REPUBLIC OF RWANDA

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES

RWANDA FEEDER ROADS DEVELOPMENT PROJECT

FINAL REPORT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN FOR INDICATIVE FEEDER ROADS

NYABIHU DISTRICT

Intercontinental Consultants and Technocrats Pvt. Ltd. (INDIA)
In Association With
ALN Consultants Ltd (RWANDA), as Sub-Consultant

April, 2018

0 EXECUTIVE SUMMARY

The Government of Rwanda (GoR) through the Ministry of Agriculture and Animal Resources (MINAGRI) and different Development Partners are intensifying their support to agriculture and indicative feeder roads infrastructure development to minimize post-harvest loss and high transport cost across the country. In this regards, the GoR launched the Rwanda Indicative feeder roads Development Project (FRDP) to develop agricultural marketing roads. This project received financing from IDA to rehabilitate, upgrade and maintain 500 km of indicative feeder roads in Rwamagana, Gisagara, Karongi and Nyamasheke Districts. The GoR also applied for additional funding for the rehabilitation of 1200 km of indicative feeder roads in other six districts, namely Gatsibo, Nyagatare, Nyaruguru, Gakenke, Rutsiro and Nyabihu Districts. Nyabihu District is one of the 7 Districts that make the Western Province. It is made up of 12 sectors, subdivided into 73 Cells and 473 villages. The District covers a surface area of 537.73 sq.km, with a population of 294,740 inhabitants[1] and road network in poor condition.

MINAGRI through FRDP prepared the feasibility report for 200.7 km of indicative feeder roads in the district of Nyabihu. The major activities associated with the indicative feeder roads in Nyabihu District include rehabilitation/upgrading of carriageway pavement with a standardised width, bridges and drainage work as well as maintenance of rehabilitated infrastructures. The potential borrow areas have been identified. The quarry sites will be identified prior to commencement of works. The map showing different indicative feeder roads and sensitive receptors is presented below.

The average carriageway width of the indicative feeder roads ranges from 2.1 to 5.1 m and will be upgraded to 6m width. The project plans to construct 479 culverts and bridges with a total length of 3,639 m and 84.73 km of drains. Out of twelve (12) potential borrow areas identified, nine (9) are close to the project site; the other three being localized in the neighbouring District of Musanze. The quarry sites are outside the project site and have not yet been identified. This identification will be done prior to construction and will be covered by the construction ESMP to be prepared and submitted by the contractor to the SPIU.

The rehabilitation of the indicative feeder roads requires the preparation of an Environmental and Social Impact Assessment/ Environmental and Social Management Plan (ESIA/ESMP) to ensure that the planned activities are environmentally and socially implemented in full compliance with Rwanda's and the World Bank's environmental and social policies and regulations. In this regards, MINAGRI/FRDP hired Intercontinental Consultants and Technocrats Pvt. Ltd. (ICT) in association with ALN Ltd to carry out an Environmental and Social Impacts Assessment (ESIA) study in indicative feeder roads of Nyagatare, Gatsibo, Nyaruguru, Nyabihu and Rutsiro Districts. The present report focuses on the main findings from Nyabihu District.

The main objective of the assignment was to assist the Rwanda Indicative feeder roads Development Project (FRDP) of the Ministry of Agriculture and Animal Resources (MINAGRI), in conducting the Environmental and Social Impact Assessment (ESIA) and corresponding Environmental and Social Management Plans (ESMP) for indicative feeder roads in Nyabihu District.

The methodology adopted for the preparation of this report includes the review of feasibility reports and detailed designs, national and international regulations related to environmental and social safeguards, district reports and field observations and measurements as well as discussions with project's experts/ personnel. Public consultation meetings with different stakeholders were also conducted in the project area to explain the project and determine the beneficiaries' opinions and concerns on the environmental impacts of the rehabilitation of indicative feeder roads in the District.

The assessment by the Consultant showed that the District is a mountainous region characterized by steeper slopes, with an altitude above 1,800 m and a very rich and vast hydrographic network. The total number of households likely to be affected is 1,071 composed of 4,910 people including 2,298 men and 2,612 women.

The results of the ESIA study revealed that the indicative feeder roads project in Nyabihu District has both positive and negative impacts. The positive impacts include employment opportunity, skill transfer, enhanced economy in rural areas, increase in social and industrial activity, improved transport system, saving in travel time, reduction in accidents, better drainage system, reduction in fuel consumption and green house gases. Potential adverse impacts include loss of 74.32 ha of land (including 48.12 ha for roads widening and 26.2 ha of borrow areas), 518 trees with at least 30 cm of girth size and relocation of 119 houses; increase in erosion rates, soil pollution due to spill of oil, grease and other chemical/ material on road, disruption of natural drainage, water pollution due to construction in water front structures or disposal of waste; increase in water demand, increased roads embankment landslides, risks to health due to poor waste disposal and outside labour employment; increase in noise and air pollution in the vicinity of the construction sites, increased road congestion, encroachment to protected areas, loss of biodiversity and 16 water points.

The above adverse impacts are low to medium and can be mitigated. Adopting a proper waste management system at the site, designing and constructing properly the drainage

pattern, provision of sanitary facilities, construction of erosion control measures in areas with high erosion risks, stabilizing 10.06 km of roads embankments with engineering measures and the remaining with vegetation, checkdams/ silt trap structures before discharging roadside runoff into receiving water bodies, using motorized equipments in good working conditions during daytime, regular spray of water during road construction whenever required, application of traffic management measures or preparing alternative roads in case of road closure, provision of protective equipments to workers, organizing awaireness campaigns for the prevention of communicable diseases, compensation for affected assets, etc. are among the measures to mitigate the potential adverse project impacts. The monitoring plan was set up to ensure the negative impacts are attenuated. The contractor and supervising firm will respectively implement the project and follow up its compliance with environmental and social safeguards under the direct supervision of MINAGRI/FRDP and Nyabihu District. RDB will approve the report while REMA will oversee the project implementation and environmental audit during the project implementation. Other stakeholders include MININFRA/RTDA, MINIRENA/RNRA, MINALOC, RSB and World Bank.

Different stakeholders (local authorities, Community, Road Users and Cooperative and church leaders) were consulted to explain the project and give them the opportunity to express their views and concerns. Most of the consulted stakeholders are in favour of the project but requested for the compensation of their properties likely to be affected.

The bills of quantities (BoQ) prepared for the cost of environmental and social management along with monitoring plans, are estimated at 647,152,000 Frw, including 593,802,000 Frw for ESMP and 53,350,000 Frw for environmental and social monitoring plans. The total ESIA/ESMP cost is 2.2% of the total District project cost.

The Government of Rwanda will locally disclose this ESIA/ESMP report and will authorize the World Bank to disclose it electronically through its External Website.

In view of the ESIA/ESMP results, it could be concluded that the project will bring substancial benefits to the Nyabihu community. The identified negative impacts can be mitigated with the proposed Environmental and Social Management Plans (ESMP). However, for the successful implementation of planned development activities, the timely implementation of the proposed mitigation measures is required.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ANNEXURE

ABBREVIATIONS

AIDS	:	Acquired Immune Deficiency Syndrome
amsl	:	Above Mean Sea Level
BP	:	Bank Procedure
CBD	:	Convention on Biological Diversity
DPR	:	Detailed Project Report
DPs	:	Displaced Persons
EA	:	Environmental Assessment
EDPRS	:	Economic Development and Poverty Reduction Strategy
EIA	:	Environmental Impact Assessment
EMP	:	Environmental Management Plans
ESIA	:	Environmental and Social Impact Assessment
ESMP	:	Environmental and Social Management Plan
FS	:	Feasibility Studies
GDP	:	Gross Domestic Product
GOR	:	Government of Rwanda
HIV	:	Human Immune Deficiency Virous
IDA	:	International Development Association
IL	:	Impact Level
IWRM	:	Integrated Water resources Management
LCV	:	Light Commercial Vehicle
LHS	:	Left Hand Side
MDG	:	Millennium Development Goals
MINAGRI	:	Ministry of Agriculture and Animal Resources
MINALOC	:	Ministry of Local Government

MINIRENA	:	Ministry of Natural Resources
NAP	:	National Action Plan
NAPA	:	National Plan of Action
NBSAP	:	National Bio-diversity Strategy and Action Plan
NCC	:	National Consultative Committee
NGOs	:	Non-Governmental Organizations
NFP	:	National Forest Policy
NMT	:	Non-Motorized Transport
NR	:	National Road
NWP	:	National Water Policy
OP	:	Operation Policy
PAPs	:	Project Affected Persons
PCRMP	:	Physical Cultural Resources Management Plan
POL	:	Petrolium, Oils and Lubricants
PM	:	Patriculate Matter
QA	:	Quality Assurance
RAP	:	Resettlement Action Plan
RCC	:	Reinforced Cement Concrete
RDB	:	Rwanda Development Board
REMA	:	Rwanda Environmental Management Authority
RFP	:	Request for Proposal
RFRDP	:	Rwanda Indicative feeder roads Development Project
RLDSF	:	Rwanda Local Government Development Support Fund
RHS	:	Right Hand Side
RMF	:	Road Maintenance Fund
RNRA	:	Rwanda National Resources Authority
RSB	:	Rwanda Standards Board
RTDA	:	Road Transport Development Agency
SPM	:	Suspended Particulat Matter
Sq. mi	:	Square Mile
STD	:	Sexually Transmitted Disease
ToR	:	Terms of Reference
ROW	:	Right of way
TP	:	Transport Policy
WB	:	World Bank
WHO	:	World Health Organization

1 INTRODUCTION

1.1 BACKGROUND OF THE PROJECT

Rwanda, the world's 149th largest country, has an area of 26,338 square kilometres (10,169 sq mi). Rwanda has four provinces (East, West, North and South) and Kigali city. Nyabihu District is one of the seven Districts that makes the Western Province. The District has 12 sectors, which are Bigogwe, Jenda, Jomba, Kabatwa, Karago, Kintobo, Mukamira, Muringa, Rambura, Rugera, Rurembo and Shyira. Nyabihu District is about 150 km from the Capital Kigali and it can be approached via National Roads RN-4 and RN-11. The District covers a surface area of 537.73 sq.km; with a population of 294,740 inhabitants[2]. The population density accounts for 548 inhab/sq.km, ranking the District seventh country-wide; density is 18% higher than the national average (415 inhab/sq.km) and 30% higher than the Western Province average (420 inhab/sq.km). The population growth 2002-2012 has been 0.9%, significantly lower than the national average (2.6%). The district is rural with a not negligible share of urban population accounting for 13.8 % of total District. Figure 1 indicates the location of Nyabihu District in Rwanda.

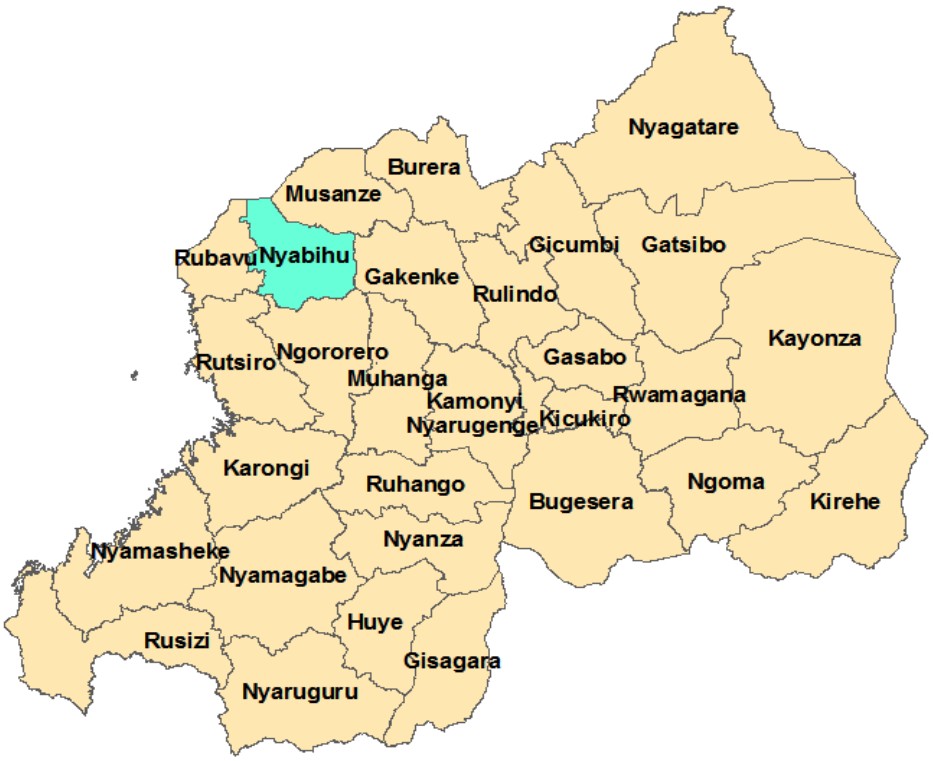

Figure 1 : Map of Rwanda showing the location of Nyabihu District

[2]Rwanda 4th Population and Housing Census, 2012 (NISR)

The Government of Rwanda, through the Ministry of Agriculture and Animal Resources (MINAGRI), has launched the Rwanda Indicative feeder roads Development Project (FRDP) in order to reduce post-harvest loss and the high transport price in the project areas by developing agricultural marketing roads. The FRDP initially received financing from IDA of the World Bank to rehabilitate, upgrade and maintain 500 km of indicative feeder roads in four Districts, namely Rwamagana, Gisagara, Karongi and Nyamasheke. Under the same project, the Government of Rwanda applied for additional funding for the rehabilitation of 1200 km of indicative feeder roads in other six Districts, namely Gatsibo, Nyagatare, Nyaruguru, Gakenke, Nyabihu and Rutsiro.

The total road network in the project area is estimated at 200.7 km which are in poor condition. The implementation of FRDP will improve the consumer access to safe and affordable food and enhance producers' access to markets, especially in areas with high agricultural potential through improvement of indicative feeder roads.

M/s Intercontinental Consultants and Technocrats Pvt Ltd, in association with ALN Consultants Ltd (*as sub-consultant*), was contracted by MINAGRI / FRDP to provide the consultancy services in conducting the Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) for indicative feeder roads in the above mentioned five Districts. The present report only concerns Nyabihu District. **Figure 2** presents the indicative feeder roads in Nyabihu District.

Figure 2 : Map showing the indicative feeder roads in Nyabihu District

1.2 OBJECTIVE

The **main objective** of the assignment is to assess the Environmental and social Impacts of the rehabilitation of indicative feeder roads in Nyabihu District for the account of Rwanda Feeder Road Development Project (FRDP).

The **specific objectives** are:

- To assess the potential positive and negative environmental and social impacts of the indicative feeder roads rehabilitation projects in Nyabihu District,
- To propose environmental and social management measures to mitigate the negative impacts and enhance positive impacts;
- To produce reports in the format and level to meet ESIA guidelines, policies and regulation of Government of Rwanda (GoR) and the operation policies and safeguards measures of the World Bank (WB).

1.3 SCOPE OF SERVICES

The scope of services includes ensuring that indicative feeder roads rehabilitation is implemented in an environmentally and socially sustainable manner and compliance with Rwanda's and the World Bank's environmental and social policies and regulations. The scope of work is issued along with Request for Proposal (RFP). However, keeping in view World Bank Operation Policy (OP), the tentative scope of work has been drawn for the study and according approach and methodology have been drawn. The scope of services in brief for the present study is as follows:

- Development of baseline status for various environmental and social attributes on Physical Environment; Ecological Environment; Physical Cultural Resources and Socio-economic profile;
- Assessment of potential positive and negative environmental and social impacts of proposed indicative feeder roads;
- Proposing Environmental and social mitigation measures and management plans to effectively address the negative impacts;
- Prepare the ESIA/ ESMP report for review and approval by FRDP, RDB and the World Bank;
- Prepare post project monitoring programs, institutional arrangement to implement the environmental and social plans and cost involved.

The project will improve the existing infrastructure in rural areas, which will boost the connectivity and transfer of goods and people from one place to another in less time. The improved indicative feeder roads will contribute towards the GDP of the project area and the country in general. The project will also pave the way for systematic improvement and continued investment in Nyabihu District.

1.4 APPROACH AND METHODOLOGY

In formulating this approach and methodology, care has been taken for the requirements of the ToR and accordingly given full consideration to the objectives, purpose and the scope of the study. The review of project reports (feasibility reports and detailed designs, project appraisal documents, etc), national and international regulations related to environmental and social safeguards, district reports; visits for field observations and

measurements; consultations with various stakeholders (local authorities, local communities, farmers' organizations, church leaders, private sector federation, etc) as well as discussions with project's experts/ personnel are tools and methodologies used to collect needed information. A questionnaire was prepared and administered to affected families within the right of way (RoW) to assess their socio-economic conditions. The sample size of 80 families, ie 2 people for every 5km, was used to collect needed information.

Based on site assessment findings, the Consultant identified potential impacts, both positive and negative, prepared Environmental and Social Management and Monitoring Plans as well as estimated costs before producing the ESIA/ESMP report. This report will be submitted for review and approval by FRDP, RDB and the World Bank.

The study was conducted in such a manner and procedure that it fulfils the requirements of Government of Rwanda and the World Bank's environmental and social appraisal procedures.

2 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

2.1 NATIONAL RELEVANT POLICIES AND STRATEGIES[3]

This chapter describes the relevant policies and strategies, legal instruments, institutional arrangement and international framework applicable to rehabilitation and /or construction of feeder road in different districts of Rwanda. It summarizes the National Laws and describes the procedure for obtaining environmental permits to allow project implementation. The awareness of environmental and social issues started as early as in 1920. Thereafter were created respectively Albert Park (1925), the National Forest of Nyungwe as a reserved forest (1933) and Akagera National Park (1935). The environmental friendly initiatives were also supported by vast campaigns for soil conservation from 1947. In 1977 action program of environmental nature were launched such as: human settlement (1977), stockbreeding (1978), soil protection and conservation (1980), water supply in rural areas (1981), erosion control (1982) and reforestation (1983). However, it is only in 2003 that an elaborate National Evironment Policy was established by the Government of Rwanda.

2.1.1 National Environment Policy

The National Environment Policy was adopted by the Cabinet in November 2003. This policy aims at the following:

- to enable the country to strike a dynamic balance between population and resources while complying with the balance of ecosystems;
- to contribute to sustainable and harmonious socio-economic development such that, both in rural and urban areas, men and women may realize their development and well-being in a sound and enjoyable environment; and
- to protect, conserve and develop natural environment.

This policy therefore seeks to integrate environmental sustainability principles into all development processes, programmes and projects. For roads, the nature of the terrain in Rwanda makes environmental issues (e.g. water runoff and landslides), the main threats to sustainable road maintenance. The terrain and the settlement patterns also indicate that roads – which are the most common mode of transport –could be a potentially dangerous development, unless environmental and social considerations of human safety, risk of losses, are prior anticipated, identified, analysed and integrated into the project design and implementation.

[3] National Environmental Policy (November 2003)

This underscores the importance of EIA in road projects.

This policy provides a framework for the reconciliation of the three pillars of sustainable development, namely environment, social and economic issues. Rwanda environment policy also advocates to ensure compliance with environment in all transport and communications activities which includes the following:

i) to ensure that land, lake and air transport regulations minimize pollution;
ii) to prevent air and soil pollution by emissions of gases and heavy metals from transport equipment;
iii) to ensure the protection of areas bordering roads;
iv) to protect the population against noise nuisances and dangers from air, lake and land transport.

2.1.2 National Transport Policy

The National Transport Policy was approved in December 2008. This policy takes into account the action plan of the Sub-Saharan Africa Transport Policy and cross-cutting issues such as HIV/AIDS, gender mainstreaming, socio-economic and environment. The transport infrastructure sector must be effective to facilitate the other socio-economic sectors and thus stimulate the growth for achievement of the objectives of EDPRS-II and Vision 2020[4].

This policy highlights the main objective of the road sub-sector in Rwanda as to Maintain, Rehabilitate and Develop the National Road Network, which is responsible for more than 80% of human and goods traffic in the country. The policy's strategies to meet these objectives are:

a) Expanding and improving Rwanda's road infrastructure, protecting existing capital investments, and improving road safety;
b) Establishing an appropriate institutional framework for the accelerated development of the road sub sector;
c) Financing road maintenance works through multi-year maintenance contracts, renewable under performance evaluation;
d) Encouraging community participation in road maintenance through the district development committees;

[4]The transport policy is inspired by planning tools such as EDPRS-II, National Investment Strategy, and the medium term expenditure framework. The policy enables the establishment of viable transport sector for economic development in Rwanda. It is also addressing the present and future shortcomings. The vision 2020 advocates the internal trade and mobility with access to market through road network particularly in rural area. The transport policy also matches with the millennium development goals of economic growth and reduction in poverty.

e) Improving the ability and quality of local road infrastructure, thereby enabling the rural community to market its crops;
f) Creating an environment conducive to the encouragement of Private Sector participation in rehabilitating, maintaining, and developing road infrastructure. Accordingly, a Road Maintenance Fund was established to provide adequate, reliable financing for road maintenance activities; and a Road Maintenance Strategy was formulated to guide the process.

2.1.3 Road Maintenance Strategy

The Road Maintenance Strategy of May 2008 emphasises routine maintenance as a more cost-effective tool of establishing and managing road infrastructure. The strategy aims to:

a) Provide a policy framework to guide RTDA and Districts staff in maintenance programming, planning and execution;
b) Ensure that investments are made in the development of roads;
c) Ensure that infrastructures are safeguarded and allowed to deliver their maximum benefit; and to allow all stakeholders to understand the investment decisions taken by MININFRA.

This strategy lays emphasis on building capacity, fostering public-private partnerships and a long-term project cycle involving multi-year contracts management. Environmental management is a key aspect of the Road Maintenance Strategy, as this is critical for cost-effective road maintenance and rehabilitation.

2.1.4 National Land Policy

National land policy was adopted in February 2004. This policy provides register and transfer of land and possibility of investments in land. It also highlights key principle of land use and land management. The policy advocates the protection of green areas, marshy land, valley and protected areas in Rwanda. These protected areas are classified as such because of their multiple roles, namely ecological, economical, cultural, and social. The main objective of their preservation was the conservation of different species and different habitats of biodiversity for educational, touristic and research purposes. These areas have been affected by various changes, one of which is the spatial reduction due to the resettlement of the population.

For road scheme development, the implications of this policy relate to resettlement and compensation; assessing the suitability of particular areas for road infrastructure; and the influence of infrastructure development on the changing value and use of land.

2.1.5 Integrated Water Management Policy

The Integrated Water Managemet Policy aims for sustainable management of water. This policy is relevant as some of the activities such as bridges, culverts and road construction will be undertaken in buffer zones of rivers and/or marshlands. The policy also highlights management of water on both demand and supply side. Policy also integrates the other policies on forests, wetland, agriculture and land.

2.1.6 National Development Strategy[5]

The Vision 2020 document has developed National Development Strategy in year 2000 wherein it is realized that Rwanda shall have a reliable and safe transport network of indicative feeder roads. Hence indicative feeder roads will continue to be extended and improved. Land use management, urban and transport Infrastructure development are considered as important pillar among 6 pillars of vision 2020 and protection of environment and sustainable natural resource management is one of the crosscutting areas of the vision. The other important planning tools are: the second Economic Development and Poverty Reduction Strategy (EDPRS-II), the National Investment Strategy, Millennium Development Goals (MDGs) and the Medium Term Expenditure Framework. The vision document advocates to the development of economic infrastructure of the country and transport infrastructure in particular. The Government of Rwanda (GoR) developed National Strategies and Action plans for the following:

- National Biodiversity Strategy and Action Plan (NBSAP) 2003,
- National Plan of Action (NAPA) for climate change adaptation (2006/7), and
- National Action Plan (NAP) for combating desertification.

These strategies and action plans reflect national priorities for Environmental Natural Resources (ENR) sector that are online with the Rwanda's second phase Economic Development and Poverty Reduction Strategy (EDPRS-II) as a medium-term framework for achieving the country's long term development aspirations as embodied in Rwanda Vision 2020 and the Millennium Development Goals (MDG) priorities.

[5]Rwanda Vision 2020; Republic Of Rwanda; Ministry Of Finance and Economic Planning (2000).

2.2 LEGAL INSTRUMENTS

The main national legislations that provide for and guide Environmental and Social Impact Assessment (ESIA) for road infrastructure, and the provisions, thereof, include the following: National Constitution of June 2003 obliges the Government of Rwanda - current and future – together with the population, to carefully harness environmental resources in order to ensure sustainability and inter-generational equity. The degree of relevance of these legislative instruments varies with the activity and area, because environmental consequences of development tend to be area and theme specific.

2.2.1 Important Environmental Legislations

The legal instruments that are more relevant to the present project are:

i. The Constitution of the Republic of Rwanda, June 2003: In particular, articles 29, 30, 49, 62, 88, 90, 93, 108, 118, 190, 191 and 201, make various provisions for environmental management; from guaranteeing rights to a healthy environment for every citizen.
ii. Organic Law No. 04/2005 determining the modalities for the protection, conservation and promotion of environment in Rwanda.
iii. Organic Law No. 08/2005 of 14/07/2005, determining use and management of land in Rwanda;
iv. Law No. 55/2011 of 14/12/2011 governing roads in Rwanda;
v. Law No. 32/2015 of 11/06/2015 relating to Expropriation in the Public Interest in Rwanda;
vi. Law No. 62/2008 of 10/09/2008 regulating the use, conservation, protection and management of water resources;
vii. Ministerial Orders No. 003/2008 and No. 004/2008 of August 2008 respectively relating to the requirements and procedure for environmental impact assessment and the list of works, activities and projects that have to undertake an environment impact assessment;
viii. Ministerial Orders No. 005/2008 and No. 007/2008 of August 2008 respectively establishing modalities of inspecting companies or activities that pollute the environment and list of protected animals and plant species;
ix. Ministerial Instruction No. 02/UPPR/09 with respect to excavations and restoration of public infrastructure by Communications and Infrastructure Service Providers (CISPs) operating in Rwanda, April 21, 2009.
x. General Guidelines and Procedures for Environmental Impact Assessment of

November 2006, prepared by Rwanda Environment Management Authority (REMA).

xi. Sector Guidelines for Environmental Impact Assessment (EIA) for Road Development Project (August, 2009);

2.2.2 Environmental Impact Assessment Legislation in Rwanda

The Rwandan legislation governing EIA concerns also the construction or rehabilitation of national roads, district roads and repair of large bridges.

Some of the roads in Nyabihu District will cross wetlands, and the Environmental Organic Law determines that:

(Article 17): The use, management of water and its resources shall not in any way use unfair methods of exploitation that may lead to natural disasters such as floods or drought. Any acts concerned with water resources like watering plants, the use of swamps and wetlands and others, shall always be subject to prior environmental impact assessment.

(Article 83): It is prohibited to dump in wetlands: 1° waste water, except after treatment in accordance with instructions that govern it; 2° any hazardous waste before its treatment. Any activity that may damage the quality of water is prohibited.

Chapter IV of Rwanda Environmental Organic Law is dedicated to EIA in its articles 67 to 70 as cited below:

(Article 67): Every project shall be subjected to Environmental Impact Assessment/Environmental Management Plan, before obtaining authorization for its implementation. This applies to programmes and policies that may affect the environment. An order of the Minister having environment in his/ her attributions shall determine the list of projects mentioned in this organic law.

(Article 68): The environmental impact assessment shall at least indicate the following:

- a brief description of the project and its variants;
- a study of direct or indirect projected effects on a place;
- analysis relating to the initial state of a place;
- measures envisaged to reduce, prevent or compensate for the damage;
- reasons based on in selecting such a place;

- an explanation of the methods that will be used in monitoring and evaluating the state of the environment before, during the activities of the project, but particularly after completion of the project;
- an estimation of the cost of the measures recommended to prevent, reduce or compensate for the negative effects the project may cause on the environment as well as the measures for examining and controlling the status of the environment.

An order of the Minister having environment in his or her attributions shall specify the details of the provisions of this article.

(Article 69): The Environmental Impact Assessment shall be examined and approved by the Rwanda Environment Management Authority or any other person given a written authorization by the Authority. The promoter pays a levy reduced from the operating cost of his or her project excluding the working capital. This tax is determined by the law establishing the National Fund for the Environment. The EIA shall be carried out at the expense of the promoter.

Note: REMA used to have the legal authority/ responsibility of overseeing the conduct of Environmental Impact Assessment (EIA) under Article 69 of the Environmental Organic Law, but since the establishment of the Rwanda Development Board (RDB) in September 2008, the responsibility of overseeing the conduct of EIAs was given to RDB under Article 3 of the Organic Law No. 53/2008 of 02/09/2008 establishing RDB and determining its responsibilities, organisation and functioning. Article 3 point 11 of the said law states that RDB should facilitate and help investors to meet environmental standards in the execution of their projects.

(Article 70): An order of the Minister having environment in his or her attributions establishes and revises the list of planned works, activities and projects, and of which the public administration shall not warrant the certificate, approve or authorize without an environmental impact assessment of the project. The EIA shall describe direct and indirect consequences on the environment. The list of works, activities and projects that have to undertake an Environmental Impact Assessment has also been published under the Ministerial Order No. 004/2008.

2.2.3 Environmental Impact Assessment Guidelines in Rwanda

Rwanda Environment Management Authority (REMA) has established a number of EIA guidelines, ranging from general EIA guidelines to sector specific guidelines in order to ease the EIA process in Rwanda. The following areEIA guidelines presently available:

1. General EIA guidelines
2. EIA guidelines for environmental auditing
3. EIA guidelines for roads development projects
4. EIA guidelines for water resources management
5. EIA guidelines for wetlands management
6. EIA guidelines for waste management
7. EIA guidelines for housing industry

i. General EIA guidelines

These guidelines were developed by REMA in August 2009 in order to assist projects developers, contractors and EIA practitioners.

An EIA process in Rwanda includes 5 steps: (i) project application and registration, (ii) screening, scoping and terms of reference, (iii) EIA study and report, (iv) submission of an EIA report and finally (v) decision making. **Figure 4** summaries the EIA procedure in Rwanda including timeline in each stage.

Screening enables categorisation of projects according to their Impact Level (IL) as follows:

Category 1: (Impact level IL1): Full EIA not required. Rwanda Development Board (RDB) advises on the appropriate environmental management measures (plan). The Exercise may take 14 days from the day received the project brief; (days may be less or more depending on the nature of the project);

Category 2: (Impact level IL2): The proposed projects under this category are screened to determine whether or not a full EIA is needed. In this connection, RDB provides the developer with clear indication of the additional information required. Once this information is received, RDB will determine whether or not a full EIA of the project is needed.

Category 3: (Impact level 3): Full EIA is required.

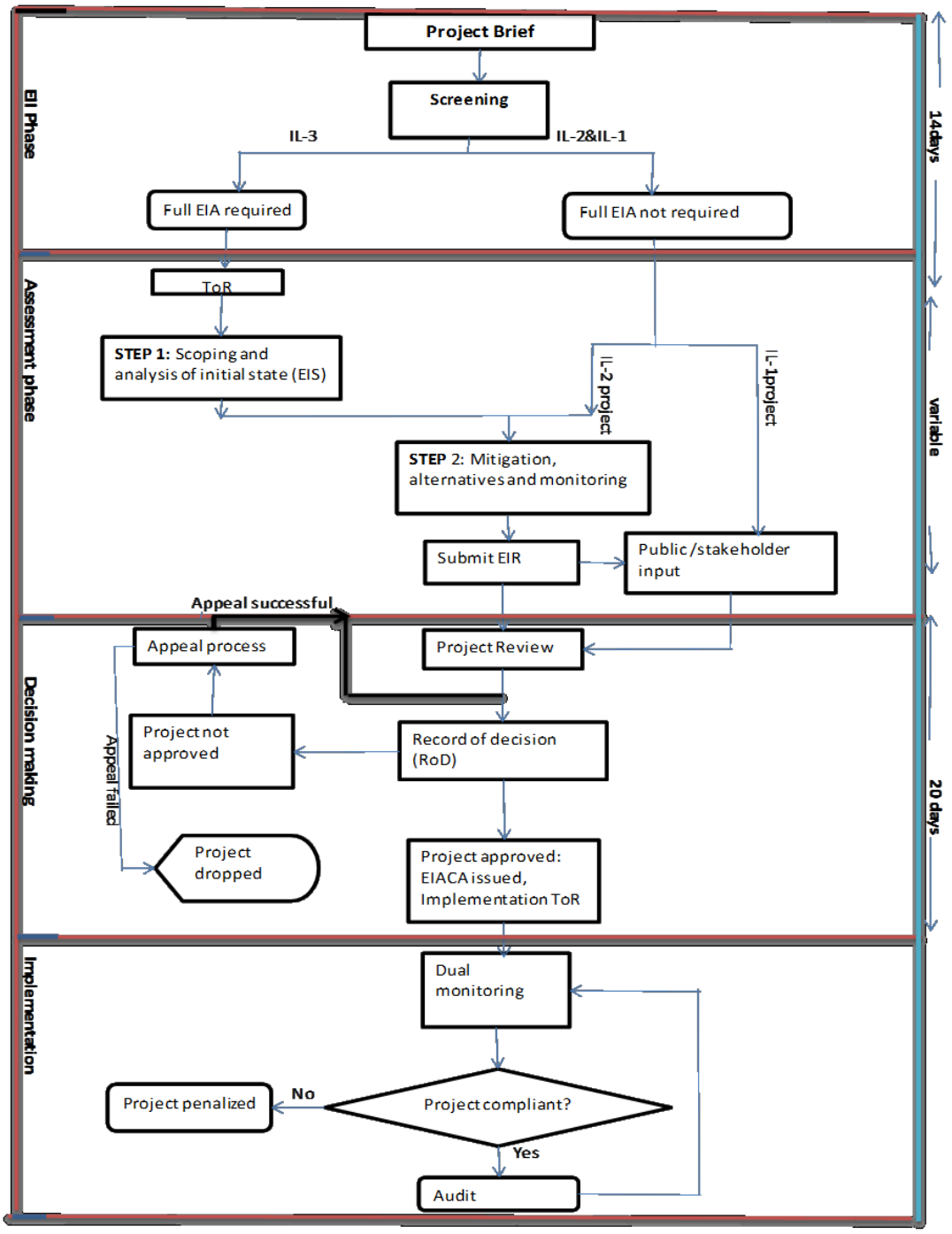

Figure 3: ESIA Procedure in Rwanda[6]

Ministerial order No. 004/2008 of 15/08/2008 establishes the list of works; activities and projects that have to undertake an EIA. They are classified into infrastructure, Agriculture and Animal Husbandry, works in park and in its buffer zones and mine extraction.

[6] General Guidelines and Procedures for Environmental Impact Assessment

According to that law, the proposed feeder road rehabilitation project falls in category 3 (IL3) of infrastructure where full EIA is required.

ii. EIA guidelines for roads development projects

These guidelines were developed by REMA in August 2009 in order to assist road developers, contractors, EIA practitioners and planners in the road sector, providing a tool that guides the EIA process so that EIA in the road sector is satisfactory and cost-effective. To ensure this, these guidelines:

- provide basic information to be collected on biophysical, social, cultural and economic parameters relevant for roads development, in each phase of the road development project cycle;
- advise on the methodology for collecting and analyzing data;
- provide a generic framework for logically documenting and presenting the EIA results (general report outline);
- provide basic guide on how to execute EIA activities including conducting public hearings for multi-stakeholder projects like roads development.

iii. EIA guidelines for water resources management

These guidelines were developed by REMA in March 2009; one of its objectives being to enable environmentally adequate management of all development project activities that may negatively impact water resources.

iv. EIA guidelines for wetlands management

These guidelines were also developed by REMA in March 2009; with the main purpose of enabling environmentally adequate management of all development project activities that may negatively impact wetlands.

2.2.4 International Environmental Related Conventions signed by Rwanda

Besides the law and regulation on EIA at national level, Rwanda has approved and signed several international conventions which are in one or another way related to environmental management of indicative feeder roads development projects:

- The CARTAGENA protocol on Biosafety to the Convention of Biodiversity signed in NAIROBI from May 15, to 26, 2000 and in NEW YORK from June 5, 2000 to June 4, 2001 as authorized to be ratified by Law n° 38/2003 of 29 December

2003;

- The KYOTO Protocol to the Framework Convention on Climate Change adopted at KYOTO on March 6, 1998 as authorised to be ratified by Law n° 36/ 2003 of 29 December 2003;
- The RAMSAR International Convention of February 2, 1971 on Wetlands of International importance, especially as waterfowl habitats as authorised to be ratified by Law n° 37/2003 of 29 December 2003;
- The STOCKHOLM Convention on persistent organic pollutants, signed in STOCKHOLM on 22 May 2001, has been approved by Presidential Order n° 78/01 of 8 July 2002;

This shows the commitment of Rwanda to fulfil all the requirements at international level in terms of environmental protection toward sustainable development.

2.3 INSTITUTIONAL FRAMEWORK

The roads sector is an anchor to social and economic transformation, and for this reason, has spider web-like networks with other sectors, including agriculture, international trade, local governance, education, health; etc. The institutional framework for environmental impact assessment in the indicative feeder roads sector is, therefore, complex. The main institutions involved and their roles are summarised in **Table 1** below.

Table 1: Key Institutions in ESIA implementation and major stakeholders in indicative feeder roads development in Rwanda

Institution / Agency	**Key interests and responsibilities for indicative feeder roads**
1. Rwanda Environment Management Authority (REMA)	National authority responsible for environmental protection, conservation and promotion. It oversees the implementation of ESIA guidelines. It is responsible for conducting public hearing during the ESIA process and conducts the project environmental audit during project implementation.
2. Rwanda Development Board (RDB)	In order to facilitate the investors, RDB has been given the responsibility of reviewing the ESIA reports, providing environmental compliance certificates to development

	projects
3. Rwanda Standards Board (RSB)	RSB has a mission to provide standards based solutions for consumer protection and trade promotion for socio-economic growth in a safe and stable environment in Rwanda. It has developed standards for design and maintenance of indicative feeder roads (RS 267:2015).It has also developed other standards related to the road sector like the standards on ambient air quality and noise levels.
4. Ministry of Agriculture and Animal Resources (MINAGRI) through FRDP	Formulating policies andinitiating public investments for the agriculture sector in the country. Together with its stakeholders, MINAGRI is implementing indicative feeder roads through FRDP for supporting the farmers in improving their access to markets, therefore improving the agriculture value-chain. MINAGRI also oversees the compensation process, approves the list of PAPs and proceeds to their payments and conducts regular crosschecking visits to PAPs and banks to ensure PAPs were paid and properly use the compensation.
5. Ministry of Infrastructures (MININFRA)	Formulating policies and laws for roads development in the country. It is also responsible for national roads, highways and bridges and oversees indicative feeder roads development policies.
6. Rwanda Transport Development Agency (RTDA)	Oversees the implementation of the transport policy, including management of roads (National roads, District Roads and Indicative feeder roads); initiating public investment in transport services. It provides technical support to the Districts in the development of indicative feeder roads.
7. Ministry of Natural Resources (MINIRENA)	Formulating policies and regulations for land administration and land use planning; environmental protection and natural resources utilization, including expropriation. In indicative feeder roads development, a major responsibility is to allow

	the exploitation of borrow pits and quarries for the required construction materials.
8. Ministry of Local Government (MINALOC).	Formulating national policies and laws on decentralisation and local governance – Supervising District authorities which are responsible for indicative feeder roads development.
9. Districts	Districts are responsible for planning and execution of indicative feeder roads construction, rehabilitation and maintenance projects. For the purpose of PAPs expropriation by FRDP where necessary, Nyagatare District will be the "Expropriator" as per the Expropriation Law.
10. Rwanda Natural Resources Authority (RNRA)	Land registration and land use planning throughout the country. Compensation and resettlement will depend on legal ownership.
11. Rwanda National Police (RNP)	The National police have statutory responsibility for law enforcement including ensuring that road traffic laws are observed; and therefore all roads are constructed in conform to appropriate legislations. They also have to provide security to road construction facilities.
12. World Bank	- Provision of loans and grants financing for road construction - Clearance of ESIA/ESMP report, - Technical assistance in the implementation of project activities;
13 Contractor	- Preparing and implementing the site specific ESMP during construction phase, including employing an environmental and social safeguards expert for the proper ESMP implementation.
14. Supervising Firm	- Supervising the proper implementation of site specific ESMP

2.4 WORLD BANK SAFEGUARD POLICIES

In order to avoid adverse negative environmental and social impacts of a proposed road for improvement, no road contract tender should be launched before a road specific ESIA and RAP based is prepared based on final designs, the ESMP with the management measures is incorporated in the bidding documents, and every person affected by the works on that section has been relocated and/or properly compensated according to Bank policies.

The World Bank Operational Policy 4.01 requires that the Environmental and Social Assessment report must be a standalone document to meet the bank appraisal procedures for the project. The disclosure should be in Rwanda where it can be accessed by both the general public and local communities. In accordance with the World Bank Safeguard operational policies and procedures the proposed Rwanda Feeder Road Development Project has been classified as Environmental Assessment (EA) risk category A equivalent to Category 3 under the Rwanda's EIA Guidelines. The EA categories are summarized on **Table 2**.

Table 2: Categorization of Projects Subjected to EIA (World Bank, 1999)

Category A	Category B	Category C	Category FI
The project is likely to have significant adverse impacts that may be sensitive, irreversible, diverse, comprehensive, broad or precedent setting. These impacts generally result from a major component of the project and affect the area as a whole or an entire sector.	Although an EIA is not always required, some Environmental analysis is necessary. The projects have impacts that are 'less significant, not as sensitive, numerous, major or diverse. Few if any of the impacts are irreversible and mitigation measures can easily be designed.	The projects result in negligible or minimal direct disturbance of the physical Environment. Typical projects include education, family planning, health, and human	It involves investment of Bank funds through a financial intermediary

A full environmental assessment is required	**Typical projects include rehabilitation, maintenance, or upgrades, rather than new construction**	resource development **No EIA or other analysis is required**.	

The project triggers the following safeguard policies:

i. **Environmental Assessment – Operational Policies (OP) and Bank Procedures (BP) (OP/BP 4.01**) require environmental assessment of projects proposed that are deemed to have potential adverse impacts upon the environment to help ensure that they are environmentally sound and sustainable.Environmental Assessment is one of the 10 environmental, social, and legal Safeguard Policies of the World Bank. World Bank Environment and Social Safeguard Policy aims at improving decision making, to ensure that project options under consideration are sound and sustainable, and that potentially affected people have been properly consulted. Operational Policy 4.01 further requires that the ESIA/ESMP report must be disclosed as a separate and standalone document by the GoR and the World Bank as a condition for Bank appraisal of this project. Potential adverse environmental and social impacts include: noise, dust, soil and water erosion, and health and safety. Mitigation measures to address these impacts have been recommended in the ESMP as part of this ESIA. An Environmental and Social Management Framework (ESMF), will be prepared, consulted upon, and disclosed prior to appraisal. The measures built on Rwanda's EIA Guidelines for Roads, World Bank Group General Environmental Health and Safety Guidelines and international good practices. An Environmental and Social Management Framework (ESMF), was prepared, consulted upon, and disclosed prior to appraisal to guide the preparation of the ESIA for those subprojects yet to be identified and/or finalized. An ESIA/ ESMP will be prepared for finalized alignments of roads.

ii. **Natural Habitats (OP/BP 4.04) -** This policy aims at the conservation of natural habitats, like other measures that protect and enhance the environment. Natural Habitats are land and water areas where the ecosystems' biological communities are formed largely by native plant and animal species, and human activity has not

essentially modified the areas primary ecological functions.The policy is essential for long term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats.

The Natural Habitats policy is triggered by the project because two of the indicative feeder roads, FR2 and FR16, pass through the remnant Gishwati forest. This native forest, was originally earmarked as forest conservation zones in 1933 but was nearly depleted largely due to resettlement, livestock farming and smallholder farms in the aftermath of the 1994 Genocide against the Tutsi. After the establishment of new Mukura – Gishwati National Park in 2015, this portion was left out of the park boundary.

Different sources reveal that the remnant Gishwati forest reserve is known for a wide range of fauna, including four species of primates: the eastern chimpanzee, the golden monkey, the blue monkey, and the l'hoest's monkey (also known as mountain monkey); more than a dozen species of East African chimpanzees; mammals such as red river hog and many birds species. The forest reserve also boasts about 60 species of trees, including indigenous hardwoods and bamboo as well as exotic Pinus spicies. The ESMF and ESIA will include mitigation measures to address the potential impacts.

iii. **Physical Cultural Resources (OP/BP 4.11) -** The Bank operational policy on safeguarding cultural properties aims at protecting cultural assets and knowledge of communities in bank financed project areas. Safeguarding cultural property policy requires the determination of what is known about the cultural aspects of the proposed project site. The policy calls for consultation involving all parties including scientific institutions and NGOs as part of this process. The policy defines cultural property as sites having archaeological, paleontological, historical, religious and unique natural value. These sites, when stumbled upon, require that the authorities are informed and the site is demarcated and protected.

The feeder road project triggers this policy as some of the indicative feeder roads pass close to physical cultural heritage resources that need to be protected. Rambura – Gasiza feeder road (FR6) passes close to the Rambura grave (at about 10 m from the road).The ESMF and ESIA will address impacts on physical cultural resources and will require preparation and submission of a detailed

physical cultural resources (PCR) management plan as soon as the alignments and road designs are finalized but prior to the commencement of civil works. The PCR Management Plan will also include "chance finds procedures".

In case a physical cultural resource is found, the civil works in that particular location will stop until the revised and updated ESIA (including a PCRMP acceptable to the Association) and final RAP have been submitted to the Bank, cleared, and disclosed and compensation paid.

iv. **Involuntary Resettlement (OP/BP 4.12) -** This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by; involuntary taking of land resulting in relocation or loss of shelter; loss of assets or access to assets, or loss of income sources or means of livelihood, whether or not the affected persons must move to another location. The objective of this policy is to avoid where feasible, or minimize the resettlement, exploring all viable alternative project designs. The proposed project settings may induce land acquisition. A resettlement plan has been prepared as a separate document to mitigate against effects of displacement.The project setting may induce land acquisition. A Resettlement Policy Framework (RPF) will be prepared, consulted upon, and disclosed prior during presentation. RAPs will be prepared during implementation as and when necessary. A comparison between Rwanda laws and World Bank Policy is presented in **Table 3**.

Table 3: Comparative Analysis between World Bank OP 4.12 and Rwanda Legislations

Principles	Rwanda Legislations	World Bank's involuntary Resettlement (OP 4.12)	Recommendations to fill the gaps
Valuation	Valuation is covered by the Expropriation Law and the Law establishing and organizing the real property valuation profession in Rwanda and stipulates that the affected person receive fair and just compensation. However a ministerial order gives the value of land and crops	OP 4.12 prefers Replacement cost method of valuation of assets that helps determine the amount sufficient to replace lost assets and cover transaction costs. In applying this method of valuation, depreciation of structures and assets should not be taken into account If the residual of the asset being taken is not economically viable, compensation and other resettlement assistance are provided as if the entire asset had been taken.	Adopt replacement cost method of valuation
Compensation	Article 27 of the expropriation law No 32/2015 of 11/06/2015 entitles the landholder to compensation for the value of the land and activities incorporated on that land on the basis of size, nature location considering the prevailing market value.	OP 4.12 gives preference to land based resettlement strategies for displaced persons whose livelihoods are land-based as compared to monetary compensation	Adopt OP 4.12 mode of compensation by giving preference to land based resettlement as opposed to monetary compensation

Participation and consultation	The Rwandan law on Expropriation simply stipulates that affected peoples be fully informed of expropriation issues. The law also conflicts the very purpose of consultation and involvement by prohibit any opposition to the expropriation program if considered to be under the pretext of self-centered justification which might not be the case	WB OP 4.12 requires that persons to be displaced should be actively be consulted and should have opportunity to participate in planning and design of resettlement programs	Adopt OP 4.12 methods of participation
Timeframe	Rwanda expropriation law stipulates a timeframe upon when the property to be expropriated must be handed over which is 90 days after compensation has been paid.	OP4.12 requires that displacement must not occur before necessary measures for resettlement are in place, i.e., measures over and above simple compensation. Measures pertaining to provision of economic rehabilitation however can and often do occur post displacement. WB OP 4.12 provides for a timeframe (cut-off date) upon which interested parties are entitled to respond	A cut- off date should be applied. OP 4.12 states that, Where the borrower has offered to pay compensation to an affected person in accordance with an approved resettlement plan, but the offer has been rejected, the taking of land and related assets may only proceed if the borrower has deposited funds equal to the offered amount plus 10 percent in a secure form of escrow or other interest-bearing deposit acceptable to the Bank, and has

			provided a means satisfactory to the Bank for resolving the dispute concerning said offer of compensation in a timely and equitable manner.
Overall strategy	Section 2 of the expropriation law on procedures, provides for the process to show how the sub projects fits into the land master plan of the area in question	Under the OP 4.12 , it's not necessary to prove that the project fits within the overall land master plan	Adopt Rwanda Expropriation Law
Eligibility	Article 26 of the law No 32/2015 of 11/06/2015 requires the person who owns land intended for expropriation to provide evidence of ownership or rights on that land and presents a certificate to that effect	OP 4.12 criteria for eligibility include even those who do not have formal legal rights to land at the time the census begins but have a claim to such land or assets--provided that such claims are recognized under the laws of the country or become recognized through a process identified in the resettlement plan and also those who have no recognizable legal right or claim to the land they are occupying	OP 4.12 will be more appropriate for determining eligibility due to the fact that many of those who farm the lands don't own it, although they may have depended on farming on such lands for their livelihood, and as such, should be assisted to at least maintain their pre-project level of welfare. (especially for assets)
	Expropriation law is silent on provision of alternative land and resettlement of those to the pre-displaced status	OP 4.12 requires and prefers resettlement of displaced persons.	Use World Bank OP 4.12. During the upgrading of the feeder road, some resettlement will be required
Required Measures	Expropriation law does not provide for alternatives when	OP 4.12 requires displaced persons to be consulted on, offered choices among, and	Use World Bank OP 4.12

	undertaking compensation	provided with technically and economically feasible resettlement alternatives	
Grievance redress mechanisms	The new Expropriation Law of 2015 creates the Resettlement and Grievance redress committee and provides complaints procedures for individuals dissatisfied with the proposed project or the value of their compensation and process for expressing dissatisfaction and for seeking redress.	OP 4.12 requires PAPs be informed of the compensation exercise and establishes Grievance Redress Mechanisms	Adopt Rwanda Expropriation Law which establishes the GRM formed by District (sector/cell) authority, PAP representatives and Project

v. Forests (OP 4.36)

The objective of this policy is to assist borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development and protect the vital local and global environment services and values of forests.

This policy applies to:

- Projects that have or may have impacts on the health and quality of forests;
- Projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests; and
- Projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantations, where they are publicly, privately, or communally owned.

The bank supports sustainable and conservation oriented forests. Where forest restoration and plantation developments are necessary to meet these objectives, the bank assist borrowers with forest restoration activities that maintain or enhance biodiversity and ecosystem functionality. The bank also assist borrowers with the establishment and sustainable management of environmentally appropriate, socially beneficial, and economically viable forest plantations to help meet growing demands for forest goods and services.

This policy is triggered by the Project as some of the indicative feeder roads, like FR4, FR5, FR14, FR9, traverse small forest plantations, privately owned. The widening of roads will require tree cutting in forest plantations.The Project plans to plant trees for the protection of rehabilitated indicative feeder roads and replacement of lost trees.

3 PROJECT DESCRIPTION

3.1 PROJECT LOCATION

Nyabihu District is situated in the Western Province of the Country. The District borders with Rubavu District in the West, Rutsiro District in the Southern-West, Ngororero District in the South, Gakenke District in the East, Musanze District in the Northern-East and the Democratic Republic of the Congo in the North. The distance between Kigali and Nyabihu District is about 150 Km on National Road 4 and National Road 11. It is approachable by road in three hours. The population of Nyabihu District is 294,740 people and spread over an area of 537.73 km^2. It has a population density of 548 person/km^2 (country density is 415 person/km^2) and ranks seven for population density among the Districts[7] of Rwanda.

Nyabihu District is made of 12 sectors; all of them are concerned with the present indicative feeder roads project: Bigogwe, Jenda, Jomba, Kabatwa, Karago, Kintobo, Mukamira, Muringa, Rambura, Rugera, Rurembo and Shyira. **Figure 5** shows the location of different sectors in Nyabihu District.

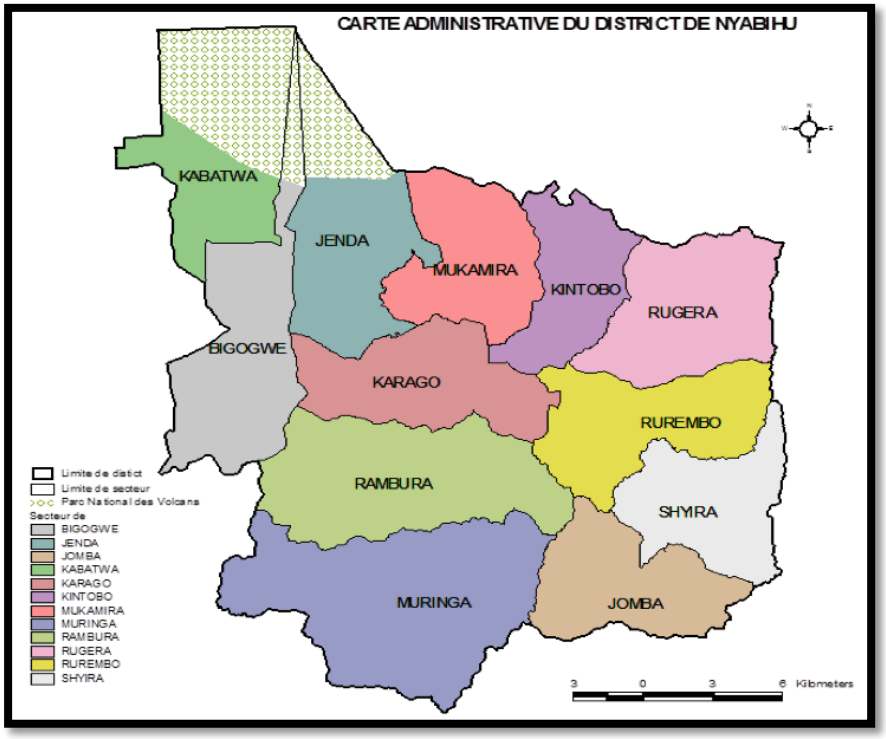

Figure 4 : Administrative Map of Nyabihu District showing different Sectors

[7] Population and Housing Census 2012, National Institute of Statistics of Rwanda

Nyabihu District is mostly mountainous and the indicative feeder roads pass in high hills terrain, low lands as well as in wetlands. The hills are populated with scattered settlements often located on the small holdings of individual households. However, the government has launched an initiative, which encourages the scattered settlers to live in small townships established at selected central locations for a population living in a defined rural neighbourhood (*Imidugudu*).

The hills are covered with forests, farms and small grazing lands. The marshlands are located in valleys between the hills, relatively well drained with many streams and rivers. The roads crossing marshlands may have to be raised and the side slopes may have to be flatter and involve widening, but this will not require relocating large population. The impact on fauna and flora is expected to be limited as the roads follow existing routes, and road sides are cultivated or already cleared. Roads in the hilly terrain require construction of culverts, many in numbers, following the existing natural water course. Side drains may require stone pitching and check dams to control erosion. The soil along the roads could be excavated by labor, which helps in limiting damages to the environment, as labor construction involves gentle cutting and minimal spill overs when a road section has to be widened.

The project area of influence covers the existing RoW, areas required for roads widening of roads, proposed borrow, quarry and disposal sites in all Sectors of the Nyabihu District, except Mukamira Sector.

3.2 OBJECTIVES OF THE PROJECT

The main objective of the project is to improve transport infrastructure with a view to support project area's social economic development. The project development will facilitate the economic growth, the improved transportation of goods and services. Specifically, the major purpose of the proposed upgrading project is to construct feeder road network in Nyabihu District in order to meet the following objectives:

- To promote socio economic development of the project area by linking it with other district and cities; and
- To increase agricultural productivity and marketing capacities, by lowering the transport costs and losses of farm input and output. In particular, improved feeder networks will enhance the commercial surpluses of rural households and their access to services, reducing poverty and isolation.

3.3 ROADS STATUS

The roads condition in Nyabihu District varies from very poor to good. About 66.0% of the roads are very poor, 25.3% are poor and 8.2% in fair condition. Only 0.5% of the roads are in good condition. Most of these roads need to be rehabilitated while others require maintenance. The 2013 Development Plan of the District indicates that Nyabibu District has 290 Kms of roads of which 88% are dirt roads and 12% is paved. The District has access to three paved roads which are Kigali- Rubavu, Mukamira – Muhanga – Huye – Burundi or Huye- Rusizi, Mukamira – Ngororero – Muhanga – karongi. It has also indicative feeder roads that are regularly in poor condition due to the high mountains and heavy regular rainfall. However, in some sectors, people walk more than 30 minutes to access the nearest road network. The poor quality and lack of roads connecting the supply area and the collection center is a major concern. During the rainy season, some of these roads become almost impracticable, while during dry season, there is too much dust that affects milk quality. In addition, the prices offered to farmers and ranchers by intermediate traders are insignificant and therefore decrease their income.

Seventeen (17) indicative feeder roads with a total length of 200.7 km were selected for the feasibility studies. The existing average carriageway width varies from 3.4 to 6.7 m.Their condition ranges from very poor to good. As per the feasibility report by Sheladia (2016), the roads sections in very poor to poor condition total up 64.4 km while those in fair to good condition count 130.6km.

3.4 PROJECT DETAILS

The project details are reproduced from the feasibility study. The project components include rehabilitation of the road corridor, culverts, bridges and cross drainage works. The affected areas of feeder road rehabilitation are limited to the road corridor, plus the widening areas, borrow and quarry areas. The existing carriage way will be widened where necessary to attain 6 m width. Due to slopes, settlements are placed along the sides of the roads. Cultivation and plantations are also extended closer to indicative feeder roads. The main food crops produced in the district are Maize, Beans, Irish Potatoes, Wheat. The land slopes less than 35 degrees are cultivated leaving very little room for native flora species. These indicative feeder roads are discussed in subsequent sections.

3.4.1 Brief Description on Indicative feeder roads

The Ministry of Agriculture and Animal Resources (MINAGRI) has prepared a feasibility report for 200.70 km indicative feeder roads in the Nyabihu District. Based on technical, economical, financial, social and environmental factors, the indicative feeder roads have been assigned the priority. The above length is covered in 17 selected sections of indicative feeder roads. A brief description of these roads is presented below:

1. Gasiza-Kibisabo-Muringa-Gitebe (NBFR1)

This alignment stretches on a total length of 13.6km with chainage zero from Gasiza on a 3 legged junction with National Road 16 (NR16), it passes by Muringa Sector Headquarter at chainage 7km and ends at Gitebe on a minor bridge over Giciye River where it connects back to NR16. This alignment follows ascending gradient towards Kibisabo up to 5.3km and descend towards its end point at Gitebe. The alignment crosses two Rivers (Nyavuvu at 12.2km and Giciye at the end point in Gitebe). Hydraulic structure over Nyavuvu River is a substandard wooden log that need replacement with a 10m span structure. The hydraulic structure over Giciye River is an 18m span metal bridge with wooden decks in need of maintenance. Other existing structures are poor wooden logs located at sub catchment outlet on the alignment. The alignment is predominantly on a hilly terrain following hillside alignment with steep slopes and susceptible to landslides during rainy seasons. Therefore it is better to widen this road on the hill side as widening on valley side would require protective structures and also encounter construction difficulties. The road has its importance in the area as it traverses through tea plantation and wood products region and also serves as connectivity of these areas to the National road leading to major markets in secondary cities of Rubavu and Musanze. The road crosses 3 forest plantations of 14.7 ha, 102 ha and 13.6 ha on distances of 0.5km, 0.7km and 0.4km respectively.The general road condition is poor due to poor or absence of hydraulic structure, landslides and poor road surface mainly on sections with rock soling.

Figure 5: FR1 Alignment features

2. Kibisabo-Masha-Arusha-Mizingo-Masha-Gatindori-Musenyi (NBFR2)

NBFR2 stretches on a total length of 32.7km beginning from Kibisabo on a 3 legged junction with FR1 (Gasiza-Kibisabo-Muringa-Gitebe) at 5.2km from National Road 16 (NR16) through FR1 alignment, and ends (main alignment) at Mizingo where it connects to National Road NR2 (Kigali-Musanze-Rubavu) and at Musenyi (as a spur from Masha) on Rubavu-Nyabihu Districts border on a minor bridge over Nyanzo River. The main alignment is 24.4km long and the spur is 8.3km long. The alignment stretches through a Natural Forest of 1,485 ha from chainage 3.2km up to 10.4km of the main alignment and from 0 up to 5.7km of the spur (In other words 40% of the whole alignment traverses a Natural Forest), therefore widening and other construction activities would cause serious environmental impact. This forest area was initially part of Gishwati Natural Reserve, then protected, but this remnant forest is not a part of the newly gazetted Mukura–Gishwati National Park nor its buffer zone. In order to avoid substantial number tree cutting on that natural forest, the construction activity along the forest section is required to be limited to available formation width where possible. This will result in reduced carriageway width. This alignment is predominantly hill side and generally following ascending gradient towards fold and descend towards trough.

From chainage 12.9km up to 16.2km of the main alignment stretches in Rubavu District. Section from 13.4km up to the end point in Mizingo is under rehabilitation although the road surface and newly posed hydraulic structures on this section have mostly been washed away by erosion from recent heavy rains in the area. Except newly constructed reinforced concrete, minor bridges and wooden decks on the section under rehabilitation, the alignment presents many substandard wooden logs on sub catchment outlets and relieve cross drains. The road has its importance in the area as it traverses tea plantation,

wood products and livestock farming region and serves as connectivity of these areas to the National road (NR2) leading to major markets in secondary cities of Rubavu and Musanze. The general condition of the road is very poor due to landslides, absence or poor drainage, trees from the natural forest falling into the road and forming blockage on the alignment.

Figure 6: FR2 Alignment features

3. Nteranya- Kareba (NBFR3)

NBFR3 alignment is 6km long and start from chainage zero located at Nteranya, a T junction on National road 2(NR2), 5.5km from Nyabihu District Headquarter on the way to Rubavu Town and ends at KarebaCenter which is one of the important trade centers with a market and a health Center on NR18 (Musanze-Kinigi-Kabatwa-Busasamana-Rubavu Petite bariere) in Jenda Sector located in the Northern part of the District in this volcanic area. The alignment description follows the ascending directing of chainage from Nteranya. From the start point at Nteranya, the alignment goes about 1km alongside a stagnant water body of 10 hectares of surface area at an average distance of 4m from the water body to the center alignment causing submergence of the alignment during rainy seasons. Moving the alignment towards the hill side and raising of the alignment is required to mitigate the submergence issue. This alignment is also on the hilly terrain mainly following hill side alignment. Widening of this road is better on the hill side as valley side filling involve construction difficulties and must be more expensive especially at the beginning of the road where stagnant water body is present. The road has its importance in the area as it traverses one of the main areas providers of Irish potatoes countrywide and serves as connectivity to the National road (NR2) leading to major markets in the country and neighboring countries (i.e.: DR Congo and Uganda). In Kareba (where the end point of the alignment is located), Irish potatoes farming

cooperatives and selling points are present. The road ends at 2km away from the Volcanoes National Park, a protected area, including 0.3km width of buffer zone forest. The general condition of the road is very poor due to absence or poor of drainage structures, landslides, big volcanic rocks present on the roadway making the road not motorable. Small width of the carriage way.

Natural water pond at Nteranya ***Substandard wooden deck***

Figure 7: FR3 Alignment features

4. Kibisabo- Akanyaru- Rugamba- Gihirwa (NBFR4)

This road is done from Gihirwa towards Kibisabo on a total length of 13.3km and therefore the zero chainage for this road is at Gihirwa. This road is mostly hill side alignment and generally following ascending gradient towards fold and descend towards trough. The starting point at Gihirwa is T junction with National Road 16 (NR16) and the end point is at Kibisabo at the junction with FR1 (Gasiza-Kibisabo-Muringa-Gitebe) which here in turn connects to NR16. From the starting point of the road to chainage 3.5km , the road passes alongside Kanama River. The road crosses three forest plantations of 6ha, 102ha and 21ha on distances of 0.4km, 0.7km and 0.05 km respectively. At chainage 11.95km, the alignment has a 1.6km spur up to Akanyaru primary school. The road is not motorable due to absence or poor drainage structures and present landslides occurred during the last rainy season. The alignment connects the area of hillside agriculture to the main road (NR16) leading to major markets.

Figure 8: FR4 Alignment features

5. Kirogotero- Rurembo Centre- Gabiro- Murungu- Nyakiriba- Tubungo-Nkotsi (NBFR5)

The proposed alignment is for a length of 48.2km with chainage zero at Kirogotero where all engineering survey have been conducted from. The alignment has 3 segments (Main alignment, Spur1 and Spur2).The **main alignment** of24.6km long starts from Kirogotero and ends at Tubungo. Kirogotero is located at T junction to National road NR16 (Muhanga-Ngororero-Mukamira) and crosses Basera River at chainage 0.1km where a 10m span reinforced concrete bridge construction works are ongoing. Other existing structures on rivers/streams crossing and sub catchment outlets are of substandard wooden logs. This alignment is only motorable up to 15.8km the rest of the section is not motorable due to landslides blocking the passage, narrowness of the carriage way on some sections along with absence or poor drainage structures. The main alignment crosses three forest plantations of 5ha, 5.7ha and 28.4ha on distances of 04.km, 0.5km and 0.5km respectively. **Spur 1** is 9km long starting from around GabiroCenter on chainage 9.7 of the main alignment and ending at Guriro on T junction with NR16. This alignment is predominantly pedestrian pathway with an average width of 2m mostly following hillside alignment susceptible to landslides, thus widening of this road is better on the hill side as valley side filling involve construction difficulties and must be more expensive. Cross drainage structures existing on this alignment are poor wooden logs.Spur 1 crosses one forest plantation of 18ha on a distance of 0.6km.**Spur 2** is 11.5 km long starting from Nkotsi in Musanze District on a T junction with NR17 (Binunga-Kibangu-Mugunga-Muhoza-Cyanika) Center and ending at Nyakiriba on chainage 19.9km of main alignment. This alignment stretches in Musanze District on a length of 2.7km to ensure connectivity to NR17; spur 2 is also predominantly pedestrian pathway with an average width of 2m mostly following hillside alignment susceptible to landslides, thus

widening of this road is better on the hill side as valley side filling involve construction difficulties and must be more expensive. Cross drainage structures existing on this alignment are poor wooden logs. The general condition of the whole alignment is very poor due to absence or poor hydraulic structures, frequent landslides along the alignment, narrowness of the roadway since it is majority pedestrian pathway in need of improvement to accommodate indicative feeder roads standards. However, this alignment would play a major role in connecting North-East area (Rurembo and Rugera Sectors) of Nyabihu District to main National roads leading to major markets and trade centers (Rurembo trade center, Rubavu markets, Musanze markets, Vunga trade cente, etc.). Spur 2 crosses Nyamutera River and the main alignment passes alongside Nyamutera River for a distance of around 3.5km.

Figure 9: FR5 Alignment features

6. Rambura - Gasiza (NBFR6)

Engineering survey for this roads starts from Rambura on a Y junction with NR16 and therefore stationing will starts Rambura at zero chainage and the alignment descriptions

follows the direction of Chainage towards Gasiza connecting back to NR16. This is a short alignment of 2.3km traversing tea plantation, primary and secondary schools and religious institutions area. NBFR6 crosses Basera River where the existing cross drain structure is a substandard wooden log in need of replacement. Other cross drain structures present on this alignment are substandard wooden logs on sub catchment outlets and on cross relieve drains. The road surface have been washed away by erosion due to poor drainage, making the general condition of the road is poor.

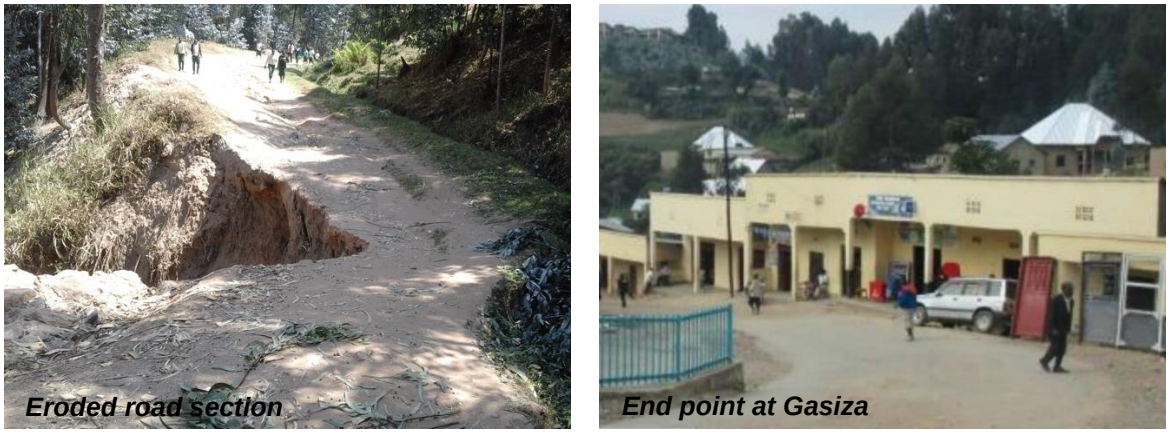

Figure 10: FR6 Alignment features

7. Kazirankara- Nturo- Kaburamba- Murago (NBFR7)

Engineering survey for this roads starts from Kazirankara and therefore stationing will starts Kazirankara at zero chainage and the alignment descriptions follows the ascending direction of Chainage towards its end point at Murago stretching on a total length of 4.9km. Kazirankara is on a T junction with a District Road class 1 DR25 (Ngororero-Nyabarongo-Vunga-Gashyushya). The road crosses Mukungwa Wetland at the start point on a distance of 0.2km. Murago (end point) is located on a minor bridge over Rubagabaga River on Nyabihu-Ngororero Districts boundary, 100m from another District road class 1DR26 (Runyinya-Gatega-Binana). This alignment is also predominantly pedestrian pathway with an average width of 2m mostly following hillside alignment susceptible to landslides, thus widening of this road is better on the hill side as valley side filling involve construction difficulties and must be more expensive. Cross drain structures on rivers/stream and sub catchment outlets on the alignment are sometimes missing or poor, however VUP public works are ongoing on this alignment trying to replace poor wooden logs with new ones but still, proper rehabilitation (especially widening and slopes stabilization) in line with indicative feeder roads standards is needed on this alignment. NBFR7 traverses medium scale banana plantation area.

The general condition of the alignment is very poor due to narrowness of the carriage way, poor drainage, landslides along the alignment, poorly laid rock soling surface, etc

Figure 11: FR7 Alignment features

8. Rugera- Nyamitazi- Gisizi (NBFR8)

This roads starts from Rugera and therefore stationing will starts from Rugera at zero chainage and the alignment descriptions follows the ascending direction of chainage towards Gisizi on a total length of 6.4km. Gisizi (end points) connects this alignment to NBFR15 (Gasura-Jomba-Centre Jomba-Dagaza). This alignment is also predominantly pedestrian pathway with an average width of 2m on a highly hilly terrain mainly following hillside alignment susceptible to landslides, thus widening of this road is better on the hill side as valley side filling involve construction difficulties and must be more expensive. As the alignment does not cross any river or marshland, existing cross drain structures are located on sub catchment outlets and on cross relieve drains. Some VUP public works on pedestrian pathway level activities (i.e.:bush Clearing) have been recently performed on this alignment but still the road is not motorable.The road crosses a forest plantation of 29ha on a distance of 0.3km.

Figure 12: FR8 Alignment features

9. Gipfuna- Muringa (NBFR9)

This road of 9.2km starts from Gipfuna and therefore stationing will starts from Gipfuna at zero chainage and the alignment descriptions follows the ascending direction of chainage towards Muringa. Gipfuna is on a minor bridge over Giciye River marking Nyabihu-Ngororero Districts boundary located at 100m from District Road Class 1 DR24 (Kabaya-Ngoma-Gasiza-Birembo-Nyamugeyo) and Muringa (end point) is on a Y junction with NBFR01 and is about 750m from Muringa Sector headquarters, reached by travelling through NBFR01. This alignment traverse towards north to reach Muringa (End point). This alignment runs in hilly terrain and mainly following hill side alignment. Widening of this road is better on the hill side as valley side filling involve construction difficulties and must be more expensive. This alignment is in poor condition and due to absence or poor drainage structures, narrowness of the roadway and poor surface road with erosion traces making the road non motorable.The road crosses two forest plantations of 15ha and 16.8 ha on distances of 0.4km and 0.6km respectively.

Start point at a bridge on Giciyeriver ***Substandard wooden deck***

Figure 13: FR9 Alignment features

10. Gatovu- Mburabuturo- Murungu (NBFR10)

This road of 6.3km starts from Gatovu and therefore stationing will starts from Gatovu at zero chainage and the alignment descriptions follows the descending direction of chainage towards Murungu where it joins with NBFR5. Gatovu is located at Y junction with District road class 1 DR34 (Rurengeri-Giharo-Kankema-Knkema-Gahanga-Cyivugiza-Bariza) at 9km from NR2 reached by travelling through DR34 towards North West direction. This alignment also on the hilly terrain mainly following hill side alignment where at some points the alignment is completely gone due to recent landslides. Widening of this road will be better on the hill side as valley side filling involve construction difficulties and must be more expensive.

The present alignment is mostly pedestrian pathway of an average width of about 2m where cross drains structures are either missing or very poor making the road non motorable and in a very poor condition.This road crosses Nyamutera River.

Figure 14: FR10 Alignment features

11. Kajagari- Kabatwa (NBFR11)

This alignment is 6km long and start from chainage zero located at Kajagari, a T junction on National unpaved road 18 NR18 (Musanze-Kinigi-Kabatwa-Busasamana-Rubavu Petite barierre), 1.7km Kareba trade center which is the end point of NBFR03 located in the northern part of the District. The alignment ends at Kabatwa where it connects back to NR18. The alignment is located in a volcanic area close to Virunga National park (at 1.4km away from the park boundaries, including a 0.3km width buffer zone forest) and predominantly follows the ridge of a low mountain and hence does not cross any river or marshland. The road has its importance in the area as it traverses one of the main areas of providers of Irish potatoes countrywide and serves as connectivity to the National roads NR18 and NR2 leading to major markets in the country and neighboring countries (i.e.: DR Congo and Uganda). In the region traversed by NBFR11, Irish potatoes farming cooperatives and selling points are present. The general condition of the road is very poor due to absence or poor condition of drainage structures and big volcanic rock soling on the roadway making the road less motorable.

Figure 15: FR11 Alignment features

12. Vuga- Kamiro- Gaharawe (NBFR12)

This alignment is 2.6km long and start from chainage zero located at Vuga, a T junction on District Road Class 2 (DR126) and at 3km from NR2 reached by travelling DR126, and ends at Gaharawe on Nyabihu-Rubavu Districts border where it connects to an already rehabilitated section of the road in Rubavu District leading back to NR2. The alignment is located in a volcanic area close to Virunga National park and predominantly follows a more or less flat area and does not cross any river or marshland. The road has its importance in the area as it traverses one of the main areas of providers of Irish potatoes countrywide and serves as connectivity to the National roads NR2 leading to major markets in the country and neighboring countries (i.e.: DR Congo and Uganda). In the region traversed by NBFR12 Irish potatoes farming cooperatives and selling points are present. The general condition of the road is very poor due to absence or poor of drainage structures big volcanic rocks present on the roadway making the road less motorable.

Figure 16: FR12 Alignment features

13. Rwaza- Kabara- Kazenzo (NBFR13)

This alignment starts from Rwaza at a junction with NBFR5 at 3.7km from NR16 reached by travelling NBFR5 toward south from Rwaza. The alignment ends at Kazenzo where it connects to DR27 which a District Road Class 1 leading to NR16 by travelling 7 km from the end point of FR13. This alignment also on the hilly terrain mainly following hill side alignment on a pedestrian pathway with an average width of 2m where at some points the alignment is completely gone due to recent landslides. Widening of this road will be better on the hill side as valley side filling involve construction difficulties and must be more expensive. At about chainage 4km, the alignment come across a hydraulic canal under construction for hydro power plant purposes. The general condition of the alignment is very poor due to narrowness of the carriage way, poor drainage, landslides etc.The road crosses Giciye River towards the end.

Start point at Rwaza

A canal crossing the road alignment

Figure 17: FR13 Alignment features

14. Rurembo Centre- Mubayu- Cyanika (NBFR14)

This alignment stretches on a total length of 11.3km with chainage zero at Mubayu on a 3 legged junction with NBFR5, follows the ascending direction of chainage towards south to RuremboCenter where it connects back to NBFR5. This alignment has a 5.4km long spur form 4.8km chainage to Cyanika health post towards east side of the district. The whole alignment does not traverse any river/stream or marshland thus, existing hydraulic structure are located on cross drains and sub catchment outlets and all are substandard wooden logs. The alignment is also predominantly on a hilly terrain following hillside alignment with steep slopes and susceptible to landslides during rainy seasons. Therefore It is better to widen this road on the hill side as widening on valley side would require protective structures and also will encounter construction difficulties.

The alignment is not motorable due narrowness of the roadway and to absence or poor condition of the drain crossing structures.The road crosses two forest plantantions of 6.6ha and 19ha on distances of 0.4km and 0.2km respectively.

Figure 18: FR14 Alignment features

15. Gasura- JombaCenter- Jomba- Dagaza (NBFR15)

This 14.2km long road starts from Gasura and therefore stationing will starts from Gasura at zero chainage and the alignment descriptions follows the ascending direction of chainage towards north east to CenterJomba and a descending direction towards North West to Dagaza end point. Gasura (start point) is located at Y junction with NR16 and Dagaza (end point) on DR27 leading back to NR16 BY travelling 4.5km. This alignment also on the hilly terrain mainly following hill side alignment, thus widening of this road will be better on the hill side as valley side filling involve construction difficulties and must be more expensive. This alignment is currently motorable on its whole length however it still needs to be upgraded to feeder road standards since existing drainage structures are absent or poor and the road surface is in a poor condition due to erosion and landslides.

Figure 19: FR15 Alignment features

16. Kadogo- Gakamba- Munzuri (NBFR16)

NBFR16 stretches on a total length of 15.5km beginning from Kagogo as chainage zero on a 3 legged junction with DR24 (Kabaya-Ngoma-Gasiza-Birembo-Nyamugeyo), crosses Giciye River on a minor metal–wood bridge marking Nyabihu-Ngororero Districts border towards Gakamba and Gatindori (end point) where it connects to the spur of NBFR2 (Masha-Gatindori-Musenyi).The road passes alongside Ruhanga river from the start point up to 2.5km. The alignment stretches through cattle farming area from chainage 7km up to 12.1km where it enters Gishwati Natural Forest (which is not an integral part of Mukura–Gishwati park) up to Gatindori (end point) stretching on a District Road class 1DR 23 from chainage 11.5km up to the end point where it connects with District Road Class 1 DR29, the latter overlapping with the above mentioned spur of NBFR2. This alignment is predominantly hill side and generally following ascending towards its end point in Gatindori. The alignment has many substandard wooden logs on rivers crossings, sub catchment outlets and relieve cross drains. The road has its importance in the area as it traverses through wood products and livestock farming regions and serves as connectivity of these areas to the Districts roads that leading to National Roads enabling connectivity to major markets in secondary cities of Rubavu, Musanze and Ngororero districts. The general condition of the road is very poor due to landslides, absence or poor drainage, trees from the natural forest falling into the road and forming blockage on the alignment. The road crosses a Gishwati natural forest of 1,485 ha on a distance of around 2.4km towards the end point of the road.

Figure 20: FR16 Alignment features

17. Gasiza- Birembo (NBFR 17)

This roads starts from Gasiza (Kibihekane) on a T junction with NR16 and therefore stationing will starts at Gasiza at zero chainage and the alignment descriptions follows the ascending direction of Chainage towards Birembo Health Center.

This is a short alignment of 0.95km serves connectivity of Birembo Health Center to the main National road NR16. NBFR17 does not cross any river or marshland, cross drain structure available on sub catchment outlets and on cross relieve drains are substandard wooden logs. The road condition is currently poor due to landslide and road surface erosion making the road non motorable.

Figure 21: FR17 Alignment features

The table below provides details on the total length of each of the indicative feeder roads, existing carriageway, number of bridges and culverts to be built, length and width of these bridges, cross drainages, paved or all-weather roads, etc.

Table 4: Details on roads and structures to be built

Road ID	Road Name	Length (km)	Average Carriageway Width (m)	Paved road (m)	Length of Built up (km)	Length of Low lying area (km)	Length of drain (km)		Culverts + bridges		
							Left	Right	Number	Length (m)	Diameter (m)
FR4	Kibisabo-Kanyaru-Rugamba-Gihirwa	13.65	2.9	6	0	7.43	2.30	1.65	11	91	1
FR1	Gasiza-Kibisabo-Muringa-Gitebe	13.73	3.4	6	2.7	1.94	4.5	4.4	50	119	1
FR2	Kibisabo-Masha-Arusha-Mizingo-Masha-Gatindori-Musenyi	32.81	4.4	6	1.36	11.17	14.25	12.20	102	98	1
FR3	Nteranya-Kareba	6.05	2.1	6	2.45	1.12	0.45	0	2	56	1
FR5	Kirogotero-Rurembo Centre-	48.59	3.4	6	12.7	0.12	8.65	10.10	123	196	1

	Guriro-Murungu-Nyakiriba-Tubungo-Nkotsi										
FR6	Rambura-Gasiza	2.30	4.8	6	0.70	0.50	0.5	2.1	3	0	1
FR7	Kazirankara - Nturo-Kaburamba - Murago	5.28	4.5	6	0.65	0.81	0.5	3.7	23	238	1
FR8	Rugera-Nyamitanzi-Gisizi	6.40	3.0	6	0.52	1.44	0.08	4.85	32	84	1
FR9	Gipfuna-Muringa	9.25	2.8	6	2.15	4.40	1.30	0.20	28	448	1
FR10	Gatovu-Mburabuturo- Murungu	6.36	3.9	6	0.25	0.92	0	0.30	22	462	1
FR11	Kajagari-Kabatwa	5.98	3.0	6	4.38	1.96	0	0	0	322	1
FR12	Vuga-Kamiro-Gaharawe	2.87	4.9	6	2.32	1.28	0	0	0	105	1
FR13	Rwaza-Kabara-Kazenzo	5.10	3.1		1.10	1.90	0.15	0.05	2	150	1
FR14	Rurembo centre-Mubayu-Cyanika	11.47	2.4		1.815	2.24	0	0	0	0	1
FR15	Gasura-Jomba-Dagaza	14.31	4.3		1.905	2.89	0.91	6.49	56	910	1
FR16	Kadogo-Gakamba-Munzuri (Pinus)	15.60	3.2	6	0.70	2.11	3.6	1.4	15	360	1
FR17	Gasiza-Birembo	0.95	5.0		0.25	0.14	0	0.10	0	0	1
Total/average		**200.7**	**3.59**	**6**	**35.95**	**42.37**	**37.19**	**47.54**	**479**	**3,639**	1

Source: Feasibility Study report, September 2016

3.4.2 Present Traffic Survey

The present traffic in the district is estimated in the feasibility study of the project. These projections are mostly linked to the demographic growth and the improvement of socioeconomic conditions during the last 10 years. The same growth pattern has been taken for the projection of traffic during next 10 years (2022). **Table 5** presents the current and projected traffic.

Table 5 : Summary of Traffic Count Survey Results on Indicative feeder roads in Nyabihu District

Feeder Road ID	Road Name	Road Length (km)	Motorized Traffic (Vehicles per day)			Non Motorized Traffic	
			Motocycles	Light Vehicles < 3.5 Tons	Heavy Vehicles > 3.5 Tons	Bicycles	Pedestrians
1	Gasiza- kibisabo- Muringa-Gitebe	13.73	76	4	5	83	655
2	Kibisabo- Masha- Arusha-Mizingo- Masha- Gatindori-Musenyi	32.81	64	4	6	51	270
3	Nteranya- Kareba	6.05	0	0	0	83	392
4	Kibisabo- Kanyaru- Rugamba-Gihirwa	13.65	33	8	2	61	967
5	Kirogotero- Rurembo Centre-Guriro- Murungu- Nyakiriba-Tubungo- Nkotsi	48.59	117	4	3	189	2440
6	Rambura- Gasiza	2.30	29	30	15	29	0
7	Kazirankara- Nturo-Kaburamba- Murago	5.28	0	0	0	121	533
8	Rugera- Nyamitanzi- Gisizi	6.40	18	14	1	16	318
9	Gipfuna-Muringa	9.25	0	0	0	106	522
10	Gatovu- Mburabuturo- Murungu	6.36	0	0	0	31	369
11	Kajagari- Kabatwa	5.98	18	11	31	36	328
12	Vuga- Kamiro- Gaharawe	2.87	38	21	1	160	698
13	Rwaza- Kabara- Kazenzo	5.10	41	7	4	77	426
14	Rurembo centre- Mubayu-Cyanika	11.47	104	7	4	117	1500

15	Gasura- Jomba- Dagaza	14.31	24	1	1	43	432
16	Kadogo- Gakamba- Munzuri (Pinus)	15.60	64	0	1	115	1674
17	Gasiza- Birembo	0.95	55	0	0	62	680

Source: Feasibility Study report, July 2016

The above summary highlights the typical traffic pattern of rural roads, partly in bad condition. Motorcycles represent the biggest share of motorized traffic, whereas light and heavy vehicles are a minor share. Another typical feature of this type of traffic is the ratio bicycles / motorized vehicles - bicycles are in greater number as compared to motorized vehicles, because of the undulating - mountainous terrain of Nyabihu District.

Table 6 presents the shares of motorized vehicles, motorcycles account for 79% of all motorized vehicles; the remaining 21% are mostly cars, pickups and, small or medium trucks with a payload up to 3.5 and 7 tons respectively.

The ratio bicycles / motorized vehicles, calculated on the total of the surveyed traffic highlights the prevalence of bicycles accounting for 159% of motorized vehicles.

Table 6: Structure of the Surveyed Traffic

Vehicle Category	**Percentage of all motorized vehicles**
Motorcycles	79%
Light vehicles	13%
Heavy vehicles	8%
Total motorized traffic	100%
Ratio bicycles/motorized vehicles	159%

3.4.3 Feeder Road Design Standards

Generally the study of rehabilitation intends to improve the condition of the district network that can:

- Ensure an average commercial speed of 40 km/h,
- Reduce routine and periodic maintenance cost, and
- Reduce vehicle operating costs and contribute to economic growth.

The existing horizontal alignments have been maintained and few corrections made near the existing bridges or when the road cross some villages. Minor realignments are however inevitable on the existing horizontal alignment at isolated sections where the radius fall short of the design requirements.

The vertical alignment follows the existing natural ground in general with exceptions in the sections where the water cross the roadway especially near the existing bridges. In those limited sections the consultant proposes to construct small embankments to raise the vertical profile elevation.

The cross section consist of one carriageway with width between 6 and 7 m , no shoulder and two side drain, one on each side of the carriageway. The proposed project aims to widen the dual carriageway for 6-7 m. **Table 7** summaries the geometric Design Standards adopted for the project.

Table 7: Proposed Design Standards for Rwanda's Rural Roads

S. No.	Description	Unit	Value
1	Design Speed (both in settlement crossings and open countryside)	Km/h	40
2	Width of Roads		
	i) Main District Roads	meter	7.0
	ii) Secondary Roads	meter	6.0
	iii)		
3	Right of Way		
	i) 3.0 m off either side of the carriage way in villages,	meter	3.0
	ii) 5.0 m outside villages	meter	5.0
4	Cross-Fall		
	1.1. Carriageway Normal Cross-fall	[%]	6.0
	1.2. Shoulder Normal Cross-fall	[%]	8.0
5	Horizontal alignment design parameters in general follow the existing road		
	i) Minimum horizontal curve radius	meter	20.0
6	Vertical alignment design parameters**:** alignment follow the existing natural gradient		

The following are designs of the proposed road section, drainage and culvert/ bridge in Nyabihu District.

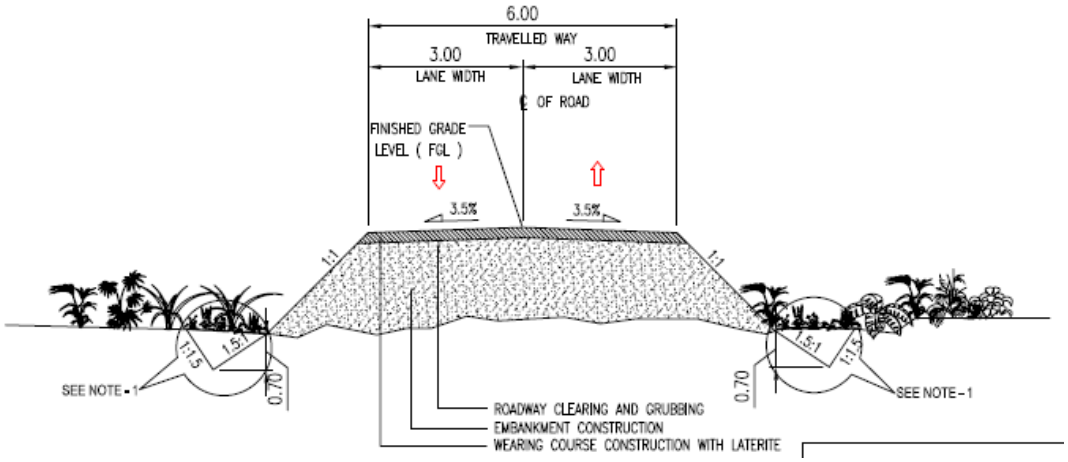

Figure 22: Design of the road section

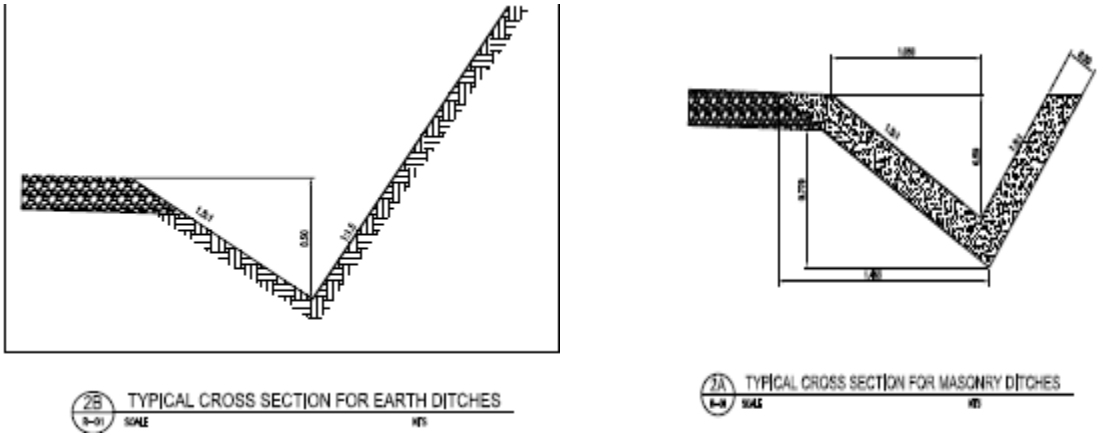

Figure 23: Design of the cross section for earth and masonry ditches

3.5 ANALYSIS OF ALTERNATIVES

During the planning stage, MINAGRI/FRDP and District as well as other district stakeholders preselect the long list of indicative feeder roads based on the district needs including access to market, social and economic services, agricultural production areas, road condition, etc. During the feasibility stage of the proposed feeder road rehabilitation/reconstruction project, the proposed list is released to Consultant for deep analysis and evaluation as well as prioritization. The road prioritization matrix was prepared to select segments and eight indicators along with their respective weights were to gauge the effects (benefits) of the FRs improvement. These indicators include the connectivity, remoteness, traffic, access to social and economic services, agriculture potential, community priority and impact on Vulnerable Sectors. The prioritization matrix as well as is presented in Annex 9.

During the feasibility stage, options were also explored and these options were weighed from all considerations such as cost, environment, and ease of implementation and maximum utilization of available infrastructure. The aim of alternative analysis is to arrive at a development option, which maximizes the benefits while minimizing the adverse impacts. Alternative analysis is also a form of mitigation measures. Various alternatives were considered and detailed below:

3.5.1 Without Project Alternative

The No Project option in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing environmental conditions. This option will however, involve several losses on socioeconomic condition both to the local population and the nation as a whole. The local farmers will continue to face the constraints they are currently experiencing due to inefficient transport network and system and the anticipated economic development aimed at fulfilling the Vision 2020 will remain unattainable. The No Project Option is the least preferred from the socio-economic and partly environmental perspective due to the following factors:

- The socio economic status of the Nyabihu District's residents would remain unchanged. Reduced interaction both at local and national levels;
- The local skills would remain under-utilized as no employment opportunities will be created for local population who would have otherwise worked at the project area;

- Reduced business development due to current bad condition of the feeder road project;
- The current erosion rate in the feeder road due to lack of drainage system will remain.

No project scenario case will also avoid social impacts due to the implementation of the project.

3.5.2 With Project Alternative

The implementation of the project will contribute to socioeconomic improvement and will have positive impacts on residents' life quality. The with project alternative have following advantages: There will be improved and assured transport facilities to the residents of the District. This will stimulate socioeconomic development of the area.

The proposed indicative feeder roads are a major deterrent for commercial growth in the area, the project scenario will catalyse commercial growth in the different centres and there will be better business opportunities for locals. There will also be savings in the vehicle operation cost (fuel, operation and maintenance) due to better feeder road condition.

This alternative will have negative impact on land use, water, forests/trees, noise and air pollution during construction and operation phases. About 48.12 ha of land are likely to be acquired to the paved road with 6.0 m width.The properties (houses, trees, crops, etc) within road corridor will be affected. Edaphic-climatic based designs, tree planting program for replacing lost trees, compensation for lost properties, proper management of borrow pits and quarry areas, proper disposal of wastes, stabilization of slopes with vegetation, provision of adequate sanitation facilities, provision with protective equipments to workers, use machinery and truck in good condition during daytime, regular watering of road sections under construction are alternative technologies to mitigate adverse impacts of roads on environment.

3.5.3 Minimizing impacts on sensitive receptors

Changing alignments and/or limiting the roads works with at least 5.0 m width to avoid passing through at long lengths and large widths at the Gishwati-Mukura National Park and physical cultural resources such as Rambura grave are some of the alternative mitigation measures considered to avoid impacting sensitive receptors. This alternative also applies to the roads passing through grouped settlements or market centers.

The encroachment to protected areas and wetlands, though converted into agriculture, are also avoided or minimized through changing alignments or limiting road works within the existing carriageway.

3.5.4 Preference of hillside cut over valley side cut

There exist some road alignments passing close to lowlands (valley/ swamp) and their rehabilitation may be done in either side of the road, while some road sections are passing through hilly areas. In such cases, the rehabilitation of the road is better done on the hillside as valley side filling involves construction difficulties and is more expensive.

3.5.5 Sourcing of construction materials and location of borrow pits

Road construction materials can be obtained from close or far away the RoW. Locally produced and sourced materialsclose to RoW are preferred over materials from very far to minimize transport costs and to also create local employement.

3.5.6 Preference of local labour over imported labour

Most building works are highly labour-intensive in nature.The use of local labour force over imported labour is important to increase local employment opportunities and ownership of project activities as well as limit the dissemination of communicable diseases. The awareness compaign on communicable diseases prevention for workers should be prioritized.

3.6 QUANTITY OF MATERIAL FOR CONSTRUCTION

The new Road Act[8], which requires upgrading some indicative feeder roads to six meter width, may involve widening the existing road formation by around five meters considering a road corridor of 10.5 m. This may necessitate expropriation of some farm lands and relocating households. Bidding process shall not be launched for a particular road section until every person affected by the works on that section has been relocated and/or properly compensated according to Bank policies. Feasibility report has estimated the quantities of construction material road wise and reproduced in **Table 8**. These have been further utilized in assessing the environmental and social impact due to development of each road.

[8] Law No. 55/2011 of 14/12/2011 governing roads in Rwanda

Table 8: Quantity of Construction Material

S.No	Description	Unit	Quantity
1	**Preliminary Works**		
1.1	Re-reveling	m^2	1,575,980
1.2	Fill material	m^3	257,535
2	**Earthworks**		
2.1	Excavation in rock and earth; Removal of heap of rocks, embankment from borrow pits and purge marshy soils	m^3	2,901,250
3	**Roadway**		
3.1	Wearing Course	m^3	219,921
3.2	Caping Layer	m^3	154
4	**Bridge, Culverts& Drainage**		
4.1	Supply and install Culvert Ø 100cm (reinforced)	m	5,359
4.2	Reinforced concrete proportioned at 350kg/m3 for all works	m^3	11,212
4.3	Stone masonry works for culverts head	m^3	81,796

3.7 CONSTRUCTION SCHEDULE

The construction schedule of indicative feeder roads depends on the methodology adopted for construction. In general the time period will also depend on the resources put in place by the contractor. 195 km indicative feeder roads may take 24 to 36 months, including design tendering and construction. A Typical Construction Schedule is shown in **Table 9.**

Table 9: Typical Construction Schedule

Activity	Duration in Month											
	1-2	2-4	4-6	6-8	8-10	10-12	12-14	14-16	16-18	18-20	20-22	22-24
Detail design of indicative feeder roads, Tender documents and BOQ												
Notice inviting Tender, Tender process evaluation & award												

Preliminary works clearing, compensation etc.												
Construction of Bridges, Culverts and Roads etc.												
Testing and Commissioning Monitoring and Evaluation												

3.8 COST OF THE PROJECT

The cost of the interventions to improve the indicative feeder roads has been reproduced from the feasibility report. The total cost for construction to improve of 200.7 km of indicative feeder roads in Nyabihu District amount to US$ 35.509 million; the average cost per km being US$ 176,930. The overall cost including construction, supervision and VAT amounts US$ 43.996 million.

4 ENVIRONMENTAL AND SOCIAL BASELINE DATA

4.1 GENERAL

The objective of Environmental Impact Assessment (EIA) is to ascertain the baseline environmental conditions and then assess the impacts as a result of the proposed feeder road project during various phases of the project cycle. Identification of environmental parameters, data collection and impact predictions are the core of Environmental Impact Assessment (EIA) process. A scoping matrix has been formulated to identify the attributes likely to be affected due to proposed project and presented in **Table 10**. In order to review and update the environmental aspects, the data has been collected, compiled and analysed for the following:

- Land Environment (land use, geology and soils);
- Water Environment (precipitation, hydrology and drainage);
- Air Environment (air quality and meteorology);
- Noise Environment (noise levels);
- Ecological Environment (flora and fauna);
- Socio-Economic Environment (demography, livelihood, income socio-economic etc.).

Based on environmental scoping matrix and project setting the attributes likely to be affected are identified for baseline data generation. Data on geology, soils, air, noise, ecology, sociology are presented in this chapter and has been collected from various sources. Majority of data have been collected from field visits and desk research. Formal and informal discussions held with the local people, project affected people and local government/non-government organisations, together with published reports, have provided very useful information for the preparation of this report. Information on project facilities, size, magnitude and cost of the construction activities, geology and soils of the project sites have been taken from the draft feasibility study of July 2016.

The concept is to assess the extent the construction and operation of the proposed indicative feeder roads project is likely to have impact on above environmental attributes. A baseline environmental condition comprises the features present within the proposed ROW as well as a strip of 5 m on either side of the existing road. This area is referred to as study area/project area in the report. It includes environmental features such as forest areas, ecological sensitive areas, water bodies (rivers, marshy and ponds), and

places of historical importance, tourism etc. The scope of this chapter is limited to only those issues, which are of concern in the environmental impact assessment. The land use of the project area is agriculture, built up, and plantation.The major purposes of describing the environmental settings of the study area are:

- Understanding the need of the project and environmental characteristics of the area;
- Assessing existing environmental quality, as well as the environmental and social impact of the proposed project development;
- Identification of environmentally significant factors or geographical areas that could influence decisions about any future development

Table 10: Scoping Matrix for the Project

Project Cycle Phase	Likely Impacts	Baseline Data Review/ collection
A. LAND ENVIRONMENT		
Design Phase	- Change of land use	- Present land use
Construction Phase	- Increase in soil erosion/ soil loss - Pollution by construction spoils;grease/oil spills and domestic waste - Use of land for labor colonies and solid waste disposal	- Soil characteristics - Rainfall - Physiographic / Slopes - Construction materials / spoils - Number of employees during construction peak period
B. WATER ENVIRONMENT		
Design Phase	- Erosion of soil/roads	- Drainage Pattern - Rainfall
Construction Phase	- Water Quality Impacts due to disposal of wastes from labor colonies and construction sites - Water and energy supply - Waste water treatment and disposal from labour camps.	- Rainfall / Storms - Water courses/Drainage - Water quality - Waste water treatment
Operation Phase	Run off Drainage Problems	
C. AIR ENVIRONMENT		
Construction Phase	- Impacts due to emissions generated by construction machinery - Fugitive emissions from various sources.	- Ambient air quality at different locations
Operation Phase	- Exhaust emission due to road operation	- Ambient air quality

D. NOISE ENVIRONMENT		
Construction Phase	- Impacts due to construction machinery - Vehicle noise	- Ambient noise quality at different locations
Operation Phase	- Noise due to road operation	- Ambient noise quality at different locations
E. ECOLOGICAL ENVIRONMENT		
Construction Phase	- Loss of Forest/Trees/aquatic vegetation - Migration of Fauna	- Forest Area/ Tree Numbers - Faunal Species - aquatic vegetation -
F. PHYSICAL AND CULTURAL RESOURCES		
Construction Phase	- Relocation of Infrastructure - Impact on Cultural Resources	- Status of Infrastructure - Status of Cultural Resources
Operation Phase	- Impact on schools, hospitals etc.	- Values of environmental attributes at sensitive locations
G. SOCIO-ECONOMIC ENVIRONMENT		
Construction Phase	- Loss of land, houses, livelihood, job potential	- Land, houses, livelihood data
	-	-
Operation Phase	- Livelihood	- Socio-economic status
	- Potential for increase in road accidents and fatalities from increased use of roads and potentially higher speeds	- Road safety status

4.2 STUDY AREA

The primary baseline data has been collected within the formation width of 10 m or 5 m on either side from centre line of the existing as well as proposed carriageway. The project influence area has been defined as 15 m on either side (arial distance) from boundary of road for collection of secondary data, including impacts due to ancillary sites like borrow areas, quarry, and material storage and disposal areas. The location of indicative feeder roads is shown in chapter 3 on project description.

4.3 LAND ENVIRONMENT

The roads are located throughout Nyabihu District. The altitude where these roads are passing is between 1,500 - 2,000 m asl. **Figure 25** shows the altitude of the project area compared to the rest of the country. Parameters involved in land environment are physiography, geology and soils and land use pattern. These are discussed in the following paragraphs.

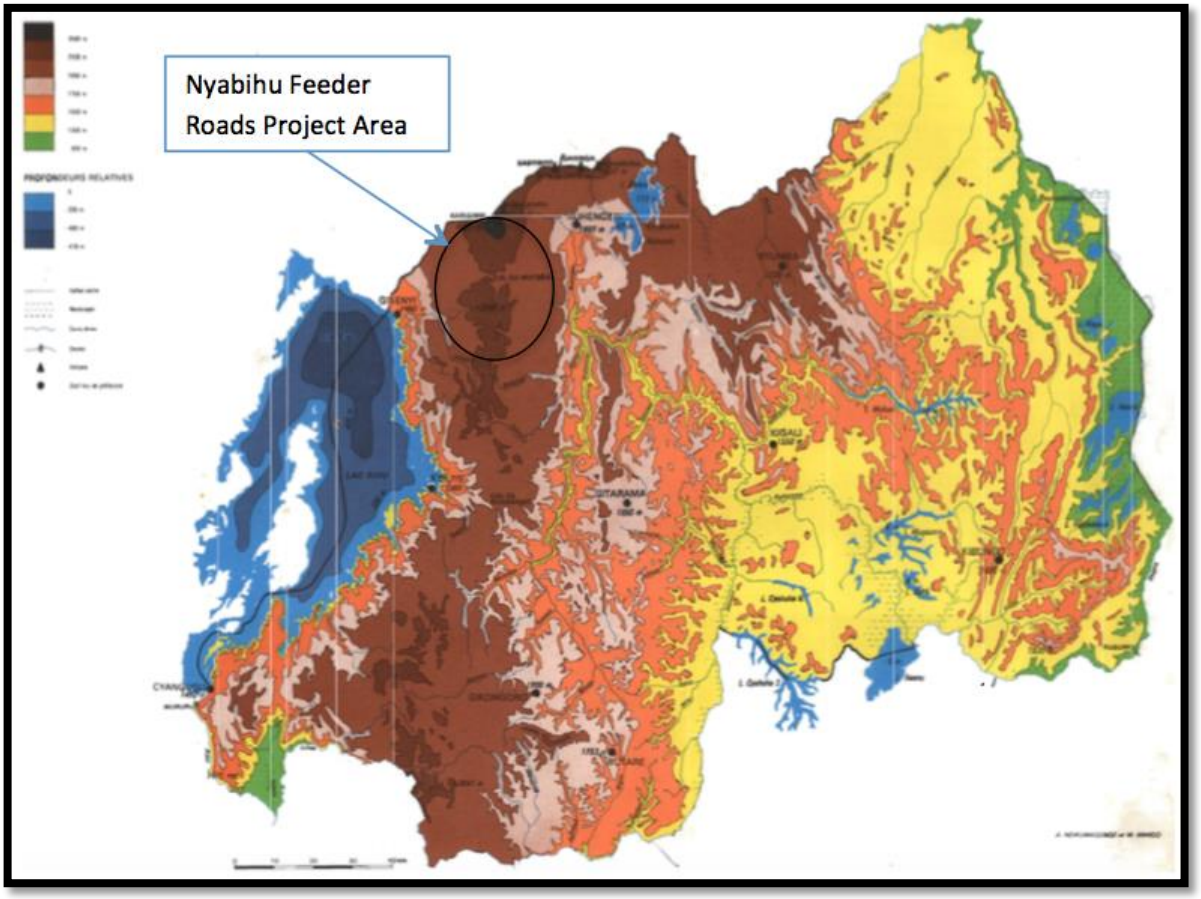

Figure 24: Map showing the altitude of the indicative feeder roads project area in Nyabihu District

4.3.1 Physiography and Land Use of Nyabihu District

Rwanda is dominated by vegetation and grassland with approximately 46 percent considered arable land and 9.5 percent dedicated to permanent crops. Forested uplands and hills are predominant characteristics of the terrain, especially in the western part of the country with a mountainous relief of more than 2,500 m of altitude in the Congo-Nile Crest and the Volcanoes in the Northern-west.

Nyabihu District, the present indicative feeder roads project area, is characterised generaly by the Congo-Nile Crest mountains in the centre and the Volcanoes in the north with Kalisimbi culmininating at 4,507 m amsl. The coverage of forests in Nyabihu District, dominated with Volcanoes National Park and remnant of Gishwati forest reserve, is about 50% of total surface area, while agriculture is practiced on 40%.

Some indicative feeder roads of Nyabihu District pass through forest plantations as well as Gishwati natural forest (the zone crossed by the roads is not part of the new gazetted Mukura-Gishwati Park). Others cross agricultural areas. None of the indicative feeder

roads crosses protected areas such as Gishwati-Mukura National Park or Volcanoes National Park which are located in the vicinity of the project area.

4.3.2 Geology and Soils

In General, Rwanda has a complex geological history which presents itself in varied topographic profiles from the mountainous Northwest to the glassland of Akagera in the East. The oldest rocks of Rwanda are the Paleoroterozoic migmatites, gneisses and mica schists overlain by the Mesoproterozoic Kibaran Belt. The folded and metamorphosed sediments of the Kibaran Belt are primarily schists and quartzites introduced by granites and cover most of Rwanda.

Thes soils in Nyabihu District are mostly clayey sand, volcanic and lateritic, and very permeable. They are very susceptible to erosion and landslide.

4.4 WATER ENVIRONMENT

Water environment consists of water resources such as streams, lakes, estuaries, water use, and quality. Understanding the water quality is essential in preparation of EIA and to identify critical issues with a view to suggest appropriate mitigation measures for implementation. Water availability is essential in the project area for construction and drinking. It is anticipated that water will be available for above purposes in project area.

Rwanda is divided into two major drainage basins: the Nile to the East covering 67 per cent and delivering 90 per cent of the national waters and the Congo to the West which covers 33 per cent and handles the remaining 10% of national waters. The country's hydrological network includes numerous lakes and rivers and its associated wetlands. A recent inventory of marshlands in Rwanda conducted in 2008 identified 860 marshlands, covering a total surface of 278,536 ha, which corresponds to 10.6% of the country surface, 101 lakes covering 149,487 ha, and 861 rivers totalling 6,462 km in length (REMA, 2008). A total annual renewable water resource is 6.3 Km^3 / Year and per capita annual renewable water resources 815 m^3/person/year. All rivers located in the Western Part of Congo Nile Ridge are part of the Congo River Basin, while those in its Eastern Part flow into the Nile River Basin.

The hydrographic network of Nyabihu District is vast with many streams and springs concentrated in lowland valleys between steep mountains. Kanama, Nyamutera, Basera, Giciye, Rugabagaba, Ruhanga, etc. are some of the rivers/ streams in the District. These

water courses are permanent and most of them are used for domestic water supply. None of these rivers or streams is used for fishing nor irrigation due to cold weather and high rainfall of the District respectively. In the area close to the Volcanoes National Park, like Kabatwa Sector, residents rely on rainwater harvesting for their water supply through water pans and gutters on their houses. Water courses in that area are mostly intermittent because of the very porous volcanic soil that doesn't retain water on the surface for long. Lake Karago is the only lake found in the District, with only 27 ha.

Though there are no water quality data on rivers/ streams of the district, studies done in 2011 on Sebeya river (there are some Nyabihu streams flowing into river) indicated that the river was low in nitrogen and phosphorus and had high turbidity and total suspended solids. Its pH and temperature ranged between 6.6-7.6 and 15.7 -17.8^{o}C respectively. The ambient air and noise are not polluted.

The proposed indicative feeder roads will be crossing or passing by side of number of water bodies. Those roads and location are summarized in **Table 11**.

Table 11: Water Bodies Along Nyabihu indicative feeder roads

Feeder Road No.	Feeder Road Name	Water Body	Cross drainage at chainage	Status / Comment
1	**Gasiza- Kibisabo- Muringa- Gatebe**	Kayanza Stream	1+200	At chainage 1+200, the road was blocked due to landslides and lack of drainage structures.
2	**Kibisabo- Masha- Arusha- Mizingo- Masha- Gatindoli- Musenyo**			
	Section 1: Mizingo- Arusha	Mizingo Wetland	0+000- 1+000	Cultivated: dominant crops include cabbage, onions, beans…
	Section 2: Masha- gatindori- Musenyi	Musenyi River	1+000- 2+000	This river forms the boarder between Nyabihu and Rubavu Districts
		Rusenyi River	13+000- 14+000	
		Rubaya River	14+000- 15+000	
3	**Nteranya- Kareba**	Nyirakigugu Dam	0+300	Due to heavy rains, the dam has overflowed and destroyed surrounding fields and the road.

		Ruraje River	2+000 - 3+000	Seasonally flooding
		Ruhorera River	4+000 - 5+000	At chainage 4+800, the road was blocked due to landslides.
4	**Gihirwa- Kanyaru-Kibisabo**	Gihirwa River	0+000-1+000	Sand mining activities
		Kanama (Kazuba) River	1+000- 2+000	
5	**Kirogotero- Rubyiniro**	Basera River	0+000- 1+000	Heavy sand mining activities for construction purposes.
		Rwaza River	4+000- 5+000	Seasonally flooding in rainy seasons
6	**Rambura- Gasiza**	Nyacyonga Wetland	0+000- 1+000	Cultivated, dominant crops include climbing beans and cabbage
		Basera River	0+000 -1+000	This river almost disappeared due to recent floods of April 2016
		Fish ponds		Disappeared and very degraded due to April 2016 floods
7	**Kizirankara- Nturo-Kaburamba- Murago**			The road is facing with landslides
8	**Gisizi- Nyamintazi-Rugera**	Giciye-River	0+200	The road is facing with landslides, especially in Rutabu/ Nyamintazi Cell
9	**Gipfuna-Muringa**	Giciye River	0+000 -1+000	
10	**Gatovu- Mburabuturo-Murungu**			At chainage 2+300 at Nyagitaba/ Gatovu Cell, the road was blocked due to landslides
11	**Kabatwa- Kajagali-Kabona**	No water body		
12	**Vuga- Tamiro- Gaharawe**	No water body		
13	**Rwaza- Kabara- Kazenzo**			The road is facing with landslides. During the visit, the road was very damaged at chainage0+100
14	**Rurembo Centre-Mubayu- Cyanika**	No water body		

15	**Gasura- Jomba- Jomba Centre- Dagaza**	Bisusa stream	14+200	
16	**Kagogo- Gakamba- Munzuri**	Giciye River	0+500	
		Kinyasenge Stream	1+200	
		Ruhanga Stream	3+600	
17	**Gasiza- Birembo**	No water body		

Nyabihu has three (3) main wetlands, Mizingo, Kanama and Mukungwa associated with Nyamukongoro, Kanama and Mukungwa rivers respectively. They are currently exploited with seasonal crops mainly irish potato and wheat in Mizingo and maize and climbing bean in the other 2 wetlands.

4.5 ECOLOGICAL ENVIRONMENT

Geographical relief of Nyabihu District is characterized by high, rocky and steep mountains. The altitude ranges between 1460m and 4507m and the highest peak at Karisimbi Volcano. Climate is generally mild, with an average temperature of 15°C, and rain fall reaching 1,400 mm per yearIn terms of soils, these are mostly clay and sandy, lateritic and volcanic. The hydrological network comprises many streams, brooks, springs, ponds and Lake Karago, which is the largest in the area (27 ha). All streams and springs are concentrated in lowland valleys between steep mountains. Nyabihu is one of the districts which are highly prone to floods and landslides.

4.5.1. Plants diversity

The vegetation is mainly characterised by planted flora dominated by exotic species as eucalyptus on the hillsides and along the indicative feeder roadsides. The rest of the areas feature different crops including vast tea plantations, banana, beans, sweet potatoes, etc. The newly established Gishwati-Mukura National Park located in the south-western part of Nyabihu has more indigenous species, but it has been badly degraded that the remaining intact natural forest is less than 7% of the original area. This was mainly due to human activities such as settlements and conversion of the forest into agriculture and livestock farmlands. In the north-western part, the district borders Volcano National Park (VNP), which is an afro-mountain forest (there is no feeder road crossing park though). VNP is stratified in nine main vegetation zones along altitudinal gradients:

Bamboo, Mimulopsis, Mixed forest, Herbaceous, Brush ridge, *Hagenia/Hypericum* Forests, Meadow, Sub-alpine and Alpine zones.

Trees within Immediate Corridor of Impact (COI): A total number of 26 dominant trees (77%) and shrubs were inventoried along indicative feeder roads project's area in Nyabihu District (Table 12).

Table 12 : Dominant trees and shrubs along the Indicative feeder roads

No	Plant species	Vernacular name	Morphological forms
1	*Acacia mearnsii*	Ibarakatsi	Tree
2	*Acacia melanoxylon*	Kasiya	Tree
3	*Alnus glutinosa*	Runusi	Tree
4	*Anthocleista grandiflora*	Umwarangabo	Tree
5	*Bersama abyssinica*	Umukaka	Tree
6	*Camelila sinensis*	Icyayi	Shrub
7	*Carapa grandiflora*	Umushwati	Tree
8	*Cupressus lusitanica*	Isipure	Tree
9	*Dalbergia nitidula*		Tree
10	*Erythrina abyssinica*	Umuko	Tree
11	*Eucalyptus globulus*	Inturusu	Tree
12	*Eucalyptus maidenii*	Mayideni	Tree
13	*Eucalyptus sp*	Inturusu	Tree
14	*Grevillea robusta*	Gereveriya	Tree
15	*Hypericum revolutum*	Umusamanzuki	Shrub
16	*Maesa lanceolata*	Umuhanga	Tree
17	*Malkhamia lutea*	Umusave	Tree
18	*Neoboutonia macrocalyx*	Icyanya	Tree
19	*Persea americana*	Avoka	Tree
20	*Pinus elliotii*	Pinusi	Tree
21	*Pinus patula*	Pinusi	Tree
22	*Podocarpus falcatus*	Umufu	Tree
23	*Polycias fulva*	Umwungo	Tree
24	*Sesbania sesban*	Umunyeganyege	Shrub
25	*Solanum aculeastrum*	Umutobotobo	Shrub
26	*Syzigium guineense*	Umugote	Tree
27	*Yushania alpina*	Umugano	Herb

A total number of five hundred eighteen individual trees (518) (with at least 30 cm of girth size, which is the upper limit of semi-mature trees) have been identified in the proposed ROW of indicative feeder roads (**Table 13).**

Table 13: Trees Along Indicative feeder roads With in Right of Way

Road	Road name	Length in Km and Number of Trees	Number of

no							trees
		0-3	3-6	6-9	9-12	12-15	
2	Bigega-Masha	17	-	-	-	-	17
3	Nteranya-Kareba	50	6	-	-	-	56
5	Guriro-Gabiro	112	-	-	-	-	112
5	Nkotsi-Nyakiriba	21	-	-	-	-	21
10	Gatovu-Mburabuturo-Murungu	26	-	-	-	-	26
11	Kabatwa-Kajagari	20	-	-	-	-	20
14	Rurembo-Cyanika	100	59	5	-	-	164
15	Gisura-Jomba-Dagaza	-	-	-	20	35	55
16	Gatindori-Gakamba-Rubaya-Kagogo	12	15	-	-	-	27
17	Gasiza-Birembo	20	-	-	-	-	20
TOTAL							518

Source: Field Surveys September 2016

The number of trees by girth size is detailed in table 14. Most trees are in the girth class of G1 (39%). Big trees have also been identified along the roads, mainly at the road Rurembo-Cyanika.

Table 14: Girth Wise Details of trees

Road no	Road name	Girth Class							Total
		G1	G2	G3	G4	G5	G6	G7	
2	Bigega-Masha	12	5	-	-	-	-	-	17
3	Nteranya-Kareba	39	6	11					56
5	Guriro-Gabiro	62	31	19					112
5	Nkotsi-Nyakiriba	-	7	5	-	4	3	2	21
10	Gatovu-Mburabuturo-Murungu	14	5	7	-	-	-	-	26
11	Kabatwa-Kajagari	20	-	-	-	-	-	-	20
14	Rurembo-Cyanika	9	52	53	2	14	13	21	164
15	Gisura-Jomba-Dagaza	22	15	16	-	2	-	-	55
16	Gatindori-Gakamba-Rubaya-Kagogo	18	6	1	-	-	2	-	27
17	Gasiza-Birembo	6	3	10	-	1	-	-	20

Total	**202**	**130**	**122**	**2**	**21**	**18**	**23**	**518**
G1:30-60cm; G2:61-90cm; G3:91-120cm; G4:121-150cm; G5: 151-180; G6: 181-210; G7: >210								

4.5.2. Forest Plantations

Natural forests and small forests plantations are found in Nyabihu District. The natural forests include Volcanoes National Park and Gishwati forest. Volcanoes National Park lies in northwestern Rwanda and borders Virunga National Park in the Democratic Republic of Congo (DRC) and Mgahinga Gorilla National Park in Uganda. This Park, created in 1929, is home to five of the eight volcanoes of the Virunga mountains and is known for the rare and endangered mountain gorilla (*Gorilla beringei beringei*) and golden monkeys (*Cercopithecus mitis kandti*). The 5 volcanoes include Kalisimbi, Bisoke, Muhabura, Gahinga and Sabyinyo. It spans 160 km2 covered in rainforest and bamboo and covers 3 Districts, namely Musanze, Nyabihu and Rubavu. Other mammals include black-fronted duiker (*Cephalophus niger*), buffalo (*Syncerus caffer*), spotted hyena (*Crocuta crocuta*) and bushbuck (*Tragelaphus scriptus*). There are also reported to be some elephants in the park, though these are now very rare. There are 178 recorded bird species. The Vegetation varies considerably due to the large altitudinal range within the park from lower montane forest between 2400 -2500 m to bamboo forest (Arundinaria alpine) between 2500 to 3200 m and grassland above 3600 m asl.

The remnant forest of former Gishwati forest reserve is another forest reserve. This native forest, initially covered more than 280,000 ha but but has lost about 90 percent of its cover. The remaining Gishwati area in Nyabihu, rehabilitated through tree planting, mostly *Pinus spp*, is estimated to 1,485 ha. In its effort to rehabilitate this reserve and promote its tourism industry, the Government of Rwanda established Gishwati and Mukura (another deforested native forest reserve in Rutsiro District) as a national park. However, this Park does not cover the area crossed/ likely to be affected by FR2 and FR16.

Mukura – Gishwati forest reserve becomes a national park in 2015. The new National Park has an area of 4,420 ha including 1,440 ha of Gishwati Forest, 1,988 ha of Mukura forest and 992 ha of the Park buffer zone. The park only covers Rutsiro District while its buffer zone is located in Rutsiro and Ngororero Districts of Western Province. Gishwati – Mukura national park is rich in fauna species including *Pantroglodytes schewinfurthii, Colobus angolensis ruwenzorii, Potamochoerus porcus, Cephalophus nigrifons,*

Dendrohyrax arboreus, Felis serval and *Felis aurata* (MINAGRI 2002 *in* Munanura *et. al*, 2006), Tree squirrel (*Funisciurus pyrrhopus*), Rwenzori sun squirrel (*Heliosciurus ruwenzori*), Ground hog (*Thryonomys swinderianus*) and the jackal species (*Canus spp.*).The Park is also rich in birds with 59 species recorded, among them 7 Albertine Rift endemic species: *Tauraco johnstoni, Apalis personata, Apalis Ruwenzori, Cynnyris regia, Zoothera tanganjicae, Bradypterus graueri* and *Parus fasciiventer* (Munanura *et. al*, 2006).

On the other hand, the District counts 15,990 ha of small forest plantations, scattered across the District and mostly privately owned. The Eucalyptus species dominate the forests plantations followed by *Pinus* spp and Alnus spp. These forests have been harvested for more than 2 times. Construction, charcoal making and firewood are the major uses of the harvested trees. In addition to forest plantations, about 26 tree species were found intercropped with crops. Those include *Ecalyptus, Grevillea, Alnus, Acacia, Ficus, Hypericum, Cedrella, Erythrina, Markamia,* etc.

The selected indicative feeder roads pass through or near the forest plantations. The FR2 and FR16 for 12.9 km and 2.4 km respectively pass through the remnant Gishwati forest while FR3, FR4, FR5, FR8, FR9 and FR 14 pass through or near small forest plantations covering a total area of 420 ha. FR11 and FR12 end at 1.4 km and 4.5 km respectively from the Volcanoes National Park.

The Project is planning to plant trees along the rehabilitated roads and in some other erosion prone areas for the protection of the roads as well as the replacement of lost tree species.

4.5.2. Wildlife diversity

Some few wild animals are hosted in the remnant forest of Gishwati. Though no assessment done during the preparation of this ESIA/ESMP, reports state some remaining wild animals including few populations of Chimpanzee (*Pan troglodytes*) and Golden Monkey (*Cercopithecus mitis kandti*). In the Volcano National Park, approximately 25% of the species richness and 45% of endemic species of the Albertine Rift are found within the park. Common large mammals include the primates such as the flagship species of Mountain Gorilla (*Gorilla beringei beringei*). The park also hosts Golden Monkey (*Cercopithecus mitis kandti*), ungulates species such as the Buffalo (*Syncerus caffer*), the Black Fronted Duiker (*Cephalophus nigrifons*) and the Bushbuck (*Tragelaphus scriptus*). Mountain Elephant (*Loxodonta africana*) is also found in the VNP.

4.6 SOCIO-ECONOMIC ENVIRONMENT

4.6.1 Demographics

Nyabihu District is part of the Western Province. The district has a population of inhabitants 294,740 (Census 2012 final data) and extends over an area of 537.7 sq.km. The population density accounts for 548 inhab/sq.km, ranking the district seventh country-wide, density is 18% higher than the national average (415 inhab/sq.km) and 30% higher than the Western Province average (420 inhab/sq.km), whereas the population growth 2002-2012 has been 0.9%, significantly lower than the national average (2.6%). The district is rural with a not negligible share of urban population accounting for 13.8 % of total district.

The population is unevenly distributed over the district area - the most populated area is the sector of Mukamira (744 inhab/sq.km) while the least populated sector is Muringa (335 inhab./sq.km) in the southernmost part of the district. Also the population density and demographic growth in decade 2002-2012 are contrasted among sectors. The growth rate ranges from -0.1% in Kintobo sector to 3.0% in Jenda. The average household size in Nyabihu district (4.5 persons/hh) is slightly above the national average household size (4.3 persons/hh). The mean demographic data of Nyabihu District are highlighted in **Table 15** below.

Table 15: Population in Nyabihu District

District Sectors	Both sexes	Urban Population	Rural Population	Population share (% of district pop.)	Area (sq.km.)	Density Inhabitants per sq. km.	Household size	Growth rate 2002-2012	Estimated population 2015
Nyabihu district	**294,740**	**40,673**	**254,067**	**100%**	**537.73**	**548**	**4.5**	**0.9%**	**309,079**
Bigogwe	31,657	12,015	19,642	10.7%	52.21	606	4.9	-0.2%	33,197
Jenda	34,648	10,465	24,183	11.8%	47.83	724	4.5	3.0%	36,334
Jomba	20,610	0	20,610	7.0%	35.03	588	4.3	0.7%	21,613
Kabatwa	18,971	0	18,971	6.4%	52.07	364	4.5	2.4%	19,894
Karago	25,681	0	25,681	8.7%	38.12	674	4.5	0.1%	26,930
Kintobo	15,379	798	14,581	5.2%	27.43	561	4.6	-0.1%	16,127
Mukamira	28,675	15,101	13,574	9.7%	38.56	744	4.6	1.1%	30,070
Muringa	22,876	0	22,876	7.8%	68.24	335	4.5	1.3%	23,989
Rambura	28,484	2,294	26,190	9.7%	63.65	448	4.6	0.8%	29,870
Rugera	24,236	0	24,236	8.2%	41.18	588	4.2	0.5%	25,415
Rurembo	23,689	0	23,689	8.0%	39.71	597	4.3	0.2%	24,841
Shyira	19,834	0	19,834	6.7%	33.71	588	4.1	1.6%	20,799

4.6.2 Gender and child context

a. Demographic data

As per the results of the 4th population and housing Census (2012), the total District population is 294,740 residents of which 53.2% are females. Females are predominant in all Sectors of the district where three sectors have the highest percentage i.e. Jomba, Kintobo and Rambura with 54%. Jenda and Bigogwe are the most populated sectors while three less populated sectors include Kintobo, Kabatwa and Shyira.

The population of Nyabihu district is mostly young. About 65.7% of the resident population of Nyabihu is under 25 years old. The elderly people (65 years and above) represent 3% of the total population of the District. The population aged below 14 years old is 129,665 people, representing 44.0% of the total district population. This group is predominantly female; 65,915 are women, corresponding to 50.8% of the population below 14 years old or 22.4% of the total district population.

b. Gender based violence and child labour /abuse situation

Gender-based violence (GBV) is a universal reality existing in all societies. The assessment done by the Gender Monitoring Office (GMO) identifies four major forms of GBV including:

- ✓ Economic violence (denial of economic rights to property, succession, employment or other economic benefits);
- ✓ Physical violence (ie the intentional use of physical force with the potential to cause harm);
- ✓ Sexual violence (act of forcing another individual, through violence, threats, deception, cultural expectation, weapons or economic circumstances, to engage in sexual behavior against her or his will); and
- ✓ Psychological violence: trauma to the victim caused by acts, threats of acts or coercive tactics; these threats are often related to sexual or physical violence).

Though there are limited data on GBV, it is not a big problem in Rwanda and particularly Nyabihu District. The Country has achieved impressive results in the fight against GBV, including a GBV hostile legal and policy framework that supports prevention and response to GBV, and provides an opportunity for further advancements. The National Policy against Gender-Based Violence and its strategic plan, the Law No 59/2008 of 10/09/2008 on prevention and punishment of gender based violence, Law No 22/1999 of

12th November 1999 to supplement Book one of the Civil Code and to institute Part Five regarding Matrimonial Regimes, Liberalities and Successions, Law No 13/2009 of 27th May 2009 regulating Labor in Rwanda, Law No 32/2016 of 28/08/2016 governing persons and family among others were put in place and awaireness campaigns on GBV prevention done. All those legal provisions prevent and punish GBV Crimes in all of its forms, sexual harassment in the workplace inclusive, provide for equal inheritance rights between women and men, girls and boys and provide for equal opportunities and equal pay for women and men.

c. Child labour and women trafficking

As per the 4th Population and Housing Census of 2012, the children (below 17 years old) constitute 55.1% of the resident Nyabihu population, with females outnumbering males. The female children represent 50.9% of the total female children population in the District.

Though there are no data for both Rwanda and Nyabihu District, the child labour or abuse situation in the District is not alarming. Legal mechanisms were put place to prevent child labour/ abuse in the country. The most noticeable regulations include the Law 54/2011 of 14/12/2011 relating to the rights and protection of the child and Law No 13/2009 of 27/05/2009 regulating labour in Rwanda, in addition to the Constitution of the Republic of Rwanda of 2003 revised in 2015.

Concerning women and child trafficking, this type of crime is likely still unknown in Rwanda, and there is no related provision in the Penal Code.

4.6.3 Population on the right of way

The indicative feeder roads in Nyabihu District pass through scattered settlement, villages and

towns. The boundaries of indicative feeder roads expansion have not been transferred on the land.

In general about 2.41 m average width will be required for widening the road to 6.0 m. The widening will have impact on houses, agriculture land and other infrastructure facilities.

The following are the socio-economic characteristics of the RoW.

a) Families within the right of way

The survey of the people likely to be affected by road widening works revealed that 1,071 families are living or have properties within the RoW for all indicative feeder roads.
The total number of people within RoW reaches 4,910 people including 2,612 women and 2,298 men.

b) Age structure of the respondents

The age structure of the respondents was a necessary part of the research to determine whether the results of the findings are from mature persons who understand the situation. According to Rwandan legislation, the majority age starts from 18 years.

The table below gives a clear age structure of the respondents. From the table below, it comes out that 43% of the respondents (majority) are in the range of 30-40 years. During this age, it assumed that people are more active and likely to be involved in various activities. This range is followed by the group age of 20-29, which represents 26%. The group 41-51 which has 16% is followed by the range of PAPs who have 52 year and above representing 10%. These results show that the majority of respondents are mature and active; therefore they can be reliable.

Table 16: Age of the PAPs of household surveyed

Age group	Number of Respondents	Percentage (%)
Less than 20	-	-
20-29	21	26
30-40	34	43
41-51	13	16
Above 52	12	15
Total	**80**	**100**

Source: Field survey and Analysis, September 2016

c) Education level of Respondents

The level of education among the affected communities is very low as revealed by the data analysis reported in **Table 17.** Among the respondents, 25% are illiterate, primary (elementary level) education represents 48% and 16% have incomplete secondary level. The proportion of 2% representing those who completed the secondary and vocational represents 9%. The main reason is the poverty of families that could not afford school fees and materials required for the education of their children.

Table 17: Level of Education of respondents

S/N	Level of education	Frequency (No)	Percentage (%)
1	Illiterate	20	25
2	Primary	38	48
3	Incomplete Secondary	13	16
4	Secondary	2	2
5	Secondary vocational	7	9
6	Incomplete Higher	0	0
7	Higher (Bachelors Degree)	0	0
8	Postgraduate	0	0
	Total	**80**	**100**

***Source**: Field survey and Analysis, September 2016*

a) Family Size of the Household of respondents

Table 18 summarizes the family size of the households' respondents. The survey' results indicated that 68% of the respondents' families are of medium size (4-6 people) while families with large size (ie above 6 per household) represents 17% of the studied population. The average size of the household of respondents on the feeder road is between 4-6.

Table 18: Family Size of the Households

S/N	Family size	Number of Respondents	Percentage (%)
1	Small (2-4)	12	15
2	Medium (4-6)	54	68
3	Large (Above 6)	14	17
	Total	**80**	**100**

Source: Field survey and Analysis, September, 2016

b) Marital status of respondents

The marital status of the PAP is an important parameter to know the views of different categories of people about the project. **Table 19** shows the marital status of the respondents. About 81% of PAPs are married while single and widows represent 8 and 11% respectively.

Table 19: Marital Status of Respondents in Household Surveyed

S/N	Marital status	Number of respondents	Percentage (%)

1	Married	65	81
2	Single	6	8
3	Widow	9	11
4	Divorced	0	0
	Total	**80**	**100**

Source:*Field survey and Analysis, September, 2016*

c) **Vulnerability of PAPs**

The vulnerability and social group for individuals in the community is for a paramount importance because it gives the idea of level of vulnerability. The **Table 20** gives the details on vulnerability within the RoW. The majority of the project affected population (74%) are in normal conditions and persons representing 10% are orphans. PAPs living with disability represent 4% while elderly people and women headed households are represented by 6% each.

Table 20: Vulnerability in the PAPs

S/N	Social group	Frequency (No)	Percentage (%)
1	Living with disability	3	4
2	Orphans	8	10
3	Women headed households	5	6
4	Aged people (above 65years)	5	6
5	People in normal conditions	59	74
Total		**80**	**100**

***Source**: Field survey and Analysis, September 2016*

d) Housing conditions of the affected communities

Housing condition is an important variable in studying socio economic aspects of a family because it gives the idea on the living conditions of family members. The survey showed that 99 % of PAPs live in their own houses, while 1% live in rented houses. About 70% of these houses are built in mud bricks known as Rukarakara, while 30% are built in woods.

4.6.4 Socio-economic Conditions

Concerning the households economic condition and making reference to poverty and extreme poverty lines, set out at 159,375 and 105,064 RWF respectively, Nyabihu district is ranked 15th position country-wide by percentage of extreme-poor and poor2 population categories, In previous survey EICV3 2010-11 Nyabihu was ranked 5th ; the significant worsening of economic conditions is attributed to the frequent flooding and draughts that have affected the agriculture and livestock coupled with the very bad road condition. About 48% of the population in Nyabihu district is identified as non-poor, 27.0% as poor

(excluding extreme-poor) and 12.6% as extreme-poor on total population by district. Compared with other 6 districts of Western Province, Nyabihu district comes 3rd (out of seven) for proportion of non-poor.

Referring to the sectors' contribution to household income, the EICV3 results show that at the national level agriculture contributes the largest share of a household's income (46%), followed by wage income (25%), business income (i.e. self-employment), transfers, and rents. In Nyabihu household income is driven by agriculture (43%), followed by wage income (25.7%) and business income (12.4%), the smallest contributor to household income are rents with 5.6%.

a) Agriculture

About 50% of Nyabihu population has an area of less than 0.3ha. This lack of land pushes farmers to work an average of 5 hours a day instead of at least 8 hours. This shows that there is unemployment among economically active people, especially among the youths (Nyabihu Development Plan, 2013-2018).

Agricultural food products, industrial and ornamental are grown extensively. For food, there are Irish potatoes, maize, bean, wheat and banana and vegetables as well. Irish potatoes, maize and beans are cultivated by 76.6% of households on average is 51,000 households. Irish potatoes are most cultivated with 83.7% followed by maize (74.3%) and beans (71.9%). Maize production represents 47.3% of the agricultural production in the district against 8.9% wheat.

The following table illustrates the proportion of the crop production in 2015 A and B Seasons in Nyabihu District.

Table 21: Crop production in Nyabihu District

Sectors	Maize	Beans	Irish Potatoes	Carrots	Wheat	All Produce
	production	production	production	production	production	output
	ton	ton	ton	ton	ton	ton
Bigogwe	0.0	41.8	76,943.0	720.0	0.0	77,704.8
Jenda	0.0	0.0	114,768.0	1,280.0	0.0	116,048.0
Jomba	5,790.0	9,578.2	0.0	0.0	2,394.5	17,762.7
Kabatwa	0.0	0.0	0.0	0.0	0.0	0.0
Karago	0.0	5,785.8	67,933.6	240.0	1,548.9	75,508.3
Kintobo	3,748.0	3,125.1	21,190.5	0.0	1,522.5	29,586.1
Mukamira	1,251.3	2,866.0	66,289.8	630.0	102.5	71,139.6
Muringa	4,157.0	756.6	22,123.0	0.0	1,593.5	28,630.1
Rambura	723.6	1,446.2	21,664.4	0.0	948.9	24,782.9

Sectors	Maize	Beans	Irish Potatoes	Carrots	Wheat	All Produce
	production	production	production	production	production	output
	ton	ton	ton	ton	ton	ton
Rugera	3,530.2	8,666.8	0.0	0.0	1,827.8	14,024.8
Rurembo	6,407.6	6,378.6	0.0	0.0	1,910.6	14,696.8
Shyira	5,220.1	3,261.9	0.0	0.0	0.0	8,482.0
TOTAL district	**30,827.8**	**41,907.0**	**390,912.3**	**2,870.0**	**11,849.1**	**478,366.2**

Source: Feasibility study of indicative feeder roads in 5 Districts by Sheladia, June, 2016

In Nyabihu District, irish potato (81.7%), bean (8.8), maize (6.4%) and wheat (2.5%) are the predominant food crops. Irish potato represents 81.7% of the total production. The total production is mainly used for domestic consumption and marketing. Tea is a perennial crops also grown in the area. The Table below presents the marketed share in Nyabihu District.

Table 22: Marketed crop production in Nyabihu District for 2015 A and B Seasons

Sectors	Maize	Beans	Irish Potatoes	Carrots	Wheat	All Produce
	production	production	production	production	production	Sold output
	ton	ton	ton	ton	ton	ton
Bigogwe	0.0	25.1	30,777.2	504.0	0.0	31,306.3
Jenda	0.0	0.0	45,907.2	896.0	0.0	46,803.2
Jomba	2,026.5	5,746.9	0.0	0.0	1,795.9	9,569.3
Kabatwa	0.0	0.0	0.0	0.0	0.0	0.0
Karago	0.0	3,471.5	27,173.4	168.0	1,161.6	31,974.6
Kintobo	1,311.8	1,875.1	8,476.2	0.0	1,141.9	12,804.9
Mukamira	438.0	1,719.6	26,515.9	441.0	76.9	29,191.4
Muringa	1,455.0	454.0	8,849.2	0.0	1,195.1	11,953.2
Rambura	253.2	867.7	8,665.7	0.0	711.6	10,498.3
Rugera	1,235.6	5,200.1	0.0	0.0	1,370.9	7,806.5
Rurembo	2,242.7	3,827.2	0.0	0.0	1,433.0	7,502.8
Shyira	1,827.0	1,957.2	0.0	0.0	0.0	3,784.2
TOTAL district	10,789.7	25,144.2	156,364.9	2,009.0	8,886.8	203,194.7

Source: Feasibility study of indicative feeder roads in 5 Districts by Sheladia, June, 2016

The total marketed production averages 42.5% of the total production and is dominated with irish potato, bean and maize, which are mostly used for home consumption.

In addition to crops production, livestock is another important source of income and food for agricultural households. The district has more than 35,000 cows. However, there is low number of milk cattle which is 1,704 of good heifers for milk production from artificial insemination. This represents 4.9% of all cows of the district.

This shows that there is a high gap and there is a need of the district to put in place the mechanisms to overcome this challenge in order to respond to the local and regional marks needs of milk products of having a cattle milk to the district .

Milk production by end of 2012, was 13,000 liters which represented 26% of capacity of Mukamira dairy that is still under construction and that will need 50,000 liters per year in order to fill its capacity. The district also plans to expand the space with a new redistribution of 1,300 hectares to farmers. This would increase the number of cows and environmental protection as farmers are among the people who are destroying the forests in search of grass for their cows.

b) Access to basic infrastructures

Nyabihu district is located in highland with dense hydrographic network. About 79.7% of households have access to improved drinking water, although 30% (16,259 HHs) of them walk for more than 30 minutes. Also 82.6% of them are supplied on free of charge; which is a good support to countryman. Father more 52.5% and 25.6% of households are supplied from protects spring and public standpipe sources respectively. The district shows high performance compare to national averages (74.2%) and province (73.9%) and others Western Province's districts after Rubavu district (93.4%) (Nyabihu District Development Plan, 2013).

Nyabihu district has 935 classrooms for primary education. 51% of them (or 478 rooms) are built of brick stew. These classes built unsustainable materials that are old might fall down on the students during the rainy season considering the high and steady precipitation that characterize the region or reproduction of unexpected events such as weather related to the arrival of winds. These classrooms and 722 latrine doors require full rehabilitation. A classroom has a capacity to host 40 students, which is lower compared to international standard which is 46 students maximum. In addition to that, the number of eligible children in first grade 7 years is slightly higher than the number of students who complete primary school. So there is no need to build more new classrooms at the primary level. The enrollment rate in secondary education is very low and equals to the national average of 20.9% and higher than the provincial level which is 17.7%.

The illiteracy level of the population aged over 15 years is also significant because 31.6% cannot read or write and it is slightly higher than the national average (30.3%) and lower than the Western provincial average which is 31.8%.

Nyabihu District has one hospital (Shyira Hospital) and 16 health centers, all serving a population of around 294,740 inhabitants. These health centers are distributed to all Sectors. In Nyabihu district, the market infrastructure is still under development.There exist a total of 5 modern markets, 5 selling points and 16 unimproved markets in the District. The district trades with the neighboring districts, mainly Musanze, Ngororero and Rubavu, especially in agricultural products. The District also trades with all the districts in the Country, especially for irish potato, since a good portion of the national irish potato production is coming from the District.

Energy sector is also another important sector in economic transformation of the District.The overall distribution of electricity in Nyabihu district is 16% which is above the national level of 10.8%. About 70 families use biogas as energy source while 80.9% of households use improved cooking stoves.

The Consultant made an inventory of basic infrastructures along the indicative feeder roads in Nyabihu District. The Table below presents the number of schools, health centers, churches, markets and public offices by road.

Table 23: Number of schools, health centers, churches and public offices by road

Feeder road ID	Road Name	INFASTRUCTURES				
		Health Centres	Schools	Public Offices	Churches	Markets
FR1	Kibisabo- Kanyaru- Rugamba- Gihirwa		3	1		
FR2	Gasiza- Kibisabo- Muringa- Gitebe					
FR3	Kibisabo- Masha- Arusha- Mizingo- Masha- Gatindori- Musenyi					
FR4	Nteranya- Kareba		1	1		1
FR5	Kirogotero- Rurembo Centre- Guriro- Murungu- Nyakiriba- Tubungo- Nkotsi	2	2	2	3	1
FR6	Rambura- Gasiza		2	1	1	
FR7	Kazirankara- Nturo- Kaburamba- Murago		2	1	2	4
FR8	Rugera- Nyamitanzi- Gisizi	1	1	1	1	2

FR9	Gipfuna-Muringa		1	2	1	1
FR10	Gatovu- Mburabuturo- Murungu	2	2	1	2	1
FR11	Kajagari- Kabatwa	1	2	1	2	1
FR12	Vuga- Kamiro- Gaharawe		1		1	1
FR13	Rwaza- Kabara- Kazenzo		2			1
FR14	Rurembo centre- Mubayu- Cyanika	2	3	2	4	2
FR15	Gasura- Jomba- Dagaza		1		2	
FR16	Kadogo- Gakamba- Munzuri (Pinus)		1	1	2	1
FR17	Gasiza- Birembo	1	2	1	1	1
	Total	**9**	**26**	**15**	**22**	**17**

About 66.1% of indicative feeder roads are in very bad condition and 25.3% are in bad condition. Only 8.6% of feeders are in fair to good condition. The indicative feeder roads are mostly used by pedestrians (81%) and bicycles (11%). The motorized traffic represents 8% of the roads users, including 90% of motocycles and 10% of vihicles. The bicycle traffic is anomalous for indicative feeder roads due to the high gradients that make difficult the use of bicycles. However, motocycles related accident due to bad road condition, distraction and inattention is the most frequent in the area and pedestrians are the most vulnerable road users.

c) Distances to basic services

Walking distance to basic services can be considered as indicator of both provision and coverage of such services and the remoteness of households' dwellings.

Referring to the mean walking distance to primary school by district, it shows that Nyabihu is classified among eleven districts with a mean walking distance to a primary school within the interval of 30 to 35 minutes.

Around 35.7% of households are still between 40 and 59 minutes of a primary school. This walking distance to a primary school in Nyabihu District is slightly higher than the national level.

The mean walking distance to a health centre in Nyabihu District is 80 minutes and only 40% of households walk for under than an hour on average to a health centre. The mean walking distance to a health centre is 70.4 minutes in rural areas, while it is one hour countrywide.

d) Social services and prevention of communicable diseases

Communicable diseases include Malaria, HIV/AIDS, Tuberculosis, epidemics and other transmittable diseases. Social services were put in place in Nyabihu District for their prevention.

The malaria within Nyabihu District is almost inexistent due to cold conditions of the area. However, treated mosquito nets continue to be distributed free of charge to pregnant women attending antenatale care (ANC) and to children under 5 years through mass campaigns countrywide and campaign for malaria prevention and treatment. The malaria treatment drugs were also introduced in all health facilities in the District and in some interested private pharmacies. The HIV/AIDS prevalence in Nyabihu district averages 2.7% and this is slightly below the national level of 3%. All health centers within the project site offer HIV/AIDS services. The percentage of children under 5 years with diarrhea averages 18.4%.

e) Employment status of affected communities

The overall employment rate is 82% of resident population aged 16 years and above in Nyabihu district while unemployment rate and economic inactivity rate are 0.1% and 17.9% respectively. The national average employment rate, unemployment rate and economic inactivity rate reach 82%, 0.1% and 17.9% respectively. Agriculture was shown as the main activity with 74% of the population aged 16 years and above, followed by Trade (6%) while other sectors like industries (mining and quarrying, manufacturing, construction, transport, etc.) are less represented.

The survey done by the Consultant revealed that 76.3% of the population within the RoW are farmers and employed in either their own or at someone else agricultural farm. Moreover, a proportion of 21.3%, among the affected communities own small business, which they combine with agricultural activities. This can be explained by the fact that in the District, the agricultural activities (potato, bean, maize, milk) are dominant and combined with small businesses like selling the produce in the local commercial centres. The percentage of PAPs that represents “mason” is 12.5%, the students/ pupils are 1.2% while others are civil servant (1.2%) and military servant (1.3%). Civil servant respondents are especially teachers in the local primary and secondary schools. **Table 24** describes the employment status of members in the communities surveyed.

Table 24: Employment Status of affected communities

S/N	Employment	Frequency (No)	Percentage (%)
1	Employed (in own agricultural farm)	50	62.5
2	Pensioner	0	0.0
3	Student, pupil	1	1.2
4	Mason	10	12.5
5	Traders	17	21.3
6	Civil servant (Teachers)	1	1.2
7	Military Servant	1	1.3
Total		**80**	**100**

Source:Field survey and analysis, September 2016

4.6.5 Physical Cultural Resources

One physical cultural resource in Nyabihu District was identified in the surroundings of FR6. This road passes close to Rambura grave (at about 10 m from the road) which might be affected by road widening activities.

4.6.6 Resettlement implications of the Project

The indicative feeder roads in Nyabihu District pass through scattered settlements, villages and trading centers (towns). The widening will have impact on houses, agriculture land and other infrastructure facilities. About 119 houses on the indicative feeder roads are likely to be affected. Most of them are concentrated on roads passing through grouped settlements or trading centers.

The land that is likely to be acquired for roads widening is 48.12 ha. About 26.2 ha will also be used as borrow areas. They will be rehabilitated after extraction and given back to their respective owners for use. The quarry sites will be identified before the the start of civil works and rehabilitated after extraction. The RAP for affected assets (roads widening and borrow pits) is being prepared and compensation for affected assets will be done before the start of civil works. This RAP will be updated by the Contractor prior to civil works and will include quarry sites as well. It will be submitted to SPIU and World Bank for review and approval.

5 PUBLIC CONSULTATION AND PARTICIPATION

Public participation and community consultation has been taken up as an integral part of social assessment process of the project. Consultation was used as a tool to inform and educate stakeholders about the proposed action both before and after the development decisions were made. This participatory process enables the participation in the decision making process. Initial Public consultation has been carried out in the project areas with the objectives of minimizing probable adverse impacts of the project and to achieve speedy implementation of the project through bringing in awareness among the community on the benefits of the project. The project consultations were made to consult with the public as well as a number of local authorities, to determine their thoughts, opinions and feedback on the impact of the rehabilitation of indicative feeder roads in Nyabihu District.

Two public consultation meetings, one at the screening stage and the second at the draft report presentation stage. The 1st public consultation meeting concerned various stakeholders, namely local authorities, private sector, farmers organizations, churches and local communities. The 2nd meeting brought together district officers (road engineers, environmental and social protection officers), representatives of the district private sector, farmers cooperatives, church leaders).

To this end, public consultation was carried out with different groups and different areas. The approach of zoning was used to group close roads in one zone. A total number of 4 zones have been identified and a public consultation was held in each zone. The **table 25** provides details of Zones and the way roads have been grouped in the zones.

Table 25: Zones of Public Consultation

S/N	Zone	Roads covered	Date of Public Consultation	Number of participants
1	JOMBA	7, 8, 15	15/09/2016	225
2	RUREMBO	5, 10, 13, 14	15/09/2016	210
3	JENDA	3, 11	15/09/2016	21
4	RAMBURA	1, 2, 4, 5, 6, 17	15/09/2016	66
TOTAL				**522**

Source: Consultant's Survey and field visit, September 2016

5.1 Stakeholders

Involving stakeholders through participatory direct or indirect consultations is central to completion of the ESIA/ESMP. The stakeholders were those who have an interest in the project, and who will be involved in the further consultative process. The main groups of stakeholders met are:

- Project Affected Persons (PAP);
- Local authorities;
- Mukura – Gishwati national park authorities
- Community People and Road Users; and
- Churches and cooperative leaders

5.2 Public Participation – Methods and Process

During the consultative process, beside the local authorities and ordinary population , other social organizations were invited to attend the communication meetings. These are church leaders, local cooperative leaders and private sector. The public consultation for ESIA and RAP, was conducted at the same time.

During these consultations, the communities were explained about the project(background, objectives, expected upcoming activities, social and environmental impacts) as well as project expectations from the beneficiaries for its success.The participants were given opportunities to raise their concerns and claims and answers were provided by the consultants.

During consultation meetings with the communities, efforts were made to reach as many people as possible. For this purpose, the strategy of reaching people in community works known as “UMUGANDA[9]” was exploited. For this purpose, public consultation was carried out with different groups in different areas.

5.3 Findings from Public Consultation Meeting

The data obtained from public consultation and views as well as concerns from different stakeholders are given in details in **Table 26**. The people who participated in the public consultation, their signed attendance sheets are available in **Annexure 6** and photographs are put at the end of this part.

[9] Umuganda : Is a traditional practice, through which citizens living in the same Village, Cell, Sector with local authorities meet in public work. This is carried out every last Saturday of the month.

5.3.1 Consultation with District authorities

a) Consultation with District authorities

As earlier indicated, the District will play a critical role in the project. Thus, during the field visits, District authorities have been consulted for the purpose of raising awareness about the project and acquiring their views/ perceptions on the project. A meeting with District authorities was held on 17/05/2016 at the District headquarters as well as meetings with the Executive Secretaries of Sectors during public consultation meetings on 15/09/2016. **Table 26** shows details of the consulted authorities.

Table 26: Authorities Consulted in Nyabihu District

S/N	Names	Function	Contact
1	NGABO James	Executive Secretary of the District	0788434624
2	MUSHIRARUNGU Deodatha	Executive Secretary of Jomba Sector	0788879423
3	KAMANZI Edouard	Chairperson of Sector Council	0788895902
4	TWIZERIMANA Alphonse	Agronomist Jomba Sector	0788846046
5	NIYITEGEKA Jerome	Land Officer Jomba Sector	0785460472
6	MUGENZI Andre	Social Protection Officer Jomba Sector	0788602454
7	HODARI Aaron	Executive Secretary of Rurembo Sector	0782678078
8	MUNYANKUMURWA Theodomir	Chairperson of Sector Council	0784086020

Source: Consultant's Survey, September 2016

The salient feature of the meeting is presented below:

i) Views from the Executive Secretary of Nyabihu District

The **Executive Secretary** of Nyabihu District supports and appreciates the "Indicative feeder roads Project". He argued *"the rehabilitation of these indicative feeder roads*

constitutes a significant ingredient of development in the eyes of Nyabihu Citizens and authorities".

There are much benefits expected from the project such as employment during the project implementation, facilitating transport for agricultural production to the market. However, he pointed out that, though the project brings positive impacts to the people, it might also generate negative impacts; thus he urged the team to think about mitigation measures, including expropriation before the project implementation. He finally insisted on the strict application of the laws, procedures and principles governing expropriation for public interests.

ii) A summary of Views from all consulted authorities in Nyabihu District

Other authorities from Nyabihu District fully support the "Indicative feeder roads Project". In their remarks during the meeting session, they stated that " *It is a pleasure to have this kind of project in our District"* They argued that *"the rehabilitation of these indicative feeder roads will certainly bring positive impact to the people"* The benefits expected are (i) improved conditions of transporting goods and people; (ii) Opening up of the hinterland and improved access to basic socioeconomic infrastructure; (iii) Creation of direct and indirect employment during the road construction, operation and maintenance phases; (iv) Reduced risk of landslides and erosion thanks to the reinforcement and monitoring of embankments; (vii) Added value of land as a result of improved accessibility; and (viii) Improved security around schools along the road.

In brief, they all acknowledge the huge benefits that they expect from the rehabilitation the indicative feeder roads in Nyabihu District. They urged the participants to welcome the project as it brings benefits to them. People should participate in the implantation and the protection of these socio economic infrastructures. People's participation has to be observed in the rehabilitation, as they will be the first ones to be given jobs. They reminded the participant that the compensation law and practices are there to protect them.

b) Consultation with Cooperative Leaders

During the public consultation, leaders of cooperatives have been consulted with the aim of raising their awareness about the project and getting their views about the project as opinion leaders. **Table 27** shows details about cooperative leaders consulted.

Table 27: Details about consulted cooperative leaders

S/N	Name of the Leader	Cooperative	Contact
1	NSEKUYE Thomas	Cooperative Abakunda Umurimo	0785230125
2	BENIMANA Perpetue	COARU (Cooperative Iharanira amajyambere rusange)	0782931786
3	NDIRABARERA Alphonse	Cooperative KOABURA	0783296095
4	NTAKIRUTIMANA Angelique	Cooperative KOPHTAGA	0783116973
5	TUYISHIMIRE Henry	Cooperative of Community Health Workers	0788398689

Source: Consultant's Survey, September 2016

The salient feature of their views is that they all appreciate and welcome the project, as it will facilitate them to channel their production to the market. For the road users (mainly transporters) they point out that the rehabilitation of these roads will help them to decrease the cost of maintenance of their cars and motorcycles. Easy access to the market will certainly boost the value of their products. However, they all raised the concern of land in case the widening of the road requires land acquisition. They suggested that the project should avail a fair compensation for their properties, and payment has to be done before the transfer of their land.

c) Consultation with Church Leaders

During the public consultation, church leaders have been consulted, for the purpose of colleting their view and concerns about the project. Being opinion leaders, they are key stakeholders of the project their views are relevant due to their influential role in the society. They all appreciate the project and argue that infrastructures in general and roads specifically, are the engine of development. Thus, the rehabilitation of these indicative feeder roads will bring development to the population. However, their prime concerns are related to the compensation, procedures that are followed, etc. They finally recommended that laws governing expropriation should be strictly observed during the project implementation, especially during the valuation and compensation payment.

Table 28: Details about consulted church leaders

S/N	Name of the Leader	Church	Contact
1	HITIMANA Innocent	Catholic Church/ Jomba Parish	0783425886
2	NTIZIHABOSE Jean Baptiste	Brothers of Jesus	0783287046
3	BARUSHWANUBUSA Augustin	Seventh Day Adventist Church	0783425952
4	NIYONZIMA Alexis	Chairperson of Civil of Society Organisation	07821109494

Source: Consultant's Survey, September 2016

5.3.2 Consultative Meetings with community

As earlier indicated, public meetings were organized and held in different zones (see **Table 16)**, after grouping close roads in one zone. Efforts were made to ensure that all prioritized indicative feeder roads are represented in the public consultation. A total number of 522 people attended the meetings including 182 female and 5 disabled persons. The main objective of the public consultations was to gather information on their concerns, perceptions, reactions and fears of the livelihood changes to be brought about as a result/consequence of rehabilitation of indicative feeder roads in Nyabihu District. The specific objectives were:

- To create awareness of the project;
- To obtain beneficiaries' feedback and concerns on the project;
- To obtain socio- economic and environmental information on the community.

After the presentations, the community was given opportunity to give their views, comments and queries. Different community problems were addressed during the meeting in which the local participants expressed repeatedly their main concerns as follows:

- Road safety issues;
- Lack of jobs and income generating activities
- Very poor road conditions in some villages;

- Lack of sidewalk;
- Narrow local roads.

Any comments or questions raised by stakeholders were responded to by and recorded. Employment opportunities in jobs associated with the rehabilitation of indicative feeder roads was a theme brought up in the meetings. The consultant explained that positive and negative impacts of the project on people and the environment would be analysed such as air pollution, dust, influx of people, employment, traffic, road safety, etc. The consultant team highlighted that the project will follow government policies in protecting the population.

All the participants confirmed that they appreciate the Indicative feeder roads Development Project. The project received high degree of acceptability in that rehabilitation of the roads will boost local economy due to increased usage of the roads hence more exposure and increased trading opportunities. The data obtained from public consultations and views as well as concerns from local communities are given in details in **Table 29**.

Table 29: Summary of Indicative feeder roads' Public Consultation in Nyabihu District

S/N	Gender	Question/comment	Response
1	Female	The project is relevant, however, I don't understand how road selection has been done, because there are important roads which do not appear in the list of selected, while they are important for us than the selected ones, such as the road linking Kavumu-Shyira-Musanze, where there are key infrastructures (Cofee industry and Health centre)	The consultant argued that, by now, the project will cover the prioritized roads due to financial constrains, depending on the availability of funds, the project can be extended to other roads
2	Female	In your presentation you indicated that the project will provide job opportunities, how are you going to select the beneficiaries? And what will be the payment?	The consultant pointed out that the section of job beneficiaries will follow the VUP approach. The payment will vary from a given type of job to another, and will consider the market rate. At this stage, it is too early to predict what will be the payment during the project implementation.
3	Male	The project is genuine and very good for us, but how about the loss of land, crops, houses, etc	The consultant team suggested that they will make a list of people affected by the project, and apply the available laws and regulations in line with compensation. The RAP will investigate these property losses in detail
4	Male	Raised a problem of road erosion due to heavy rains	With the local authorities, the team explained that the project will bring proper drainage of the roads and will adhere to the requirements of environment protection

5	Male	Raised the issue of employment, he suggested that the local people should be the first ones to be employed by project	The consultant team explained that local people will be involved, and priority employment for locals applied during indicative feeder roads construction and maintenance. This will concern both skilled and unskilled people
6	Female	Normally projects help vulnerable people, people with disabilities. This project is not doing that.	The project will benefit all people. The local people with ability to work will be employed by the project. However, the entitlements matrix contains allowances for vulnerable people to nominate a member of their household to take advantage of the project benefits on their behalf.
7	Male	The project is good, people are happy with it. What about the materials to be used in rehabilitation (gravel, stone, or macadam)?	The project team explained that the indicative feeder roads will be rehabilitated as gravel roads and according to the standards. The project will use the locally available materials for laterite, gravel and stones.
8	Male	Wishes to speed up the road rehabilitation (project)	This is likely to occur.
9	Female	Comment – If I lose my land, will you employ me for my survival?	The team explained that the employment does not replace the compensation process prescribed by the law. They assured the projected affected people that they will be compensated in line with the law.
10	Female	Can anything be done to help disabled people get the jobs?	The project will consider employment for vulnerable people whenever possible. However, the available employment is mainly for jobs requiring enough physical energy that people with disability may have difficulty to accomplish.
11	Male	We have experienced such projects; at the beginning, they seem to be good, but during the implementation it becomes something else. They cut our banana, trees and other crops without compensation.	The consultant team explained that each project is unique, therefore the current one will fully comply with all the principles and laws as well as procedures related to compensation by all means.
12	Female	I appreciate the project, but I am wondering whether the project will support the fees related to land title modification after land acquisition.	The consultant team pointed that this will be examined and taken care of, in line with the legal provisions. He urged the participants to look for titles of their properties, as these will constitute the proofs for compensation.
During public consultations, compensation and employment have been raised as participants' prime concerns. Based on ESIA/ESMP requirements, the Consultant provided responses to the best satisfaction of participants.			

Source: Primary data genereted through public consultation, September 2016

During public consultation following points have emerged as their recommendations:

- The PAPs and other stakeholders consulted are in favor of the project;
- The PAPs will prefer financial compensation for houses and other properties likely to be affected;

- Most of the PAPs are looking forward to get employed by the project, and hope the project implementation to start soon.

The signed attendance list of people who participated in public consultation and photos are presented in appendices of this report.

Figure 25: A Photographic View of Public Consultation in Nyabihu District

5.3.3 Consultative Meeting with forests reserve authorities

The consultant met with the Coordinator of Landscape Approach to Forest Restoration and Conservation (LAFREC) and Conservation Division Manager at RDB to raise awaireness on planned project activities. LAFREC is a World Bank financed project under REMA aiming to demonstrate landscape management for enhanced environmental services and climate resilience in Gishwati-Mukura Landscape. One road, FR2, is passing through the remnant Gishwati forest. After consultation, it was found that this portion is not within the boundary of the newly gazetted park under reconstitution by LAFREC. As a natural reserve, it is under the responsibility of RDB. The LAFREC and RDB authorities met advised the Project to avoid any damage to reserve biodiversity during works execution. They promised to provide the needed technical support for the conservation of biodiversity along the roads.

6 ENVIRONMENTAL AND SOCIAL IMPACTS

6.1 ENVIRONMENTAL IMPACTS

In pursuance of the global goals of nature conservation and protection of environment to which Rwanda is committed, the Government of Rwanda has initiated plans, schemes and actions to implement various legislations. The Organic Law of 2005 determining the modalities for protection, conservation and promotion of environment in Rwanda and the Ministerial Order of 2008 determining the requirements and procedures for conducting EIA are the most important legislation for environmental assessments in Rwanda. The Guidelines and procedures for ESIA were issued in 2006 for development projects. The schedule of the notification has categorized the projects from environmental angles as per sectors. The roads/ highways have been kept in infrastructure and need environmental clearance prior to their implementation.

The present project is about reconstruction and modification/ expansion of indicative feeder roads in Nyabihu District, the Westhern Province. Hence an EIA is required before construction of the project. The project is expected to impact a large number of people, therefore its social impacts have been more emphasized in the present report, making it an Environmental and Social Impact Assessment (ESIA).

With rapid strides in economic development, the need for rationalizing the development is imperative. In the process of development, there has been intensive use of natural resources; very often leading to ecological imbalance. In construction projects like this, involving wide ranging construction activity, conservation of flora and fauna is an important aspect of eco-development. The impacts of the project could be positive or negative. Both types of impacts have been studied and wherever possible, have been quantified. The potential impacts have been assessed in this chapter from the proposed development on environmental baseline conditions (refer to **Chapter 4**), while recommendations for environmental management and enhancement measures have been enumerated in **Chapter 7.** Both negative and positive impacts are categorized as direct or indirect.

6.2 IMPACT IDENTIFICATION

The potential environmental impacts depend on the location of the project and type and volume of the interventions due to proposed development.

The project activities such as levelling, cutting, clearing of vegetation, felling the trees along the road, construction of culverts and bridges on rivers or swamps, setting up of labour camps, installation of construction machinery and other related operations are bound to cause environmental impacts, either positive or negative. The impact to environment due to road project, can be minimized or avoided, if appropriate management measures are adopted during design, construction and operation phases. The identification of potential impacts is based on field inspection of existing road with due consideration of direct, indirect, cumulative, positive or negative and secondary impacts on environmental attributes. The impacts are presented for both positive and negative in nature for different phases of project cycle in the following sections.

6.3 POSITIVE IMPACTS

The positive impacts likely to result from the proposed project have been identified based on project description in Chapter 3 and the existing environmental conditions in Chapter 4. The current state of the road is challenging especially to the road users. Rehabilitation of Nyabihu feeder road network will thus bring about many benefits. The identified positive impacts for different phases of the project cycle are discussed in the following sections.

6.3.1 Impact during Planning and Design phase

i) Employment opportunities

During the planning and design period, new jobs will be created for the skilled and unskilled labour in the community to conduct topographical and geological investigations. A majority of unskilled labour will be sourced from the local residents. Indirect employment will be in the form of suppliers and other forms of sub-contracted works that will be required for planning and design of project components. Women and youth will also have an opportunity to secure employment.

ii) Skills transfer

The international consultant will associate with local partners. In the process of planning and design, the local technical manpower will work with the international experts. This process of working together will transfer design and planning tools, computer design software and other useful guideline which are used in similar topographical conditions in the world.

iii) Training

The international consultant will provide training to local counterparts for acquiring new skills likely to be necessary for the planning and design activities. This training and trained manpower will go a long way in meeting the requirements of the country in the transport sector in general and the roads development in particular.

6.3.2 Impacts during Construction Phase

i) Employment Opportunities

The construction of indicative feeder roads will use a labour-intensive approach. During the construction phase, it is estimated that about 500 people will be working as labour both skilled and unskilled. The majority of this labour will be unskilled and will be sourced from the local residents, hence creating employment throughout the District. Indirect employment will be in the form of suppliers and other forms of sub-contracted works that will be required for the construction of project components. In addition, new jobs will be created in the Government for the implementation, monitoring and evaluation of the project. Women will also have an opportunity to secure employment.

ii) Enhancement of Rural Economy

As the construction works are spread throughout the District in rural areas, people in these areas will get an opportunity to work for the project. This will increase their income, therefore supporting the rural economy. Those who are involved in trade will have opportunities to supply construction materials for the project or the other items required for the work force working at site.

iii) Social Interaction

The National and International; local and regional manpower will be working together for the project. This interaction will enhance social interaction between the people from different places and social levels.

iv) Boost to Industrial Activities

During construction, locally made product will be utilized such as cement and gravels. The consumption of these will give boost to industrial production of construction materials.

During construction, supply of construction materials, direct sale of household goods, consumables and foodstuffs to the workers will improve trade at local and regional levels in Rwanda. In addition, the transport sector will benefit from transport of materials from manufacturing site to construction site. This will provide direct and indirect employment.

v) Induced impacts of the project

Due to road construction activities, small businesses will be created/ enhanced. The selling of construction materials such as sand and stones will be developed in the project site. Other small businesses like mobile restaurants and pubs will be run to meet workers' food needs at work.

6.3.3 Impacts during Project Operation

i) Improved Transport System, Accessibility and Communication

It has been noted that the most of the roads in Nyabihu District are presently in a such bad condition that they need rehabilitation to make them all-weather motorable. As a consequence to the poor road condition, investors in the transport industry have no incentive, hence the public transport system is underdeveloped and unreliable with only some buses plying the road at designated times in some sections of the road. Residents, therefore, have to use mostly the motocycles or seek other means of transport from unauthorized vehicles such as pick-ups and trucks. With the improvement of the road, transport will be improved both in terms of travel time, comfort, safety and lower costs associated with an increase in public service vehicles. During operation, accessibility to the various public institutions and markets will be enhanced, in particular, accessibility to health centers and educational institutions. After rehabilitation and reconstruction of feeder road network, the condition of the road will improve and transportation of commodities to and from the project areas will become easy. This will contribute on long term basis for the socio-economic development of the project area. The improved road safety and reduction in road accidents as opposed to the current situation in which, accidents are quite rampant due to the rutty, rugged nature of the road, dust, ditches, mud and pools of water in rainy season etc. The indicative feeder roads development will lead better and wider connection of the project area with the rest of the country, enhancing Nyabihu District development in particular, and the whole country in general.

ii) Employment Opportunities

In the post construction phase, the project will provide social benefits in terms of direct employment by way of better commercial and industrial development of the area. Additionally, more people may be indirectly employed in allied activities and trade. In the operation phase of the indicative feeder roads project, more job opportunities will arise in various sectors such as the transport industry, the tourism sector, commerce and trade of agriculture products. Taken together, job creation will help to reduce the problem of unemployment with improvement in income for the workers' household and revenue for the country. Apart from additional employment opportunities in farming operations, access to nearby market, would also provide opportunity for marketing of farm products and farm inputs creating additional employment in the locality.

iii) Enhancement of Rural Economy (Agriculture and Trade)

The road will provide a stimulus growth to Nyabihu District as well as improving trade with the other nearby Districts through faster transportation of agriculture products. The performance of this sector is likely to experience the greatest gain upon improvement of the road since majority of the population derive their livelihood from agriculture. The agriculture is expected to be the greatest beneficiary of the project. The poor road network was repeatedly cited as one of the major hindrances to the growth of the agriculture sector that accounts for 80 percent of employment in Rwanda. Road condition has led to low incomes for farmers and the subsequent inability of the District to increase the sector as required.

After rehabilitation and upgrading of the road, there is greater potential for the establishment of agro-processing plants to process the huge supply of agriculture produce. In the fieldwork survey, it was noted that a lot of agriculture products are sold in the cities of Rubavu and Musanze, or even as far as Kigali. Currently local farmers face a problem of market because of higher transportation costs. In addition, some of the agricultural goods like vegetables from the locality were of lower quality due to the longer transport time to markets. The market potential will be augmented by upgrading and rehabilitating access roads to the cities, thereby increasing incomes in agribusiness sector and raising the socio-economic status of local households. With the anticipated efficient, reliable and cheap transport, the following are likely to be achieved.

- Quick and easy transport of perishable farm produce such as vegetables and fruits to markets and livestock too on less price;

- Cheaper and available farm inputs and ease in provision of services to farmers;
- Easy access to bigger and better markets such as Kigali and in surrounding Districts, with a potential to export to the neighbouring countries (Congo and Uganda);
- Improved marketing of agricultural products, thus higher prices.

It is likely that the farmers of most agricultural products in the area will improve depending on the commodity and the season. All the above impacts on this dominant sector will have indirect positive impacts on other sectors, especially trade and commerce, transportation, health and nutrition, and education.

iv) Reduction in Length and Travel Time from Origin to Destination

The proposed indicative feeder roads intersect with National Road NR4 at number of places. On commissioning, the indicative feeder roads, will improve connectivity between different places, provides faster access to Kigali resulting in reduction in vehicle expenses and travel time and facilitate the development of this important economic corridor.

v) Potential to Improve Drainage and its Environmental Benefits

The current drainage structures are mainly inadequate and / or in disrepair. Often the structures cannot accommodate high flows associated with flash floods in the wet seasons. In addition, soil depositions, debris and solid waste have also clogged several drainage structures where routine maintenance activity is inactive. The project will redesign, upgrade and reconstruct all these structures. The improved road drainage system and reconstruction of bridges will reduce erosion rate. On the roads embankments, the application of bioengineering measures in high erosion risk zone will reduce possible landslides from heavy rains.

vi) Skills Transfer and Training

Through local labour recruitment, the workers will have an opportunity to learn an array of skills that relate to road rehabilitation and reconstruction. These skills will be very important during regular maintenance that will be carried out during the project operation, and generally done by the local population. Improved transport will improve interaction with other communities outside the project area, that will also provide an opportunity for further learning and cultural exchange.

vii) Enhanced Social Interaction

The infrastructures for social services developed in the area are schools, health centres, water and energy. The expected rehabilitation/ upgrading of the feeder road will enhance access to existing social amenities and stimulate their growth as more people will be using them; ultimately adding to agricultural development. With the construction of indicative feeder roads, the main artery for social interaction amongst towns and villages along the route shall be strengthened. The general quality of life along the route will be enhanced, spurring the District's development.

viii) Road Safety

The improvement of indicative feeder roads will make travelling easy and safer, because theaccidents are quite rampant due to the rutty, rugged nature of the indicative feeder roads for the current situation. From the public consutlations, most of road accidents are caused by motocycles. Improved indicative feeder roads will attract investments in public transport, therefore reducing the number of people using motocycles, thus improving road safety.

ix) Reduction in Green House Gases

During operation of improved indicative feeder roads, the vehicles will operate closer to design speed which will help reduction of emission of hydrocarbons and carbon-monoxide from exhaust. Hence the emission reduction of carbon monoxide will decrease the green house gases at regional and global levels which will have positive impact locally and regionally.

x) Reduction in Fuel Consumption

The vehicles provide better fuel performance at optimum air to fuel ratio which is optimum around design speed. The indicative feeder roads in Nyabihu District are designed for 60 km per hour (maximum)[10] which is closer to design speed of vehicles. This will facilitate in less fuel consumption which will have less burden on exchequer and will be direct impact on country's economy.

xi) Induced impacts of the project

The indicative feeder roads are passing through grouped settlements and small trading centers, poorly developed due to poor road conditions. It is expected to have new and

[10] Feasibility Study report

improved constructions erected for business purposes. This will acquire agricultural land and convert it into urban settings.

6.4 NEGATIVE IMPACTS

Leopold matrix has been used to show possible interaction between developmental activities and a set of environmental characteristics. On top on X-axis, project cycle activities are considered; while on Y-axis, Valued Ecosystem Components (VEC) are taken to identify the impacts, through interaction method. The boxes are marked with possible impact during different phases of the project cycle. Impacts on environmental component due to project activities are summarized in **Table 30** and discussed in subsequent sections.

Table 30: Impact Matrix for Potential Environmental Impacts

Component Affected	Project Activity								
	Planning Phase	Construction Phase							Operation Phase
	Land Acquisition	Site clearance	Removing trees and vegetation	Contractor camps	Vehicles & Machines operation and maintenance	Quarries	Construction/ modification of Roads	Construction Machinery	Operation
Soil	Loss of Agricultural land	Loss of crops, trees and other vegetation	Erosion and loss of top soil	Contamination from wastes	Contamination by fuel and lubricants; Compaction of soil	Increase in erosion, siltation and slope instability	Soil pollution	Pollution due to spills	Soil contamination due to surface runoff
Ground Water			Increased evaporation	Water extraction for drinking and other purposes	Water extraction for cleaning		Exploitation of water for construction		Maintenance of trees /shrubs
Surface water	Loss of water body	Change in water quality and siltation	Siltation Torrent runoff	Pollution from sanitary & other wastes	Contamination by fuel & lubricants	Water logging and mosquito breeding	Change in water quality and reduction of Ground Water recharge	Pollution due to spill into water bodies	Degradation due to spills & road runoff
Drainage		Change in natural drainage pattern	Change in natural drainage pattern	Change in drainage pattern due to disposal of solid wastes on soils	Change in natural drainage pattern due to spills	Change in drainage pattern	Interference with natural drainage and water logging		Cleaning & maintenance

Component Affected	**Project Activity**								
	Planning Phase	**Construction Phase**							**Operation Phase**
	Land Acquisition	**Site clearance**	**Removing trees and vegetation**	**Contractor camps**	**Vehicles & Machines operation and maintenance**	**Quarries**	**Construction/ modification of Roads**	**Construction Machinery**	**Operation**
Air Quality		Increase in SPM	Reduced buffering of air pollution, change in climatic conditions	Pollution due to fuel burning	Dust & air pollution	Dust pollution	Dust pollution	SPM, SO_2	Increase in SPM, SO_2 and NO_X
Noise Quality		Increase in Noise level	Reduced buffering of Noise		Increase in Noise level	Vibration from blasting operations	Vibrators, mixing plant noise etc.	Increase in Noise	Increase in noise levels due to increased traffic.
Flora & Fauna		Loss of trees and migration of wild life	Loss of trees and disturbance to wild life	Cutting of trees for fuel burning			Disturbance of Wildlife		Collision with Wildlife
Socio-economic	Rehabilitation and Resettlement	Loss of Livelihood	Loss of forest and fruit trees	Transmission of Disease					

6.4.1 Impact during Planning Phase

i) Change of Land Use Pattern

The development in the study area will definitely bring substantial change in the land use pattern as the road improvement/ construction will require additional land from private and government. It is estimated that 6.0 m widening will require **48.12** ha land (borrow and quarry areas exclusive) for the indicative feeder roads improvement. The analysis of data has also indicated that about 80% of land on roadside is under agriculture. Hence around 38.5 ha will be under agriculture. The land use change is presented in **Table 31.**

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Table 31: Land Use Change

Feeder road No	Description	Average existing road width (m)*	Required road width (m)*	Required RoW (m)*	Average additional width for 6.0 m width road (m)	Average additional width for the RoW (m)	Length (km)*	Additional area required for the 6.0 m width roads (ha)
FR1	Gasiza-Kibisabo-Muringa-Gitebe	3.40	6	10.5	2.60	7.10	13.73	3.57
FR2	Kibisabo-Masha-Arusha-Mizingo-Masha-Gatindori-Musenyi	4.17	6	10.5	1.83	6.33	32.81	6.00
FR3	Nteranya-Kareba	3.50	6	10.5	3.90	8.40	6.05	2.36
FR4	Kibisabo-Kanyaru-Rugamba-Gihirwa	2.91	6	10.5	3.09	7.59	13.65	4.22
FR5	Kirogotero-Rurembo Centre-Guriro-Murungu-Nyakiriba-Tubungo-Nkotsi	3.30	6	10.5	2.22	6.72	48.59	10.79
FR6	Rambura-Gasiza	4.80	6	10.5	1.20	5.70	2.30	0.28
FR7	Kazirankara-Nturo-Kaburamba-Murago	4.50	6	10.5	1.50	6.00	5.28	0.79
FR8	Rugera-Nyamitanzi-Gisizi	3.00	6	10.5	3.00	7.50	6.40	1.92
FR9	Gipfuna-Muringa	2.80	6	10.5	3.20	7.70	9.25	2.96
FR10	Gatovu-Mburabuturo-Murungu	3.90	6	10.5	2.10	6.60	6.36	1.34
FR11	Kajagari-Kabatwa	3.00	6	10.5	3.00	7.50	5.98	1.79
FR12	Vuga-Kamiro-Gaharawe	4.90	6	10.5	1.10	5.60	2.87	0.32
FR13	Rwaza-Kabara-Kazenzo	3.10	6	10.5	2.90	7.40	5.10	1.48

FR14	Rurembo Centre-Mubayu-Cyanika	3.02	6	10.5	2.98	7.48	11.47	3.42
FR15	Gasura-Jomba-St Jomba-Dagaza	4.30	6	10.5	1.70	6.20	14.31	2.43
FR16	Kagogo-Gakamba-Munzuri(pinus)	3.20	6	10.5	2.80	7.30	15.60	4.37
FR17	Gasiza-Birembo	5.00	6	10.5	1.00	5.50	0.95	0.10
	Total				**2.40**	**6.90**	**200.700**	**48.12**

Source: Consultant's computation and (*) Feasibility report

6.4.2 Impact during Construction Phase

i) Change of Land Use due to Borrow/ Quarry Areas

About 570,000 m^3 of earth work is likely to be involved in up-gradation/ widening of indicative feeder roads from excavation in rock and earth from borrow areas for wearing course and capping layer. Out of this, about 480,000 m^3 will be from borrow areas. The excavations of earth from rock in mining areas and borrow areas will require cutting of the rock and soils. If a depth of 4 m is taken for quarry/ mining, the land required will be 2.3 ha and for average depth of 2 m for borrow areas, the land required will be about 24.0 ha. The total area required for will be about **26.2 ha**.

The borrow areas have been identified in the vicinity of the proposed roads to minimize/avoid additional transport costs. Twelve (12) borrow pits were identified in private land as potential sites for the source of construction materials.The quarry areas are outside the project site but have not yet been identified. This identification will be done prior to construction and will be covered by the construction ESMP to be prepared and submitted by the contractor to the SPIU for review and approval. The following table illustrates the proposed borrow pits in Nyabihu District indicative feeder roads.

Table 32: Borrow pits areas in Nyabihu District indicative feeder roads

Label	Indicative feeder roads ID	Administrative location				Height (m)	Area (Ha)
			Sector	Cell	Village		
NBBP1	FR2, FR3, FR11, FR12	Nyabihu	Bigogwe	Rega	Kariyeri	40	Hill
NBBP2	FR2, FR12	Nyabihu	Bigogwe	Arusha	Ngamba	25	Hill
NBBP3		Musanze	Gataraga	Rubindi	Kabaya	6	1.2
NBBP5	FR2, FR3, FR4, FR11, FR12	Nyabihu	Bigogwe	Kijote	Bukinanyana	25	Hill
NBBP6	FR2, FR3, FR11, FR12	Nyabihu	Kabatwa	Gihorwe	Kaminuza	25	Hill
NBBP8	FR1, FR5, FR6, FR9, FR13, FR15, FR16, FR17	Nyabihu	Jomba	Nyamitanzi	Kivumu	25	Hill
NBBP9		Musanze	Kimonyi	Kivumu	Musezero	6	0.8
NBBP11	FR5	Musanze	Muko	Kivugiza	Karwabigwi	5	0.5
NBBP12	FR1, FR9, FR15, FR16	Nyabihu	Muringa	Gisizi	Kinyasenge	20	1.5

Source: Feasibility study of indicative feeder roads in 5 Districts by Sheladia, June, 2016

Note: NBBP1, 5, 6, and 11 are not included in lead distance calculations due to low CBR values (less than 25 at 95%). However, they can be considered for blending with volcanic materials after detailed blending analysis

The excavated borrow pits and stones quarries are required to be restored and reclaimed in a satisfactory manner on completion of burrow and quarry operations. Excavation of earth from borrow areas and stones from quarry areas may lead to undrained pits that create additional habitats for water borne disease vectors and possible safety issues for people and livestock (drowning in deep/steep pits). It may also lead to loss of topsoil and soil erosion problem during rains; affecting otherwise productive farm land and degrading the aesthetic views of the landcape. Most of the above impacts are of short duration and could be managed by the management plans. The proper management of borrow and quarry areas will be implemented during construction phase.This impact is a temporary and reversible change in land use pattern.

The pits reclaimation should be done in a way it leaves the site in a safe, stable, and non-polluting condition with no remaining plant, soils or stones unnecessary for post-operational use, prevents the establishment of stagnant water, erosion and supports vegetationgrowth over the long-term. After excavations, the surplus of excavated soils from roads, topsoil from land acquired for road widening as well as topsoil from burrow areas will be spread over the borrow pits to fill them. The organic materials will also be applied to improve the soil fertilityof the rehabilitated borrow areas, especially those under croplands, before handing them over to their respective owners and used for crop production. Trees or grasses will be planted after rehabilitation of borrow pits located in forest land or abandoned land. With regards to stone quarry sites, their closure and restauration should be done through reshaping the quarry pits, backfilling the pits using topsoils from within or outside the site and revegetating the areas. The use of indigenous trees species will be encouraged.

About 48.12 ha of area will be stripped for cleaning the road surface for the project work. Excavated earth material estimated at 2,900,000 m^3 will be reused in the road construction or will be used to fill the low laying areas or fill borrow pits/ quarry areas, hence its disposal is not likely to have impact on the environment. However, this soil material should never be disposed of into the wetlands.

The acquired land for road widening will be permanently lost since it will be an integral part of the carriageway. This impact is permanent and irreversible. Compensatory measures will be planned for.

ii) Soil Loss

The soil loss will be in terms of top soil erosion from the road corridor, borrow pits, quarries, and storage of material areas. In the areas of the District where the slopes are over 25%, the project may cause risks of high erosion and slope stability, which is in turn relevant to the design of the project and the conduct of operations such as excavation and drilling. **Figure 26** below shows that Nyabihu District is among the country's high risk zones with respect to erosion caused by steep slopes. The construction will be completed in 12 months. The soil erosion is likely to take place due to up-gradation and widening of project roads.

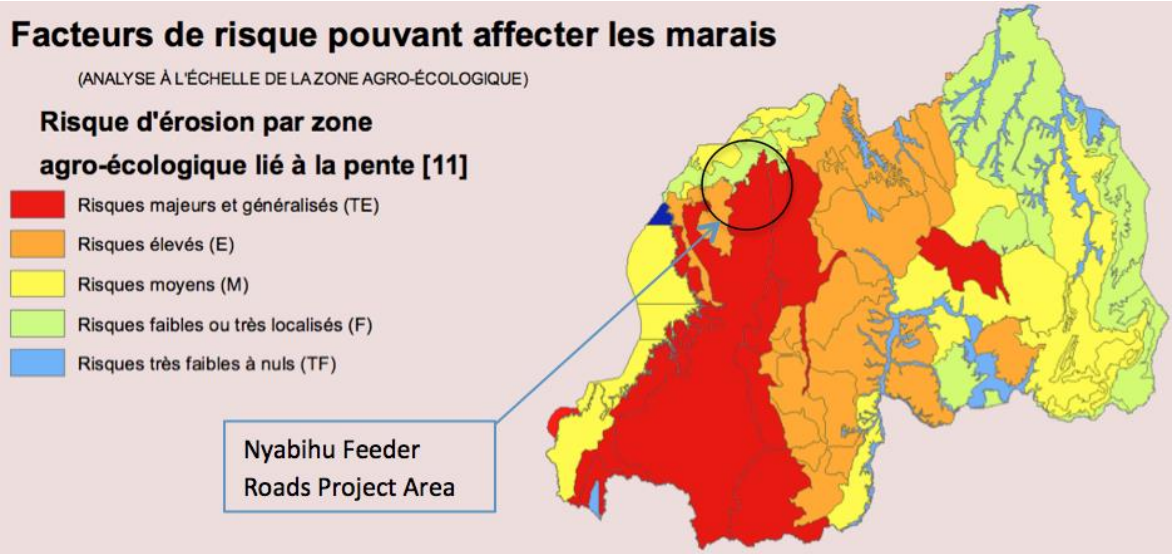

Figure 25: Map showing different erosion risk zones in Rwanda

The map is highlighted in different colors with the following meaning:

Red: *very high erosion risk zones*

Orange: *high erosion risk zones*

Yellow: *medium erosion risk zones*

Green: *low or localised erosion risk zones*

Blue: *very low or non erosion risk zones.*

Throughout the road rehabilitation works, heaps of soils could be washed away by rains causing damages downstream, including properties (crops, trees, houses, land, etc), loss of land productivity, pollution of receiving water bodies, etc. This is likely to happen during rainy season and is of short term duration and will be reversible.During the construction of Nyaruguru indicative feeder roads, extra care should be taken while constructing roads crossing wetlands which might already be eroded; by avoiding the disposal of soil and/or other constructions materials into the wetlands.

The construction works during the great wet season (mid-March to mid-May) are likely to be stopped to prevent or minimize soil erosion. Any area that has topsoil and vegetation removed need to have measures in place prior to the rainy season to avoid erosion and siltation of wetlands and streams.In addition, heaps of soils can be properly disposed of before the coming of heavy rains and dumped into the borrow/ quarry areas for their backfilling. Around 72,000 m^3 of the topsoil from all areas shall be stripped to a specified depth of 150 mm and preserved properly. This top soil will be around 360 m^3 per km. The stored topsoil will be utilized for the restoration of borrow areas and top dressing of the road embankments.

During the construction, embankment/slopes along sections of the indicative feeder roads might be prone to the soil erosion. Such embankments and slopes will need to be stabilized with grasses and engineering measures. This will be done at the same time as the road works to provide immediate protection to newly cut slopes and avoid exacerbating erosion. Grasses on embankments and trees along the rehabilitated roads will be planted for erosion control.

iii) Soil Pollution

The soil pollution is likely to be caused by the inadequate disposal of waste material on the open ground. The waste likely to fall on the ground may be solid waste/ liquid waste from labour camps or spillage of oil and grease by construction machinery and equipments, especially during their maintenance. The impacts are of short duration and will be reversible with a proper management.

Appropriate waste disposal methods have to be adopted. Construction machinery and project vehicles should be maintained only in service stations and approved areas. Proper care should be taken while locating the above utilities/ facilities so as to minimize the soil pollution. A proper waste management system should be established.

In this regards, dustbins for collection of domestic wastes at the camp or construction site should be provided. The collected wastes should be disposed of in landfills approved by the District.

Construction materials will be required for the construction of road pavement, bridges and culverts, road side drains etc. About 10-15% of the construction material is left behind by the contractor as construction waste/ spoils. The material required for construction is summarized in **Table 8** and reproduced in **Table 33** which may need disposal.

Table 33: Construction Spoils Need Disposal after Construction

S.No	Material	Construction Material (m^3)	Construction Spoils (m^3)
1	Concrete	12,729	1,300
2	Stone Masonry	81,796	8,200
3	Stone Riprap	10,915	1,100

Source: Consultant's computation based on feasibility report

Dumping of construction waste/ spoil in haphazard manner may cause surface and ground water pollution near the construction sites and breeding site for mosquitoes, hence, it is proposed to clean the area and dump/dispose the construction spoils at the dumping site specified by the local authority to avoid any adverse impact on health and well-being of people.

iv) Disruption in Drainage Pattern

The roads that intersect drainage basins generally modify the natural flow of surface water by concentrating the flow to certain points and increasing the velocity of flow. Depending upon the flow, these changes can contribute to flooding, soil erosion, channel modification, siltation of streams, properties damages, conflict over project beneficiaries, etc. These effects are often felt well beyond the immediate vicinity of the road. Proper cross drainage works on the alignments will be required. There is a number of major bridges, causeways and many culverts that will also need improvement. Critical points that need to be considered mostly include wetlands or water courses receiving the drainage, steep embankment slopes, road section where the drainage crosses the road, etc. Drainage pattern should well designed and constructed to channel water from road sides or upstream the roads to appropriate outlets.

v) Water Pollution

Surface water bodies such as rivers, streams and wetlands are located within the project area. The indicative feeder roads are crossing a good number of water courses and wetlands. It is assumed that soils from roads and borrow areas especially during rainy season may be washed away and dumped into receiving water bodies or wetlands. This will ultimately impact the water quality of the surface water. Contamination of water bodies may also come from spilling of construction materials, oils and greases and paints during transportation and at the equipment yards.

But the quantity of such spills will be negligible. Construction of bridges/ culverts may also create water pollution and increase turbidity during construction phase. The short-term increase in runoff laden with sediment and nutrients may also occur due to the removal of trees, vegetative cover and top soil. The suspended sediments and the associated pollutants may get washed into these water bodies, leading to change in water quality.

Care however, needs to be taken to provide adequate sanitary facilities and drainage in the temporary colonies of the construction workers. The provision of adequate washing and mobile toilet facilities with septic tanks and appropriate refuse collection and disposal system should be made obligatory. The construction of checkdams or silt trap structures before discharging runoff water from roads into receiving water bodies (river, stream, etc) to minimize sediments loads.

vi) Increased road embankments' landslides

Many of the indicative feeder roads in Nyabihu District traverse hilly areas and landslides are frequently observed in the area. The identification of critical and highly unstable slopes was made and the cumulative total section length of 10.06 km from all roads was found to necessitate provision of soil retaining structures.

Sliding of roads' embankments is expected to increase during construction works in the rainy period, causing road closure, damages to properties downstream. etc.Therefore, the construction works should be done during dry periods or low intensity rainfall. The protection of 10.06 km of critical embankments slopes with stone masonary as well as stabilization of the remaining embankments slopes with grasses will be done at the same time as the road works to provide immediate protection to newly cut slopes and avoid exacerbating erosion.

In addition, the ditches in the upstream of the slopes with high landslide risks will be constructed to control runoff water causing embankment landsliding. Tree plantation programs should be combined with engineering measures to control erosion, landslides, especially under zones with critical slopes. The area proposed for tree planting is equal to 20.7 ha.

vii) Increased Water Demand

The water requirement will be increased during construction phase for both road construction and workers needs. About 500 people are estimated during peak period. The peak demand is estimated at about 35 KL/day. Water sources and quality, including surface water, is likely to be impacted due to road construction activities such as setting up of workers camp, transportation and storage of construction material. However, no conflict over water resources since the hydrologic network of the project area is very dense.

viii) Health Risks due to Waste Disposal

Health risks include disease hazards due to lack of sanitation facilities (water supply and human waste disposal) to the workers during construction both at construction site and at the contractor's camp. Unscientific disposal of waste from contractor's camp can lead to contamination of both ground and surface water. This could lead to outbreak of water borne diseases such as diarrhoea, dysentery, typhoid, etc. The solid waste generated in contractor's camp if not treated properly may cause leaching and environmental pollution.

The project will employ enough labour force for its timely completion. Communicable diseases like tuberculosis, malaria, diarrhoea, etc. are therefore likely to be disseminated especially during peak demand for manpower. Different types of accidents at the site (injuries caused by handling of construction equipments, spills and leakage of hazardous materials, injuries from stepping on or using sharp objects, fires, accidents by vehicles, motocycles and bicycles, etc) are likely to increase due to rise in manpower and traffic.

Child labour, prostitutions or sexual offences, gender imbalance are also predicted due to increased employment opportunities. The impact will be of short duration and reversible, but can be of a high magnitude if not well managed.

Management measures including proper sanitation, waste disposal facilities, awaireness campaigns for the prevention of AIDS/HIV, sexually transmitted diseases and other

communicable diseases, sensitization for health insurance will be needed at the project site.

The provision of protective equipments to workers (helmets, boots, masks, etc) will also compulsery. The reinforcement of laws on child labour, sexual harassment/ prostitutions and gender equity should be done.

ix) Air Pollution

The impact of road transport on air environment is a factor of type of vehicle, fuel used and its capacity. The consultant has taken emission factor to estimate the pollution potential on air environment during construction and operation phases. It is also assumed that the quarry site will be closer to the road under construction to save on fuel and emission load on environment. During calculation density of soil and rock is taken as 1800 kg/m^3 and 2400 kg/m^3 respectively. The vehicle emission factors are summarized in **Table 34.**

Table 34: Vehicles Emission Factors

Vehicle Type	Emission Factor (gm/km)				
	CO	HC	NOx	CO2	PM
Moped	0.81	0.5	0,29	20.1	0.01
Motor cycle	3.12	0.78	0.23	22.42	0.01
Passenger Car (Diesel)	0.06	0.08	0.28	148.8	0.015
Passenger Car (Petrol)	0.84	0.12	0.09	172.9	0.002
LCV	3.66	1.35	2.12	401.2	0.47
Trucks	6.0	0.37	9.30	762.4	1.24
Bus	3.2	-	11.0	-	-

Source: Emission Factor in Developing Countries (India) for vehicle Manufactured after 2000.

Although, in the construction phase, air quality impacts are of short duration, but it does not mean that these should not be considered. Consumption of diesel during construction activities will be the principal cause of incremental air pollution. Diesel powered trucks required for the haulage of earth and other construction materials and running of construction machinery at the construction yards are the major sources of air pollution.

The construction materials required for the project are about 40,000 m^3 of rock, 210,000 m^3 of earth and 25,000 m^3 of other construction materials. These have to be transported to site and will increase the traffic volume due to the material haulage and other construction activities during the period of major material transport.

The air quality due to the movement of trucks will be impacted. These impacts can be minimized by transporting the materials during the off-peak hours.

The likely impact on air environment is presented in **Table 35.** The pollutants emitted during construction period of 12 months are estimated at 31 tons other than carbon-dioxide**.** The emission due to transportation of material will be spread into the atmosphere all over the road site vicinity. Due to high windturbulence in the atmosphere, rainfall, wide spread area and dispersion; the increase in ambient quality of any pollutant is estimated to be less than 1 µg/m^3 which is not significant.

Table 35: Emission during Construction (12 months)

S/No	Pollutant	Unit	Value Due to Transportation of				Total (Tons)
			Earth	Rock	Other Material	Passenger	
1	CO	Tons	11.52	6.48	1.56	0.02	19.58
2	HC	Tons	0.71	0.40	0.10	0.03	1.24
3	Nox	Tons	17.86	10.04	2.42	0.10	30.42
4	CO2	Tons	1,464	823	198	54	2,540
5	PM	Tons	2.38	1.34	0.32	0.01	4.05

Source: Consultant's computation based on emission factors

In order to provide an estimate of emissions of air pollutants at the construction yard, fuel consumption rates for major construction machinery were estimated. The data on fuel utilization rates of the units expected to be in operation during the road construction are provided in **Table 36**. During the period of maximum construction activity the fuel consumption at the construction yard is expected to be about 135 litre of diesel per hour.

Table 36: Fuel Consumption Rates for Construction Machinery

S. No.	Machines	Fuel Consumption (litre/h)
1	Cement Concrete Mixer	7
2	Generator	30
3	Bulldozer	20
4	Graders	12
5	Rollers	20
6	Excavators	20
7	Dumpers & Tippers	18
8	Water Tanker	8

Source: Based on Manufacturers Information

The most important pollutant during this phase will be suspended particulate matter. Such deterioration of air quality can be assigned to:

- Fugitive dust emission from construction activities like excavation, back-filling and concreting;
- Hauling and dumping of earth & construction spoils;
- Vehicular movement along the indicative feeder roads or temporary diversions.
- Gaseous emission from construction equipment and vehicular traffic.

Impacts on air quality will be low and spatially restricted along the immediate site of construction. The above will be operated at different location the impact at a particular site will be insignificant.

x) Noise Levels

The magnitude of impact during the construction phase will depend upon the types of the equipment used, the construction methods employed and the scheduling of the work. Noise associated with road development affects the environment through which road passes and has four main sources: a) vehicles; b) friction between vehicles and the road surface; c) driver behavior; and d) construction and maintenance activity. Vehicle noise comes from the engine, transmission, exhaust, and suspension, and is greatest during acceleration, on upgrades, during engine braking, on rough roads, and in stop-and-go traffic conditions. Poor vehicle maintenance is a contributing factor to this noise source. Frictional noise from the contact between tires and pavement contributes significantly to overall traffic noise. The level depends on the type and condition of tires and pavement. Frictional noise is generally greatest at high speed and during quick braking. Drivers contribute to road noise by using their vehicles' horns, by playing loud music, and sudden braking or acceleration. Road construction and maintenance generally require the use of heavy machinery, and although these activities may be intermittent and localized, they nevertheless contribute sustained noise during equipment operation. Construction activities are expected to produce noise levels in the range of 80-85 dB(A) at 15 m distance, which will decrease with increase in distance. Noise due to construction machinery is predicted as presented in **Table 37.**

The noise levels will be with a limit of 55-65 dB(A) at a distance of 100-125 m from construction site. The expected noise levels due to operation of construction machinery at site are summarized in **Table 38**. The noise levels will decrease with distance.

Table 37: Noise Due to Construction Machinery

S. No.	Machine	Operation	Noise In dB(A)
1	Dump Truck	Haul	83
2	Compactor	Fill	81
3	Dozer	Fill	85
4	Excavation by Shovel	Cut	87
5	Excavation by Caterpillar	Cut	87

Source: Consultant's own survey from other projects

Table 38: Noise Levels During Construction, dB (A)

Source	Dump Truck	Compactor	Dozer	Excavation by Shovel	Excavation by caterpillar
Noise Level dB(A)	83	81	85	87	87
Source Distance (m)	15	15	15	15	15
Noise Levels at Distance (m) from source					
20	78.5	76.5	80.5	82.5	82.5
25	76.1	74.1	78.1	80.1	80.1
30	74.0	72.0	76.0	78.0	78.0
35	72.1	70.1	74.1	76.1	76.1
40	70.5	68.5	72.5	74.5	74.5
45	69.0	67.0	71.0	73.0	73.0
50	67.5	65.5	69.5	71.5	71.5
55	66.2	64.2	68.2	70.2	70.2
60	65.0	63.0	67.0	69.0	69.0
75	61.5	59.5	63.5	65.5	65.5
100	56.5	54.5	58.5	60.5	60.5
125	54.6	52.6	56.6	58.6	58.6
150	53.0	51.0	55.0	57.0	57.0
175	51.7	49.7	53.7	55.7	55.7
200	50.5	48.5	52.5	54.5	54.5
225	49.5	47.5	51.5	53.5	53.5
250	48.6	46.6	50.6	52.6	52.6

Source: Consultant Measured at Source and Computed at Distances

xi) Loss of Biodiversity

The FR2 and FR16 are passing through the depleted Gishwati reserve. The widening of the forest section to 6m carriageway width would inevitably lead to loss of biodiversity and

other induced environmental damage. The risks of introduction of invasive species into the area through construction machines or labour force is also anticipated.

In order to minimize adverse impacts on the reserve, the following is suggested:

(i) the road expansion along the depleted forest section should strictly be limited to 6.0 m width maximum and carefully done under the strict control of the forest reserve agency (RDB), contractor, Consultant, District and MINAGRI/SPIU to limit adverse environmental impacts;

(ii) the tree cutting, grass removal outside the RoW, or introduction of new species, whether invasive or not, in the area should be avoided; the tree planting along the road section crossing the forest reserve remains the responsibility of the RDB.

(iii) Proper management system of waste (construction wastes, domestic waste, etc) should be established to avoid their dumping in the area;

(iv) Ensuring the proper drainage within the forest section; the field guide of the park should fully be involved in the management of that forest section.

(v) Awareness campaigns and enforcement of a worker's code of conduct for the protection of biodiversity: workers should be clearly informed of environmental rules of conduct, along with the penalties for noncompliance.

(vi) Posting signposts especially in the forest reserve zone, etc.

The total number of 518 forest trees (of more than 30 cm of girth size) fall within the RoW during project construction and are likely to be affected. Different types of vegetation plants, crops and agroforestry trees inclusive, will also be affected. This will lead to loss of habitat for birds. The tree planting programme after road construction in the project areas is planned to replace species that are likely to be affected. *Alnus spp, Pinus spp*, etc are some of the species that can be used in the region.

None of the endangered plant or animal species will be affected by the project. The trees which will need to be cut can easily be reproduced and replanted in other spaces after the project is over.

xii) Encroachment into the protected areas

The two roads FR11 and FR12 are a few km away from the Volcanoes National Park (1.4 km and 4.5 km respectively). There will be potential increase in tourism and other economic activities and possibly increase in poaching of wildlife in the Park.

Though the park is well protected (ie fenced, guarded and law on protected areas reinforced), the following will be done minimize encroachments:

- ✓ Reinforcement of the existing law on the conservation of protected areas and regulated tourism;
- ✓ Anti-poaching and regular monitoring of the park and its key biodiversity should be reinforced;
- ✓ The control of dust and noise pollution should also be done. The water spray should regularly be done to minimize dust emissions. The movement of heavy machinaries near the roads' end should carefully be controlled to avoid wildlife disturbance in the park.
- ✓ Continuous mobilization of local community for park conservation by RDB and local authorities.

The feeder road FR2 and FR16 passes through the remnant Gishwati forest for 12.9km and 2.4 km long respectively, and the main environmental impacts are expected to occur on sections passing through the forest section. The expansion of the road section passing through the forest should be done carefully under the control of RDB (park and forest reserve agency), District, SPIU and Contractor. In addition, the existing law on the conservation of protected areas or forest reserve, should be reinforced. The tree cutting or waste dumping into the protected area should be avoided. A safe drainage system should also be set to control wetlands floodings or forest environment by roadside runoff water. Support for local environmental education and biodiversity conservation organizations can also be considered in the ESMP. Restoration activities should not include potentially invasive species of trees and grasses with a preference for native species as possible.

xiii) Road congestion or closure

Some road sections might be congested during construction as a result of construction works and increased traffic. Some other road sections may even experience total closure for a limited time because of the nature of undertaken works. This will create difficulties for the road users as they may need to take longer routes, therefore causing more costly and time consuming travels.

The application of traffic management measures and the preparation of alternative roads in case of road closure will minimize the road congestion in the project areas.

The road closure or congestion may also cause inaccessibility to water by cattle as some of the roads are passing through pastures. The pathways for cattle should be planned for to avoid depriving cows of water.

xiv) Encroachment to physical cultural resources

The indicative feeder roads FR6 passes close to Rambura grave (at about 10 m from the road edge). In order to protect the Rambura grave, (i) the affected area can be relocated and (ii) the physical cultural resources management plan (PCRMP) should be developed before the implemention of the activity. Roads designs should also take care of the proposed management plan. (iii) The Project should not damage the physical cultural heritage. However, the civil works will not start until the revised and updated ESIA (including a PCRMP acceptable to the Association) and final RAP have been submitted to the Bank, cleared, and disclosed and compensation paid.

The PCRMP shall comply with the national and international cultural heritage regulations (world bank policy on physical cultural resources), consult the local community and other key stakeholders on the proposed project. In case any unpredicted adverse impact occurs, the Project will immediately assess the nature and extent of the impacts, revise the ESMP to incorporate the proposed mitigation measures, avail required budget and implement additional programs, as appropriate, to avoid the impact, promote and enhance the conservation purpose of the protected cultural resources.

xv) Displacement of PAPs

The rehabilitation and upgrading of feeders to 6.0 m width is likely to affect people's assets and displacement. About 1071 families formed of 4,910 people with 2,612 females and 2,298 males are living or having properties within the 10.5 m RoW. It was found that the road widening is likely to cause the relocation of 119 houses and acquire 48.12 ha likely to be permanently lost for 6.0 m road carriageway and 26.2 ha for borrow pits.

The land acquired for road widening is presented in Table 32 while details on PAPs will be presented in a standalone Resettlement Action Plan (RAP) for Nyabihu indicative feeder roads, currently under preparation. The compensation for affected communities accompagnied with a livelihood restoration program for relocated PAPs are among the mitigation measures.

xvi) Loss of water points

There are sixteen (16) public water taps that are likely to be affected by road construction activities, causing temporary inaccessibility and loss of drinking water to users. The replacement and/or relocation of existing water points as well as construction of new water points, where needed, will be required to satisfy the water needs of the affected communities.

6.4.3 Impact during Operation Phase

i) Air Pollution

The extent of air pollution will depend upon i) the rate of vehicular emission and ii) the prevailing meteorological conditions. The traffic data for the year 2016 are available in Chapter 3 (Refer **Table 3**). The emission factors for vehicles have been used to estimate the ground level concentration near the indicative feeder roads. The available litterature has been used to predict the carbon monoxide and nitrogen oxides. There are assumptions that the increase in pollutants concentration will not be significant in the nex ten years. Air quality is likely to improve in the initial years after commissioning because of saving of fuel in the vehicular traffic riding on smooth and improved roads with much less interruption. But dust emissions are likely to increase during dry periods.

ii) Noise Levels

During the operation phase of the road, movement of heavy and light vehicles is expected to give rise to higher ambient noise levels. In order to quantify the project induced noise impacts with respect to existing noise levels, noise monitoring was carried out. It was observed that during the day time the noise levels at all the monitoring locations vary between 40 to 60 dB(A). Assessment of noise impacts due to the project have been carried out using Highway Noise Model based on the guidelines suggested by Federal Highway Administration (FHWA). The details of the model and the model commutations are described below:

$$L(eq)(hi) = L(OE,i) + \left(\frac{10log}{S(i)T}\right)N(i) + \left(\frac{10log}{D}\right)15^{(1+\alpha)} + \delta s - 13$$

Where:

L(eq) (hi) : Equivalent noise level at hour (h) for the vehicle type (i);

L(OE,i)	:	Reference mean energy level for (i^{th}) type of vehicle;
N(i)	:	Number of vehicles of (i^{th}) class passing in time T,1 hour;
S(i)	:	Average speed for vehicle (i^{th}) class;
T	:	Time Duration for which L(eq) is desired (T= 1 hr);
D	:	Perpendicular distance(m) from the center line of traffic lane to observer;
α	:	Absorption characteristic factor;
δs	:	Shielding factor.

The vehicular noise emission levels vary significantly with speed. It therefore becomes necessary that speed dependency of the noise emissions for different categories of vehicles should be taken into account. In view of the above, speed related noise levels are considered for prediction. The maximum speed assumed for the present scenario is 40 km/hr. **Table 39** shows noise emitted by different vehicle types. The computed results are summarized in **Table 40.** The results have indicated a maximum increase in noise level to the tune of 10 dB(A) being highest 65 dB(A) on the indicative feeder roads specially in urban area near markets which is moderate. Otherwise in rural area it will be around 45 dB(A) during peak hours.

Table 39: Noise Emitted by Different Vehicle Types in dB (A)

Speed (Kmph)	Vehicle Type			
	Cars	**Trucks**	**Buses**	**2-Wheelars**
40	65.0	81.0	81.0	68.0

Table 40: Projected Noise Level on Feeder Road with Maximum Vehicles

Description	Feeder Road, dB(A)
Existing Maximum (dBA)	50
Total Projected (2026) dB(A)	60
Total Noise Exposure, dB (A)	60
Increase (dBA):	10
Impact :	None

Source: Consultant's computation from field survey

iii) Water Pollution

The sediments from the road drainage system may adversely affect the receiving water bodies; this could be dealt with by incorporating check dams within the drainage system to retain the sediments and a regular maintainance of the system.

iv) Increased road embankments' landslides

All the indicative feeder roads in Nyabihu District traverse hilly areas and landslides are frequently observed in the area. The roads' embankments are prone to sliding, especially during rainy season. The protection of road slopes with vegetation, stone masonry and construction of water retention ditches along roads and regular maintenance of destroyed roads are some of the mitigation measures to minimize the sliding in the area.

v) Road safety

The road safety measures are essential both in construction and operation phases. Due to improved road conditions, traffic will be increased and speed limits are likely to be exceeded, thus leading to rise in road accidents. The mitigation measures include the following:

- Adhere to speed limits;
- Display signage on road indicating the problem.
- Wear helmet while driving two wheeler; and
- Awaireness campaigns to drivers/ bicyclists/ motorcyclists and pedestrians for pedestrians safety.

vi) Induced impacts of the project

Due to improved road accessibility in the area, the encroachment to forest plantations for charcoal making and firewood is likely to be increased, thus accentuating deforestation in the area. The hunting/ poaching of wildlife for meat (rabbits, etc) or other purposes is also likely to happen. The reinforcement of the law on protected areas, collaboration between institutions and awaireness campaigns for wildlife protection will be required to mitigate the induced adverse impacts.

6.5 IMPACTS ANALYSIS

Checklist is the list of environmental parameters or impact indicators, which the environmentalist is encouraged to consider when summarizing the potential impacts. A typical checklist identifying the anticipated environmental impacts due to the project activities are shown in **Table 41**. The impacts have been categorized and analyzed in the following manner:

i) Nature (positive/negative, direct/indirect);
ii) Magnitude (high, moderate, low);
iii) Extent/location (area/volume covered, distribution);
iv) Timing (during construction or operation, immediate; or delayed);
v) Duration (short term/long term, intermittent/continuous);
vi) Reversibility/irreversibility;
vii) Likelihood (probability, uncertainty); and
viii) Significance (local, regional, global)

Table 41: Impacts Analysis of indicative feeder roads works

S. No.	Activity	Potential Impact	Nature	Magnitude	Extent/ Location	Timing/ Phase	Duration	Reversible /Irreversible	Likelihood	Significance
i)	Planning and Design of Roads	Skill Transfer & Training	Positive Direct	Low	Medium	Pre-Construction	Long Term		Probability	Regional
ii)	Site Acquisition for road construction	Change in land use/ Loss of Land	Negative Direct	Medium	Small Area/ Large Distribution	Pre-Construction	Long Term	Irreversible	Probability	Regional
iii)	Disposal of waste material, construction spoils, spill of oil and grease from construction machinery.	Soil Pollution	Negative Direct	Low	Small area/ Large Distribution	Construction	Short Term	Reversible	Probability	Local
iv)	Exposed surface due to widening of ROW, borrow pits, quarries site construction of bridges	Soil Loss/ Erosion on ROW	Negative Direct	Low	Large Distribution	Construction/ Operation	Long Term	Reversible	Probability	Local
		Soil Loss from Borrow/Quarry Areas	Negative Direct	Low	Large Distribution	Construction	Short Term	Reversible	Probability	Local
v)	Movement of Vehicles on adjoining productive land	Loss of soil fertility	Negative Direct	Low	Small area/ Large Distribution	Construction	Short Term	Reversible	Probability	Local
vi)	Construction of road, borrow areas and quarry sites	Change in Natural Drainage Pattern	Negative Direct	Low	Small area/ Large Distribution	Construction	Short Term	Reversible	Probability	Local

S. No.	Activity	Potential Impact	Nature	Magnitude	Extent/ Location	Timing/ Phase	Duration	Reversible /Irreversible	Likelihood	Significance
vii)	Runoff from roads, quarry site and borrow areas; construction of bridges and abutments on river and streams	Water Pollution	Negative Direct	Low	Small Distribution	Construction	Short Term	Reversible	Probability	Local
viii)	Disposal of waste	Health Risk due to Waste Disposal	Negative Direct	Low	Low	Construction	Short Term	Reversible	Probability	Local
ix)	Use of water in Constr and drinking	Increased Water De	Negative Dire	Low	low	Construction	Short Term	Reversible	Probability	Local
x)	Movement of vehicles for construction works and then use of road	Air Quality	Negative Direct	Low	low	Construction/ Operation	Long Term	Reversible	Probability	Regional
		Increase in Green House Gases	Negative Direct	Low	low	Construction/ Operation	Long Term	Reversible	Probability	Regional
		Fuel Consumption	Negative Direct/ Indirect	Low	low	Construction/ Operation	Long Term	Irreversible	Probability	Regional
		Noise Levels	Negative Indirect	Low	low/ less area	Construction/ Operation	Long Term	Reversible	Probability	Regional
xi)	Acquisition of land for road widening	Loss of Tress	Negative Direct	Low	Moderate/ large area	Pre-Construction	Short Term	Reversible	Probability	Regional
xii)	Widening of Road, construction of bridges and culvers	Encroachment into water bodies/ marshy land	Negative Direct	Low	low/ less area	Construction	Short Term	Irreversible	Probability	Local

S. No.	Activity	Potential Impact	Nature	Magnitude	Extent/ Location	Timing/ Phase	Duration	Reversible /Irreversible	Likelihood	Significance
xiii)	Widening of Road,	Loss of Physical Cultural Resources	No Impact							
xiv)	Widening of Road,	Re location of Physical Structure	Negative Direct	Low	Less area	Construction	Short Term	Reversible	Probability	Local
xv)	Construction and operation of road	Employment Opportunities	Positive Direct	Medium	Large Distribution	Construction/ Operation	Long Term		Probability	Regional
		Enhancement of Rural Economy	Positive Direct	Medium	Large Distribution /Permanent	Construction/ Operation	Long Term		Probability	Regional
xvi)	Operation of road	Reduction in length and travel time	Positive Direct	Medium	Permanent	Operation	Long Term		Probability	Regional
		Enhanced Social Interaction	Positive Direct	Medium	Permanent	Construction/ Operation	Long Term		Probability	Regional
xvii)	Construction of roads, bridges and culverts and Operation of road	Skill Transfer and Training	Positive Direct	Medium	Permanent	Construction/ Operation	Long Term		Probability	Regional
xviii)	Side cutting for road widening	Land Slides	Negative	Low	Temporary	Construction	Short Term	Reversible	Probability	Local
xix)	Construction Activities	Workers Safety	Negative	Low	Temporary	Construction	Short Term	Reversible	Probability	Local
xx)	Employment of outside labour	Health Safety (Transmission of STD, HIV/AIDA	Negative	Low	Temporary/ Permanent	Construction	Short Term	Reversible	Probability	Local

The roads rehabilitation works is likely to have social impacts including land acquisition of 74.32 ha (including 48.12 ha for road widening and 26.2 ha of borrow pits), relocation of 119 houses and 1071 affected families. These social impacts are considered Medium because none of the project affected households (PAHs) will leave his plot due to project activities. The people likely to be relocated will not leave their plots; they will rather move at some distances from the RoW within the same plot. In addition, the loss of land due to road works will not render the remaining area unusable and PAPs losing their assets will be compensated for. Not only the borrow pits will be rehabilitated using surplus from RoW and topsoils from both borrow area but also the soil fertility will be restored through organic materials application soon after the murram extraction.

7 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN, MITIGATION AND ENHANCEMENT MEASURES

7.1 MANAGEMENT PLANS

Conservation, protection and preservation of environment have always been a primary consideration in Rwanda ethos, culture and traditions. In order to meet people's requirement in transportation sector, up-gradation/ modification/ construction of indicative feeder roads are planned which affects the ecology and the environment of project area. The impact due to project on different attributes of environment are discussed and presented in Chapter 6. Management of Environment by provision of necessary safeguards in planning of the project itself can lead to reduction of adverse impacts due to project. This chapter spells out the set of measures to be undertaken during project construction and operation to reduce or mitigate or bring down the adverse environmental impacts to acceptable levels based on the proposed Environmental Management Plan. Mitigation measures are actions that are intended to avoid, alleviate or reduce environmental impacts on the environment. These measures include generic and site-specific measures based on the results of the impact assessment and measures/guidelines for roads set by the Rwandan Government and the World Bank's Safeguard Policies, including the WB General Environmental Health and Safety Guidelines.

The most reliable way to ensure that the plan will be integrated into the overall project planning and implementation is to establish the plan as a component of the project. This will ensure that it receives funding and supervision along with the other investment components. For optimal integration of ESMP into the project, there should be investment links for:

- Funding,
- Management and Training, and
- Monitoring.

The purpose of the first link is to ensure that proposed actions are adequately financed. The second link helps in embedding training, technical assistance, staffing and other institutional strengthening items in the mitigation measures to implement the overall management plan. The third link provides a critical path for implementation and enables

sponsors and the funding agency to evaluate the success of mitigation measures as part of project supervision, and as a means to improve future projects.

For every issue discussed for above measures, the implementing agency as well as staffing, equipment, phasing and budgeting have been presented as far as possible.

All required funds will be channelled through the executing agency. The mitigation measures are set forth to maximise positive impacts and minimise negative impacts as a result of the proposed indicative feeder roads. The following general mitigation measures will be applied:

- Cut material shall be temporarily and properly stored along the road side to prevent it eroding into the streams and it will be reused in the road levelling activities.
- Stabilization of road sides quarry and borrow areas by replanting the trees to minimize erosion;
- Rehabilitation works are highly recommended to be implemented during the dry season;
- Excavated areas should be restored immediately after excavation to limit the exposure of loose soils, thus minimizing soil erosion;
- Land clearing should be limited to only those areas necessary for the road rehabilitation and upgrading of the project indicative feeder roads;
- Installation of check dams, silt traps and oil and grease interceptors wherever necessary to avoid water pollution;
- Cross drainage works at regular interval in flood prone areas with adequate size to meet flood requirements specially minor bridges;
- Provision of water supply and sanitation facilities in construction camps;
- Provision of top-covered trucks carrying earth to avoid air dust pollution;
- Disposal of solid waste generated from construction activities as construction spoils and domestic solid waste from house activities; and
- Tree plantation on side of indicative feeder roads specially on steep landscapes to reduce erosion and accidental risks, to reduce air-pollution and to improve the visual quality of the road.

7.2 PROPOSED MITIGATION MEASURES IN DIFFERENT PROJECT PHASES

Based on project description Chapter 3, Environmental Baseline Data Chapter 4 and Environmental Impacts Chapter 6, it is proposed to prepare the environmental management plans to mitigate or reduce negative impacts. Based on impacts, environmental management plan has been prepared by adopting mitigation measures for negative impacts and are presented for different phases in **Table 42**.

Table 42: ESMP during Project planning, construction and operation Phases

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
PROJECT PLANNING AND DESIGN					
Selection of indicative feeder roads	Conflict over project beneficiaries	Involve all the stakeholders in roads selection (organizing meeting, sites visits with stakeholders)	Planning stage	Districts Authorities, Opinion leaders, farmers' organizations Local community, MINAGRI/ FRDP	2,000,000
Selection of borrow pits/quarry areas	Conflict over project beneficiaries	Consultation with affected communities	Feasibility study stage	District road Engineer & Environmental Officer, MINAGRI/FRDP Engineer and Environmental Specialist Contractor	1,000,000
	Loss of properties (crops, trees, houses, etc)	Compensate for lost assets as per the Rwanda Expropriation Law and WB policy on Involuntary Resettlement	Feasibility study stage	Contractor District road Engineer & land officer MINAGRI/FRDP Environmental Specialist	5,000,000
		Minimize the number of borrow pits by increasing the free haul distance in BOQ;	Feasibility study stage	Contractor	0
Road realignment	Loss of properties (land, houses & crops)	Involve all the stakeholders in roads selection	Planning stage	District road Engineer Contractor	0
		Integrate representatives of PAPs in the Project	Planning stage	District road Engineer Contractor	0

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
				MINAGRI/FRDP social safeguards specialist	
		Compensatefor lost assets as per the Rwanda Expropriation Law and WB policy on Involuntary Resettlement Integrate representatives of PAPs in the Project	Planning stage	- District - MINAGRI/FRDP	Included in compensation cost above
Subproject design			Feasibility study stage	MINAGRI/FRDP road Engineer Contractor	0
Capacity building of District staff and focus groups	Poor monitoring of roads activities	Trainings on safeguards and monitoring	Planning & Construction stage	MINAGRI/SPIU Environmental and Social Safeguards Specialists	20,000,000
PROJECT CONSTRUCTION PHASE					
Borrow pits/quarry sites exploitation	- Loss of topsoil and soil erosion affecting productive farm land and landscape aesthetics; - Stagnant water in undrained borrow pits/quarry areas creating habitat for water borne disease vectors and possible safety issues for people and livestock	Employing Environmental and Social and Health Safety Experts of Contractors & Consultants	Construction Phase	MINAGRI/SPIU District	84,000,000
		Establishing a detailed borrow pit / quarry management plan	Construction Phase	- Contractor Environmental & Social Safeguards Expert; - Environmental & Social Safeguards Expert of the Supervising Firm - District Environmental Officer - MINAGRI/ FRDP Environmental Specialist	2,500,000
		Proper implementation of the borrow pit / stone quarry management plan			
		Reshaping, transport and spreading over topsoils in the	Construction Phase	- Contractors Engineer and Environmental & Social	50,000,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
		pits on 26.2 ha for rehabilitation		Safeguards Expert; -Resident Engineer & Environmental & Social Safeguards Expert of the Supervising Firm	
		Planting of trees and grasses and maintenance for 1.5 years	Construction Phase	- Contractors Environmental &Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm -District Environmental Officer - District Agronomist - MINAGRI/ FRDP Environmental Specialist	19,250,000
	Safety risks at the borrow/quarry sites (accidents,	Design borrow pits/ quarry sites safety measures	Construction phase	Contractor's Engineer and Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm	0
		Posting of safety signposts and guards at the site	Construction phase	Contractor's Engineer and Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm	5,000,000
Earthworks	Loss of	Compensation for lost	Construction phase	- Contractors Environmental &	Included in the Nyabihu RAP budget

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
(Road construction and Camp site installation)	beneficiaries' properties (land, trees, crops, houses & other structures)	properties		Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm- District Environmental OfficerDistrict Agronomist - MINAGRI/ FRDP Social safeguards Specialist	
	Soil erosion causing water quality degradation and property damages	Avoid earthworks during heavy rains (mid-March to mid-May);	Construction works schedule	Contractor District Road Engineer MINAGRI/FRDP Engineer	0
		Disposal of unused stockpiled topsoils before rains	Construction phase	Contractor Engineer & Social/ Environmental safeguards Expert	20,000,000
		Protection of road embankments/ slopes with vegetation to reduce landslides	Construction phase	- Contractors Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm- District Environmental OfficerDistrict Agronomist - MINAGRI/ FRDP Environmental Specialist	40,000,000
		Install proper road drainage and check dams, silt traps where necessary to reduce silts, 10.0 km retaining wall	Construction phase	Contractor	100,000,000
	Soil pollution	Maintenance of motorized machinery and equipments in service stations	Construction phase	Contractor	0

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
		Provision of dustbins for waste collection	Construction phase	Contractor	4,000,000
		Cleaning of the site and dispose of the construction spoils at the dumping site approved by the District	Construction phase	-Contractor Engineer & Social/ Environmental safeguards Expert -Resident Engineer and Social/ Environmental safeguards Expert, Supervising Firm -District Engineer and Environmental Officer -MINAGRI/FRDP Environmentalist	Included in the above budget for borrow/quarry management plan
	Disruption in drainage pattern	Proper design of drainage canals	Feasibility study phase	Contractor	0
		Construction of drainage canals as per the designs	Construction phase	Contractor District road Engineer FRDP Engineer	0
		Proper conveyance of excess water from Nyirakigugu Dam	Construction phase	Contractor District road Engineer FRDP Engineer	0
	Water pollution	Provision of sanitary facilities to workers	Construction phase	- Contractor Engineer & Environmental & Safeguards Expert - Resident Engineer & Environmental & Safeguards Expert, Supervising Firm - District Environmental Officer - MINAGRI/FRDP Environmentalist	5,000,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
		Construction of checkdams or silt trap structures to minimize sediments loads before discharging roadside runoff into receiving water body	Construction phase	- Contractor Engineer - Resident Engineer - District road Engineer - MINAGRI/FRDP Engineer	Included in the budget above
	Increased road embankments' landslides	Construction works should be done during dry periods or low intensity rainfall	Construction phase	- Contractor Engineer - Resident Engineer - District road Engineer - MINAGRI/FRDP Engineer	
		Construction of stone masonry on 10.0 km with critical road embankment slopes	Construction phase	Contractor Engineer - Resident Engineer - District road Engineer - MINAGRI/FRDP Engineer	0
		Construction of diversion ditches in the upstream of the slopes with high landslide risks to control runoff water causing embankment sliding	Construction phase	- Contractor Engineer - Resident Engineer - District road Engineer - MINAGRI/FRDP Engineer	Included in the budget above
		Tree planting on 20.7 ha	Construction phase	- Contractor Environmentalist - Resident Environmentalist - District Environmentalist - MINAGRI/FRDP Environmentalist	25,000,000
	Health risks	Developing a health and safety management plan	At the start of the construction phase	Contractor Engineer & Environmental & Safeguards Expert -Resident Engineer & Environmental & Safeguards Expert, Supervising Firm	2,300,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
		Provision of sanitary facilities (toilet, water, etc)	Construction phase	-Contractor Engineer & Environmental & Safeguards Expert -Resident Engineer & Environmental & Safeguards Expert, Supervising Firm -District Environmental Officer -MINAGRI/FRDP Environmentalist	Included in Water pollution Cost above
		Awareness campains for the prevention of communicable diseases, STDs, etc	Construction phase	- Contractor Environmental & Safeguards Expert; - Supervising firm Environmental & Safeguards Expert; - District Health Centers staff - MINAGRI/FRDP Environmentalist	1,000,000
		Use a field guide and information from the park department for reconnaissance of park boundaries in the area	Construction phase	- Contractor Environmental & Safeguards Expert; - Supervising firm Environmental & Safeguards Expert; -RDB field Guide/ LAFREC Technician	200,000
		Provision of protective equipments to workers	Construction phase	-Contractor Engineer & Environmental & Safeguards Expert -Resident Engineer & Environmental & Safeguards Expert, Supervising Firm	5,000,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
				-District Environmental Officer -MINAGRI/FRDP Environmentalist	
		Availing well equipped First Aid facility	Construction phase	Contractor	5,200,000
		Provision of medical insurance to workers	Construction phase	Contractor Workers	0
		Reinforcement of the laws on child labour, sexual harassment/ prostitutions and gender equity	Construction phase	Contractor District Environmental Officer District Social protection officer District Road Engineer FRDP Environmentalist & social safeguards specialist	0
	Increase of Gender based violence cases, prostitutions and use of child labour	Reinforcement of the laws on child labour, sexual harassment/ prostitutions and gender equity	Construction phase	- Contractor Environmental & social safeguards Expert - Supervising firm Environmental & social safeguards Expert - District Environmental Officer - District Social protection officer - District Road Engineer -MINAGRI/FRDP Environmentalist & social safeguards specialist	0
		Awaireness meetings on GBV, child labour, prostitutions preventions	Construction phase	- Contractor Environmental & social safeguards Expert - Supervising firm Environmental & social	2,000,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
				safeguards Expert - District Social protection officer -MINAGRI/FRDP Social safeguards specialist	
		Awareness programs on child protection through close collaboration with existing Child protection Committees within the community and capacity building for those committees	Construction phase	- MINAGRI/FRDP Social safeguards Specialist, - District Social protection officer	2,000,000
	Other subproject management issues	Discussion meeting to resolve issues raised	Once two weeks during the Construction phase	- Supervising Firm - Contractors - Community	0
	Air pollution due to dust and exhaust fumes	Spray water regularly when constructing roads to reduce the dust	Construction phase	Contractor's Engineer Supervising firm Engineer District Environmental Officer MINAGRI/FRDP Environmentalist	20,070,000
		Use equipments and automobiles with certification of good working conditions from "National Automobile inspection centre" to avoid exhaust fumes	Construction phase	Contractor Environmentalist & social safeguards Expert Supervising Firm Environmentalist & social safeguards Expert District Environmental Officer MINAGRI/FRDP Environmentalist	0
		Routine maintenance, repair of trucks and machines by the	Construction phase	Contractor	15,000,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
		contractor			
	Noise Pollution	Restriction of activities creating lots of noise or irritations to normal working hours (7h00-18h00) to prevent noise for neighbours at night	Construction phase	- Contractor Engineer & Environmental & Safeguards Expert - Environmental & Safeguards Expert, Supervising Firm - District Environmental Officer - District Road Engineer MINAGRI/FRDP Environmentalist &Engineer	0
		Use equipments and automobiles with certification of good working conditions from "National Automobile inspection centre" to avoid noise	Construction phase	- Contractor Engineer & Environmental & Safeguards Expert - Environmental & Safeguards Expert, Supervising Firm - District Environmental Officer - District Road Engineer MINAGRI/FRDP Environmentalist &Engineer	0
	Loss of flora and fauna habitat	Limiting the construction activity along the FR2 forest section to the existing road width	Construction phase	Contractor Engineer, Supervising firm Engineer MINAGRI/FRDP Engineers RDB	0
		Reinforcement of the law on the conservation of protected areas	Construction phase	- Contractor Environmental & Safeguards Expert - Supervising Firm's Environmental & Safeguards Expert, - District authorities - MINAGRI/FRDP	0

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
				Environmentalist -RDB	
		- Awaireness campaigns for the protection of biodiversity, - Posting warning signposts especially in the protected zone	Construction phase	- Contractor Environmental & Safeguards Expert - Supervising Firm's Environmental & Safeguards Expert, - District authorities - MINAGRI/FRDP Environmentalis	0
		Tree planting programme to replace affected trees	Construction phase	- Contractor Environmental & Safeguards Expert - Supervising Firm's Environmental & Safeguards Expert, - District Environmental Officer MINAGRI/FRDP Environmentalist	Included in the budget for tree planting
		Compensation for lost assets	Construction phase	- Contractors Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm - District Environmental Officer - MINAGRI/ FRDP Social safeguards Specialist	Included in the cost for lost assets above
	Road congestion /closure	Application of traffic management measures	Construction phase	- Contractor's Engineer - District Road Engineer - MINAGRI/FRDP Engineer	0

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
		Construction of alternative roads in case of roads closure	Construction phase	- Contractor's Engineer - District Road Engineer - MINAGRI/FRDP Engineer	10,000,000
	Encroachment to physical cultural resources	Developing Physical Cultural Resources Management Plan (PCRMP)	Construction phase	- Contractors Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm- District Environmental Officer - MINAGRI/ FRDP Social safeguards Specialist	5,000,000
		Relocation ofa portion of the Rambura grave	Construction phase	- Contractors Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm - District Environmental Officer - MINAGRI/ FRDP Social safeguards Specialist	Included in the Nyabihu RAP budget
		Chance find procedures	Construction phase	- Contractor's Environmental & Social Safeguards Expert; -Environmental & Social Safeguards Expert of the Supervising Firm - District Environmental Officer - MINAGRI/ FRDP Social safeguards Specialist	5,000,000
	Loss of water points	Relocation and construction of new water points	Construction phase	- Contractor's Environmental & Social Safeguards Expert; -Environmental & Social	9,300,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
				Safeguards Expert of the Supervising Firm - District Environmental Officer - MINAGRI/ FRDP Social safeguards Specialist	
	Non compliance with safeguards in camps site	Implementing the recent WB guidelines regarding worker camps	Construction phase	Environmental & Social Safeguards Expert of the Supervising Firm - District Environmental Officer - MINAGRI/ FRDP Social safeguards Specialist	0
PROJECT OPERATION PHASE					
Fast moving vehicles bringing noise and dust	Air pollution causing health risks due to dust and exhaust gas from vehicles	Provision of speed restriction measures (speed limit signs, bumps) near villages and special facilities (schools, health posts, markets)	Operation phase	District Road Engineer	0
	Noise pollution causing health risks due to noise from vehicles	Provision of speed restriction measures (speed limit signs, bumps) near villages and special facilities (schools, health posts, markets)	Operation phase	District Road Engineer	0
		Adhere to speed limits	Operation phase	Roads users	0
Road safety	Reduced traffic safety due to improved roads, inducing drivers to exceed the speed limits and cause	Provide traffic control signage prominently at the entrance and throughout populated village areas	Operation phase	District Road Engineer	10,000,000
		Provision of speed bumps in the vicinity of populated areas like	Operation phase	District Road Engineer	5,000,000

Activity	Adverse impacts	Mitigation measures	Implementation schedule	Responsibility	Estimated cost (Frw)
	accidents (mostly to pedestrians)	villages, schools, markets, health posts, etc.			
		Wear helmets when driving two wheeler	Operation phase	Road users	0
		Community awareness meetings on traffic safety issues	Operation phase	District Authorities National Police	10,000,000
Heavy rains causing embankments landslides, bringing debris and clogging the drainage system and roads	Water pollution and Property damages	Regular maintenance of the road drainage system	Operation phase	Local Community Association (LCAs) District Road Engineer	50,000,000
	Landslides of roads embankments	Protection of slopes with vegetation and regular maintenance of the embankments and its upstream part	Operation phase	Local Community Association (LCAs) District Road Engineer	
TOTAL					**539,820,000**

The total cost for the ESMP implementation from planning to operational phase is estimated to 539,820,000 Frw. This excludes the estimated cost for the compensation of assets likely to be affected by road widening and borrow sites and contingencies.

7.3 SPECIFIC ISSUES WITH ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

i) Road Embankments

All necessary actions will be taken to ensure embankment stabilisation, including the selection of less erodable material, and good compaction, particularly around bridges and culverts. Contract documents will specify that final forming and re-vegetation must be completed as soon as possible following fill placement to facilitate regeneration of a stabilising ground cover. Embankment slopes and road cuts are required to be stabilised by re-vegetation with unpalatable (grazing resistant) plant species, placement of fibre mats, or other appropriate technologies. Installation of drainage structure and rising of road formation level may create bare slopes that will be stabilised before the onset of the monsoon. Discharge zones from drainage structures will be furnished with riprap to reduce erosion when required. Down drains/chutes will be lined with rip-rap/masonry or concrete to prevent erosion. Construction in erosion and flood prone areas will be restricted to the dry season.

ii) Soils Erosion due to Land Clearing

Since the proposed indicative feeder roads will be a rehabilitation of existing rural roads, the land likely to be acquired is the agriculture land. The entire stretches of the alignments are subjected to erosion of varied degree. This area shall be treated through environmental measures. Mitigation measures include careful planning and timing of cut-and fill operations and re-vegetation. Turfing will be provided on the banks of embankment. In general, construction works shall be stopped during the rain season. Cost involved to prevent erosion has been included in the actual construction cost.

iii) Quarries and Crushers

It is appropriate to give consideration to the environmental implications in selection of quarry sources since poorly run operations create dust problems, contribute to noise pollution, ignore safety of their employees, or cause the loss of natural resources. To ensure adequate mitigation of potential adverse impacts, only licensed quarrying operations are to be used for material sources. Efforts should be made to use material commonly found along the roadway as construction material.

iv) Borrow Pits

Twelve borrow areas (12) have been identified in the vicinity of the proposed indicative feeder roads to minimize/avoid additional transport costs (see Table 32). The restoration of the borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the Supervising Engineer, is required after excavation. All the borrow areas will be properly dressed maintaining drainage to outwards. The side slopes shall be provided with turfing. Topsoil from the opening of borrow pits from agriculture land shall be saved and reused in re-vegetating the pits to the satisfaction of the Engineer. Additional borrow pits will not be opened without the restoration of those areas no longer in use.

v) Environmental and Social due diligence in borrow and quarry areas

Environmental and social due diligence in borrow and quarry areas is required to mitigate the environmental impact of indicative feeder roads project as well as its social implications and protect contractors, Supervising firms, property owners and Client (District and FRDP) from expensive compliance obligations and ensure that they are getting the best value for the investment made. The sites identified for borrow areas or quarry areas will be approved by the Supervising Firm and competent authority (District or Ministry) that will issue the extraction permits upon presentation of the specific borrow/ quarry restoration plans by each Contractor. The just and fair compensation for borrow and quarry areas should be followed before excavation of construction materials.

vi) Water Quality

The proposed project will not alter the existing water quality on a permanent basis, but during the construction phase, extent of surface runoff and silt load may increase giving rise to a negative impact on receiving natural bodies especially the marshy, streams, and rivers. The water will be consumed/ utilized and not likely to pose serious water pollution problems. However, additional water supply provision needs to be made in water supply system. To prevent the water pollution from the construction site following measures will be taken:

- Silt fencing to prevent sediments from the construction site into the nearby water resources;
- Sedimentation chamber to remove the sediments from road side runoff to avoid entry in nearby water courses;

- Oil interceptor for the removal of oil and grease from point sources during construction as well as during operation.

vii) Cross Drainage

Adequate sizes of drainage structures at regular intervals in flood-prone areas and at crossing points (e.g. intermittent streams) are essential. Adequately sized drainage channels to accommodate 25-year flood in the case of culverts and minor bridges and 50-year floods in the case of major bridges may be established for design purpose. Downstream slopes will be stabilized with concrete, or walls to avoid erosion.

Water Supply and Sanitation: Water supply will be needed both for the labour camp and for construction activities. In addition, public health facilities, such as sanitation and toilets will be required in contractor's camp. Water supply provision may be made at 70 litres of water per person per day for such locations. Water should be treated well before use and should be brought up to drinking water standards. It is recommended that water should be treated by conventional water treatment process like sedimentation, filtration and chlorination so as to render it safe for drinking and other purposes. This will help in reduction of water borne diseases among the labour force. Collection and safe disposal of human wastes are among the most critical problems of environmental health. Individual sewerage disposal system by way of septic tank could be adopted for sewage from contractor's Labour Camp. The capacities for septic tanks serving individual dwellings are indicated in **Table 43**. It will be the responsibility of the contractor to provide proper water supply and sanitation facilities.

Table 43: Capacity of Septic Tanks for Individual Dwellings

S/No.	Max persons served	Liquid capacity of tank (liters)	Recommended dimensions (m)			
			Width	Length	Liquid depth	Total depth
1	8	5,000	1.22	2.60	1.37	1.68
2	10	5,900	1.22	3.05	1.37	1.68

viii) Air Quality

During construction period the impact on air quality is mainly due to the material movement. The latter affects air quality over a large area, though, not in significant levels.

There is an increase in the dust levels all along the haul roads, the borrow areas and dumping areas. The emissions from the construction machinery are the source of ambient air pollution during the actual construction. Continuous use of generators, bulldozers, rollers, crane, trucks etc. give rise to the ambient levels. The mitigation measures are as follows:

- In order to curb the increased fugitive dust emissions in the area due to vehicular movement and raw material transport, provisions should be made for sprinkling of water on the haul roads in the area. Sprinkling of water should be carried out at least once a day on a regular basis during the entire construction period. Special attention should be given to all the haul roads passing through residential areas in the region. Daily inspection at haul roads and at construction site should be carried out to ensure removal of construction debris to the landfill sites;
- It should be ensured that the dust emissions from the quarries do not exceed the standard;
- Covered trucks shall be used for transportation of materials prone to fugitive dust emissions. Additionally materials which may collect on the horizontal surfaces of these trucks during loading should be removed before transportation;
- Idling of delivery trucks or other equipments should not be permitted when not in active use;
- The emission levels from diesel vehicles being used should be checked on monthly basis and brought to the required levels of emission standards;
- Proper care should be taken for storage of furnace oil, diesel, petrol etc;
- Work schedule and the operation time of construction machinery should be suitably modified to exercise a control on ambient air quality standards;
- To ensure the efficacy of the mitigation measures suggested, air quality monitoring shall be carried out as per environmental monitoring plan;
- As soon as the construction activity is over the surplus earth should be utilized to fill up the low lying areas, if any;
- The ambient air quality levels in future years will increase due to increase in traffic. The mitigation measures are suggested as under;

- It should be made compulsory by government authorities for all vehicles to adhere to the engine maintenance schedule and standards to reduce the air pollution due to vehicular emissions;
- Planting of trees all along the road can reduce 30% of the concentration of pollutants at ground levels. It is therefore recommended that the area available along the project road should be used to develop green belt.

ix) Noise Quality

Noise is also important for the construction and operational phases. During the construction phase, there would be an increase in ambient noise levels due to construction machinery operation and movement of construction vehicles. Following mitigation measures may be adopted:

- Construction yard shall be established at least 200 m away from any residential area. This will allow the noise to attenuate.
- Special acoustic enclosures should be provided for individual noise generating equipments. Enclosures may be provided by way of noise shields, which can be either brick masonry structure or any other physical barrier which is effective in adequate attenuation of noise levels. A 3 m structure made up of brick and mud with internal plastering and of non-reflecting surface will be very effective in this regard.
- Noise measurement should be conducted during construction to assess the prevailing noise levels. Earplugs should be provided to those workers who will be working very close to noise generating construction machinery.
- The exposure of workers to high noise levels especially, near the construction site needs to be minimized during construction period. This could be achieved by: Job rotation, Protective devices, Noise barriers. Stationery construction equipment should not be located near human habitation in particular schools, hospitals and institutions.
- Noise levels from loading and unloading can be reduced by usage of various types of cranes and by placing materials on sand or on the beds of sandy bags.
- Use of noisy construction equipment should not be permitted during night hours near residential areas or sensitive areas.

x) Sensitive receptors

The sensitive receptors along Nyabihu indicative feeder roads include Mukura-Gishwati National Park, wetlands, physical resources, houses and communities likely to be affected, land acquired, etc. The Subproject is likely to affect 1071 families, counting 4910 people and cause the relocation of 119 houses. Details on affected people (PAPs), land acquisition, affected properties, houses inclusive will be presented in a standalone Resettlement Action Plan (RAP). The information on other sensitive receptors (national parks, physical resources and wetlands) and how close or far these receptors are to the RoW is presented in Annex 8. The mitigation measures for the protection of the park and identified physical cultural resources were discussed above.

xi) Tree Plantation in the RoW

We recommend careful cutting of 518 trees by respecting required safety standards of accommodating alignment widening and upgrading the conditions of adjacent areas. For the trees located in the Gishwati forest reserve, we recommend avoiding any cutting and only keep the existing width wherever possible. In other roads, the trees which would be cut should be replaced after the project activities, and we suggest tripling the number of removed trees by reintroducing indigenous species wherever possible. Thus, as part of the reforestation compensatory approach, around 1554 saplings should be planted, and the choice of the species must meet the ecological conditions of the area.

xii) Human Health and Safety

The Project will have no significant impact on disease transmission or other health factors. Positive health impacts will include improved access to health care facilities and quicker response time in emergency situations. No additional mitigation actions related to health are warranted. Mitigation related to potential safety impacts will include improved road standards, and improved signage. The construction camps will be fenced off using chain-link fencing to prevent unauthorised entry. Chain link is commercially available in rolls and can be raised on site along the perimeter of the construction camps, vehicle-parking areas and any other areas where temporary enclosure is required. The chain-link fencing will ensure that visual continuity is intact.

The road safety measures are essential both in construction and operation phases. The mitigation measures include:

- Adhere to speed limits;

- Wear helmet while driving two wheeler; and
- Display signage on road indicating the problem.

Efforts need to be made to employ local labour to avoid the transmission of STD, HIV/AIDS. In addition the manpower shall be tested and treated for these disorders before employment to avoid further risk to fellow workers.

xiii) Hill/ Mountain Side Environmental Conservation

The hilly landscape in the project area, slope erosion by runoff is serious risk to any investment in the roads development sector. The Government and private land owners already have soil conservation measures in place.

But with the widening of road some disturbances are likely to take place. This may create landslides. Hence following measures are recommended:

- Cutting road side hills should be minimum;
- Focus on implementing a comprehensive soil erosion control practices all along the road in hilly landscape in order to fight against erosion;
- The erosion control measures currently being implemented include constructing anti-erosion structures (bench terraces and drainage system) along the steep slopes;
- The outfall of the drainage shall also be looked into while designing the drainage;
- The valley side of the road shall also be protected by environmental enhancement measures such as plantation of trees, rip-rapping and grass soling.

xiv) River and Marshland Protection

The indicative feeder roads are crossing at number of places through marshland and river zone. These are likely to be effected due to water pollution and physical disturbances during construction. Following measures may be adopted for protection of these resources:

- The minor and major bridges shall be constructed to accommodate the 25 and 50 years floods; otherwise it will accelerated sedimentation and clogging of the marshland during the rainy season;
- During construction the work of foundations may be separated from the stream flow by creating the construction enclosure;

- The all side of embankment should be protected by stone pitching, grass soling or riprap methods to avoid erosion as soon as construction work is over.

xv) Fuel Provisions in Contractors Camp

The contractor shall provide the cooking gas in the contractor camp to reduce pressure on the cutting of trees from the area. However, it will be appropriate to employ local labour on site. This will also decrease the fuel requirements in the camps.

7.3.1 Restoration of Facilities

The facilities available on road side and/ or right of way are reported in chapter 4. The electrical pole and water tanks need to be shifted out of the road corridor. However efforts shall be made that during construction that these civic facilities such as water supply and sanitation, electricity supply should remain in operation.

In addition safe passage shall be provided by creating appropriate diversions to schools, churches, mosques, health centres and memorial sites. It will be appropriate if people can be deputed to help in crossing at these sites.

7.3.2 Design Considerations during Detailed Engineering

The incorporation of environmental considerations from the stage of design, avoids number of environmental impacts. Hence it is proposed to include the following in the project designs:

i) The embankments, road layout shall match with the landscape of the area especially at embankments, bridges sites, near water bodies, villages, memorials, etc.

ii) The mergers of indicative feeder roads with other feeder road and/or with national roads shall be as per technical requirements. The designs should take into consideration of possibility of accidents, turn around, slopes, etc.

iii) The minor and major bridges on rivers / or streams shall be designed to accommodate 25 and 50 years flood respectively.

iv) The transport policy advocates cross drainage works at every 250 m. The outfall of these cross drainage should be connected to natural drainage system for final disposal of storm water to stream.

v) There are sites where indicative feeder roads are having less width and impact is likely on both sides, design should locate the facility from central line of the road.

vi) The site for contractors camp, quarry and borrow pits shall be identified well in advance to avoid major impacts. These sites shall be at least 200 m from settlement, away from water bodies and closer to the indicative feeder roads.

7.3.3 Environmental and Social Management Issues in Tender Document

The Project opted for Output and Performance based Roads Contracts (OPRC) type of contracts in the implementation of Gatsibo indicative feeder roads. In order to have environmental and social safeguards compliance, it is proposed to include the following in the tender document:

- Contractor shall revise / update the ESIA/ ESMP based on final designs to update existing data or include missing baseline data, potential access roads to borrow areas and quarries, detailed information on the wetlands, natural habitats and forests,information and data on the hippos and their habitats and how to protect / enhance them given that OP/BP 4.04 applies,site specific impacts and mitigation measures;
- The PCR Management shall also be included in the document along with the conditions such as 'chance find' and authority to be informed such as Genocide Commission, Institute of National Museum; etc
- Contractor shall confirm the borrow areas and quarry site to usefor construction material and close them as soon as work is over; the exposed surface likely to be eroded may be brought in the notice of resident engineer;
- Contractor shall establish the machinery yard and labour camp (if any) on location/ place approved by FRDP; the contractor have to make his own arrangements for water supply, sanitation, solid waste management, health check up, canteen, fuel and light;
- The machinery and vehicles shall meet international noise and emission standards; the oil and grease spill shall be collected for safe disposal to avoid water and soil pollution;
- The sites and work place should not pollute the water sources, protect trees forests, ecology and physical cultural resources; relocate the civic facilities and provide guidance for diversions if any;
- The environmental and social management plans / items shall be i as specified in the Bill of Quantities;

- The site monitoring shall be conducted as specified in the bill of quantities along with required frequency, the results of monitoring shall be keep for record and shall be submitted to FRDP in quarterly report;

The issues mentioned in Section 7.3.3 and others should form part of the RSA clearance.

7.4 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN IMPLEMENTATION

Institutional strengthening will be undertaken to achieve the goals of the project including sound environmental management. This EMP will be implemented by the several institutions mentioned below who are directly or indirectly involved in the project under the following sub-headings:

- Organization and Staffing;
- Environmental Training;
- Monitoring and Reporting; and
- Record-keeping.

7.4.1 Organization and Staffing

World Bank

The **World Bank** is the financier of the project including monitoring and evaluation of the implementation of the ESMP within the budget of **Rwanda Feeder Road Development Project (FRDP).** The main role of the Bank is to ensure that compliance is achieved as per the requirements of the ESMP.

MINAGRI

Ministry of Agriculture and Animal Resources (MINAGRI) through the FRDP is the lead agency in the implementation of this ESMP and the project. The role of the FRDP is to implement mitigation measures, building the capacity of other actors in SPIU, and in environmental management. The SPIU co-ordinator will be the focal point for training in FRDP and will liaise with the ministry of agriculture and animal resources for technical support. The capacity building activities should be through hands-on experience approach. The project should establish one capacity building road which will act as the field school. The role of MINAGRI will be to ensure that the roads, bridges and drainages are constructed according to the specifications of international technical and safety standards.

MININFRA/RTDA

The Ministry of Infrastructure (MININFRA) through RTDA will provide technical support and oversee the project implementation.

RDB and REMA

RDB will issue an ESIA certificate of approval, authorizing FRDP to start civil works while REMA will oversee the Project compliance with national environmental regulations. RDB will also play a key role in the conservation of the Volcanoes National Park and Gishwati forest reserve.

District

The project will be implemented by the District.It will closely work with MINAGRI/FRDP to follow up the civil works and compliance with environmental and social safeguards.

Contractor

The Contractor shall prepare a Construction ESMP (CESMP) based on this ESMP and final road alignments and design prior to the commencement of civil works. The CESMP will include a detailed PCR Management Plan, which will be submitted by the Contractor to the Supervision Consultant and MINAGRI/SPIU for review and approval.

No civil works shall commence until a CESMP has been approved by MINAGRI/SPIU. The Contractor shall hire an Environmental and Social Development Specialist to implement the CESMP.

Supervision Consultant/Firm

The Supervision Firm/Consultant shall be hired to supervise the implementation of the CESMP by the Contractor.

7.4.2 Implementation and budget

MINAGRI has the required capacity to implement the environmental and social management plans and monitoring programs in Nyabihu District. The District also has in its core staff, the environmental and social safeguard officers (District Environmental Officer and District Social Protection Officer).

In addition, the Supervision firm will add to the capacity to manage the processes in the plan. In case required, expert opinion should be sought from government agencies or specialist consultants. Moreover the contracting firms that will be constructing the indicative feeder roads will also use their capacity for environmental and social protection. The ESIA has made provisions for training and the individual capacity may be enhanced through specialized module in the required field.

MINAGRI will designate one of its officers to act as Environmental and Social Safety Officer (EO), to formally address environmental and social issues on a routine basis, who will have an oversight of environmental aspects of the construction contracts, including the enforcement of all monitoring provisions, the locations of construction and labour camps, etc. Before the commencement of construction, the designated EO will receive training in the environmental and social issues associated with road construction and maintenance projects. The designated EO will further organise the training.

The main duties of the designated EO will include:

- Review of bids to ensure their adherence to the environmental and social specifications and the requirements of the Environmental and Social Management Plan (ESMP);
- Collection and dissemination of relevant environmental documents including amendments to environmental protection acts issued by REMA;
- Co-ordination with government departments on environmental and social issues and obtaining the necessary clearances from the regulatory authorities;
- Monitoring the environmental aspects during construction to ensure that the environmental requirements of the contract and the mitigation measures proposed in the ESMP are implemented;
- Supervising contractors and preparation of environmental and social input to the quarterly progress report.

The project will closely work with RDB, REMA, MININFRA/RTDA and District staff to ensure the adequate implementation and monitoring of safeguards. The cost for the implementation and monitoring the ESMP proposed for Nyabihu indicative feeder roads project is presented below.

Table 44: Bills of Quantities and Cost Estimates for Environmental and Social Management Plan

S/No	Activity	Unit	Quantity	Frequency	Rate	Total (RWF)
A	**Project Planning and design Phase**					
1	Meetings/ site visits for beneficiaries' involvement in selection of indicative feeder roads	Number	13	Once per road before works	LS	2,000,000
2	Consultations with affected communities	Number	14	Once per road before works	LS	1,000,000
3	Compensation of assets to be lost during the selection of borrow/quarry areas and roads realignment	Assets		Once	LS	5,000,000
4	Capacity building of district staff & local communities	Number	50	Twice a year	LS	20,000,000
	SubTotal A					***28,000,000***
B	**Project Construction Phase**					
5	Employing Environmental & Social & Health and Safety Experts of Contractors & Supervising firms	Number	7	Six Lots, one contractor's expert per lot and One Expert from the Supervising firm for all lots for 12 months	1,000,000	84,000,000
6	Developing and implementing a PCR management plans	report	1	Once before the construction works	LS	5,000,000
7	Implementing Chance and find procedures	report	1	Whenever identified	LS	5,000,000
8	Developing detailed borrow pits/ quarry	report	1	Once after confirmation	LS	2,500,000

	management plans			of the borrow/quarry area selection		
9	Reshaping, transport and spreading over topsoils in the pits	ha	26.2	Once at the completion of excavations	1,908,000	50,000,000
10	Borrow/quarry areas rehabilitation and Tree and grass plantation in borrow/quarry areas and maintenance for 1.5 years	Number	5,500	Up to 1.5 Years	LS	19,250,000
11	Tree plantation upstream the critical embankment slopes	ha	20.7	Once, and maintenance to be done by land owners	250,000	25,000,000
12	Posting of safety sign posts	Number	100	Once and as required	50,000	5,000,000
13	Disposal of unused stockpiled topsoils before rains	m^3	180,000	depending on available materials	LS	20,000,000
14	Protection of roads embankment with vegetation	km	40	as required	1,000,000	40,000,000
15	Proper design &Construction of drainage systems, checkdams and silt traps and 10 km retaining walls	km		where required	LS	100,000,000
16	Solid Waste container for collection	Number	40	Once every 5 km,	100,000	4,000,000
17	Provision of sanitary facilities to workers	number of workers	maximum 500		LS	5,000,000
18	Developing health and safety management plan	Number	1	Once before the start of civil works	LS	2,300,000
19	Awaireness campaigns for preventing communicable diseases	Meeting	2/ road	Monthly	LS	1,000,000
20	Using a field guide & information from	Number	1	During works in the park	LS	200,000

	the parkDepartment for reconnaissance of park boundaries in the area			section		
21	Provision of protective equipments and clothing to workers	number of workers	maximum 500	Continuous	LS	5,000,000
22	Provision of first aid facilities	Number	14	One per road	LS	5,200,000
23	Water sprayer/ Watering for dust suppression	km	200.7	As and When Required, mostly once a day	100,000	20,070,000
24	Routine maintenance, repair of trucks and machines	Number	50	As required	LS	15,000,000
25	Construction of alternative roads in case of roads closure	km		When required	LS	10,000,000
26	Construction of water points	Number	16	once	LS	9,300,000
27	Awaireness programs on child protection through close collaboration with existing Child protection Committees within the community and capacity building for those committees	Number	60	Continuous	LS	2,000,000
28	Awaireness meetings on GBV, child labour, prostitution preventions	Number	60	Continuous	LS	2,000,000
	Sub Total B					**436,820,000**
C	**Project Operation Phase**					
29	Provision of traffic control signage prominently at the entrance & throughout populated areas		Where required	Once	LS	10,000,000
30	Provision of speed bumps in the vicinity of populated areas		Where required	Once	LS	5,000,000

31	Awaireness meetings on traffic safety issues	Number	at least 10	At least two meetings per road	LS	10,000,000
32	Regular maintenance of the road drainage system					50,000,000
	Sub-Total C					**75,000,000**
	Total (A+B+C)					**539,820,000**
	Contingencies (10% of A+B+C)					**53,982,000**
	TOTAL					**593,802,000**

7.4.3 Environmental and Social Training

The training program will cover measurement techniques in the field, tools for the prediction of pollutants, reforestation methods and procedures, conservation of water bodies including marshlands, etc. Immediate short-term training will be required for the Project in-charge and designated Environmental Officer to raise the level of environmental awareness. The training institutions, the institutions of high learning in Rwanda (universities) and the World Bank's Economic Development Institute (Environment and Natural Resources Division), conducts regular training and access to their resources may be sought. The need for additional and specialised training will be examined and appropriate training will be undertaken as required. Training of personnel to be deployed on the proposed project during construction and operation, with regard to environmental requirements should be the integral part of the planning. The project authority should be asked to submit a detailed programme for training of personnel and implementation with regard to the environmental requirements. Apart from the training, such programme should include guidelines for safety, methods of disaster prevention, action required in case of emergency, fire protection, environmental risk analysis etc. Capacity to quantitatively monitor water sediments or turbidity (by suitable portable test equipment) and noise is always advantageous, but monitoring will primarily involve ensuring that actions taken are in accordance with contract and specification clauses, and specified mitigation measures. Some awareness training will be provided to the contractor personnel to ensure that this occurs effectively. The provision of training has been made in cost estimates for environmental training **(Refer to Chapter 8).**

7.4.4 Monitoring and Reporting Procedures

The baseline data should be collected before the project begins. This will help in monitoring and controlling environmental impacts caused by the development of the project. The project in charge and designated EO will visually assess contractor's practices and, if high pollutant levels are suspected, will direct the contractor to Rwanda Standards Board (RSB) or other laboratories to verify measurements on a routine basis. Photographic records will be established to provide useful environmental monitoring tools. A full record will be kept as part of normal contract monitoring. All applicable regulations need to be enforced by the Project In charge and designated EO. Under the Environment Organic Law (2005) water quality discharge standards, air pollution emission standards and noise standards have been established. It is a legal obligation of the Contractor that any discharges from the work sites meet these standards.

Steps will be taken by the Project Incharge and designated EO to ensure that regular monitoring of water quality parameters such as pH, suspended solids, turbidity, Magnesium, oil and grease be carried out as provided in the contract. Regular monitoring of noise and dust will also be carried out as provided in the environmental monitoring program.The monitoring of accident frequency as compared to baseline will also be done.

Throughout the construction period of indicative feeder roads'activities, the Contractor and the Supervising firm will both provide the monthly progress report on the subproject compliance with environmental and social safeguards. The report will be submitted to the MINAGRI/SPIU FRDP for review and approval. The Project Enironmental Officer will prepare periodic environmental and social consolidated reports (three month progress report) on the monitoring progress of the indicative feeder roads project inthe district. These reports should be forwarded to REMA and World Bank for information.

7.4.5 Record Keeping

Monitoring form should be devised for documentation, analysis and record of parameter. The form should focus attention on environmental issues and provide feedback for the future stages of the work. Mitigation and enhancement measures adopted in final design will be explicitly under the bill of quantities (BOQ) so that performance and completion is readily documented. Daily project diaries would record environmental problems (spills, dust, noise, etc.) as well as safety incidents and will be retained as part of accepted modern contract management and summarized in Quarterly Environmental Reports.

7.4.6 Implementation Schedule

The most important aspects of the implementation are the appointment of the Environmental Officer to oversee the implementation of the environmental mitigation measures incorporated in the design and contract specifications. Development and delivery of an environmental training program for selected staff and Project coordinators responsible for overseeing the construction contracts can commence immediately thereafter. This will be an ongoing process. Contracts will be awarded over a period of time stretching over many months. Schedule for Implementation of Environmental and Social Management Plan (ESMP) is given in **Table 45.**

Table 45: Schedule for Implementation of EMP

S/N	Activity	Frequency and/or Implementation Date
1	Appoint Environmental Officer	Date to be determined
2	Initiate First Training Program	Date to be determined
3	Ongoing Training	As required
4	Check Monitoring	Quarterly
5	Prepare Environmental Reports	Quarterly
6	Construction Supervision	During Construction
7	Roadside Environment Safety and Non-Motorised Transport Policy Development	Long-Term
8	Development of Compensatory Habitats Policy	Long-Term
9	Set up an Environmental Unit	Long-Term

Source: Consultant Proposal

7.5 CONSTRUCTION MANAGEMENT GUIDELINES

In order to avoid major environmental issue, it will be appropriate to follow construction management guidelines:

- Access roads should not be constructed near water bodies. If at all it is necessary to construct them, then a buffer strip should be provided to prevent water pollution.
- In order to avoid congestion of road during construction, traffic shall be diverted to other roads with sign boards and information.
- Water Supply, sewerage and drainage lines likely to be affected need to be diverted suitably without affecting the supply system.
- People working/living near indicative feeder roads should be made aware about possibility of high noise, hazards and other information in the Right of Way.
- There may be damage to surface and sub-surface drainage and also rotting and mixing of top soil. To avoid this, it is essential to retain original surface contours as far as possible and minimize the earth work involved.

- As far as possible, care should be taken to compact all loose soil before end of work every day and avoid work during rainy season. This will help control erosion of soil.
- Care must be exercised not to spill fuel by keeping vehicle/equipment in a well maintained condition. Special attention should be given to oil seals of equipment/vehicle involved. Maintenance should be done in automobile service stations and other approved service areas. In case of accidental oil spills, proper clean-up should be conducted by skilled technicians.
- It is necessary to check the noise generated during construction. The equipment and vehicles should be in good working condition to allow for minimum generation of noise.
- The occupational noise levels during 8-hour work shift should not exceed 85 dB(A). The public exposure should be limited to 55 dB(A) during day time(6AM - 9PM) and 45 dB(A) during night time (9PM - 6AM).
- Use of electrical equipment should be preferred over pneumatic ones in order to minimize noise generation,

First aid: At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided. Workplaces remote and far away from regular hospital will have indoor health units with one bed for every 250 workers. Suitable transport will be provided to facilitate taking of injured or ill person (s) to the nearest applicable hospital.

Setting up of Construction site: The contractor may follow the guidelines to identify the location of the construction equipment site.

1. A minimum of 1 km away from any major settlement or village,
2. A minimum of 300 m away from major surface water course or body,
3. On non-agricultural lands, as far as possible, and
4. Safety measures to Workers during construction.

Risk from Operations: The implementing agency is required to comply with all the precautions as required for the safety of the workmen. The contractor will supply all necessary safety appliances such as safety goggles, helmets, masks, etc., to the workers and staff. The contractor has to comply with all regulation regarding safe scaffolding, ladders, working platforms, gangway, excavation, and trenches.

Workers Camps: All temporary accommodation must be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing; Adequate washing and bathing places shall be provided, and kept in clean and drained condition; Construction camps people shall be adequately provided with health care; drains and ditches should be treated with bleaching power on a regular basis.

Shelter at Workplace: At every workplace, shelter place shall be provided free of cost, for meals and for rest, and separately for use of women labourers. The height of shelter shall not be less than 3 m from floor level to lowest part of the roof. Sheds shall be kept clean and the space provided shall be on the basis of at least 0.5 sq. m per head.

Canteen Facilities: A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered necessary. The contractor shall conform generally to sanitary requirements of local medical, health and municipal authorities and at all times adopt such precautions as may be necessary to prevent soil pollution of the site.

Day Creche Facilities: At every construction site, provision of a day creche shall be worked out so as to enable women to leave behind their children while working.

7.6 ALTERNATIVES

The indicative feeder roads are passing through villages, and close to commercial centres, schools and churches at number of places. Such sections shall be reviewed during detailed engineering. In addition, the feeder road sections also need to be reviewed at the locations where indicative feeder roads are merging with other indicative feeder roads or with National Road and passing through protected areas.

8 ENVIRONMENTAL AND SOCIAL MONITORING PLAN

8.1 ENVIRONMENTAL AND SOCIAL MONITORING

Environmental and social monitoring programme is a vital process of any environmental management. This helps in signalling the potential problems resulting from the proposed project and will allow for prompt implementation of effective corrective measures. The environmental monitoring will be required during construction and operational phases. The following parameters shall be monitored:

- Water Quality,
- Air Quality,
- Noise levels, and
- Soil conservation,
- Accident frequency
- Socio-economic Conditions; and
- Reforestation.

A matrix has been developed for monitoring of impacts to facilitate the monitoring frame work which includes the following:

- Parameters to be monitored,
- Indicators,
- Method used for verification,
- Frequency of monitoring,
- Responsibility, and
- Costs involved.

Table 42 summarizes the above monitoring program. The bills of quantities (BoQ) have been prepared for environmental and social management plans along with costs involved are presented in **Table 46.**

8.2 TOTAL ENVIRONMENTAL AND SOCIAL MONITORING COSTS

The environmental and social monitoring costs is estimated as **53,350,000 RWF** (including contingencies 10%).

Table 46: Environmental and Social Monitoring Program

S/No	Adverse Impact	Parameter to be Monitored	Indicator	Method	Frequency	Responsibility	Cost Estimates (RWF)
1	Loss of properties (houses, trees, crops, etc)	Compensation for lost assets	Lists of PAPs & their affected assets, Lists of paid PAPs	Site visits for meeting with PAPs and crosschecking at the Banks	Continous	District authorities, MINAGRI/FRDP Social safeguards Specialist	2,000,000
2	Grievances raised by affected families	Complaints raised by PAPs	Number of complaints recorded	Meetings, site visits	As and when required	Grievance redress committees, District	0
3	Water Pollution	Water quality (DO, Ca,Mg, TSS, Turbidity, Coli form Count)	Nutrient and sediments loads	Bi-annually during wet seasons	Once every wet season	FRDP	3,000,000
4	Soil Pollution	Soil Chemical properties,	Soil nutrient loads	Soil sampling and laboratory analysis	As and when required	FRDP	1,500,000
5	Loss of trees	Tree species along roads and other identified areas	Number / area of planted trees	Field observations	Once in a month for 3 years	FRDP Environmentalist District PAPs	8,000,000

6	Safety hazards	safety at the site	Incidences, accidents, diseases,	Review and evaluation of incidences, accidents register, diseases records,	continuous	MINAGRI/ FRDP District	7,000,000
		Accidents frequency	Nbr of accidents per month	Review of police records on roads accidents	Continuous	National Police District MINAGRI/FRDP	2,000,000
7	Low capacity of beneficiaries in the implementation of safeguards	Capacity/skills in environmental and social management	training reports, number of trained staff	Training of District Environmental Officers and other officers involved in environmental and social management	Twice a Year	MINAGRI/FRDP MINALOC Districts	25,000,000
	Total						**48,500,000**
	Contigency (10%)						**4,850,000**
	Total						**53,350,000**

8.3 GRIEVANCE REDRESS MECHANISMS

The grievance redress committee, composed of representatives from the participating District, MINAGRI/FRDP, Contractor and Supervising firm as well as affected comminities willbe created to supervise the safeguards compliance throughout the project implementation period and resolve related issues/ conflicts. This committee will ensure that all affected people are fully informed of the process for expressing dissatisfaction and for seeking redress, and will issue warnings about the consequences of failure to lodge their complaints in time.Sub-comittees will also be created at the feeder road level and will be Sector based. These sub-comittees will work under the coordination of the Subproject Committee.

It is encouraged to resolve the issues at Cell, Sector or District levels, as they are aware of and involved in the whole process. If the grievance is not resolved in this way, the dissatisfied party can refer the matter to the competent court. Local courts should be used. If not resolved then the high court or court of appeal of Rwanda remains an avenue for voicing and resolving these complaints.

MINAGRI/RFRDP will follow up the aggrieved PAP at each level to ensure that the grievances are resolved. Each sector should identify one PAP to work with MINAGRI/FRDP and the local leaders to ensure that the grievances are attended to in time.

9 DISCLOSURE OF ENVIRONMENTAL SAFEGUARDS INSTRUMENTS

The Ministry of Agriculture and Animal Resources will disclose this ESIA/ESMP report after the Bank's clearance by making copies available at its head office and in District / Sectors/ Cell project is situated. The copies shall also be made available to the Government's agencies (REMA, RDB, RTDA, etc), the Environmental and Social Group and other stakeholders. The Government of Rwanda will also authorize the World Bank to disclose this ESIA/ESMP electronically through its External Website.

The FRDP opted for Output and Performance based Roads Contracts (OPRC) type of contracts in the implementation of Nyabihu indicative feeder roads, where the successful Contractor / Entity is expected to complete the detail design and update the ESIA/ESMP based on the final selection of the roads and the design. After updating and reviewing the the ESIA/ESMP report, the latter will be submitted to the Bank for review and clearance. Once the updated report cleared, it will be re-disclosed both locally and through the Bank external website.

10 CONCLUSION AND RECOMMENDATIONS

10.1 CONCLUSION

Based on Project Description (Chapter-3)**,** Environmental Baseline Data (Chapter-4), Environmental Impacts (Chapter-5) and Environmental Mitigation Measures (Chapter-6), the following conclusions are drawn:

i) The indicative feeder roads are mostly in hilly terrain in the district of Nyabihu. A feasibility study was done for a total of 200.7 km of indicative feeder roads, and an environmental and social impact assessment study was conducted to establish en environmental and social management plan.

ii) The project area is about 150 km from Kigali and may be reached by road via National Road 4 and National Road 11. The integration of these roads with National Roads will help in economic development of the region. One of the important aims of rehabilitating Nyabihu district indicative feeder roads is to provide access to the rural areas and to improve quality of life of local community. This will enable to fulfil the goal of vision 2020, EDPRS II and other development programs to a large extends. Apart of this aim, the feeder road will help improve social and cultural environment and development of other sectors like agriculture, commerce and trade. Hence the proposed feeder road rehabilitation will play an important role in economical growth and reduction of the poverty. Educational, cultural and health centres will have an easy access thus making improved living standards and quality life of the people.

iii) The cost of the interventions to improve the indicative feeder roads has been reproduced from the feasibility report. The total cost of construction to improve of 200.70 km of indicative feeder roads amount to US$ 35.509 million, the average cost per km amounts to US$ 176,926. The planned activities include: rehabilitation / maintenance of drainage, bridges and carriageway. The environmental and social management and monitoring costs are estimated to RWF **647,152,000** (including 10% Contingencies) which is 2.2 % of project costs.

iv) It is estimated that 518 trees are likely to be cut for expansion of indicative feeder roads. An inventory of these trees has been made. It is proposed, to plant a little more than trees cut; hence 1,554 trees will be planted at suitable locations along

the indicative feeder roads. In addition about 27,324 trees will be planted on road side as an environmental enhancement measure and also to protect the valley side erosion. In addition, the borrow area and quarry sites will also be vegetated to prevent erosion.

v) The major positive achievements of feeder road project are:
   - The road network in the District with national road linking with other Districts, mainly Rubavu, Musanze, Rutsiro and Ngororero.
   - Development of social and cultural environment of not only influence area but also the surrounding Districts.
   - Development will stimulate ancillary projects in agriculture and allied areas which will improve economical status of the local population;
   - More employment of people during construction and operation phases;
   - Less travel time to schools, health centre and markets.
   - Development of potential socio-economic centres, enhancement of rural economy and improved transport system,
   - Skill Transfer and Training,
   - Potential to improve drainage, road safety and reduction in green house gases.

vi) The project is planning appropriate drainage pattern which will reduce the erosion rate in the different catchments. The underground utilities such as water pipeline, valve chambers etc. are likely to be relocated. Income generation of the rural population will be greatly enhanced through creating new avenues like trade commerce and other small agro processing industries.

vii) The environmental and social mitigation measures as stipulated in ESMP shall be monitored during implementation of the feeder road project. In order to perform monitoring of ESMP the construction company shall monitor the plans in the supervision of the experienced monitoring laboratory or Company.

viii) The noise and air quality of the project area is within the permissible limits. With the increase in traffic the maximum increase in noise level anticipated in the project area will be about 10 dB(A) as estimated based on field measurements. The change in air quality will be insignificant. The overall impact on air and noise

quality during construction is limited to site and of short duration and can be mitigated.

ix) The labour camps shall be established away from the forests and wetlands to avoid the problem of water pollution.

x) The environmental monitoring will be required before the start of the construction and during the construction and operation phases. The following parameters need to be monitored: Water Quality, Air Quality, Noise quality, and Soils. The parameters will be as specified in monitoring program in chapter 8.

xi) During public consultation, few recommendation were drawn are :i) Involve local communities in all stages of project planning and development, ii) Permanent communication between project initiators and local authorities, iii) All people whose properties have been affected by the project have to be compensated for loss of house, land, crops and trees, iv) Grievance redress and monitoring register have to be set-up and the process be publicized in the affected areas v) During construction, first priority should be given to local people for employment of skilled and unskilled manpower.

10.2 Recommendations

In view of above it could be concluded that project will bring benefit to the people of the area. The negative impacts are within the manageable limits and can be mitigated with the proposed management plans and hence project may be implemented.

ANNEXURES

Annexure 1 : Study Team

S/No	Name of the Expert	Specialization
1	Pr. Dr. Jean Bosco Gashagaza	Environmentalist / Team Leader
2	Mr. Samuel NSHUTIYAYESU	Ecologist / Natural Resources Management Specialist
3	Eng. Naila UMUBYEYI	Water Resources Management Specialist
4	Dr. Balinda RUTEBUKA	Sociology Specialist

Annexure 2: Tolerance Limits for Discharged of Domestic Wastewater

S. No.	Parameter	Limits Treated	Methods of Test
1	TDS mg/l	<1500	ISO 6107-2:1989
2	TSS mg/l	<50	ISO 11923:1997
3	ph	5-9	ISO 10523:1994
4	Nitrates mg/l	20	ISO 5663:1984, ISO 6778:1984, ISO7890-3:1988
	Nitrites mg/l	2	ISO 6777:1984
	Total Nitrogen	30	ISO 11905
5	Total phosphorus mg/l	5	ISO 6878:2004
6	Temperature variation of Treated water compare to ambient Temperature of water ^{0}c	<3	Thermometer
7	BOD_5 mg/l	< 50	ISO 5815-2:2003
8	COD mg/l	< 250	ISO 6060:1989
9	Faecal Coli forms mg/l	400	ISO 4831:2006
10	Oil and grease mg/l	<10	ISO 9377-2:2000
11	Chlorine mg/l	<2	ISO 7393
12	Sulphate mg/l	500	ISO 22743
13	Color Pt-Co	200	ISO 7887

Annexure 3: Permissible Limits for Industrial Waste Water Discharge

S/N	Parameter	Permissible Limit	Test Method
1	Temperature increase 0C	<3	Thermometer
2	Total suspended solids mg/l	50.0	ISO .11923:1997
3	Total Dissolved Solids mg/l	2000.0	ISO 7868:1985
4	Oil and greasemg/l	10 0	ISO 9377-2:2000
5	BOD5 mg/l (20 0C)	50.0	ISO 5815-2:2003
6	COD mg/l	250 0	ISO 6060:1989
7	Faecal Coli forms MPN/I00ml	400	ISO 4831:2006
8	Ammonia (as N) mg/l	20.0	ISO 6778:1984
9	Arsenic mg/l	0.01	ISO 11969 1996
10	Benzene mg/l	0.1	ISO 11423-2:1997
11	Cadmium mg/l	0.01	ISO 5961:1994
12	Hexavalent Chromium mg/l	0.05	ISO 23913:2006
13	Copper mg/I	3.0	ISO 8288:1986
14	Cyanide mg/l	0.1	ISO 6703-1:1984
15	Iron mg/i	3.5	ISO 6332:1988
16	Lead mg/l	0.1	ISO 8288:1986
17	Mercury mg/l	0.0002	ISO 5666:1999
18	Nickel mg/l	3.0	ISO 8288:1986
19	Phenol mg/l	0.2	ISO 8165-1:1992
20	Sulphide mg/l	1.0	ISO 13358:1997
21	Zinc mg/l	5.0	ISO 8288:1986
22	pH	5-9	ISO 10523:1994

Annexure 4: Ambiant Air Quality Tolerance Limits

S/N	Pollutant	Time weighted average	Land Use Area			Test Methods
			Industrial Area	Residential Rural & other Area	Controlled area	ISO 4221-1980
1	**Sulphur oxides(SOx);**	Annual Average*	80µg/m3	60µg/m3	15 µg/m3	-
		24 hours**	125 µg/m3	80µg/m3	30µg/m3	
2	**Oxides of Nitrogen (NOx)**	Annual Average*	80µg/m3	60ug/m3	15µg/m3	-
		8 hours				
3	**Suspended particulate matter(SPM)**	Annual Average	360µg/m3	140µg/m3	70µg/m3	ISO 9835:1993
		24 Hours	500µg/m3	200µg/m3	100µg/m3	
4	**Respirable particulate matter(<10um)(RPM)**	Annual Average	70µg/m3	50µg/m3	50µg/m3	ISO 9835;1993
		24 Hours	150µg/Nm3	100µg/Nm3	75µg/Nm3	
5	**MP2.6**	Annual Average	35µg/m3	-	-	ISO 9835;1993
		24 Hours	75µg/m3			
6	**Carbon monocide(CO)/ Carbon dioxide(CO_2)**	8hours**	5.0mg/m3	2.0mg/m3	1.0mg/m3	ISO 4224:2000

Annexure 5: Noise Exposure Limits

Area Code	Category Area	Limits in dB (A) Maximum	
		Day time 06:00 – 21:00	***Night time*** 21:00 – 06:00
A	Industrial Area	75.0	70.0
B	Commercial Area	65.0	55.0
C	Residential Area	55.0	45.0
D	Silence Zone	50.0	40.0

Source: Rwanda Standards Board **RS 236:2014**

Annexure 6: List of Participants in Public Consultation Meetings

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT
Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
1	TWIZERIMANA Alphonse	NYAMITANZI	FR8	0788846096	Agronomist	[signature]
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5	BANGAMWIKI Esperance	GISIZI	FR15		HINZI	[signature]
6	HAKORA	GURIRO	FR15			[signature]
7	NDARIFITE Célestin	B. HINGA	FR15	0783425826	MUDUGUDU	[signature]
8	[illegible] PASCAL	GAFUZA	FR7	0783491385	Mudugudu	[signature]
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12	NYIRABAZAZA Suzana	NYAMITANZI	FR8		HINZI	[signature]
13	SEKARAGWA Sylvain	GURIRO	FR15	0783485946	mudugudu	[signature]
14	Habimana Theophile	Nyamitanzi	FR8	0732990925	muhinzi	[signature]
15	Amashami yama mdudu	KIBUMBU	FR7		muhinzi	[signature]

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ALN Consultants Ltd (Rwanda)

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S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
16	MUGENZI André	KAYUMU	FR7	0788602454	Social protection officer of JOMBA	[signature]
17	TURINAMAHIRWE Théophile	NYAMITANZI	FR8	0786667254 0788546257	Umunyabanga w'Imirenge	[signature]
18	MBARUSHIMANA FRANÇOIS	GURIRO	FR15	0783425951	MUDUGUDU	[signature]
19	MUKARUSEGO Florence	NYAMITANZI	FR8	–	Ushinzwe mu mudugudu Kivumu	[signature]
20	MUJAWAMARIYA Constantine	NYAMITANZI	FR8	–	Umuhinzi	[signature]
21	Sindambiwe J. Baptiste	Nyamitanzi	FR8	0785385826	Umuturage	[signature]
22	Uwizeyimana Adela	Nyamitanzi	FR8		Umuturage	[signature]
23	Mu Sefu	NYSAMITANZI	FR8	0786407862	Umuturage	[signature]
24	NTAMUNOZA APHRODIS	GISIZI	FR15	0783425911	Mu Du Gudu	[signature]
25	Ntibonfite Feresiyani	Gasura	FR15		Umuturage	[signature]
26	RUCYAHA Pascal	GASIZA	FR7	0783425924	Mudugudu	[signature]
27	NIKAKASE Bonifacie	NYAMITANZI	FR8		Umuturage	[signature]
28	BANGANA Clonothilde	Nyamitanzi	FR8	0783425877	Mudugudu	[signature]
29	Nyiraburunzi Dativa	Nyamitanzi	FR8	0783425869	Mudugudu	[signature]
30	BANEZA YAhaya	GASURA	FR15	0787601443	umuturage	[signature]

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32	DUSABIMANA M. Goreth	ES/Gasiza Cell	FR 7	0782003083	ES/Gasiza Cell	
33	NYIRABAHIZI Clotilde	Nyamitanzi	FR 8	-	NZI	
34	NYIRARIBURA Izabella	Gasiza	FR 7	-	Nzi	
35	Ndundimana Emmanuel	GASURA	FR 15	0786887039	NZI	
36	Ruzuzura Alphonse	Nyamitanzi	FR 8	0785730342	//	
37	Habumuhakunze Supiye	Gurizo	FR 15	0783425953	Mudugudu	
38	Nyirangalimana Bera	Gurizo	FR 15	-	NZI	
39	Nzasangamaliya	Gasura	FR 15	0783891617	NZI	
40	Benimana Pupetue	Gasura	FR 15	0782931786	Mudugudu	
41	NDUWAMUNGU JOBOSCO	KAVUMU	FR 7	0781762514	NZ	
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43	Nzabanita Ernesiyani	Gasiza	FR 15	0784942965	NZI	
44	Nyiramushikazi Beniyasi	Nyamitanzi	FR 8		NZI	
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(3)

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50	RIBERAKURORA Valens	GASIZA	FR7	0792499916	Umucitkano	[signature]
51	UWITEZE Chantal	GASIZA	FR7		Umuhinzi	[signature]
52	Gasekuru Benoit	Kabaya	FR15	0784230203	Umucuruzi	[signature]
53	UWAMAHIRWA Aline julienne	Nyamitanzi	FR8	0783298453	Umwalimu	[signature]
54	Ntabuntubuzi muse Gaudence	Nyamitanzi	FR8		Umuhinzi	[signature]
55	Furagiramariya. Leocadia	Gasiza	FR7	0782947356	Umuhinzi	[signature]
56	dansira nyiramihigo	gurizo	FR15		umuhinzi	[signature]
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58	musabeyezu Adofarina	gafiza	FR7		umuhinzi	[signature]
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60	nyirabarandinme Regina	gasura	FR15		umuhinzi	[signature]

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63	NIYIKWIYIKIZE Christophe	NYAMITANZI	FR8	0785704551	UMUHINZI	
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65	KABIRIGI J. damascene	KAVOMO	FR7	0784516135	Umuhinzi	
66	Bizimungu Ryanda Cosmas	Gitebe	FR15	0783362857	Umuhinzi	
67	Bizabatunuka Boniface	Kiliwe	FR7	" " " "	Umuhinzi	
68	Mukangarama Bonifasi	Nyakinunga	FR8	" "	Umuhinzi	
69	MUGERANGABO Emmanuel	NYAMITANZI	FR8	0782889311	Umuhinzi	
70	Ndimubanzi Augustin	Muhore	FR15	0728084682	Umuhinzi	
71	Kayuhura Diyodone	Gasanze	FR15	0783425895	Umuhinzi	
72	NYIRABIRORI Verosera	NYAMITANZI	FR8		UMUHINZI	
73	NYIRABANZINDUGA Eugenie	NYAMITANZI	FR8		UMUHINZI	
74	NYIRAHABIYAKAMUREMYI	GISIZA	FR15		UMUHINZI	
75	NTUGANYENABO J. Nepomuscene	NYAMITANZI	FR8		UMUHINZI	

(5)

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79	RUBANGAMO Francois	NYAMUMBA	FR8		Umuhinzi	
80	BAHATEGEJE Innocent	GISIZI	FR15	0783485929	Umuhinzi	
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82	Ryarahamunyuza	Gisizi	FR15	0783425923	Umuhinzi	
83	Mukarerabarosha Jamille	Nyamulevu	FR8	0784802050	Umuhinzi	
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87	MUKANKUSI M. Gorette	GASIZA	FR7		Umuhinzi	
88	NZITAKARI Kabudwenie	GASIZA	FR7		Umuhinzi	
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(6)

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99	NTAWUKURIZAJANDE	KAVUMU	FR 7	0788096082	Rugi Ruro	[signature]
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(7)

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108	NKUNDIMANA Teresphore	NYAMITANZI	FR8		NZ,	
109	NTAKIRENZE ANISETI	NYAMITANZI	FR8		NZ,	
110	Uwimana Jacqueline	Nyamitanzi	FR8		NZ,	
111	Ntawuhorugeraumuwonzi Conso.	Nyamitanzi	FR8		NZ,	
112	Nyirabambutsa Priscilla	Nyamitanzi	FR8		NZ,	
113	Bihoyinkura Regina	Nyamitanzi	FR8		NZ,	
114	MPERINDA	GASURA	FR15		NZ,	
115	MIHANDAGO	NYAMITANZI	FR8			
116	HABARUREMA Tomllaude	GURIRO	FR15	0783425933	NZ,	
117	Ngirirapaster	Nyamitanzi	FR8	0785451272	NZ,	
118	Serugendo	Nyamitanzi	FR8		NZ,	
119	Gafiti Boniface	Gasura	FR15			
120	Ntahomvukiye	Nyamitanzi	FR8			

(8)

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122	NTAWANGUKE J. Baptiste	NYAMITANZI	FR8	0783425882	Umudugudu	
123	NDANGABAJE Jean Paul	NYAMITANZI	FR8	0783425881	Chef Umudugudu	
124	MANIRIHO Jean Damascene	GURIRO	FR15	0787602045	umuhinzi	
125	RUKUNDO Bonaventure	Guriro	FR15	0783250929	[illegible]	
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127	NTEGEREJIMANA Cesaire	GURIRO	FR15	0782230298	[illegible] HINZI	
128	NKERAMUGABA Protais	GASUTA	FR15	0788499330		
129	NTEZIRIZAZA J. Damascene	GASURA	FR15	0783538296	umuhinzi	
130	UWACU Clarisse	NYAMITANZI	FR8	0782230241	"	
131	UWINEZA Alphonsine	NYAMITANZI	FR8	0789170031	"	
132	HABUMUGISHA Faustin	NYAMITANZI	FR8	0788724832	UMUHINZI	
133	MUGABONKUNDI Jean d'Amour	GASIZA	FR7	0788695743	Umuhinzi	
134	NYIRAHABANGUTSE Rosalie	NYAMITANZI	FR8	0787398774	UMUHINZI	
135	NYIRAKAZI Rosalie	NYAMITANZI	FR8		UMUHINZI	

(9)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIRASI Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
136	GASHIRABAKE Schadrack	Nyamitanzi	FR8	0781580514	DASSO	[signature]
137	UWIMANIRAGIYE Jean Pierre	"	FR8	0787691993	Umuhinzi	[signature]
138	BAKURIREHO Sylvestre	RUHONGORE	FR15	0783977700	Umuhinzi	[signature]
139	N. MBABAZI Anitha	BIHINGA	FR15	0781156037	Umuhinzi	[signature]
140	HSENGIYUMVA Jean Bosco	GASIZA	FR7	0786158999	UMWUMZI	[signature]
141	UWIMANA J. Damascène	NYAMITANZI	FR8	0782931849	A.S.C	[signature]
142	MURINDABI GUY Theogene		FR7	0786683210	UMWUZUNGU	[signature]
143	MBONIMPA	Odedi	FR7	078473707	UMUHINZI	[signature]
144	HAKUZWEYEZU Aphrodis	KAVUMU	FR7	0783425900	Umuhinzi	[signature]
145	HAGANGIMBABAZI Christine	KAVUMU	FR7	0782331807	Umuhinzi	[signature]
146	BAGENGA Théogène	Nyamitanzi	FR8	0788154288	NZ	[signature]
147	Zugiramahoro Emmanuel	GASURA	FR15	0787206937	Umucuruzi	[signature]
148	NGAYOBURIKO Filibel	NYAMITANZI	FR8	0788644866	Umuhinzi	[signature]
149	Nyiraboshyitsi Gouda	Gurira	FR15	0782931768	Umuhinzi	[signature]
150	NDAGENDEREHO Elegen	Gurira	FR15	0784023635	Umuhinzi	[signature]

(10)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
151	MUNANDI EGIDE	NYAMITANZI	FR8	0788679568	Hinzi	
152	SERUREZI Emmanuel	NYAMITANZI	FR8	0785704737	Hinzi	
153	HABIJAREMYE Emmanuel	"	FR8	0784927616	Hinzi	
154	NTIBARIMPASHA Bernard	"	FR8	0783186621	Hinzi	
155	SEBAHAN Etienne	GURIRO	FR15	0788364302	Hinzi	
156	NTAKAZIRAHO Petronile	GURIRO	FR15	0735264573	Hinzi	
157	HAKIZIMANA Joseph	NYAMITANZI	FR8		Hinzi	
158	Mbyukure Donkeni	"	FR8	0784187096	Hinzi	
159	NYIRABAGISHA Stephanie	GURIRO	FR15		Umuhinzi	
160	MUKASINE François	GURIRO	FR15		Umuhinzi	
161	HABARUREMA Théogène	NYAMITANZI	FR8	0782801592	Umuhinzi	
162	UWAMUKUHIRIMANA Jean	GISIZA	FR15		Umuhinzi	
163	KAJIHURA	NYAMITANZI	FR8		Umuhinzi	
164	SEMISHOGORO Théophile	GASIZA	FR7	0782889261	Umuhinzi	
165	NYIRAMBARANSABITSE M. Goret	GURIRO	FR15		Umuhinzi	

(11)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
166	NYIRASEBURA Christine	GASURA	FR15	0783426259	Muduguda	
167	NGARUKIYIMTWAAI Frederic	GISIZI	FR15	0783425920	mudugudu	
168	KURABUGEHGE Eugenie	NYAMITANZI	FR8	0789422149	Hinzi	
169	NGIRABEGA pascal	NYAMITANZI	FR8	0782098346	hinzi	
170	NTAMITARIZO Théodomir	GASURA	FR15	0782931787	Mudugudu	
171	MUHAWENIMANA Naphtal	NYAMITANZI	FR8	0782931841	ASC	
172	NGAYABERURA Laurent	GASURA	FR15	0783425934	Mudugudu	
173	RYIBUTSANDE Laurent	GASIZA	FR7	0783425928	Mudugudu	
174	MBONABAGENDA Pascal	NYAMITANZI	FR8	0787210110	hinzi	
175	DUKUZIMANA Florence	GISIZI	FR15		hinzi	
176	MUKARUKUNDO Beatrice	GISIZI	FR15		hinzi	
177	MUKANDHERI Francine	GISIZI	FR15		hinzi	
178	MASHUKANE Venantie	GISIZI	FR15		hinzi	
179	NYIRANTEZIMANA Angelique	NYAMITANZI	FR8		Umuhinzi	
180	UWAMAHORO Jeanne	GURIRO	FR15	0781428886	Umuhinzi	
181	UMUHOZA Mariselime	GASIZA	FR7	-	UMUVOMESHA	

(12)

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MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
181	KABAREBE	Nyamitanj	Nyam	FR8	Ngabikir	
182	Shyiramako	Kiouma	Nyami	FR8	Nyabiky	
183	SIBOMANA Jean Damasc	Kiouma	Nyamitanzi	FR8	"	
184	NIANZIRA Euphrasie	NTWARO	Nyamitanzi	FR8	"	
185	MUGEMANZI Désiré	NTWARO	Nyamitanzi	FR8	"	
186	NTAWUKIGIRUWE Marie Claudette	GASIZA	Gasiza	FR7	"	
187	NYIRAMAHIRANE Ancille	RUBAVU	Nyamitanzi	FR8		
189	NZABONARIBA Emmanuel	NYAMITANZI	Nyamitanzi	FR8		
190	Nyakaire Diripo	Cbigi	Futi	FR15	Hinzi	
191	Bwenge Meriene	Gasiza	Sangano	FR15	Hinzi	
192	Akimanine	Nyamitanzi	Nyamitanzi	FR8	Hinzi	
193	Mukarulibi	"	FR8	0784398840	Hinzi	
194	Munyaliirekumana	Nyamitanzi	FR8		NZI	
195	Rukamberenzi Clémantine	Nyamitanzi	FR8		NZI	
196	Mukundufite Véstine	Nyamitanzi	FR8		NZI	

(13)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
196	NDAGIJIMANA Odo	Nyamitanzi	FR8	0788201029	muhinzi	
197	BAREBEREHO JOSEPH	GURIRO	FR15	0786909972	HINZI	
198	SEZIBERA JUSTIN	NYAMITANZI	FR8	-	HINZI	
199	HABIMANA	NYAMITANZI	FR8	-	HINZI	
200	Allame Mbarushimana	GURIRO	FR15	0781428808	HINZI	
201	Nsabimana JBaptiste	Gasura	FR15	0786226778	nzi	
202	Nirahuba Velina	Guriro	FR15		nzi	
203	NTAWUHONGERISHARI M. Rose	Guriro	FR15		nzi	
204	YARAMUNDA Silasi	Nyamitanzi	FR8		nzi	
205	UWAMARIYA Jani	Guriro	FR15		nzi	
206	Mujawabera Angelina	Nyamitanzi	FR8		nzi	
207	Simumuyabo Domasiene	Guriro	FR15		nzi	
208	NTUGWERA Consolle	GASURA	FR15		UMUHINZI	
209	BASHORIMANA Donatien	Nyamitanzi	FR8		UMUHINZI	
210	AYARUMONDO Beatrice	Nyamitanzi	FR8		Umuhinzi	
211	NGIRABABYEYI Anoliyata	Nyamitanzi	FR8		umuhinzi	

(14)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
211	Uwantege Claudine	Guriro	FR15	0782003086	ES	
212	Dusabimana Denyse	Kavumu	FR7	0782003119	ES / Cell	
213	NYIRABAHIZI Charlotte	GISIZI	FR15	0782003073	ES / Cell	
214	Bahushakamabusa Augustin	Gihiko	FR15	0783485952	Muhinzi	
215	yamfashije Kelementine	Gihiko	FR15	0785779803	–	
216	Ndagijimana Frederic	Nyamitanzi	FR8	0783425878	Muhinzi	
217	NTAHUNEZA Pelagie	GURIRO	FR15	0781455867	Herembere	
218	NTABAHIRANIYE	ARAMA	FR15	04839247	Umuhinzi	
219	BARIMENSHI NATORONA	NYUNDO	FR17		NZI	
220	CYITAFIRE P. Célestin	RUGERA/NYAMITANZI	FR8	0782003074	ES/ Cell	
221	Ngirisi Musitima	KAVUMU	FR7	0786656962	Terambere	
222	NYIRATERI Thérèse	GURIRO	FR15	-	NZI	
223	NGRENTE Augustin	Nyamitanzi	FR8		NZI	
224	Nyiramajyambere Therese	GASIZA	FR7		NZI	
225	ZIBUKIRA	Nyamitanzi	FR8	0752888936	NZI	

(15)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
1	Niyonsaba alodie	Murambi	FR5	-	Umuhinzi	[signature]
2	Bagamiro J Bosco	Murambi	FR5	0788662778	Umukombo	[signature]
3	Nizeyimana Faustin	Murambi	FR5	-	umuhinzi	[signature]
4	Bizimana Hiki	Murambi	FR5	0782711352	Hinzi	[signature]
5	Muhawenimana	Murambi	FR5	0788083074	Hinzi	[signature]
6	Rizitikira Florida	Murambi	FR5		Hinzi	[signature]
7	N. BAHSABIMANA Jeanette	Murambi	FR5	078 1298727	Hinzi	[signature]
8	Nyiramaraba Marisenia	Murambi	FR5	-	Himze	[signature]
9	Nyirabaliamba Bonifide	Murambi	FR5	-	Himze	[signature]
10	SEMIRA	Murambi	FR5	-	Himzi	[signature]
11	Uwilingiyimana	Murambi	FR5	0785590892	Himzi	[signature]
12	NSABIMANA	Murambi	FR5	0783936512	Himzi	[signature]
13	Ndikumigimana Eric	Murambi	FR5		Hinzi	[signature]
14	Nyumukiza Paloma	Murambi	FR5	0782190500	Himzi	[signature]
15	Gato ya J Bosco	Murambi	FR5	-	Himzi	[signature]

(16)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: ..... Date: .....

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
16						
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MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYAruto *Date:* 17/09/2014

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
31	BAKUNDA Juvenal	MURAMBI	FR5	0788298252	Umuhinzi	
32	SIBOMANA Nestor	RURAMBI	FR5	0785117839	Umuhinzi	
33	NDAGIJIMANA J.M.V	Rurambi	FR5	0787625126	Umuhinzi	
34	NDAYAMBAJE Celestin	Rurambi	FR5	0782711789	Umuhinzi	
35	NSABIMANA J.M.V	Rurambi	FR10	—	Umuhinzi	
36	SEMKOKO Zefaniya	Rurambi	FR10	–	Umuhinzi	
37	RUKAMANZI Julienne	Rurambi	FR10	0781042954	Umuhinzi	
38	MUTABAZI Jean de Dieu	Rurambi	FR5	0789494672	Umuhinzi	
39	IYAKAREMYE Jean Pierre	Rurambi	FR10	—	Umuhinzi	
40	NIZEYIMANA Wellars	Rurambi	FR10	0782347370	Umuhinzi	
41	IYAMDEMYE Innocent	Rurambi	FR5	0784403754	Umuhinzi	
42	KAMAJIRESE Laurance	Rurambi	FR5	0782647668	Umuhinzi	
43	NTABANGANYIMANA Lidie	Rurambi	FR10	–	Umuhinzi	
44	RUSABYIMANA Jean Claude	Rurambi	FR5	0787293479	Umuhinzi	
41	BARIHUTA Cyprien	Rurambi	FR5	0784399204	Umuhinzi	

(18)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
46	Twahirwa Kizito	Ruvana	FR5	0786348774	Mai	
47	Bushimirimana Emm.	Rurambi	FR5	0783474743	Mai	
48	Maniragaba Innocent	Rurambi	FR5		Mai	
49	Kuradusenge Patrick	Ruvaza	FR5	078743074 5	Mai	
50	Karambizi J. Pierre	Ruvaza	FR5	0787365327	Mai	
51	Ntamaramiro J. de Dieu	Rurambi	FR5	0786511609	Mai	
52	Bikorimana Diogene	Ruvaza	FR5	078563832	Mai	
53	HARINDIMANA Justin	Murambi	FR5	0788854066	Shofeur	
54	Biguimana Ernest	Murambi	FR5	0783425348	Mai	
55	Gakuru Venantie	Rurambi	FR10	—	Mai	
56	Ruzigatira Emm.	Ruvana	FR10	—	Mai	
57	Habyarimana J. Claude	Ruvana	FR10	—	Mai	
58	NIYONSABA Gaston	Murambi	FR5	—	Mai	
59	AHOBANGEZE Vestin	Murambi	FR10	0786697147	Mai	
60	BIGIRIMANA Ernest	Murambi	FR10	0783425348	Mai	

(19)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
61	Ntibaliraho Theresse	Murambi	FR5	0783425350	umuhinzi	
62	Ruhimangamizi Thomas	Mukamira	FR5	-	umuhinzi	
63	Hocyekaki Sitamburano	Mukamira	FR5	-	umuhinzi	
64	Habamabuheko Fecunder	Mukamira	FR5	-	umuhinzi	
65	Ruhumuliza Theomartie	Mukamira	FR5	0786742593	umuhinzi	
66	Gafaruri Etienne	Murambi	FR5	0723581239	umuhinzi	
67	Mahoma Sylvere	Gahondo	FR10	–	umuhinzi	
68	Rurikiba yedinomas	Murambi	FR10	0782110502	umuhinzi	
69	Gakuba Gilbert	Muramba	FR10	0788298475	Ahinzi	
70	Habanabaki Thomas	Kuwa Ita	FR10	0787765890	umuhinzi	
71	Mugabejimana modeste	Mugamba	FR5	/ /	umuhinzi	
72	Murtabazi Rachid	Murambi	FR5	0785014956		
73	Zaninka Clementine	Murambi	FR10	0788124316	umuhinzi	
74	Nkurunziza J Pierre	Murambi	FR10	~	umuhinzi	
75	Uwamahoro Joseline	Murambi	FR10	—	umuhinzi	

(20)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
76	Harerimana J. Damascene	Murambi	FR5	0783425342	umuhinzi	
77	Ndayambaje Alphonse	Hurambi	FR5	0785594673	Umuhinzi	
78	Rwakana Leonald	Musamba	FR5	0783425349	umuhinzi	
79	Habiyambere Emmanuel	"	FR5	0738287947	"	
80	Ntahorudi Jean pierre	Runyenza	FR10	0782719944	umuhinzi	
81	Turatsinze Anastase	Muramba	FR10	0784702048	"	
82	Turatsinze Jean Bedien	Rwaza	FR10	0785356215	"	
83	Bitorimana Theogene	Murambi	FR5	–	"	
84	Habiyaremye Innocent	Murambi	FR5	–	"	
85	Busabeyezu Jean Baptiste	Murambi	FR5	0789658687	"	
86	Barerigundamy	Murambi	FR10	–	"	
87	Mahoro Eric	Murambi	FR10	–	"	
88	Nyiraganju M. Louise	"	FR10	–	"	
89	Nzamuye Evariste	"	FR10	–	"	
90	Mbitsemunda David	"	FR10	–	"	

(21)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
91	Ntuyembazi Cyprien	Murambi	FR5	0786689341	Umuhinzi	[signature]
92	Hakizimana J. Pierre	Murambi	FR5	0789836740	Umuhinzi	[signature]
93	Hagenimana	Murambi	FR5	0781455522	Umuhinzi	[signature]
94	Samvura J. B	Murambi	FR5	0786645584	Umuhinzi	[signature]
95	Semiruho J. P	Rurenga	FR5	0788888945	Umuhinzi	[signature]
96	Bimenyimana J. Bosco	Rukumbi	FR5	0787491184	Umuhinzi	[signature]
97	Balarane Alphonsina	Rukumbi	FR5	0781455549	Umuhinzi	[signature]
98	Bendantukuka	Rukumbi	FR5		Umuhinzi	[signature]
99	Uwimana Anitha	Rukumbi	FR5	0786687158	Umuhinzi	[signature]
100	Semauza J. Fidele	Rukumbi	FR5		Umuhinzi	[signature]
101	Uwamahoro Esperance	Rukumbi	FR5	0789999682	Umuhinzi	[signature]
102	Nsekerabanzi	Rukumbi	FR5		Umuhinzi	[signature]
103	Sebarore Alphonsi	Rukumbi	FR5		Umuhinzi	[signature]
104	Hategikimana Bahati	Rukumbi	FR5	0788610768	Umuhinzi	[signature]
105	Bazubafite Beatrice	Rukumbi	FR5	0784886608	Umuhinzi	[signature]

(22)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
106	Nyiransabimana M.claire	Murambi	FR5	-	umuhinzi	[signature]
107	Musabyimana Bernard	Murambi	FR5	0783425351	Chef mudugudu	[signature]
108	Mukabutimura Solange	Mwana	FR14	-	Umuhinzi	[signature]
109	Ruvugundi	Gitega	FR14	—	umuhinzi	[signature]
110	BIGINGINTABEJ Chrysostome	MURAMBI	FR14	—	umuhinzi	[signature]
112	MUNYAKAZI Stanislas	MURAMBI	FR14	—	umuhinzi	[signature]
113	Musabyimana Faustin	Murambi	FR14	—	umuhinzi	[signature]
114	ABUNU S. SHA	[illegible]	FR14	—	umuhinzi	[signature]
115	[illegible]	murambi	FR14	-	umuhinzi	[signature]
116	[illegible]	murambi	FR14	-	umuhinzi	[signature]
117	HARERIMANA KAMIZIYO	MURAMBI	FR14	—	Umuhinzi	[signature]
118	HABIYAMBERE Augustin	RWAZA	FR13	0783425199	Mudugudu	[signature]
119	MUDAHINYUKA Theophile	MURAMBI	FR13	0786779189	Umuhinzi	[signature]
119	BISUNGINTABE-jean	Murambi	FR14	—	umuhinzi	[signature]
120	Bizimana modeste	Rwaza	FR13	0785330074	umuhinzi	[signature]

(23)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
121	BUGENIMANA Josiane	Muramba	FR5	0784082296	Teacher	
122	Mariniho Vestine	Muramba	FR5	0783298173	Umuhinzi	
123	KAbanyana Marceline	Muramba	FR5	0787482135	Umuhinzi	
124	MUKANDORI Clemence	Muramba	FR5	0783878031	Umuhinzi	
125	NYIRABAGEGA Bonifrida	Muramba	FR14	0788110292	Umuhinzi	
126	HATEGEKIMANA Balati	Muramba	FR14	078 3260567	Umuhinzi	
127	MUSINGIZIMANA M.claire	Muramba	FR14	078463 1182	Umuhinzi	
128	BAYAYUGE Marie	Muramba	FR14	—	Umuhinzi	
129	MUNYANEZA Bonaventure	Muramba	FR10	0786251226	Umuhinzi	
130	TUYOGEZE ROGER Sulfblas	Muramba	FR10	0786532055	umuhinzi	
131	TWAGIRAYEZU Didier	Muramba	FR10	—	Umuhinzi	
132	NYIRAMAHANO Patricie	Muramba	FR14	0783298652	Umuhinzi	
133	UMUTONI Emeline	Muramba	FR14	0781982491	Umuhinzi	
134	HABUMUGISHA J.NEPO	Muramba	FR14	0783445202	Umuhinzi	
135	NIYONKURU Innocent	Gitega	FR14	0781450586	Umuhinzi	

(24)

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MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: .... Date: ....

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
136	UWIMANA Bernard	MURAMBI	FR 14	0783192508	Cultivator	[signature]
137	TUBIHIMANA J.M.V.	MURAMBI	FR 14	—	Umuhinzi	[signature]
138	HAGENIMANA J d'amour	MUREMURE	FR 14	0785176618	Umuhinzi	[signature]
139	MWISENEZA Placas	GITEGA	FR 14	0787654938	Umuhinzi	[signature]
140	BUKIZUMUREMYI Jean d'amour	MWANA	FR 14	0787413191	Umuhinzi	[signature]
141	BIKORIMA	MURAMBI	FR 14	—	Umuhinzi	[signature]
142	BENZIRA Apolinerd	MURAMBI	FR 10	—	Umuhinzi	[signature]
143	MURAGIJIMANA Evariste	MURAMBI	FR 10	0782631759	Umuhinzi	[signature]
144	MANISHIMWE Fousti	MURAMBI	FR 10	—	Umuhinzi	[signature]
145	IYAGENA Joyeux	MURAMBI	FR 5	0781587592	Umuhinzi	[signature]
146	NSHIMIYIMANA	MURAMBI	FR 5	078 5237436	Umuhinzi	[signature]
147	MAORAYABO Jean Bernard	MURAMBI	FR 5	078 3L253259	Umuhinzi	[signature]
148	NKURUNZIZA Jean d'amour	MURAMBI	FR 5	0782746649	Umuhinzi	[signature]
149	NYIRABAGENZI Jacqueline	MWANA	FR 14	078 4411357	Umuhinzi	[signature]
150	MUJAWAMARIYA Joselyne	MURAMBI	FR 14	-	Umuhinzi	[signature]

(25)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: .... Date: ....

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
151	Nautarama Patrice	Murambi	FR10	0782533254	Umucuruzi	
152	Nyirasafari Odile	Murambi	FR 10		Umutarage	
153	Bihoro Stratoni	Murambi	FR14		Umuhinzi	
154	Akimanimpaye Carine	Murambi	FR 14		Umutarage	
155	Mukarubuga Patricie	Murambi	FR14		Umuhinzi	
156	N. Manua Angelique	Murambi	FR 5		Umuhinzi	
157	Akimanimpaye Jeannine	"	FR5		"	
158	Uwamahoro Joseline	"	FR5	0781443862	"	
159	Ndayaji Emmanuel	Gitega	FR14	0787212 189		
160	Nyirensa Babera	RUBAVU	FR 5	078 6235843		
161	Abayisenga Clarisse	BUGESHI	FR5	0785663966		
162	Nyirongo a nwe ni nona	Muremure	FR5	078388085		
163	ISINGIZINE Grace	Murambi	FR5	0781587598	Umuhinzi	
164	UWIMANA Belie	Murambi	FR5	0783878025	Umuhinzi	
165	NTAWUKURIRAYO William	Murambi	FR5	—	Umuhinzi	

(26)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

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District: NYABIHU Date: ....

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
166	HABUMUGISHA J. Baptiste	RWAZA	FR13	0784468673	N21	
167	NKUNDABANYANGA Issa	MURAMBI	FR14	0787207608	N21	
168	ICYIMANIZANYE Farida	Murambi	FR14	-	N21	
169	NZAYISENGA J. d'Amour	RWAZA	FR13	-	N21	
170	NKURUNZIZA J. de Dieu	RWAZA	FR13	-	N21	
171	BYAMUNGU	MURAMBI	FR14	-	N21	
172	NTABANGANYINGO J. Pierre	MURAMBI	FR5	0784400542	N21	
173	SEBAKANDIDA Innocent	MURAMBI	FR5	-	N21	
174	KWIBUKA YO	MURAMBI	FR5	0782715959	N21	
175	NYIRIMANZI Léonste	MURAMBI	FR5	0781177002	N21	
176	SEMAHANE Jean	MURAMBI	FR5		N21	
177	MBARUSHIMANA Emmanuel	RWAZA	FR13	0785843944	N21	
178	NYIRAGATESI	MURAMBI	FR13	—	N21	
179	UWAMBAJE	MURAMBI	FR5	—	N21	
180	NYIRAKAMARI Elina	MURAMBI	FR5	-	N21	

(27)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: ....

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
181	NIYONZIMA Jean	MURAMBI	FR10	0786132814	Umuhinzi	[signature]
182	TUYISHIME	MURAMBI	FR10	-	Umuhinzi	[signature]
183	MUNYAMEZA	MURAMBI	FR10	0786758822	Umuhinzi	[signature]
184	BINTUMIMANA	MURAMBI	FR10	-	Umuhinzi	[signature]
185	NTAKIRUTIMANA	RWAZA	FR10	-	Umuhinzi	[signature]
186	MUKASINE Jeannette	MURAMBI	FR5	0782370044	Umuhinzi	[signature]
187	HAKIZIMEYEZU Alexis	MURAMBI	FR5	0788414219	Education Officer	[signature]
188	TWAHIRWA Evariste	MURAMBI	FR5	0789616o478	Umuhinzi	[signature]
189	GAKURU Anastase	MURAMBI	FR5	0783425335	Umuhinzi	[signature]
190	TWAHIRWA	MURAMBI	FR5	-	Umuhinzi	[signature]
191	NZAMUYE Jean Christophe	MURAMBI	FR5	078888141??	Umworozi	[signature]
192	NABIMANA VENA??	MURAMBI	FR5	07?5????????	Rwiyemezamirimo??	[signature]
193	Bazyarukize Anastase	Murambi	FR5	0782827468	Umuhinzi	[signature]
194	Yamfashije	"	FR5	0784464897	"	[signature]
195	Ndayambaje Andrew	"	FR 5	—	"	[signature]

(28)

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: Nyabihu *Date:* 15/03/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
196	NKUNDABAKURA Félicien	Rwaza	FR 13	—	Umuhinzi	
197	NIZEYIMANA J. Dedien	Murambi	FR 13	0783425341	Rwiyemezamirimo	
198	NYIRANSABABERA Claire	Murambi	FR5	0786235843	Umuhinzi	
199	ABAYISENGA Clarisse	Murambi	FR 5	0785863866	Umuhinzi	
200	AKIMANIZANYE Mikera	Mwana	FR14	—	Umuhinzi	
201	MUSANABERA Joseline	Murambi	FR 14	0782709967	Umuhinzi	
202	MUKAHIRWA Immaculée	Murambi	FR5	—	Umuhinzi	
203	NYIRASIYAMBERE Epiphanie	Murambi	FR5	0783553994	Umuhinzi	
204	NYIRAMAHIRWE M. Claire	Murambi	FR5	0785906760	Umuhinzi	
205	MUKANKUSI Immaculate	Murambi	FR5	—	Umuhinzi	
206	IRAFASHA Edmond	Murambi	FR5	0782836013	Umuhinzi	
207	UWIRINGIYIMANA	Murambi	FR5	0782007716	Shar	
208	Dukundane Patric	"	FR5	0785696441	hinzi	
209	Uwimana Angelita	"	FR5	—	—	
210	Tuyizimana Noel	"	FR5	—	—	

(29)

RAMBURA SECTOR

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU *Date:* 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
01	HABANUWIGIRA J Chrysostome	KIBISABO	FR2	0782932177	NJYANAMA	
02	BERUYUEWANGO Jean Eric	KIBISABO	FR2	0787036850	NJYANAMA	
03	HAREKIMANA Emmanuel	GURIRO	FR5	078600 [illegible]	NJYANAMA	
04	NTEKIJE Verediane	KIBISABO	FR2	0732490340	Njyanama	
05	NGIRIMPUHWE Claudine	Guriro	FR5	0782883399	Njyanama	
06	Uwimana Beatrice	Kibisabo	FR2	0784464689	Njyanama	
07	MUKAREMERA Antoinette	KIBISABO	FR2	0782932172	NJYANAMA	
08	Uwimeza Antoinette	Guriro	FR5	0721500498	njyanama	
09	UWANYIRIGIRA Francine	Nyundo	FR17	0783435136	Njyanama	

30

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MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
1.	WIBABARA Claudine	Rusereka	FR 2	0786777308	Secretaire wa mya mama y Abagore Inama	[signature]
2	Cashirabake Celine	Karamfuho	FR 2	0785401938	CHF	[signature]
3	MWISENEZA Marie NAMOA.	MURAMBI	FR2	0782139282	CHF	[signature]
4	UZAMUKUNDA SPESIOSE	KIRAZA	FR2	0782932283	Nyamama ya Kagari	[signature]
5	Hitiyaremye Felicien	KIBISABO	FR2	0782003138	Executive Secretary of cell	[signature]
6	MUHAWENIMANA Venantie	BIRENGO	FR 17	0782003739	E.S of Cell	[signature]
7	MUKESHIMANA Louise	GURIRO	FR5	0783420612	SEDO/Cell	[signature]
8	NYIRABARERA Alphonsine	GURIRO	FR5	0783296095	NYAMAMA AKGI	[signature]
9.	ZANINKA Marie Rose	GURIRO	FR5	0785233730	NYANAMAKOR	[signature]
10	Nyirahumure Esperance	Guriro	FR5	0782708785	Nyanama mu kagari	[signature]
11	Mukamukwende Daphrose	Gihisabo Nyampuhu	FR2	0780055120	Nyanama	[signature]
12	Sibomana Clementine	KIBISABO	FR2	0784469065	Nyanama	[signature]
13	N. habimana Goudelive	KIBISABO	FR2	0782932168	Nyanama	[signature]
14	SIBOMANA Amable	Guriro	FR5	0788003170	Ed Guriro CE	[signature]
15.	MUNYANDEKWE Sylvere	KIBISABO	FR 2	0783228472	IDP KIBISABO	[signature]

(31)

RANBURA SECTOR

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU Date: 11/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
1	TUYIRINGIRE Odette	BIREMBO	FR17	0783999502	Umujyanama	
2	Uwimana Claudine	NYUNDO	FR17	0782334310	CNF	
3	NYIRANAHIRA ESPERANCE	NYUNDO	FR17	0786774973	CNF	
4	Mukantabana Esperance	Nyundo	FR17	0783514830	Umujyanama	
5	Tuyisenga Esperance	Nyundo	FR17	0785483330	Umujyanama	
06	NYIRAGAHIMA Marie	MUTAHO	FR2	0781588377	umujyanama 30%	
7	MANISHIMWE Violette	KIBISABO	FR2	0785831702	umugore ku kazi	
8	UWAMBAJIMANA Divine	KIBISABO	FR2	0788332490	umugore ku kazi	
9	MUKANOHELI Solange	MUTAHO	FR2	0783797366	umugore ku kazi	
10.	MUKANDAYISABA Gaudiose	BIREMBO	FR17	0782932195	umugore ku kazi	
11	Mukabadege Annonciata	Birembo	FR17	0786347062	umugore ku kazi	
12	Abimani Jeanne marie Jeanne	Nyundo	FR17	0783425450	umugore ku kazi	
13	NAHIMANA Annonciée	Nyundo	FR17	0788729772	umujyanama	
14	mukayubi Solange	Nyundo	FR17		30% umujyanama	
15	Nzabanita Leonidas	Kibisabo	FR2	0783034880	umujyanama	

(32)

RAMBURA SECTOR

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

Preparation of the Environmental & Social Impact Assessment / Environmental & Social Management Plan & Pre-Resettlement Action plan

District: NYABIHU *Date:* 15/09/2016

ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
1	NIYOYITA Emmanuel	Birembo	FR17	0788769942	Sefo of cell	
2	DUKUZUMUREMYI Thaciènne	NYUNDO	FR 17	0782331028	—	
3	NIZEYIMANA Dieudonné	GURIRO	FR5	0788647894		
4	Baraturutse Agnes	Birembo	FR17	0782932906		
5	Ndikubwimana Angelique	Birembo	FR17	0782932210		
6	M. Uwiheba Beatrice	KIBISABO	FR2	0782932176		
7	Uwizeyimana M. Claire	KIBISABO	FR2	0784004894		
8	Dusabimana Christine	Birembo	FR17	0782398537		
9	MUTONI Anthère	Birembo	FR17	0781111055		
10	Mukanguiza Clémentine	KIBISABO	FR2	0782932186	Opinion leader	
11	GASHIRABAKE Patrice	Birembo	FR17	0786774789	Secretary	
12	NIYONSENGA Jeanne d'Arc	KIBISABO	FR2	0783408412	Opinion leader	
13	MUKAKIMENYI Vestine	NYUNDO	FR17	0782932243	uvuga rikijyana	
14	Mukaromi Josephine	Birembo	FR17	0784305305	umugorikijana	
15	Nzagirahayo Olive	Kibisabo	FR2	0731985083	umuganikijana	

(33)

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RAMBURA SECTOR

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ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
	BAZIGORWA Pascal	NJUNDO	FR17	0788613001	Opinion leader	
	MPAKANIJE Déo	RUGAMBA	FR2	0782003205	E.S of cell	
	SENTANAGE Damascène	KIBISABO	FR 2		Umuhinzi mworozi	
	Dusingizimana Emmanuel	Kibirabo	FR2	0784004284	Umuhinzi mworozi	
	Ntakirutimana Angélique	Guriro	FR5	0783116973	Umuhinzi mworozi	
	BARAMUREMA Augustin	GURIRO	FR5	0782932260	Umuhinzi mworozi	
	BARAJAVUGA Augustin	MUGAMBA	FR2	0782003206	E. S/Mumbo	
	NJIRABARANYEKETSE Valérie	Mumbo	FR2	0787633191	O. leader	
	NYIRABIRORI M Jeanne	BIREMBO	FR17	0782932198	C.N.F	
	Bagabirwa Théophine	Birembo	FR 17	0782932207	Umuhinzi mworozi	
	Nyandagaza Honoré	Birembo	FR 17		Umuhinzi mworozi	
	Hakizimana Vianney	Birembo	FR 17	0787330697	Umuhinzi mworozi	

(34)

JENDA SECTOR

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

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ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
01	MPATSWENUMUGABO J Pierre	Rega	FR 11	0783214757	Agronome	[signature]
02	GAKINA - K - Gerard	Bukinanyana	FR 3	0782003223	Executif	[signature]
03	RUSAMIYIMANA Desire	"	FR 3	0788700796	Mudugudu	[signature]
04	YANKURIJIYE Epimaque	"	FR 3	0788417868	Umuhinzi	[signature]
05	BUSHIMIMANA Emmanuel	"	FR 3	0783122031	Umuhinzi	[signature]
06	MUNYANSHONGORE Gaspard	"	FR 3	—	Umuhinzi	[signature]
07	Rugwizangoga Fidele	"	FR 3	0783888764	"	[signature]
08	Panyomhoj.. Byson	"	FR 3	0785863446	Umuhinzi	[signature]
9	Kamali Cautius	"	FR 3	0781581794	"	[signature]
10	Rwabizinda Narcisse	"	FR 3	"	"	[signature]
11	KAMARI JOSE	"	FR 3	"	"	[signature]
12	BUSHIMIMANA Innocent	"	FR 3	0713095201		[signature]
13	MABANGA Mathias	"	FR 3	0788769897	"	[signature]
14	MUKARWEGO M. Claudine	"	FR 3	0781586773	"	[signature]

35

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JENDA SECTOR

MINISTRY OF AGRICULTURE AND ANIMAL RESOURCES / RWANDA FEEDER ROADS DEVOLOPMENT PROJECT

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ATTENDANCE LIST FOR PUBLIC CONSULTATION MEETINGS

S/N	Names	Cell	Rd No.	Phone No.	Occupation	Signature
1	NTURANYENABO Jean Pierre	KORA	FR 11	0726060187[illegible]	Umuhinzi	[signature]
2	BUSANDI Alphonse	Bukinanyana	FR 11	—	Umuhinzi	[signature]
3	Kizu Jiga Varemi	Kimomana	FR 11	0784494908	umuhinzi	[signature]
4	Bizimungu Oroyizi	Rega	FR 11	—	umuhinzi	[signature]
5	HAGUMIMANA Immaculé	BUGARARA	FR 11	0785177822		[signature]
6	Muai Bahizi Ngezi	Rugeri	FR 11	—	umuhinzi	[signature]
7	Ngendahimana Emmanuel	Bukinanyana	FR 11	0782230336	umuhinzi	[signature]

36

Annex 7: Interim checklist - Review of E&S Implementation in T&I Bank-financed Works Contracts

Project Name	
Project Number	
Country	
Contract Name	
Contract Duration and completion date	
Implementing Agency	
Review Date	

No	Measure	Current Status (Please elaborate rather than a "Yes/No"- approach)
Contractual Arrangements on site		
1	Is there a full-time Employer's Representative (ER) on site at all times? If not frequency of visits?	
2	Years of experience of the ER?	
3	Name of Supervision Consulting Firm (SC)	
4	Does SC TOR require oversight over ESMP, RAP, HIV/AIDS awareness implementation?	
5.	If yes, to the above, does the SC contract provide sufficient resources?	
6.	If yes, to the above, does the works contract provide sufficient resources to implement all activities? Are they provisional sums or budgeted activities?	
7	Name of SC Team Leader The Resident Engineer - RE)	
8	Years of experience of RE	
9	Does the Employer have an Environmental Unit – if yes, how many full-time technical staff are employed?	
10	Does the Employer have an Social Unit – if yes, how many full-time technical staff are employed	
Contract Reports and Instruments		
11	Does the Bank receive Monthly Progress Reports from the RE on schedule?	
12	ESMP in place, and cleared, being	

	implemented and documented in the MPRs? Provide dates of submission and clearance and any sequencing of works to accommodate clearance process.	
13	Is the ESMP an integral part of the contractors contract with clear activities and costs?	
14	RAP or ARAP, if required, completed and RAP or ARAP completion Report cleared? Provide dates of submission and clearance and any sequencing of works to accommodate clearance process.	
15	Is there any additional expropriation which will require a RAP amendment?	
16	Contractor's Health and Safety Management Plan in place and approved by ER, and implementation documented in the MPR?	
17	Any Citizen engagement activities under implementation?	
18	Any Gender-based activities and/or data collection in place	
19	Contractor's Traffic Management Plan in place, cleared by RE, and being implemented?	
20	HIV/AIDS Awareness/STI mitigation measures in place?	
21	Who is HIV/AIDS service provider? Are they registered with the National Aids Commission?	
Site arrangements		
22	Grievance Redress System in place?	
23	Contractor/Cs/ER combined Meetings with affected communities undertaken and how regularly?	
24	Number of contractor's staff provided with site accommodation.	
25	Distance of contractor's base camp vis-à-vis towns, villages, centers of population and environmentally sensitive areas.	
26	Percentage of staff recruited from the Project Impact Area vs. brought from outside.	
27	Condition of site accommodation and	

	amenities provided.	
28	Do out-of-area workers receive any allowances additional to their salary/wages? If so, please describe.	
29	Wages paid to casual and permanent works and their compliance with local labor laws.	
30	Compliance with local working hours and site safety laws for contractor's workers.	
31	Are Contractor's staff wearing issued personal protection equipment?	
32	Emergency contact numbers for Contractor/ ER shown in conspicuous place?	

Annexure 8: Sensitive receptors along the RoW of indicative feeder roads

NO	ROAD NAME	Length (km)	Sensitive receptors			
			National park	Water bodies	Cultural Resources	Remarks
1	Gasiza-Kibisabo-Muringa-Gitebe	13.73		Kayanza stream		The road is crossing the stream and is far from the park under reconstitution
2	Kibisabo-Masha-Arusha-Mizingo-Masha-Gatindori-Musenyi	32.81	Mukura-Gishwati	Mizingo marshland, Musenyi, Rusenyi & Rubaya streams		The road passes through the remnant forest reserve of Gishwati on about 12.9 km The road also crosses four rivers, Mizingo, Musenyi, Rusenyi & Rubaya
3	Nteranya-Kareba	6.05		Nyirakigugu Dam, Ruraje, Ruhorera stream		The road is dominated with seasonal food crops and facing with flooding and landslides
4	Kibisabo-Kanyaru-Rugamba-Gihirwa	13.65		Kanama wetland and Gihirwa stream		The road crosses Kanama and Gihirwa rivers and is far from the Park.
5	Kirogotero-Rurembo Centre-Guriro-Murungu-Nyakiriba-Tubungo-Nkotsi	48.59		Basera, Rwaza stream, Giciye/Mukungwa wetland		The road is passing through an area dominated with seasonal food crops (maize, beans, etc). It ends in Mukungwa/Giciye wetland
6	Rambura-Gasiza	2.30		Nyacyonga a stream	Rambura	The road is passing close to the grave and is crossing the Nyacyonga valley
7	Kazirankara-Nturo-Kaburamba-Murago	5.28				The road is very far from the Mukura - Gishwati National Park and no wetland is crossed
8	Rugera-Nyamitanzi-Gisizi	6.40		Giciye river		The road is very far from the Mukura - Gishwati National Park and passes near Akanyaru wetland which was converted into agriculture
9	Gipfuna-Muringa	9.25		Giciye river		The road is crossing Giciye river
10	Gatovu-Mburabuturo-Murungu	6.36				The road is crossing Giciye river
11	Kajagari-Kabatwa	5.98				The road is passing through potential area for irish production
12	Vuga-Kamiro-Gaharawe	2.87				The road is far from the park (VNP) and does not cross any water body
13	Rwaza-Kabara-Kazenzo	5.10				The road is far from the park and does not cross any water body
14	Rurembo Centre-Mubayu-Cyanika	11.47				The road is far from the park and does not cross any water body
15	Gasura-Jomba-St Jomba-Dagaza	14.31		Bisusa		The road is crossing Bisusa river

16	Kagogo-Gakamba-Munzuri(pinus)	15.60		Giciye, Kinyansenge, Ruhanga		The road is crossing three rivers, namely Giciye, Kinyansenge and Ruhanga
17	Gasiza-Birembo	0.95				The road is far from the park and does not cross any water body

Annexure 8: Sensitive receptors along the RoW of indicative feeder roads (Cont'd)

NO	ROAD NAME	Length (km)	Sensitive receptors			
			Households likely to be affected	Houses likely to be affected	Total land to be acquired for 10.5m RoW (Ha)	Total land to be acquired for 6.0m paved road
1	Gasiza-Kibisabo-Muringa-Gitebe	13.73	73	25	9.75	3.57
2	Kibisabo-Masha-Arusha-Mizingo-Masha-Gatindori-Musenyi	32.81	210		20.77	6.00
3	Nteranya-Kareba	6.05	32		5.08	2.36
4	Kibisabo-Kanyaru-Rugamba-Gihirwa	13.65	67	5	10.36	4.22
5	Kirogotero-Rurembo Centre-Guriro-Murungu-Nyakiriba-Tubungo-Nkotsi	48.59	264	25	32.65	10.79
6	Rambura-Gasiza	2.30	8	6	1.31	0.28
7	Kazirankara-Nturo-Kaburamba-Murago	5.28	21	15	3.17	0.79
8	Rugera-Nyamitanzi-Gisizi	6.40	32	8	4.80	1.92
9	Gipfuna-Muringa	9.25	49		7.12	2.96
10	Gatovu-Mburabuturo-Murungu	6.36	31	5	4.20	1.34
11	Kajagari-Kabatwa	5.98	46	5	4.49	1.79
12	Vuga-Kamiro-Gaharawe	2.87	13		1.61	0.32
13	Rwaza-Kabara-Kazenzo	5.10	35	4	3.77	1.48
14	Rurembo Centre-Mubayu-Cyanika	11.47	64	8	8.58	3.42
15	Gasura-Jomba-St Jomba-Dagaza	14.31	65	2	8.87	2.43
16	Kagogo-Gakamba-Munzuri(pinus)	15.60	56	7	11.39	4.37
17	Gasiza-Birembo	0.95	5	4	0.52	0.10
		200.7	**1071**	**119**	**138.44**	**48.12**

Annexure 9: Prioritization matrix for the indicative feeder roads

Priority Indicators - variation range [5,1]								Benefits indicator & ranking		Road Improvement cost per beneficiary (weighted by benefits' indicator) USD/hab.
1	2	3	4	5	6	7	8			
Connectivity	Road condition	Remoteness	Traffic	Access to social & economic services	Agriculture potential	Community Priority	VUP Impact			
Indicator Weight								Indicator [5,1]	Ranking	
0.10	0.09	0.05	0.11	0.20	0.35	0.07	0.03			

The ***connectivity*** is the potential of the FR under evaluation to connect other areas within and outside the district. It allows to assess the contribution of the FR improvement to the transport performance of the district's road network. The ***road condition*** has a significant influence on the transportation costs and thereby onto its use. The bad condition of a FR is a limiting factor to the development of economic and social activities in its direct and wider influence areas.

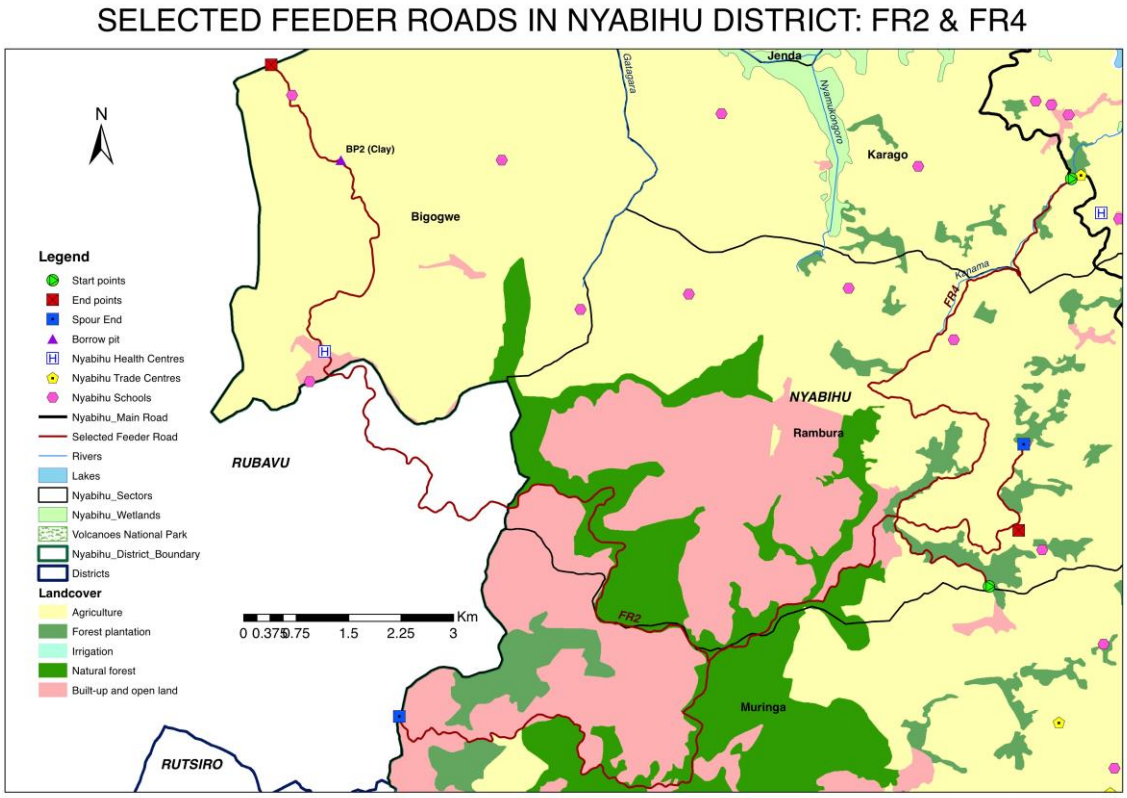
The ***remoteness*** combines two criteria: (i) level of permanent or periodic inaccessibility of the FR under evaluation and, (ii) the distance from the closest national road (NR). The objective of this indicator is to evaluate the effect of the FR improvement on the all-weather use of the road.

Traffic and ***Access to Social and Economic Services*** are other important indicators. The first indicator refer to the expected traffic after FR improvement. The expected traffic takes into consideration the generation effect linked to the road improvement and the economic potential of served areas. The objective of this indicator is to assess the contribution of the road improvement to the development of the served area. The objective of the access to social and economic services is to assess the impact of the FR improvement on the living condition of the served area population. The greater is the number of services benefitting from the FR improvement, the higher will be the priority of planned improvement.

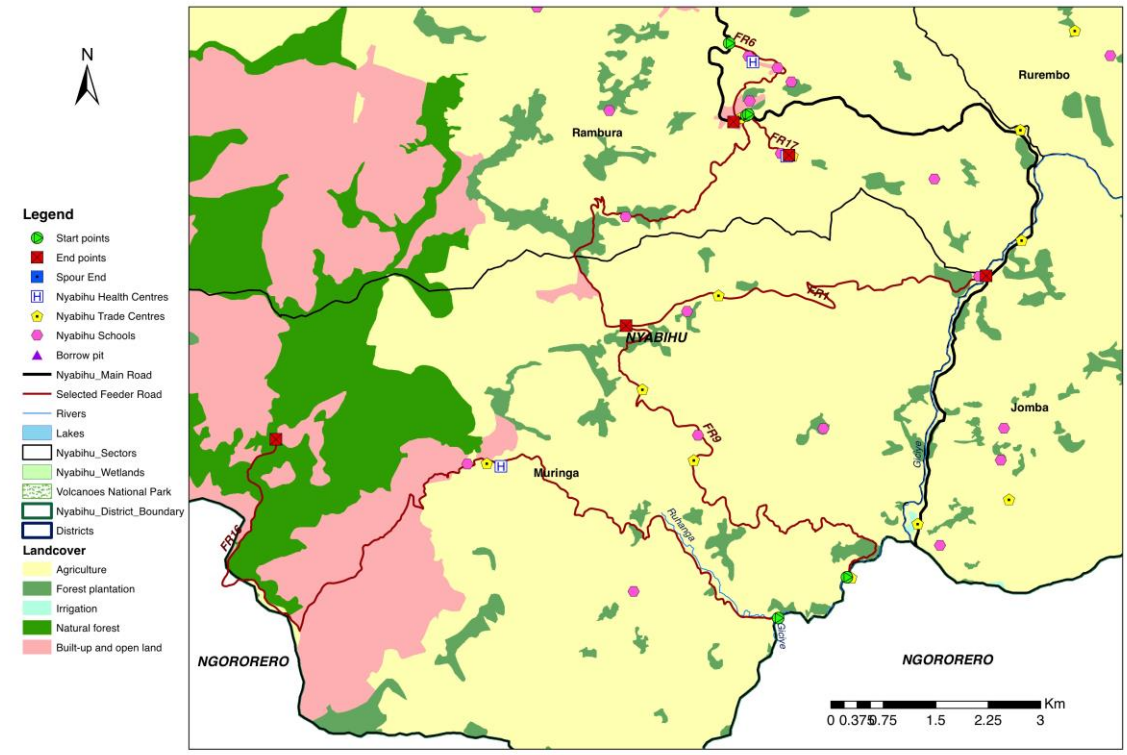
Agriculture potential is the main driver of the transport demand in rural areas. The assessment of its potential can substantiate the socioeconomic justification for roads' improvement. In this regards, agriculture development and support projects can play an important role in stimulating the transportation demand, hence the need of improved roads.

Community priority: The objective of this indicator is to asses to what extent the road improvement is felt as factor of living condition amelioration. The last indicator is the ***Impact on Vulnerable Sectors***. Sectors beneficiary of Vision 2020 Umurenge Program (VUP) are particularly vulnerable and if the FR proposed for improvement passes through a vulnerable Sector as decided by VUP, the FR improvement would produce an enhanced social impact.

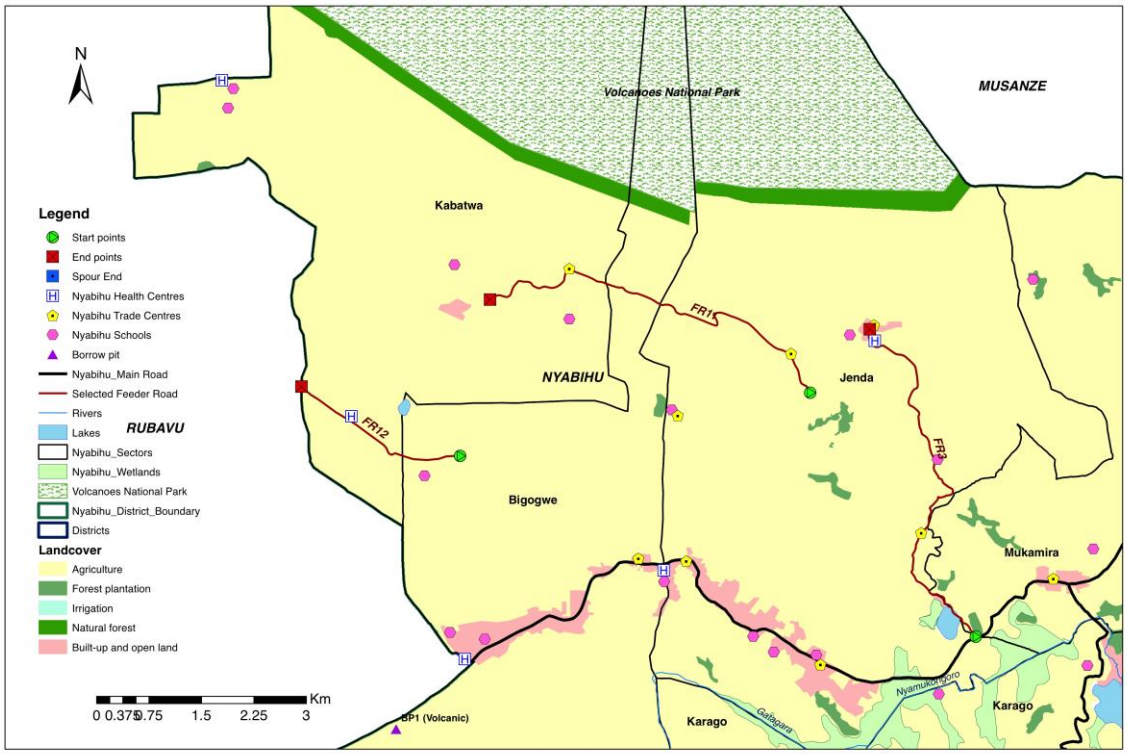
Annexure 10: Maps showing locations of indicative feeder roads in Nyabihu District



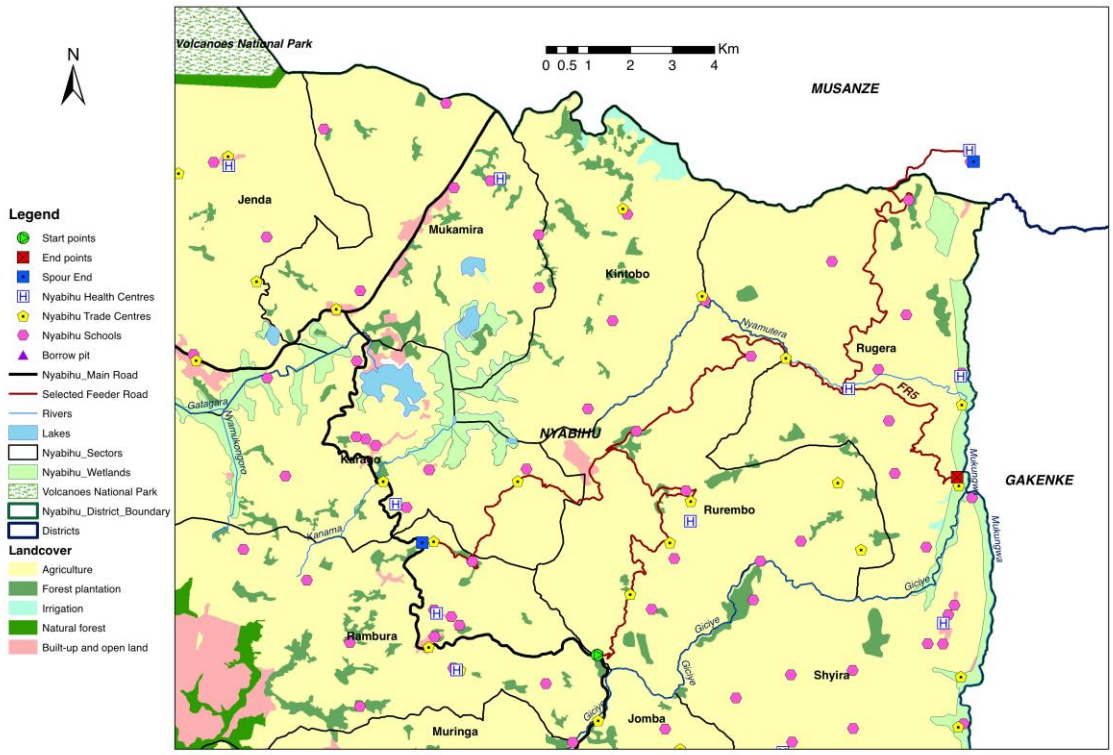
SELECTED FEEDER ROADS IN NYABIHU DISTRICT: FR1, FR6, FR9, FR16 & FR17



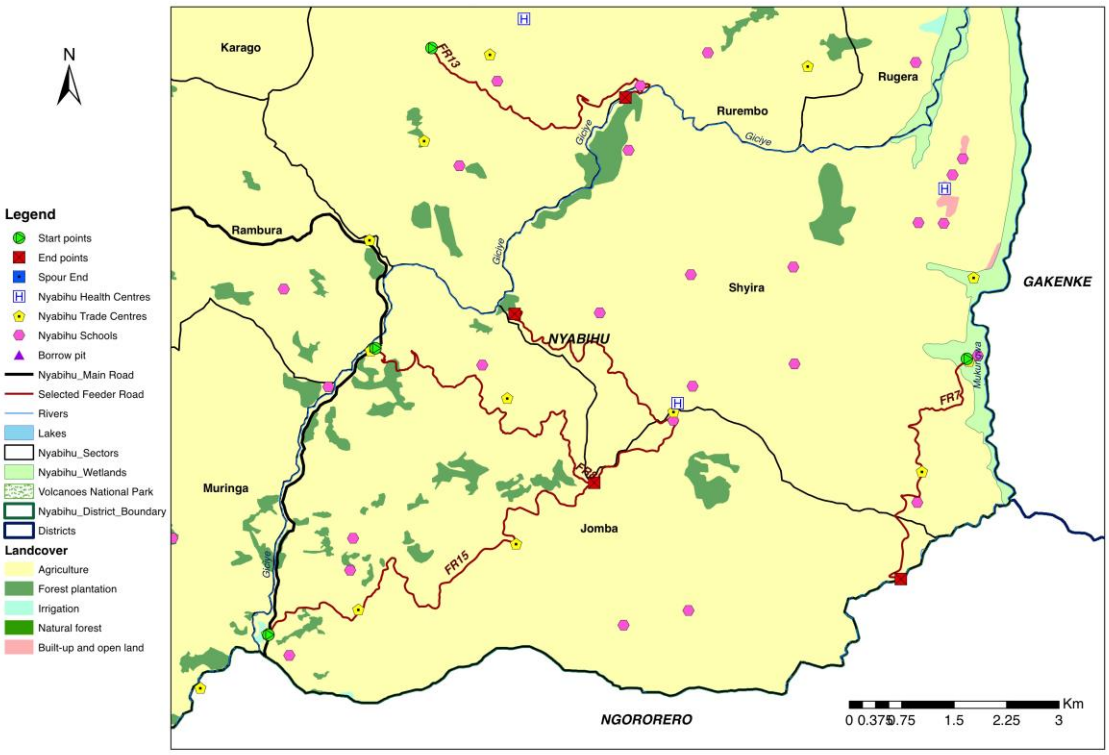
SELECTED FEEDER ROADS IN NYABIHU DISTRICT: FR3, FR11 & FR12



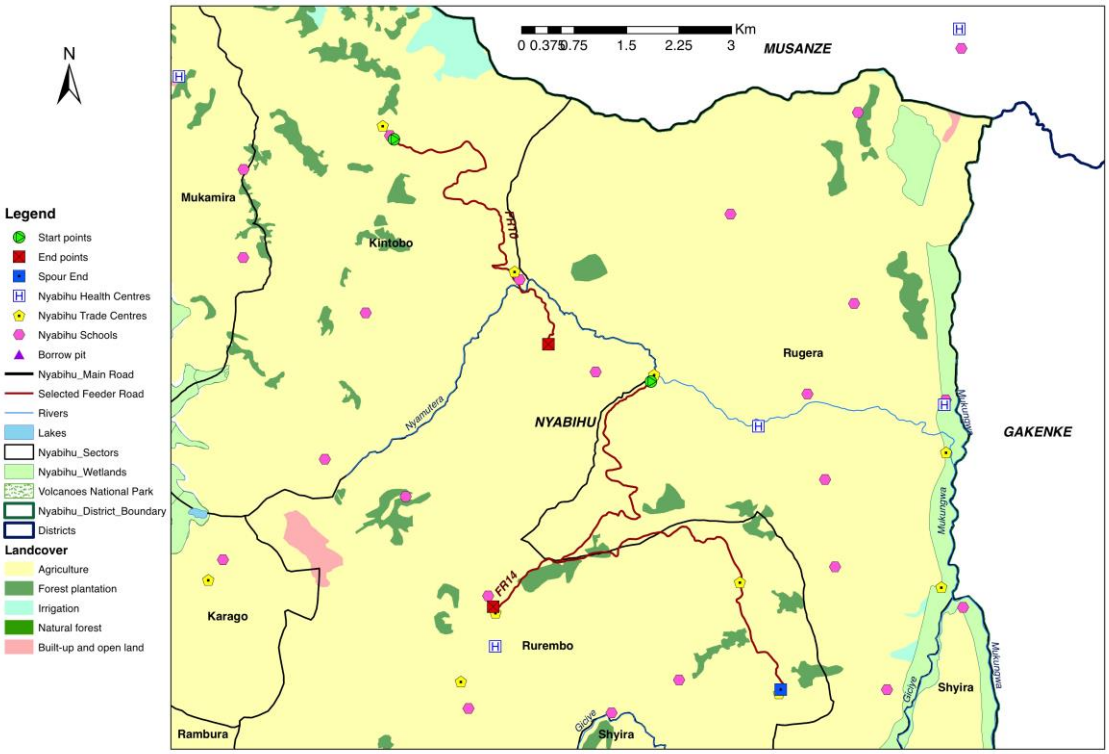
SELECTED FEEDER ROADS IN NYABIHU DISTRICT: FR5



SELECTED FEEDER ROADS IN NYABIHU DISTRICT: FR7, FR8, FR13 & FR15



SELECTED FEEDER ROADS IN NYABIHU DISTRICT: FR10 & FR14



Annexure 11: Map showing Mukura – Gishwati location in Rutsiro District