



Ministry of Water and Environment

Irrigation for Climate Resilience Project (ICRP)

TERMS OF REFERENCE FOR CONSULTING SERVICES FOR COMPREHENSIVE REVIEW AND UPDATING OF ESIA STUDIES FOR NYIMUR IRRIGATION SCHEME IN LAMWO DISTRICT

June 2026

1. Background

The Government of Uganda (GoU) with support from the International Development Association (IDA) is implementing the Irrigation for Climate Resilience 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 is supporting the construction of the Kabuyanda and Matanda schemes, and it will prepare 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 Nyimur, Irrigation scheme in Lamwo District.

The ICRP was approved by the World Bank Board in May 2020, declared effective in December 2020, and closing is set in April 2028. 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.
- 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 Framework and the relevant ESS's. 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 Nyimur Irrigation scheme (to be designed under the project but to be constructed under future investments) shall be subjected to separate ESIA following the project ESMF, and reviewed and cleared by the World Bank. Aspects specific to Nyimur highlighted in the ESMF include, among others:

Issues of child labour in irrigated fields: Child labor comes with its social vices of sexual exploitation and abuse especially of the girl child causing instances of early pregnancies. 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 Nyimur will be prepared by MWE in line with the RPF, in parallel with the current assignment.

The Ministry of Water and Environment therefore seeks to hire a suitable firm to prepare an Environmental Social Impact Assessment (ESIA) for Nyimur Irrigation Scheme in Lamwo District. The consultant will undertake the ESIA study in close coordination with the Feasibility Studies being carried out under a separate study. The consultant will share information, give feedback, incorporate findings and recommendations from the Feasibility Studies and Detailed Design Consultant.

Project Description

The Nyimur River is one of the tributaries of the Aswa River. The Aswa basin is host to a variety of livelihood systems including pastoral, agro-pastoral and pure farming societies from both Uganda and South Sudan displaced by armed conflicts. This has led to acute poverty and in terms of pressures on the environment, the social upheaval led to the degradation of abandoned agricultural land and intensive collection of firewood and unsustainable use of other natural resources near population centres. This resulted in deforestation, encroachment on and degradation of wetlands and overexploitation of other areas with natural vegetation. This has resulted in abject poverty in the area and likewise wildlife has suffered from hunting and loss of habitat.

Given the prevailing conditions, the following interventions have been proposed

Construction of an earth dam on Nyimur river with storage capacity of 44 MCM to irrigate an estimated 5,105ha of land along Aswa River. Other components will include intake structures, and irrigation pipe network, spill way scheme buildings and other auxiliary structures to be utilised during the construction phase.

2. Objectives of the ESIA

The overall objective is to carry out an Environmental Social Impact Assessment (ESIA) for the development of Nyimur Irrigation in Lamwo District. This will include establishment of a socio-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 study will be undertaken within the framework of the Government of Uganda as well World Bank Environmental and Social Framework (ESF) requirements.

2.1 The specific objectives of the assessment are:

- To provide baseline information about the environmental, social, and economic conditions in the project area;
- 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;
- Evaluate the social and socio-economic aspects of proposed project, identify stakeholders, carry out public consultations, 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.
 - To assess the best alternative project at most benefits and least costs in terms of financial, social, and environment.
 - To develop an Environmental and Social Management Plans (ESMP). The ESMP shall outline 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 study findings and related Environmental and Social Management Plans (ESMPs) shall be prepared in a level of detail specific enough for downstream work towards project implementation.

3. Scope of work for ESIA

Task 1: Establishment of a Socio-Environmental Baseline

Task 1.1: Description of the Proposed Project

The Consultant shall describe the proposed project and its geographic, environmental, social, and temporal context, including any offsite investments that may be required (e.g., access roads, power supply, water supply, raw material and product storage facilities), as well as the project's primary suppliers. The Consultant shall review existing documentation provide and describe all project components including associated facilities and infrastructure (drawing from the feasibility study and design reports for Nyimur Irrigation Scheme). 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 dam/ reservoir, the other uses benefiting from the reservoir other than irrigation, size and characteristics of the catchment, and aspects related to operation and maintenance of irrigation schemes. The Consultant shall include a map of sufficient detail, showing the project site and the area that may be affected by the project's direct, indirect, and cumulative impacts.

Task 1.2: Description of the Environmental condition of the Project Area

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 area, highlighting relevant environmental and social issues. The description will include the characteristics of proposed project area and cover areas potentially affected by impacts, the potential compensation area, and area affected by alternatives. This will take into account current and proposed development activities within the project area but not directly connected to the project. 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 area of influence of the proposed dam and 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 project. In addition to field sampling, the consultant will review information from secondary sources, such as the Nyimur Irrigation Scheme Feasibility Study report prepared under the Irrigation for Climate Resilience Project and other relevant documentation.

Key socio-economic issues to be considered include demographic profile with social categories, number of households/families, types of housing, health and education profile, migration patterns, if any; 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.

The level of detail should be sufficient to convey the general nature of environmental and social resources condition of the affected areas.

Task 2: Socio-Environmental 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. The scoping, which will involve stakeholder consultation will cover the physical, biological, socio-economic and cultural environments of the proposed project.

The exercise shall focus on the following areas amongst others:

- Impacts on the flora and fauna (biodiversity).
- Likely change in the river regime;
- Impact due to change in hydrological cycle;
- Impact on siltation preferably using quantitative techniques;
- Impact on water quality (surface and ground water);
- Impact on ground water levels and recharge potential;
- Impact due to change in waste assimilation capacity of the river system;
- Impacts on the soils, wetlands, drainage and water resources
- Impacts on landscape and general aesthetics,
- Impacts on recreation
- Erosion concerns and associated siltation
- Impacts on land use and agriculture
- Impacts on protected areas, swamps, as well as other relevant natural and critical ecosystems and habitats
- Impacts on ecosystem services and the use of living natural resources, such as wetlands and forests;
- Impacts on cultural property and practices
- Water issues for livestock purposes
- Impacts on property, settlements and community facilities
- Land uptake and resettlements;
- Disease burden and associated health impacts, HIV/AIDS issues, safety issues
- Induced development resulting from the implementation of the project

- Gender related issues
- Potential cumulative impact assessment issues, appropriate boundaries for analysis, and identifying relevant past, present, and future actions.
- Threats to human security through the escalation of personal or communal conflict, crime or violence
- Impact on health, safety and well-being of workers and project-affected communities

As part of the scoping exercise, the Consultant 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 and the main ESIA Report. The findings of these consultations will also be made accessible to the relevant stakeholders, including potentially affected persons.

Task 3. Policy, Legislative, Regulatory and Administrative Considerations

The Consultant shall analyze the legal and institutional framework for the project, within which the environmental and social assessment is carried out. The Consultant shall identify and describe the pertinent regulations and standards - both local and World Bank Environment and Social Framework relevant to the nature of the project. The Consultant shall take into account applicable requirements under the relevant Environmental and Social Standards (ESSs) the World Bank Group Environmental Health and Safety (EHS) Guidelines, and other relevant Good International Industry Practice (GIIP). The examination of the legislation should include the relevant international conventions to which the government of Uganda is a signatory. All applicable legislation, regulations, policies and standards in relation to the construction and operation of the Irrigation Scheme shall be highlighted. The Consultant shall compare the existing national environmental and social framework and the ESF. The consultant shall assess the relevant government agencies involved in environmental and social management issues, 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 projects

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 enhancement that may occur, during the pre-construction, construction, operation and decommissioning phases of the project. The assessment will distinguish between positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts as well as cumulative impacts and 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. The Consultant will identify potential impacts in line with the relevant ESSs including but not limited to:

- Social and ecological effects of reservoir inundation (loss of agricultural, forestry and grazing land, population resettlement, impact on flora and fauna; impact on historic and cultural sites, effects on water resources outside and inside command area, etc.).
- Effects on any natural and critical habitats

- Effects of invasive species
- Transboundary effects
- Effects on the hydrology and water quality of the river
- Effects related to construction works: soil erosion; 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.
- 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, potential for increased incidence of water-borne and water-related diseases.
- Effects on riverine fisheries and potential for creating a reservoir fisheries resource.
- 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.).
- Impact of altering water supply on urban and rural users.
- Potential environmental and social impacts by planned and unplanned immigration into the area.
- Effect of existing and predicted land use in the watershed on the functioning and longevity of the dam, reservoir and the irrigation command area.
- Effects of climate change and variability on the planned project during project implementation. Reference will be made to previous climatic studies undertaken by the NELSAP, as well as the NELSAP climate adaptation mainstreaming guidelines,
- Effects on cultural heritage

Cumulative impacts and their contribution to the overall cumulative effect.

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 including dam safety
- 6) Traffic Safety
- 7) Transportation 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.
- 10) Emergency Preparedness

Occupational health and safety (OHS)

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

Task 5: Formulation of Mitigation Measures

The Consultant will formulate cost-effective and technically feasible mitigation measures following the mitigation hierarchy: anticipate and avoid risks and impacts; where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; once risks and impacts have been minimized or reduced, mitigate; and where significant residual impacts remain, compensate for or offset them, where technically and financially feasible. Measures shall be consistent with the requirements of ESS1 and all other relevant ESSs.

The consultant shall also clearly distinguish between measures applicable during pre-construction, construction, operation and decommissioning phases of the project. 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). The extent to which the different mitigation measures will reduce the scale of impacts arising from the scheme will be evaluated, and unavoidable residual impacts identified. The measures will be incorporated in the Environmental and Social Management Plan (ESMP).

Task 6: Analysis of alternatives to the proposed project

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--including the "without project" situation--in terms of their potential environmental and social impacts; 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 7: Preparation of an environmental flow assessment report

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

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- i) (such as indirect impacts, cumulative impacts, and impact interactions).
 - ii)

Task 8: Review and incorporation of Dam Safety Plans into the ESMP

- iii) Data collection, review and study planning;

- iv) Propose methodologies and conducting field surveys;
- v) 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;
- vi) Implementation of water flow and quality modeling;
- vii) Assessment of risks and impacts, including assessment of the expected sedimentation, cumulative impacts, and of the required environmental flow downstream the proposed Nyimur Irrigation Scheme.
- viii) 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;
- ix) 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).
- x) 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.
- xi) 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.
- xii) Propose a Biodiversity and Ecological Flow Management Plan to improve conditions of downstream biodiversity and ensure proper actions implementation and monitoring

Task 9: Review and incorporation of Dam Safety Plans into ESMP

The consultant shall review and give in put into preparation of Dam Safety Plans to be prepared under the Feasibility and Design Study. The Plans shall be covering all aspects related to the World Bank dam safety requirements under ESS4 : Community Health and Safety and the plans shall make an integral part of the ESMP. The plans shall include: (i) Operation and Maintenance Plan including the first impoundment and dam safety inspection procedures (ii) Dam safety monitoring and instrumentation plan (iii) Emergency preparedness plan and (iv) Quality control plan

Task 10: Development of 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 Consultant shall prepare an ESMP outlining (a) the exact project activities and their ecological and social impacts, the proposed mitigation measures, the institutional arrangements (including nature, function and capacity of the relevant agencies at both local and national levels) required for effective implementation and monitoring of the proposed mitigation measures, including time horizons and cost estimates for these activities, (b) recommendations pertaining to the strengthening of the institutions responsible for the implementation of the ESMP; and (c) relevant monitoring indicators. Budgetary cost estimates for implementing these measures shall also be provided including the capital and recurrent cost estimates and sources of funds for implementing the ESMP. These figures shall also be integrated into the total project cost tables. The ESMP shall include the schedule for the implementation of the various mitigation and monitoring measures, showing phasing and coordination with overall project implementation. 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:

- Summary of Potential Impacts
- Description of Planned Mitigation Measures (incl. dam safety requirements)
- Description of Planned Environmental Monitoring
- Description of Planned Public Consultation Process
- Description of the Responsibilities and Authorities for Implementation of Mitigation Measures, Monitoring Indicators and Monitoring Requirements
- Description of Responsibilities for Reporting and Review
- Work Plan including staffing chart, proposed schedules of participation by various members of the project team, and activities and inputs of various government agencies
- Detailed Cost Estimates
- Mechanisms for feedback and adjustment

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

- Realistic sampling program (temporal and spatial)
- Sampling methods relevant to source
- Collection of quality data
- Comparable new data with other relevant data used in environmental assessment
- Cost-effective data collection
- Quality control in measurement and analysis
- Innovations (e.g., in tracing contaminants and automated stations)
- Appropriate databases
- Multidisciplinary data interpretation to provide useful information
- Reporting for internal management and external checks
- Allowance for, and response to, input from third parties.
- Detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions
- Monitoring and reporting procedures
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Task 11: Preparation of the Integrated Pest Management Plan (IPMP)

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 in line with the requirements of ESS1 and ESS3.

1. Presentation in the public arena (external assessment. 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.

2. Duration, Reports and Schedule of Deliverables

It is envisaged that the assignment will take up to 12 months. The Consultant will report to the Commissioner Water for Production 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 Table 3 below.

Table 1: Reports and schedules of deliverables

ITEM	REPORT/DOCUMENT TITLE AND TIMELINE	CONTENT	NO. OF COPIES
A.1	Inception One (1) month 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. The Consultant shall meet and present the report to Client for review comments and input.	3 hard copies and soft copy to be submitted by electronic mail
	ESIA Scoping report Two (2) months into the assignment	ESIA scoping report and TOR ready for submission to NEMA for review and clearance.	

A.2	Environmental Flow Assessment Report Five (5) 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.	3 copies and a soft copy to be submitted by electronic mail
A.4	Draft ESIA report: Eight months from the date of commencement	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,	3 hard copies and a soft copy
A.5	Final ESIA report Ten (10) months	A Final report that addresses 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.	3 hard copies and a soft copy to be submitted by electronic mail
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 hardcopies (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 three 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 make arrangements to present each deliverable to the Client’s team for comments and input.

3. Data and Services to be provided by the client

Data and documentation on hydrological, meteorological, water quality and other relevant aspects including the Feasibility study report, ESIA study report prepared

under NELSAP, project ESMF and RPF 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 the feasibility study consultants (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 the study. (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.

4. 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.

5. Qualification of the Consultant

General experience of Eight (8) years in carrying out ESIA studies for medium to large scale infrastructure projects.

1. Submit the firm's organogram to demonstrate the firm's technical and managerial capability.
2. Experience of the at least (5) similar assignments for Medium to large scale irrigation schemes, dams/ reservoirs, medium scale to large scale hydropower, medium to large scale water supply and management infrastructure projects in Sub Saharan Africa.
3. Firm should have experience in providing ESIA for World Bank funded Projects

Presence of appropriate skills among staff including: Team Leader / Environmental Assessment Specialist, Social Expert, Hydrologist, Aquatic Ecology & Fisheries Specialist and Air Quality & Noise Expert.

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, Agricultural or Irrigation Engineer. 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 8 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 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. Registration with NEMA as Environmental Practitioner (Team Leader) is a requirement.</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 qualification is a requirement and 8 years' experience in preparing 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 ESF and or safeguards policies 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 Safeguards and Policies 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 Eight (5) years of progressively senior experience in the hydrologic and aquatic environmental modelling as for medium to 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</p>

Position	Competencies
	lead determination of Environmental Flow recommend modifications to feasibility and designs where necessary.
Aquatic Ecology and Fisheries Specialist	University degree in Ecology, MSC or higher and related qualifications would be considered as an advantage with previous experience in preparing EIA's distinctly advantageous. This should be a senior specialist with at least Eight 5 years of experience in environmental assessments, management and the preparation of EIAs and EMPs. He/she should have experience from at least 5 comparable projects in the water Infrastructure. The specialist should have demonstrated experience in aquatic ecological assessments appropriate to dams and rivers, and preferably in sub-Saharan Africa.
Air Quality and Noise Expert	<p>University degree in Environmental Science, Environmental Management, Environmental Engineering or related field.</p> <p>Msc degree in Natural Resources Management, Environmental Health and Safety Management, Environmental Engineering or related field with least Five (5) years' experience in preparing ESIA's, Air quality and Noise Monitoring for development Projects in Sub Saharan Africa. The specialist shall have experience in Air Quality and Noise Monitoring in Sub Saharan Africa.</p>

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.

6. 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

7. 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.

8. 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.
- ii) Obtaining signoffs 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.

9. 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

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 Nyimur Irrigation Scheme 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 Nyimur irrigation Scheme 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 Nyimur Irrigation Scheme 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 Nyimur Irrigation Scheme 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 Nyimur. 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 Nyimur 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 Nyimur Irrigation Scheme 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 consultant international guidelines.¹

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.

- Freshwater Biodiversity sampling sites: will be sampled within two transects always upstream of the flow sampling areas to avoid disturbance.
 - 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.
 - Water quality sampling: will be sampled at the same sites of freshwater biodiversity sampling and always before the flow sampling measurements.
 - 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 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

¹ <https://publications.iadb.org/publications/english/document/Good-Practices-for-the-Collection-of-Biodiversity-Baseline-Data.pdf?download=true>

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 Nyimur 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 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 Nyimur 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 Nyimur and tributaries confluences (1-2-3 order); c) downstream the river Nyimur 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.² 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.
- (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

²The 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

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 Nyimur Irrigation Scheme 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 Nyimur Irrigation Schme dam on the sediment transport, water quality and ecological environment of the downstream of the dam. The Nyimur Irrigation Scheme 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 Nyimur Irrigation Shcme dam on the mass/sediment transport and connectivity of the River Nyimur 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 Safeguard Policies.
- (v) **Assessment of the Environmental Flow Requirements (EFR):** Comparison of a diverse range of operation scenarios for the Nyimur Irrigation Scheme 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 Nyimur Irrigatiin Scheme 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 Safeguard Policies.

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 Nyimur river monitoring system:** Review and assess the monitoring system and procedures for the river Nyimur, 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 Nyimur 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		Once
Vanadium		
Nickel		
Cobalt		
Cyanide		
Cadmium		
Mercury		
Lead		
Copper		
Selenium		
Zinc		
DDT and other toxic agrochemicals used in the area (consultant to proposed indicators)		