



Ministry of Water and Environment

Irrigation for Climate Resilience Project (ICRP)

Terms of Reference for

**Environmental and Social Impact Assessment
(ESIA)**

**for the Construction of Amagoro Irrigation scheme
in Tororo District**

August 2022

1. Background

Irrigation for Climate Resilience Project

The Government of Uganda (GoU) with support from the International Development Association (IDA) is implementing the Irrigation for Climate Resilient Project (ICRP). The project will provide farmers in the project areas with access to irrigation and other agricultural services, and establish management arrangements for irrigation service delivery.

The project has three components: Component 1. Irrigation Services; Component 2. Support services or agricultural production and value-chain development; and Component 3. Institutional Strengthening and Implementation Support.

Component 1. Irrigation Services

Access to irrigation is critical to allowing farmers cope with climate variability, to increase yield and intensification, and diversify towards higher value crops. Component 1 aims at providing farmers with irrigation water across various irrigation models, classified around the size of irrigation development as per the National Irrigation Policy, spanning across the country. Component 1 comprises three sub-components.

Sub-component 1.1 Large and Medium-scale Irrigation. Large (>1,000 ha) and Medium (100 to 1,000 ha) scale irrigation schemes are established when an important water source is available in conjunction with a sizable irrigable area, offering the chance of developing economies of scale for marketing and value addition. As water might not be directly accessible across the whole irrigable area, and/or as the water source might be at a certain distance from the irrigable area and/or variable over the year, off-farm infrastructures (i.e. dams, diversions weirs, transmission pipes or canals, distribution networks) are required. The project will construct new irrigation schemes; support the development and strengthening of management model of irrigation schemes; and develop studies for future irrigation schemes. The project will support the construction of the Kabuyanda and Matanda schemes, and it will support the design of the Enengo, Nyimur and Amagoro schemes (to be designed under the project but to be constructed under future investments).

Sub-component 1.2 Small and Micro-scale Irrigation. Small (5 to 100 ha) and Micro (<5 ha) scale irrigation schemes are smaller in size, relying on a nearby water source mobilized with simple and relatively low-cost infrastructure, making it possible for farmers to take charge of irrigation development and management. The project will pilot public support for the construction of farmer-led small and micro scale irrigation schemes around the two new irrigation schemes and in areas close to Kampala characterized by high marketing potential, adopting a value chain approach.

Sub-component 1.3 Integrated Catchment management. It will develop and implement integrated catchment management interventions for the two new irrigation schemes (Kabuyanda and Matanda), to improve the sustainability of the schemes, including the restoration/reforestation activity in Rwoho CFR.

Component 2. Support services for agricultural production and value-chain development

Component 2 aims to support farmers carrying out on-farm irrigation, accessing production and value addition knowledge and skills, and developing sustainable market access. Component 2 will comprise of two sub-components.

Sub-component 2.1 On-farm Production and Productivity. It will provide support to farmers and farmers' groups for production and productivity improvement at the farm level in the new irrigation schemes, in existing irrigation schemes, in small and micro irrigation schemes as well as in the area of the proposed future irrigation scheme.

Sub-component 2.2 Value Addition and Market Linkages. It will provide support to farmers' groups for value-chain development and strengthening and establishment of market linkages.

Component 3. Institutional Strengthening and Implementation Support

Component 3 will support institutional strengthening. Activities will include: (i) short-term studies on management models in irrigation, tariff structures, and prerequisites for financial sustainability; and (ii) capacity building, training and study tours. The project will contribute to improvement of farm incomes, rural livelihoods, food security, climate resilience, sustainable natural resources management and agricultural enterprise development through development of Amagoro, Irrigation scheme in Tororo District.

The ICRP was approved by the World Bank Board in May 2020, declared effective in December 2020, and closing is set in April 2026. The following World Bank Environmental and Social Standards (ESS) are relevant to the project.

- 1) ESS1: Assessment and Management of Environmental and Social Risks and Impacts
- 2) ESS 2: Labor and Working Conditions
- 3) ESS 3: Resource Efficiency and Pollution Prevention and Management
- 4) ESS 4: Community Health and Safety
- 5) ESS 5: Land Acquisition, restrictions on Land Use and Involuntary Resettlement
- 6) ESS 6: Biodiversity Conservation and Sustainable Management of Living Resources
- 7) ESS 7: Indigenous Peoples/ Sub-Saharan African Historically Underserved Traditional Local Communities.
- 8) ESS 8: Cultural Heritage.
- 9) ESS10: Stakeholder Engagement and Disclosure.

During the ICRP preparation, an Environment and Social Management Framework (ESMF) was prepared. The ESMF establishes procedures and methodologies for environmental and social screening, assessment, review and approval, and implementation of investments in compliance with the Ugandan and World Bank Environmental and Social Safeguard Policies.

The ESMF also provides guidance on stakeholder consultations, engagement, and disclosure of documents to the relevant stakeholders, institutional arrangements for project implementation, and guidance on siting, assessment and management of auxiliary facilities such as workers camps, equipment storage yards, stone quarries, gravel areas, etc. The ESMF was prepared in a consultative manner and disclosed by MWE and on the World Bank's website on January 29, 2019. The ESIA of the Amagoro scheme (to be designed under the project but to be constructed under future investments) shall be subjected to a separate ESIA following the project ESMF and reviewed and cleared by the World Bank. Aspects specific to Amagoro highlighted in the ESMF include, among others:

Issues of child labour in rice irrigated fields: The regional distribution of child labor in Uganda indicates that eastern region (where the proposed Amagoro site falls) has a relatively higher proportion of working children aged 5-9 years and reveals the highest number of working children compared to other regions. Child labor comes with its social vices of sexual exploitation and abuse especially of the girl child causing instances of early pregnancies.

Land insecurity: Consultations with local residents in Amagoro site indicate high level of land insecurity.

During the ICRP preparation, a Resettlement Policy Framework (RPF) was prepared (consulted upon, cleared and disclosed on February 18, 2019 and on the World Bank's website on February 20, 2019). A site-specific RAP for Amagoro will be prepared by MWE in line with the RPF, in parallel with the current assignment.

2. Objectives of the assignment

The objective of the assignment is to carry out an Environmental and Social Impact Assessment (ESIA) for Amagoro Irrigation Scheme. This will include establishment of a socio-economic environmental baseline, assessment of proposed development options, scoping; prediction of the magnitude and significance of environmental and social impacts, recommending mitigation measures for identified impacts, and devising how they can be incorporated into project design and implementation plans. The ESIA will be developed in line with the approved ESMF.

The study will be undertaken within the framework of the Government of Uganda, as well as World Bank ESF (2018) that sets out the World Bank's commitment to sustainable development. There are ten Environmental and Social Standards which set out the mandatory requirements that apply to the Borrower and Projects. They include:

- 1) ESS1: Assessment and Management of Environmental and Social Risks and Impacts.
- 2) ESS 2: Labor and Working Conditions.
- 3) ESS 3: Resource Efficiency and Pollution Prevention and Management.
- 4) ESS 4: Community Health and Safety.
- 5) ESS 5: Land Acquisition, restrictions on Land Use and Involuntary Resettlement
- 6) ESS 6: Biodiversity Conservation and Sustainable Management of Living Resources.
- 7) ESS 8: Cultural Heritage.
- 8) ESS10: Stakeholder Engagement and Disclosure.

Disclosure policies as well as World Bank Group Environmental Health and Safety Guidelines (EHSs) (General and Industry-specific). Items where World Bank Policy and requirements are more comprehensive must be addressed over and above requirements of the regulatory framework of Uganda. According to the National Environment Act 2019; *Abstraction or utilisation of surface water for agricultural, industrial or urban use of more than 1000 m³/day*, is among projects listed in Schedule 5, of the Act where an ESIA is mandatory, as such projects have significant Environmental Impacts.

The purpose of the ESIA is to ensure that the proposed investments implemented through the Project comply with the existing Ugandan environmental management laws, regulations and standards, as well as with the ESF; and will not have a lasting adverse impact on the country's population and their livelihood, the natural environment or assets of particular cultural heritage value. The ESIA will assess in an integrated way all relevant environmental and social risks and impacts, including those specifically identified throughout applicable ESSs2-10. The environmental and social assessment will apply a mitigation hierarchy, which will: (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.

The ESIA will:

- (i) determine the environmental and social-economic baseline condition at the proposed project site;
- (ii) assess the environmental and social risks and impacts of the construction and operation of the selected irrigation infrastructure investments related to the project, including pre-assessment of environmental and social risks and impacts in accordance with the decision of relevant institutions in Uganda;
- (iii) identify cost related mitigation measures and monitoring activities, and undertake public consultations, focusing particularly on project affected people, if any, and other main stakeholders to discuss any environmental and social risks and impacts, positive and negative as well as key project benefits. The impact assessment and mitigation shall consider all phases of project development, i.e. pre-construction/planning, Construction and operational phases. Decommissioning planning at the end of life time of the projects should also be considered in the ESIA.

2.1 Specific objectives

- 1) To provide baseline information about the environmental, social, and economic conditions in the project area;
- 2) To identify, analyze and evaluate the type and extent of likely potential environmental and social impacts with emphasis on significance, magnitude and distribution of beneficial/adverse effects of the planned project on the existing biophysical and socio-economic environmental components, and assess the capacity of the institutions responsible for management of these impacts;
- 3) Evaluate the social and socio-economic aspects of the proposed project, identify stakeholders, carry out public consultations (in line with ESS 10), including potentially project affected persons, analyze their views regarding the environmental and social impacts, design social provisions and measures, formulate strategies for participatory implementation, and recommend the incorporation of the findings into the project design.
- 4) To assess the best alternative project at most benefits and least costs in terms of financial, social, and environment.
- 5) To develop Environmental and Social Management Plan (ESMP) (the ESMP will follow the indicative outline shown in ESS1 on pages 26 & 27, Section E of the ESF). The ESMP shall outline and recommend the mitigation/enhancement, monitoring, consultative and institutional strengthening measures to prevent, minimize, mitigate or compensate for adverse environmental and social impacts and to enhance beneficial impacts, costs of the measures and monitoring requirements. The ESMP shall be prepared in such a manner that environmental and social requirements (mitigation measures and monitoring, technical specifications) related to the construction phase could be incorporated in the bidding/contract documents.

The consultant will undertake the ESIA study in close coordination with the Feasibility studies and detailed design being carried out under a separate consultancy. The consultant will share information, give feed- back, incorporate findings and recommendations from the feasibility studies and detailed design consultant.

3. Scope of work for ESIA

Task 1: Establishment of a Socio-economic and Environmental Baseline

1.1: Description of the proposed project

The Consultant shall review existing documentation, provide and describe the proposed project and its geographic, environmental, social and temporal context, including all project components and associated facilities and infrastructure (drawing from the conceptual project formulation from the feasibility study consultant). The Consultant will carry out a thorough analysis of the proposed project activities and determine the project area of influence (covering the project's direct, indirect and cumulative impacts). In addition, the description shall provide information on, but not limited to, the general design and extent of irrigation and drainage works including specifications of reservoir, the other uses benefiting from the reservoir other than irrigation, size and characteristics of the catchment including hydrological capacity to sustain the planned and existing land-uses, and aspects related to operation and maintenance of irrigation schemes. All types of ancillary works and associated facilities should be analyzed and included in baseline studies and impact assessment.

1.2: Description of the Environmental and Social Conditions of the Project Area

ESS 1, Annex 1 shall apply in totality and as guided under Annex 1 (D)-d, on baselines studies; this stage will comprise a description of the present environment in the predicted Area of Influence (AOI) of the project, determined from actual site visits, site specific baseline studies in terms of the physical, biological and socio-economic domains. The baseline conditions will set out in detail the baseline data that is relevant to decisions about project location, design, operation, or mitigation measures. This should include a discussion of the accuracy, reliability, and sources of the data as well as information

about dates surrounding project identification, planning and implementation; Identify and estimate the extent and quality of available data, key data gaps, and uncertainties associated with predictions.

The baseline surveys are intended to provide a measure of existing environment and the socio-economic situation against which future changes due to the project can be monitored. The consultant shall describe and analyze the physical, biological and socio-cultural conditions prevailing in the project areas, highlighting relevant environmental and social issues including any changes anticipated before the project commences. The description will include the characteristic of proposed project area and cover areas potentially affected by impacts, the potential compensation areas, and areas affected by alternatives. Monitoring indicators will be developed.

The Consultant shall collect, evaluate and present baseline data and information on the relevant environmental characteristics of the present environment in the areas of influence of the proposed dam site upstream and downstream, irrigation command area and related activities, determined from actual site visits, site specific and regional baseline studies in physical, biological, and socio-economic domains. Collection of baseline data should be designed to satisfy information requirements and focused on relevant aspects that are likely to be affected by the proposed irrigation scheme developments. In addition to field sampling, the consultant will review information from secondary sources.

Generation of baseline data will involve the following

- i) Physical environment
- ii) Biological environment
- iii) Socio-economic and cultural constraints.

The methodologies employed to obtain baseline and other data should be prepared by the consultant and approved by the Client.

i) Physical

Investigation of the climate, topography, soils, geology and hydrology of the area including river sediment for all the proposed irrigation schemes. Special emphasis should be placed on storm water run-off and drainage patterns. Any slope stability issues that could arise should be thoroughly explored. The general hydrological characteristics and capacity to sustain both the existing and planned project activities should be considered, including any catchment management plan that may be in place for the affected watershed.

Water quality and quantity of river reaches within the area of influence. Quality Indicators should include but not necessarily be limited to suspended solids, turbidity and dissolved oxygen. Obvious sources of pollution existing or expected and extent of contamination. Determination of environmental flow adequate to ensure No Net loss in aquatic and riparian ecosystems as well as ensure safety of downstream communities and users.

ii) Biological

Survey of the existing flora and fauna (terrestrial and aquatic) in the expected area of influence, with special emphasis on naturally protected, vulnerable, migratory, rare, endemic, protected or endangered species of the following minimum groups: fish, aquatic macro-invertebrates, mammals, reptiles, amphibians, bird species, aquatic plants and riparian vegetation species, among others. The survey should cover natural habitats and ecologically sensitive areas.

iii) Socio-economic & cultural baseline

i. Key socio-economic issues to be considered include population demographic profile with social categories, number of households/families likely to be affected or benefit from the project, types of housing, health and education profile, migration patterns, if any;

- 1)** Land ownership and holding; Existing cropping pattern of the project area and changes; Agricultural practices including traditional knowledge on endemic species; Improvement in crop production and productivity; Possible improvement in surface and ground water availability and benefits accrued to irrigated agriculture, drinking water use, and industries;

Agricultural input pattern; Economics of cultivation; Non-agricultural practices such as poultry, livestock keeping etc; Employment profile; Income profile; Other economic activities prevailing in the region; Availability of social and economic infrastructure; Gender issues; revenue disparities, health problems, land use patterns and civil society structures, propose practical compensation options and livelihood restoration measures where applicable. The level of detail should be sufficient ~~to~~ to convey the general nature of environmental and social resources condition of the affected areas.

Task 2: Environmental and Social Scoping

The Consultant shall carry out an environmental scoping exercise to define the important issues and impacts that need to be studied and confirm the ToR for the study. Based on current information, the scoping, which will involve stakeholder consultation will assess the scope of the area to be studied and describe relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commences; and also takes into account current and proposed development activities within the project area but not directly connected to the project.

The exercise shall focus on the following areas amongst others:

Environment

- 1) Impacts on the flora and fauna.
- 2) Likely change in the river regime;
- 3) Impact due to change in hydrological cycle;
- 4) Impact on siltation preferably using quantitative techniques;
- 5) Impact on water quality (surface and ground water);
- 6) Impact on ground water levels and recharge potential;
- 7) Impact due to change in waste assimilation capacity of the river system;
- 8) Impacts on the drainage and water resources
- 9) Impacts on landscape and general aesthetics,
- 10) Erosion concerns and associated siltation
- 11) Impacts on soils, land use and agriculture
- 12) Impacts on protected areas, swamps, as well as other relevant natural and critical habitats
- 13) Impacts on ambient air quality
- 14) Potential cumulative impact assessment issues, appropriate boundaries for analysis, and identifying relevant past, present, and future actions.

Social

- 1) Impacts on property, settlements and community facilities
- 2) Land uptake and resettlements;
- 3) Impacts on social settings and community ties/relations
- 4) Impacts on livelihoods
- 5) Identify vulnerable groups likely to be affected by the project
- 6) Induced development resulting from the implementation of the project
- 7) Impacts on cultural property.
- 8) Impacts on recreation.
- 9) Gender dynamics/related issues and risks of GBV.
- 10) Water issues for livestock purposes.

Community health and safety (CHS)

- 1) Security implications.
- 2) Potential influx of labour and prospects of employment benefits to the community.
- 3) Disease burden and associated health impacts, HIV/AIDS issues, safety issues
- 4) Impacts on water quality and availability
- 5) Structural Safety of Project Infrastructure
- 6) Traffic Safety
- 7) Transport of Hazardous Materials

Occupational health and safety (OHS)

- 1) Physical Hazards
- 2) Chemical Hazards
- 3) Biological Hazards
- 4) Special Hazard Environments

As part of the scoping exercise, the assignment will consult the affected population and other relevant stakeholders using an appropriate methodology. The outcome of the Public Consultations shall be recorded in the Scoping Report. The findings of these consultations will also be made accessible to the relevant stakeholders, including potentially affected persons.

Task 3: Policy, Legislative, Regulatory, administrative Considerations

The Consultant shall analyze the Legal, Policy and Institutional Framework of the proposed project. The Consultant shall identify and describe the pertinent laws, regulations and standards - both National and International (World Bank ESF and the relevant ESS's, identifying which of these should be triggered, justification for triggers, and description of how each policy requirements shall be/have been met and governing the environmental quality, health and safety, protection of sensitive areas, protection of endangered species, land use control at the national and local levels and ecological and socio-economic issues. The assessment shall take into account the applicable National Legislation, Regulations, policies and standards, and institutional capabilities (including implementation) relating to environmental and social issues in the construction and operation of the project, applicable requirements under the relevant ESSs, the World Bank Group Environmental Health and Safety Guidelines (both General and Industry-specific) and other Good International Industry Practice (GIIP). The examination of the legislation should include the relevant international conventions to which the governments are signatories. The Consultant shall compare the existing national environmental and social framework and the ESSs and identify the gaps between them. The consultant shall identify design or operating procedures, which the project components must meet to comply with the World Bank ESF, such as effluent standards, extraction limits, receiving water quality standards, noise standards and road safety standards etc., and any legal steps necessary to ensure the effective implementation of the identified environmental protection and impact mitigation measures. The consultant shall assess the relevant government agencies involved in environmental and social management issues, including the institutional capacity with a view of identifying gaps and recommending appropriate remedial measures to ensure that the ESMP will be effectively implemented. Thereafter, the Consultant shall identify the project activities that should comply with the identified regulations.

Task 4: Determination of the potential impacts of the proposed Irrigation scheme

Following the scoping and baseline assessment, the consultant will predict and assess the environmental and social benefits and negative impacts of the Project as well as any environmental and social enhancement that may occur during the planning, construction, operational and decommissioning phases including the environmental and social risks and impacts specifically identified in the relevant ESSs. The assessment will distinguish between positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts, permanent and temporary, as well as impacts that are unavoidable or irreversible. Wherever possible, impacts will be described quantitatively, in terms of costs and benefits. For each potential impact, the consultant should determine the magnitude, the consequences (who it will affect and how), the probability of reversing the impact, and the probability that the impact can be avoided. Once the impacts have been analyzed, their significance will be determined, i.e., whether they are acceptable, require mitigation, or are unacceptable. Impacts should cover the permanent project works, ancillary works and associated facilities if any. The consultant should explicitly describe impacts relevant to the ESF and the relevant ESS's. Key findings from the other Environment and social instruments including RAP and dam safety plans should be summarized in the ESIA. Potential impacts will include but not limited to:

Environment

- 1) ecological effects of reservoir inundation (Impacts on the flora and fauna, Impacts on the drainage and water resources outside and inside the command area, Likely change in the river regime; Impact due to change in hydrological cycle etc;
- 2) impact on siltation preferably using quantitative techniques;
- 3) impact on water quality (surface and ground water);
- 4) impact on ground water levels and recharge potential;
- 5) impact due to change in waste assimilation capacity of the river system;
- 6) impacts on landscape and general aesthetics,
- 7) erosion concerns and associated siltation;
- 8) impacts on soils, land use and agriculture;
- 9) impacts on protected areas, swamps, as well as other relevant natural and critical habitats;
- 10) impacts on ambient air quality;
- 11) effects of climate change and variability on the planned project during project implementation;
- 12) potential cumulative impact assessment issues, appropriate boundaries for analysis, and identifying relevant past, present, and future actions;
- 13) effects related to project operation: pollution by agrochemicals impacts on soils (waterlogging, salinization, etc.); changes in groundwater levels inside and outside command area; changes in surface water quality and risks of eutrophication;
- 14) effects on riverine fisheries and potential for creating a reservoir fisheries resource;
- 15) Impacts of altering river flow regimes on the ecology of the floodplain, and the economic activities/land use on the floodplain (agriculture, livestock production, etc.);
- 16) effect of existing and predicted land use in the watershed on the functioning and longevity of the dam, reservoir and the irrigation command area;
- 17) assessment of construction material source points, murrum, clay core, rock fill sand and other material to be sourced from quarries within the vicinity of the project site.

Social

Social effects of reservoir inundation (loss of agricultural, forestry and grazing land, Land up-take and population resettlement, impact on historic and cultural sites, Impacts on property, settlements and community facilities etc.)

- ~~1)2)~~ Impacts on social settings and community ties/relations
- ~~2)3)~~ Impacts on livelihoods
- ~~3)4)~~ Induced development resulting from the implementation of the project
- ~~4)5)~~ Impacts on recreation
- ~~5)6)~~ Gender dynamics/related issues and risks of GBV
- ~~6)7)~~ Water issues for livestock purposes
- 8) Potential environmental and social impacts by planned and unplanned immigration into the area.

Social-Economic Baseline

The consultant will also prepare the socio-economic baseline of the area which will be used to assess the impact of the project to the communities and this will cover:

ii. Socio-economic assessment will include: Administrative set up of project area, Population demographics, community structure and employment characters house hold surveys for key characteristics including culture, ethnicity and religion, livelihood and economic activities, housing and settlements, water and sanitations, education and literacy, HIV/AIDs and their health, gender and children rights as well as the special interest groups (elderly, people with disability), peace and security. The consultant shall also include local economy and income distribution, social services e.g., schools and health centres in the area and types of land use, existing social infrastructure, and other complementary services.

iii. Land and water use patterns at both the house hold and communal levels and any local management structures (leaders, water and sanitation committees, etc., access roads).

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Community health and safety (CHS)

- 1) Security implications.
- 2) Potential influx of labour and prospects of employment benefits to the community.
- 3) Disease burden and associated health impacts, HIV/AIDS issues, safety issues
- 4) Impact of altering water supply on urban and rural users.
- 5) Structural Safety of Project Infrastructure
- 6) Traffic Safety
- 7) Transport of Hazardous Materials
- 8) Effects related to construction works: construction spoils (disposal of); sanitary conditions and health risks associated with construction camp and workers coming into the area; social and cultural conflicts between imported workers and local people.
- 9) Effects related to project operation: potential for increased incidence of water-borne and water-related diseases.

Occupational health and safety (OHS)

- 1) Physical Hazards
- 2) Chemical Hazards
- 3) Biological Hazards
- 4) Special Hazard Environments.

Task 5: Analysis of Alternatives

The objective of comparative analysis will be to define the merits and demerits of realistic alternatives, thereby providing decision makers and the public with a clear basis for choosing between options. The consultant will assess alternatives that were examined in the course of developing the proposed project (by the feasibility study) and identify other alternatives, which would achieve the same objective. The Consultant will systematically compare feasible alternatives to the proposed project site, technology, design, and operation and maintenance procedures--including the "without project" situation--in terms of their potential environmental and social impacts on land and energy requirements; impacts on the population and their livelihood; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, the analysis shall quantify the environmental costs and benefits to the extent possible, and attach economic values where feasible. This will include analysis of (i) costs and benefits of environmental impacts; (ii) costs, benefits, and cost-effectiveness of mitigation measures; and (iii) discussion of impacts that have not been expressed in monetary values, in quantitative terms where possible (e.g. weight of volume estimates of pollutants).

Task 6: Formulation of Mitigation Measures

The Consultant will formulate cost-effective measures to mitigate (preventing, minimizing, compensating or enhancing beneficial impacts) anticipated environmental and social changes and impacts during project implementation and operation, or further reduce the residual environmental and social changes inherent in the selected project design and propose optimized alternatives as necessary. The scope will include technical, social, and institutional measures to be implemented as integral elements of the project. The measures will inform technical designs of the project components (under the feasibility study). A risk mitigation hierarchy should be used which will: (a) Anticipate and avoid risks and impacts; (b) Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; (c) Once risks and impacts have been minimized or reduced, mitigate; ~~25~~ and (d) Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible. The extent to which the different mitigation measures will reduce the scale of impacts arising from the scheme will be evaluated, and unavoidable residual negative impacts identified, including specifying issues that do not require further attention, providing the basis for this

determination. The Consultant will to the extent possible, assess the acceptability of those residual negative impacts. The mitigation measures proposed should be practical to implement and realistic to the impact assessed. It must be time bound. During development of mitigation measures, the ESIA shall assess and take into consideration the institutional, training, and monitoring requirements for the proposed mitigation measures to be effectively implemented. The measures will be incorporated in the Environmental and Social Management Plan (ESMP).

Task 7: Preparation of an environmental flow assessment report

The Consultant will carry out an Environmental Flow Assessment as summarised below and detailed in Annex 1.

- i) Data collection, review and study planning;
- ii) Propose methodologies and conducting field surveys;
- iii) defining the zone of influence magnitude and extent of the impacts (environmental, social and ecological) of the planned operation of the irrigation scheme and associated infrastructure, with an emphasis on key ecosystem services, aquatic and terrestrial biodiversity (such as fish, amphibians and macro-invertebrate species) and the downstream users;
- iv) Implementation of water flow and quality modeling;
- v) Assessment of risks and impacts, including assessment of the expected sedimentation, cumulative impacts, and of the required environmental flow downstream the proposed Amagoro Irrigation Scheme.
- vi) propose/assess measures to mitigate, as much as technically and economically feasible, any detrimental impact on key ecosystem services, aquatic biodiversity (such as fish, macro-invertebrate and amphibians' species) and the downstream users as a result of irrigation scheme construction and operation;
- vii) selection of 'indicators': use baseline information to identify biological and physical indicators, (e.g. richness of key species, diversity (Simpson Index), number of migratory species) and social uses of the aquatic ecosystems that respond to a change in the flow, sediment or migration routes. The Consultant will develop preliminary relationships between the indicators and flow based on baseline data/ information. The selection should also include 1 or 2 indicators related to the riparian area (vegetation next to the river/stream channel up to 20 meters), the discharge flow and the social use of the river (for example for fishing). GIS analysis and spatial tools. Using spatial databases and GIS, the consultant will identify the status of the riparian areas along the river section to be affected by the project (reservoir), downstream from the dam and further down to the command areas. Maps and estimates of the vegetation cover, slope, community density, land use and other parameters will be estimated from the riparian areas by the consultant.
- viii) determine and recommend an environmental flow requirement (EFR) for the dry and wet seasons to ensure no-net loss (NNL) in aquatic and riparian ecosystem as well as to ensure safety and wellbeing for downstream communities and users based on feasibility study findings, make recommendations that will continue to allow the operation of the Dam to supply the expected flow for the irrigation areas.
- ix) Propose a Biodiversity and Ecological Flow Management Plan to improve conditions of downstream biodiversity and ensure proper actions implementation and monitoring

Task 8: Cumulative Impact Assessment

Undertake Cumulative Impact Assessment (CIA). The CIA shall provide an assessment of impacts over a longer period of time into the past and future to determine the cumulative impact over time, as well as an assessment of the impacts over a larger (i.e. regional) area. The CIA also needs to consider any impacts on Valued Environmental and Social Components (VECs) due to both the project and interactions with other past, existing, and reasonably foreseeable future actions. The assessment shall also provide an evaluation of the significance of other impacts than just local and direct effects (such as

indirect impacts, cumulative impacts, and impact interactions). It is recommended the consultant reviews the guidelines¹ of the World Bank that have been prepared to guide CIA assessments.

Task 9: Develop an Environmental and Social Management Plan (ESMP)

The objective of this task is to describe how the mitigation and other measures to enhance the benefits of Environmental and social protection will be managed, who will implement them, and when and where they will be implemented. The outline of the ESMP shall follow the indicative guideline shown on page 26, section E, under Annex 1 of the ESS1. As part of the ESMP preparation, the consultant will assess the institutional needs required to implement environmental and social assessment recommendations and recommend steps to strengthen or expand them so that the management and monitoring plans in the environmental and social assessment can be implemented. The consultant will also prepare a detailed schedule to monitor the implementation of mitigation measures and the impacts of the project during construction and operation. The ESMP shall not only include recommendations for actions and the procedures for their implementation in the short and long term, but must also set out the costs (capital and recurrent) for its implementation. It should show how management and mitigation methods are phased with project implementation and when costs will be incurred. The participation of various agencies, NGO and public organizations constitutes a key element of this study. The Environmental and Social Management Plan shall be discussed with all the parties concerned. The Consultant will show the extent of the consultations undertaken in order to obtain the opinion of these persons/organizations.

Elements to be included in the ESMP will include but not limited to the following:

- i) Summary of Potential Risks and Impacts
- ii) Description, with technical details, of Planned Mitigation Measures (incl. dam safety requirements and land acquisition), including the type of impact to which it relates, and the conditions under which it is required, together with designs, equipment descriptions and operating procedures, as appropriate.
- iii) Estimation of any potential environmental and social impacts of the proposed mitigation measures
- iv) Description of Planned Environmental Monitoring with linkages to the impacts and the proposed mitigation measures
- v) Specific aspects such as Health and Safety of both the workers and public, employment conditions for workers, waste management, traffic management, chance finds management, etc.
- vi) Description of Planned Public Consultation Process
- vii) Description of the Responsibilities and Authorities for Implementation of Mitigation Measures and Monitoring Requirements.
- viii) Description of Responsibilities for Reporting and Review
- ix) Work Plan including staffing chart, proposed schedules of participation by various members of the project team, and activities and inputs of various government agencies
- x) Detailed Cost Estimates
- xi) Mechanisms for feedback and adjustment
- xii) Grievance redress mechanism
- xiii) Identification of institutional needs, Staffing, training and capacity building requirements

Other necessary support services to implement the mitigation measures e.g., Contractor's ESMP, Code of Conduct, ESHS specifications in procurement documents and contracts.

Elements to be included in the Monitoring Plan will include but not limited to the following:

- i) Realistic sampling program (temporal and spatial) (incl. parameters to be monitored, methods to be used, sampling locations, frequency of measurements, detection limits (where appropriate) and definition of thresholds that will signal the need for corrective actions)
- ii) Collection of quality data
- iii) Cost-effective data collection

¹ [IFC_GoodPracticeHandbook_CumulativeImpactAssessment.pdf](#)

- iv) Quality control in measurement and analysis
- v) Innovations (e.g., in tracing contaminants and automated stations)
- vi) Appropriate databases
- vii) Multidisciplinary data interpretation to provide useful information specific description of institutional arrangements, and the monitoring and reporting procedures to ensure early detection of conditions that necessitate particular mitigation measures and furnish information on the progress and results of mitigation.
- viii) Reporting for internal management and external checks
- ix) Provide a work plan for all project activities
- x) Allowance for, and response to, input from third parties
- xi) Presentation in the public arena (external assessment).

Task 10: Preparation of the Integrated Pest Management Plan (IPMP)

The Amagoro Irrigation scheme is aimed at increasing agricultural production amidst evidently variable climatic conditions as such, there will likely be problems of pests and diseases, which will necessitate use of agro-chemicals, which triggers ESS 3: Resource Efficiency and Pollution Prevention and Management and has necessitated inclusion of a Pest Management Plan alongside this ESIA. The purpose of this task is to develop a detailed plan that lays out all the activities related to the use and Management of pesticides during the operational phases of the project.

1. Preparation of the ESIA Report

The consultant will prepare an ESIA report, with the Baseline report, ESMP and appendices. shall be tailored with main sections to follow outline on ESF, page 25, Section D under Annex 1 of the ESF). The report shall be in the English Language and should be clear and concise. The report should include but not limited to the following:

Table of Contents

- i) Executive summary;
- ii) Introduction
- iii) Description of the Project
- iv) Policy, legal and Administrative/Institutional framework
- v) Description of the Environment and
- vi) Social baseline information
- vii) Environmental flow assessment report
- viii) Analysis of Alternatives
- ix) Anticipated Environmental and Social Risks and Impacts, and Mitigation Measures
- x) Environmental and Social Management Plan.
- xi) The ESMP should include; a) Institutional arrangement, roles and responsibilities; b) E&S management Plan matrix clearly divided into planning, construction and operational phases; c) E&S Monitoring Plan; d) Capacity building, training and awareness raising plan; e) GRM; f) Implementation schedule and cost estimates, which may be incorporated in item g). The ESMP should take into account and be consistent with other key E&S studies and mitigation plans including e-flow study, IPMP, dam safety plans and RAP.
- xii) Public Involvement and Disclosure.
- xiii) Conclusions
- xiv) Appendices (i) glossary, (ii) an explanation of acronyms (iii) references, names of members of the ESIA team (iv)

- xv) Annexes –(i) Baseline and detailed environmental flow assessment report, Integrated Pest Management Plan (IPMP) .
- xvi) Views of stakeholder engagements,
- xvii) List of Names of stakeholders consulted

2. Methodology and standards

The Consultant will be expected to employ the most effective methodology and standards to achieve results with optimal national stakeholder involvement. In addition the Consultant will be expected to: (i) collect data from review and analysis of existing secondary sources of information such as assessment reports and various other regional and relevant global publications (ii) Prepare clear, concise and focused reports and (iii) Ensure reports are delivered in time as per the agreement.

3. Reports and Schedule of Deliverables

It is envisaged that the assignment will take up to 12 months. The Consultant will report to the Project Coordinator who will be responsible for approving the outputs. The Consultant shall prepare and submit the following reports and documents, in English, in an approved format to the Client. The Consultant will initially submit two copies of draft reports for comments by the Client and a soft copy. The comments of the Client shall be incorporated in the final version of the reports. The detailed schedule for the reporting is contained in the Table below.

Table 1: Reports and schedules of deliverables

ITEM	REPORT/DOCUMENT TITLE	CONTENT	SUBMISSION
A.1	Inception and ESIA Scoping report: Two (2) Months from the date of commencement	The consultant shall submit an Inception Report indicating the Consultant's plans, approach, and updated schedule for carrying out this assignment, and any new issues or concerns that may have arisen, an updated work plan, state of mobilization, and understanding of assignment, issues identified for Client's attention, ESIA scoping report, proposed content and structure of the various reports. A meeting will be held after month 1 to discuss the report.	to the MWE
A.2	Environmental Flow Assessment Report (Four (4) months from date of commencement of the assignment)	The consultant shall prepare and submit to the client (MWE) an Environment Flow Assessment report with complete text (and preliminary maps, analysis, data), for together with environmental flow assessment with the relevant annexes. The Report shall be shared and reviewed with the World Bank.	to MWE
A.3	Interim Report (Month 8 Months)	The Consultant shall submit an Interim report covering preliminary analysis of baseline environmental and social findings, Environmental and Social Impact Assessment, (ESIA) and an Environmental Social Management Plan. The report shall also address all comments on the Environmental Flow Assessment Report. The report will be shared and reviewed with the World Bank.	to MWE
A.4	Draft ESIA report and (Month 10)	The consultant shall Submit a Draft ESIA Report covering Environmental and Social Impact Assessment (ESIA), Environmental and Social Management Plans (ESMP) with all the relevant chapters and annexes,	to MWE
A.5	Final ESIA report (Month 12)	A Final report that incorporates the provided comments on the draft ESIA report from MWE, stakeholders and the World Bank covering Environmental and Social Impact Assessment, Environmental and social management Plan (ESMP) of the Project as well as all the relevant annexes.	to MWE
A.6	Progress reports every two (2) months 1st week of every month	1-2 page maximum comprising of a narrative and bar charts or other graphic presentation, showing details of the Consultant's progress, changes in the assignment schedule, impediments and proposed remedies will be submitted on a monthly basis.	Submission by electronic mail

All deliverables shall be submitted in electronic form and in hard copies (color). Deliverables will include all data files, maps, GIS data, digital data, excel file and text files. Text of all reports shall be in Word, with Times New Roman Font size 12. Maps and Figures should indicate coordinates, north, scale, symbology and datasets used. Deliverables will be considered "draft" upon initial receipt. Draft reports will be reviewed, and comments provided within two weeks of receipt, or as specified in the above-table of deliverables. All reports for this contract shall be submitted in English. Costs to produce reports will be borne by the consultant.

The Consultant shall be required to make regular presentations to the client and the World Bank after completion of each deliverable, the frequency of the presentations shall depend on the consultant's ability to address comments on each deliverable to the Client and World Bank's satisfaction.

4. Data and Services to be provided by the client

The client will provide available documentation, including the ICRP project document, ESMF and RPF. Data and documentation on hydrological, meteorological, water quality and other relevant aspects of the study which the client may have will be availed to the consultant; however, the consultant has the ultimate responsibility for collecting the required data and documentation which cannot be made available by the project from official sources. The Client will (i) Facilitate in establishing communication with the relevant institutions and feasibility study / design consultant; (ii) Liaise and assist the consultant in obtaining any other information and documents required from other government agencies which the Client considers essential for conducting of the (iii) Arrange and participate in consultative meetings and ensure linkage with relevant Central and local Government authorities. The Consultant shall operate their own project office and shall bear all accommodation, local transportation, visas, and other costs necessary to carry out the assignment.

5. Services and facilities to be provided by the consultant

In carrying out this assignment, the consultant shall provide the following services, among others, which should be duly provided for in the consultant's proposal:

- a. Suitable office in terms of space and furnishing for the consultant's team engaged on the assignment.
- b. Office supplies, as required for the period of services.
- c. Utility services and costs.
- d. Long-term accommodation for the consultant's staff while in Uganda and hotel accommodation for short term experts.
- e. Subsistence (or per diem) payments for official travel for consultant's staff.
- f. Secretarial and administrative support staff.
- g. International and local telephone services for official communication only.
- h. Transport for the period of the assignment.

6. Qualification of the Consultant

Experience of the consultancy firm in Environmental Social Impact Assessment (ESIA) studies with at least eight (8) years of core business as a firm undertaking (ESIA) for Large Infrastructure Projects specifically (Large Scale Irrigation schemes with irrigation dams, Water Supply, Large scale Hydropower and Transport projects.

Experience of the consultancy and familiarity with World Bank's Environment and Social Policies is a necessity as will be evidenced from similar assignments (at least (5) five carried out and Financed by the World Bank within the last (10) ten years.

Experience in similar conditions in Sub-Saharan Africa or other countries in the world at similar level of development as Sub-Saharan Africa.

The team will be led by a Senior Environmental Assessment Specialist with a clear strategic understanding of project objectives from an integrated and multipurpose perspective. The areas of expertise required include: environmental and social impact assessment, hydrology, aquatic and terrestrial ecology, Sociology. The Consultant may optimize their personnel to demonstrate the

competences required for the assignment. The personnel of the Consultant should have a wide practical experience in the areas mentioned. The qualifications of the key experts are as follows.

Table 2: Key Experts and their qualifications

Position	Competencies
Team Leader / Environmental and Social Assessment Specialist	<p>University Degree in Environmental Science or Natural Resource Management, Masters or higher qualifications is a key requirement with at least 15 years of progressively senior experience in managing ESIA studies for large and complex dam and irrigation development projects, preferably in East Africa. Familiarity with World Bank environmental and social framework and the relevant ESS's is a necessity as will be evidenced from similar works carried out and Financed by the World Bank. The Expert will lead the overall effort on this ESIA project, and will provide specialist knowledge on all matters affecting the development of this ESIA.</p> <p>The expert will be responsible for preparation of the ESIA, overall coordination of support and expertise within the project team, coordination and gaining agreement with Environmental Agencies and other stakeholders with respect to delivering positive ESIA' reports, including scoping process and review process.</p>
Social Expert	<p>University Degree in social sciences (anthropology, sociology, social work or economics), Masters or higher qualifications would be considered an advantage and 10-15 years progressively senior experience in preparing and implementing social impact assessments, resettlement and compensation plans for large projects, preferably in East Africa, ability to identify and assess gender related issues Familiarity with World Bank environmental and social framework (ESF) is a necessity. The Social Expert will be responsible for social aspects of the process. She/he will describe socio-economic environment of the project areas, and be responsible for identification and evaluation of potential social impacts and mitigation measures. The person shall have significant experience with World Bank Social Framework (ESF and the relevant ESF) as will be evidenced from similar works carried out and Financed by the World Bank.</p>
Hydrologist	<p>University degree in Hydrology or Water Resources Engineering, Masters or higher qualifications an advantage with at least 10 years of progressively senior experience in the hydrologic and aquatic environmental modelling as for large water resource infrastructure development projects, and especially in determining in-stream flow requirements/ Environmental Flow Requirements. The Hydrologist will among other things review the proposed dam designs from the parallel feasibility study, and will lead determination of Environmental Flow and recommend modifications where necessary.</p>
Aquatic Ecology and Fisheries Specialist	<p>A minimum of a Bachelor's degree (BSc) in Fisheries Biology or related field, advanced degree in Aquatic Ecology or Fresh water biology/Ecology, Limnology, Fisheries, related field. The specialist should have demonstrated experience in aquatic ecological assessments appropriate to dams and rivers. This should be a senior specialist with at least 10 years of experience in years' in the Fisheries related studies; experience in Ichthyology and aquatic entomology/freshwater biology of tropical Africa, preferably including River systems in Uganda. He/she should have experience from at least 5 comparable projects in the water Infrastructure. Be able to prepare and present information clearly and concisely (both oral & written) and have superior report writing skills. Experience with World Bank Environmental Requirements</p>
Irrigation/ Agricultural Specialist	<p>University degree in Civil, or Agriculture or Irrigation Engineering, Masters or higher qualifications is an advantage, with at least 7 years in preparing ESIA's for irrigated Agricultural Projects or major water infrastructure. The specialist should have demonstrated experience in irrigation or major Water infrastructure projects, and preferably in the region.</p>
Vegetation Expert/ Plant Ecology Expert	<p>University degree in Botany, biodiversity, Plant Ecology and/or related equivalent subject. Masters or higher and related qualifications would be considered as an advantage. This should be a senior specialist with at least 10 years of experience in environmental assessments, management and the preparation of ESIA's and EMPs. He/she should have experience from at least 5 comparable projects in Infrastructure developments. The specialist should have demonstrated experience in assessing impacts of watercourse impoundments.</p>

Position	Competencies
Zoologist/Fauna Expert	University degree Bachelor in Wildlife health Science or related equivalent subject. Masters or higher and related qualifications would be considered as an advantage. This should be a senior specialist with at least 10 years of experience in environmental and Wildlife management and the preparation of ESIA's and EMP's. He/she should have experience from at least 5 comparable projects in infrastructure developments. The specialist should have demonstrated experience in assessing impacts of watercourse impoundments on Wildlife.

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The contract for this assignment shall be lump sum and the consultant shall show the costs of his proposed services in accordance with these contractual arrangements.

7. Logistical Setup and Staffing

Within the technical proposal, the consultant shall elaborate on the envisaged logistical setup and deployment of appropriate skills for the execution of the assignment. The consultant shall present the staffing schedule in a manner that clearly shows the stage and duration where each of the proposed team members is planned to be involved on the project. An organogram reflecting the responsibilities of each staff member and line management setup of the proposed team shall be part of the proposal.

To enhance MWE's skills and experience in similar assignments, the consultant will be assigned WfP regional officers for learning and capacity building purposes during execution of this assignment. The consultant will be expected to name a team leader from amongst the proposed staff to carry out day-to-day management of the project. The consultant is free to propose additional skills as he deems necessary to execute the assignment within the stated methodology.

8. Quality Management requirements

The Consultant will be required to demonstrate in their proposal, evidence of adoption of use of a Quality Management System as well as to describe how quality control will be implemented in the course of the assignment.

9. Meeting Requirements

The consultant will avail appropriate personnel for review meetings with the client and the design consultant during the entire project period. The review shall be for the purposes of:

- i) Assessing progress of the assignment.
- ii) Obtaining sign-offs on proposals made to the design consultant in respect of minimizing project impacts on the environment
- iii) Exchanging information and data relevant for the successful accomplishment of the entire assignment.
- iv) The nature of the meetings, locations (e.g. site MWE/ WfP offices, and consultant's offices) and agenda shall be agreed upon by the consultant's and the client's project managers in agreement with the design consultant.

10. REPORTING AND SUPERVISION ARRANGEMENTS

The Consultant will be directly supervised by the Water for Production Department on behalf of the Client reporting to:

The Project Coordinator – Irrigation for Climate Resilience Project; Attn: Eng. Henry Kizito Ministry of Water and Environment Plot 3-7, Kabalega Crescent, Luzira, Kampala, Uganda E-mail: henry.kizito@mwe.go.ug, kizitohl@yahoo.co.uk and mot.motram@gmail.com

ANNEXES TO THE TERMS OF REFERENCE

Annex 1: Environmental Flow Assessment (EFA)

1. Objectives

The objective of this assessment is to develop a proposed Biodiversity and Ecological Flow Management Plan to mitigate the downstream ecological impacts of the planned Amagoro Dam, to monitor the impact and maintain or improve the ecological condition of the downstream areas.

This study is aimed at:

- i. defining the magnitude and extent of the impacts (environmental, social and ecological) of the planned operation of the Amagoro Dam, with an emphasis on key ecosystem services, aquatic and terrestrial biodiversity (such as fish, amphibians and macro-invertebrate species) and the downstream users.
- ii. propose/assess measures to mitigate, as much as technically and economically feasible, any detrimental impact on key ecosystem services, aquatic biodiversity (such as fish, macro-invertebrate and amphibians' species) and the downstream users as a result of Dam construction and operation; and
- iii. identify and recommend acceptable flow regime that will continue to allow the operation of the Dam to supply the expected flow for the irrigation areas.

2. Scope of Work

This study involves the following main tasks:

- i) Data collection, review and study planning;
- ii) Propose methodologies and conducting field surveys;
- iii) Implementation of water flow and quality modeling;
- iv) Assessment of risks and impacts, including assessment of the expected sedimentation, and of the required environmental flow downstream the proposed Amagoro dam.
- v) Propose a Biodiversity and Ecological Flow Management Plan to improve conditions of downstream biodiversity and ensure proper actions implementation and monitoring.

2.1 Data collection, Review and Study Planning

The Consulting Firm will:

- (i) **Review the existing knowledge & data in both biodiversity and flows:** Review relevant documentation related to the Amagoro dam and impacts of the dam on downstream ecology and ecological functions. Review the biodiversity data and social uses of the selected river stretch, and the level of dependence of riparian and nearby communities on ecosystem services provided by the river Malaba. Review and evaluate the knowledge and data collected to: identify main types of aquatic ecosystems, habitats, species, and socio-economic uses likely to be affected by the proposed project, and the existing conservation status of relevant habitats and species.
- (ii) **Preliminary selection of 'Sampling sites':** The sites will be selected on the river Malaba and its tributaries in accordance with international best practices for biodiversity and flow assessments. Based on field visits and information available, the consultant will select sites/stream-river stretches with representative aquatic ecosystems, important ecological features (habitat of critical endangered, vulnerable, endemic, migratory, restricted home range species, other), areas of socioeconomic and cultural uses, likely to i) be affected by the Amagoro dam by the reduced flow ii) might have similar species composition or communities in the watershed and iii) local or national importance due to local interest or regulations.

Scientific methods common to the assessment of the different taxonomic groups will be used in the consultancy. The consultant should consult international guidelines.²

The Consultant will propose the number of sampling sites – river -stream reaches of about 50 meters each. Each river/stream reach will be divided into transects. Freshwater Biodiversity sampling will always start from the downstream transect to prevent disturbance of communities and sedimentation.

- a) Freshwater Biodiversity sampling sites: will be sampled within two transects always upstream of the flow sampling areas to avoid disturbance.
 - b) Terrestrial /riparian Biodiversity sampling sites: will be sampled within the selected river-stream reaches and in transects of 50 meters in both sides of the stream if possible.
 - c) Water quality sampling: will be sampled at the same sites of freshwater biodiversity sampling and always before the flow sampling measurements.
 - d) Flow sampling area: will be performed at each transect- or cross-sectional areas after the sampling of freshwater biodiversity sampling.
- (iii) **Preliminary selection of 'indicators'**: Based on information collected and available, the review will identify key biological and physical aspects (e.g. richness of key species, diversity (Simpson Index), number of migratory species) and social uses of the aquatic ecosystems that respond to a change in the flow, sediment or migration routes. The Consultant will develop preliminary relationships between the indicators and flow based on data to be collected and existing information. The selection should also include 1 or 2 indicators related to the riparian area (vegetation next to the river/stream channel up to 20 meters), the discharge flow and the social use of the river (for example for fishing).
- (iv) **GIS analysis and spatial tools.** Using spatial databases and GIS, the consultant will identify the status of the riparian areas along the river section to be affected by the project (reservoir), downstream from the dam and further down to the last sampling site. Maps and estimates of the vegetation cover, slope, community density, land use and other parameters to be agreed will be estimated from the riparian areas by the consultant.
- (v) **Dam Operation and Maintenance Plan.** The consultant will review the proposed plans as it relates to the ecological flow.
- (vi) **Needs Assessment:** As a result of this initial desk-based task, the Consultant will confirm the adequacy of the originally proposed project and field teams, and restructure accordingly the needed relevant disciplines. The Consultant will confirm its ability to collect the remaining information / data to produce the required deliverables.

The outcome of the scoping exercise will be a Scoping - Inception Report.

2.2 Field work and Surveys

During this phase, the Consultant will conduct the necessary surveys proposed during the scoping exercise in accordance with scientific and international best practices to develop biodiversity and ecological flow assessment.

- a) Sampling areas. The sampling sites and methodology to be finally used for this consultancy will be agreed once the inception report is prepared. Sampling will be carried out along the river Malaba and its tributaries in accordance with river ecology and international best practices for biodiversity evaluations.
- b) Timing. Survey Field work will cover one rainy and dry season in the study period.

Specifically, the following parameters are expected to be surveyed and analyzed:

- a) *Flora and Fauna Species Richness*: Document and identify the species (including identification of nationally protected, vulnerable, migratory, rare, endemic and critically and endangered species) of

² <https://publications.iadb.org/publications/english/document/Good-Practices-for-the-Collection-of-Biodiversity-Baseline-Data.pdf?download=true>

the following minimum groups: fish, aquatic macro-invertebrates, mammals, reptiles, amphibians, bird species, aquatic plants and riparian vegetation species, others. Detailed fish surveys should be undertaken during different times of the year to ensure that important lifecycle events are assessed (spawning, migration, etc.). For both flora and fauna, the survey should make note of notable species or communities (e.g., species at limits of distributional range, new records, lack of records of expected species, how typical/representative/distinctive are the species/communities). Determine the diets and preferred habitat of key fauna species to be agreed.

- b) Migratory fish and macroinvertebrate data: Determine which fish or macroinvertebrate species or other tax move through the surveyed area and map where and when they live and move/migrate, as well as their ecological or conservation status, within project impact area.
- c) Vegetation: A description of the vegetation, including species lists and classification of vegetation types. The level of detail may vary from a broad narrative description to a formal vegetation classification. Vegetation may be described by type, and area and percentage of area covered by each vegetation type, together with corresponding tables and maps at an appropriate scale. Provide an evaluation of existing vegetation condition and likely future condition, taking account of influences such as deforestation, fires, grazing, pest animals, invasive plants and land use practices.
- d) Riparian fauna and flora: In the riparian buffer area agreed for the study (20 meters wide buffer strip at each side of the river/stream), the consultant will register the species of flora and fauna living in this riparian buffer zone or depend of this zone for feeding, reproduction, resting, etc. or for any other key activity of their life cycle. An assessment of the quantity and quality of type of habitat available for fauna at various times of year or life-cycle (e.g., breeding, spawning, foraging, refugia, nursery sites, roosting sites, pre-migration “staging” sites, terrestrial and aquatic migration routes) and the main issues affecting the riparian area such as fires, agriculture, water extraction, hunting, pollution, etc. In the report, a separate chapter and analysis will be prepared on the riparian area to discuss the impacts due to the project, current risks and the measured richness, diversity and land use.
- e) Hydrological, Hydraulic and fluvio-morphological characteristics: The consultant will report the river flow and stage measurements available for the suitable locations based on the survey data, hydrological modeling and other tools and particularly at the selected ‘EFA sites.’ Hydrological data from nearby stations should also be considered. In the sampling sites, the consultant will collect data of the river stretch and parameters such as: width, water depth, bed structure (cobble, boulders), presence of runs, riffles and pools, infrastructure and obstructions (bridges, roads, channels, etc), among others parameters. Also, the consultant will perform a GIS analysis and mapping to identify fluvio-geomorphological characteristics of the river basin and project area (slope, gradient, meandering, order, etc.)
- f) Water quality: Measure and evaluate water quality. Proposed parameters are attached as Annex 2 to these TORs and will need to be verified by the Consultant once a month.
- g) Abundance/biomass of benthic organisms: Assess the relative abundance and biomass of macroinvertebrates and periphyton to provide information on productivity of the surveyed area along the river and food availability for larger organisms;
- h) Indicators: Confirmation of key species or other biophysical aspects of the aquatic ecosystem to be used as indicators of impact of flow and sediment related changes during the Risk and Impact assessment of these TORs; also consider social and riparian area indicators.
- i) Habitat classification: Describe the different ecosystem types, as well the threat and conservation status.
- j) Social values and uses: Document key social values, such as land and ecosystem use, local fishing practices, type of uses of the river by communities, siting of communities, cultural and traditional sites, recreational and tourism sites/activities;
- k) Georeferenced pictures of both river banks and other important features shall be taken at each cross section.

The Consulting Firm will:

- a) **Field Survey:** Perform field sampling campaigns to fill in any data gaps and data requirements for the assessment, and in consultation with the Client, the World Bank, and other contributors. All data collection and analysis methods should be described fully or by citation of standard methods.

The description of methods for sampling local populations of flora and fauna should include: spatial scale; sampling design; sampling methods; location, duration and timing of surveys; equipment and personnel (including any training given); and data treatment.

- a. **Survey Team:** The survey team should include a biologist with knowledge of the aquatic habitats of the East African region, water quality specialist, geomorphologist/sedimentologist, botanical ecologist, macroinvertebrate ecologist, fish ecologist, mammalogist, other biological specialists as appropriate, and a social specialist with experience in rural livelihood assessment. An individual of the team may serve several roles if professional and experience are present.
- b. **Survey Timing:** The bi-modal nature of the hydrology in the area allows for limiting survey timing to the significant flow periods. Field surveys will be conducted during low flow as well as during high flow conditions. In the inception report the consultant will propose a calendar for the field surveys.
- c. **Survey Areas:** The surveys should be carried out along the river Malaba and its tributaries in accordance with scientific methods and international best practices. Survey sites will include (but not limited to) sampling sites for biodiversity and ecological flows as described in Section 2.2 and will include the following areas: a) downstream (majority of points, up to 10 km downstream the dam) and upstream (limited points as baseline) of the dam, b) the river Malaba and tributaries confluences (1-2-3 order); c) downstream the river Malaba and tributaries confluences; and d) other areas as determined to be of interest and agreed with the consultant.
- b) **Baseline determination:** The Consultant will provide an assessment of the current ecological and social status of the aquatic ecosystems (downstream of the dam). The baseline will describe and interpret pertinent physical conditions and processes (e.g., soils, geology, topography, climate, hydrological features, geomorphological features and processes, land use, etc.), as well as the flora and fauna that potentially would be affected, at appropriate temporal and organizational scales (e.g., populations, habitats and/or ecosystems). The baseline will provide a basis during the assessment of risks and impacts to predict how conditions will change downstream of the Project, as well as the data against which to monitor the actual changes in ecological conditions brought about by the construction and operation of the Project. The Consultant will also confirm the location and suitability of the identified EFA sites and provide relevant maps incl. survey areas and key identified areas along the river.

2.3 Eco-hydraulics / Habitat modeling

The Consultant Firm will:

- (i) **Hydrologic/Hydraulic study:** There are more than 300 methods used around the globe to determine an ecological flow.³ The consultant will review the literature (e.g. Drift, IFIM, PHASIM), and propose three alternatives of methods for ecological flow analysis to be use for this consultancy. A suitable model should be prepared and calibrated to accurately model the downstream flow, habitat and species flow preference; this model will facilitate the management of the release flow during the operation stage. The complexity of the model should be adequate and in proportion to the assessment tasks outlined in these TORs. The Consultant will carry out hydrologic/hydraulic studies as necessary to support the assessment by performing at least the following cases: a) Calibration model run corresponding to the flow conditions observed historically and during the surveys to confirm the adequacy of the model representation and roughness coefficients; and b) Steady flow simulations covering the flow range. The Consultant Firm will develop for each of the EFA sites a stage-discharge curve derived from the steady state simulation results. As needed the consultant will organize workshops to explain the government and local communities on the methodologies, consult proposals and collect data that can useful for the study.

³The World Bank. Ecological Flows.

<http://documents.worldbank.org/curated/en/828931468315285821/pdf/263200NWP0REPL1Concepts0and0Methods.pdf>

http://siteresources.worldbank.org/INTWAT/Resources/Env_Flows_Water_v1.pdf

- (ii) **Water quality / mass transport study:** The Consultant will construct a water quality model of the reservoir and downstream river of requisite complexity as needed for the assessment of the impact of the flow operation scenarios on the downstream environment, particularly concerning changes in sediment load. The model is then used to assess the impact on water quality of proposed operation, especially during low flow periods.

2.4 Assessment of Risks and Impacts

The task will include the assessment of the potential risks and impacts during the construction, operation and maintenance phases of the Project, as well as the identification of opportunities for avoidance of impacts, mitigation, ecological enhancement and biodiversity net gain. The assessment of risks and impacts should take into account the baseline conditions to allow for a description of how the baseline conditions will change because of the Project and associated activities. Based on the results of the surveys, the consultant will proposed mitigation measures identified to be included in the ESMP of the ESIA.

The Consulting Firm will:

- (i) **Indicators:** Identify key biophysical aspects and social uses of the aquatic ecosystems that can be used as indicators of flow and sediment related changes; also indicators to describe the conditions of the riparian areas which are fundamental for the aquatic ecosystem functions. The indicators should also be relevant, easy to understand and easy to measure. For each EFA site describe the relationships between the indicators chosen and the changes in flow, sediment and connectivity associated with the proposed project, as well as possible effects of these changes on people/communities.
- (ii) **Scenario development:** Review the design and operating rules for the Amagoro dam and identify the set of design/operational scenarios for evaluation in the assessment. Scenarios to model downstream changes will be specified by the Consultant's Inception Report and may include: a) Current status (natural hydrograph); b) recognized climate change/variation inflow scenarios; c) options for minimum and maximum daily / weekly / monthly / seasonal environmental flow requirements; and d) options of flood hydrographs and e) operational rules for the safety of the dam and ensuring the release of the agreed ecological flows. The scenarios should be chosen so as to incorporate expected release regime mimicking natural flows as far as possible.
- (iii) **Effect of flow releases on sediment flows:** Assess the effect of the water releases from the Amagoro dam on the sediment transport, water quality and ecological environment of the downstream of the dam. The Amagoro dam will trap a significant portion of the river sediment, altering the stream mass transport connectivity, as well as turbidity and nutrient availability in the downstream areas. The consultant will provide a comprehensive assessment of the effect of the releases of the Amagoro dam on the mass/sediment transport and connectivity of the River Malaba downstream of the dam, incl. potential risks and impacts on water quality. Based on the assessment, the consultant will confirm impacts on sediment transport and the adequacy of related mitigation measures, and if needed propose additional mitigation measures.
- (iv) **Mitigation measures/plan:** Propose mitigation measures. Considering the determined risks and impacts by this study, the Consultant will develop a plan, specifying measures and actions during the construction and operation phases of the Project, following the mitigation hierarchy of risks and impacts. For each impact, the Plan will, at a minimum: i) describe the applicable mitigation measures together with, as pertinent, designs, equipment descriptions and operating procedures; ii) identify responsibilities and institutional arrangements for the implementation of measures and supervision of their effectiveness, including tools for verifying compliance with implementation of measures and effectiveness of measures; iii) estimate the cost of implementation of measures; and iv) specify the implementation schedule of the measures and reporting obligations regarding implementation and supervision. The Consultant will provide confirmation that the proposed operation scenario meets the World Bank's Environment and Social Framework.
- (v) **Assessment of the Environmental Flow Requirements (EFR):** Comparison of a diverse range of operation scenarios for the Amagoro dam including an assessment of the impact of water flow

fluctuations on downstream sediment loads, aquatic and riparian habitats and biota, and ecosystem services/human uses. The predicted changes in the river ecosystem are evaluated per site as an estimated mean percentage change from baseline in the abundance, area or concentration of the key indicators, with particular focus on water users and fish species. The assessment will predict the change in ecological and social indicators as a result of the proposed project, and the cumulative effects associated with the planned operation.

- (vi) **Recommend Environmental Flows and Procedures:** The Consultant using the agreed method for ecological flow analysis will propose ecological flows for the dry and wet seasons. The recommendation should be based on the agreed ecological flow method and an comprehensive assessment of the potential impacts on the downstream environment and population as well as alternative analysis. The recommendation for the EFR should consider the developed scenarios and their determined relative impact on the downstream environment and involve consultations with stakeholders and downstream population.
- (vii) **Dam Operation and Maintenance Plan.** The Consultant will recommend operation rules for the Amagoro Dam to ensure release of the agreed ecological flows by this study and mitigate as much as possible detrimental impacts on ecosystems of the river, with the aim of achieving no net loss. Seasonality in flows, key indicator species requirement and ecosystem uses should be taken into consideration. Consideration should be made of the reduced river flows due to the abstraction and the effects on the downstream users of the river and those near the confluence of rivers downstream. The Consultant Firm will for the recommended scenarios determine the (if any) residual impact on biodiversity and socio-economic indicators, and if there is a need to compensate for lost livelihoods of PAPs.
- (viii) **Environmental Flow Management Plan (EFMP):** Prepare the requisite EFMP for the suggested management approach and EFR. The Consultant shall prepare an EFR Protocol that concisely sets out the EFR objective and the proposed boundary conditions, revised as necessary in the light of the baseline and follow-up monitoring and modeling. The Consultant shall provide a recommendation/proposal for the EFR management system satisfying the overall conditions: a) system should be economical, i.e. no more complicated than it must be to achieve the objective; and b) designed around adaptive assessment. The Consultant will provide confirmation that the proposed operation scenario with the proposed Ecological flows will meet the requirements for the targeted species, national regulations and World Bank ESF and the relevant ESS.

2.5 Consultations

Consultations on the study are required and should be documented accordingly. The Consultant will carry out a public consultation process with local communities on supplemental information and results of this analysis. The Consultant will consult with MWE for guidance of the scope of this public consultation (consultation methods to be used, number and location of consultation events, publicity for consultation events, which organizations to invite, or contact, etc.). MWE will also provide any needed logistical support to publicize and conduct the consultation events. In addition, the consultants will carry out direct consultations with: (i) Ministry of Water and Environment (MWE); (ii) Directorate of Fisheries Resources at Ministry of Agriculture Animal Industry and Fisheries (MAAIF); (iii) National Fisheries Resources Research Institute (NAFIRRI); (iv) District Fisheries Office; (v) Biodiversity Specialists and/or Civil Society Organizations (through Environmental Alert – Lead Environmental CSO); (vi) Academia (Makerere University); and (vii) Civil Society and NGOs (working in biodiversity like WCS, Nature Uganda, others and through Environmental Alert, coordinator of environmental NGOs in Uganda). (viii) District Community Development Officer.

2.6 Monitoring Plan

The Consulting Firm will:

- (i) **Assess Amagoro river monitoring system:** Review and assess the monitoring system and procedures for the river Malaba, especially downstream the proposed dam. Conduct a ‘gap analysis’ of the need for improvements to the monitoring system and management and propose the team needed for effective monitoring plan, sites for installing flow monitoring stages, field

equipment needed and local capacity needed for the implementing this monitoring plan, among others.

- (ii) **Propose a Biodiversity and Ecological flow Monitoring Program:** Design a biodiversity and ecological flow monitoring program using the same sampling sites of the study upstream and downstream of the proposed dam (which includes river reaches at the main river Malaba and its tributaries). The monitoring program will be implemented (under a separate consultancy) annually and determine overtime (for at least 5 years) if the project EFR and other mitigation measures is sufficient to meet the hydrological, ecological and local user needs. Consultant will use the same parameters measured in this consultancy (or other new ones to agreed) and key performance indicators (KPIs) to be monitored on a cost-effective routine basis and specify any more extensive periodic monitoring that may be necessary to assess attainment of the EFR objective and to inform adaptive environmental assessment and management. For each impact, the monitoring plan will provide a description and technical details of monitoring activities, including parameters, methods of data collection, sampling locations, frequency of measurements, detection limits if appropriate, and definition of thresholds signaling the need for corrective actions. The monitoring program must be seasonal and take place during the life of the Project after the dam is filled, in order to understand the cumulative effects of the dam and adjust its operating regime if necessary, so the project can monitor the conditions of the affected area, the impact of the project in biodiversity, the effect of reduced flows in the existing biodiversity of the river system and its riparian areas.

Annex 2: List of Proposed Water Quality Parameters to be sampled.

Parameters	Units	Measurement recurrence
<i>In-situ parameters</i>		
Temperature	°C	Monthly and in every sampling site and every sampling time
Dissolved Oxygen	mg/l and %	
Conductivity	µS/cm	
pH	-	
<i>Laboratory analyzed parameters</i>		
Turbidity	NTU	Monthly and in every sampling site and every sampling time
COD	mg/l	
Alkalinity	mg/l	
Calcium	mg/l	
Magnesium	mg/l	
Chloride	mg/l	
Nitrogen as Nitrate and Ammonia	mg/l	
Sulphate	mg/l	
Phosphate	mg/l	
Iron	mg/l	
Manganese	mg/l	
Fluoride	mg/l	
Aluminum	mg/l	
Total dissolved solids	mg/l	
Coliform bacteria, Total coliforms	100 ml/number of colonies	
Phenols		
Vanadium		
Nickel		
Cobalt		
Cyanide		
Cadmium		
Mercury		
Lead		
Copper		
Selenium		
Zinc		
DDT and other toxic agrochemicals used in the area (consultant to proposed indicators)		