



Japan International Cooperation Agency

FINAL REPORT

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED PROJECT OF
IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI.**

Prepared by:



BUREAU FOR ENVIRONMENTAL AND ENVIRONMENTAL STUDIES/ BESST Ltd

Tel: +250788643982

email: best_ltd@yahoo.com

[/www.besstltd.com](http://www.besstltd.com)

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DISCLOSURE OF THE CONSULTANT

I hereby undertake that all requirements included in terms of reference provided by the client and approved by Rwanda Development Board (RDB) for the preparation of **Environmental Impact Assessment for Improvement of Water Supply Services in North Central Kigali** complied with. I also undertake that the facts given in this ESIA report are factually correct to the best of our knowledge.



Théogène HABAKUBAHO
Managing Director/ BESST LTD
Certified Lead Environmental Practitioner
Email: besst_ltd@yahoo.com
Phone: +250 788 643 982
Website: www.besstltd.com
Kigali-Rwanda

EXECUTIVE SUMMARY

Project background

Water and Sanitation Corporation (WASAC Ltd) with the support from Government of Japan through Japan International Cooperation Agency (JICA) have achieved a series of actions in water supply sectors. This includes the rehabilitation of water transmission pipelines for strengthening transmission capacity from the city's largest Nzove WTP to the Ntora Reservoir, technical cooperation for non-revenue water (NRW) reduction, as well as the formulation of the Kigali Water Supply Master Plan (KWSMP). The main objective of these interventions for efficient and effective facility development from a long-term perspective. In this regard, another priority project identified under KWSMP is the development and renewal of water transmission and distribution facilities in the section between Ntora Reservoir and Remera Golf 8 Reservoir. In compliance with national environmental regulations and JICA guidelines for environmental and social considerations, such project requires an environmental Impact Assessment Study.

Objective of the Environmental Impact Assessment (EIA)

Some of the proposed activities such as construction and expansion of existing reservoirs and replacement of distribution water pipelines may have environmental and social impacts on receiving environment and surrounding communities. Therefore, the objective of this study is preparing an Environmental Impact Assessment (EIA) including an Environmental Management Plan (EMP) to meet both national environmental regulations and JICA guidelines for environmental and social consideration and other international best practices. This serves to ensure that the project is implemented in an environmental and social sustainable manner and in full compliance with Rwandan and JICA Environmental and Social requirements.

Approach and methodology used for the study

To achieve the study objectives, the consultant followed procedures stipulated in the general guidelines and procedures for conducting EIA studies in Rwanda, JICA guidelines as well as World Bank Safeguards Policies as recognized under JICA guidelines. The study adopted the following approach: (i) preliminary assessment and review of project designs, (ii) review of secondary data on baseline information (iii) review of policies and regulations, (iv) consultations with stakeholders, (v) interviews with key stakeholders, and (vi) field surveys and assessments at the project sites.

Project location and description

The proposed project will be implemented in Kigali City, Gasabo district, Gisozi sector (Musezero and Ruhango cells); and Kinyinya sector (Gacuriro and Kagugu cells). The project also has a section of Nyarutarama – Golf 8 Reservoir located in Remera Sector (Nyarutarama and Nyabisindu cells). The project consists of construction of grounded water reservoirs (Kagugu and Batsinda sites) and elevated tanks at Nyarutarama and Kibagabaga sites as well as constructions of 5 pressures breaking chambers. It also includes construction of water transmission and distribution pipelines of around 57 km (with dimension varying between ND 160-300); modification of the existing transmission main from Ntora reservoir (ND 400 and ND 500) and the installation of flowmeters, level gauges and monitoring system.

Prediction and assessment of potential impacts

The project is expected to have both positive and negative socio-environmental impacts. Positive impacts expected from the project implementation include but not limited to: reduction of water losses, increased accessibility to treated and clean water, improvement of water distribution systems via decreasing of non-revenue water and increasing energy efficiency, improved sanitation, temporary and permanent jobs creation and employment opportunities, income generation to the local population, transfer of knowledge from skilled to non-skilled people who may interact with the project activities; increasing of social welfare, etc.

Anticipated adverse impacts range from physical environment impacts, biological impacts and social impacts and include air and noise pollution, disturbance of normal traffic, possible site injuries and accidents, possible soil erosion at the construction works, water pollution and loss of biodiversity etc. Adverse social impacts include social disturbance, temporarily loss of land, permanent loss of land at Batsinda site, possible loss of ornamental trees at the pipeline routes and possible loss of income during construction period.

Mitigation measures for each of adverse impact identified and projected were proposed to an extent that they can be avoided, reduced, limited, or eliminated and therefore manageable. In this context the Environmental Management Plan (EMP) and an Environmental Monitoring Plan indicating the mitigation measures, procedure to be followed, monitoring indicators, the responsible institutions to implement these measures and estimated cost of implementation were also provided.

Taking into consideration the nature and location of the project, the project works as well as the identified potential impacts, the consultant can conclude that the adverse impacts identified can be avoided, mitigated, and eliminated by the implementation of appropriate mitigation measures. In fact, the project of improvement of water supply services in north-central Kigali is bound to be executed in a sustainable manner and in compliance with national environmental regulations, JICA environmental and social considerations as well as other international environmental and social safeguards policies.

Therefore, to meet the study objectives requires full implementation of proposed mitigation measures and regular monitoring as per the proposed Environmental Management Plan (EMP) and Environmental Monitoring Plan as proposed in this report. The total estimated budget for the implementation and monitoring the EMP is 13,900 USD for the installation and transmission of the pipes, 24,900 USD for the construction of water tanks and reservoirs and replacement of distribution pipes, and 21,800 USD for the implementation of monitoring of the Nyarutarama –Golf 8 reservoir section. These amounts are indicative budget based on similar projects or consultant experience. Hence contractor shall prepare final budget for the implementation of proposed mitigation measures when required.

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ABBREVIATIONS

BESST	: Bureau for Engineering and Environmental Studies
CEDO	: Cell Economic Development Officer
EDPRS	: Economic Development and Poverty Reduction strategy
EIA	: Environmental and Social Impact Assessment
ESIA	: Environmental and Social Impact Assessment
ESMP	: Environmental and Social Management Plan
GIS	: Geographic Information System
GoR	: Government
GPS	: Global Positioning System
IUCN	: International Union for the Conservation of Nature
IWRMP	: Integrated Water Resources Master Plan
JICA	: Japan International Cooperation Agency
JST	: JICA Study Team
Ltd	: Limited
MININFRA	: Ministry of Infrastructure
MoE	: Ministry of Environment
NGO	: Non-Government Organization
NISR	: National Institute of Statistics of Rwanda
NRW	: Non-Revenue Water
OHS	: Occupational, Health and Safety
RDB	: Rwanda Development Board
REG	: Rwanda Energy Group
REMA	: Rwanda Environment Management Authority
RLMUA	: Rwanda Land management and Use Authority
RURA	: Rwanda Utilities Regulatory Agency
ToRs	: Terms of Reference
WASAC	: Water and Sanitation Corporation

1. INTRODUCTION

1.1. Project background

Government of Rwanda has made sustainable water supply one of the priorities of the National Development Agenda and is establishing supportive policies and legislation in this regard. The main objective of water supply and sanitation policy is to ensure safe, reliable, and affordable water supply services for all 100% by 2024 thereby ensuring universal and equitable access to safe and affordable drinking water for the people while achieving NST-1 along with Sustainable Development Goals (SDGs). The Government of Rwanda with the support from Government of Japan through Japan International Cooperation Agency (JICA) have achieved a series of actions in water supply sectors which include the renewal of water transmission pipelines for the purpose of strengthening transmission capacity from the city's largest Nzove WTP to the Ntora Reservoir, technical cooperation for non-revenue water (NRW) reduction, as well as the formulation of the Kigali Water Supply Master Plan (KWSMP) for efficient and effective facility development from a long-term perspective.

Under KWSMP three priority projects were identified including the rehabilitation and extension of Karenghe WTP and supply system, the construction of a new water treatment plant in Masaka, and renewal of water transmission and distribution facilities in the section between Ntora Reservoir and Remera Golf 8 Reservoir. NRW reduction measurement in the entire city of Kigali is planned under a long-term investment plan with 4 phases during the next 10 years and the present project contributes to the first phase and will be implemented in Kigali city, district of Gasabo, (Gisozi, Kinyinya and Remera sectors).

The implementation of the present project will be conducted via accomplishment of a series of activities which include but not limited to the construction of water storages and water transmission and distribution facilities such as water grounded reservoirs and elevated tanks, construction of water pipelines and equipment required for block systems. There are two transmission pipelines (diameter 500 mm and 400 mm) from Ntora Reservoir. The 500 mm diameter pipeline is connected by gravity flow to Remera Golf 8 reservoir, which is the water distribution base for the eastern area of Kigali where there is a rapid increase of new water demand. This pipeline also supplies water to the emerging residential area at the North-Central part of the city. However, almost all the water supply (average of about 35,000 m³/day) is consumed before reaching Remera Golf 8 Reservoir, which results in the water shortage in supplied area.

The gap between water consumption and water demand in water supply area of Ntora Reservoir is vast (about 13,000 m³/day). Therefore, strengthening the capacity of this pipeline along the small-diameter section (with a diameter of 300 mm, about 3.5km length) will increase water transmission amount to Remera Golf 8 reservoir.

1.2. Project developer

As per the law N° 87/03 of 16/08/2014; Water and Sanitation Corporation (WASAC) Ltd is government entity setup to manage water and sanitation services in Rwanda. The Company was created in the on-going government reform intended to deliver water and sanitation utility sufficiently focused to deliver new water infrastructure; efficient and effective service delivery; build a strong people capability; and meet key national milestones. It was created to reverse the status quo that includes inadequate planning and investments; inefficient and wasteful operations; inadequate institutional management focus; improve viability and autonomy; and establish a sustainable and customer-centric utility to deliver an important mandate that touches people of all walks of life. The mission of the company is providing quality, reliable and affordable water and sewerage services through continuous innovations and detailed care to customers' needs.

1.3. Presentation of the consultant

According to the law on environment, Environmental studies are conducted by practitioners licensed under Rwanda Association Professional Environmental Practitioners (RAPEP). This report was prepared by BESST LTD (Bureau for Engineering and Environmental Studies) under JICA study team. BESST Ltd is a Rwandan company Registered with Rwanda Development Board (RDB) and was subcontracted by JICA. The company is licensed by RAPEP with license number RAPEP/EA/O72 (list certified experts available at www.repep.org). BESST Ltd has its headquarters in Kigali City, Gasabo district, KG 182 st, Martin Plaza, second Floor.

The company is specialized in Environmental studies, Resettlement Actions Plans (RAP), climate change risk assessment, socio-economic assessment, baseline surveys, waste management, water and sanitation, advisory services in sectors ranging from Agriculture, energy development, Infrastructure and housing development, transport, and water supply. For this specific assignment of preparation of EIA, the company used the following team:

Théogène HABAKUBAHO, Team leader He is an authorized EIA Lead expert (**RAPEP/EA/024**). He holds a Master of Science in environmental science management and development and BSc in physical geography. He has over 14 year's professional experience in the field of environmental assessment and management. He has worked on various projects as team leader of environmental studies. Key projects worked on include irrigation projects, green house agriculture, Water supply mining projects, road and bridge construction projects, building and house constructions, schools and hospitals, among others.

NSHIMIYIMANA Fabien, Hydrologist: He is an authorized EIA Associate Expert (**RAPEP/EA/035**). He- holds a Master of Science in Water resources and environmental science and a BSc in Chemistry. He is a Water Resources Engineer with over 10 years' experience in planning, management, design and construction and supervision of water resources infrastructure. Conversant with water resources studies, Environmental and Social Impact Assessment Studies, hydrological, hydrodynamic and groundwater modelling, GIS & remote sensing

NSEKANABANGA Jovine, Statistician: He is an experienced data collector, analysis, and he has a bachelor's degree in applied statistics with over five years of experience in data collection and analysis. He supervised socio-economic data collection, data entry and conducted data analysis.

NZAMURAMBAHO Etienne, surveyor: He is an experience land surveyor with bachelor's degree in land survey and diploma in topography. He coordinated assets inventory and identification of project affected people and he was tasked assignment related to project maps reproduction.

Team of socio-economic surveyors composed by a group of experienced personnel in data collection, data analysis and interpretation with an experience ranging from 5 years to 8 years in socio-economic survey. The team was composed by Mrs Emma BENEMARIYA, KWITONDA Aimable Clément, BYUKUSENGE Gabriel, Jeanne d'arc UWANYIRIGIRA, NIYITANGA Egide, TUYISINGIZE Jean Paul, NIRAGIRE Aime Pauline and UWASE Djamila.

1.4. Objectives of the study

The overall objective of this study is to prepare an Environmental Impact Assessment (EIA) report and Environmental Management Plan (EMP) for the proposed project. The social and environmental assessment was also done with the aim to:

- Identify and evaluate environmental and social risks and impacts of the project implementation.
- Propose mitigation measures to anticipate and avoid, or where avoidance is not possible, minimize and, where residual impacts remain, compensate for risks and identified impacts to workers, affected and local community and the environment in general.
- Identify key stakeholders and their responsibilities before and during the project implementation.

1.5. Scope of the study

The study covered the impacts of the project from planning phase, construction and operational phases and considered the decommissioning phase of the project with considerations of the project sites and its surroundings. This EIA study was prepared in compliance with national and international environmental regulations and JICA guidelines for environmental and social considerations. To this extent, the scope of the study was to:

- Identify legislation, policies (both local and international) that are likely to influence the implementation of the project;
- Develop an overview of the baseline environment of the project intervention area. i.e. study area description, physical, biological and social- economic-environment etc.;
- Description of the likely significant impacts (both positive and negative) of the proposed project that could be caused by the project implementation on environment and local community;
- Description of the methods used in the analysis, description, and classification of the impacts;
- Description of impacts on human health especially during the construction phase;
- Propose mitigation measures against the predicted adverse impacts; and

- Propose an Environmental Monitoring Plan with measurable indicators and parameters for the mitigation measures to ensure sustainability of the project

1.6. Approach and methodology

To achieve the study's objectives, consultant followed procedures stipulated in General Guidelines and Procedures for Environment Impact Assessment. The methodology used involve several stages from scoping phase and these include preliminary assessment to understand and establish boundaries of the study area; desk review, field visits, stakeholders' consultations, analysis of primary and secondary data, analysis of alternatives, prediction of both positive and negative impacts, as well as the proposal of mitigation measures leading to an Environmental and Social Management and Monitoring plan. These steps were followed as per the requirements of the Organic law N° 48/2018 of 13/08/2018 on Environment determining the modalities of protection, conservation, and promotion of environment in Rwanda, the Ministerial order No 001/2019 of 15/04/2019 establishing the list of projects that must undergo environmental Impact assessment, instructions, requirements and procedures to conduct environmental impacts assessment and JICA guidelines on Environmental and Social considerations. The followed methodology is detailed as follow:

1.6.1. Preliminary assessment/ scoping study

Scoping study involved the consultation with WASAC Ltd and JICA team. Initially, a field visit was conducted at the proposed project sites including at the location of project infrastructures to understand the project context area and the proposed infrastructures and their receiving environment. The scoping exercise further covered the following:

- To establish clear boundaries of the study and focus on relevant issues concerning the study.
- Preliminary findings of the existing environment; (physical, biological and socio-cultural environment)
- Preliminary prediction of likely positive and adverse impacts.

1.6.2. Field surveys

Field surveys were conducted in different phases with the aim to assess the baseline physical and biological environmental of the project areas and to identify environmental and socio-economic components that are likely to be significantly affected by this proposed project. During field surveys, basic data and information on the biological and physical resources were collected. The socio-economic data were collected during the socio-economic survey that was also conducted as one standalone component of the project components.

1.6.3. Documents review

Secondary data and legal framework were mainly collected on existing institutional legislation, policies, plans and programs which are likely to influence different parts of the implementation of the present project. Key legal instruments consulted include but are not limited to the:

- The law N° 48/2018 of 13/08/2018 on Environment in Rwanda.
- Ministerial order N° 001/2019 of 15/04/2019 establishing the list of projects that must undergo environmental Impact assessment, instructions, requirements, and procedures to conduct environmental impacts assessment.
- National Water Resources Master Plan;
- National Land Use Development Master Plan;
- Kigali Water Supply Master Plan;
- Water supply and sanitation policy;
- Preliminary project designs

In addition to national policies and regulations influencing this project, international policies, and standards especially JICA guidelines on environmental and social consideration were also considered during the study.

1.6.4. Public Consultation with stakeholders

Information collected from the preliminary desk review, preliminary consultation with JICA study team and WASAC Ltd helped the consultant team to identify the project key stakeholders. Without chronological priority, these stakeholders were identified in three categories. (1) First category of Government officials, (2) Second category of local government officials and (3) Third category of households that are likely to benefit or be affected by the project implementation.

1.6.5. Impacts Assessment

The prediction and analysis of project impacts involved assessment of the entire project cycle in its different phases i.e., project mobilization, construction, operation, and decommissioning phases. Impact assessment applied several tools and techniques to determine the nature (positive or negative), direct or indirect, extent (spatial), occurrence (one-off, intermitted, or constant), magnitude, whether reversible or irreversible, probability of occurrence and significance with and without mitigation. These tools were used to predict and analyze the project impacts:

- **Geographical Information System (GIS)** - used to show the extent of a particular project activity influence on the area by mapping it out.
- **Checklist**- the analysis of project impacts vis a vis project activity was conducted. The impacts that might affect or enhance the livelihood in the project areas were listed and drawn against environment indicators and occurrence.
- **Impact Matrix**- under the impact matrix, the analysis by these tools of GIS, checklist, CBA, were tested against their significant effect on recipients in the project area of intervention. Impact matrix in tabular format was drawn, in which impacts from project activities were tested against their significant effect on the areas of intervention.

For each adverse impact identified, its level of significance was indicated, mitigation measures proposed, and an Environmental Management Plan (EMP) developed.

1.7. Structure of the report

The structure of this report is as follows:

0. Introduction and general background of the project
1. Project description
2. Policy, legal and institutional framework
3. Environmental and socio-economic baseline data
4. Public consultation and participation
5. Project needs and project alternatives
6. Impacts identification, evaluation, and proposed mitigation measures
7. Environmental Management Plan and Environmental Monitoring Plan
8. Conclusions and recommendations

2. PROJECT LOCATION AND DESCRIPTION

As per the ToRs but also referring to best practices, the EIA consultant is requested to describe the proposed project and its activities. The description of project activities was made based on phases of project life cycle i.e. pre-construction, construction, operation, maintenance, and decommissioning phases. This chapter provides the location of the project, projects component/activities in different phases and projects requirements in terms of material or associated facilities.

2.1. Project location

Administratively, the proposed project is in Kigali City, Gasabo district, Gisozi Sector (Musezero and Ruhango cells) and in Kinyinya Sector (Gacuriro and Kagugu cells). The project also has a section of Nyarutarama – Golf 8 Reservoir located in Remera Sector (Nyarutarama and Nyabisindu cells). The map below illustrates the project area:

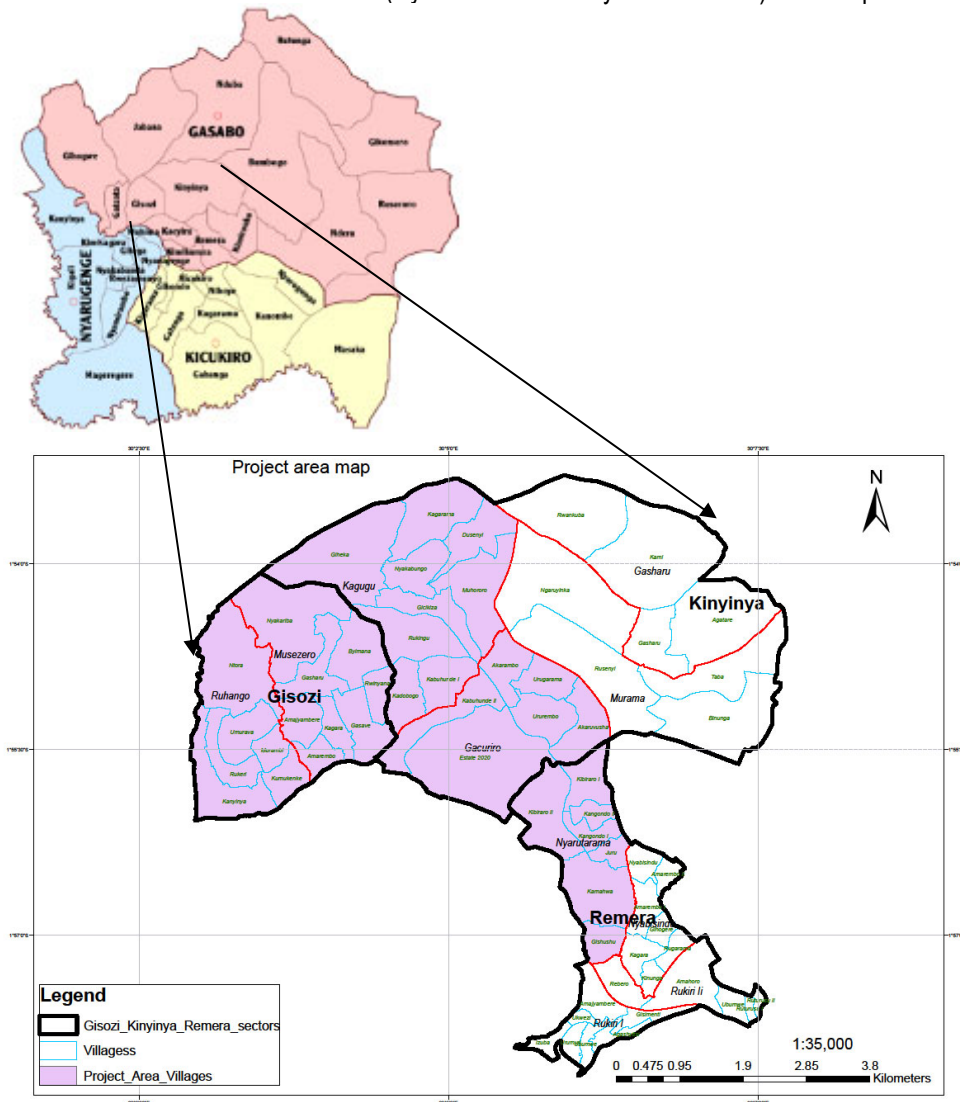


Figure 1: Administrative location of project area

Source: BESST Ltd, 2022

2.2. Project target area

The target area for this project is the area to improve the water supply system and thus the area for the investment of the facilities. The project assumes NRW reduction from 40.3%¹ to 20.9% by the extensive rehabilitation and expansion of the facilities.

The completion of the project is expected to be in the year 2025, its target year for water demand was set as 2030, five years after the completion, in accordance with the benchmark year of the Kigali Water Supply Masterplan.

¹ NRW ratio in the area is as of the data in Feb. 2022. The verification will be finalized in March. 2022.

Table 1: Target year and NRW

Target Year of Project Completion	2025
Target Year	2030
Target for Non-Revenue Water per connection per	20.9 % ¹

Source: JST, 2022

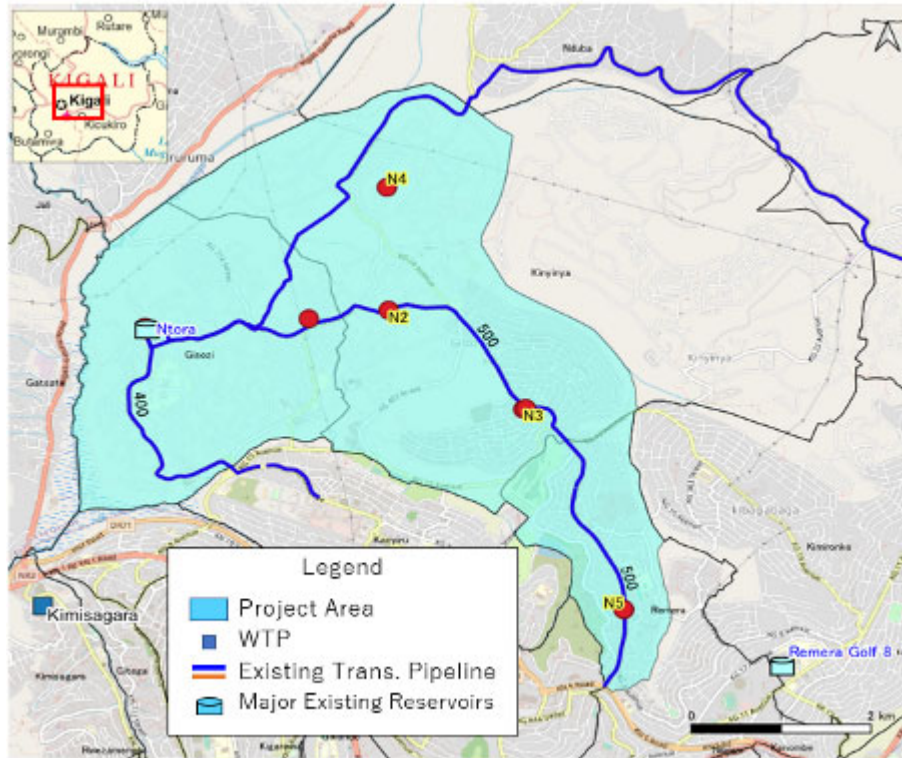


Figure 2: Project target area

Source: Project preliminary Design, JST, 2022

The project initially assumed expansion of transmission pipeline from Nyarutarama to Remera Golf 8 due to the severe water restriction surrounding the area. However, the water interruption around the area has been already improved by the successful completion of the Kanzenze WTP. JST recommended to focus the facility improvement in the target area as shown in figure 2 above. Meanwhile, WASAC advised that the pipeline connection the ND500mm at Nyarutarama to Remera Golf 8 is still important because the water management will be more flexible by the pipeline. Based on the comment, JST studied the routes and feasibility of the pipeline laying as shown in Figure 2. As a result of field reconnaissance JST recommends including the pipeline in the scope of the work of the project. The scope of work will be subject to the review by JICA.

¹ The target NRW ratio may be reviewed before finalization. Target Leakage amount is 150 liter/connection/day.



Figure 3: Selection of the route from Nyarutarama to Golf 8
Source: Project preliminary Design, JST, 2022

In case the transmission pipeline to Golf 8 is not deemed appropriated in light of Grant Aid’s mission, JST proposes to increase the scope of works for the additional construction in the target area. JST recommended that the installation of some part of the secondary and tertiary pipes shall be included in the scope of the work.

2.3. Project components

The project is made of different components that include the construction of water grounded reservoirs and water elevated tanks, the construction of water pipelines (primary and secondary lines of around 57 km, the construction of the pressure breaking chambers as summarized in the table below:

Table 2: Project components and main equipment

Project components	
1. Reservoirs and Elevated Tanks	4 locations Kagugu ^{*1} : Elevated Tank, 450 m ³ Batsinda ^{*1} : Ground Reservoir, 1,000 m ³ Gacuro: Elevated Tank, 500 m ³ Nyarutarama: Elevated Tank, 200 m ³
2. Pressure Breaking Chambers	5 locations (Approx. 3m x 4m each)
3. Transmission and Distribution Pipelines	Approx. 57 km (ND160-300)
4. Secondary and Tertiary Pipe at selected sites	Batsinda Area
5. Modification to Existing Transmission Mains from Ntora Reservoir	Line Valves and Washout on existing pipelines (ND400 and ND500)
6. Flowmeter, Level Gauges and Monitoring Systems	Flowmeter: 25 locations Level Gauges: 12 locations Monitoring System, Display
Equipment	
1. Secondary Pipes	HDPE ND63-110: 95km
2. Tertiary Pipes, Fittings and Connections before the water meter	HDPE ND25 (3/4"): 85km - Branch saddle, valves and miscellaneous - Equipment necessary for construction
3. Connection Materials for Poor Customer and Meters	HDPE ND25 (3/4"), Branch saddle, water meters, valves and miscellaneous equipment
4. Others	Equipment for Maintenance and Leakage Detection etc.

Note: ^{*1} Land acquisition will be required
 ND: Nominal Diameter

The general schematic drawing of the water distribution for the project is given below:

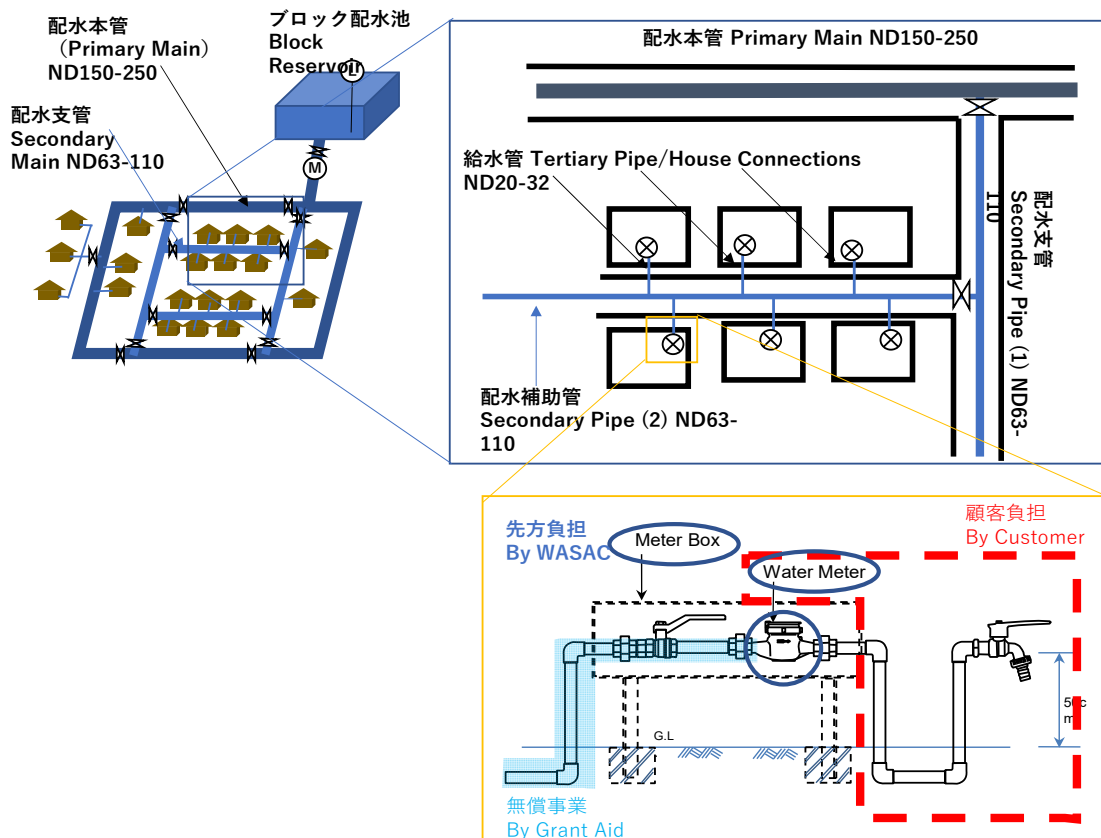


Figure 4: Project Water Distribution Schematic drawing
Source: Project preliminary Design, JST, 2022

2.4. Description of the project

The scope of works covers the reservoirs or elevated tanks at the key locations of new distribution Blocks to be constructed, primary and secondary distribution pipelines, tertiary pipes and fittings, valves necessary for operation and monitoring systems. Water meters are also necessary for reducing the apparent loss (commercial loss) and augment the customer reliability to WASAC. The proposed project will consist at construction of 5 different water grounded reservoirs and elevated tanks as described in the table below (table 2) as well as the construction of 5 pressures breaking chambers, the construction of water transmission and distribution pipelines of approximately 57 km (dimension varying between ND 160-300); the modification of the existing transmission main from Ntora reservoir (ND 400 and ND 500) and the installation of flowmeters, level gauges and monitoring system. As the project will follow the existing pipeline and taking into consideration that mostly project activities will be done around the existing roads, there are no access roads that shall be constructed as most efforts have been made to use the buffer zones and walkways to construct project structures.

Table 3: Summary of the project description

Name	Type and Capacity	Required land (sqm)	Description
Kagugu	Elevated Tank, 500m ³	450	The elevated tank is to supply water to the entire Kagugu hill including the Kadobogo village. The selected land is located along the main road KG14 opposite the church (Catholic Church_ Kagugu Parish).
Gacuriro	Elevated Tank, 500m ³	450	The elevated tank is to supply water to the top of Gacuriro hill where the water pressure is not enough by the existing reservoir, and currently supplied water by the by-pass from transmission pipeline.
Batsinda	Ground Reservoir, 1,000m ³	1,000	The reservoir is to supply water to the new development areas at the Batsinda commercial area and surrounding residential areas with high development (R3). The location is at the top of the village named Muhororo. The land is located near the church (Catholic Church Centrale Batsinda).
Nyarutarama-South	Elevated Tank, 200m ³	450	The elevated tank is to supply water to the top of the southern part of Nyarutarama sector where the water pressure is not enough by the existing reservoir, and currently supplied water by the by-pass from transmission pipeline.

Source: JST, 2022

The water demand and its allocation, and other considerations for designing the distribution blocks are elaborated in the table below:

Table 4: Basic conditions of the target area

Item	2021	2030
Non-Revenue Water	43%	20%
Water Distribution Amount (m3/day)	12,910	20,300
Billed Water Consumption (m3/day)	7,380	16,300
Number of Service Connections	15,500	23,200
Number of Households with On-plot Water Supply	31,000	46,400
Served Population	124,000	185,600
Average water consumption per connection (m3/day)	0.48	0.70

2.5. Project activities

Different activities will be conducted throughout project implementation and among them include Construction works of elevated water tanks and grounded water reservoirs, replacement of old water transmission and distribution pipes with new pipes and the installation of flow meter as well as the installation of level gauges systems. The project will be based on the following main workings:

2.5.1. Project design principles

The project design principles are summarized in the next table below:

Table 5: Project design principles

Component	Design principles
Distribution Blocks	<ul style="list-style-type: none"> - Distribution blocks shall be established and are 1) individually district metered at an entry point of water, 2) controlled dynamic pressure within the block with appropriate ranges. - Maximum static pressure shall not exceed 100 mAq (10 bar). - Minimum dynamic pressure at the entry point at the peak time shall be not less than 10mAq (1 bar). - A reservoir, elevated tank, or a Pressure Breaking Chamber (PBC) at an entry point of the Distribution Block. The pressure-reducing valves can be only used for small areas (equal to or less than 100mm in diameter) for it requires frequent maintenance. - Standard pipe materials for transmission pipes will be DIP and those for distribution pipes shall be HDPE
Distribution Mains and Secondary Pipes	<ul style="list-style-type: none"> - The diameter for distribution mains shall be 150mm. - The line valves shall be placed at the branch of the distribution main and the branch. - Distribution mains shall have at least one washout.
Block Distribution Reservoirs	<ul style="list-style-type: none"> - A block reservoir should have at least a capacity of three hours of daily maximum water supply amount. - The inflow control to the reservoir shall be a motorized valve automatically controlled in coordination with the reservoir level. - The block reservoirs have at least 3 hours of the daily maximum water demand. - The flow rate at the inlet and levels of the reservoirs shall be monitored at the water management center at the UWSSD. The monitoring screen image shall also be monitored at the customer center at WASAC HQs which is operating business 24 hours.

2.5.2. Mobilization or Pre-construction activities

Pre-construction activities consist at preparatory survey to provide the project orientation, project effectiveness, technical and economic validity of the project, preliminary design and scope of project as well as the outline of project cost and implementation plan. In our case the pre-construction activities will results in three main outputs including:

- **Preliminary technical designs:** The preliminary technical designs provide information on size and location of project features, mapping of project area that need to be cleared, associated structure/infrastructure estimates of staff and duration, construction materials and their sources and storing, equipment and tools, etc.
- **Environmental Impact Assessment (EIA) including household survey:** the environmental impact assessment provides baseline information of the projects area both physical and Social, assess the legal requirement, identify potential impacts associated with the projects, gives their mitigation measures, and proposes an environmental management and monitoring plan.

- **Abbreviated Resettlement Action Plan (A-RAP):** the abbreviated Resettlement Action Plan provides information on project land requirements and involuntary resettlement implication. It includes socio-economic status of projects affected household, an inventory of assets that are likely to be affected by projects and proposes mitigation and compensation measures. In our context, the A-RAP was developed at Batsinda plot in Kagugu where a grounded water reservoir of 1,000 m³ will be constructed and only one (1) PAP affected.

Pre-construction works do not have many environmental and social impacts but provide the basis for deep analysis of potential impact during construction, operation, and decommissioning phases of the project.

2.5.3. Construction phase activities

The construction works will consist at construction of new water reservoirs, installation of water pipes and construction of other project structures. It is important to note that maximum efforts have done during the project designs to use the buffer zone of existing roads while avoiding the creation of new access roads. The total length of the pipes both distribution and transmission to be installed is estimated at 57 km and the total number of reservoirs to be constructed is 5 with varying capacities from 200 m³ (Nyarutarama) to 1000m³. (Batsinda). For the water pipelines the area that would be cleared and excavated including the working space would not exceed 2 m width and 1 m depth. The summary of key project activities during construction phase is summarized in sub-sections below:

i. Reservoirs construction activities:

Main project activities connected to the construction of the reservoirs are:

- Site clearance and soil excavation,
- Manufacturing and transportation of construction materials,
- Stones masonry with mortar,
- Concrete mixture,
- Civil engineering works,
- Equipment installation etc.

ii. Pipe installation activities

The installation water pipes will necessitate different activities including:

- Site clearance and soil excavation,
- Roads cut and crossing at same sections,
- Reiver crossing for Nyarutarama to Golf 8 reservoir (at Nyabisindu)
- Manufacturing and transportation of pipes from manufacture to the installation site,
- Pipe installation,
- Repair of damaged road sections,
- Concrete mixing and use for pipes protecting etc.

iii. Construction on public roads and in residential areas

Construction activities to be carried out along the public roads and in residential areas special precautions shall be taken into consideration. Among them include that:

- Pipes shall be laid in the road reserves or the walkways.
- All construction in the public road shall be carried out after approvals of the City of Kigali and in coordination with WASAC personnel
- When the activities will be carried out on public road or closer to residential areas, maximum efforts shall be made to avoid dust caused by construction works.
- Watering exercises by a water tanker shall be made in timely manner, especially in the dry season to suppress dust.
- The contractor shall without delay, clean the road surface if any construction material or refusal is spilled on the road during the haulage or construction works.
- The contractor shall take all necessary precautions to avoid causing damage to roads, properties, lands, trees, roots, crops, boundaries and other features, and the apparatus of other utilities such as REG 's properties.
- The contractor shall be responsible for arranging any road and footpath diversions or closures required and for determining and providing any traffic control measures with the relevant authority. Where the temporary diversions or closures are required by the construction work, the contractor shall provide and maintain an alternative.

- Road structures shall be as the same as the exiting road design and shall get an approval from the competent authority and be tested appropriately.

iv. Road crossing

The number of road crossing shall be minimized so as not to cause the extensive disturbance of public transport. Considering the nature of the work, the damage to the road is limited because the pipe diameters are small. The typical cross section of the excavation/pipe laying work is as below.

- The pipes shall be constructed by open cut trench. Therefore, the road shall be cut by the road cutter to minimize the areas of the road cutting and the aesthetic value of the road. The contractor shall not directly break the road by backhoe before cut by the road cutter.
- Pipe shall be carefully installed to avoid the future leakages that might cause the caving under the road and repair works that incurs the re-excavation.
- Pipe bed shall be carefully prepared at planned level using the purchased soft sand to avoid the damage of pipes by gravel or concrete wreckage.
- All pipe structures shall be laid at least one meter under the surface of the road.
- Safety measures are strictly taken both in accordance with the regulations in Rwanda and construction restriction by JICA.
- The road reinstatement shall be done by the certified and experienced sub-contractor to implement the quality construction.
- When the depth of the trench may exceed 1.5m, the temporary retaining (sheeting and shoring) shall be applied to the site so as not to cause the collapse of the trench.

Following are typical road cut section and the excavation pipe laying.

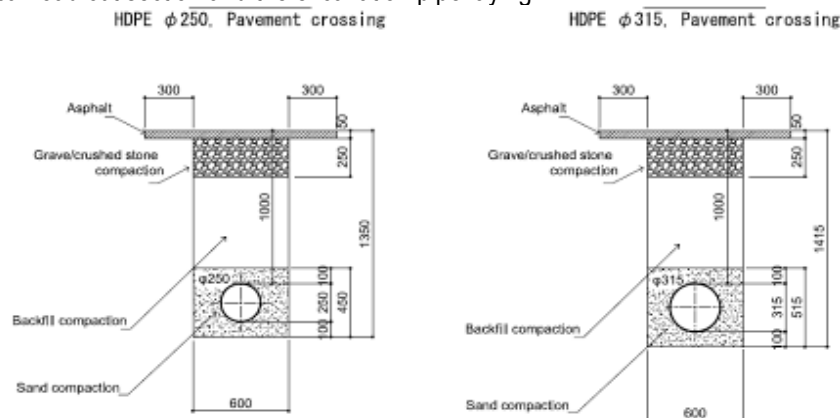


Figure 5: Cross section of the excavation and pipe laying
Source: Project preliminary design, JST, 2022

Figure below presents the project pipeline routes

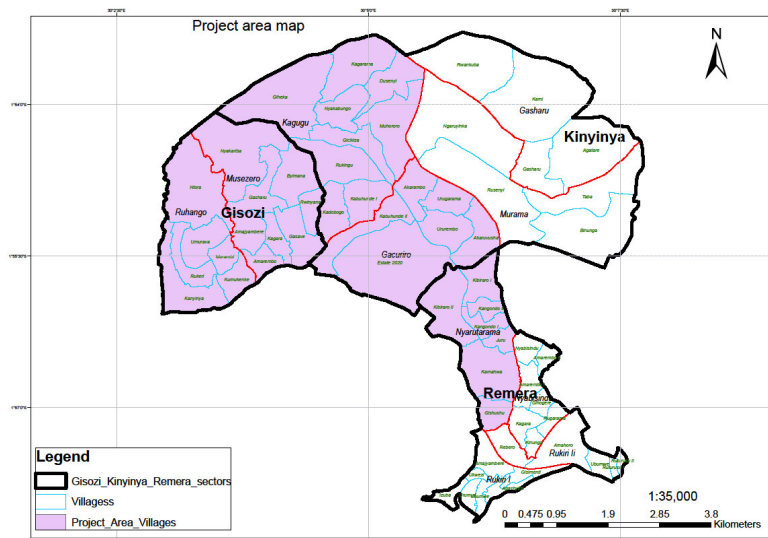


Figure 6: Proposed principal pipeline route and reservoir locations

v. Installation work of water pipes at the steep slope

At steep slope areas, attention will be made to avoid and limit soil erosion. The proposed methods at these areas to limit the soil erosion include:

- The planning of the project activities should be done while taking into consideration to conduct excavation works during the dry season
- Setting safety fence at bottom of the slope made by wooden/steel pile with mesh wire;
- The excavated trenches should be backfilled as soon as the laying of pipes is done
- Properly store and re-use the excavated soil for backfilling
- Setting mono-rail in order to carry the dug soil out of the site;
- Manual-excavating and carrying the dug soil;
- Constructing concrete foundation and the stairs to carry the pipes on the foundation.
- Installing pipes and welding joint.
- Fixing pipes by covering with the concrete at some points.

2.5.4. Operation and maintenance activities

After the installation of water pipes as well as the construction of the water reservoirs, no major works are planned during the operation phase. Only monitoring work will be conducted to check any defect or leakage. If any defect or leakage is identified, then rehabilitation works will be undertaken.

2.5.5. Decommissioning activities

Major activities to be considered in this project include movement and demolition of construction facilities such as temporary construction yard, removal of all construction debris and restoration of the project areas. No other major structure that is envisaged to be destructed during the decommissioning phase.

2.6. Construction Nyarutarama to Golf 8 Reservoir section

The section for Nyarutarama to Golf 8 reservoir is considered as potential extension and will be implemented by WASAC if additional funds are secured. Therefore, this section was included in this EIA study to assess potential impacts and possible mitigation measures for any adverse impact occurring at the section. The general schematic drawing of the project transmission system is given in figure below:

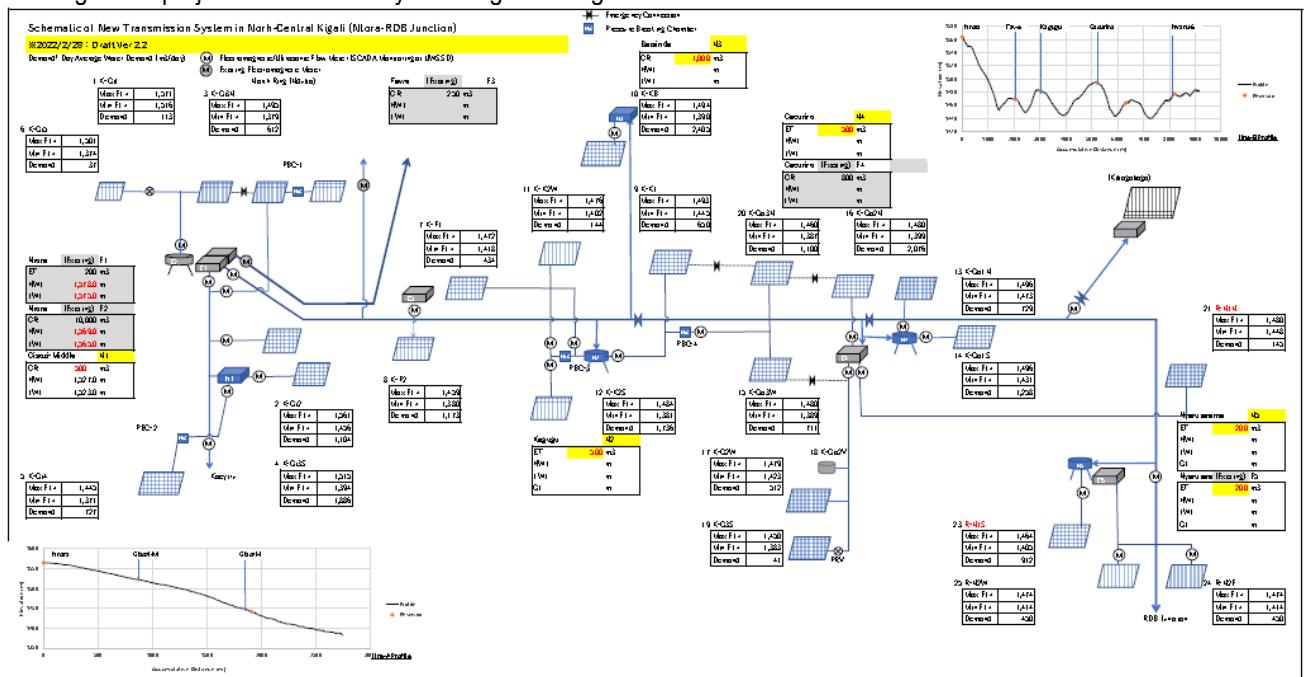


Figure 7: Schematic drawing of the new transmission system in north central Kigali
Source: Preliminary design study, 2022

3. POLICY LEGAL AND REGULATORY FRAMEWORK

The project of improvement of water supply services in north-central Kigali is owned and will be implemented by WASAC Ltd and is funded by JICA. Taking into consideration the Rwandan environmental policy and regulations as well as the JICA guidelines on environment and social considerations, the project developer is requested to establish an overarching policy defining the environmental and social objectives and principles that guide the project to achieve sound environmental and social performance.

The present chapter of policy, legal and regulatory framework describes policies, laws, regulations, and institutional framework that will oversee the implementation of the project and the implementation of proposed mitigation measures. Both international and national regulations were reviewed to come up with a consolidated legal and regulatory framework to ensure that the project is implemented in compliance with national regulations and international policies and standards.

3.1. National legal, regulatory, and institutional framework

3.1.1. Summary of legal and regulatory framework

This project was designed and will be implemented in compliance with existing regulations relevant to environment and social management, water supply, and natural resource management. Key national policies and regulations considered for this project are summarized in the next table below.

Regulations/Policies Standards	Requirements
National Legal and regulatory framework	
Environment and climate change policy (2019)	Seeks to integrates environmental aspects into all the development policies, planning and in all activities carried out at the national, provincial and local level, with the full participation of the population, conservation, preserve and restoration of ecosystems and maintenance of ecological and systems functions.
Land policy (2019)	With regard to water supply infrastructure, the implications of this policy relate to resettlement and compensation; assessing the suitability of particular areas for transport infrastructure; and the influence of infrastructure development on the changing value and use of land.
Health Sector Policy (2015)	Priority areas of intervention include strengthening the culture of conducting Occupational Safety and Health related risks assessment and come up with appropriate preventive measures, qualifying Occupational diseases, raising awareness on OSH
National Water Resources Management Policy 2011	The water policy aims at fair and sustainable access to water, improvement of the management of water resources, etc. through reforestation on hillsides and water catchments areas.
Sanitation policies (2016)	Requires enhance storm water management in urban areas to mitigate impacts on properties, infrastructure, human health and the environment and implement integrated solid waste management
National Gender Policy (2010)	Requires Undertaking measure to ensure equal and effective participation of women and men in all environmental protection and natural resources programs and ensure effective dissemination and enforcement of the land law.
National Regulations	
Rwandan Constitution (2003 and amended 2015)	Articulate the rights and responsibilities of all citizens and the role of the state regarding the environment by providing that every citizen is entitled to a healthy and satisfying environment and that every person has the duty to protect, safeguard and promote the environment respectively. Further, stipulates that private ownership of land and other rights related to land are granted by the State.
Law on Environment (2018)	Requires preparing and implement environmental management instruments and get required permits before any construction
Land law in Rwanda (2021)	Determines modalities of allocating, acquisition, transfer, and management of land in Rwanda. It also institutes the principles that are to be respected on land legal rights accepted on any land in the country and all other appendages whether natural or artificial. According to the law, land in Rwanda is categorized into two: individual land and public land. Only one household will be affected, and compensation will be done in accordance with national regulations and JICA guidelines for environmental and social considerations
Ministerial order establishing the list of projects that must undergo an environment impact assessment (2019)	Specify the works, activities and projects that must undertake an environmental impact assessment before being granted permission to commence. Water supply projects fall under projects that should undergo full EIA
Law governing biodiversity in Rwanda (2021)	Requires all developers to comply with modalities for management and conservation of biological diversity within Rwanda and provide guidance on biodiversity planning and

Regulations/Policies Standards	Requirements
	monitoring, management of ecosystems, endangered and invasive species, and bioprospecting-access and benefit sharing as well as permitting provisions. This project is not expected to have major impacts on biodiversity as only few clearances are expected.
Expropriation Law for Public interest (2015)	Any level, which intends to carry out acts of expropriation in the public interest, shall provide funds for inventory of assets of the person to be expropriated and for just compensation on its budget
Law establishing and organizing the Real Property Valuation Profession in Rwanda	The valuation of land and property incorporated thereon shall be conducted by valuers certified by the Institute of Real Property Valuers in Rwanda
Law on mining and quarry operations (2018)	An EIA Certificate is required for each quarry and borrow pits to be exploited and conditions of approval should be complied with include preparation and implementation of rehabilitation plans.
Law regulating labor in Rwanda (2018)	Requires providing a conducive working environment for the employee and comply with labor and working standards including minimum age, prohibition of child labor, Prohibition of forced labor, Prohibition of sexual harassment, Protection against discrimination at workplace, Right to freedom of opinion and association, employment contracts etc.
Ministerial Order determining conditions for occupational health and safety (2013)	Requires Every employer to ensure the health, safety and welfare at workplace for all persons working in his/her workplace, installation of safety signs, control of air pollution, noise and vibration, Fire-fighting measures, Personnel protective equipment etc.
Ministerial Order determining the list of water pollutants (2013)	Provide the list of water pollutants and requires everyone to avoid any discharge of such pollutant in water bodies.

3.1.2. Instructional framework

In Rwanda there are various institutions involved in environmental management and EIA process and the next table summarizes the role of various institutions connect to this project implementation.

Institution	Roles and responsibilities
Water and Sanitation Corporation Limited (WASAC Ltd)	<p>WASAC Ltd is the entity created by the law N° 87/03 of 16/08/2014 and to manage water and sanitation services in Rwanda. The entity was created with the aim to deliver water and sanitation utility sufficiently focused to deliver new infrastructure; efficient and effective service delivery; build a strong people capability; and meet key national milestones. It is expected to reverse the status quo that includes inadequate planning and investments; inefficient and wasteful operations; inadequate institutional management; improve viability and autonomy; and establish a sustainable and customer-centric utility to deliver an important mandate that touches people of all walks of life. The mission of the company is providing quality, reliable and affordable water and sewerage services through continuous innovations and detailed care to customers' needs.</p> <p>As implementing agency, WASAC Ltd will play key roles in project implementation but also in the implementation of the Environmental and Management Plan. WASAC Ltd will also be responsible for monitoring of the implementation of mitigation measures and report back to Rwanda Environment Management Authority and JICA.</p>
Ministry of Environment (MoE)	<p>The Ministry of Environment was established to ensure the protection and conservation of the environment and ensure optimal and rational utilization of Water Resources, Lands and Forests for sustainable national development.</p> <p>The ministry has different responsibilities as stipulated in the Prime Minister's Order N°108/03 of 15/10/2020 determining mission, responsibility's organizational structure, salaries, and fringe benefits for employees of the Ministry of Environment. These responsibilities include:</p> <ol style="list-style-type: none"> 1. To develop and disseminate the environment and climate change policies, strategies, and programs through the following activities: <ol style="list-style-type: none"> a. To develop strategies to promote partnership and enhance capacity of private sector to invest in activities of environment and climate change for sustainable economic development. b. To develop laws and regulations to ensure protection of the environment and conservation of natural ecosystems; c. To develop institutional and human resources capacities in environment and climate change. 2. To monitor and evaluate the implementation and mainstreaming of environment and climate change policies, strategies and programs across all sectors, especially productive sectors; 3. To oversee and evaluate institutions under its supervision by providing guidance on the implementation of specific programs to be realized by the institutions under its supervision and local government; 4. To mobilize necessary resources for the development, protection and conservation of the environment for the climate change adaptation and mitigation.

Institution	Roles and responsibilities
	<p>The role of the MoE is to monitor and ensure that the project of improvement water supply in North Central Kigali is implemented in a sustainable manner and in line with the existing environmental protection and conservation policies, laws and other legal requirements.</p> <p>In the case that EIA certificate is not issued, project developer may make an appeal to the Ministry of Environment.</p>
Rwanda Environment Management Authority (REMA)	<p>REMA is an institution that was established to implement the environment related policies and laws in Rwanda. Under supervision of the Ministry of environment and from Law N°63/2013 of 27/08/2013 determining the mission, organization and functioning of REMA, it has the legal mandate for national environmental protection, conservation, promotion, and overall management, including advisory to the government on all matters pertinent to the environment and climate change. REMA has different key responsibilities where according to this proposed project, it will:</p> <ul style="list-style-type: none"> - Closely monitor and assess the project to ensure compliance with the laws on environment; - Participate in the preparation of activities and strategies designed to prevent risks and other phenomena which may cause environmental degradation and propose remedial measures; - Provide, if necessary, advice and technical support in terms of natural resources management and environmental conservation. <p>In this project, REMA will be responsible for overall environmental protection audits and project general overview vis a vis the environmental protection and management compliance. REMA will also play key roles in the implementation of the Environmental Management Plan as key environmental protection regulator.</p>
Rwanda Water Resources Board (RWB)	<p>Rwanda Water Resources Board (RWB) was established by the law N° 71/2019 of 29/01/2020 with the different responsibilities aiming at proper water resources management. Among those responsibilities include:</p> <ul style="list-style-type: none"> - To implement national policies, laws and strategies related to water resources management; - To advise the Government on matters related to water resources management; - To control and enforce water resources use efficiency; <p>Therefore, RWB will be partner in ensuring a well-managed water resources and advising for water resources efficiency use.</p>
Rwanda Land Management and Use Authority (RLMUA)	<p>RLMUA is an organ responsible for putting in place and operationalizing an efficient system of land administration, use and management that secures land ownership, promotes investment in land for socio-economic development and poverty reduction.</p> <p>Some of the responsibilities of RLMUA include:</p> <ul style="list-style-type: none"> - Put in place mechanisms which procure security of land tenure for the promotion of investment - Promote proper allocation of land, and proper use of land resources, according to their potential. - Orient land management towards a more profitable and sustainable production, by making good choices among methods of land development. - Develop methods that protect land resources from various types of land degradation. - Establish order and discipline in the allocation of land, as well as in land transactions in order to control the pressure on land, inappropriate development, speculation and trafficking of land. - Involve and sensitize the public at all levels in order to ensure protection of the environment and good management of the land. - Ensure the sustainable use of wetlands. <p>The role of RLMUA in this project is to guarantee the wise use of wetlands located within the project sites (Nyarutarama- Golf8 section) and will play key role in land registration located at the project infrastructures as well as the land transfer process between expropriated land and WASAC Ltd.</p>
Rwanda Development Board (RDB)	<p>RDB was established with the mission of improving the well-being of all Rwandans by fast-tracking development, catalyzing sustainable economic growth, and creating prosperity for all. This a one stop institution bringing together several government bodies in Rwanda focused at promoting investment. RDB is also tasked to review and approve all EIA reports for proposed projects and programs before their implementation.</p> <p>RDB in this project is a key partner as it will be responsible for issuing the EIA ToRs, review the report with aim of approving the study report and ensuing the EIA certificate for the project before implementation.</p>
Rwanda Utility Regulatory Authority (RURA)	<p>Rwanda Utilities Regulatory Authority (RURA) was created with the mandate to regulate:</p> <ul style="list-style-type: none"> - Telecommunications, information technology, broadcasting and converging electronic technologies including the internet and any other audio-visual information and communication technology. - Postal services; - Renewable and non-renewable energy, industrial gases, pipelines and storage facilities; - Water supply including tariffs; - Sanitation; - Transport of persons and goods; and

Institution	Roles and responsibilities
	<ul style="list-style-type: none"> - Other public utilities, if deemed necessary. <p>The regulation of water supply activities and other public utilities are among the mandates of RURA which makes it important to this proposed project as it is about the construction of water distribution infrastructures and non-revenue water project.</p>
Gasabo district and Local decentralized entities	<p>Generally, decentralized entities are responsible for the implementation of laws, policies, strategies, objectives and programs relating to protection, conservation and promotion of the environment in Rwanda. Article 61 of environmental law state that in the framework of conservation and protection of the environment, decentralized entities are particularly responsible for:</p> <ul style="list-style-type: none"> - ensuring activities related to better management of land, especially controlling soil erosion and tap rain water; - Afforestation, protection and proper management of forests; - efficient management of rivers, lakes, sources of water and underground water; - efficient management and effective use of swamps; - Protection and proper management of reserved areas, historical sites, endangered animal and plant species. <p>Under the General Guidelines and Procedure for EIA Local Governments including Kigali City, and Gasabo district and its respective sectors are tasked to perform the following functions:</p> <ul style="list-style-type: none"> - Review Project Briefs so as to advise on Terms of Reference, - Provide information or advice to developers and EIA Experts when consulted during EIA process, - At the request of RDB, review EIA reports and provide comments to RDB, - Assist RDB in organizing public hearings, - Host public hearings, - Host individual consultations, - Gather written comments from public and transmit them to RDB. - Facilitate the land acquisition process through land bureau office; - Plan and complaints resolutions.

3.2. International legislative and policy framework

In addition to national environmental legislations, Rwanda is also party to several regional and international conventions and protocols on environment. To this, the present project will be implemented in compliance with those international policies and regulations particularly the JICA Environmental and Social considerations (project funder) and the World Bank safeguards Policies.

3.2.1. JICA guidelines on environmental and social consideration

The project of improvement of water Supply services in North Central Kigali will be implemented in compliance with the JICA Environmental and Social Considerations guidelines. JICA encourages host country governments including local governments, borrowers, and project proponents, to implement the appropriate measures for environmental and social considerations when engaging in cooperation activities. At the same time, JICA provides support for and examinations of environmental and social considerations in accordance with the guidelines.

The guidelines cover five schemes: (1) Loan aid, (2) Grant aid (excluding projects executed through international organizations), (3) Preliminary studies of grant aid undertaken by MOFA, (4) Technical cooperation for development planning, and (5) Technical cooperation projects.

- **Objectives of JICA guidelines**

The objectives of JICA guidelines are to encourage project proponents to have appropriate consideration for environmental and social impacts, as well as to ensure that JICA's support for an examination of environmental and social considerations are conducted accordingly. The guidelines outline JICA's responsibilities and procedures, along with its requirements for project proponents in order to facilitate the achievement the above-mentioned objectives. In doing so, JICA endeavors to ensure transparency, predictability, and accountability in its support for an examination of environmental and social consideration.

- **Key principles of JICA guidelines**

Some of the principles of JICA guidelines on environmental and social considerations are summarized as follows:

1. Environmental impacts that may be caused by projects must be assessed and examined in the earliest possible planning stage.
2. Alternatives or mitigation measures to avoid or minimize adverse impacts must be examined and

incorporated into the project plan.

3. Examinations must be endeavored to include an analysis of environmental and social costs and benefits in the most quantitative terms possible, as well as a qualitative analysis. These must be conducted in close harmony with the economic, financial, institutional, social, and technical analyses of projects.
4. The findings of the examination of environmental and social considerations must include alternatives and mitigation measures and must be recorded as separate documents or as a part of other documents. EIA reports must be produced for projects in which there is a reasonable expectation of particularly large adverse environmental impacts.
5. For projects that have a particularly high potential for adverse impacts or that are highly contentious, a committee of experts may be formed so that JICA may seek their opinions, in order to increase accountability.

- **Responsibility of JICA in EIA process**

While project proponents take the initiative to deal with the environmental and social considerations of projects, JICA provides support for and examinations of the environmental and social considerations for the project proponents in accordance with Sections 2 and 3 of the guidelines and depending on the nature of cooperation projects. Project proponents are required to incorporate the output of environmental and social considerations studies into project planning and decision-making processes. When JICA provides support for and examinations of environmental and social considerations, JICA examines the requirements that must be met.

- **Categorization of projects and JICA guidelines**

JICA classifies projects into four categories according to the extent of environmental and social impacts they may cause as well as considering an outline of project, scale, site condition, etc. The four categories are the following:

Category A: Proposed projects are classified as Category A if they are likely to have significant adverse impacts on the environment and society. Projects with complicated or unprecedented impacts that are difficult to assess, or projects with a wide range of impacts or irreversible impacts, are also classified as Category A. These impacts may affect an area broader than the sites or facilities subject to physical construction. Category A, in principle, includes projects in sensitive sectors, projects that have characteristics that are liable to cause adverse environmental impacts, and projects located in or near sensitive areas.

Category B: Proposed projects are classified as category B if their potential adverse impacts on the environment and society are less adverse than those of category A projects. Generally, they are site-specific; few if any are irreversible; and in most cases, normal mitigation measures can be designed more readily. The rehabilitation of irrigation facilities in Rwamagana can be classified as category B projects.

Category C: Proposed projects are classified as Category C if they are likely to have minimal or little adverse impact on the environment and society.

Category FI: Proposed projects are classified as Category FI if they satisfy all of the following requirements: JICA's funding of projects is provided to a financial intermediary or executing agency; the selection and appraisal of the sub-projects is substantially undertaken by such an institution only after JICA's approval of the funding, so that the sub-projects cannot be specified prior to JICA's approval of funding (or project appraisal); and those sub-projects are expected to have a potential impact on the environment.

- **Impacts to be assessed**

The impacts to be assessed about environmental and social considerations include impacts on human health and safety, as well as on the natural environment, that are transmitted through air, water, soil, waste, accidents, water usage, climate change, ecosystems, fauna and flora, including trans-boundary or global scale impacts. These also include social impacts, including migration of population and involuntary resettlement, local economy such as employment and livelihood, utilization of land and local resources, social institutions such as social capital and local decision-making institutions, existing social infrastructures and services, vulnerable social groups such as poor and indigenous peoples, equality of benefits and losses and equality in the development process, gender, children's rights, cultural heritage, local conflicts of interest, infectious diseases such as HIV/AIDS, and working conditions including occupational safety. Items to be addressed in the specific project are narrowed down to the needed ones through the scoping process.

In addition to the direct and immediate impacts of projects, the derivative, secondary, and cumulative impacts as well as impacts associated with indivisible projects will also be assessed about environmental and social considerations, so far as it is rational. The life cycle impact of a project period is also considered.

Various kinds of relevant information are needed to assess impacts on the environment and local communities. There are, however, uncertainties in predicting such impacts caused by the incomplete understanding of impact mechanisms and the limited information available. Therefore, if the scale of uncertainty is large, project proponents etc. provide environmental and social considerations that include preventive measures as much as possible.

3.2.2. Framework convention on climate change

This convention considers the fact that climate change has trans-boundary impacts. The basic objective of this convention is to provide for agreed limits on the release of greenhouse gases into the atmosphere to prevent the occurrence of climate change. It also aims to prepare countries to minimize the impact of climate change, should it occur.

3.2.3. Convention on biological diversity

The convention on biological diversity has three goals. These are:

- Conservation of biodiversity;
- Sustainable use of the components of biodiversity; and
- Fair and equitable sharing of the benefits arising from the use of genetic resources. Rwanda has ratified this convention and all project developers are urged to implement the convention during project implementation.

Based on the above assessment of legal and institutional framework both national and international, it can be concluded that the present project of Improvement of Water supply in North Central Kigali has a comprehensive legal and regulatory framework that can enable the project to be implemented in sustainable manner if complied with. The consultant recommends implementing the proposed project in consideration of national and international laws and policies as well as the associated standards especially the JICA guidelines on environmental and social considerations.

4. ENVIRONMENTAL AND SOCIAL BASELINE DATA

4.1. Introduction

To understand the existing environmental and socio-economic conditions of the project, baseline data have been collected, compiled, and analyzed for the following:

- Socio-economic environment
- Physical environment and
- Biological environment

The information presented has been collected from various sources and most data have been collected from field visits and surveys, as well as from secondary data collected from literature review. Formal and informal discussions were held with the local people, project affected people and local government/non-government that provided useful information for preparation of this report. Information on project facilities, size and magnitude have been taken from the preliminary design documents done by JICA study team. Therefore, the data provided in this chapter shall be used as benchmarks for future project impacts monitoring.

4.2. Socio-economic baseline data

In this section data presented are from the socio-economic survey conducted on 300 households located in the project area of intervention and project impacted zones. Demographic characteristics of households

- **Sex of heads of households**

In this section, the study results were presented by describing the sex of heads of households.

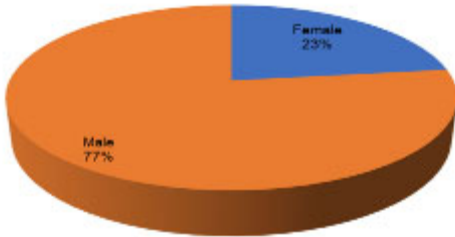


Figure 8: Percentage (%) of sex of heads of household
Source: Household survey 2022

As seen from Figure 9, from 300 sampled households 23% households are headed by females and 77% households headed by males. In terms of sex of respondents, results shows that 64% of respondents were females and 36% males. This shows how females are the one who do the housework and remain at home while main are involved in works outside the home.

- **Age of respondents**

Ages of respondents were presented in form of intervals from 18 years to more than 65 years.

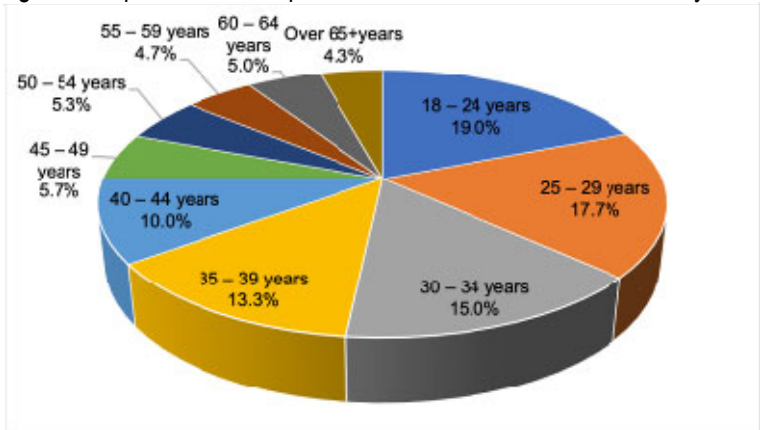


Figure 9: Percentage (%) of respondents by age
Source: Household survey 2022

From the Figure 10 among 300 respondents 19% were aged between 18-24 years old, 17.7% aged between 25-29 years old, 15% aged between 30-34 years old, 13.3% aged between 35-39 years old, 10% aged between 40-44 years old, 5.7% aged between 45-49 years old, 5.3% aged between 50-54 years old, 4.7% aged between 55-59 years old and 5% were aged between 60-64 years old as well as 4.3% were aged 65 years old and above.

- **Size of households Composition of households**

With its young population and low level of family planning, Rwanda has a relatively high household size which is 4.2. The survey results do not differ a lot to this average though some cells go to six. It is worth to note that in Kigali the size of households is increased by members of family who leave rural area and stay with the relatives in the city. Further, many of households in the city has at least one house helper.

Table 7: Households by average size in the survey area

Sector	Cell	Person per HH (Average)	Count/Sample (Total)
Bumbogo	Ngara	5.4	16
Gisozi	Musezero	5.4	38
	Ruhango	4.7	29
Kimironko	Bibare	5.8	16
	Kibagabaga	5.4	23
	Nyagatovu	5.2	19
Kinyinya	Gacuriro	4.7	14
	Gasharu	5.1	13
	Kagugu	5.2	60
	Murama	5.0	20
Remera	Nyabisindu	5.5	22
	Nyarutarama	6.0	18
	Rukiri I	5.2	7
	Rukiri II	3.3	5
Grand Total		5.2	300

Source: Household survey, 2022

4.2.1. Socio-economic characteristics

- **Education level of respondents**

The results of EICV6 state that educational attainment refers to the highest level of education that an individual has attained or completed. This is distinct from the level of schooling that an individual is attending. Most Rwandans have attended school, and many have attended primary school.

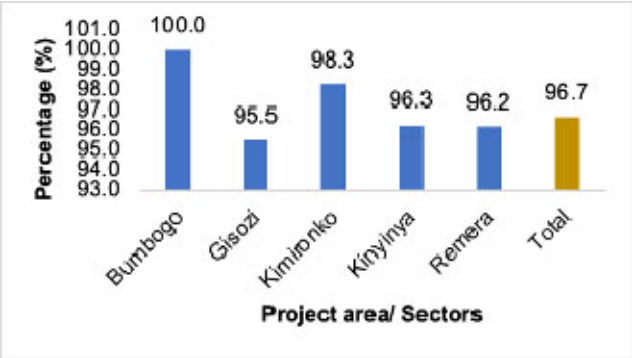


Figure 10: Literacy of respondent (%)

Source: Household survey 2022

As seen from Figure 10, from 300 household's sampled equivalent to 300 respondents, around 96.7% were literate against that 3.3% were not. From the above figure to each cell, the remaining percentage from 100% represent the number of illiterate respondents.

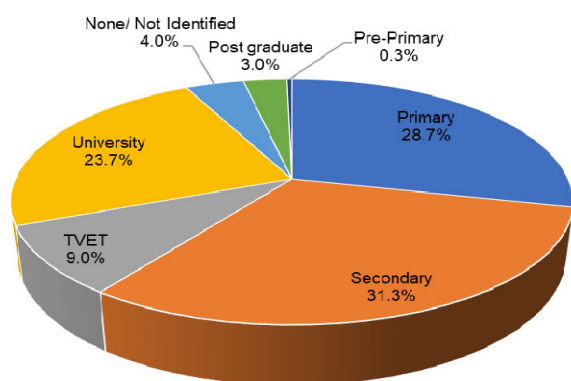


Figure 11: Education level of respondents (%)
Source: Household survey 2022

As seen from Figure 11, among 300 respondents 28.7% attended primary education, 31.3% attended secondary education, 9% attended TVET, 23.7% attended university, 7.1% did not attend any or not identified their education attainment level, 3% attended postgraduate, and 0.3% attended pre-primary education only.

- **Occupation of respondents**

Occupation in Rwanda has significant meaning as the main source of income or determinant of working status. In this section, the researcher has assessed the occupation status of respondents within the project area and the results are presented below.

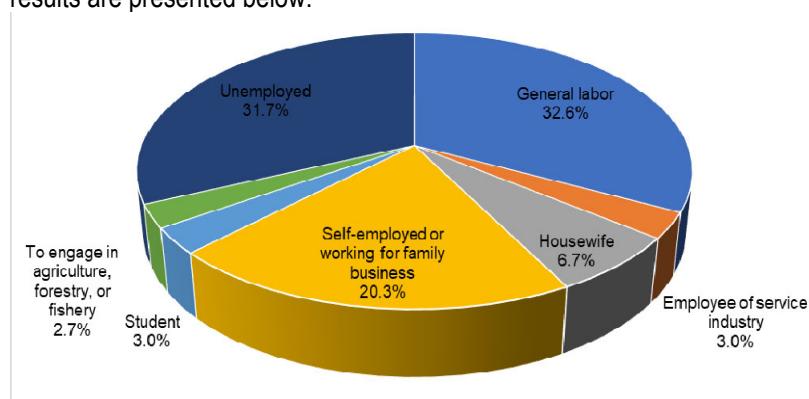


Figure 12: Percentage (%) of Respondents by occupation
Source: Household survey 2022

As seen from Figure 12, from 300 respondents assessed, 32% are general labor occupants, 31.7% are unemployed, 20.3% self-employed or working in family business, 6.7% are housewives, 3% are students, 3% are employees of service industry and 2.7% are engaged in agriculture forestry, or fishery.

- **Household monthly income**

Household income was estimated to all people in each household working for money (who have share in feeding the household members or in satisfaction their other needs primary or secondary).

Table 8: Percentage (%) of monthly income by households (FRW³)

Sector	Cell	10,000-50,000	50,000-100,000	100,000-200,000	200,000-500,000	500,000-300,000,000	12,000,000	N/A	Count/Sample	Average (Rwfs/Month)
Bumbogo	Ngara	31.3	25	0	18.8	0	0	25	16	141,250.00
Gisozi	Musezero	5.3	13.2	0	5.3	7.9	0	68.4	38	321,666.70
	Ruhango	0	0	3.4	3.4	0	0	93.1	29	350,000.00
Kimironko	Bibare	12.5	6.3	0	0	0	0	81.3	16	50,000.00
	Kibagabaga	0	4.3	4.3	8.7	8.7	0	73.9	23	358,333.30
	Nyagatovu	0	31.6	15.8	15.8	10.5	0	26.3	19	284,642.90
Kinyinya	Gacuriro	28.6	14.3	7.1	7.1	0	7.1	35.7	14	1,440,555.60
	Gasharu	30.8	46.2	15.4	0	0	0	7.7	13	84,166.70

³ 1US\$ =1030 FRW

Sector	Cell	10,000-50,000	50,000-100,000	100,000-200,000	200,000-500,000	500,000-3,000,000,000	12,000,000	N/A	Count/Sample	Average (Rwfs/Month)
	Kagugu	23.3	18.3	16.7	6.7	0	0	35	60	117,692.30
	Murama	15	15	25	5	10	0	30	20	392,500.00
Remera	Nyabisindu	4.5	4.5	13.6	27.3	27.3	0	22.7	22	716,117.60
	Nyarutarama	5.6	22.2	11.1	33.3	0	0	27.8	18	220,769.20
	Rukiri I	14.3	0	0	28.6	28.6	0	28.6	7	556,000.00
	Rukiri II	0	0	0	40	20	0	40	5	933,333.30
Grand Total		12.3	14.7	9.3	11	6	0.3	46.3	300	355,428.60

Source: Household survey 2022

As seen from Table 8, from 300 household sampled only a single (0.3%) household is earning 12 million Rwandan francs per month, 6% are earning monthly income ranged between 500,000 to 3,000,000 FRW per month, 11% earn monthly income ranged between 200,000 to 500,000 FRW, 9.3% earn monthly income between 100,000 to 200,000 FRW, 14.7% earn monthly income ranged between 50,000 to 100,000 FRW and 12.3% earn monthly income between 10,000 to 50,000 FRW. Note that, most of respondents (46.3%) did not feel free to announce their monthly income, they keep the number as secret.

- **Household expenditure**

This sub-section gives distribution of households by ranges of payment on different items which are necessary in living conditions. It gives also average per each category of payment. The main touched are costs of water from WASAC or any other water distributor, costs of electricity, energy for cooking, cost on telephone, and capacity of payment for each household once water is supplied regularly (full day and night).

Table 9: Households by average monthly paid bills for basic needs (FRW/Month)

Sector	Cell	Average of Water tariff paid to WASAC or another distributor	Average cost on Bottled/Jerrycan water including transportation fee	Average of cost on electricity	Average cost on Telephone/Cell phone/ Telephone	Average cost on energy for Cooking
Bumbogo	Ngara	18,285.00	3,662.50	10,562.50	6,756.30	14,968.80
Gisozi	Musezero	12,700.00	4,628.60	9,046.90	6,302.90	18,220.80
	Ruhango	10,808.40	4,644.40	5,657.70	7,064.00	14,875.00
Kironko	Bibare	14,164.70	7,050.00	17,625.00	5,346.20	21,875.00
	Kibagabaga	20,214.90	3,227.30	20,239.10	13,700.00	29,886.40
	Nyagatovu	17,409.50	1,106.70	14,921.10	17,105.30	19,794.70
Kinyinya	Gacuriro	20,433.40	777.7	11,818.20	13,030.00	16,846.20
	Gasharu	3,576.50	466.2	3,615.40	4,346.20	17,884.60
	Kagugu	6,103.90	1,918.50	5,613.80	3,101.80	14,626.70
	Murama	10,236.80	2,056.40	10,825.00	7,900.00	22,600.00
Remera	Nyabisindu	17,904.80	1,922.10	10,159.10	11,431.80	21,000.00
	Nyarutarama	6,307.80	4,805.00	11,111.10	7,622.20	23,934.70
	Rukiri I	21,542.90	12,740.00	14,428.60	13,285.70	24,900.00
	Rukiri II	13,000.00	24,000.00	14,000.00	8,400.00	18,500.00
Grand Total		12,568.00	3,437.70	10,315.40	7,948.60	19,091.60

Source: Household survey 2022

As seen from Table 9, among 300 assessed households, each pay an estimated average of 12,568 Frw per month on water bill to WASAC or any other water distributor. The lowest payment of this category was found in Gasharu cell of Kinyinya sector (3,576 Frw per month) and the highest average monthly payment of water bill was found in Rukiri I of Remera sector which is estimated to 21,543 Frw. By the average of bottled/ jerrycan water including transportation fees, each household was found paying around 3,438 Frw per month where the lowest average was found in Gasharu cell/ Kinyinya sector (466. FRW per month) and the highest bill was found in Rukiri II which is estimated to 24,000 Frw per month.

In terms of electricity fees, survey results indicates that in average a household pays 10,315.4 Frw per month. The lowest monthly average is 3,615 Frw per month obtained in Gasharu cell/ Kinyinya sector and the highest being 20,239.1 Frw per month in Kibagabaga cell/ Kironko sector.

Telephone monthly payment was also among consuming categories to households' members in the project area for communication and other online services accessibility. Each household was attributed to an average telephone bill payment of 7,948 Frw per month. The lowest monthly telephone bill is 3,101.8 Frw found in Kagugu cell/Kinyinya sector and the highest being 17,105 Frw in Nyagatovu cell/ Kironko sector. For cooking energy households, in

average, pays 19,091.6 Frw per month. The lowest monthly bill for energy for cooking is 14,626 Frw reported in Kagugu cell/ Kinyinya sector and the highest is 24,900 Frw obtained Rukiri I cell/ Remera sector.

- Housing and house ownership**

This section presents the type of building tenure status of the housing unit from 300 sampled households in the project area. This is referred to the current building types available in Rwanda and tenure status available in Rwanda from all areas (mainly Kigali City).

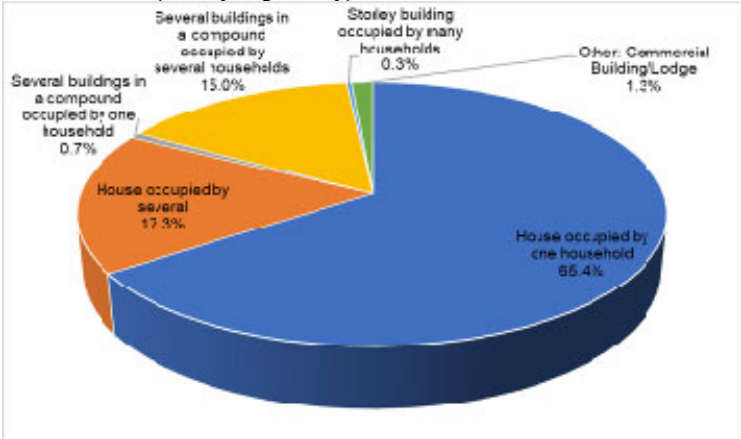


Figure 13:Percentage (%) of Households by type of building

Source: Household survey 2022

As seen from Figure 13, among 300 households sampled, 65.3% are living in a house occupied by one household, 17.3% in house occupied by several households, 15% in several buildings in a compound occupied by several households, 1.3% households are living in other type of building such as commercial building/lodge, 0.7% were in several buildings in a compound occupied by one household and 0.3% households are living in story building occupied by many households. In terms of ownership, among 300 sampled households 54.7% are owner of the house (even when he/she is still paying the bank loan), 44.3% are tenant and 1% is free lodging.

- Source of energy**

The main sources of energy described are both electricity (grid electricity and off-grid solutions), and energy for cooking.

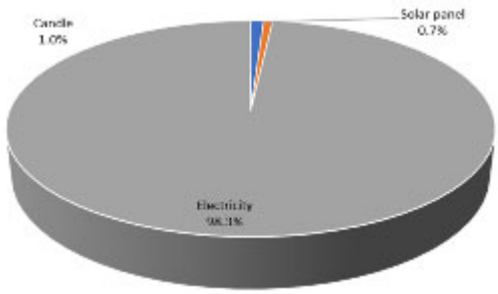


Figure 14:Households (%) by main source of energy for lighting

Source: Household survey 2022

As seen from Figure 14, from 300 sampled households most of them (98.3%) are using grid electricity as main source of energy for lighting, 1% are using candle while 0.7% are using solar panel as main source of energy for lighting. For Cooking, most of households (61%) are using charcoal as main source of energy for cooking, 35.3% are using cooking gas (LPG), 2.7% use firewood, and 1% are using electricity.

- Equipment and amenities owned by households in study area**

In this section, the results on the household’s equipment were presented. This refers to the average amount of equipment per household in the project area by cells and sectors of location.

Table 10: Distribution of assets in households (average per household per each asset)

Sector	Cell	Car	Motorbike	TV	Video deck	Landline Telephone	Cellular phone	Smart phone	Personal computer	Air conditioner	Refrigerator	Washing machine	Microwaves/Electric Cooker	Iron	Blender	Mixer	Kettle
Bumbogo	Ngara	0.2	0.1	0.8	0.1	0.0	1.9	1.3	0.3	0.0	0.3	0.1	1.0	1.0	1.0	1.0	1.0
Gisozi	Musezero	0.5	0.1	0.8	0.1	0.2	1.9	1.8	0.6	0.1	0.3	0.0	1.0	1.1	1.0	0.0	1.0

Sector	Cell	Car	Motorbike	TV	Video deck	Landline Telephone	Cellular phone	Smart phone	Personal computer	Air conditioner	Refrigerator	Washing machine	Microwave	Electric Cooker	Iron	Blender	Mixer	Kettle
Kironko	Ruhango	0.3	0.1	0.7	0.0	0.1	1.2	2.0	0.4	0.1	0.3	0.0	0.0	1.0	0.0	1.0	0.0	0.0
	Bibare	0.7	0.0	0.9	0.0	0.0	1.3	2.4	0.5	0.2	0.8	0.8	0.0	1.0	0.0	1.0	0.0	0.0
	Kibagabaga	1.0	0.0	1.1	1.0	0.1	2.9	4.1	2.0	0.1	1.0	0.2	1.1	1.0	1.0	0.0	1.5	0.0
	Nyagatovu	0.4	0.1	0.9	0.9	0.1	3.5	2.7	1.2	0.0	0.5	0.1	1.0	1.0	0.0	0.0	1.0	0.0
Kinyinya	Gacuriro	0.4	0.1	0.6	1.2	1.0	2.1	2.1	1.1	0.1	1.1	1.0	1.0	1.0	0.0	0.0	0.0	0.0
	Gasharu	0.5	0.1	0.5	0.6	0.0	2.1	0.9	0.2	0.0	0.1	0.0	1.0	1.0	0.0	0.0	0.0	0.0
	Kagugu	0.1	0.1	0.7	0.4	0.1	1.7	1.2	0.2	0.0	0.1	0.0	1.2	1.0	0.0	0.0	1.0	0.0
	Murama	0.3	0.1	1.0	0.2	0.1	1.8	2.9	0.9	0.0	0.6	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Remera	Nyabisindu	0.9	0.0	0.9	0.0	0.1	1.3	2.5	1.0	0.1	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Nyarutarama	0.2	0.2	0.7	0.1	0.0	1.7	1.9	0.8	0.1	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Rukiri I	0.3	0.0	0.7	0.0	0.0	0.9	2.7	0.7	0.0	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Rukiri II	0.2	0.0	0.8	0.2	0.0	1.4	1.8	0.4	0.0	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Grand Total		0.4	0.1	0.8	0.3	0.1	1.9	2.1	0.7	0.1	0.5	0.2	1.1	1.0	1.0	1.0	1.0	1.1

Source: Household survey 2022

As seen from Table 10, among 300 sampled households some of them have one or more equipment. From a list of equipment listed, at least each has a specific household which hold it. And the study results show that, there is no household lacking any among the above list of equipment in the Table 10 The most frequent equipment found is smart phone, whereby the average of each household among 300 sampled has 2.1 smart phones. This may be the results of government program of distributing smartphone to poor family but to the development of ICT in the country where most of the services are offered electronically.

- **Socio-economic infrastructures in project area**

Different socio-economic infrastructures such as schools, health centers and churches will benefit from the project by getting sufficient and reliable water. Further, the project was designed in a way that is not affecting existing infrastructures such as electrical lines, poles and roads. The next map presents key socio-economic infrastructure.

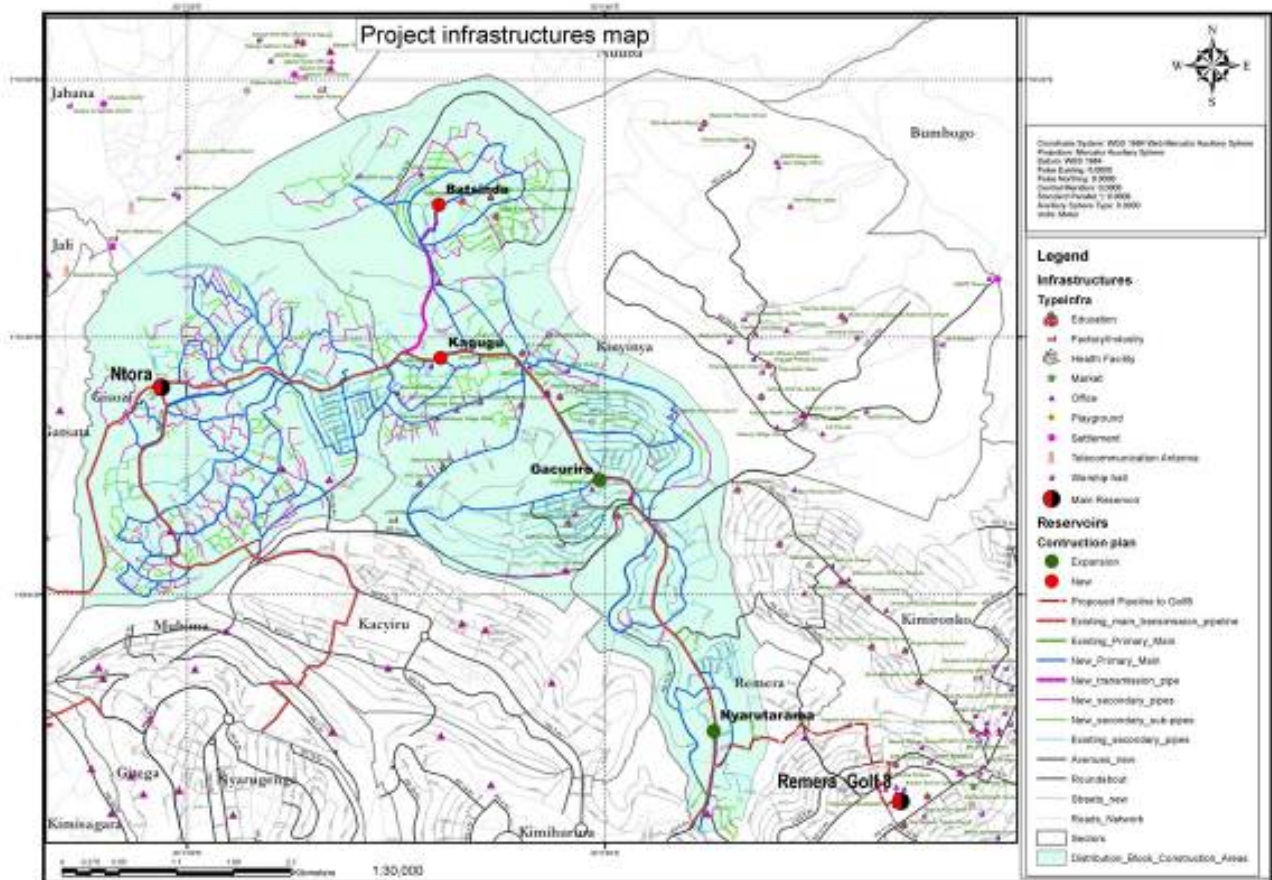


Figure 15: Socio-economic infrastructure and facilities in the project area

Source: Filed survey, 2022

4.2.2. Water supply

In this section, the study findings present the amount paid on water used (drinking and domestic), water fluctuation for these with water at home, and type of water usage (cooking, shower, laundry, car wash and gardening).

- **Water availability**

Though the country made important steps in ensuring that people have clean water, the project area is still facing water fluctuation and as presented in the next table.

Table 11: Status of average number of days for water availability in the entire week.

Sector	Cell	Average days that water was available for entire / Week (Days)	Average days of non-availability of water through the Week (Days)	Average days water partially available for entire week / Week (Days)
Bumbogo	Ngara	5.2	0.0	1.8
Gisozi	Musezero	5.0	0.7	1.4
	Ruhango	4.6	0.7	1.7
Kimironko	Bibare	4.5	1.0	1.9
	Kibagabaga	4.2	1.6	1.2
	Nyagatovu	5.1	0.9	1.1
Kinyinya	Gacuriro	4.4	1.3	1.3
	Gasharu	4.5	1.7	0.8
	Kagugu	4.6	1.0	1.5
	Murama	5.1	0.9	1.1
Remera	Nyabisindu	4.7	1.3	1.2
	Nyarutarama	5.8	0.5	1.1
	Rukiri I	5.4	1.0	1.3
	Rukiri II	5.2	0.8	1.0
Grand Total		4.8	0.9	1.4

Source: Household survey 2022

As seen from Table 11 among 300 sampled households in the project area, during the 7 days of the week; in the average 4.8 days water was available for the entire day and night, 0.9-days water was not available for the entire day and night and 1.4 days water was partially available for entire day and night.

- **Distance or time between or spend respectively between household and water source**

In this section, the study results presented are related to the distance between household and drinking water sources in both seasons (dry and rainy) and distance between household and domestic water source in dry and rainy season. This section also presents the waiting time in the queue as well as time it takes for going and come back from the main domestic water source.

Table 12: Distance (%) between household and drinking water source by season

Sector	Cell	1-30		31-60		61-120		121-500		501-1,000		1,001-4,000		N/A		Average (Meters)		Count/ Sample
		D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	
Bumbogo	Ngara	12.5	25.0	12.5	6.3	6.3	6.3	12.5	6.3	0.0	12.5	18.8	6.3	37.5	37.5	293.8	379.25	16
Gisozi	Musezero	2.6	5.3	5.3	7.9	15.8	15.8	18.4	18.4	2.6	0.0	5.3	2.6	50.0	50.0	128.2	109.87	38
	Ruhango	17.2	6.9	13.8	13.8	13.8	10.3	13.8	24.1	0.0	6.9	6.9	0.0	34.5	37.9	121.7	150.45	29
Kimironko	Bibare	6.3	12.5	31.3	25.0	12.5	18.8	12.5	25.0	12.5	0.0	0.0	0.0	25.0	18.8	122.8	126.25	16
	Kibagabaga	8.7	4.3	8.7	13.0	34.8	34.8	30.4	30.4	0.0	0.0	0.0	0.0	17.4	17.4	106.5	109.43	23
	Nyagatovu	10.5	0.0	21.1	10.5	10.5	5.3	15.8	36.8	5.3	5.3	0.0	0.0	36.8	42.1	92.9	121.05	19
Kinyinya	Gacuriro	0.0	0.0	0.0	7.1	7.1	14.3	28.6	35.7	21.4	0.0	0.0	0.0	42.9	42.9	167.9	107.14	14
	Gasharu	0.0	7.7	15.4	7.7	15.4	15.4	23.1	30.8	7.7	0.0	0.0	0.0	38.5	38.5	104.6	100.92	13
	Kagugu	5.0	5.0	5.0	5.0	18.3	16.7	16.7	23.3	8.3	1.7	1.7	0.0	45.0	48.3	115.7	104.22	60
	Murama	10.0	10.0	5.0	10.0	5.0	5.0	30.0	25.0	5.0	0.0	0.0	0.0	45.0	50.0	96.5	76.50	20
Remera	Nyabisindu	0.0	0.0	0.0	0.0	18.2	18.2	31.8	31.8	0.0	4.5	4.5	0.0	45.5	45.5	136.4	136.36	22
	Nyarutarama	5.6	11.1	5.6	5.6	27.8	16.7	27.8	33.3	22.2	22.2	0.0	0.0	11.1	11.1	281.7	299.72	18
	Rukiri I	0.0	0.0	28.6	28.6	28.6	28.6	14.3	14.3	0.0	0.0	0.0	0.0	28.6	28.6	84.3	84.29	7
	Rukiri II	0.0	0.0	0.0	0.0	20.0	20.0	60.0	60.0	0.0	0.0	0.0	0.0	20.0	20.0	140.0	140.00	5
Grand Total		6.3	6.3	9.3	9.0	16.7	15.7	21.3	26.0	6.0	3.7	3.0	0.7	37.3	38.7	137.4	139.08	300

Source: Household survey 2022

As seen from Table 12 among 300 sampled households in the project area, there is no large change in distance between the dwelling and the drinking water source from dry season to rainy season. 21.3% of households in dry season and 26% in rainy season are in distance between 121 meters to 500 meters in between dwelling to drinking water source, 16.7% in dry season and 15.7% in rainy season are in distance between 61 meters to 120 meters, 9.3% in dry season and 9% in rainy season are in between distance of 31 meters to 60 meters, 6.3% in dry season which not change in rainy season live at distance between 1-30 meters, 6% in dry season and 3.7% in rainy season are distance between 501-1,000 meters from dwelling to drinking water source and 3% in dry season and 0.7% in rainy season situated in distance between 1,001-4,000 meters from dwelling to drinking water source.

By average there is around 137.4 meters between each household / dwelling in the project area to the main source of drinking water in dry season and 139.08 meters in rainy season. The minimum average distance in dry season is 84.3 meters and the maximum average is 293.8 meters while in the rainy season the minimum obtained was 76.5 meters and 379.25 meters as the highest average distance between dwelling and drinking water source.

- **Quantity of water used in households by seasons**

In this section, the study results were presented as number of 20 liters jerrican used in households for drinking and domestic use in either dry or rainy season. Data are presented as percentage of households in each range of water (range of number of 20 liter's jerrican) and average number of 20 liters jerrican.

Table 13: Distribution (%) of quantity of 20-liter of jerrican use for drinking water per week by season

Sector	Cell	0.1-1		1.1-2		2.1-6		N/A		Average (Number of Jerrican)		Count/ Sample
		D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	D.S	R. S	
Bumbogo	Ngara	43.8	43.8	18.8	18.8	0.0	0.0	37.5	37.5	1.30	0.73	16
Gisozi	Musezero	44.7	36.8	5.3	5.3	0.0	7.9	50.0	50.0	1.07	0.72	38
	Ruhango	51.7	44.8	6.9	10.3	6.9	6.9	34.5	37.9	1.25	0.84	29
Kimironko	Bibare	56.3	62.5	12.5	18.8	6.3	0.0	25.0	18.8	1.33	1.00	16
	Kibagabaga	60.9	56.5	17.4	21.7	4.3	4.3	17.4	17.4	1.22	1.08	23
	Nyagatovu	36.8	36.8	26.3	21.1	0.0	0.0	36.8	42.1	1.27	0.70	19
Kinyinya	Gacuriro	28.6	28.6	28.6	28.6	0.0	0.0	42.9	42.9	1.50	0.84	14
	Gasharu	38.5	53.8	15.4	0.0	7.7	7.7	38.5	38.5	1.50	0.77	13
	Kagugu	33.3	38.3	16.7	8.3	5.0	5.0	45.0	48.3	1.45	0.69	60
	Murama	45.0	40.0	5.0	10.0	5.0	0.0	45.0	50.0	0.97	0.41	20
Remera	Nyabisindu	40.9	36.4	9.1	18.2	4.5	0.0	45.5	45.5	1.27	0.66	22
	Nyarutarama	50.0	50.0	27.8	27.8	11.1	11.1	11.1	11.1	1.56	1.39	18
	Rukiri I	28.6	28.6	28.6	42.9	14.3	0.0	28.6	28.6	1.80	1.07	7
	Rukiri II	40.0	40.0	20.0	20.0	20.0	20.0	20.0	20.0	1.75	1.40	5
Grand Total		43.0	42.3	15.0	14.7	4.6	4.3	37.3	38.7	1.33	0.81	300

Source: Household survey 2022

As seen from Table 13, from 300 sampled households in the project area 43% in dry season are using 0.1-1 20 liters jerrican of drinking water per week and 42.3% in rainy season, 15% in dry season and 14.7% in rainy season use between 1.1-2 20 liters jerrican, 4.6% in dry season and 4.3% in rainy season use 2.1-6 20 liters jerrican of drinking water while 37.3% in dry season. By Average each household was found using 1.33 average number of 20 liters jerrican of drinking water and 0.81 average number of 20 liters of jerrican in rainy season (in rainy season, they use less quantity of drinking water rather than in dry season).

4.2.3. Gender issues

- ✓ **Daily household activities**

For each household member mainly at working age, each has capacity for allocating time per activities. The assessed activities are housework, work (to earn money), childcare, community activity and other activities such as studying and rest. Here below are details in percentage (%).

Table 14: Daily time spending on specific activities (average % of day partition)

Sector	Cell	Housework (%)	Work (to earn money) (%)	Childcare (%)	Community activity (%)	Others: Study, Rest
Bumbogo	Ngara	36.56	38.63	22.38	2.44	0.13
Gisozi	Musezero	33.08	30.13	31.84	5.00	0.00
	Ruhango	40.69	30.03	16.24	7.24	2.24

Sector	Cell	Housework (%)	Work (to earn money) (%)	Childcare (%)	Community activity (%)	Others: Study, Rest
Kimironko	Bibare	39.06	39.69	16.56	4.69	6.25
	Kibagabaga	32.48	42.87	11.00	5.83	3.48
	Nyagatovu	29.63	43.63	23.95	2.79	0.11
Kinyinya	Gacuriro	33.50	48.93	9.00	0.71	1.07
	Gasharu	33.46	33.46	30.77	2.31	0.00
	Kagugu	46.83	24.75	25.05	3.28	0.08
	Murama	40.00	24.20	24.25	5.15	4.25
Remera	Nyabisindu	33.73	45.23	17.86	5.23	0.00
	Nyarutarama	40.67	29.44	17.22	8.22	4.44
	Rukiri I	18.29	61.43	17.14	2.71	0.43
	Rukiri II	38.00	48.00	7.00	7.00	0.00
Grand Total		37.54	34.56	21.28	4.53	1.46

In general, among 300 sampled respondents equivalent to 300 households visited in the project area, the most work consuming time is the housework which occupy around 37.54% of total time allocated to the activities with interests to the households, and this is followed by work to earn money which occupy 37.54%, childcare 21.28%, community activities occupy 4.53% and other activities like studies and rest or other not listed occupy 1.46%.

- **Women involvement in household**

In this section, the survey results present the status at which women participate in productive or income generating activities, and the kind of activities, women occupation which take long time and women burned works among household's works.

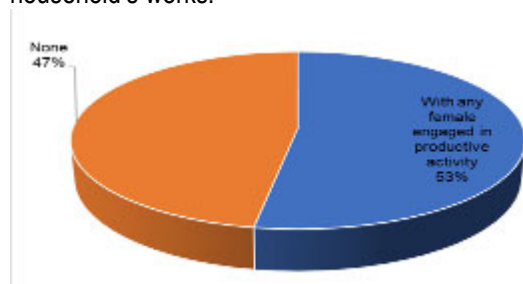


Figure 16: Distribution of households (%) with female engaged in productive activity

Source: Household survey 2022

As seen from Figure 16, among 300 households assessed in the project area 53% are with women engaged in productive activities and 47% are not.

4.3. Physical environment baseline data

The physical environment assessed in the present environment and social impact assessment study include geological formation and soil, hydrology and water resources, climate and weather conditions and land use set up in project area.

4.3.1. Topography of the project area

The project area of intervention is extended on three different sectors of Gasabo district namely Gisozi, Kinyinya and Remera cells. The project starts from Ntora water reservoir located in Gisozi Sector and goes to Nyarutarama Water reservoir. It passes through Kagugu, Batsinda and Gacuriro areas. There is also a section for the project that will be connected from Golf 8 reservoir to Nyarutarama via Nyabisindu area. The topography of the site is characterized by the lowest elevation point to be located at 1,377 m above sea level, and the highest point is located at 1,625 m above sea level at Ntora water reservoir. The area encounters general characteristics of Gasabo district where from west to east, the district is characterized by a succession of mountains and hills, usually with marshlands between them. The altitude varies from 1300 m to 1900 m above sea level.

4.3.2. Climate

With reference to records of mean monthly temperatures and rainfall of the Kigali meteorological station, the project of improvement of water supply services in North Central Kigali will be implemented in the zone which is characterized by a humid tropical climate. The area has two major climatic seasons in a year, the dry and rain seasons. The two major climatic seasons alternate within the year. However, the duration for these seasons is irregular and one cannot precisely fix the temporal limits of each season. The rainy season may extend for some weeks into the dry season and vice versa. These variations may be associated to the challenge of global climate change. The two seasons are marked by an alternate succession of rains and drought.

According to three levels of drought (atmospheric dryness, pedological dryness and geological/hydrological dryness) as developed by Roger Lambert, the area experiences four months of long dry season (mid-May to mid-September) followed by a short rainy season (Mid-September, October, November and mid-December), another short dry season (mid-December, January and mid- February) and finally a long rainy season (Mid-February, March, April and mid-May). In general, the mean temperature varies between 21.5°C and 24°C, while the precipitations range from 65 mm to 200 mm.

4.3.3. Land use

The project will be implemented in urban area of Kigali city, Gasabo district. The most dominant land use of the project is residential and the mixture of residential and commercial. Other land uses of the project area are arable land, bush land, and recreational area/ pitch. There are no industrial zones that have been identified to be affected by the project. Plots where reservoir are to be constructed in Batsinda are dominated by banana plantation mixed with other crops but is zoned for residential area by the Kigali city land use master plan. Other plots are free and owned by government and used to accommodate water reservoirs.

4.3.4. Geology and Soil

Gasabo District like elsewhere in Kigali City presents a soil relatively young. The area consists of sandy loams characterized by small particles and gravel. The base rock in the region is mainly granite series which form a small island and consist of patches of quartzite. According to the soil classification taxonomy on the soil map of Rwanda, three dominant units of soils characterize the landscape of Gasabo District following their pedogenesis. In general, the District of Gasabo has good soils which are well drained and deep enough to support various crops suitable for the zone, except for top of hills, especially Jali and some in Bumbogo Sectors where 70% of soils have rocks and saprolites limitation at 50 cm, making them inappropriate for agriculture.

4.3.5. Air pollution level in project area

The project is in the neighborhoods of urban areas where the ambient air is slightly polluted by man-made related activities including transportation and combustion of fuels. The ambient air quality is also expected to be affected during the construction and decommissioning phases of the project due to particulate matters that shall be released in the atmosphere from project activities such as excavation and earth movement. The poor management of solid waste through burning could also contribute to negative impact on air quality. More specifically the pollutants of air include suspended matter, sulfur dioxide, nitrogen dioxide, hydrocarbons, and ozone due to population growth, urbanization, industrialization, and increased use of motor vehicles. Rwanda has one of the lowest emissions per capita in the world, estimated at 0.65 tones CO₂/person (including land use change), compared to a global average of 4.63 tones CO₂/person. According to the second National Communication (SNC) to the UNFCCC, the majority of GHG emissions were CO₂ (87%) at 531 Gg, dominated by transport (52%) and industrial processes (28.5%). Therefore, even though there are no air pollution measurements conducted in the project area, this shows that the project area presents less quantities of air polluting matters that are generated from transportation and human activities being carried out in the project area.

4.3.6. Noise and vibration level in the project area

Noise and vibrations are expected to be generated during constructions from operation of excavation machines and trucks transporting material, soil stripping, trenching, pipe stringing, welding and laying and backfilling activities. Noise and vibration impacts are of temporary by nature. Baseline noise levels of the proposed project area were measured during field survey at three different areas namely Kagugu, Batsinda and Gacuriro. This was done using Digital noise level meter MS6708 which has an active range of 30-130 decibels (dB). In Rwanda Noise pollution is determined when sound goes beyond 80 decibels, but Rwanda has adopted the East Africa Community (EAC) standards that sets the maximum permissible noise levels for residential areas at 60 dB (A).

Table 15: Noise exposure limits for EAC countries

No	Area	Time during day (hours)	Limits dB(a)
1.	Industrial Noise	07:00-21:00	60.0
		21:00-07:00	55.0
2.	Neighborhood Noise	07:00-18:00	60.0
		18:00-21:00	55.0
		21:00-07:00	50.0

Source: EAC, 2016

Some of the proposed project components will be implemented in the areas with some settlements and some of them fall within a commercial area and or in multipurpose uses. The baseline noise levels within the proposed project area were therefore assessed based on the maximum permissible noise levels for residential areas which are set at 60 dB (A). Noise levels were recorded on 2nd and 6th April 2022 between 8h00am and 5h00 PM at four different points where reservoir tanks will be constructed. Full noise level was recorded and the maximum, minimum and the average e measurements found are presented in the following table.

Table 16: Average noise levels determined in the project area

Full name of the feature/area	Maximum dB(A)	Minimum dB(A)	Average dB(A)
Batsinda water reservoir site	63,4	38,6	51
Kagugu water reservoir site	72,3	42,1	57,2
Gacuriro water tank site	74,3	53,6	63,9
Nyarutarama elevated tank site	70,8	41,9	56,3

Source: On field measurement, 2022

Based on the results presented in Table 16, the maximum noise levels recorded in the project area is slightly above the permissible limits for residential and industrial areas as provided by EAC. Since the main sources of noise during this project implementation are vehicles, trucks and machines, the noise level is expected to increase during construction phase. These shall occur during the excavations and with vehicles and truck transporting people, material, and other equipment to and from the project sites. The contractor will ensure that it remains in permissible limits. However, construction activities should not continue during night to avoid project impacts.

4.3.7. Hydrology

There is no water body in direct project area except at Nyarutarama Golf 8 reservoir section where a small river is found in Nyabisindu area. In general, the hydrology of Gasabo district is made up of streams and rivers that are part of the Akagera river basin. There are many watercourses in Gasabo district of low importance, but the main ones are Lake Muhazi, Akagera River and Nyabugogo River. The hydrographic network of the district is composed of only one basin, the Nyabugogo River which after having recovered water of its affluent flows into Nyabarongo, which further and out of the Gasabo District meets the Akanyaru River and flows into Akagera. Effluents of Nyabarongo River are primarily fed during rainy seasons and each year the maximum risings occur in April.

4.4. Biological environment baseline data

The ecological survey at the project area consisted of desktop and field survey. A literature review was undertaken to assess the list of animal species that are found in the project area. This was outsourced from existing documents, and previous studies conducted in the project vicinities. The animal species provided herewith consists of a list of species that occur or could occur in the study area based upon their habitat affinities and ranges.

4.4.1. Fauna

Birds are the most fauna species that may be found in the project area except that their occurrence is low considering that the project areas are in urban developing areas. There are no fish species recorded or reported to be found within the project sites. Only some species of reptiles can be rarely found at Nyabisindu swamp according to the information recorded from residents. The list of animal species recorded within the project area is provided in the table below.

Table 17: Bird species recorded in the study area and their IUCN conservation status

No	Order	Family	Common Name	Vernacular Name	Scientific Name
1	Coliiformes	Coliidae	Spickled Mousebird	Umusure	<i>Colius striatus</i>
2	Passeriformes	Motacillidae	African-Pied Wagtail	Inyamanza	<i>Motacilla aguimp</i>
3	Passeriformes	Ploceidae	Fan-tailed widowbird		<i>Euplectes axillaris</i>
4	Passeriformes	Ploceidae	Slender-Billed Weaver	Isandi	<i>Ploceus pelzelni</i>
5	Pelecaniformes	Ardeidae	Cattle Egret	Inyange	<i>Bubulcus ibis</i>

No	Order	Family	Common Name	Vernacular Name	Scientific Name
6	Pelecaniformes	Threskiornithidae	Hadada Ibis	Nyirabarazana	<i>Bostrychia Hagedash</i>
7			snake	incarwatsi	<i>Philothamnus heterolepidotus</i>
8	Charadriiformes	Charadriidae	Grey-Headed Heron	Uruyongoyongo	<i>Ardea cinerea</i>

4.4.2. Flora

The project of improvement of water supply services in North Central Kigali will be implemented in zones of urban area where there is no remaining natural vegetation.

Along the roads where pipelines will be laid only ornamental trees can be found. Some seasonal and perennial crops such maize, potatoes, bananas, beans, cassava, and others were also identified at Batsinda site while other sites are dominated by paspalum plantations.

Table 18: Plant species identified in project area and its vicinities

No	Order	Family	Scientific Name	Vernacular Name
1	Lamiales	Bignoniaceae	<i>Markhamia lutea</i>	Umusave
2	Proteales	Proteaceae	<i>Grevillea robusta</i>	Gereveriya
3	Laurales	Lauraceae	<i>Persea gratissima</i>	Avoka
4	Lamiales	Verbenaceae	<i>Lantana camara</i>	Umuhengeri
5	Fabales	Fabaceae	<i>Acacia sieberana</i>	Umunyinya
6	Poales	Poaceae	<i>Pennisetum purpureum</i>	Urubingo
7	Alismatales	Araceae	<i>Colocasia esculenta</i>	Amateke
8	Zingiberales	Musaceae	<i>Musa spp.</i>	Insina
9	Myrtales	Myrtaceae	<i>Eucalyptus sp.</i>	Inturusu
10	Sapindales	Anacardiaceae	<i>Mangifera indica</i>	Umwembe
12	Arecales	Arecaeae	<i>Phoenix reclinata</i>	Umukindo
13	Fabales	Fabaceae	<i>Acacia senegalensis</i>	Umukonji
14	Malpighiales	Euphorbiaceae	<i>Manihot esculenta</i>	Imyumbati
15	Caryophyllales	Amaranthaceae	<i>Achyranthes aspera</i>	Umuhurura
16	Asparagales	Asparagaceae	<i>Agave sisalana</i>	umugwegwe
17	Lamiales	Lamialeae	<i>Clerodendrum rotundifolium</i>	Ikiziranyenzi
18	Asterales	Asteraceae	<i>Vernonia amygdalina</i>	Umubirizi
19	Fabales	Fabaceae	<i>Phaseolus vulgaris</i>	Igishyimbo
20	Fabales	Fabaceae	<i>Acacia Sieberiana</i>	Umunyinya
21	Malpighiales	Poaceae	<i>Zea mays</i>	Ikigoli
22	Solanales	Solanaceae	<i>Solanum lycopersicum</i>	Inyanya
23	Lamiales	Verbenaceae	<i>Lantana camara</i>	Umuhengeri
24	Proteales	Proteaceae	<i>Grevillea robusta</i>	Gereveriya
15	Malpighiales	Euphorbiaceae	<i>Euphorbia tirucalli</i>	Umuyenzi

The following Plate illustrates the vegetation in targeted plots for reservoirs construction





Figure 17: Flora species nearby the river passing Nyarutarama to Golf 8 Reservoir section



Source: Field survey, BESST Ltd, 2022

5. PUBLIC CONSULTATION AND PARTICIPATION

5.1. General overview

To build a strong, constructive, and responsive relationships and for the successful management of project's environmental and social impacts, public consultation and stakeholders' engagement are mandatory for such kind of project. Stakeholders' engagement is an on-going process that involves different elements that include stakeholders' analysis and planning, consultation and participation, disclosure and dissemination of information, grievance mechanism and on-going reporting to affected communities.

5.2. Purpose of public involvement

The purpose of stakeholder consultation and public involvement are mainly:

- To ensure effective engagement with local communities and key stakeholders throughout all project phases
- To build a trusting relationship with the affected communities and other interested stakeholders based on a transparent and timely supply of information and open dialogue.
- To collect relevant and trustable information that shall be based on to formulate project impacts as well their mitigation measures.
- To prepare communities on potential emergency scenarios that could be caused by the project and can affect the community.
- To actively build and maintain productive working relationships based on principles of transparency, accountability, accuracy, trust, respect and mutual interests with affected communities and other stakeholders.

5.3. Consultation at central and district level

Consultation at central and district level consisted at explaining the proposed project, project environmental concern, legal and regulatory requirements as well as roles and responsibilities of different stakeholders for the EMP monitoring. The consultation at central and district level took place during the period of 6th and 18th January 2022 and consulted institutions at central level are:

- Rwanda Land Management and Use Authority (RLMUA)
- Rwanda Water Board (RWB);
- Rwanda Environment Management Authority (REMA)
- Rwanda Development Board (RDB)
- Water and Sanitation Authority (WASAC Ltd)
- Gasabo District

Key outcomes of the consultations at central and local level are summarized in the table below:

Table 19: Outcome consultation at central and local level

Stakeholder	Summary of discussion	Key outcomes
RLMUA	<ul style="list-style-type: none"> - Land rights and land use for the buffer zone of the roads - Land transfer and registration after project implementation especially for Batsinda water tank area - Zoning Plan of the project areas 	<ul style="list-style-type: none"> - Land located within the buffer zone of the road is under public land. Therefore, the project will be implemented in consideration with the existing laws related to land use and rights. - It is mandatory that after compensation the expropriated land be registered under government properties via WASAC. All procedures required must be fulfilled to get the land register. RLMUA will facilitate in this regard by its staff located at Gasabo District. - This project is not compromising the land use plan of the City of Kigali
RWB	<ul style="list-style-type: none"> - Impact of project implementation on water resources. - Project activities and project impacts at project location. - Water allocations 	<ul style="list-style-type: none"> - This is an extension and rehabilitation of an existing water supply system. No major impacts will be noted at the water abstraction source (Nzove WTP). There will be no additional daily water abstraction within Nyabarongo than the allowed at the water Plant. - Some impacts will be in the project areas. Mitigation measures have to be implemented as requisite to avoid those that will be noted at the project site. - Regular monitoring has to be implemented by all parties involved and regular reporting to competent institution is recommended. - No water abstraction permitting is required for the project. - Regular monitoring of water quality is mandatory.
REMA	<ul style="list-style-type: none"> - Project activities and environmental pollution. - Potential source of pollution within project area 	<ul style="list-style-type: none"> - Main potential source of water pollution would be associated to human activities within the project area. - Efforts should be made to minimize project's environmental impacts by application of appropriate mitigation measures to each identified and

Stakeholder	Summary of discussion	Key outcomes
	<ul style="list-style-type: none"> - Impacts of the project implementation on the surrounding environment. - REMA's responsibilities in the project life span 	<ul style="list-style-type: none"> predicted impact. - REMA will play key role in the EMP during all phases of the project. - Impacts compensation measures of the identified impacts would be clearly developed and implemented. However, efforts have to be made to refuse and avoid those identified impacts. - Various impacts connected to this project implementation were discussed and are incorporated in this report. - Monitoring is recommended to be undertaken on regular basis to avoid potential environmental pollution.
RDB	<ul style="list-style-type: none"> - ESIA process and requirement. - Project impacts and mitigation measures - ESIA report review and analysis - ESIA approval and Certification 	<ul style="list-style-type: none"> - All processes and steps have to be meet as required. - Project impacts were discussed and are incorporated in this report. - Regular monitoring of the proposed mitigation measure is mandatory during the project life span.
WASAC Ltd	<ul style="list-style-type: none"> - Need for and importance of the project implementation - Project requirements. - Water issues in the project areas - Labor and work force. - Safety and health management during project implementation - Land requirements and land issues - Compensation and expropriation issues - Project's waste generation and management plan 	<ul style="list-style-type: none"> - This project implementation is a necessity to meet the fixed target and existing policies and programs objectives to supply 100% of clan water to all Rwandans by 2024. - The project is within the mandate of WASAC Ltd. - The land for the project will be acquired via the existing laws related to the expropriation/ compensation in public interests. Fair compensation will be made when necessary - The work force is available in the project area and willing to support. New jobs will be created, and manpower is available in the project area. - The project will be implemented in compliance with the existing laws and regulations related to environmental, health and social protection. - No chemicals are expected to be used by the present project. Therefore, no impacts associated to the use of chemical are expected. - Waste management plan will be developed and be followed with maximum effort by the contractor. . .
REG/ EUCL	<ul style="list-style-type: none"> - Utilities property under the project working areas (pipeline routes) 	<ul style="list-style-type: none"> - Prior to any activities that shall affect the electrical utilities, information shall be given to the nearby EUCL branch for them to be prepared accordingly. - Maximum efforts shall be made to avoid such impacts. - Project designs shall take into consideration the existing electrical utilities within the project areas.
MoE	<ul style="list-style-type: none"> - Environmental concerns related to the project implementation - Laws and regulation related to environmental protection 	<ul style="list-style-type: none"> - The project will be implemented in line with the existing environmental protection laws and regulations. - Regular monitoring of the project implementation is required. - Mitigation measure to the identified impacts must be implemented as well as the regular reporting is required. - Project impacts were discussed and are incorporated in this report.
District, Sector and Cell officials	<ul style="list-style-type: none"> - Impact of project implementation in the project area - Water availability and water issues - Project's impacts in the project area. - Land ownership and land issues. - Land required for the project. - Challenges and impacts associated to the project implementation - Labor and work force - Compensation of affected properties 	<ul style="list-style-type: none"> - The project is of high importance since it will contribute to the development, sanitation increases, availability, and reliable clean water in the project areas, etc. - Project implementation would be beneficial to the local population and where possible RURA should intervene in terms of water tariff fixing. - It is recommended that water tariffs be revised since water will be available in the area. - All households in the project areas should be connected and for the residents to benefit from the project implementation. - Other affected properties that land shall be also fairly compensated as required. - Different project positive and negative impacts were discussed and incorporated in this report. - Mitigation measures for the identified impacts were also discussed.

The list of stakeholders consulted is presented in annex 1 of this report.

5.4. Consultations with local community

Consultation at community were conducted at three stages: (i) initial consultation at inception phase, (ii) consultation at scoping phase, and (iii) consultation at EIA/ARAP draft phase. In consultation with local authorities, it was agreed that consultations with local people at the project zones should be organized during the community works known as umuganda which are held on the last Saturday of each month countrywide. This was proposed as the best option as

it allows to have a good number of participants and an opportunity to inform and consult with larger community given that everyone is requested to attend the event. During the consultations, the restrictions imposed by COVID-19 were respected.

5.4.1. Initial consultations at inception phase January 14th – February 4th, 2022

Initial consultaion were conducted at inception phase and before the socio-economic survey which covered 5 sectors of Gasabo district and 14 cells. The main purposes of these initial consultations were:

- To disseminate project information and proposed studies,
- Tu understand initial houselhd perception about water supply statatus;
- To get the cooperation of households especially during the household survey,
- To explain the objectives of EIA, ARAP and the socio-economic survey

These consultations were held during the period of January 14th, 2022, to 4th February 2022 and a total number of 300 households were consulted spread of over 10 cells as presented in the table below.

Table 20: Questions /Suggestions and responses provided during initial consultaion-inception phase

No	Names	Questions/Suggestions	Responses provided by the consultant
Gisozi sector			
1	DUSABIMANA Samuel	At this stage do you know where pipelines will pass?	Pipelines routes are still under evaluation, but it anticipated that pipelines will be laid where existing pipelines are passing.
2	ERIC RUBIBI	In other areas where WASAC implemented projects we have heard delays in compensation. What are you doing to avoid this situation?	The design will be done in away that avoid involuntaly resettlement or land acquisition. Further, an abbreviated resettlement Plan will be prepared to ensure timely compensation
3	Mahoro Solange	During the previous projects some of the pipelines that were supplying us water were not re-connected and we are still struggling. Will the project do the same mistakes?	Normally the pipes to be installed are not directly supplying water to locals. These are transmissions pipes while connection is done to distribution pipes. It is expected that this project will not cause such impacts to locals.
4	MUREFU Vincent	Will be there any compensation to those who will temporally close their businesses such as kiosk, fence and pavemen?	This will be assessed during detail EIA study and this impact is additifed then will be covered under Resetellment plan.
5	Nyirahabimana Aline	What will happen to structure such as Raod, pavement and electrical installation that maybe affected by construction works?	Construction methods for crossing raods will be included in the study and where structure are affected rehabilitation will be made
Remera sector			
1	KABANDA Diane	Currentely we are experiencing water shortage and sometimes we only have water twice a week. Is this project going to resorve these issues?	This is one of the objectives of this project and the issue will be addressed through increased capacity of reservois and new pipes
2	BIZIMANA Cynthia	Will the project give job opportunities to local people or only engineers will be employed by the project	Local people will be employed and are priorities when allocating jobs. Both local and non-locals will be employed during project implementation
3	Kansayiza Janvier	After the construction works especially where pipes will pass, people are they allowed to continue using their land?	After construction works and pipes laying, landowners will continue to use their land as usual. However no major structures such as fences will be allowed on the pipelines.
4	Eric BYUMVUHORE	Some have assets on the land where probably the project will pass. Will the project compensate them?	All affected properties will be compensated according to the existing laws related to the compensation in public interests. However, na major land acquisition anticipated because pipelines will use existing road reserve and reservoir are on public land except in batsinda
5	MUNYAWERA Chrales	Water is currently expensive and is becoming more expensive. WASAC in charge should look on these issues and act accordingly.	The message is taken into consideration and will be forwarded to WASAC for consideration.
Kinyinya Sector			
1.	Benineza Claudien	This project is very important because it will help as to resolve issues related to water shortage. When the project will be completed?	The project is still at feasibility stage and the timelines will be communicated to you in next consultation meetings
2	GAKUNZI Janvier	When the maps of the project will be available, it will be better to be displayed at the villages and at open spaces so that different people can have access to the information related to the line route and other project components?	Maps of the project location will be published to cell/ villages information will be made public to all.
3	INGABIRE	Who will implement this project?	The project will be implemented by WASAC in

No	Names	Questions/Suggestions	Responses provided by the consultant
	Christa		collaboration with city of Kigali and JICA will provide funds.
4	ISHIMWE Brian	Water is currently expensive and is becoming more expensive. WASAC in charge should look on these issues and act accordingly.	The message is taken into consideration and will be forwarded to WASAC for consideration.
5	KAYITESI Jacqueline	Recently WASAC increased water tariff and yet the water is not available all the time. What are you planned to address this situation?	WASAC is still discussionng with its development parners to first address water shortage in the city of Kigali and rural areas but the tariff will be also discussed.
Kimironko Sector			
1.	DUSABIMANA Erneste	Which cells will be covered in Kimiroko sector?	The socio-economic survey will cover all three cells of Kimironko sector but there is no components that will be implemented in Kimironko.
2	KAGABA Alexis	How Kimironko sector will benefits from this project?	Improvement of water supply system in neighbouring sector from Ntora reservpir will allow Kimironko sector to receive water from other networks. Further, other project that will supply water in kimironko are planned
3	MUGENI Theonira	Water is currently expensive and is becoming more expensive. WASAC in charge should look on these issues and act accordingly.	The message is taken into consideration and will be forwarded to WASAC for consideration.
4	Mukamsoni Mariane	The key issues we have is water shortage and high cost of water. Is the project going to resolve these issues?	The project aims at reducing water losses which will ioncrease water supplied to people. This may also cpntriobute to the reduaction of high cost of water. This concern will also be reported in the study.

Source: Field survey, BESST Ltd, 2022

Table 21: Number of households consulted during inception phase

Sector	Cell	Sample Size
Bumbogo	Sb-total	16
	Ngara	16
Gisozi	Sb-total	67
	Musezero	38
	Ruhango	29
Kimironko	Sb-total	58
	Bibare	16
	Kibagabaga	23
	Nyagatovu	19
Kinyinya	Sb-total	107
	Gacuriro	14
	Gasharu	13
	Kagugu	60
	Murama	20
Remera	Sb-total	52
	Nyabisindu	22
	Nyarutarama	18
	Rukiri I	7
	Rukiri II	5
GRAND TOTAL		300

List of people who atndanded these meetings are presented in annex 2

5.4.2. Consultaion at scoping phase- March 26th, 2022

The second round of consultaions were conducted at scoping stage and were conducted on March 26th in three sectors where the project will be implemented namely Gisozi, Kinyinya and Remera. These consultaions focused on project components, scoping issues as well as the draft terms of reference for EIA study. Communities were provided with time to ask questions, provide inputs and suggestions. Information and comments collected from the public consultations are all summarized in the Table 22 below and lists of attendance are presented in annex 3

Table 22: Questions /Suggestions and responses provided during public consultations

No	Names	Questions/Suggestions	Responses provided by the consultant
Gisozi sector, Saturday, 26th March, 2022			
1	NIBISHAKA Isaac	-Where will the pipelines pass?	-The pipelines will pass where the existing pipes pass especially in the road reserve from Ntora to Gacuriro

No	Names	Questions/Suggestions	Responses provided by the consultant
2	MUKANDOLI Chantal	You said that during the project implementation, some of the pipes will be replaced. Will be there water shortages during the period of replacement?	The project is designed in a way that there will be no water shortages during project implementation. In case these happen, people will be informed in advance for them to get prepared.
3	MUKAKABERA Seraphine	We have experienced cases where some of our crops have not been compensated by WASAC. Example is made to my crops affected during the recent constructed Ntora –Gasanze pipe. How can you ensure that this project will be implemented differently while the developer is the same?	Maximum efforts are being done to avoid compensation during the project implementation. In case it happens, compensation will be made before project works. Local people are also required to get all required conditions such as land documents, account numbers etc. in order to get paid. Details in order to get paid shall be discussed during the valuation process.
4	BAMPORIKI Jean Baptiste	During the previous projects some of the pipelines that were supplying us water were not re-connected and we are still struggling. Will the project do the same mistakes?	Normally the pipes to be installed are not directly supplying water to locals. These are transmission pipes while connection is done to distribution pipes. It is expected that this project will not cause such impacts to locals.
5	YANGIRIYENEZA Egide	Will be there any compensation to those who will temporarily close their businesses such as MTN kiosk owner during the project implementation	So far it is expected that compensation will be made at only damaged assets. Those having movable properties shall be requested to move them in order to pave the way project activities. However, those owning such business shall be allocated jobs during project implementation and bring back their kiosks after project works.
Remera sector, March 26th, 2022			
1	UWINGABIRE Marianna	When is the implementation of the project expected to start for us to get prepared?	Different studies related to the project studies are going on and the kick off is expected as soon as the studies are finished and approved and the funds available. It is expected that the project will be started during the next fiscal year and this section to be completed within two years
2	KURADUSENGE David	Will the project give job opportunities to local people or only engineers will be employed by the project	Considering the project nature, local people will be employed and are priorities when allocating jobs. Both local and non-locals will be employed during project implementation
3	SEZIBERA Issa	After the construction works especially where pipes will pass, people are they allowed to continue using their land?	After construction works and pipes laying, landowners will continue to use their land as usual. However no major structures such as fences will be allowed on the pipelines.
4	NDAYISABA Valens	Some have assets on the land where probably the project will pass. Will the project compensate them?	All affected properties will be compensated according to the existing laws related to the compensation in public interests.
Kinyinya Sector, Saturday, March 26th, 2022			
1.	MUGISHA Jean Claude	We would like to know the exact location of the water tanks in this area. Is only one water tank or the project will build different tanks in our area?	The water tank in Kagugu will be constructed in the plot located near Batsinda Central Catholic Church. Other tanks will be located nearby the existing tanks in Gacuriro and Nyarutarama except the other new tank to be constructed opposite Kagugu Catholic Parish
2	NIYONZIMA Jean d'Amour	When the maps of the project will be available, it will be better to be displayed at the villages and at open spaces so that different people can have access to the information related to the line route and other project components?	For sure. Maps of the project location will be published to cell/ villages information will be made public to all.
3	NIYONSENGA Jean Bosco	It should be better that WASAC also take part in the project implementation	For sure. The project will not be implemented only by JICA. WASAC Ltd is project developer and will definitely be part of the project implementation.
4	NDABARORA Eliezer	Water is currently expensive and is becoming more expensive. WASAC in charge should look on these issues and act accordingly.	The message is taken into consideration and will be forwarded to WASAC for consideration.
5	NYIRABUHO M. Aimee	When do you think the project should start?	The project has started with detailed design and onsite works are expected to start next fiscal year that will start in June 2022.
6	MURATABIGWI Fidele	Regarding the work to be available for the project will JICA fully own the payment of manpower? How about the compensation of damaged properties?	Payment of local manpower will be done by the contractor who will be doing the implementation. While compensation of damaged properties will be done through Government budget via WASAC Ltd.
7	MASUMBUKO Oscar	Is it possible for WASAC to think about the prepaid system as this was done for electricity?	Message is taken and will be forwarded to WASAC for consideration

Source: Field survey, BESST Ltd, 2022



Source: Photos taken during the on-site consultation meetings

5.4.3. Consultations at draft stage-June 4th, 2022

These consultation meetings were held Saturday 04th -06-2022 Nyabisindu Village (Remera sector, Nyabisindu cell), Nyakabungo village (Kinyinya Sector, Kagugu Cell,) and Gasharu village (Gisozi Sector, Musezero Cell). These meetings were attended by local communities and local leaders at cell and sector levels. These meetings aimed at keeping informed the residents and authorities about the project progress and activities as well as collected their views and concerns about the project implementation. Specifically, the meeting focused on showing participants final pipelines routes and selected sites for water reservoirs. Participants were also informed about potential environmental and Social Impacts as well as proposed mitigation measures. Participants were also given time for comments, views, and questions. The next table present key outcomes of this consultations meeting.

Table 23: Outcomes of the consultations at draft EIA/ARAP report- June 4th , 2022

No	Names	Questions/Suggestions	Responses provided by the consultant
Gisozi sector			
1	KARUMUNA Jean Willison	The approach you are using to keep us informed about the project is well appreciated and we request you to inform other institution such as REG and others having project of simile nature to keep local people informed to avoid any inconvenient or misunderstanding that shall occurred during the project implementation.	Message taken and will noted. Usually, the ESIA studies require this kind of consultation, and your message will be transmitted as required.
2	KAYITARE jean Paul	Was there any change about the pipeline routes from the existing line with the new lines?	No major changes have been done. The new pipes will be installed parallel to the existing lines.
3	KARANGWA	Is there anyone that will be relocated? Is yes how the compensation will be done	According to the project designs no one will be relocated. Those having properties to be affected will be compensated according to the compensation law in public interests.
4	MUKASHAYAKA Odette	We are lucky to have this project as it aims at the general development of our region. Will this project supply water to those not connected? We will be able be employed during project activities?	The project will supply water to some areas/ zones not connected to WASAC or to any other water service providers. Those wishing to be connected will have opportunity to get connected. For sure job will be given and priority will be residents.
Remera sector,			
1	MUDAHARISHEMA Jean Baptiste	Will have opportunity to get jobs from this project	For sure. Job opportunities will be available during project implementation and those willing to be employed will get the opportunity. However, job numbers are limited based on the project nature and type.
2	UWAMARIYA Dative	Those having land will be compensated?	land for pipes lines will be temporally used during pipes laying and installation. No land compensation is planned during this project.

No	Names	Questions/Suggestions	Responses provided by the consultant
			However, any assets to be damaged shall be compensated as per the expropriation laws and regulation in place.
3	MUKANGENZI Vestine	When is the implementation starting?	It is expected that the project shall start in the next financial year according to the required agreement between Rwanda and JICA. People will be kept informed about the project progress
Kinyinya Sector			
1.	NSENGUMUREMYI Felicien	Thank you for keeping us informed about the project. We are suggesting that during the project implementation WASAC should look for alternatives for water supply for those connected. Otherwise, people will suffer from lack of water and yet the project will be a challenge to them and not well appreciated.	Alternatives for water supply will be provided and are being discussed between WASAC and project funder and this will be implemented during project works. People would not worry about this. Effort shall be made to minimize water shortages.
2	GATABAZI Pascal	We are requesting that WASAC look on how the payment system for water tariffs shall be pre-payment as we are familiar for electricity. We only use the electricity that we have paid. And WASAC is advised to look for this possibility to use	The message is taken and will be forwarded to WASAC for consideration
3	MUKAKIGELI Josephine	Will the project give jobs to local people?	Job opportunities will be available even if are limited. Priority considerations will be given to residents.
4	UWANYIRIGIRA Jacky	Water is expensive. Will the project contribute to the reduction of prices of water tariffs?	The message will be taken to WASAC for consideration and assessment. We cannot confirm now that water tariffs will be reduced due to project implementation.

In general, the consultations were successfully conducted as planned before. The local community appreciated the project progress as well as the approach being made of keeping them about the project. They requested to be considered as priorities when allocating jobs that not require specific and additional knowledge. Lists of participants are presented in annex 4.

6. ANALYSIS OF PROJECT ALTERNATIVES

6.1. Overview

The present section describes different project alternatives that were examined while designing the proposed project and identify other alternatives, which would achieve the same objective of the project implementation. The 'No action' alternative was also analyzed to demonstrate environmental and social conditions without the project. Consideration of alternatives should extend to siting, design, technology, construction techniques, phasing, and schedule, and operating and maintenance procedures alternatives. Alternatives were compared in terms of potential environmental and social impacts; capital and operating costs; suitability under local conditions; and institutional, training, and monitoring requirements. For the present project of improvement of water supply services in north Central Kigali, alternative focused on choice of line route, the location of water reservoirs and the implication of each line route in terms of different criteria including environmental and social Impacts, resettlement implication and the project cost.

6.2. No- Project option

The no Project alternative option will entail leaving the water supply mechanism in the present situation and this option is not desirable considering the importance of the project implementation. Besides, there are many significant and specific benefits that would not be accrued if the proposed development is not to be implemented. The project targets to improve the water supply system and assumes NRW reduction from 40.3% (ratio in the area is as of the data in Feb. 2022) to 20.9% by the extensive rehabilitation and expansion of the project facilities. The completion of the project is expected to be in the year 2025, its target year for water demand was set as 2030, five years after the completion, in accordance with the benchmark year of the Kigali Water Supply Masterplan.

The project implementation is also justified by the need of increasing the capacity of water supply in Kigali City to satisfy its growing population. The project is also implemented in line with the targets and objectives and visions of Rwanda to have access to safe clean water to all as per the water supply master plan considering that the study area needs 21, 300m³ / day by 2030. In the case of no project option, this means that project is not implemented. This option is the most suitable alternative from environmental perspective as it ensures non-interference with the existing environmental conditions. However, this option involves several losses on socio-economic conditions both to the local population and the nation in general. The loss is not only associated to the scarcity of drinking water in the project area, the economic gains; however, the negative impacts associated to the project implementation will be aggravated and worsened. For the above reasons the consultant could not recommend No-Option alternative. Instead, the consultant is recommending the implementation of the proposed project with appropriate mitigation measures.





6.3. Project alternatives with mitigation measures

The design team has proposed different line route alternatives and based on the present criteria the best line routes were proposed. Maximum efforts have been made to minimize resettlement impacts as the line routes for the project are the buffer zones of the existing roads. The replacement of the existing pipes will be done parallel to the old ones to be replaced. The EIA consultant assessed the proposed alternatives and confirmed the selected line routes but proposed mitigation measures for the identified potential environmental and social impact including avoiding narrow spaces along the existing roads, rehabilitation of the damaged areas, compensation of damages etc. and these are discussed in detail in chapter seven and eight.

6.3.1. Alternative analysis for pipelines

The next table presents different options explored on both pipelines' routes explored and the construction sites for reservoirs.

Table 24: Alternatives considered for transmission pipeline routes

	Finalized route Nyagatovu	Alternative 1 Nyabisindu	Alternative 2 KN5 (RDB) - KG17 route (to Golf 8)	Alternative 3 KG201 (Gasabo District) – KG17(to Golf 8)
Total length	3.05 km	3.14 km	3.01 km	2.96 km
Route composition				
Wetland crossing	No	Yes (100m)	No	
Impact on Road Structures	Limited impact on asphalt paved road (Most of the road are unpaved and will impact pavement only at the road crossing part.)	Necessary to lay pipe under the car road on KG16 Avenue (Approx. 1.0km)	Limited impact on pavement (Pipe can be installed under the walkways and will impact the pavement only at the road crossing part.)	Limited impact on pavement (Pipe can be installed under the walkways and will impact the pavement only at the road crossing part.)
Impact on traffic	Positive impact. Most of the roads are unpaved so the pipe construction will improve the road condition after completion.	Pipe laying under the car road (KG16) will incur one-side traffic closure.	Construction on National Road (KN5) and the major city road (KG17) will have high impact on heavy traffic.	Minimized the impact on national road but heavy traffic the major city road (KG17).
Resettlement	No	No	No	No
Land acquisition	No	No	No	No
Construction period	Shorter than other alternatives.	Long because of the wetland crossing and construction under the car road.	Long because of the construction along national road and congested road (KG17).	Long because of the construction along congested road (KG17).
Construction cost	Low	High	Low	Low
Environmental impacts	Low environmental Impacts given that no site clearance is limited, traffic disturbance is limited in time	Substantial Environmental impacts due to wetland crossing and traffic disturbance	Moderate to medium Environmental impacts due longer traffic disturbance	Moderate to medium Environmental impacts due longer traffic disturbance
Conclusion	Selected	Not selected to avoid wetland crossing and the construction under the car road.	Not selected to avoid the construction under the national road (KN5).	Not selected to avoid the construction under the congested road (KG17).

6.3.2. Alternative analysis for reservoir construction

Table 25: Alternatives considered for construction sites of reservoirs

	Finalized Plan	Alternative 1	Alternative 2	Zero Option
Location and type of reservoirs	<ol style="list-style-type: none"> 1. Kagugu (Elevated Tank) 2. Gacuriro (Elevated Tank) 3. Batsinda (Ground reservoir) 4. Nyarutarama-South (Elevated Tank) +4 Pressure Breaking	<ol style="list-style-type: none"> 1. Kagugu (Elevated Tank) 2. Gacuriro (Elevated Tank) 3. Batsinda (Ground reservoir) 4. Nyarutarama-South 	<ol style="list-style-type: none"> 1. Kagugu (Elevated Tank) 2. Gacuriro (Elevated Tank) 3. Batsinda (Ground reservoir) 4. Nyarutarama-South 	No reservoirs to be constructed.

	Finalized Plan	Alternative 1	Alternative 2	Zero Option
	Chambers	(Elevated Tank) 5. Gisozi-Low Reservoir 6. Gisozi-Middle Reservoir + 6 Pressure Breaking Chamber	(Elevated Tank) 5. Fawe Reservoir 6. Nyarutarama North Reservoir 7. Gisozi-Low Reservoir 8. Gisozi-Middle Reservoir	
Physical Resettlement	No resettlement is expected.	No resettlement is expected.	No resettlement is expected.	No resettlement is expected.
Land acquisition	Kagugu (public land) and Batsinda (private land) needs to be acquired. Both land acquisition can be settled as the WASAC has good communication with their owners.	In addition to Kagugu and Batsinda, Gisozi-middle needs land acquisition from the University. Gisozi-low may have difficulty in land acquisition because the road expansion is planned.	Nyarutarama North, is the private land that needs land acquisition.	No land acquisitions
Impact on traffic	No significant impact on traffic.	No significant impact on traffic.	No significant impact on traffic.	If there is no construction, the leakage on the pipes will be accelerated because the pressure in the pipelines will not be reduced. As a result, the traffic will be interrupted by the leakage and leakage repairs.
Construction period	Shorter than Alt 1 and 2.	Shorter than Alt 2.	Longer.	No construction.
Construction cost	Lower than Alt 1 and 2.	Lower than Alt 2.	Higher.	
Maintenance cost	Lower than Alt 1 and 2.	Lower than Alt 2.	Higher.	Maintenance cost will be higher due to increased leakages.
Environmental Impacts	Low impacts due to reduce site clearance and construction sites	Moderate to medium impacts due to increased site clearance and construction sites	Moderate to medium impacts due to increased site clearance and construction sites	No environmental Impacts
Evaluation	Selected	Not selected due to the difficulties in land acquisition and moderate Environmental impacts due to the number of construction sites	Not selected due to the difficulties in land acquisition and moderate Environmental impacts due to the number of construction sites	Not selected because the Positive social impact and viability of water supply will be lost if there is no construction.

6.4. Recommended project alternatives

Based on the proposed project nature, extend and location as well as the technical designs and proposed mitigation measures, and based on the social and environmental assessment of the project site, the consultant can conclude that the most preferred alternative would be implementing the project with the proposed and detailed mitigation measures in place. The selected pipeline route has been found to be the most option as it minimizes the potential environmental and social impacts especially those related to resettlement impacts. No Physical displacement identified in all options. Only private land will be acquired at Batsinda reservoir.

The project has more positive impacts especially increasing the capacity of water supply in Kigali and does not have any irreversible environmental and social impacts. The identified potential impacts to both social and environment have been found to be at an extent that can be avoided, minimized, or compensated when applying the proposed mitigation measures the Environmental Management Plan and monitoring plan as developed in this report.

7. IMPACT PREDICTION ANALYSIS AND MITIGATION MEASURES

7.1. General overview

Environmental and social impact refers to the changes of existing conditions of any area or environment caused by human activities or any internal or external influence which may be positive or negative (Government of Rwanda, 2018). The impact may be direct or indirect, long term or short term and may be local or extensive. The process of identification of the impacts associated to the present project revealed that there might be different environmental and socio impacts both positive and negative during the project phases especially during construction and operation.

The objective of impacts assessment is to identify and assess all the significant impacts that may arise from the undertaking of an activity and findings used to inform the competent authority's decision as to whether the activity should be either authorized, authorized subject to conditions that will mitigate the impacts to within acceptable levels or refused.

7.1.1 Scoping of impacts

In compliance with the JICA guidelines, the positive/adverse impacts resulting from the project were evaluated with the application of scoping matrix. The scoping of the predicted impacts for the project was done and different impacts were identified as described in the table below.

Table 26: Scoping of the project impacts

Category	No	Items	Evaluation		Reason	
			Before/ During Constructio n	Operation	Construction of Reservoir Installation/Replacement of Distribution piles	Installation of Transmission pipes
Anti-pollution measures	1	Air pollution	B-	D	[During Construction] Emission gas and dust will be generated; however, their impact on ambient air quality is expected to be limited, due to the limited number of heavy vehicles & trucks and limited period of construction work at each place. [During operation] There is no plan to install pumps at the newly constructed reservoirs, so no impacts on air quality is expected.	[During Operation] There will be no impacts on the ambient air quality.
	2	Water pollution	B-	D	[During Construction] At the most parts of the primary distribution lines, re will be replaced with new pipes, and there need to be treatment of water residue. [During Operation] There will be no impacts on the water quality.	[During Construction] There is one wetland-crossing points, but the area is limited and water flow is very small during the dry season.
	3	Soil pollution	C	D	[During Construction] There could be oil contamination during the maintenance work of heavy vehicles and trucks; however, its impact would be limited.	
	4	Waste Municipal solid waste (MSW)	D	D	[During Construction] It is likely that workers are recruited locally and accommodations and camps for workers would not be prepared. Therefore, MSW would not cause a serious problem. [During operation] No MSW is generated.	
		Construction waste (CW)	B-	D	[During Construction] Construction waste such as excavated soil and concrete debris will be generated. Some of them can be reused as road construction materials. It is necessary to formulate a waste management plan to promote recycling. [During operation] No waste is generated.	
5	Noise and Vibrations	B-	C	[During Construction] There will be problems of noise and vibrations due to the construction work of the new reservoirs. In particular pile driving work would cause serious noise and vibration problems. There will be also problems by distribution pipeline installation/replacement works	[During Construction] There will be temporary problems by transmission pipeline installation works	

Category	No	Items	Evaluation		Reason	
			Before/ During Constructio n	Operation	Construction of Reservoir Installation/Replacement of Distribution piles	Installation of Transmission pipes
					[Operation] There is no plan to install pumps at the newly constructed reservoirs, so no problems of noise and vibrations will be expected.	
	6	Ground subsidence	D	D	Design based on the boring survey can prevent ground subsidence	
	7	Odor	D	D	Problems of odor are not expected	
	8	Bottom sediment	D	D	There will be no activities which have impacts on bottom sediment	
Natural Environment	9	Protection area	D	D	The project area is located in urban areas and there are no protection area such as national park inside the Project area.	
	10	Biota and ecosystems	B-	D	[During Construction] The project area is located in urban areas and the impact of the project on ecosystem is very limited.	[Before/during construction] There is a wetland crossing but the target area is very limited
	11	Hydrology	D	D	There will be no activities which would affect the Hydrology.	
	12	Geographical features/Soil erosion	C	D	[During construction] There will be no activities which affect geographical features and soil erosion.	[During construction] There is a wetland crossing but the target area is very limited
	13	Resettlement/ Land acquisition	B-	D	[Before Construction] There would be no need of resettlement, but one plots of lands would need to be acquired for the construction of reservoirs.	[Before Construction] There would be no need of resettlement and land acquisition
Social Environment	14	Vulnerable groups /Poor people	B-	D	[Before/during Construction] No issues of minority and indigenous people are identifies. Based on the result of the socio economic survey, support for vulnerable groups and poor people will be considered, if necessary [During Operation] No negative impact would be expected.	
	15	Local economy such as employment and livelihood	B+/-	B+	[During Construction] The project would create jobs such as construction workers. Demand for food and daily necessities from construction personnel could have positive impact on the local economy. On the other hand, there would be loss of land [Operation] The introduction of the block distribution system could decrease the fluctuation including leakage in water delivery. This could improve the business environment and then enhance the local economy and increase jobs	[During Construction] The project would create jobs such as construction workers. [Operation] The installation of transmission pipeline could improve water supply system, and this improve business environment.
	16	Utilization of land and local resources	D	D	[During Construction] There would be no activities which affect the use of the land and local resources	
	17	Water use Water for drinking and domestic use	B-	B+	[During Construction] Water supply will be suspended for a certain period of time due to the replacement work of distribution pipes. [Operation] The introduction of the block distribution system could decrease the fluctuation including leakage in water delivery.	[During construction] Electric and communication cables could cause interruption of the construction work. [Operation] Supply Water volume will be increased and this makes it possible for WASAC to improve the management.
	18	Existing social infrastructures and services	B-	B+	[During Construction] Traffic congestions would be expected along some of the main roads such as KG 14. [Operation] The water supply system is improved.	[Operation] The water supply system is improved. The surface of unpaved roads would be improved by the transmission pipe installation work

Category	No	Items	Evaluation		Reason	
			Before/ During Constructio n	Operation	Construction of Reservoir Installation/Replacement of Distribution piles	Installation of Transmission pipes
	19	social institutions such as social infrastructure and local decision-making institutions	D	D	There will be little impact on social infrastructure and local decision-making institutions	
	20	Misdistribution of benefits and damages	B-	D	[During Construction] Some of local people would face problems of noise and vibrations. Some others would benefit from the project by getting jobs or selling goods and food. [During Operation] The project area would benefit from the improvement of water supply.	
	21	local conflict of interests	D	D	[During Construction] The construction work is mainly the replacement of pipes, and the project will bring the benefit for all the communities, so the local conflict of interests would not be expected.	
	22	Cultural heritage	D	D	No cultural heritages are not identified	
	23	Landscape	C	D	The project could not change the landscape significantly. Some trees would be cut down and, in this case, trees of the same species would be planted.	
	24	Gender Children's right	C	D	[Before/During Construction] The negative impact on gender issues is not expected; however, socio-economic survey will check the economic situations of female headed household, and supporting measure will be considered, if necessary. The negative impact on Children's right is not expected; however, if socio-economic survey identifies problems related to children, supporting measures will be considered.	
	25	infectious diseases such as HIV/AIDS	B-	D	[Before/During Construction] Workers will be employed locally and it is unlikely that the Project would spread infectious diseases such as HIV/AIDS; however, HIV/AIDS issue is one of concerns in Rwanda, and it is important to promote awareness about HIV/AIDS for not only workers but also local people in order to prevent further infection.	
	26	Work Conditions including Work Safety	B-	D	[Before/During Construction] There would be a possibility of accidents, injuries, and diseases at the construction site. Contractor will be required to follow Rwandan laws and international rules such as OHSAS in order to make sure of work safety.	
	27	Accidents	B-	D	[Before/During Construction] There would be a possibility of traffic accident during the construction work.	
	28	Global warming	D	D	The operation of heavy vehicles and trucks generates greenhouse gas; but the generation amount is limited.	

Legend	Impact
A+	Significant Positive impact
A-	Significant Adverse Impact
B+	Positive Impact
B-	Negative Impact
C	Moderate Impact
D	No /Negligible Impact

7.1.2 Impact types

Different types of impacts may occur from the implementation of this type of project. The impact may be positive or negative and can be categorized as being either direct (primary), indirect (secondary) or cumulative. Direct impacts are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (for example, dust generation resulting from excavation activities). These impacts are usually associated with the construction, operation or maintenance activities and are obvious and quantifiable.

Indirect impacts are induced changes that may occur because of the activity (for example the use of water from a natural source at the activity will reduce the capacity for supply to other users). These types of impacts include all the potential impacts that either do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity (REMA, 2006).

Cumulative impacts are those that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present, or reasonably foreseeable future activities (for example, removal of vegetation may cause soil erosion, leading to excessive sediments in receiving water body, leading to reduced sunlight penetrating the water and thus reducing dissolved oxygen in the water and adversely affecting aquatic life

and water quality). Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

7.1.3 Identification of potential impacts

To identify the potential impacts of this project, a matrix was designed and used with the aim to assess the impacts associated with almost any type of development project. Its main strength is a checklist that incorporates qualitative information on cause-and-effect relationships.

Table 27: Matrix used for identification of potential impacts associated to the project implementation

Environmental components			Physical (Land-Water-Air)						Biological				Socio-economic								
			Geology		Soil		Water		Air		Visual		Flora		Fauna		Resettlement		Quality of life		
Project activities			Geological formation	Soil pollution	Soil erosion	Water Pollution	Runoff and infiltration	Underground water	Air quality	Visual impacts	Flora disappearance	Flora succession	Fauna disappearance	Fauna habitat	Loss of Crops	Loss of private land	Effects on infrastructure and public utilities	Occupational health and safety	Employment	Skills transfer	Noise and vibration
			Project Phase	#	Main Activity																
Design and Planning	1	Preliminary Survey and detailed design including EIA and ARAP																	X	X	
Construction	2	Site clearing	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	3	Installation of pipes	X	X	X	X		X	X		X	X	X	X	X		X	X	X	X	X
	4	Installation of elevated tank		X	X	X	X	X	X	X							X	X	X	X	X
	5	Construction of water pumps	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	6	construction of pressure breaking chambers	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	7	Modification of existing transmission mains from Ntora reservoir	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	8	Construction / installation of flowmeter	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	9	Construction / installation of level gauges	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	10	Construction / installation of monitoring system	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	11	Storage for construction materials	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	12	Disposal of construction wastes	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	13	Influx of workers																X	X	X	
	Operation and maintenance	14	Operation of the project facilities																		
15		Maintenance and rehabilitation of water infrastructure	X	X	X	X	X	X	X										X	X	X
Decommissioning	16	Site closure	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X
	17	Decommissioning	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X

7.1.4 Impact analysis

Impact analysis was done through conducting risk assessment, risk evaluation and risk management (relating directly to applicable mitigation measures to be implemented.) and the impact analysis matrix is presented in the next Table.

Table 28: Impact analysis matrix

Nature or Status of the Impact: The type of effect the activity would have on the environment		
Status	Description	
Positive:	a benefit to the holistic environment	
Negative:	a cost to the holistic environment	
Neutral:	no cost or benefit to the holistic environment	
Duration of the Impact: The lifetime of the impact		
Score	Duration	Description

1	Short term	Less than 2 years
2	Short to medium term	2 – 5 years
3	Medium term	6 – 25 years
4	Long term	26 – 45 years
5	Permanent	46 years or more
Extent or Scale of the Impact: The distance from source that impacts may be experienced		
Score	Extent	Description
1	Site specific	Within the site boundary
2	Local	Affects immediate surrounding areas
3	Regional	Extends substantially beyond the site boundary
4	National	Affects country
5	International	Across international borders.
Reversibility of the Impact: To what degree its influence on the relevant environment can be negated.		
Score	Reversibility	Description
1	Completely reversible	Reverses with minimal rehabilitation & negligible residual affects
3	Reversible	Requires mitigation and rehabilitation to ensure reversibility
5	Irreversible	Cannot be rehabilitated completely/rehabilitation not viable
Magnitude or intensity of the Impact: Severity of the negative and magnitude of positive impacts		
Score	Severe/beneficial effect	Description
1	Low	Little effect - negligible disturbance/benefit
2	Low to moderate	Effects observable - environmental impacts reversible with time
3	Moderate	Effects observable - impacts reversible with rehabilitation
4	Moderate to high	Extensive effects - irreversible alteration to the environment
5	High	Extensive permanent effects with irreversible alteration
The Probability of the Impact: Describes the likelihood of the impact actually occurring		
Score	Rating	Description
1	Unlikely	Less than 15% sure of an impact occurring
2	Possible	Between 15% and 40% sure of an impact occurring
3	Probable	Between 40% and 60% sure that the impact will occur
4	Highly Probable	Between 60% and 85% sure that the impact will occur
5	Definite	Over 85% sure that the impact will occur
The Consequence (C)		= Magnitude/Intensity (M/I) + Extent (E) + Duration (D) + Reversibility (R).
The Significance (S)		= Consequence (C) x Probability (P)

7.1.5 Determination of significance

After assessment of an impact in accordance to the criteria described above, the significance of an impact can be determined. The various ratings as indicated above are accorded to these criteria. These ratings are then used to calculate a significance (S) rating and are formulated by adding the sum of ratings given to the extent (E), duration (D), Reversibility (R) and intensity (I) and then multiplying the sum with the probability (P) of an impact as follows:

Significance (S) = (E+D+R+I) X P. The score is group as follow

Score out of 100	Significance
1 to 20	Very low
21 to 40	Low
40 to 70	Medium
Over 70	High

Description of significance

Significance	Description
Positive impacts	- Positive impacts are positive changes to the receiving environment
Very low	- No impacts on biophysical and social environments / livelihood / health / gender - No public concerns - No legal issues
Low	- Low/minor impact on environment / livelihood / health / gender - Minor social impacts - No legal issues
Medium	- Some level of impact on environment / livelihood / health / gender - Social issues apparent - May have legal implications

Significance	Description
Severe/high	<ul style="list-style-type: none"> - High level impacts on environment / livelihood / health / gender - High public concerns or perceptions - Legal non- compliance

The following table summarizes the evaluation of impacts associated with the proposed project of and it shows their significance through the projects phase.

Table 29: Project impact analysis matrix

Impacted Aspect	Impact	Positive/ Negative/ Neutral Impact	Magnitude (M/A)	Extent (E)	Duration (D)	Reversibility (R)	Probability (P)	Significance (S)	Mitigation
I. Planning Phase									
Activity 1. Preliminary survey									
General	Job creation and employment opportunities	Positive	4	2	3	5	5	70	NO
	Income generation	Positive	5	3	3	5	5	80	NO
	Increased savings for the local employees	Positive	3	2	4	3	5	60	NO
	Influx of job seekers	Negative	3	2	1	3	4	36	YES
	Child labor and sexual harassment	Negative	1	1	2	1	3	15	YES
	Risks of job accidents	Negative	2	1	1	5	3	27	NO
II. Construction of the pipelines									
Activities 2.1: Installation principal water pipe									
Soil	Risk of soil erosion	Negative	2	1	3	5	3	33	YES
	Risk of surface water pollution	Negative	1	2	3	5	3	33	YES
	Risk of ground water pollution	Negative	1	2	2	5	3	30	YES
	Risk of dust generation and air pollution	Negative	4	2	3	3	5	60	YES
	Risk of increase of noise levels at the project sites	Negative	4	1	2	3	4	40	YES
	Loss of fauna and flora	Negative	4	1	1	3	4	36	YES
Quality of life	Job creation	Positive	4	2	3	3	5	60	NO
	Risk of diseases contamination such as HIV/AIDS	Negative	3	4	5	5	2	34	YES
	Risk of onsite work accidents	Negative	4	1	1	3	4	36	YES
	Traffic congestions	Negative	4	2	1	1	4	32	YES
	Disruption of public utilities	Negative	4	3	2	1	3	30	YES
	Vandalism of infrastructures	Negative	2	2	4	5	2	26	YES
Child labor and sexual harassment	Negative	2	2	2	1	3	21	YES	
Activity 2.2: Construction of elevated water elevated tanks, water reservoirs and pressure braking chambers									
Property	Loss of land	Negative	4	2	1	1	4	32	YES
	Loss of income	Negative	2	2	2	1	3	21	YES
	Loss of crops and tress	Negative	4	3	2	1	3	30	YES
Soil excavation	Risk of soil erosion	Negative	3	2	1	3	4	36	YES
	Risk of surface water pollution	Negative	1	1	1	5	2	16	YES
	Risk of ground water pollution	Negative	1	1	1	5	1	8	YES
	Risk of dust generation and air pollution	Negative	4	2	3	3	5	60	YES
	Risk of increase of noise levels at the project sites	Negative	4	2	2	3	5	55	YES
	Loss of fauna and flora	Negative	2	2	4	5	2	26	YES
Construction	Oils spillages	Negative	3	2	1	3	3	27	YES
	Injuries or fatalities from improper manual handling	Negative	4	1	1	5	4	44	YES
	Traffic congestions	Negative	2	2	1	3	3	24	YES
	Disruption of public utilities	Negative	3	2	1	3	3	27	YES
	Soils waste generation	Negative	4	2	1	3	5	50	YES
	Quality of life	Job creation	Positive	4	2	3	3	5	60
Risk of diseases contamination such as HIV/AIDS		Negative	3	4	5	5	2	34	YES
Risk of onsite work accidents		Negative	4	1	1	3	4	36	YES
Traffic congestions		Negative	2	2	1	3	3	24	YES
Disruption of public utilities		Negative	3	2	1	3	3	27	YES
Child labor and sexual harassment		Negative	2	2	2	1	3	21	YES
Activity 2.5: Project operation									
Operation	Access to potable water	Positive	5	5	4	4	5	90	NO
	Gender balance enhancement	Positive	4	4	4	4	2	34	NO
	Improved sanitation	Positive	5	4	4	4	3	72	NO
	Improved water supply services	Positive	4	4	4	4	4	68	NO
	Increased water revenues at central level	Positive	5	4	4	4	5	90	NO
	Water losses reduction	Positive	5	4	5	4	5	90	NO
Quality of life	Risk of social conflict with local communities	Negative	3	2	1	1	2	14	YES
	HIV/AIDS& communicable diseases	Negative	2	4	5	5	2	32	YES

Impacted Aspect	Impact	Positive/ Negative/ Neutral Impact	Magnitude (M/M)	Extent (E)	Duration (D)	Reversibility (R)	Probability (P)	Significance (S)	Mitigation
	Gender Based Violence and sexual exploitation	Negative	3	4	3	3	3	39	YES
Activity 3.1. Maintenance and rehabilitation of water infrastructure									
Maintenance and rehabilitation work	Employment opportunities	Positive	4	2	1	3	5	50	NO
	Risk of surface water pollution	Negative	3	2	2	5	2	24	YES
	Disruption of public utilities	Negative	2	1	1	1	3	15	YES
	Risk of ground water pollution	Negative	1	2	2	5	1	10	YES
	Risk of dust generation and emission	Negative	2	2	1	3	3	24	YES
	Increase of noise levels	Negative	1	2	1	3	3	21	YES
	Oils spillage	Negative	2	1	1	5	3	27	YES
	Solid waste generation	Negative	3	1	1	3	5	40	YES
	Loss of flora and fauna	Negative	2	1	1	3	4	28	YES
	Vandalism of infrastructures	Negative	1	1	1	1	2	8	YES
Risk of work accidents	Negative	3	1	1	1	3	18	YES	
IV. Decommissioning/closure and post-closure phase									
Activity 4.1: Project Closure									
Decommissioning	Soil contamination	Negative	3	1	1	5	4	40	YES
	Risk of surface and ground water pollution	Negative	3	3	1	5	1	12	YES
	Increase of noise levels	Negative	2	2	1	3	2	16	YES
	Improvement of the beauty of the area	Positive	3	3	3	5	3	42	NO
	Risk of accidents	Negative	4	1	1	1	2	14	YES
Activity 4.2. Pipeline routes revegetation									
Revegetation	Soil structure and texture improvement	Positive	5	1	3	3	4	48	NO
	Vegetation cover and proliferation of fauna habitats	Positive	4	3	4	3	4	56	NO
	Landscaping and aesthetic	Positive	5	3	4	3	4	60	NO
	Improvement of surface and ground water quality	Positive	4	3	4	3	4	56	NO
	Job creation	Positive	3	2	1	3	4	36	NO

7.2 Impacts identified and proposed mitigation measures

As per the general guidelines for Environmental Impact Assessment in Rwanda and JICA guidelines for environmental and social considerations both positive and negative impacts associated to the project implementation were assessed. A summary of impacts analysis in tabular form is also presented at the end of this section and an Environmental Management and Monitoring Plan is provided in Chapter 8.

7.2.1 Overall positive socio-economic impacts of the project implementation

The present project is likely to have substantial positive socio- and economic impacts in the City of Kigali in general and in the project area specifically. Direct positive impacts include the provision of employment and availability of water infrastructures that can support the country's objectives in terms of clean water supply and economic development. The following section highlights the potential social-cultural and economic impacts associated with the project of Improvement of water supply services in North Central Kigali.

➤ Employment opportunities

The implementation of this project will provide employment opportunities to local population. During the implementation of the project, new jobs will be created in the form of skilled and unskilled labor in the local community. Most of the unskilled labor 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. These are positive outcomes of the project implementation to both national and for the local population.

➤ Income generation

The employment opportunities connected to project implementation will generate income to local population who will be directly or indirectly employed by the project as well as to the project workers in general. This will contribute to their increase of the family and personnel income generation through salary gained from the project.

➤ Increased savings for the local employees

The increase of the project's local work force and employee's revenue will lead to the possibility of savings in local banks such as SACCO and local micro-finances of the project area.

➤ **Skills and knowledge transfer**

In the process of planning and design, the local technical work force will work with the experts in different domain. This process of working together will transfer design and planning tools and other useful guidelines, which shall be used in the future in similar project implementation countrywide.

➤ **Economic diversification and improved local socio-economy**

It is no doubt that a big number of works related to the project implementation will provide a positive increase to the local and national economy. This will contribute to the socio-economic benefits within and around the project area. The economic expansion will enable alternative businesses and economic activities to develop and also increased earnings by project workers will most likely be spent locally further supporting already established businesses in the area, as well as potential new businesses that may arise.

➤ **Access to potable water and reliability of water supply system**

Access to the new water supplied areas within Kigali city such as Batsinda will be emerged through the implementation of the present project. Hence the project will increase the number of people with access to clean water. The improvement and expansion of water supply system will enable greater responsiveness to the demand, increasing also the reliability of the operating system.

➤ **Gender balance enhancement**

During the project implementation women will equally benefit as men in terms of employment opportunities and benefits. This will contribute to the government vision of fighting against gender inequality and ensuring that women are given equal opportunity in terms of employment.

➤ **Healthcare for employees**

Employees and their immediate families will be provided with basic healthcare. This will benefit the overall health of the local population. HIV/AIDS information and COVID- 19 prevention will be dispersed to employees to prevent the spread of such diseases and other STDs amongst the project employees and their families.

➤ **Improved sanitation in the project area**

The project will significantly contribute to improvement of sanitation within its areas of intervention because of access to safe and clean water. Therefore, this will contribute to the improvement of living conditions of local population.

7.2.2 Negative impacts and mitigation measures for block system - construction of reservoirs and installation/replacement of distribution pipes

It is anticipated that construction of ground and elevated water storages, installation and replacement of existing pipes will have negative impacts on both social and physical environment. This section describes negative impacts associated with components covered under the JICA grant.

➤ **Labor influx**

There is within the local population, high expectations of getting employed by the project. During the public consultation, the issues raised were related to employment opportunities. Indeed, although the project will create employment opportunities, the jobs will be limited, and it is therefore important that the procurement processes be clear and fair. It is expected that creation of not enough jobs will create frustration on part of the local people and conflicts can occur or be generated in relation to the project.

Mitigation measures:

- Local and affected project persons (those having land that shall be affected by the project) should be prioritized when allocating jobs
- Recruitment should be done in a clear and fair process.
- Establish recruitment committees prior to job commencement while involving local authorities in recruitment as they are aware of the behavior of residents
- Women should equally benefit as men from job recruitments opportunities

➤ **Resettlement implications**

The project was designed in a way that it avoids and minimizes physical resettlement. The required land for water reservoirs will be acquired and some structures and assets privately owned may be partially affected by project activities among them including the loss crops and trees and or fences. Fair compensation to those affected will be conducted before project implementations detailed in the ARAP report.

➤ **High expectations of getting great compensation in case of compensation**

It is no doubt that some people will lose their land or crops and some business may be temporally affected due to the project implementation. Some of them may have a bad behavior of highly benefitting from the project implementation while expecting more form the compensation.

Mitigation measures:

- Valuation of damaged assets should be done with the certified independent valuer as per the existing regulations and laws.
- Full replacement cost should be used so as to provide fair compensation and the application of market and value of money to be applied.
- The compensation exercise has to involve different project partners including WASAC, Local population and local leaders, district etc.

➤ **Conflicts among workers and the local population of the project area**

Even though the project will try to employ local population, projects involving major works include, often, the potential for the occurrence of social conflicts between workers who may temporarily settle in the local and community residents. Such behaviors are generally related to socially unacceptable behavior according to local social standards and can be seen, for example, cases of drunkenness and disregard/lack of respect for local customs. This impact should be considered even though an important part of the manpower to be recruited locally.

Mitigation measures:

- Where possible maximum efforts should be made to recruitment of local population who returns to their homes after work.
- Elaborate and enforce the code of conduct to all project workers
- Punitive measures to be imposed to those not complying with the project regulations

➤ **Injuries or fatalities from improper manual handling**

The most common injuries or illnesses connect to similar projects as a result of manual handling are musculoskeletal disorders in various parts of the body (back, neck, shoulders, or other) and include from sprains and strains to damage to muscles, joints and vessels. Other injuries include cuts, bruises, lacerations and fractures due to unexpected events such as accidents caused by manual handling.

Mitigation measures:

- The entire project should be insured
- The contractor to establish health and safety measures that must be implemented at the project site by all workers.
- Provision of appropriate Personnel Protective Equipment (PPE) to all employees,
- Provide and avail permanent First aid kit at the work site,
- Provide health insurance for all workers as means of health affordability
- Working conditions should respect the requirement of the Law n° 66/2018 of 30/08/2018 regulating labour in Rwanda.
- Measures are taken to oblige workers to wear properly the PPEs and to properly manage generated waste in order to prevent any accidents during the construction works
- The safety plan and measure have to be prepared and enforced at the project site.
- Basic trainings on safety measure to be conducted to the project workers.
- Provide sign boards at the project site in order to prevent accidents and troubles involving site workers

➤ **Traffic congestion and injuries or fatalities**

The project will consist at rehabilitation of existing water pipelines while new pipes will also be constructed. Efforts have been made to design the line routes along the existing roads in the buffer zone of the road. However, at some point the pipelines cross both paved and unpaved roads. During construction period there will be increase in traffic due to moving machineries and vehicle traffic for material supply. This may cause both congestion and accidents.

Mitigation measures

- Prepare traffic management plan before project works
- Rehabilitate of affected structures and infrastructures should be done as soon as possible after project works;
- Inform local population about the planned activities and the inconvenience that may be caused
- Use the traffic signs at the affected sections.
- Provide safety people to guide traffic especially where the works will be undertaken near paved roads

➤ **Work related health issues**

Health related issues are mainly resulted from emission of dust, noise and vibration which can result in possible respiratory irritation, discomfort, or illness to workers and local communities.

Mitigation measures

In addition to the safety measures mentioned above, the following additional measures should be implemented:

- PPE should be provided to workers who are exposed to dust, noise and vibration for a prolonged period.
- Regularly watering the project site, when necessary, especially near business places to suppress dust during construction, use of gas masks and goggles for dusty sections is strongly recommended;
- Enforce the acquiring of medical insurance “mituelle de sante” for all workers as a means of affordability of treatment.
- The safety and sanitation plan will be prepared and implemented, and regular safety education will conduct, in consultation with a district work safety inspector.

➤ **Possible increases of HIV/AIDS and other communicable diseases such Covid -19**

Risk of increase of HIV/AIDS and other Sexually Transmitted Diseases (STD) as well as the increase of other contaminating diseases due to the increase of people from outside of the project zone may arise among workers.

Mitigation measures

- Regular sensitization on ways of HIV/AIDS prevention,
- Regularly enforce the measures of hygiene and workers should be sensitized on the prevention of such diseases.
- Hygiene should be mandatory to the works sites and disciplinary measures should be implied to those not complying.

➤ **Disruption of public utilities such as water supply networks, roads and electrical network etc.**

Water supply network will be rehabilitated or replaced which may cause disruption in water supply. In addition some electricity and communication cables as well as some road crossing sections were observed in the project zones. During construction works, some of these infrastructures are likely to be affected and causing temporarily impacts to the local population. Further, the replacement of transmission pipeline will cause suspension of water distribution.

Mitigation measures

- A well-planned work schedule, including connection between newly installed distribution pipes and existing service pipes, as well as secondary and tertiary distribution pipes, could minimize the water suspension period.
- The contractor will avoid as much as possible to affect these infrastructures by properly planning in advance for the project activities and identify those to be affected and use alternatives
- The quick rehabilitation of affected infrastructures will be done to avoid greater impacts
- Before the excavation works get information from local authorities on the exact location of such utilities when not prior identified
- Inform local residents ahead of time any expected impact on public utilities (such as power cuts etc)
- Where possible and deemed necessary identify new alternatives for water sources and electricity supply when performing project activities

✓ **Child labor, forced labor, discrimination, and abusive dismissal**

The implementation of the present project will necessitate the recruitment of local population. Among the recruited may be identified those that are under the age of employment. Others recruited may be exposed to forced labor and discrimination.

Mitigation measures

- Protect workers' rights and provide work contract to all project employees
- Establish, maintain, and improve the employee–employer relationship;

- Promote compliance with national legal requirements and provide supplemental due diligence requirements where national laws are silent;
- Comply with international Labor Organization, and the UNICEF Convention on the Rights of the Child, where national laws do not provide equivalent protection;
- Protect the workforce from inequality, social exclusion, child labor, and forced labor

➤ **Adverse impacts on physical environment**

The project of Improvement of water Supply services in North- central will be implemented in urban area with the topographic conditions characterized by a terrain of small step slopes. At some areas the construction activities will contribute to the loss of the topsoil combined with soil compaction which may result in reduced capacity of the ground to retain water and increase surface water run-off especially during periods of rainfall. The construction around wetland will also cause water and soil pollution from drilling muds, borrow pits and quarries; as well as disturbance/loss of vegetation. The identified physical impacts to the project implementation are described above and their proposed mitigation measures:

➤ **Impacts on soil**

Soil damage includes compaction and disturbance of the soil profile. Soil erosion involves transport of the soil down slope by running water or, more rarely but still a significant factor, away from the site by wind. Soil compaction and disturbance, usually accompanied by vegetation and litter layer damage, are preconditions for accelerated soil erosion. Most soil damage occurs as the result of movement of machine, trucking, and to some extent through felling of trees during excavation works. Soil erosion depends not only on soil damage but also soil type, rainfall, and angle and length of slope. Soil erosion is mostly anticipated on steep slopes of Gisozi and Batsinda and soil contamination may occur from the spillage of oils and lubricants during construction and operation activities.

Mitigation measures

Among the mitigation measure include:

- Setting safety fence at bottom of the slope to avoid erosion
- Setting monorail to carry the dug soil out of the site.
- Manual-excavating and carrying the dug soil.
- Properly manage the excavated soil at the project sites

➤ **Changes of landscape - Visual impact**

Impacts on the physical environment will consist of landscape transformation causing visual impacts. These impacts will remain during operational phase. Temporary physical impacts will occur during the construction period at places selected to store construction material and pipes. However, the project could not change the landscape significantly. Some trees would be cut down and, in this case, trees of the same species would be planted.

Mitigation measures

- To clear only the area demarcated for project activities especially at the water reservoirs and elevated tanks
- Rehabilitate the damaged areas through trees plantation and landscaping

➤ **Noise and vibration emissions**

Noise will be caused by construction traffic transporting construction materials/workers to and from the site and from the construction sites. These would be also generated by the operation of heavy machines, heavy trucks, right of way preparation, soil stripping, trenching, welding and laying and backfilling activities. However, the impacts are limited as the construction works will be for a short period and only to be done during normal working hours.

Mitigation measures

- Limitation of heavy works in daytime 7am to 5pm;
- Provision of PPE to workers;
- If necessary, local community should be given notice of intended noisy activities so as to reduce degree of annoyances.
- Workers operating equipment that generates noise should be equipped with noise protection gear.
- A regular monitoring of noise will be conducted as to check the compliance of noise pollution with permissible level.
- As most of the expected noise is from vehicles, truck and machines, the contractor will be requested to use equipment in good condition and certificate of technical control will be required
- Equipment with heavy noise and vibration will be restricted on normal working hours, from 7am to 5 pm,
- Facing sites should be mandatory to limit noise emitted especially at water reservoirs areas.

➤ **Air Quality / dust release and nuisance**

Exposed surface with loosened topsoil contributes to the increase of dust raised in the project area especially during sites preparation and pipes removal. Dust will also be raised by haulage vehicles transporting materials to and from the sites of the project. The dust raised during construction can pose a nuisance to workers although the impact of this is considered relatively small and localized. This situation will be worse during the dry season and during the afternoons when the winds are most prevalent. Dust particulate matters may cause hazardous to the nearby project sites and residents.

Mitigation measures

- Exposed ground should be wetted when need be in a manner that effectively keeps down the dust.
- Exposed construction sites will be fenced with wind brokers to avoid dust emissions to neighboring areas especially in residential and commercial areas.
- Workers on the site should be issued with dust masks during dry and windy conditions.
- Most of the emissions are expected to come from vehicles, tractors, and machines to be used. The contractor will be required to present technical control certificate for all vehicles, machines, and trucks. The certificates are those issued by National police / motorbike inspection department.
- A regular monitoring on ambient air will be conducted to check the level of air pollution. In the case the level exceeds the minimum permissible air pollution level, the developer will be required to reduce his emissions.

➤ **Generation of solid waste**

Solid waste generated during project activities such as site preparations, construction works and pipes replacement would include several types of solid wastes that include off cut vegetation, typical construction waste, soil, metals, pipes leftovers and papers etc. These wastes would negatively impact the project sites and surrounding environment if not properly managed and disposed of accordingly.

Mitigation measures

- A site waste management plan should be prepared by the contractor prior to project commencement.
- Contractor to hire an approved waste collector of the project area
- Temporally waste deposit and storage area should be designated and marked.
- All generated waste to be transported at Nduba landfill depending on their types.
- Waste recycling would be the best option whereby construction recycled soil and concrete debris can be used as roadbed materials in different areas of the project interventions.

➤ **Impacts on quarries and burrow pits**

It is anticipated that the project will necessitate the use of construction material such as sand and stones. Therefore, it is appropriately to consider the environmental implications in selection of quarry sources since poor operations of quarry sites would create environmental problems and degradation in general.

Mitigation measures

- All construction materials must be outsourced from approved and licensed quarries.
- Borrow pits areas shall preferably be selected from high land and/or waste land. Although locations of the borrow areas are negotiated between contractor and local suppliers of construction materials it is recommended that all quarries for the sources of construction materials be approved and have the EIA certificate issued by competent authority as per the environmental regulations.

➤ **Contamination by oil spillage**

During the construction activities it is expected that machinery including trucks, bulldozer and other equipment that require re-fueling, maintenance works, and repair works which in effect result in oil spillage. At point sources, contamination of soils and run-off ending in the receiving bodies could cause water quality degradation.

Mitigation measures

- Re-fueling, oil change, maintenance works, repair works shall be allocated at a restricted area and far from water body and marshland and preferably positioned in an area that have no adverse effects if degraded.
- Water quality will be regularly monitored to compare the baseline and monitoring results. If during monitoring process water is contaminated, then additional correctional measures will be taken.

➤ **Loss of flora and fauna**

Some crops and trees established in the project area will have to be cleared where the pipeline and water reservoirs will be installed and constructed. Luckily, there is no plant or animal species of special attention or conservation purpose that was surveyed and that will be affected.

Mitigation measures

- This impact is unavoidable and will be mitigated through compensation measures which include fair compensation of affected crops and trees.
- The site clearance should be only done on an area demarcated for construction;
- The landscaping through rehabilitation and re-planting of affected trees is recommended after project construction works.

➤ **Disturbance of ecosystems habitats**

The clearing of existing vegetation at the project sites will result in the complete loss of associated ecological habitats and their fauna, within the project sites. Noise, vibrations, and intrusive activities related to construction works will tend to scare away living biota remaining on the site after vegetation clearance.

Mitigation measures

- Clearing and construction activity should be restricted within the area of the project development.
- Construction works should be limited at only project areas
- Construction works to be done only at daytime

➤ **Vandalism of water supply infrastructure**

With the construction of the reservoirs, several infrastructures will be made from metal, steel and concrete and the replacement of the pipes shall generate pipes leftovers and some people may be involved in vandalism of that equipment's.

Mitigation measures

- Provide permanent guard at the project sites
- Sensitization of local communities on the project ownership and protection
- Use community policing as a means of ascertaining security to avoid vandalism.
- Regulations on penalties to perpetrators convicted of vandalism are necessary.
- Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism.

7.2.3 Negative impacts associated with the installation transmission line between RDB Junction and Remera Golf 8

Though this portion of water supply system is not part of JICA grant, it was agreed that impacts associated with planned works will be assessed under this EIA and WASAC will mobilize funds to construct this pipeline. Therefore, this section presents negative impacts associated with the installation of transmission pipeline between RDB Junction and Remera Golf 8.

➤ **Water pollution at Nyabisindu bridge**

The project will cross the Nyabisindu-Nyarutarama Bridge. The excavation and installation of project facilities may contribute to the nearby water pollution.

Mitigation measures

- Avoid at the maximum the use of machinery such as excavators instead manpower.
- Consider establishing measure that prevent pollution of existing water such as proper location of construction material
- On site adequate sanitary facilities have to be provided far from the water body and be well maintained
- Staff to be regularly sensitized on the best way of waste management at the site
- Avoid any form of dumping nearby the wetland
- All unused materials to be properly handled
- Regular monitoring of potential sources of water pollution at the site

➤ **Risk of alteration of hydrology and wetland at Nyabisindu**

Working nearby the water course may have impacts on the hydrological features of the areas. However, considering the project nature and site characteristics these anticipated impact are minor and attenuated by the proposed mitigation measures

Mitigation measures

- Watercourse crossing must be designed in a way that avoids any disturbance of normal water flowing that shall affect the stability and long-term performance of riverbanks and flood defenses

- Consider the seasonal sensitivity of ecological resources when planning river crossings;
- Use appropriate thecnology that do not alter with the hydrological aspect of the area.

➤ **Disturbance and mortality of terrestrial fauna**

Even though there are no terrestrial fauna that have been identified during the project survey, it is anticipated that some of them may occur especially nearby the river banks of the project areas. Mitigation measure to protect any of the fauna finds at the project sites include:

Mitigation measures

- Restrict construction activities do the daylight;
- Limit the area earmarked for site clearance
- Inspect the area to be cleared for any terrestrial fauna before bush clearing and digging;
- Protect any trench left overnight with a net fence to block fauna from being trapped inside;
- Capture and release fauna away from the direct influence zone (including species trapped in the trenches if any)

➤ **Work health issues**

Health related issues are mainly resulted from emission of dust, noise and vibration which can result in possible respiratory irritation, discomfort, or illness to workers and local communities.

Mitigation measures

- PPE should be provided to workers who are exposed to dust, noise and vibration for a prolonged period.
- Regularly watering the project site, when necessary, especially near residential and business places to suppress dust during construction.
- Enforce the acquiring of medical insurance “mituelle de sante” for all workers as a means of affordability of treatment.
- Ensure all employees have health insurance to afford health facilities

➤ **Possible injuries and incidents for the students of the nearby school (Good Shepherd Nursery and Primary School)**

The project activities will be carried out nearby the good shepherd nursery and primary school located in nyabisundu areas. Project activities should cause negative impacts to the schools users and students.

Mitigation measures

- Proper demarcate the excavated trenches by warning tape
- Provide day guard in charge of student management especially during the project works
- Conduct awareness campaign related to safety at the school
- Liaise with the school management for proper management of the student especially during project works.
- Non authorize personnel/ student should not enter the working site

➤ **Injuries or fatalities from improper manual handling**

The improper handling of the project materials may cause some common injuries or illnesses that include musculoskeletal disorders in various parts of the body such as back, neck, shoulders and others and include from sprains and strains to damage to muscles, joints and vessels. Other injuries include cuts, bruises, lacerations and fractures due to unexpected events such as accidents caused by manual handling.

Mitigation measures:

- The project should be totally insured for any kind of incident or accident.
- The contractor should establish health and safety measures that must be implemented at the project site by all workers.
- Provision of appropriate Personnel Protective Equipment (PPE) to all employees,
- Provide and avail permanent First Aid Kit at the work site as means of emergency aid. ,
- All workers project workers shall have health insurance as means of health affordability.
- Conduct regular awareness campaign on safety measures and to all project workers.

➤ **Air and noise pollution**

Project implementation shall generate dusts that may contribute to air pollution.

Mitigation measures

- The machinery and automobiles to be used on site should have certification of good working conditions from “National Automobile inspection centre” to reduce noise or exhaust fumes emissions.

- Ensure routine maintenance, repair of trucks and machines.
- Spray water when deemed necessary to reduce dust in the ambient environment.
- Construction sites to be fenced by dust barriers and suppressors especially at good school.
- Provision of protective equipment to all workers
- Topsoil to be stored separately from subsoil.
- After completion of works, the topsoil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas.

➤ **Nuisance of noise from construction activities**

Different activities of the project may also cause disturbances at the project areas through noise emissions such as excavation etc.

Mitigation measures

- The Contractor shall restrict any of his operations, which result in undue noise disturbance between 7h00 am and 5h00 pm (e.g., blasting activities and operation of heavy machinery and construction traffic)
- Where not possible if any blasting activities are to be conducted prior notice shall be given to the concerns to suppress the impacts. Notice should indicate the location time and possible nuisance that the activities shall cause.
- Restrict construction and operation of heavy machines to daylight;
- Ensure noise emissions are kept down and meet the existing noise emission standards depending on sites of works.
- Reduce truck movements by careful planning of needs of delivery of construction materials.
- Regular and effective equipment maintenance in order to ensure all machinery is in good working order and use does not generate excess noise

➤ **Sediment load and disturbance of natural soil structure, mixing of layers**

Project activities such as excavations and backfilling may have impacts on soil while creating soil waste at the project sites. Proper management of the excavated soil is mandatory, and these include

Mitigation measures

- Proper handling and management of generated soil waste at site.
- Topsoil to be stored separately from subsoil and be re-used in the future for further project activities.
- After completion of works, the topsoil must be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas.
- Compaction of soil to be minimized by careful stockpiling and separation of top and sub-soils. All excavated material to be carefully re-used, replaced and/or planted up with grass and other indigenous seedlings.
- All earthworks for site preparation and levelling shall be carried out in a proper designated manner and must be done by the experienced personnel
- Wastes produced must be disposed of in a designated area far from water body

➤ **Disturbance of traffic**

As the project will be carried out in Kigali city nearby the existing roads with regular traffic, the project may cause disturbance to the normal traffic of the areas of intervention. To avoid such impacts some mitigation measures are put in place.

Mitigation measures

- Provide appropriate equipment and manpower to complete the work in short time especially for the section that cross the roads
- Work closely with the national Police / traffic unit to control and manage traffic at the affected sites
- Use alternative road while conducting project activities that may cause incident to the road users.
- Appoint staff in charge of traffic management
- Use of appropriate traffic signpost
- Rehabilitation of affected section
- Excavation and backfilling of the affected section during evening hours where there is no heavy traffic

➤ **Influx of job seekers**

The nearby project resident may have intention and high expectations of getting employed by the project. Though, the project will create employment opportunities, the jobs will be limited. Therefore, the creation of not enough jobs will create frustration on part of the local people and conflicts can occur between those employed and non employed.

Mitigation measures

- Disclosure the exact number of jobs available for the project; the job application period and the remuneration to be allocated for each type of work before project implementation Local persons should be prioritized when allocating jobs
- Recruitment should be done in a clear and fair process.
- Women should equally benefit as men from job recruitments opportunities
- Involve local leaders in local employee's recruitment process;
- Recruitment should consider both male and female.
- Avail and sign work contract before project works

➤ **Resettlement implications**

Distribution pipes require limited space and do not involve permanent land acquisition. However, some privately owned structures and assets may be partially affected by project activities such as crops and trees, ornamental trees, movable kiosks etc.

Mitigation measures:

- Fair compensation to those affected will be conducted before project implementations.
- Involve local authorities in assets inventory and ownership testimonies.
- Affected persons shall be prioritized when allocating jobs.
- Land easement should be secured through negotiation with local community prior to the project activities.

➤ **Conflicts among workers and the local population of the project area**

Even though the project will try to employ local population, projects involving major works include, often, the potential for the occurrence of social conflicts between workers who may temporarily settle in the local and community residents.

Such behaviors are generally related to socially unacceptable behavior according to local social standards and can be seen, for example, cases of drunkenness and disregard/lack of respect for local customs. This impact should be considered even though an important part of the manpower to be recruited locally.

Mitigation measures:

- Where possible maximum efforts should be made to recruitment of local population who returns to their homes after work.
- Elaborate and enforce the code of conduct to all project workers
- Punitive measures to be imposed to those not complying with the project regulations

➤ **Child labour, forced labour and discrimination**

The implementation of the present project will necessitate the recruitment of local population. Among the recruited personnel may be identified those that are under the age of employment as per the labor Law in Rwanda. Others recruited may be exposed to forced labour and discrimination.

Mitigation measures

- Record all site workers by sex and age
- Protect workers' rights and provide work contract to all project employees
- Establish, maintain, and improve the employee-employer relationship;
- Promote compliance with national legal requirements and provide supplemental due diligence requirements where national laws are silent;
- Protect the workforce from inequality, social exclusion, child labour, and forced labour.

➤ **Disruption of public utilities such as water supply networks, roads and electrical network etc.**

Water supply network will be rehabilitated or replaced which may cause disruption in water supply. In addition some electricity and communication cables as well as some road crossing sections were observed in the project zones. During construction works, some of these infrastructures are likely to be affected and causing temporary impacts to the local population. Further, the replacement of transmission pipeline will cause suspension of water distribution.

Mitigation measures

- A well-planned work schedule, including connection between newly installed distribution pipes and existing service pipes, as well as secondary and tertiary distribution pipes, could minimize the water suspension period.
- The contractor will avoid as much as possible to affect these infrastructures by properly planning in advance for the project activities and identify those to be affected and use alternatives

- The quick rehabilitation of affected infrastructures will be done to avoid greater impacts
- Before the excavation works get information from local authorities on the exact location of such utilities when not prior identified
- Inform local residents ahead of time any expected impact on public utilities (such as power cuts etc)
- Where possible and deemed necessary identify new alternatives for water sources and electricity supply when performing project activities

➤ **Risk of increase of HIV/AIDS and other Sexually Transmitted Diseases and increasing of COVID- 19 Contamination**

Risk of increase of HIV/AIDS and other Sexually Transmitted Diseases (STD) as well as the increase of other contaminating diseases due to the increase of people from outside of the project zone may arise among workers.

Mitigation measures

- Providing surveillance and active screening and treatment of workers
- Providing daily health and hygiene induction talk to prevent such diseases
- Providing basic health services facilities at the project sites
- Use of Personal Protective Equipment
- Enforce the health measures established by competent authorities to fight such diseases (wear of protective mask, regular hand washing, keeping distance among workers etc).

➤ **Possible soil erosion on step slop**

During the excavation works some of the soil erosion may happen in case the excavated soil is not well managed. The following are mitigation measures to avoid any soil erosion that may happen and caused by the project activities.

Mitigation measures

- Preferably all earthworks for site shall be carried out during dry season. The tendering plan should take into consideration the weather conditions of the project works
- Storm water drainage system shall be installed on sites susceptible to erosion.
- Soil erosion barriers have to be installed on site.
- Restrict clearing works to only project sites and at the minimum possible
- Only use appropriate machinery at each type of activity in order to minimize the risks;
- Remove and stockpile topsoil, sub-soils and any parent material separately.
- Where necessary construct water ways with check dams in order to reduce sediments
- After completion of works, the top soil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas.

➤ **Vandalism of project infrastructure**

With the coming of the project some people may be involved in vandalism of project equipment's.

Mitigation measures

- Provide permanent guard at the project materials storage sites
- Sensitization of local communities on the project ownership and protection
- Use community policing as a means of ascertaining security to avoid vandalism.
- Regulations on penalties to perpetrators convicted of vandalism are necessary.
- Punitive actions towards perpetrators by the authorities will facilitate compliance by the locals thereby avoiding vandalism.

8. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

The Environmental Management and Monitoring Plan (EMMP) is divided into two parts one is the Environmental Management Plan and the other is the Environmental Monitoring Plan. The Environmental Management Plan translates the proposed mitigation measures into actions and provides management measures to be undertaken during the construction and operational phases of the project. The Environmental Monitoring Plan details monitoring activities and measures to be undertaken during construction and operation phases of the project.

WASAC Ltd should designate an environmental officer who will make day to day the follow up of the implementation of the EMMP as well supervise and liaise with project stakeholders. The contractor will also require having an Environmental, Social Health and Safety officer to follow up the implementation of Environmental Management Plan.

8.1 Environmental Management Plan (EMP)

The table below (Table 30) presents the EMP and provides environmental adverse impacts of the project implementation, the proposed mitigation measures, responsible and the responsible for monitoring.

Table 30: Environmental Management Plan for block system- reservoirs and installation/replacement of distribution pipes

Environmental /social impacts	Proposed mitigation measures	Responsible	Monitoring	Estimated cost (USD)
Influx of job seekers	<ul style="list-style-type: none"> - Disclosure the number of available jobs and required personnel for the project disclosure the job application period and deadline before project implementation. - The available job opportunities places should be made known to the interested parties through local authorities - Involve local authorities in local manpower recruitment process; - The employment opportunities to consider both male and female without any segregation. <p>Residents to be prioritized in the recruitment process.</p>	Contractor	WASAC Ltd/Local authorities	No cost required
Land acquisition	<ul style="list-style-type: none"> - Fair compensation of land from owners should be done before project activities - Land should be acquired from only land owners with no intermediaries - Secure the required land from competent authorities especially for the land under public domain before project activities. - Involve and work with district/ Sectors authorities to better solve any conflict that may arise connect to right of way 	Property valuer WASAC Ltd /District/ local authorities	MINECOFIN WASAC Ltd /District	Under ARAP budget
High expectations of getting great compensation	<ul style="list-style-type: none"> - Compensation mechanisms should be implemented in all justifiable cases. - Involve PAPs in all steps required for the fair compensation as stipulated in the expropriation laws and regulations. - Establish and make operational conflicts resolutions committees. 	Contractor/WASAC Ltd / Local Authorities	WASAC Ltd/ Local authorities/ District	No cost required
Loss of individual owned crops, trees and other assets	<ul style="list-style-type: none"> - Valuation of damaged assets to be conducted by independent valuer. - Valuation of damaged properties should be fair and done according to the existing law related to expropriation in public interest. - Fair compensation should be done prior to the project activities - Compensation to be done only at the property's owners without intermediaries 	WASAC Ltd/ Independent valuer	WASAC Ltd/ Local authorities/MINECOFIN	Expropriation budget

Environmental /social impacts	Proposed mitigation measures	Responsible	Monitoring	Estimated cost (USD)
Disruption of public utilities especially water supply networks, electrical network and traffic etc	<ul style="list-style-type: none"> - A well-planned work schedule, including connection between newly installed distribution pipes and existing service pipes, as well as secondary and tertiary distribution pipes, could minimize the water suspension period. - The contractor will avoid as much as possible to affect these infrastructures by properly planning in advance for the project activities and identify those to be affected and use alternatives - The quick rehabilitation of affected infrastructures will be done to avoid greater impacts - Before the excavation works get information from local authorities on the exact location of such utilities when not prior identified - Inform local residents ahead of time any expected impact on public utilities (such as power cuts etc) - Where possible and deemed necessary identify new alternatives for water sources and electricity supply when performing project activities 	Contractor	WASAC Ltd/ REG-EUCL/ RURA/RTDA/ Local authorities	No cost required
Incident and accident at excavated trenches	<ul style="list-style-type: none"> - Demarcate all hazardous trenches with signs posts and warning tapes - Conduct daily morning briefs related to safety measures for all workers - Only authorized personnel to enter the working areas - Provision of Personnel Protective Equipment to all project workers - Sensitization of workers on safety measures - Provide first aid kit on the site - Ensure all employees have health insurance 	Contractor/ site workers	WASAC Ltd//Local authorities	5,000
Loss of vegetation cover and plant diversity	<ul style="list-style-type: none"> - Where possible align the excavations to follow existing parallel water pipeline in order to minimize the loss of vegetation cover - During the site clearance and pipeline excavations, the removal of vegetation should be restricted to the minimum necessary width - Create contour drains during construction works - Stabilize soil with grasses and trees at the areas susceptible to erosion 	Contractor	REMA/WASAC Ltd	1,800
Soil erosion and soil compaction	<ul style="list-style-type: none"> - Restrict clearing works to only project sites and at the minimum possible - Only use appropriate machinery at each type of activity in order to minimize the risks; - Remove and stockpile topsoil, sub-soils and any parent material separately. - Where necessary construct water ways with check dams in order to reduce sediments - After completion of works, the top soil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas. - All earthworks for site preparation and levelling have to be carried out during the dry season - Storm water drainage system has to be installed on sites susceptible to erosion. - Soil erosion barriers have to be installed on site. 	Contractor	WASAC Ltd/ REMA	Under construction budget
Disturbance of natural soil structure and mixing of layers	<ul style="list-style-type: none"> - Top soil should be stored separately from subsoil and be re-used in backfilling the excavated trenches. - Compaction of soil should be minimized by careful stockpiling and separation of top and sub-soils. 	Contractor	WASAC Ltd/ REMA	No cost required

Environmental /social impacts	Proposed mitigation measures	Responsible	Monitoring	Estimated cost (USD)
Disturbance and mortality of terrestrial fauna	<ul style="list-style-type: none"> - Restrict construction activities do the daylight; - Inspect the area to be cleared for any terrestrial fauna before bush clearing and digging; - Restrict construction activities and operation machinery to daylight, when most wildlife is active and can react to noise. 	Contractor	WASAC Ltd/REMA	7,00
Noise pollution	<ul style="list-style-type: none"> - Construction activities shall be restricted to normal working hours (7h00-17h00) to prevent noise for neighbours at night - The machinery and automobiles to be used on site should have certification of good working conditions from "National Automobile inspection centre" in order to reduce noise or exhaust fumes emissions. - Ensure routine maintenance, repair of trucks and machines. - Provision of protective equipment to all site workers. - The contractor to inform the general public any activity that shall emit noise prior to execution in order to minimize the impacts (e.g. blasting activities and operation of heavy machinery and construction traffic). - Restrict construction and operation of heavy machines to daylight; - Ensure noise emissions are kept within the Rwanda standards; - Reduce needed truck movements by careful planning of needs of delivery of construction materials. 	contractor	WASAC Ltd/REMA	2,500
Land degradation	<ul style="list-style-type: none"> - All earthworks for site preparation and levelling shall be carried out in a proper designated way and to be executed by the qualified engineers. - Excavated soil shall be well managed and re-used to backfilling the excavated trenches. - The unused soil and considered as waste shall be deposited in a well designated area to be approved in close collaboration with Gasabo District. 	Contractor	WASAC Ltd/ Gasabo district/REMA/Cok	1,400
Child labour, forced labour and discrimination	<ul style="list-style-type: none"> - All site workers to be recorded by sex and ages - Protect the workforce from inequality, social exclusion, child labour, and forced labour; - Promote compliance with national legal requirements and provide supplemental due diligence requirements where national laws are silent; - Establish, maintain, and improve the employee–employer relationship 	Contractor	WASAC Ltd/ MIFOTRA/ Cok /District/ local authorities	No cost required
Conflicts among workers and local population	<ul style="list-style-type: none"> - Local population should be prioritized when recutting for project personnel and manpower. - Keeping a good relationship with local communities - Establishment and implementation of set of rules for the workplace 	Contractor	WASAC Ltd	No cost required
Fugitive dust generated during excavation works and air pollution	<ul style="list-style-type: none"> - Spray water when deemed necessary in order to reduce the dust. - Compaction of soil to be minimized by careful stockpiling and separation of top and sub-soils. 	Contractor	WASAC Ltd/REMA	2,000
Disturbance of natural soil structure, mixing of layers	<ul style="list-style-type: none"> - Topsoil to be stored separately from subsoil. - After completion of works, the topsoil has to be spread over some areas which can be partially restored in order to facilitate plant regeneration. - Compaction of soil to be minimized by careful stockpiling and separation of top and sub-soils. 	Contractor	WASAC Ltd/REMA	1,000
Pollution of surface and ground water	<ul style="list-style-type: none"> - Provide onsite adequate sanitary facilities - All unused materials to be properly handled at the construction sites - Work with the accredited companies in waste management and handling activities 	Contractor	WASAC Ltd/REMA/RWB	Under construction budget

Environmental /social impacts	Proposed mitigation measures	Responsible	Monitoring	Estimated cost (USD)
Sediment load	<ul style="list-style-type: none"> - Proper handling and management of generated of waste on site. - All excavated material to be carefully re-used, replaced and/or planted up with grass and other indigenous seedlings. 	Contractor	WASAC Ltd/ RWB/ REMA/ Cok/ district	Constructi on budget
Disturbance of traffic	<ul style="list-style-type: none"> - Appoint staff in charge of traffic management - Use of appropriate traffic signpost at the working areas - Excavation and backfilling of the affected section during evening hours where there is no heavy traffic 	Contractor	WASAC Ltd/ Traffic police/ RTDA	2,000
Vibrations and noise pollution	<ul style="list-style-type: none"> - To avoid noise and vibrations, construction activities shall be restricted to normal working hours (7h00-17h00) to prevent impacts to neighbors at night. - The machinery and automobiles for the project shall have certification of good working conditions from "National Automobile Inspection centre" to reduce noise or exhaust fumes emissions. - All workers should be equipped with protective equipment including protective masks. - Ensure noise emissions are kept down and meet the existing noise emission standards depending on sites of works.; 	Contractor	WASAC Ltd/REMA	2,000
Injuries and accidents during construction works	<ul style="list-style-type: none"> - All workers shall be equipped with Personnel Protective Equipment - Ensure that all employees have health insurance to afford health facilities - Conduct daily morning briefs related to safety measures for all workers. - The safety and sanitation plan is formulated and safety trainings are provided for workers 	Contractor	WASAC Ltd/Local authorities	3,000
Abuse of drugs and use of alcohol	<ul style="list-style-type: none"> - Avail free of charge potable and safe drinking water for all workers. - Avoid any kind of use of alcohol and other drugs at the project sites. 	Contractor/site workers	WASAC Ltd/ local authorities/ RIB	No cost required
Poor solid waste management	<ul style="list-style-type: none"> - On site adequate sanitary facilities have shall be provided at the project sites - Appropriate waste management mechanisms shall be imposed at the project sites. - All unused materials shall be properly handled - Storage sites shall follow the appropriate regulations related to Waste Management. - No materials storages shall be located nearby water body - Contractor shall regularly monitor water pollution sources at the project sites - Contractor shall maximize efforts to avoid oil spillages at the construction sites 	Contractor	WASAC Ltd/ REMA/ RWB	No cost required
Sediment load	<ul style="list-style-type: none"> - All excavated soil shall be properly handled and managed at the project sites to avoid any incident. - All excavated soil shall be carefully re-used to backfill the excavated trenches - The unused soil shall be dumped at the approved site selected in close collaboration with Gasabo District. 	Contractor	WASAC Ltd/ RWB/ REMA	No cost required
Gender based violence and sexual Exploitation and Abuse (GBV/SEA)	<ul style="list-style-type: none"> - Preparation and implementation workers Code of conduct - Conduct GBV/SEA awareness among all workers - 	Contractor	WASAC Ltd/ Districts/ Isange One Stop Center	800

Environmental /social impacts	Proposed mitigation measures	Responsible	Monitoring	Estimated cost (USD)
General occupational health and Safety (OHS)	<ul style="list-style-type: none"> - Contractor shall ensure that all employees have health insurance as means of health care affordability; - Contractor shall provide personal protective equipment (PPEs) to all project workers and visitors. - Avail permanent first aid kit at the project sites - Avail an Environmental and safety officer at the site to oversee environmental management, social concerns and the implementation of environmental policies and regulations; - Install safety and warning signage as appropriate - Appoint ESHS Manager to assist with sampling, monitoring and daily environmental compliance; - Provide environmental and health induction talks to all employees. 	Contractor	REMA/ WASAC Ltd/Districts	2,000
Total				23,500

Table 31: Environmental Management Plan for transmission pipeline between RDB Junction and Remera Golf 8

Environmental/ social impacts	Proposed mitigation measure	Responsible	Monitoring responsibilities	Estimated cost (USD)
Water pollution at the Nyabisindu bridge	<ul style="list-style-type: none"> - Avoid at the maximum the use of polluting machinery at the site. - On site adequate sanitary facilities must be provided far from the water body and be well maintained - Staff to be regularly sensitized on the best way of waste management at the site. - Avoid any form of dumping nearby the wetland - All unused materials to be properly handled - Consider establishing measure that prevent pollution of existing water such as proper location of construction materials - Regular monitoring of potential sources of water pollution at the site 	Contractor	WASAC Ltd/ REMA/ RWB	No cost required
Risk of alteration of hydrology and wetland at Nyabisindu	<ul style="list-style-type: none"> - Watercourse crossing must be designed in a way that avoids any disturbance of normal water flowing that shall affect the stability and long-term performance of riverbanks and flood defenses; - Consider the seasonal sensitivity of ecological resources when planning river crossings; etc. 	Contractor	REMA/ RWB/ WASAC Ltd	No cost required
Disturbance and mortality of terrestrial fauna	<ul style="list-style-type: none"> - Restrict construction activities do the daylight; - Limit the area earmarked for site clearance - Inspect the area to be cleared for any terrestrial fauna before bush clearing and digging; - Protect any trench left overnight with a net fence to block fauna from being trapped inside; - Capture and release fauna away from the direct influence zone (including species trapped in the trenches if any) 	Contractor	WASAC Ltd/ REMA/ CoK	5,00
Injuries and accidents of workers	<ul style="list-style-type: none"> - Provision of Personnel Protective Equipment to all staff - Sensitization of workers on safety measures - Provide first aid kit at the site - Ensure all employees have health insurance to afford health facilities 	Contractor	WASAC Ltd/Local authorities	1,000
Possible injuries and incidents for the students of the nearby school (Good Shepherd Nursery and Primary School)	<ul style="list-style-type: none"> - Proper demarcate the excavated trenched by waring tap - Provide day guard in charge of student management especially during the project works - Conduct awareness campaign related to safety at the school - Liaise with the school management for proper management of the student especially during project works. - Non authorize personnel/ student should not enter the working site 	Contractor/ students at the school	WASAC Ltd/ school manager/ local authorities/ Cok	2,000

Environmental/ social impacts	Proposed mitigation measure	Responsible	Monitoring responsibilities	Estimated cost (USD)
Air and noise pollution	<ul style="list-style-type: none"> - Construction activities shall be restricted to normal working hours (7h00-17h00) to prevent noise for neighbors - The machinery and automobiles to be used on site should have certification of good working conditions from "National Automobile inspection centre" in order to reduce noise or exhaust fumes emissions. - Ensure routine maintenance, repair of trucks and machines. - Spray water when deemed necessary in order to reduce dust in the ambient environment. - Regularly watering when clearing land to reduce dust - Construction sites to be fenced by dust barriers and suppressors especially at the school. - Provision of protective equipment to all workers. 	Contractor	WASAC Ltd/ REMA / CoK/ Local authorities/ district	1,700
Fugitive dust generated during excavation works	<ul style="list-style-type: none"> - Wetting the surface when deemed necessary during construction - Top soil to be stored separately from subsoil. - After completion of works, the top soil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas. - Compaction of soil to be minimized by careful stockpiling and separation of top and sub-soils. 	Contractor	WASAC Ltd/ REMA/ Local authorities	Under construction budget
Nuisance of noise from construction activities	<ul style="list-style-type: none"> - The Contractor shall restrict any of his operations, which result in undue noise disturbance between 7h00 am and 5h00 pm hour (e.g. blasting activities and operation of heavy machinery and construction traffic) - Where not possible if any blasting activities are to be conducted near the school and residential areas, prior notice shall be given to the concerns to suppress the impacts. Notice should indicate the location time and possible nuisance that the activities shall cause - Restrict construction and operation of heavy machines to daylight; - Ensure noise emissions are kept down and meet the existing noise emission standards depending on sites of works. - Reduce truck movements by careful planning of needs of delivery of construction materials. - Regular and effective equipment maintenance in order to ensure all machinery is in good working order and use does not generate excess noise. 	Contractor	WASAC Ltd/ Local authorities/ CoK	No cost required
Disturbance of natural soil structure, mixing of layers	<ul style="list-style-type: none"> - Top soil to be stored separately from subsoil and be re-used in the future for further project activities. - After completion of works, the top soil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas. - Compaction of soil to be minimized by careful stockpiling and separation of top and sub-soils. 	Contractor	WASAC Ltd/ REMA	No cost required
Sediment load	<ul style="list-style-type: none"> - Proper handling and management of generated waste on site. - All excavated material to be carefully re-used, replaced and/or planted up with grass and other indigenous seedlings. 	Contractor	WASAC Ltd/ RWB/ REMA	No cost required
Land degradation at the source of local construction materials	<ul style="list-style-type: none"> - Purchase of all raw materials and construction materials has to be done from approved quarries and gravel pits. - Regular inspection of the source of construction materials and the contractor to outsource construction materials from the approved quarry sites 	Contractor	WASAC Ltd/ local authorities/ REMA	No cost required
Disturbance of natural soil structure, mixing of layers	<ul style="list-style-type: none"> - Top soil to be stored separately from subsoil and be re-used in the future for further project activities. - After completion of works, the top soil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas. - Compaction of soil to be minimized by careful stockpiling and separation of top and sub-soils. 	Contractor	WASAC Ltd/ REMA	No cost required
Land degradation	<ul style="list-style-type: none"> - All earthworks for site preparation and levelling shall be carried out in a proper designated manner and have to be done by the qualified engineers. - Wastes produced have to be disposed of in a designated area far from water body 	Contractor	WASAC Ltd/ RLUMA/ Local authorities	500

Environmental/ social impacts	Proposed mitigation measure	Responsible	Monitoring responsibilities	Estimated cost (USD)
Disturbance of traffic	<ul style="list-style-type: none"> - Provide appropriate equipment and manpower in order to complete the work in short time especially for the section that cross the roads - Appoint staff in charge of traffic management - Use of appropriate traffic sign post - Rehabilitation of affected section - Excavation and backfilling of the affected section during evening hours where there is no heavy traffic 	Contractor	WASAC Ltd/ Local authorities / Traffic police/ RTDA	Under construction budget
Influx of job seekers	<ul style="list-style-type: none"> - Disclosure the exact number of jobs available for the project; the job application period and the remuneration to be allocated for each type of work before project implementation - Involve local leaders in local employee's recruitment process; - Recruitment should consider both male and female. - Avail and sign work contract before project works 	Contractor	WASAC Ltd/Local authorities	No cost required
Child labour, forced labour and discrimination	<ul style="list-style-type: none"> - Record all site workers by sex and age - Establish, maintain, and improve the employee–employer relationship; - Comply with international Labour Organization, and the UNICEF Convention on the Rights of the Child, where national laws do not provide equivalent protection; - Protect the workforce from inequality, social exclusion, child labour, and forced labour; 	Contractor	WASAC Ltd/ MIFOTRA	No cost required
High expectations of getting great compensation cost in cases of assets and crops compensation	<ul style="list-style-type: none"> - Expropriation and compensation mechanisms should be implemented in all justifiable cases. - Full involve the PAPs in all steps required for the fair compensation as stipulated in the expropriation laws and regulations. - Establish and make operational conflicts resolutions committees. 	Contractor WASAC Ltd Local Authorities	WASAC Ltd/ Local authorities/ District/ MINECOFIN	No cost required
Disruption of public utilities especially water supply networks, electrical network and traffic etc	<ul style="list-style-type: none"> - A well-planned work schedule, including connection between newly installed distribution pipes and existing service pipes, as well as secondary and tertiary distribution pipes, could minimize the water suspension period. - The contractor will avoid as much as possible to affect these infrastructures by properly planning in advance for the project activities and identify those to be affected and use alternatives - The quick rehabilitation of affected infrastructures will be done to avoid greater impacts - Before the excavation works get information from local authorities on the exact location of such utilities when not prior identified - Inform local residents ahead of time any expected impact on public utilities (such as power cuts etc) - Where possible and deemed necessary identify new alternatives for water sources and electricity supply when performing project activities 	Contractor	WASAC Ltd/ REG-EUCL/ RURA/RTDA/ Local authorities	No cost required
Risk of increase of HIV/AIDS and other Sexually Transmitted Diseases and increasing of COVID-19 Contamination	<ul style="list-style-type: none"> - Providing surveillance and active screening and treatment of workers - Regular checkup of workers on site - Providing health and hygiene training - Providing basic health services facilities at the project sites - Use of Personal Protective Equipment - Enforce the health measures established by competent authorities to fight such diseases (wear of protective mask, regular hand washing, keeping distance among workers etc). 	Contractor	WASAC Ltd/Local authorities MINISANTE /CoK	3,000
Gender based violence and sexual Exploitation and Abuse (GBV/SEA)	<ul style="list-style-type: none"> - Preparation and implementation workers Code of conduct - Conduct GBV/SEA awareness 	Contractor	WASAC Ltd/ Districts/Isange One Stop Center	1,000

Environmental/ social impacts	Proposed mitigation measure	Responsible	Monitoring responsibilities	Estimated cost (USD)
Overall environmental management	<ul style="list-style-type: none"> - Avail an Environmental and Social Manager at the site to oversee environmental management, social concerns, environmental training, and the implementation of environmental policies; - Appoint ESHS Manager to assist with sampling, monitoring and daily environmental compliance; - Provide environmental training to all employees. 	Contractor	WASAC Ltd/REMA	1,800
Loss of individual owned crops, trees and other assets at pipelines	<ul style="list-style-type: none"> - Valuation of damaged assets to be conducted by independent valuer. - Valuation of damaged properties should be fair and done according to the existing law related to expropriation in public interest. - Fair compensation should be done prior to the project activities - Compensation to be done only at the property's owners without intermediaries 	WASAC Ltd/ Local residents	WASAC Ltd / local authorities and district	Expropriation budget
Land degradation at construction sites	<ul style="list-style-type: none"> - All earthworks for site preparation and levelling shall be carried out in a proper designated way and to be executed by the qualified engineers. - Excavated soil shall be well managed and re-used to backfilling the excavated trenches. - The unused soil and considered as waste shall be deposited in a well designated area to be approved in close collaboration with Gasabo District. - Backfilling borrow pits after excavation and rehabilitating with vegetation. 	Contractor	WASAC Ltd/ local authorities/ REMA	No cost required
Possible incidents and accident to the passengers and project workers	<ul style="list-style-type: none"> - Demarcate all hazardous trenches with signs posts and warning tapes - Conduct daily morning briefs related to safety measures for all workers - Only authorized personnel to enter the working areas - Provision of Personnel Protective Equipment to all project workers - Sensitization of workers on safety measures - Provide first aid kit on the site - Ensure all employees have health insurance; 	Contractor	WASAC Ltd/ Local authorities	4,000
Possible soil erosion at steep slope between Nyarutarama and golf 8	<ul style="list-style-type: none"> - Preferably all earthworks for site shall be carried out during dry season. The tendering plan should take into consideration the weather conditions of the project works - Storm water drainage system shall be installed on sites susceptible to erosion. - Soil erosion barriers have to be installed on site. - Restrict clearing works to only project sites and at the minimum possible - Only use appropriate machinery at each type of activity in order to minimize the risks; - Remove and stockpile topsoil, sub-soils and any parent material separately. - Where necessary construct water ways with check dams in order to reduce sediments - After completion of works, the top soil has to be spread over those areas which can be partially restored in order to facilitate natural regeneration of those areas. 	Contractor	WASAC Ltd/ REMA	800
Vibrations, air and noise pollution nearby primary schools and neighboring residential areas	<ul style="list-style-type: none"> - To avoid noise pollution, construction activities shall be restricted to normal working hours (7h00-17h00) to prevent noise for neighbors at night. - The machinery and automobiles for the project shall have certification of good working conditions from "National Automobile Inspection centre" in order to reduce noise or exhaust fumes emissions. - When the ambient air is polluted by dust generated from project activities, water should be sprayed when deemed necessary in order to reduce dust in the ambient environment. - All workers should be equipped with protective equipment including protective masks. - Ensure noise emissions are kept down and meet the existing noise emission standards depending on the area of works (residential, commercial etc); 	Contractor	WASAC Ltd/ REMA	2,000

Environmental/ social impacts	Proposed mitigation measure	Responsible	Monitoring responsibilities	Estimated cost (USD)
Disturbance of traffic during excavation and alignment of pipes	<ul style="list-style-type: none"> - Provide appropriate equipment and appropriate number of manpower in order to complete the work in short time especially for the section that cross the roads - Appoint staff in charge of traffic management at each section crossing the road - Avail appropriate traffic sign posts at working sites - Conduct quick rehabilitation of affected section - Excavation and backfilling of the affected section shall be conducted during evening hours where there is no heavy traffic 	Contractor	WASAC Ltd/ Local authorities / Traffic police/ RTDA	Under construction budget
Abuse and use of drugs and alcohol at the site	<ul style="list-style-type: none"> - Avail free of charge potable and safe drinking water for all workers. - Avoid any kind of use of alcohol and other drugs at the project sites. 	Contractor / Site workers	WASAC Ltd/ local authorities/ RIB	2,000
General occupational health and Safety (OHS)	<ul style="list-style-type: none"> - Contractor shall ensure that all employees have health insurance as means of health care affordability; - Contractor shall provide personal protective equipment (PPEs) to all project workers and visitors. - Avail permanent first aid kit at the project sites - Avail an Environmental and safety officer at the site to oversee environmental management, social concerns and the implementation of environmental policies and regulations; - Install safety and warning signage as appropriate 	Contractor/ site workers	REMA/ WASAC Ltd /District	1,500
Total				21,800

8.2 Environmental Monitoring Plan

8.2.1. General Environmental monitoring parameters

The monitoring plan provided in this section is indicating measurements of parameters, responsibility, and cost estimates of outcomes of the proposed mitigation measures. A monitoring plan stands to facilitate and ensure the follow-up of the implementation of the proposed mitigation measures and helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. However, a general monitoring plan should be implemented on site as it facilitates and ensures the follow-up of the implementation of the proposed mitigation measures. It helps to anticipate possible environmental hazards and/or detect unpredicted impacts over time. Monitoring tools include the:

- Visual observations;
- Selection of environmental parameters/indicators at specific locations;
- Sampling and testing of the selected parameters.

To address all activities that may cause adverse impacts, this environmental monitoring plan should be implemented through the project phases. The implementation of this monitoring plan should be based on direct or indirect indicators of emissions, effluents and resource use and the monitoring frequency should be sufficient to provide representative data for the parameter being monitored.

The following are key parameters to be monitored during this project implementation:

- **Noise and vibration**

It is expected that the project will cause noise and vibrations at the project sites. Therefore, period noise level measurements should be taken at the project sites especially nearby residential areas as well consultation with local Community with the aim to assess the project impacts regarding noise pollution.

- **Water Quality Monitoring**

Construction activities at river crossing in Nyabisindu area are subject to cause surface and ground water at the site if not well controlled and monitored. It is recommended therefore that WASAC monitor water quality parameters that shall include water temperature, PH, TSS and turbidity to assess the effects of water quality of the nearby river during the project activities.

- **Soil erosion monitoring**

The project is not likely to have major impact on soil quality as no major activities are anticipated nearby water bodies. However, soil erosion is anticipated at the sites where excavation works shall be carried out. A regular monitoring is then required to avoid any soil erosion that may occur.

- **Monitoring of accidents/incident**

Most of the project activities will be carried out along different roads within the project areas. WASAC, JICA and any other contractor must make sure that appropriate signs are posted at appropriate locations/positions to minimize/eliminate risk of accidents. In addition, health inspectors should make sure that:

- Measures to create awareness regarding sexually transmitted diseases such as HIV/AIDS, Covid- 19 and other diseases are taken among project workers;

The following parameters could be used as indicators:

- Level of awareness of communities pertaining to dangers/risks associated with the project; and
- Accident and incidents reports: records on actual accidents associated with the project.

- **Monitoring of social impacts**

The monitoring of the social impacts of the project is based on the experience of the communities and households. The following impacts should be monitored with the help of local authorities and households.

- Employment opportunities associated to the project implementation
- Clean water availability within the project area
- Inclusion of women and men when allocating jobs
- Dust and air pollution in the project area

- **Community relationship:**

Conflicts between project workers and local community due to arrival of non-resident workers in the project area. The number of workers should be recorded by their origin, sex, and age. The following table summarizes the parameters to be monitored and the monitoring plan of the project.

8.2.2. Environmental Monitoring Plan for block system-Reservoirs and pipelines

The next table presents Monitoring plan for the construction of reservoirs and installation/replacement of pipes covered under JICA grant.

Table 32: Environmental Monitoring Plan for block system - reservoirs and installation/replacement of distribution pipes

Environmental items	Monitoring item	Parameter/Indicator to be monitored	Location	Frequency	Responsible	Budget
Pre-construction and site mobilization phase						
Land securing and compensation	Compensation for private owned land	Area of land compensated	Project site	Once before construction works	WASAC Ltd	ARAP monitoring report
	Land easement and securing from public land	land for water tank and pipelines secured	Project area	Once before project activities	WASAC/ local Authorities	No cost required
	Complaints related to pipelines locations nearby residential areas	GRM logbook	Project area	Once before project activities	WASAC Ltd/ local authorities	no cost required
Air pollution	Equipment and automobiles in good conditions	certificate of good working condition issued by automobile inspection center	Project sites	As appropriate	Contractor/ traffic police	200
Noise and vibrations	Noise and vibrations	Noise level and vibrations	At reservoirs and water tanks sites	before and during project works	Contractor/ Cok/ wasac	800US\$
Construction phase						
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	Project site	When deemed necessary	Contractor WASAC/ traffic police	Operational Cost

Environmental items	Monitoring item	Parameter/Indicator to be monitored	Location	Frequency	Responsible	Budget
Air Pollution	Equipment and automobiles in good shape	Regular inspection and maintenance	at project site	Daily	Contractor	No cost applicable to monitor.
	Records on water spray at the project site	dust at the project site	project sites	regular and when necessary	Contractor	Operational cost
Noise and vibrations	Noise emissions	Noise level Vibration level	Reservoirs, pipelines and water tanks construction sites	During earth works or concrete vibrations.	Contractor/ WASAC / Cok	under implementation cost
Soil erosion	Presence of soil erosion barriers at the project sites	soil erosion level	project areas	daily	Contractor/ WASAC	Operational Cost
Soil Waste	Proper management of excavated soil and other waste generated from the project	presence of waste management plan	at project site	regular	Contractor/ WASAC	Under Operational Cost
Fauna and flora removal	Re-vegetation to offset lost flora and fauna	Restored area	At the project area	After project implementation	Communities/local authorities / Contractor	Operational Cost
Work conditions	Occupational health and Safety	Availability at site of OHS Plan	Project sites	Permanent through project activities	Contractor/ WASAC Ltd	Operational Cost
	Awareness meeting on social, health and safety	Number of meetings and trainings/ Induction	Project sites	Daily	Contractor/ WASAC Ltd	Operation cost
	Incidents and accidents at the project site	Presence of warning and sign post at the site	Project site	daily	WASAC/ Contractor/	5000 USD
	Personal Protective Equipment (PPEs)	Number of workers with PPEs	project area	daily	Contractor/ JICA/WASAC Project contractor/ project workers	2000 USD
Traffic congestions	Traffic management Plan and traffic signage	Availability of TMP Number of traffic signage	Project area	daily during project works nearby roads	Contractor/ WASAC/ traffic Police	Operational Cost
HIV/ AIDS and other transmitted diseases	Health and sanitation for labor workers	presence of sanitation facilities and diseases preventive measures	Project sites	regular	Contractor/ WASAC Ltd	Operational Cost
Child and forced labour	Minimum working age and working condition	Employment record by age	Construction areas	regular	Contractor /Local authorities/ project workers	no cst required
Disruption of public utilities especially water supply networks, electrical network and traffic etc	Water, electricity, traffic etc	Duration of utilities due to construction	Project area	Regular	Contractor/ WASAC Ltd	Operational Cost
Operational Phase						
Water losses	Water leakage	Infrastructures damages	Operation	Regular	WASAC Ltd/ water users	500

8.2.3. Environmental Monitoring plan for pipeline between RDB junction and remera golf 8

The next table presents Monitoring plan for the installation of water pipeline between RDB Junction and Remera golf 8.

Table 33: Environmental Monitoring Plan for transmission pipeline between RDB Junction and Remera Golf

8

Environmental items	Monitoring item	Parameter/Indicator to be monitored	Location	Frequency	Responsible	Budget (USD)
Pre-construction and site mobilization phase						
Land acquisition and easement	Land easement and securing	land for pipelines secured	Project site	Once before project activities	WASAC/ local Authorities/ CoK	No cost required
	Complaints related to pipelines locations in residential areas	GRM logbook	Project area	Once before project activities	WASAC Ltd/ local authorities	No cost required
Air pollution	Equipment and automobiles in good conditions	Certificate of good working condition issued by automobile inspection center	Project sites	As appropriate	Contractor/ traffic police/ WASAC	300
Water pollution especially at Nyabisindu area	Surface water quality	(Temperature, pH, TSS, Turbidity)	Upper site and lower site of the river	before, during and after project activities	Contractor/ WASAC Ltd	300
Noise and vibrations	Noise and vibrations	Noise level and vibrations	At project sites	before and during project works	Contractor/ CoK/ WASAC	600
Construction phase						
Accidents and incidents	Number of accidents and incidents	Incidents and accidents logbook	Project area	When deemed necessary	Contractor / WASAC/ traffic police	Operational Cost
Air Pollution	Equipment and automobiles in good shape	Regular inspection and maintenance	at project area	Daily	Contractor	No cost applicable to monitor.
	records on water spray at the project area	dust at the project area	project areas	regular and when necessary	Contractor	Operational cost
Water pollution at Nyabisindu river crossing	Surface water quality	temperature, pH, TSS, Turbidity	Upper site/ lower site of the river	during project activities at the river crossing site	Contractor/ WASAC Ltd	1,900
Noise and vibrations	Noise emissions	Noise level Vibration level	At pipelines construction sites	During earth works or and compaction	Contractor/ WASAC / CoK	under implementation cost
Soil erosion	presence of soil erosion barriers at the project sites	soil erosion level	project areas	daily	Contractor/ WASAC	Operational Cost
Soil Waste	Proper management of excavated soil and other waste generated from the project	presence of waste management plan	at project site	regular	Contractor/ WASAC	Under Operational Cost
Fauna and flora removal	Re-vegetation to offset lost flora and fauna	Restored area	At the project area	After project implementation	Communities/local authorities / Contractor	4000
Work conditions	Occupational health and Safety	Availability at site of OHS Plan	Project sites	Permanent through project activities	Contractor/ WASAC Ltd	Operational Cost
	Awareness meeting on social, health and safety	Number of meetings and trainings/ Induction	Project sites	Daily	Contractor/ WASAC Ltd	Operation cost
	Incidents and accidents at project site	Presence of warning and sign post at the site	Project site	daily	WASAC/ Contractor/	1000
	Appropriate Personal Protective Equipment (PPEs)	Number of workers with PPEs	project area	daily	Contractor/ JICA/WASAC Project contractor/ project workers	2000
Traffic congestions	Traffic management Plan and traffic	Availability of traffic Management Plan Number of traffic	Project area	daily during project works nearby roads	Contractor/ WASAC/ traffic Police	Operational Cost

Environmental items	Monitoring item	Parameter/Indicator to be monitored	Location	Frequency	Responsible	Budget (USD)
HIV/ AIDS and other transmitted diseases	signage Health and sanitation for labor workers	signage available on site presence of sanitation facilities and diseases preventive measures	Project sites	regular	Contractor/ WASAC Ltd	Operational Cost
Child and forced labor	Minimum working age and working condition	Employment record by age	Construction areas	regular	Contractor /Local authorities/ project workers	no cost required
Disruption of public utilities especially water supply networks, electrical network	Water, electricity, traffic etc	Duration of utilities due to construction	Project area	Regular	Contractor/ WASAC Ltd	Operational Cost
Operation phase						
Water losses	Water leakage	Infrastructures damages	Operation	Regular	WASAC Ltd/ water users	500

8.3 EMP implementation arrangements

8.3.1 Overall implementation responsibility

The overall responsibility of implementation of this EMP is under Contractor and Water and Sanitation Corporation (WASAC Ltd). WASAC Ltd will designate a staff in charge of Environmental and Social safeguard who will be responsible for addressing environmental and social issues on a routine basis. The staff will have an oversight of environmental aspects of the construction contracts, including the enforcement of all monitoring provisions, etc. The project Contractor will also have an Environmental Health and Safety Manager to oversee the implementation of project during construction. The main duties of the designated Environmental and social officers will include but not limited to:

- Have an insight on the designs and ensure they adhere to the environmental and social specifications and the requirements of the Environmental and Social Management Plan (EMP).
- Co-ordinate and liaise with government institutions on environmental and social issues and obtaining the necessary clearances from the regulatory authorities.
- Collect and dissemination of relevant environmental documents
- Monitor the environmental and social aspects especially during construction phase to ensure that the environmental requirements of the contract and the mitigation measures proposed in this ESMP are implemented.

8.3.2 Environmental and social awareness campaigns

The awareness campaigns will cover health and safety, traffic management, measurement techniques in the field, tools for the prediction of pollutants, waste management, etc. various competent authorities may be consulted for such campaigns. The need for additional and specialized campaign shall be examined and appropriate training will be undertaken as required. Training of personnel to be deployed on the proposed project during construction and operation, about environmental requirements should be an integral part of the planning. In addition, all employees will be trained on safety, HIV/AIDS prevention, methods of disaster prevention, action required in case of emergency, fire protection, environmental risk analysis etc.

8.3.3 Monitoring and reporting procedures

During the project implementation WASAC will designate an EHS officer who will visually assess contractor's practices and if high pollutant levels are suspected instruct the contractor to make corrections. 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 Manager and designated EHS manager. The regular monitoring of noise and dust will also be carried out as provided in the environmental monitoring program. It is the mandate for the contractor to use the materials which meet the standards being in civil construction works, the machinery to be used or the pipe to be installed

8.3.4 Record keeping

Monitoring reports should be documented and recorded. The focus shall be done on issues that are environmental and social harmful and provide feedback for the future stages of the work. 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 monthly and Quarterly Environmental and social safeguard Reports.

8.3.5 Implementation schedule

The most important aspect of the implementation is the appointment of the Environmental Officer at WASAC level and at Contractor level to oversee the implementation of the environmental mitigation measures incorporated in the design and contract specifications. Most of the planned mitigation measure will be implemented along with project activities and is provided in Environmental Management Plan and Environmental Monitoring Plan.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The conduct of this Environmental and Social Impact Assessment study has revealed several issues associated to the proposed project of improvement of water supply services in North Central Kigali. The impacts identified have been analyzed in detail to formulate mitigation measures in response to negative aspects which have been raised. The proposed Environmental Management Plan (EMP) provides a way forward for implementation of the mitigation measures and should be implemented as a requirement for a positive Record of Decision by appropriate authorities.

The pertaining impacts have been assessed and described in detail to gain an adequate understanding of possible socio and environmental effects of the proposed project in all its implementation phases. When the mitigation measures listed in this document are fully implemented in the design, construction, and post-construction phases, it is no doubt that the project will benefit to both people and the environment. The cost for the implementation of the EMP are estimates indicative to the general cost and were estimated based on the current local prices on the market. Appropriate bills of quantities should clearly give the real costs in any case the consultant has used judgment and cost for similar project to come up with these figures

In any case potential disputes among workers arise and connected to the project activities, a project Grievance Mechanism (GRM) is proposed as a dispute resolution mechanism option available to redress grievances and disputes emanating or associated with this project to avoid potential social impact. Therefore, based on the study findings, the Consultant is of the opinion that most of the potential environmental impacts identified can be mitigated. The proposed Environmental Management Plan and Environmental Monitoring Plan if implemented will safeguard the integrity of the environment. To this extent, the consultant is concluding that the potential impacts associated with the proposed development are of a nature and extent that can be reduced, limited, and eliminated by the application of appropriate mitigation measures

9.2 Recommendations

In addition to the mitigation measures proposed in the Environmental Management Plan, consultant is recommending the following:

- Before the implementation of the project, WASAC shall secure in full the locations of the water distribution facilities via fair compensation such as the location of water tanks (such as Batsinda site) and fair compensation of other assets to be affected by the project. Agreed compensation should be paid prior to commencement of works
- The project should assign the Health, Social and Environmental officer who will oversee undertaking the monitoring of the mitigation measures for the project through its existence. This will help to achieve sustainable project implementation at reduced cost for undertaking the monitoring despite the facts that regular internal monitoring shall be carried out by the project developer
- Local and affected people should be given priority in works;
- Taking into consideration that most of the project activities will be carried out along the existing roads, special attention shall be given to the management of traffic and roads repair to avoid any incident associated to the project activities.
- Prior to the project implementation, WASAC Ltd is required to involve local authorities and establish a joint monitoring team including the representative of City of Kigali, REMA, RWB, WASAC, National Traffic Police, and Gasabo district to regularly monitor the implementation of the proposed EMP.
- Mid-term environmental audit should be conducted to evaluate the effectiveness of proposed mitigation measures and provide corrective measures as appropriate.
- Prior to the project implementation, the contractor shall prepare the Construction Environmental and Social Management Plan (CSEMP) as well as the Construction Environmental Health Safety Plan (CEHSP) related to the project
- The negative socio-cultural impacts associated to the project are very low as there is no involuntary settlement that may be associated to the project implementation. Hence, the project developer (WASAC Ltd) should work closely with local authorities in raising awareness among local communities for the protection and maintenance of the project infrastructures.

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ANNEXES

Annex 1: List of consulted people at central and local institutions

No	Names	Contact	Institution	Function
1	ABIMANA Eric	0787812829	Bibare Cell	CEDO
2	Alain SEZIBERA	0788521930	Rwanda Development Board	EIA Analyst
3	BUGINGO Davis	0788230018	Rwanda Water Board	Flood Management and Water Storage Development Division Manager
4	BYUKUSENGE Jean d'Amour	0788984400	Musezero Cell	CEDO
5	DUFATANYE Israel	0788481541	REMA	Environmental Inspector
6	DUSABIMANA Annuaritte	0788452328	Gisozi Sector	Health and Sanitation Officer
7	Eng. MUHORAKEYE Jeanne	0788875101	Kimironko sector	Act land management & Notary team leader
8	Enode NIYONSABA	0787958813	Nyabisindu	ES
9	GASANA Donatien	0785984429	Gasharu Cell	CEDO
10	HABINSHUTI Jean Pierre	0788881465	Gasabo District	Water District Engineer
11	HAVUGUZIGA NTABWIKO Charles	0788300397	Kanyinya sector	Executive secretary
12	Jean Pacifique TUYISHIMIRE	0783393820	Murama cell	CEDO
13	Jeannine MUKARUKUNDO	0783441942	Kibagabaga cell	CEDO
14	KALISA Hamza Fidel	0788876579	Gisozi Sector	Land manager support Officer
15	KARAMUZI Godfrey	0788861810	Remera sector	Executive secretary
16	KARURANGA Dismas	0788779208	Rwanda Water and Forest Authority	In charge of Water Quality
17	KAYITESI Redempta	0783877212	Gacuriro cell	Executive Secretary
18	MBONAMPEKA Claudine	0788492092	Rukiri II	Executive Secretary
19	MUKAMANA Phoebe	0788583832	Gasabo District	Environmental Officer
20	MUKAMANA Phoebe	0788583832	Gasabo District	District Environmental Officer
21	MUKAMURENZI Antoinette	0788683611	Gisozi Sector	Health and good governance
22	MUKANTWARI Sandrine	0787433065	Gasharu Cell	ES of the cell
23	MUSASANGOHE Providence	0788451827	Gisozi Sector	Executive Secretary
24	NDAMYIMANA Elysée	0788414332	Remera sector	Land bureau
25	NIYONSABA Pascal	0738583283	Rukiri I	Executive Secretary
26	NSENGIMANA Janvier	0788668943	Remera sector	Community Health and Sanitation Officer
27	RUGAMBIRWA Deo	0788815450	Bumbogo Sector	Executive Secretary
28	RUKUNDO Augustin	0782756565	Gasabo District	District Sanitation Officer
29	RUSINE Alphonse	0788440290	Gasabo District	Land Survey & GIS
30	RUTARINDWA Alphonse	0784902626	Gasabo District	Director of Health and Socio-economic development
31	SHUMBUSHO Faustin	0789198930	Bumbogo Sector	Ngara Cell Executive Secretary
32	TUYISHIMIRE Evelyne	0784388649	Nyagatovu cell	CEDO
33	UMUHOZA MBATEYE Aimee Francine	0788486203	Water and Sanitation Corporation	In Charge of Planning
34	UMUHOZA RWABUKUMBA	0788304546	Kimironko sector	Executive secretary
35	UMURERWA Josiane	0788627922	Bumbogo Sector	Social affairs
36	UWAMAHOLO Chantal	0788946525	Kimironko sector	Community health and sanitation officer
37	UWAMAHOLO Jeanne d'Arc	0788315593	Nyarutarama cell	CEDO
38	UWAMAHOLO Jeanne d'Arc	0788649667	Kimironko sector	Social affairs
39	UWERA Jeanne d'Arc	0787959858	Bumbogo Sector	Customer care

Annex 2: Participants to initial consultations-inception phase – January 16th to February 4th 2022

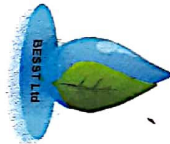
No	Names	Sector	Cell	Village	Contacts
	Remera sector				
1	Alexis RUBAYITA	Remera	Nyabisindu	Amarengo I	784459211
2	BARAHIRA	Remera	Rukiri I	Gashyitsi	788482700
3	BIRUNGI Vivien	Remera	Nyabisindu	Gihogere	788423773
4	BIZIMANA Cynthia	Remera	Rukiri I	KISIMENTI	781557214
5	BYUKUSENGE Elisabeth	Remera	Nyabisindu	Gihogere	788593480
6	Clarisse Uwimana	Remera	Nyarutarama	Kibiraro I	788234784
7	Eric BYUMVUHORE	Remera	Nyabisindu	Gihogere	732267644
8	Eugenie	Remera	Rukiri I	Kisimenti	788570259
9	FOCAS	Remera	Rukiri II	Amahoro	788789087
10	Francoise	Remera	Nyarutarama	Kangondo II	788679936
11	GATARI Fabrice	Remera	Nyarutarama	Kangondo I	788465982
12	HABAKUBANA	Remera	Rukiri I	Gashyitsi	786114000
13	Harelimana Jean Claude	Remera	Nyabisindu	Marengo I	782281088
14	INGABIRE Clemantine	Remera	Nyarutarama	Kangondo	
15	Jeanne	Remera	Nyabisindu	Amarengo I	780973528
16	Jeanne d'Arc	Remera	Nyabisindu	Amarengo I	788581458
17	KABANDA Diane	Remera	Rukiri I	Kisimenti	788885318
18	KABERA Manzi Gerard	Remera	Nyarutarama	Kangondo I	788675347
19	Kansayiza Janvier	Remera	Nyarutarama	Kangondo II	788895929
20	KANYANGE Jacqueline	Remera	Nyarutarama	Kangondo I	784721707
21	Kanyarukiga NGABONZIZA Richard	Remera	Nyabisindu	Marengo I	786058158
22	Kevin	Remera	Nyabisindu	Gihogere	785282685
23	KIREZI	Remera	Nyarutarama	Kangondo I	784441109
24	MAHIRWEYOGUSENGA Hycenthe	Remera	Nyarutarama	Kangondo I	783558352
25	MBONINGABO	Remera	Rukiri I	Gashyitsi	784217545
26	Mukakabeza P	Remera	Nyarutarama	Kibiraro I	783605451
27	MUNYAWERA Chrales	Remera	Rukiri II	Rebero	786231642
28	Musoni Didas	Remera	Nyabisindu	Amarengo 1	782536496
29	Mutwarasibo Leonidas	Remera	Rukiri II	Amahoro	788478833
30	MVUYEKURE J.de Dieu	Remera	Nyabisindu	Gihogere	784898199
31	NIBEMA Brigurigitte	Remera	Nyarutarama	Kangondo II	787020945
32	NIWEMWANA Donata	Remera	Nyarutarama	Kangondo I	788232479
33	NSABIMANA Emmanuel	Remera	Nyabisindu	Gihogere	789139341
34	NSABIMANA Evaliste	Remera	Nyabisindu	Marengo	782500886
35	NSABIMANA Ibrahim	Remera	Rukiri I	Gisiment	788540442
36	NTAGENGWA Patrick	Remera	Nyabisindu	Gihogere	783542031
37	NYANGABIRE Lucie	Remera	Nyarutarama	Kangondo II	
38	Nyirabashumba	Remera	Nyarutarama	Kibiraro I	789610360
39	Nyirahabimana	Remera	Nyarutarama	Kangondo II	786134842
40	NYIRAMATABARO Epiphanie	Remera	Nyarutarama	Kibiraro I	786191900
41	NZIRORERA Issa	Remera	Nyabisindu	Marengo I	788496382
42	Odette	Remera	Nyabisindu	Gihogere	788821102
43	Sakindi Esperance	Remera	Rukiri II	Amahoro	788516762
44	TWAGIRAMUNGU Emmanuel	Remera	Nyabisindu	Marengo I	788290249
45	UMUGWANEZA Clarisse	Remera	Nyabisindu	Gihogere	782502944
46	Umugwaneza Diane	Remera	Rukiri II	Rebero	788876974
47	Uwamurera	Remera	Nyabisindu	Gihogere	7823919113
48	Uwayezu Diane	Remera	Nyabisindu	Amarengo I	785894573
49	UWAYISABA Berthlode	Remera	Nyarutarama	Kangondo I	
50	UWINGABE Christella	Remera	Nyarutarama	Kangondo I	
51	UWINGABIRE	Remera	Nyabisindu	Amarengo I	7888680623
	Kinyinya Sector				
1	AZAMU Busingye	Kinyinya	Kagugu	Nyakabungo	788564818
2	BAYISINGIZE M. Claire	Kinyinya	Kagugu	Gicikiza	787350435
3	Benineza Claudien	Kinyinya	Gacuriro	Akaruvusha	780509037
4	Buregeya J Bosco	Kinyinya	Kagugu	Nyakabungo	783413506
5	Claude	Kinyinya	Gacuriro	Karuvusha	783769209
6	DUSABE	Kinyinya	Kagugu	GIHEKA	
7	GAKUNZI Janvier	Kinyinya	Murama	Rusenye	788413033
8	Habineza Olivier	Kinyinya	Kagugu	Giheka	783496903
9	HABUMUKIZA Lucien	Kinyinya	Kagugu	Giheka	
10	HATEGEKIMANA Patrick	Kinyinya	Murama	Binunga	783987448
11	INGABIRE Christa	Kinyinya	Kagugu	Gicikiza	781405289

No	Names	Sector	Cell	Village	Contacts
12	INGABIRE Regine	Kinyinya	Kagugu	Kabuhunde II	784131344
13	INGABIRE Sandrine	Kinyinya	Kagugu	Nyakabungo	787713266
14	IRADUKUNDA Claudine	Kinyinya	Kagugu	Rukingo	783077684
15	ISHIMWE Brian	Kinyinya	Gacuriro	Akarambo	
16	Ishimwe Saratiel	Kinyinya	Gacuriro	Karuvusha	783003883
17	ISIMBI Nicole	Kinyinya	Murama	Taba	780508017
18	IYAMUREMYE Emmanuel	Kinyinya	Gacuriro	Karambo	784533541
19	Jean Claude	Kinyinya	Kagugu	Dusenyi	786194521
20	Jean Pierre	Kinyinya	Murama	Rusenyi	780074007
21	KANEZA Julienne	Kinyinya	Gacuriro	Akarambo	
22	KANNKINDI Dafroza	Kinyinya	Kagugu	Nyakabungo	786425728
23	KANYAMUHUNGU Paifique	Kinyinya	Murama	Binunga	788586045
24	KANYANDWI	Kinyinya	Kagugu	Gicikiza	788845128
25	KANYARAMA Epiphanie	Kinyinya	Kagugu	Nyakabungo	
26	KANYARWANDA Daniel	Kinyinya	Kagugu	Gicikiza	788652064
27	KARANGWA	Kinyinya	Murama	Taba	788237922
28	KARANGWA Judith	Kinyinya	Gacuriro	Akarambo	788687784
29	KARIMBA Alexis	Kinyinya	Kagugu	Giheka	786825285
30	Kayitare Maurice	Kinyinya	Kagugu	Giheka	783610375
31	Kayitesi Christine	Kinyinya	Kagugu	Dusenyi	788731960
32	Kayitesi Clarisse	Kinyinya	Murama	Rusenyi	787341533
33	KAYITESI Jacqueline	Kinyinya	Gacuriro	Urugarama	
34	KEZA Tania	Kinyinya	Gacuriro	Akaruvusha	787288141
35	MANEZA Emeline	Kinyinya	Kagugu	Gicikiza	788378081
36	MISIGARO Francois Xavier	Kinyinya	Kagugu	Nyakabungo	789188311
37	MUGABEKAZI	Kinyinya	Murama	Taba	785045789
38	Muhawenimana Jeannette	Kinyinya	Kagugu	Giheka	782116321
39	MUHIRWA Adeliphine	Kinyinya	Murama	Binunga	788598220
40	Mujawayezu	Kinyinya	Kagugu	Muhororo	789478363
41	MUKAHIRWA Veneranda	Kinyinya	Kagugu	Gicikiza	783267798
42	MUKALETA Claudine	Kinyinya	Gasharu	Kami	78844560
43	MUKAMANA Edissa	Kinyinya	Kagugu	Giheka	787863529
44	MUKAMASABO Florence	Kinyinya	Kagugu	Kabuhunde II	7890870999
45	MUKAMBARUSHA Joselyne	Kinyinya	Kagugu	Giheka	785119660
46	MUKAMURENZI Jeanette	Kinyinya	Gasharu	Gasharu	785312232
47	MUKANDAYAMBAJE Christine	Kinyinya	Gasharu	Agatare	790597653
48	MUKANDEKEZI Immaculee	Kinyinya	Gacuriro	Akarambo	785385041
49	MUKANGOMA Herene	Kinyinya	Kagugu	Giheka	
50	MUKANTABANA	Kinyinya	Murama	Taba	785844182
51	Mukanyandwi Josiane	Kinyinya	Kagugu	Giheka	787145101
52	Mukarukundo Jeanne	Kinyinya	Kagugu	Gicikira	788725139
53	MUNEZERO Florence	Kinyinya	Murama	Binunga	787163276
54	MURENZI Emmanuel	Kinyinya	Kagugu	Gicikiza	785203460
55	MUSHIMIYIMANA	Kinyinya	Murama	Taba	781549723
56	MUTONI Esperance	Kinyinya	Kagugu	Rwangu	784261381
57	MUTUMWIREHE Dohve	Kinyinya	Murama	Taba	788446280
58	Mutuni Clementine	Kinyinya	Kagugu	Giheka	785329388
59	MUTUYIMANA Yvanny	Kinyinya	Murama	Taba	
	Kimironko Sector				
1	Brian	Kimironko	Kibagabaga	Rugero	788460545
2	Chantal UWANYIRIGIRA	Kimironko	Kibagabaga	Nyirabwana	788470414
3	DUFITIMANA INGABIRE Joyce	Kimironko	Kibagabaga	Kamihanda	788945225
4	DUSABIMANA Ernest	Kimironko	Bibare	Imena	7872268436
5	Elie UWIMANA	Kimironko	Nyagatovu	Urugwiro	788329273
6	GAKIRE Damien	Kimironko	Nyagatovu	Ibuhoro	785538112
7	GAKWAVU Bonus	Kimironko	Bibare	Imena	788521362
8	HATUNGIMANA Jean de Dieu	Kimironko	Nyagatovu	Itetero	788709780
9	IKIMPAYE Petronile	Kimironko	Bibare	Inyange	788858042
10	IKISHATSE Claude	Kimironko	Bibare	Inganji	727390877
11	INGABIRE Jeannette	Kimironko	Bibare	Intashyo	783072767
13	ISHIMWE MUHUMUZA Christian	Kimironko	Kibagabaga	Kamahinda	780460175
14	KABATESI Florah	Kimironko	Bibare	Imitari	787701022
15	KAGABA Alexis	Kimironko	Bibare	Intashyo	788504277
16	KAMARIZA Justine	Kimironko	Nyagatovu	ijabiro	790875644
17	KAMARIZA Liliane	Kimironko	Nyagatovu	Urugwiro	788817189

No	Names	Sector	Cell	Village	Contacts
18	KARANGANWA Venuste	Kimironko	Kibagabaga	karongi	788520936
19	KAYIGEMA Jacques	Kimironko	Kibagabaga	Kageyo	788866769
20	KAYIRANGA Theophile	Kimironko	Kibagabaga	Rindiro	788846374
21	MAPENDO Esperance	Kimironko	Kibagabaga	Nyirabwana	788541945
22	Mbarubukeye Derick	Kimironko	Kibagabaga	kalisimbi	782658913
23	MUBANDAKAZI Egidie	Kimironko	Bibare	Inyange	783470290
24	MUGABO Frank	Kimironko	Kibagabaga	Ibuhoro	788531996
25	MUGENI Theonira	Kimironko	Nyagatovu	ijabiro	788851451
26	MUHIRWA Francois	Kimironko	Nyagatovu	Isangano	787831113
27	MUHSHAPUNDU Eriane	Kimironko	Nyagatovu	Itetero	783849888
28	MUKABAGIRE Nadine	Kimironko	Bibare	Inganji	788312860
29	Mukamsoni Mariane	Kimironko	Nyagatovu	Ibuhoro	786553694
30	MUKAMUVUNYI Eugenie	Kimironko	Nyagatovu	Rukinyanya	783664985
31	MUKANKUBITO Speciose	Kimironko	Kibagabaga	Rugero	788304341
32	MUKANYIRIGIRA Alfonsine	Kimironko	Nyagatovu	Urugwiro	781096535
33	MUKESHIMANA J. Claude	Kimironko	Kibagabaga	Ibuhoro	788256037
34	MUMPOREZE Jeanette	Kimironko	Kibagabaga	Karisimbi	791447011
35	MUREGO Eugene	Kimironko	Nyagatovu	Rukinyanya	788593189
36	MUREKEYISONI Therese	Kimironko	Bibare	Imanzi	788572557
37	MURUNGI Deliphine	Kimironko	Bibare	Intashyo	788801227
38	MUTABAZI Stiven	Kimironko	Bibare	Intashyo	788541147
39	MWENEMAMA Sania	Kimironko	Nyagatovu	Urugwiro	788997103
40	NTABAJYANA J. Bosco	Kimironko	Kibagabaga	Rindiro	788885579
41	NYINAWABO Margaritte	Kimironko	Kibagabaga	Kageyo	788653985
42	NYIRANZIYINO Esther	Kimironko	Kibagabaga	Rindiro	780121151
43	NYIRARUKUNDO Immaculee	Kimironko	Nyagatovu	Bukinyanya	788539620
44	Odette Nyotwizera	Kimironko	Bibare	Imitari	733075875
45	RUTAZIGWA Louis	Kimironko	Bibare	Amariza	788309959
46	Ryamuhenga Emmanuel	Kimironko	Kibagabaga	Rugero	788748343
47	UBIFITIYE Therese	Kimironko	Nyagatovu	Buhoro	788583528
48	UMUGWANEZA Oteri	Kimironko	Nyagatovu	Isangano	788548492
49	UMUTESI Eduige	Kimironko	Kibagabaga	Kalisimbi	788471520
50	UMUTONI Imacullee	Kimironko	Bibare	Intashyo	788760995
51	UWIMBABAZI Alexia	Kimironko	Kibagabaga	Rugero	783284528
52	UWINGABIRE JACQUELINE	Kimironko	Bibare	Inyange	788826286
53	UZAMUSHAKA Anne Marie	Kimironko	Nyagatovu	Bukinyanya	
	Gisozi Sector				
1	Batamuriza Beline	Gisozi	Ruhango	Murambi	
2	BIKORIMANA S.	Gisozi	Musezero	Gasharu	785701106
3	DUSABIMANA Samuel	Gisozi	Musezero	Gasharu	783000237
4	ERIC RUBIBI	Gisozi	Ruhango	Kumukenke	788736545
5	HAKIZIMANA Andre	Gisozi	Musezero	Amajyambere	788353246
6	HARELIMANA Eliel	Gisozi	Musezero	Gasharu	788848365
7	Harindintwali Theogene	Gisozi	Ruhango	Kanyinya	784482576
8	INGABIRE	Gisozi	Ruhango	Kanyinya	788522152
9	Ingabo Roger	Gisozi	Ruhango	Kanyinya	787896454
10	Joffrey Kwizera	Gisozi	Ruhango	Murambi	785842245
11	Kwibuka Hozanna	Gisozi	Musezero	Nyakariba	780982329
12	Mahoro Solange	Gisozi	Musezero	Nyakariba	783284523
13	Mbabazi Kevine	Gisozi	Musezero	kagara	787797605
14	Mugorewindinda Aloysie	Gisozi	Ruhango	Murambi	783042741
15	MUKAMAZIMPAKA Prudencienne	Gisozi	Musezero	Amajyambere	788719740
16	MUKAMUHIRWA Florence	Gisozi	Musezero	Nyakariba	784533664
17	Mukandamutsa Vestine	Gisozi	Ruhango	Kumukenke	788443796
18	Mukanyirigira Jeanette	Gisozi	Ruhango	Kumukenke	788696021
19	Mukasonga Madelaine	Gisozi	Ruhango	Kumukenke	788499981
20	MUKAYISENGA Claudine	Gisozi	Musezero	Nyakariba	786074887
21	Mukunzi Diane	Gisozi	Musezero	Nyakariba	788697781
22	Munezero Joseline	Gisozi	Musezero	Nyakariba	784599979
23	MUNYABUGINGO Eric	Gisozi	Ruhango	Rukeri	788278356
24	MUREFU Vincent	Gisozi	Musezero	Amajyambere	785802440
25	Murekatete Solange	Gisozi	Musezero	Nyakariba	788227125
26	Murorunkwere Gaudence	Gisozi	Ruhango	Kanyinya	783559020
27	Murungi Sharon	Gisozi	Musezero	Kagara	788695418

No	Names	Sector	Cell	Village	Contacts
28	MURYARA Stella	Gisozi	Musezero	Amajyambere	789185020
29	MUTESI Jeanette	Gisozi	Musezero	Kagara	783835024
30	MUTESI Yvone	Gisozi	Musezero	Amajyambere	782185564
31	Mutoni Ange Sandrine	Gisozi	Ruhango	Kumukenke	787401102
32	Mutoniwase Fatuma	Gisozi	Ruhango	Kanyinya	785586037
33	NDAYISENGA Florence	Gisozi	Musezero	Gasharu	788229901
34	NDUNGUTSE Jonas	Gisozi	Ruhango	Ntora	788960166
35	NGENDAHIMANA Valens	Gisozi	Ruhango	Rukeri	788979000
36	Niyomufasha Arivela	Gisozi	Musezero	Amaremba	787891336
37	NSENGIYUMVA M. Marc	Gisozi	Ruhango	Kumukenke	783584127
38	NSHIYIMANA Zche	Gisozi	Musezero	Amajyambere	782777863
39	NTAKIRUTIMANA Shabani	Gisozi	Musezero	Amajyambere	784021217
40	Nyamwiza Margot	Gisozi	Ruhango	Kanyinya	781837236
41	Nyirahabimana Aline	Gisozi	Musezero	Nyakariba	784147506
42	NYIRAHABINEZA Edissa	Gisozi	Ruhango	Ntora	780346714
43	NYIRANSABIMANA Donatha	Gisozi	Musezero	Amajyambere	780123826
44	NYIRANSHIMIYIMANA Claire	Gisozi	Ruhango	Ntora	786792234
45	TUYIZERE Evod	Gisozi	Ruhango	Ntora	786507279
46	Umuhoza Bijoux	Gisozi	Ruhango	Murambi	790741160
47	UMUTESI Solange	Gisozi	Musezero	Gasharu	
48	UMUTONI Carine	Gisozi	Ruhango	Rukeri	788565881
49	UMUTONI Vanessa	Gisozi	Ruhango	Umurava	782288399
50	UTAMURIZA Gloriose	Gisozi	Ruhango	Kanyinya	788407589
51	Uwamahoro Zuena	Gisozi	Musezero	Nyakiriba	788212472
52	UWAMARIYA Claire	Gisozi	Ruhango	Umurava	782039103
53	UWAMARIYA Olive	Gisozi	Musezero	Nyakariba	783558150
54	UWAMBAJE Phelomene	Gisozi	Ruhango	Kanyinya	788875401
55	Uwera Chantal	Gisozi	Musezero	Nyakariba	789801457
56	Uwimana Dancilla	Gisozi	Musezero	Nyakariba	789980515
57	UWINEZA Jeannette	Gisozi	Ruhango	Umurava	787285742
58	UWINGABIRE Rachel	Gisozi	Ruhango	Ntora	789684848
	Bumbogo Sector				
1	Gatabazi Emmanuel	Bumbogo	Ngara	Birembo	786944544
2	KUNDAWIZERE Emmanuel	Bumbogo	Ngara	Birembo	786669823
3	MUKANKUSI Mediatrice	Bumbogo	Ngara	Birembo	78824651
4	MUSONI Alex	Bumbogo	Ngara	Birembo	783104414
5	NAKABONYE Antoinette	Bumbogo	Ngara	Birembo	785383547
6	NTEZIRIZAZA Silivestre	Bumbogo	Ngara	Birembo	788811522
7	Shyaka Felix	Bumbogo	Ngara	Birembo	781680749
8	UWIMANA Marie	Bumbogo	Ngara	Birembo	782510077

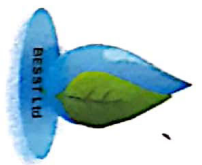
Annex 3: Participants to the consultations at scoping phase-March 26, 2022



PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN THE REPUBLIC OF RWANDA

STAKEHOLDERS CONSULTATIVE MEETING
 PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT: ... Nyakabwira, ... ON: 26th 03, 2022.

#	Name	Sector	Cell	Phone number	Email	Signature
1	Hababarimana Sam	Remera	Nyakabwira	0788517450	-	
2	Nyirorokoreza Louise	Remera	Nyakabwira	0783083950		
3	Quwibwenge Aline	Remera	Nyakabwira	0785492040		
4	Nirwanzi Fadohahel	Remera	Nyakabwira	0785444346		
5	Begum meza chantal	Remera	Nyakabwira	0785255694		
6	gabonwamy teozaol	Remera	Nyakabwira	0783891368		
7	NYIRABIZIMANA Thérèse	"	"	0788603402		
8	Nyirorokoreza Louise	"	"	0785328281		
9	NYIRABIZIMANA Valentine	Remera	Nyakabwira	0786418896		
10						
11						



**PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN
THE REPUBLIC OF RWANDA**

STAKEHOLDERS CONSULTATIVE MEETING
PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT..... Nyakabanda..... ON 26th 03rd 2022

#	Name	Sector	Cell	Phone number	Email	Signature
1	NYIRAMUNU NAHEISE	Kwera	Nyakabanda	0789391999		
2	Ngoyisa Vens	"	"	0787981341		
3	NGIRUMONSANGA	"	"	0783529068		
4	NYIRAMUNU NAHEISE	Kwera	Nyakabanda	0788699178		
5	GATETE GLEPHORO	"	"	0788896267		
6	Ngoyisa Vens	Selabisa	"	0782128923		
7	UMUZEYIMANA ESTHER	Kwera	Nyakabanda	0781006092		
8	Kwizimukunda J. N. V.	"	"	0788448244		
9	MIZIYE VERONIC	Kwera	Nyakabanda	0780647475		
10	NYIRAMUNU NAHEISE	Kwera	Nyakabanda	0786369739		
11	SINIKOBWAGO JOSEPH	Kwera	Nyakabanda	0787552859		



PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN THE REPUBLIC OF RWANDA

STAKEHOLDERS CONSULTATIVE MEETING

PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT: Nyakisisinda ON 26th 03 2022

#	Name	Sector	Cell	Phone number	Email	Signature
1	BUSA OIYAMA ARUBAKURU		NYAKISISINDA	0788 45 3200		
2	SEZABONA SSA REMEDA		NYAKISISINDA	0788 88 9390		
3	IMUHAYAZURUWA		NYAKISISINDA	0788 95 6400		
4	IMUHAYAZURUWA		NYAKISISINDA	0784 61 1070		
5	IMUHAYAZURUWA		NYAKISISINDA	0788 99 530		
6	IMUHAYAZURUWA		NYAKISISINDA	0786 96 3803		
7	IMUHAYAZURUWA		NYAKISISINDA	0785 72 6667		
8	IMUHAYAZURUWA		NYAKISISINDA	0788 20 8514		
9	IMUHAYAZURUWA		NYAKISISINDA	0788 74 6667		
10	IMUHAYAZURUWA		NYAKISISINDA	-		
11	IMUHAYAZURUWA		NYAKISISINDA	0788 99 5374		



**PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN
THE REPUBLIC OF RWANDA**

STAKEHOLDERS CONSULTATIVE MEETING
PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT..... ON 26th 03rd 2022

#	Name	Sector	Cell	Phone number	Email	Signature
1	MURAHMURETA Emmanuel	Kenema	Nyabisiinda	0788535286		
2	BATHIZI Eugene	Kenema	Nyabisiinda	0988303684		
3	MURASABA Modeste	Kenema	Nyabisiinda	0788539292		
4	GASHAKA Emmanuel	Kenema	Nyabisiinda	0783025103		
5	KENEMANA Evariste	Kenema	Nyabisiinda	01-82500886		
6	MUKEMANA Odette	Kenema	Nyabisiinda	0788769390		
7	AKOBAHUKI STANISLAS	Kenema	Nyabisiinda	0782478104		
8	URAZEYIMANA STANISLAS	Kenema	Nyabisiinda	078676550		
9	KEBAMANA Evariste			0788844536		
10	RUYIMBAGE Eugene			0787249812		
11	MUYIMYENDAHAYE Fontaine			0783453113		



**PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN
THE REPUBLIC OF RWANDA**

**STAKEHOLDERS CONSULTATIVE MEETING
PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT ... Nyakabanda ... ON 26th 05.2022**

#	Name	Sector	Cell	Phone number	Email	Signature
1	WIRTHA R D HONIQUE	REHERA	NYABISINDU	0782610804		
2	LWIN GABYE HAIRANA	HEREMBA	NYABISINDU	0785487422		
3	NYINA SHUMBERA SHO	REMERO	NYABISINDU	0788744682		
4	NYIRAMAKUBA HERERE			0783664734		
5	NYIRAMBA AIRANE			0784514022		
6	IBITEGENTSE JAMVIRE			0785655996		
7	MURAKAZI TEJE AMUKA			0735180190		
8	MURUNDAKAZI EWEZANIEL			0788884550		
9	NYIRORWA BUNDO BASHALLA			0787866849		
10	MUKESHIKIMANA THORCEL	REMERO	NYABISINDU	589671		
11	UBURUNDAKAZI EWEZANIEL	REMERO		0786466507		

KINGINDA - KAGABU



PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN THE REPUBLIC OF RWANDA

STAKEHOLDERS CONSULTATIVE MEETING
PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT: NYAKAKABO, NYAKAZI, KIGALI, RWANDA, 26th/03/2022

#	Name	Sector	Cell	Phone number	Email	Signature
1	Mugisha Z. Uwase	Kinginyira	Kagugu	0788662578	mugisha.z@kigali.gov.rw	[Signature]
2	Murungirye Françoise	Kinginyira	Kagugu	07833863772		[Signature]
3	Munyaneza Claudine	Kinginyira	Kagugu	0790252707		[Signature]
4	NGABONZIZA Adair	Kinginyira	Kigali	0788404500	adair@kigali.gov.rw	[Signature]
5	NGEYIMANA					
6	Hakizabera J.M.V	Kinginyira	Kagugu	0785007450		[Signature]
7	MURAHIMANA J de Dieu			0783269895	murahimana.j@kigali.gov.rw	[Signature]
8	Nyirakwiza Jean Bosco	Kinginyira	Kagugu	0772226475		[Signature]
9	MURAHIMANA			0785776166		[Signature]
10	MURAHIMANA			078809070		[Signature]
11	MURAHIMANA			0777072578		[Signature]
12	MURAHIMANA			0788299595		[Signature]

[Signature]



PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN THE REPUBLIC OF RWANDA

STAKEHOLDERS CONSULTATIVE MEETING
 PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT MUKASHIMANA, X. LILABE ON 26/03/2022

#	Name	Sector	Cell	Phone number	Email	Signature
1	NSHIMIRAMA Aphimba		Kagame	0789236865		[Signature]
2	Ndugyari Cyiza Eupai		Kagame	0785144777		[Signature]
3	Tyamurumye Theogene		Kagame	078682152		[Signature]
4	Kakurumuna Theogene			0786974026		[Signature]
5	Kayumba Jean Paul		Kagame	0786161361		[Signature]
6	Muhamuza Paul		Kagame	078601613		[Signature]
7	Muhamuza Celestin			0786065399		[Signature]
8				078679636		[Signature]
9	Iradukunda Clément					
10	Muase Igabe Olive			072673071		[Signature]
11	MUGABO Paul			0722180991		[Signature]

KINYINYA-KAGUGU



PREPARATORY SURVEY ON THE PROJECT FOR IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI IN THE REPUBLIC OF RWANDA

STAKEHOLDERS CONSULTATIVE MEETING
 PREPARATION OF ENVIRONMENTAL IMPACT ASSESSMENT HELD AT KINYINYA-KAGUGU ON 26th 10.31.2022.

#	Name	Sector	Cell	Phone number	Email	Signature
1	Rwanda Water Fund	Kinyinya	KAGUGU	0788592926		[Signature]
2	Niyonzima Ltd	Kinyinya	KAGUGU	0788320897		[Signature]
3	Nyiranganyizi	Kinyinya	KAGUGU	0788447955		[Signature]
4	Utwitwitsa	Kinyinya	KAGUGU	0788382107		[Signature]
5	Eleza	Kinyinya	KAGUGU	0788537346		[Signature]
6	Habyarimana	Kinyinya	KAGUGU	0788461857		[Signature]
7	Dumugwiza	Kinyinya	KAGUGU	0788337225		[Signature]
8	Mukondakige	Kinyinya	KAGUGU	0788567327		[Signature]
9	Uwizururwa	Kinyinya	KAGUGU	0788513134		[Signature]
10	Munyeshamba	Kinyinya	KAGUGU	078748474		[Signature]
11	Uwizururwa	Kinyinya	KAGUGU	0782133739		[Signature]
12	Uwizururwa	Kinyinya	KAGUGU	0786243737		[Signature]

UMURENGE WA GUSIDZA

AGARIKA MUSEZERA

UMURONGORONGORWA GASHARI

AGYABIRIYE UMUGANDA USOZA (KWEZI KWA WERURWE 2022

N	AMAZINA YORIBI	ISIBO ABAREZWARA	TELEFONE	UMURONGORONGORWA
1	Muhariyaseye	Hamukuzo	0782658080	John
2	Rutahizwe J.N		0787773534	Paul
3	UGASISENGA Emmanuel	TEZATIWA	0791040012	Esther
4	MURUNDA M. I	J.P.V	0785634509	Sgt
5	Mrs. Yili			
6	Kogoro Serahini		0789566991	W/O
7	KUP. D. W			
8	KAMUKA		0788905778	19
9			0784000828	
10	NSABIMANA M	PASCAL	0788559678	
11	MURUNDA Wily	Paulo	0788990671	John
12	MURUNDA	Coatyme	0788442751	John
13	by. Lingulwa		0788715112	John
14	Nyamukama	Walter		John
15	Elena		0791530438	John
16	IRAKIN		283996067	John
17	MURUNDA	Isilubane	0792693293	John
18	MURUNDA		283718211	John
19	STEVEN		07841147344	John
20	NYANDU	DIOGA	0780516326	John
			07850476094	Sgt

RENJE WA GISOZI

AGARI KA MUSEZERO

AJUKUNJUI WA GASHARU

AMTABIRIYE UMUGANDA USOZA UKWEZI KWA WERURWE 2022

N	AMAZINA YOMBİ	ISEB ABARIZWAMO	TELEPHONE	UMUKORO
1	I RAKOBE KELLIN	UMURUNDA	079150283	[Signature]
2	MAHINDU BASHA		0785660982	[Signature]
3	KOJIMBELO BASHA		022554214	[Signature]
4	HASHIMU BASHA	UMUTEKANO	073643825	[Signature]
5	USENGI NANA ZANZA		0785183807	[Signature]
6	SARUMBO ENSHI		0784573328	[Signature]
7	TUPA SHANI		0780164180	[Signature]
8	MURANGI MASHA		0781448815	[Signature]
9	MURANGI MASHA		078426385	[Signature]
10	MURANGI MASHA		0788267201	[Signature]
11	MURANGI MASHA		0783232266	[Signature]
12	MURANGI MASHA		078-449	[Signature]
13	MURANGI MASHA		07883-328	[Signature]
14	MURANGI MASHA		07842181	[Signature]
15	MURANGI MASHA		077707769	[Signature]
16	MURANGI MASHA		078648240	[Signature]
17	MURANGI MASHA		078171500	[Signature]
18	MURANGI MASHA		078643457	[Signature]

UMURENGE WA GIBOZI

AKAGARI KA MUSEZERO

UMURUKUNDA WA GASHARI

AMAFABIRWE UMUGANDA USOZA UKWEZI KWA WEURWE 2022

NR	AMAZIRA YOMBI	YABO ABARIZWANYE	TELEFONE	UMURUKUNDA
1.	SENGAHO Epimaco	JABURIZWANYE	0788229643	Epimaco
2.	Mukigimana	Mukigimana	0783485524	Mukigimana
3.	PISTIMANI Thomas		0785330354	Mukigimana
4.	Mwamburama	Mwamburama	0783485524	Mwamburama
5.	Mwamburama Felix	Mwamburama	0783485524	Mwamburama
6.	Mwamburama	Mwamburama	0783485524	Mwamburama
7.	Mwamburama	Mwamburama	0783485524	Mwamburama
8.	Mwamburama	Mwamburama	0783485524	Mwamburama
9.	Mwamburama	Mwamburama	0783485524	Mwamburama
10.	Mwamburama	Mwamburama	0783485524	Mwamburama
11.	Mwamburama	Mwamburama	0783485524	Mwamburama
12.	Mwamburama	Mwamburama	0783485524	Mwamburama
13.	Mwamburama	Mwamburama	0783485524	Mwamburama
14.	Mwamburama	Mwamburama	0783485524	Mwamburama
15.	Mwamburama	Mwamburama	0783485524	Mwamburama
16.	Mwamburama	Mwamburama	0783485524	Mwamburama
17.	Mwamburama	Mwamburama	0783485524	Mwamburama
18.	Mwamburama	Mwamburama	0783485524	Mwamburama
19.	Mwamburama	Mwamburama	0783485524	Mwamburama
20.			0783485524	Mwamburama

MURENGE WA GISOZI

KAGARI KA MUSEZERO

IMUGABU WA GASHARU

ABITABIRIYE UMUGANDA USOZA UKWEZI KWA WERURWE 2022

N	AMAZINA YOMBI	KIBO ABABIRIYANCI	TELEFONE	UMUKONO
1	NGOGA OLIVIERE	Ndashyamba	0784051120	
2	MUKAZUMBA DOMINIQUE	MADALIZA	0785699607	
3	DOMINIQUE MAMUZI GISE	MAMUZI	0785914352	
4	MUKAZUMBA DOMINIQUE	MAMUZI	0784100000	
5	MUKAZUMBA DOMINIQUE	MAMUZI	0787964223	
6		(Erekeje)		
7	MUKAZUMBA DOMINIQUE	MAMUZI	0783550987	
8	MUKAZUMBA DOMINIQUE	MAMUZI	0786879495	
9	MUKAZUMBA DOMINIQUE	MAMUZI	0782554155	
10	MUKAZUMBA DOMINIQUE	MAMUZI	0789483576	
11	MUKAZUMBA DOMINIQUE	MAMUZI	0782256215	
12	MUKAZUMBA DOMINIQUE	MAMUZI	0781365300	
13	MUKAZUMBA DOMINIQUE	MAMUZI	0781306675	
14	MUKAZUMBA DOMINIQUE	MAMUZI	0786543115	
15	MUKAZUMBA DOMINIQUE	MAMUZI	078217525	
16	MUKAZUMBA DOMINIQUE	MAMUZI	0780349958	
17	MUKAZUMBA DOMINIQUE	MAMUZI	0783173575	
18	MUKAZUMBA DOMINIQUE	MAMUZI	0787859005	
19	MUKAZUMBA DOMINIQUE	MAMUZI	0782434201	
20	MUKAZUMBA DOMINIQUE	MAMUZI	0782677601	

UMURENGE WA GISOZI

ARAGASHI KA MUSEZERO

UBUMUNYAMA WA GASHARU

ABITABIRIYE UMURANGA W'ISHURI UKWEZI RWAGA WEKUBITWE 2022

N	AMAZINA Y'ABANYI	ISHO ABARIRIBAYE	TELEPHONE	UMUKONO
1.	<i>[Handwritten Name]</i>			
2.	<i>[Handwritten Name]</i>			
3.	MURASHA Arok	Abarokoro 12	078267298	<i>[Signature]</i>
4.	Rampasiki yamu Rukiko Gasharu		0788356290	<i>[Signature]</i>
5.	HANUVANIMFUZA	Abarokoro	0783009710	<i>[Signature]</i>
6.	SEANUCUUCI EVANITA	Abarokoro	078302288	<i>[Signature]</i>
7.	WIKUNZA	Abarokoro	0788230066	<i>[Signature]</i>
8.	KAMUKUNYI	Abarokoro	0783600510	<i>[Signature]</i>
9.	KARUKITA	Abarokoro	0788466662	<i>[Signature]</i>
10.	MUKOMUKESHI	19 Abarokoro	0784111205	<i>[Signature]</i>
11.	MUKOMUKESHI	7	0787458267	<i>[Signature]</i>
12.	MUKOMUKESHI	8 Mukeli	0788465972	<i>[Signature]</i>
13.	MUKOMUKESHI		078348042	<i>[Signature]</i>
14.	MUKOMUKESHI		0782311686	<i>[Signature]</i>
15.	MUKOMUKESHI		0780756219	<i>[Signature]</i>
16.	MUKOMUKESHI		0787611152	<i>[Signature]</i>
17.	A BANZE		0787926282	<i>[Signature]</i>
18.				
19.				

UMURENGE WA GISOZI
AKAGARI KA MUSEZERO
UMUDUGUDU WA GASHARU

ABITABIRIYE UMUGANDA WO KU WA 4/6/ 2022

N	AMAZINA YOMBI	ISIBO. ABARIZWAMO	TELEFONE	UMUKONO
1	Ntziyimana Emmanuel	Umuwamba	0984109778	
2	KARUMUKA J. N. Paul	INGELI	0781864253	
3	IRAMBOMA Thashe	Buterimbere	0787569972	
4	HABINAKARE Augustin	Abajyamugamba	0783253281 0788715999	
5	BYIRINGIRO V. ANA			
6	Ndayimana	Buterimbere	078586247	
7	NSABIMANA J. B. B.		0787955762	
8	IRAKINDIMURU SPAXI J. P.	Umuwamba	0788840563	
9	NGOMA OLIVIER	Buterimbere	07807451183	
10	IRAGUMA RUGIRA J. Claude		0788822058	
11	IRARAGINIMANA Emmanuel		0788821449	
12	NSENGIYOMVA		0788214413	
13	HAMUGISHA		0790517426	
14	IRABIMANA Jean Claude	GASAVE	0790074551	
15	Karamukundiye Idratwa	GASHARU	0782229138	
16	KAYITARE J. Paul	GASHARU	0782271580	
17	UMUTONI Christina	GASHARU	0788873790	

UMURENGE WA GISOZI
AKAGARI KA MUSEZERO
UMUDUGUDU WA GASHARU

ABITABIRIYE UMUGANDA WO KU WA 4/6/ 2022

N	AMAZINA YOMBI	ISIBO ABARIZWAMO	TELEPHONE	UMUKONO
1.	Gashumba Faustin	Inyunguungu	0783359339	✓
2.	Kajabo Thabli	Intambwe	0780378785	✓
3.	Mihani Paulin	Abizerwa	0783039106	✓
4.	Ubumuemy Jacqueline	ubumwe	0781276299	✓
5.	Tupinyatu Damascene	ubumwe	0785715946	✓
6.	Mukashyamba Bwatha	ubumwe	0788869551	✓
7.	Kansimira	ubumwe	0785185216	✓
8.	Manipasha	ubumwe	0792167922	✓
9.	Kavuhira	ubumwe	0783274206	✓
10.	Mutsiadasya EVA	INDATSINI	0788508105	✓
11.	Bwirungiro Eliso	ubumwe	0788840310	✓
12.	Nyirukwaga Steph	ubumwe	0782689100	✓
13.	MAKUSA		0787175719	✓
14.	IRINGIRAClement	umuteho	0786413025	✓
15.	SINDIKUBWA BO Ppho	ubumwe	0783614110	✓
16.	Bazira wita H Kazazi		0788690363	✓
17.	Mukashyamba adette	umumuna	0788507191	✓
18.	Kajabo Mutimurwa	INDATSINI	0788508105	✓

UMURENGE WA GISOZI
 AKAGARI KA MUSEZERO
 UMUDUGUDU WA GASHARU

ABITABIRIYE UMUGANDA WO KU WA 4/6/ 2022

N ^o	AMAZINA YOMBI	ISIBO ABARIZWAMO	TELEFONE	UMUKONO
01	MUNDAKAMA Emmanuel	Amukalya	0783786714	Kabite
02	MUKAMUNGA Esperance	Amukalya	0783791170	
03	AMUKAMA Claudette	Kibere	0784538874	
04	Byukustama S.D Amari		0788384400	
05	Mundu Kunda J claud		078867813	
06	AB Rohan		0786626100	
07	Uwambaye Frederic		0788849540	
08	HAKIZI PAVA OSLAZI	IRIBoni	0788916413	
09	Uwamaliya ocathia	ABARIZWAMO	0783157949	
10	Mulizi Amable	ABARIZWAMO	0782688348	
11	PISHAMARU VIKAZI Emomvu	ABARIZWAMO	029370889	
12	Mukokamari Charal	Umurava	078245588	
13	Uwamgabise Clarisa	Umurava	0788060388	
14	nyirabashumba	Umurava	0782022083	
15	BALGIZA JUSTIN	UMURAVA	0787181030	
16	NKURAZIZA Zepal	UMURAVA	0782212815	
17	MUNDAKAMA SOKIMI	UMURAVA	093958968	
18	MUKAMUNGA SEZINE	KIBERE	0784546719	
19	MUKAMUNGA ALOHANI	UMURAVA	07992180100	



PROJECT OF IMPROVEMENT OF WATER SUPPLY SERVICES IN NORTH-CENTRAL KIGALI.

STAKEHOLDER CONSULTATION MEETING / ATTENDANCE LIST.

DATE: 04/06/2022

No	Names	Cell village	Village	Telephone	Signature
16	SEBUTAMA Elias	Nyakabungo	Kagugu	0787521783	[Signature]
17	BIMENYIMANA Emmanuel	"	"	-	[Signature]
18	NGABONZIZA Adéodatus	"	"	0788444500	[Signature]
19	MUKAMANA Béatrice	"	"	0780731792	[Signature]
20	MUKAKYATAMU marceline	"	"	0788509897	[Signature]
21	usumbaza Egidio	nyakabungo	KABUBU	0789894488	[Signature]
22	Ntuzanyu Jean	Nyakabungo		0782164892	[Signature]
23	BITEGEKIMANA SPOM de Dieu	"	KAGUGU	0788947955	[Signature]
24	Mukandayisenga Juliette	Nyakabungo	Kagugu	0789381509	[Signature]
25	Kohamanda Alice	Nyakabungo	Kagugu	0781512286	[Signature]
26	UMUGOZA Jeanne	Nyakabungo	KAGUGU	078022607	[Signature]
27	NFITUMUKA ZA JEANNE	Nyakabungo	KAGUGU	07905735530	[Signature]
28	Umugandaga Zhenia	"	Kyerecyga	078820627	[Signature]
29	J. Marie	"		078577616	[Signature]



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No	Names	Cell Village	Village-Cell	Telephone	Signature
30	Kantengwa Xaverine	Nyakabungo	Kagugu	0788755752	[Signature]
31	Nsanzi-utukine Ali	Nyakabungo	Kagugu	0783560912	[Signature]
32	KO KUKUMU S. M. O. J. D.	Nyakabungo	Kagugu	0788755752	[Signature]
33	Ngobo Olivier	"	"	0783295415	[Signature]
34	Kutanyi Sire Laurent	Nyakabungo	Kagugu	0788647280	[Signature]
35	Gatabazi Pascal	Nyakabungo	Kagugu	-	[Signature]
36	ISAMUREMYE Théopène	Nyakabungo	Kagugu	0788682152	[Signature]
37	Mwatabigira Fidèle	Nyakabungo	Kagugu	0788217320	[Signature]
38	NSENYEMURUMUZI Felicien	Nyakabungo	Kagugu	0786660493	[Signature]
39	UMDEYIMANA Karim	Nyakabungo	Kagugu	0799736615	[Signature]



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No	Names	Cell	Village	Telephone	Signature
1	PURAH GILBERT	KAGUGU	NYAKABUNGO	0788518405	
2	NTARENKANYA J. CHRISTOPHER	KAGUGU	NYAKABUNGO	0788747987	
3	RUTANZISIRE ABDOU	KAGUGU	NYAKABUNGO	0788652726	
4	Nyirakamama Henriette	KAGUGU	Nyakabungo	0787384575	
5	NHIMYIMANA Iphanga	Kagugu	Nyakabungo	078874744	
6	MUKONORO PAPA ANGELENE	KAGUGU	NYAKABUNGO	0785028729	
7	MUKAKIGELI JOSEPHINE	KAGUGU	Nyakabungo	0788601686	
8	NSENGAMUNGU JEAN PIERRE	KAGUGU	NYAKABUNGO	0786719835	
9	NSENGAMUNGU Emmanuel	KAGUGU	NYAKABUNGO	078876926	
10	MUKAKIGELI JOSEPHINE	KAGUGU	Nyakabungo	078875381	
11	MUKAMPERE FIANA	KAGUGU	Nyakabungo		
12	MUKONDO G. CONSOLE	KAGUGU	Nyakabungo	0784252656	
13	MUKAKIGELI JACKY	KAGUGU	Nyakabungo	0784896765	
15	MUKAKIGELI VINCENT	KAGUGU	Nyakabungo	0784881278	



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No	Names	Cell	Village	Telephone	Signature
	MUSABYIMANA Claude	NYABISINDU	NYABISINDU	0788884550	
	USI BONZIMA Florencia	NYABISINDU	NYABISINDU	0785218518	
	NYIRIMANA Athanasie	nyabisindu	nyabisindu	0783772255	
	MUSABYIMANA Jean Claude	''	''	0785880000	
	Munyantwari Emmanuel	''	''	0788884550	
	MURINDAKIMANA Shairie	''	''	0788 236636	
	Munyantwari Innocent	''	''	0787453522	
	Korugwa Aphrodite	''	''	0788936218	
	Uwirana Emmanuel	''	''	0788867929	



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No	Names	Cell	Village	Telephone	Signature
1	N. P. K. M. W. I. S. E. K. E. G. I. L. L. E. R. T.	Nyabisiindu	Nyabisiindu	0788276045	
2	N. Y. I. T. G. E. H. A. J. O. A. N. S.	Nyabisiindu	Nyabisiindu	0783511304	
3	M. U. K. I. M. P. U. N. A. J. A. N. N. E. T. T. E.	Nyabisiindu	Nyabisiindu	0724657944	
4	N. Z. I. Y. U. M. V. I. R. A. M. A. S. U. M. B. U. T. O.	Nyabisiindu	Nyabisiindu	078061888	
5	N. Z. I. Y. U. M. V. I. R. A. M. A. S. U. M. B. U. T. O.	Nyabisiindu	Nyabisiindu	0780657287	
6	M. W. I. Z. I. Y. I. M. A. M. N. A.	muringani	muringani	0486593621	
7	M. U. K. I. M. P. U. N. A. J. A. N. N. E. T. T. E.	Nyabisiindu	Nyabisiindu	0783856134	
8	M. U. K. I. M. P. U. N. A. J. A. N. N. E. T. T. E.	Nyabisiindu	Nyabisiindu	078668880	
9	M. U. K. I. M. P. U. N. A. J. A. N. N. E. T. T. E.	Nyabisiindu	Nyabisiindu	078462270	
10	M. U. K. I. M. P. U. N. A. J. A. N. N. E. T. T. E.	Nyabisiindu	Nyabisiindu	0788611136	
11	N. D. E. R. E. R. I. H. A. N. A.	Nyabisiindu	Nyabisiindu	0789547852	



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DATE: 09/06/2019

No	Names	Cell	Village	Telephone	Signature
	UNAGAZE Thomas	Nyabisiinda	Nyabisiinda	0783165574	
	MUKABAZA mu Irifurine	Nyabisiinda	Makumbura	0784513491	
	CHIZA Jean	Nyabisiinda	Makumbura	0785959157	
	MURAKAYEJE M. Jeanne	"	"	0780659054	
	MUTUYIMANA Jene	"	"	0788665256	
	MUKABAZAANA Coleffe	"	"	0782215449	
	Umuboni Lemurine	"	"	0780668113	
	UMANAHOBO Odouze Prudence	Nyabisiinda	"	0788233557	
	MUKAMPABAGE Esperance	"	"	0789400744	
	MURONENGE Gasiane	"	Makumbura	0785500281	
	Uherumanya Dotika	"	Makumbura	078487727	
	MZAMUKIYE Kuzo NicaCe	"	"	0782826231	
	MUKANGENZI Vestin	"	"	0781522602	
	DUSABE BERENGE	Nyabisiinda	"	0787163060	



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STAKEHOLDER CONSULTATION MEETING / ATTENDANCE LIST.

DATE: 04.10.2022

No	Names	Cell	Village	Telephone	Signature
1	UJAJIYIMANA FUGEN	NYUBISIMBU	NYUBISIMBU	0784251384	[Signature]
2	AKIZIMANA ANDREA			0788630966	[Signature]
	USUBUMIBAJIMANA ESIPERUKA			0784658817	[Signature]
3	ADABASEMVA F			0790126900	[Signature]
4	NYABYENOH A ROSS			0783427008	[Signature]
5	NYIRANTEZI MARIYA SHARIRATI			098879870	[Signature]
6	MUDAMURUSHEKA J. Bapstite	NYUBISIMBU	NYUBISIMBU	0785718537	[Signature]
7	SUBUGA MARIE			0781499981	[Signature]
8	NDIKUSUMANA S. Pierre Vianey			0783111807	[Signature]
9	BIMENYIMANA JOSEPH			0788440458	[Signature]
10	MANIRAKORA DAMASCENE			0781959775	[Signature]
11	KADIMANA ALEXIS			0780344110	[Signature]
12	NYIBESYAHUJ JAMU			0788701026	[Signature]
13	RWASINDWA IMY			0785305908	[Signature]
14	NYISHIMANA B. Gervaise				[Signature]

Annex 5: Interview guiding questionnaire

Ibibazo bizayobora ikiganiro hamwe n'abaturage ku mushinga wo kongera ubushobozi kw'itangwa ry'amazi muri gice cy' Amajyaruguru yo hagati y'Umujyi wa Kigali/ Interview guide with local population / Project of Improvement of water Supply services in North Central Kigali

1. Mwigeze mubwirwa ko hari umushinga wo kongerera ubushobozi kw'itangwa ry'amazi meza muri aka gace mutuyemo? *Have you ever been told about the present project improvement of water supply services in this area?*
2. Niba mwarawumenye n'ubu mukaba muwusobanuriwe muwishimiye mute? *How do you appreciate this project?*
3. Mwumva uruhare rwanyu rwaba uruhe kugira ngo uyu mushinga uzagere ku ntego zizagerweho? *What do you think can be your role and contribution to the sustainability of the present project?*
4. Mubona uyu mushinga wo kubagezaho amazi meza hari icyo uzahindura ku mibereho yanyu ya buri munsu/Do you think that this project will improve your living conditions?
5. Niba ari yego mu buhe buryo? *If yes, kindly explain.*
6. Ni iki kindi mubona umushinga uzahindura ku imibereho yanyu bitari ukubagezaho amazi meza gusa? *What else do you think the project will contribute to your normal living conditions except the accessibility to clean water?*
7. Hamwe na hamwe aho umushinga uzakorera hari ibizangirika. Mubona ari iki cyakorwa ngo umushinga uzagende neza? *During the project implementation, there will be some negative impacts on land and vegetation. What do you think can be done to avoid those negative impacts?*
8. Hari ingaruka ku bidukikije mwaba muzi ziterwa no gushyira mu bikorwa imishinga imwe n'imwe? Niba ari yego izihe? *Do you have any information about the environmental impacts caused by the implementation of some projects? If yes, what are they? Ni izihe ngaruka ku bidukikije mubona zizatezwa n'uyu mushinga? What do you think are the main environmental impacts of the present project implementation?*
9. Ingaruka mwavuze haruguru mubona zakwirindwa zite? *What are your suggestions related to mitigation measures to those identified impacts?*
10. Ni iki mwumva mwasaba kugira ngo uyu mushinga uzabagirire akamaro muri rusange kandi uzabungabunge ibidukikije? *What can you suggest that this project may be useful and successfully implemented while conserving the environment?*

Murakoze ku kiganiro tugiranye/thank you

END