



The Republic of Uganda

MINISTRY OF WATER AND ENVIRONMENT
INTEGRATED WATER MANAGEMENT AND DEVELOPMENT
PROJECT

Terms of Reference

For

**Consultancy Services for Design of River Nyamwamba
Maintenance and Flood Protection Works**

September 2022

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1. BACKGROUND

Kasese District has experienced devastation caused by the flash floods resulting from the five major rivers in the area – Nyamwamba, Mubuku, Nyamugasani, Lhubiriha, Rwembya and Sebwe – bursting their banks during heavy rainfall events; inundating the surrounding lowlands.

In recent times, the floods started in May 2013 with River Nyamwamba bursting its banks on several weak points along the river in particular the areas of Kasese Municipality, with Nyamwamba and Bulembia division being severely affected. Eight (8) major floods have occurred since then with the most recent river flooding experienced on July 15, 2021. These floods swept away Kyanjuki-Katiri Bridge, Bulembia primary school, Nyamwamba Hydropower plant, Kilembe water supply system, and Kilembe mines Hospital infrastructure including the Store, Morgue and hospital wards.

This was not the first-time floods have ravaged Kasese district or the Mt Rwenzori region in general. Before 2013, the area had experienced four (4) major floods since 1966 when the first ever devastating floods were recorded at Kilembe mines (Figure 1). So far, the most devastation by all these floods has occurred in the R. Nyamwamba catchment.

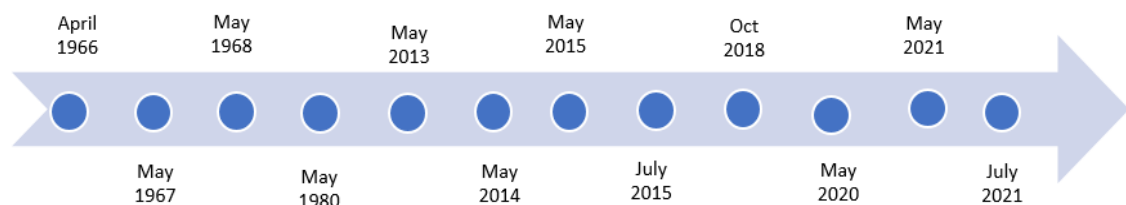


Figure 1: Major floods in Kasese since 1966

Government of Uganda with support from the World Bank has prioritized the implementation of integrated flood risk management activities in R. Nyamwamba catchment Kasese District to mitigate the impacts of future flooding in the area.

In a bid to minimize the loss of life, livelihood and property caused by the frequent flooding that River Nyamwamba experiences; the Integrated Management and Development Project intends to implement both structural and non-structural measures to reduce the impact of flooding in the river catchment. This will involve construction of gabions, dykes, check dams, weirs and other interventions along the river in Kasese district.

To this effect, the Ministry of Water and Environment intends to hire a Consultant to carry out detailed engineering designs for River Nyamwamba Maintenance and Flood Protection Works in Kasese district. The Consultancy assignment will specifically review the river Nyamwamba Water Resources Assessment and the Strategic Social and Environmental Assessment reports and undertake the hydraulic and structural designs for the flood protection in the mentioned areas and come up with suitable systems to efficiently manage and control flood flows in the river.

2. OBJECTIVES OF THE ASSIGNMENT

The specific objectives of the assignment are:

- (i) To carry out relevant technical investigations and studies comprising but not limited to topographical survey, hydrological assessments including sediment transport analysis and geotechnical investigations along the river reach.
- (ii) Prepare engineering designs for river maintenance and flood protection structures.
- (iii) Identify feasible and sustainable nature-based solutions to the floods.
- (iv) Prepare tender documents for identified work packages for proposed river maintenance and structural measures (Flood Protection works) in accordance with the World Bank procurement and safeguard policies and guidelines as well as with the latest Multilateral Development Bank (MDB) harmonized version of the FIDIC conditions of contract.

3. SCOPE OF SERVICES

The consultant is expected to undertake studies leading to detailed engineering designs for River Nyamwamba Maintenance and Flood Protection Works in Kasese district. The Consultant is also expected to identify feasible and sustainable nature-based solutions to the floods.

The Ministry of Water and Environment has identified six (6) hotspot areas as detailed below but the Consultant is expected to undertake a comprehensive study of the entire river reach and where feasible, identify other hotspot areas proposed for river maintenance and flood protection works.

Table 3-1: Scope of services

| S/N | Location | Coordinates | | Cross Sectional Area (m ²) | Section Length (m) | Infrastructure (Livelihoods) at Risk | Proposed Action |
|-----|---|--|--|--|--------------------|---|--|
| | | Start | End | | | | |
| 1 | Kyambogho | 0°14'02.4"N 29°58'45.4"E K1 | 0°13'56.5"N 29°58'51.3"E M1 | 25 | 270 | Hydropower Intake hydraulic structures, penstock and 14 acres of community owned trees | River maintenance/desilting, gabion masonry, cyclopean concrete, dykes, embankments, nature-based solutions, bridges and river maintenance equipment |
| 2 | Masule | 0°13'56.5"N 29°58'51.3"E M1 | 0°13'29.8"N 29°59'30.3"E KY1 | 25 | 2100 | 20 Houses, livestock and 40acres of farm land | River maintenance/desilting, gabion masonry, cyclopean concrete, dykes, embankments, nature-based solutions, bridges and river maintenance equipment |
| 3 | Kyanjuki Village | 0°13'29.8"N 29°59'30.3"E KY1 | 0°11'47.1"N 30°00'53.6"E KYC1 | 25 | 3560 | Kilembe Secondary School, Kilembe Hospital, Kyanjuki Bridge, Hydropower Intake hydraulic structures, penstock, 100 Houses, livestock and 40acres of farm land | River maintenance/desilting, gabion masonry, cyclopean concrete, dykes, embankments, nature-based solutions, bridges and river maintenance equipment |
| 4 | Kyanjuki Camp Namuhuga and Dog Section (Kyonjojo) | 0°11'47.1"N 30°00'53.6"E KYC1 | 0°11'30.8"N 30°02'53.3"E KYC2 | 25 | 4780 | Kilembe Hospital staff Quarters, Katiri Bridge, PowerHouse for Nyamwamba HPP1, 2.5km of paved road, 250 Houses, livestock and 10 acres of farm land | River maintenance/desilting, gabion masonry, cyclopean concrete, dykes, embankments, nature-based solutions, bridges and river maintenance equipment |
| 5 | Rukoki (mubuku irrigation intake) | 0°11'30.8"N 30°02'53.3"E | 0°11'41.3"N 30°05'42.9"E | 10 | 3890 | Mubuku Irrigation Scheme Intake | River maintenance/desilting, gabion masonry, cyclopean concrete, dykes, embankments, nature-based solutions, bridges and river maintenance equipment |
| 6 | Rukoki | 0°11'41.3"N 30°05'42.9"E R1 | 0°10'22.38"N 30° 7'48.85"E R2 | 10 | 5000 | Main Bridge (Kasese-Fort Portal Road) | River maintenance/desilting, gabion masonry, cyclopean concrete, dykes, embankments, nature-based solutions, bridges and river maintenance equipment |

Below are the details of what the assignment entails.

A. Design Phase

3.1 Technical Studies

3.1.1 Introduction

The Consultant will be responsible for designing all components of the works required for maintenance of the river and for the design of the flood protection works. All these will take place after the Consultant has visited the site, carried out detailed investigations and determined, the most appropriate recommendations for type and size of structures to be constructed in each of the sections.

It is therefore expected that the Consultant will directly undertake the technical studies and investigations elaborated below;

3.1.2 Topographical Survey

The main objective of topographic surveying works is to acquire topographic and surveying information essential for detailed design of different components of the structures.

The consultant will collect, review and undertake topographical surveys along the river reaches and analysis to establish suitable siting, alignment of infrastructure and the extent of flooding. The survey will also capture and geo-reference existing and proposed infrastructure within the proposed project area, trees and vegetation, rock outcrops, borrow areas, trial pit locations, access roads, site camps etc. The following specific activities will be undertaken:

- (i) Preparation of topographic maps of (i) check dams, dykes and gabion sites, at a scale of not more than 1:500 and with contour intervals of not more than 0.5 m, showing all of the features upstream, downstream, left and right of the proposed sites, and including the locations of observation and test pits and borrow areas, and (ii) the projected flood area, at an appropriate scale and with contour intervals of 0.25 m, covering the area up to an elevation of maximum expected water level plus 6 m. Adequate numbers of control points should be tied into the national coordinate systems, located on the topographic maps, and fully detailed in tabular form.
- (ii) Topographic survey of sites cross sections at appropriate intervals, and preparation of corresponding longitudinal and cross-sectional profile drawings at both vertical and horizontal scales of 1:100 showing all pertinent site features.
- (iii) Topographic survey of the banks of the river for a minimum offset of 250m from the center line on either side of the river. The survey should be done with cross sections at appropriate intervals, and preparation of corresponding longitudinal and cross-sectional profile drawings at both vertical and horizontal scales of 1:100 showing all pertinent project features.
- (iv) All existing features and those features likely to significantly affect design and actual construction should be plotted in detail to the scale of the contour maps.
- (v) All plans shall be produced in both digital and hardcopy forms with a suitable scale and suitable contour interval.

3.1.3 Hydrological Analysis

The Consultant shall review the river Nyamwamba Water Resources Assessment report.

The Consultant shall also undertake his own hydrological analyses such as rainfall-runoff and sediment modelling to estimate inflows and sediment yields as well as flood yield relationships.

Specific Hydrological Analyses should include for each site:

- (i) Updating hydrological analyses and completing the data sets for the base period up to the end of 2020.
- (ii) Constructing flow data sets with 10-day/monthly time step.
- (iii) Estimates of sediment transport. The consultant will also predict the sediment inflow through the proposed structures (based on local geological formation information and sediment measurements upstream).
- (iv) Preparation of flood inundation maps, considering past and recent information, climatic conditions surrounding extreme events, flood durations and accumulated volumes, and multiple/ successive flood events. The analyses should establish the inflow design floods to facilitate the sizing of hydraulic structures.
- (v) Determination of flow duration curves to facilitate more reliable hydraulic design of the structural components.
- (vi) Establishment of area capacity curves based on the sediment yield.
- (vii) The consultant will also assess the impacts of climate change on the hydrological characteristics.

A report will be prepared outlining field activities, methods of analysis, and site-specific catchment models. All data will be stored as shapefiles /arcinfo format.

3.1.4 Hydraulic Analysis

The Consultant shall use the information gained from the topographical survey and hydrological analysis to create 1D and 2D hydraulic models that will be used to assess the full impact of flooding on a development, as well as the development's impact on a local watercourse. Accurate flood maps shall be generated to support planning applications and develop effective mitigation options, keeping project area and its occupants safe.

Specific Hydraulic Analyses for each site shall inform:

- (i) All components of the works required for maintenance of the river and for the design of the flood protection works. These will include structural measures taken to improve the river and its banks such construction of dykes, gabion, check dams and weirs and any other interventions that may be deemed feasible. River maintenance and training is an important component in the prevention and mitigation of flash floods and general flood control, as well as in other activities such as ensuring safe passage of a flood under a bridge. The Consultant should model the impact of the proposed interventions on the river flows for the selected return periods/ design flows.

This above information will be used to provide estimates of the cost of construction of the proposed interventions.

3.1.5 Sediment Transport Assessment

Sedimentation is one of the main challenges within the catchment. The Consultant will review the river Nyamwamba Strategic Social and Environmental Assessment reports prepared as part of the river Nyamwamba Catchment Management Plan. This will be used to determine the sediment yield (estimates of sediment load should include projections of changes in upstream sediment, factoring in upstream development plans and implementation of planned catchment restoration activities)¹.

The Consultant shall be required to use appropriate modelling tools to refine the sediment regime and total sediment transport of the river system. A one-dimensional model will be used to simulate the sediment deposition in the river. The accurate prediction of the rates of sediment transport and deposition will be necessary for the success and longevity of the project.

This above information will be used to provide estimates of the cost of construction of the proposed interventions.

3.1.6 Socio-Economic Surveys

The Consultant will review the river Nyamwamba Strategic Social and Environmental Assessment reports prepared as part of the river Nyamwamba Catchment Management Plan. This will be used to develop relative priority structural designs for each purpose (including foot bridges etc.). The Consultant should compare the socio-economic impact of recent flooding events on the affected communities versus the socio-economic gain from the proposed structural measures being proposed in this study.

The consultant shall however be required to undertake additional socio-economic surveys where needed in order to enumerate the socio-economic benefits that may be derived from the utilization of the proposed flood protection structures.

3.1.7 Geotechnical Investigations

The Consultant will conduct geotechnical investigations primarily to determine suitability of the foundation, required foundation treatment, excavation and slope stability and availability, characteristics and suitability of construction materials (through in-situ and laboratory tests) to aid in weir, dyke and gabion design.

The recommended locations and depth of geotechnical investigation for different types of structures and appurtenances are variable. The decision shall be made by the consultant based on engineering judgment to that specific structure and geologic complexity.

(a) Field Explorations

A number of explorations will be done by the consultant depending on the structure proposed as provided in the table below:

¹ The World Bank is going to carry out a sediment transport assessment to review the existing situation of sediment transport. The report will detail estimates of suspended sediment concentrations, rates of sediment erosion and deposition and sediment transport pathways, the deficits and problems related to sediment transport and deposition and define the needed data and modelling tools needed to make a more accurate assessment of the sedimentation in the catchment.

Table 3-2: Types of field explorations during design

| S/N | Type of structure | Locations | Methods of exploration | Spacing of exploration | Depth of exploration |
|-----|--|---|---|------------------------|---|
| 1 | Borrow fill area | Over the area | Mostly manual excavations (test pits, trenches or augers) | 100- 200m | Limited to end of suitable depth or sufficient quantity |
| 2 | Dykes, check dams and weirs | Length-wise over the foundation on the axis | Pitting, trenching, auguring or may be including drilling or in combination | 100-200m | $\leq H$, where H is the height of the embankment |
| 3 | Retaining structures (masonry, concrete, gabions, etc) | Length-wise over the foundation on the axis | Pitting, trenching, auguring or may be including drilling or in combination | 200-500m | $\geq 1.5B$, Where B is the width of the foundation. |

(b) Field Tests

A number of field tests will thereafter be undertaken to include:

- (i) **Sounding Tests/ Standard Penetration Test (SPT):** These shall be carried out to determine underground information for foundation design purposes.
- (ii) **Groundwater Table Measurement:** The groundwater table shall be established as accurately as possible if it is within the probable construction zone. Some groundwater situations may have an important bearing on the choice of the type of flood protection structure to be constructed and on the estimates of costs of foundations.
- (iii) **In situ Unit Weight Determination:** The in-situ density of a soil shall be used in the stability analysis, to provide information on the natural state of compaction and as an input to the soil mechanics analyses. The methods to be employed by the consultant will include either the Core-cutter method, Sand replacement method, or Water displacement method.
- (iv) **Strength Tests:** The main strength tests to be undertaken by the consultant will include the shear strength, bearing and settlement strengths.

(c) Laboratory Tests

Due to the nature of the subsoil or due to the requirement of the work piece, some laboratory tests are mandatory in flood structure investigations. The most important laboratory tests required for geotechnical designs on both disturbed and undisturbed samples will be the strength, compressibility and permeability. Additionally; index properties, chemical behaviors, etc., of the substratum may be sought by the consultants.

The major laboratory tests to be undertaken are provided in the table below.

Table 3-3: Types of laboratory during design

| S/N | Structure/material | Sample location | Purpose | Types of tests |
|-----|--------------------|---------------------|--|---|
| 1 | Retaining walls | Along the alignment | Foundation investigation | <ul style="list-style-type: none"> • Index tests (sp.gr, Atterberg limits, gradation, etc.); • Free swell; • Bulk density and natural moisture content; • Shear strength, consolidation., rock strength, etc. |
| 2 | Diversion canal | Along the alignment | Foundation investigation | <ul style="list-style-type: none"> • Same as above including permeability |
| 3 | Borrow materials | Clay source | As core, lining, blanket, etc. | <ul style="list-style-type: none"> • Index tests; • Free swell; • Compaction; • Permeability; • Shear strengths; • Consolidation; etc. |
| | | Embankment fills | As shell and selected excavated fills | <ul style="list-style-type: none"> • Same as above depending upon the material type. |
| | | Sand | Concrete fine aggregate, transition materials, bedding, etc. | <ul style="list-style-type: none"> • sp.gr, & sieve; • soundness; etc. |
| | | Gravel | Concrete fine aggregate, transition materials, bedding, road surfacing, etc. | <ul style="list-style-type: none"> • Same as above including abrasion tests, if required |
| | | Rock | As riprap, rock-toe, rock fill, masonry, etc. | <ul style="list-style-type: none"> • Visual examination, compressive strength, & petrographic analysis, if required |

The outputs of the geotechnical investigation will be:

- (i) Characteristics of the foundation soils, classification, strength parameters, coefficient of permeability and compression indices.
- (ii) Precise geotechnical report with recommendations on the design of the flood protection structures.

3.2 Detailed Designs

3.2.1 Introduction

The Consultant shall, through a consultative process, produce detailed designs for use during River Nyamwamba Maintenance and Flood Protection Works in Kasese district. The designing aspect will include the utilization of the results of the hydrological analysis, topographical survey, sediment transport analysis and geotechnical investigation to determine the feasible structures. The final design will consider the attributes of currently existing flood protection structures in the region and the challenges related to the maintenance. Alternative choices made shall have to be clearly substantiated in the design report. The design shall include options analysis for flood management structures with ranked priority measures for the short and medium term, with due consideration of the social, economic and environmental factors. The design shall also take into consideration the ongoing intervention under the IWMDP for the Emergency Maintenance of River Nyamwamba for Flood Mitigation against Damage of Critical Infrastructure and Loss of Livelihoods in Kasese District within 5,407m over three (3) priority hotspot locations/sections of the river as well as the catchment interventions in the upper, middle and lower areas.

The Consultant shall take full responsibility for the complete maintenance and Flood Protection Works designed. Should the selected technology differ fundamentally from the previously promoted and applied technologies in the region, the Consultant shall provide full justification for the design to demonstrate upfront the likely performance of the facility.

Early consultation is required at the design stage to enshrine public participation at the beginning and ensure the appropriateness of the proposed flood mitigation measures. Activities include: discussion on the need for the mitigation measures with the relevant stakeholders. A feedback mechanism to brief all stakeholders at central and local government level will therefore be incorporated in the proposal and will focus mainly on how consensus can be built among all stakeholders. Concerns raised by the stakeholders will be addressed satisfactorily, before the final designs are completed.

The following information will constitute the design:

3.2.2 Detailed Analysis and Design

Based on the technical analyses and investigations, the consultant shall carry out: (i) detailed designs for the River Nyamwamba maintenance and flood protection works and (ii) identify and propose feasible and sustainable nature-based solutions to the floods in Kasese district.

Major features of design to be considered include: foundation treatment and design, abutment stability, stability of slopes and flood control structures, and ability of the maintained river to maintain the design flood conveyance capacity. These features should be studied with reference to field conditions and to various alternatives.

The consultant shall recommend the best flood control structures/measures and scenarios considering size and other conditions. Specifically, the Consultant shall prepare designs, drawings, bills of quantities and specifications, to internationally recognized standards but also in conformity with local norms and standards where these are compatible, covering:

- (i) Hydraulic and geotechnical design for the river maintenance.

- (ii) Hydraulic, geotechnical and structural designs for the flood protection works, including gabions, dykes, check dams, weirs and other interventions along the river in Kasese district, considering the geological and geotechnical investigation findings.
- (iii) Layout and project components which should be carried out based on field investigation and studies (both structural and nature-based solutions). Drawings for the main structures shall be elaborated.
- (iv) Preliminary cost estimates and costed bills of quantities.
- (v) Estimation of the implementation support and annual O&M requirements and inputs (equipment) including preparation of the detailed O&M plan.

3.3 Technical Specifications

The Consultant will prepare specifications for workmanship and materials, which shall have been agreed upon in consultation with the Client.

3.4 Construction Plans and Implementation Scheduling

The Consultant shall establish construction schedules for the implementation the River Nyamwamba Maintenance and Flood Protection Works. Apart from the construction items of the earthworks and concrete works for the main structures these schedules shall include mobilization, construction of temporary access roads as well as routes to borrow areas, mapping and information on quantity and quality of borrow areas, establishment of the construction camp, construction packaging, work methods and preliminary labour force requirements. In the schedules the Critical Path Method shall be applied. Based on this the disbursement schedule of the project main components will be estimated as an input for the financial and economic analysis.

3.5 Economic Analysis

The consultant shall carry out an economic analysis to determine the viability of the proposed flood protection structures taking into account the various tangible benefits identified and costed. The cost of construction management shall also be included in the estimate as separate items. Appropriate contingencies will be applied to take into account factors which cannot be adequately defined at the design phase.

A cost-benefit analysis shall be carried out to determine the Economic Internal Rate of Return (EIRR) of each scenario. To the extent possible, all the social, economic and environmental costs and benefits should be enumerated, quantified and included in the analysis. Where it is difficult to directly quantify, proxies should be used. Wherever applicable, opportunity costs should be applied instead of the financial costs, and shadow pricing should be applied as necessary. The opportunity cost of capital should be carefully estimated for comparison with the EIRR.

3.6 Tender Documents

Once the designs are approved by the Client, the tender documents for the works should be prepared. The text of the Conditions of Contract universally recognized (and generally adopted by the international Development Banks) is the FIDIC (Federation Internationale Des Ingenieurs Conseils)'s appropriate "book".

The following information will constitute the Tender Documentation:

- (i) Drawings, bills of quantities (BoQ) and all tender documents (including engineering cost estimates) prepared in accordance with the Civil Engineering Standard Method of Measurement (CESMM4). It is expected that the proposal

shall state the number of drawings to be produced with description of the purpose of each drawing.

- (ii) Specifications for workmanship and materials, which shall have been agreed upon in consultation with the Client.
- (iii) Special conditions of undertaking the supervision of construction works based on the FIDIC Contract for Works of Civil Engineering Construction.

The Tender documents shall include a provisional schedule, based on the Consultant experience, framing the aimed duration of the construction Works. Such program shall include key dates (usually related to meteorological constraints or delivery planning of equipment), and be based on reasonable productions of main items (excavations, filling, concrete, etc.).

The tender documents shall be prepared in accordance with the applicable World Bank requirements.

3.7 Environmental and Social Impact Assessment (ESIA)

An independent Consultancy Service for Undertaking Social and Environment Impact Assessment of River maintenance Works on River Nyamwamba will be commissioned by the Ministry of Water and Environment. The information from this study will further allow the consultant to:

- (i) Assess environmental and social impacts that could make the project non-feasible or financeable, or result in costs likely to exceed the intended benefits when mitigation is considered;
- (ii) Assess whether any resettlement, land and asset acquisition will be associated with the project; and
- (iii) Examine design alternatives, access roads, material sources (borrow areas), etc. and make comparison of such alternatives, in technical, economic, social and environmental terms, so that the best recommendations are forwarded to the team members working on the engineering aspects for incorporation in the project designs.

The Consultant will however carry out a preliminary Environmental and Social Impact Assessment (ESIA) to ensure that the proposed structural designs and construction methods avoid or minimize potential adverse environmental impacts while contributing to sustainable ecosystem management.

4. ORGANIZATION OF THE ASSIGNMENT

4.1 Contractual Arrangements

The Consultancy will be implemented under a Lump sum contract.

The Consultant shall show the costs of his proposed services in accordance with these contractual arrangements.

4.2 Liaison with the Client

The Client shall nominate members to constitute a Contract Management Team with the overall supervision and direction by the Component Manager, Integrated Water Management and Development Project. The team will comprise of Project Manager and Engineer. The Project Manager shall carry out all project management oversight activities, supervisory roles and review, sign-off and approval of Consultant's reports.

It will be the Consultant's duty to maintain close contact with the Project Manager on all aspects of work. As a matter of principle, all formal communications relating to the work will be directed to the attention of the Project Manager.

The Client shall nominate an Engineer as part of the contract management team, responsible for the day-to-day coordination and monitoring of the project activities. As such, the Engineer shall closely work with the Consultant to ensure that all the technical requirements of the Project are fully met. In particular, the Engineer, under the guidance of the Project Manager, shall review and provide the Client's input, comments and guidance on the work plans, methodologies and reports prepared by the Consultant for quality assurance and achievement of set objectives. The Client shall also assign social and environment safeguard specialists responsible for supervision of EHS and social aspects of the Project.

4.3 Logistical Setup and Staffing

4.3.1 Introduction

Within the technical proposal, the Consultant shall elaborate the envisaged logistical setup and deployment of appropriate skills for 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 member is planned to be involved in 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. It is recommended that the Consultant integrates local expertise into the project execution team.

In the course of implementation of the assignment, all the proposed personnel must be available for this assignment. Staff changes shall not be accepted, except in exceptional circumstances (and at the discretion of the Client) where the replacement must have equal or superior qualifications according to the job description or requirements of the assignment.

The minimum number of key experts and mandatory non-key experts including the minimum time input and minimum qualifications of each are indicated in sections 4.3.2.

The Consultant is free to propose additional skills as are deemed necessary to execute the assignment within their stated methodology whilst considering the emergency nature of the assignment.

4.3.2 Key Experts

Key experts for the assignment are indicated in the table below.

Table 4-1: Key Experts

| Expert | Minimum relevant experience (years) | Minimum staff input (months) |
|--|--|-------------------------------------|
| Project Manager /Civil or Water Resources Engineer | 15 | 7 |
| Geotechnical/ Structural Engineer | 10 | 4 |

| Expert | Minimum relevant experience (years) | Minimum staff input (months) |
|---------------------------------------|--|-------------------------------------|
| Hydraulic Engineer | 10 | 5 |
| Hydrologist | 7 | 3 |
| Land Surveyor | 7 | 3 |
| Environmental Safeguards Expert | 10 | 3 |
| Sociologist/ Social Safeguards Expert | 10 | 3 |
| Economic Analyst | 10 | 2 |
| Sub Total 1 | | 30 |

Mandatory Non-key Experts for the assignment are indicated in the table below.

Table 4-2: Mandatory Non-key Experts

| Expert | Minimum relevant experience (years) | Minimum staff input (months) |
|--------------------------|--|-------------------------------------|
| GIS Technician. | 7 | 2 |
| CAD Technician | 5 | 2 |
| Quantity Surveyor/Valuer | 7 | 1 |
| Sub Total 2 | | 5 |
| TOTAL - DESIGN | | 35 |

4.3.3 Qualifications of Experts

The key personnel shall have minimum qualifications and experience as stipulated below:

Table 4-3: Minimum Qualifications and Experience of Key Personnel

| Expert | Minimum Qualifications and Experience |
|--|--|
| Project Manager /Civil or Water Resources Engineer | <p>Education: Minimum of a Master's Degree in Civil/Water Resources/Environment/Hydraulic Engineering or Construction Management.</p> <p>General Experience: Minimum of 15 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 10 years' experience in design of civil works infrastructure projects involving flood protection works, dams, retaining structures, river training, and earthworks. • Experience as Project Manager or Team Leader on not less than 3 previous projects similar in scale and content to this one. |

| Expert | Minimum Qualifications and Experience |
|---|---|
| | <ul style="list-style-type: none"> • Experience in implementation of projects in Sub-Saharan Africa. • Shall be a Registered Engineer in Uganda or any other recognized engineering society. |
| Geotechnical/ Structural Engineer | <p>Education: Minimum of Masters' degree in Civil/Structural/Geotechnical Engineering or other relevant discipline.</p> <p>General Experience: Minimum of 10 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 7 years' specialist experience in the field of geotechnical engineering and shall have worked as Geotechnical Engineer on not less than 3 previous projects involving flood protection works, dams, retaining structures, river training, and earthworks. • Shall be a Registered Engineer in Uganda or any other recognized engineering body. |
| Hydraulic Engineer | <p>Education: Master's Degree in degree in Civil/Environmental/ Hydraulic Engineering or other relevant discipline.</p> <p>General Experience: Minimum of 10 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 7 years' experience in design of hydraulic structures. • Experience on not less than 2 previous river engineering projects as hydraulic expert. • Shall be a Registered Engineer in Uganda or any other recognized engineering body. |
| Hydrologist | <p>Education: Minimum of a Master's degree in Water Resources Engineering or related field.</p> <p>General Experience: Minimum of 7 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 5 years' experience in assessment of water resource availability, hydrological analysis, sediment analysis, flood protection works, and design for flood control structures. |
| Land Surveyor | <p>Education: Minimum of Bachelor's degree in Surveying or other relevant discipline.</p> <p>General Experience: Minimum of 7 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 7 years' specialist experience in cadastral, topographic and route surveying. • Experience in surveying works on not less than 2 previous projects involving flood protection works, dams, retaining structures, river training, and earthworks. • Must be registered with relevant professional body. |

| Expert | Minimum Qualifications and Experience |
|---------------------------------------|--|
| Environmental Safeguards Expert | <p>Education: Minimum of a Master’s degree in Environmental Engineering, Environmental/Natural Sciences, or equivalent.</p> <p>General Experience: Minimum of 10 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 7 years’ specialist experience in assessing environmental compliance of infrastructure projects including Environmental Social Impact Assessments (ESIA). • Experience in delivering good international industry practice with respect to Environment, Social, Health and Safety (ESHS). • Must be a NEMA- accredited environmental practitioner, have familiarity with World Bank’s environmental safeguards policies. |
| Sociologist/ Social Safeguards Expert | <p>Education: Minimum of Master’s degree in Social Sciences, Sociology, or any closely related field.</p> <p>General Experience: Minimum of 10 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 7 years’ experience in conducting socio-economic assessments for civil works’ projects specifically, payment for ecosystem services. • Experience in conducting socio-economic studies for projects in Sub-Saharan Africa. • The person shall have familiarity with World Bank’s social safeguards policies. • Experience in managing project associated social risks. |
| Economic Analyst | <p>Education: Minimum of Master’s degree in Engineering Sciences with a bias in Engineering Economics or Economics with a bias in Financial and Economic analysis of investment projects or any closely related field.</p> <p>General Experience: Minimum of 10 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 7 years’ specialist experience in conducting Financial and Economic analysis of civil works Projects. Must have experience in assessment of key financial performance indicators/ratios such as operating cash flow CAPEX cover, operating cash flow debt service cover, NPV, FIRR, DSCR, ROE, ROA, debt to equity, and the EIRR of civil works projects. |
| GIS Technician | <p>Education: Minimum of a Bachelor’s degree in geography, computer science, planning, engineering or any closely related field.</p> |

| Expert | Minimum Qualifications and Experience |
|--|---|
| | <p>General Experience: Minimum of 7 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 5 years' experience in the use of GIS/ESRI software in developing/managing a GIS database, analyzing all the spatial data in the project and generating GIS maps. |
| CAD Technician | <p>Education: Minimum of a Diploma in Civil Engineering/ Surveying or an equivalent.</p> <p>General Experience: Minimum of 5 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 5 years' relevant experience in use of CAD software like Auto CAD in preparation of design drawings. |
| Quantity Surveyor/Valuer | <p>Education: Minimum of Bachelor degree in Surveying, Land and/or Development Economics or an equivalent</p> <p>General Experience: Minimum of 7 years working experience.</p> <p>Specific Experience:</p> <ul style="list-style-type: none"> • 5 years' specialist experience in estimation and tendering of engineering works and preparing of bills of quantities. • Experience in valuation of properties and preparation of strip maps for compensation on infrastructure projects in Uganda. • Must be registered with relevant professional body. |
| <p>NB: All CVs including for Key and Non-Key staffs shall be endorsed by the Experts and the Consultant's representative (with power of attorney).</p> | |

4.4 Familiarization with the Assignment

To familiarize Consultants with the services to be provided under this consultancy, a pre-bid meeting will be held in the river Nyamwamba Catchment in Kasese District and it will include a tour to the project area. It is at the Consultant's discretion to make additional visits to the project area, in case they feel there is need to gather more information. It should be understood, that any cost incurred to the Consultant in this regard shall not be reimbursed.

5. DURATION OF THE ASSIGNMENT

The assignment is envisaged to take a total of 7 calendar months.

The above stated durations are to be understood as guidance and it is the responsibility of the Consultant to establish a detailed work program within the above time estimates. The estimated staff time inputs should be provided in accordance with the Consultant's professional judgment and knowledge of the local conditions and needs.

6. PRICING

In accordance with the World Bank rules, the consultancy services shall be priced in any fully convertible currency, singly or in combination of up to three foreign currencies.

7. REPORTING AND MEETING REQUIREMENTS

7.1 Reporting Address

All reports will be submitted to:

*The Permanent Secretary
Ministry of Water & Environment,
Plot 3-7, Kabalega Crescent Road, Luzira
Fax: 256-41-505941
E-mail: ps@mwe.go.ug
Attention: The Project Coordinator – Integrated Water Management and
Development Project*

The Consultant will be required to deliver a hard copy of each of the reports as shown in section 7.2.1 below to the World Bank at the following address:

*The Task Team Leader - Integrated Water Management and Development
Project
World Bank
Uganda Country Office
Rwenzori House, Plot 1, Lumumba Avenue
Kampala*

As indicated in Tables 7-1 below, the Consultant will be required to produce and submit the following principal reports and documents in the quantities and timing indicated. At each reporting stage, the Consultant shall also be required to submit to the Client an electronic copy, using the software specified in the tables.

The Ministry of Water and Environment and the World Bank shall review draft reports and approve/give comments within two weeks of submission.

7.2 Reporting Requirements and Content

7.2.1 Reporting Requirements and Content – Design Phase

During the design phase, the Consultant shall submit reports as stated in the table below.

Table 7-1: Reporting Requirements

| Description | Timing in months from contract effectiveness | No. of hard copies to | | Electronic copies to MWE contact person |
|------------------|--|-----------------------|-----|---|
| | | World Bank | MWE | |
| Inception report | 1 | 1 | 2 | Word; Excel (all tables) |

| Description | Timing in months from contract effectiveness | No. of hard copies to | | Electronic copies to MWE contact person |
|----------------------------|--|-----------------------|-----|--|
| | | World Bank | MWE | |
| Technical appraisal report | 3 | 1 | 2 | Word; Excel (all tables); Copy of all documents in PDF |
| ESIA report | 4 | 1 | 2 | Word; Excel (all tables); Copy of all documents in PDF |
| Draft design report | 5 | 1 | 2 | Word; Excel (all tables); CAD (all drawings); Copy of all documents in PDF |
| Final design report | 6 | 1 | 2 | Word; Excel (all tables); CAD (all drawings); Copy of all documents in PDF |
| Tender documents | 7 | 1 | 4 | Word; Excel (BoQ); CAD (all drawings); Copy of all documents in PDF |

The reports shall, as a minimum, have the following contents:

(i) Inception report

The inception report shall define the design criteria and assumptions for the design of the Nyamwamba flood protection structures. It will include the consultant's revised work breakdown and schedule, clearly outlining how the terms of reference will be fulfilled. The inception report shall also indicate any advice and recommendations related to the assignment, which are deemed necessary to be incorporated at an early stage.

(ii) Technical Appraisal Report (TAR)

The report will include the details of all technical field investigations, design criteria and standards for the different elements of works, conceptual designs, preliminary cost estimates, and financial and economic viability of the proposed structures.

(iii) ESIA Report

The ESIA report shall present the baseline data according to the findings of the independent Environmental and Social Safeguards study. The report shall discuss the technical, economic, social and environmental parameters and the identified impacts for the proposed project and its alternative scenarios. An Environmental and Social Management Plan shall be presented in the report identifying the required actions needed to avoid or mitigate the environmental and social impacts of concern as well as the required monitoring measures and responsibilities for implementation and oversight and an estimate of investment and/or maintenance budget required. The ESIA report shall comply with the national legislation and the World Bank policies and Environmental, Health and Safety guidelines.

(iv) Draft design report

The report shall be based on the recommendations of the technical appraisal report. The report shall include the following:

- The draft design of the structures to be constructed at the site, including the basis for determining the dimensions and structural characteristics of the different elements of the works.
- Draft Drawings of all the elements of the works in such detail as to enable their construction at the selected site.
- Draft Bills of quantities and preliminary estimates.
- Options analysis and results of the economic analysis.
- Implementation schedule/ construction plan.
- Technical specifications for periodic river maintenance equipment including operation and maintenance plan.

(v) Final design report

The final design report shall have the same contents as the draft design report. The report shall reflect all changes requested by and agreed with the Client. This report shall also include the specifications for workmanship and materials equipment, which are to be incorporated into the works.

(vi) Tender documents

The tender documents shall be in accordance with the applicable World Bank requirements.

7.3 Meeting and Workshop Requirements

Following the submission of the inception report, the Consultant will avail appropriate personnel for review meetings with the Client during the entire project period. The review shall be for the purposes of assessing progress, obtaining signoffs on proposals made in respect of minimizing project's social and environmental impacts, and exchanging information and data relevant for the successful accomplishment of the entire assignment.

The nature of the meetings, locations (e.g. site, MWE offices, and Consultant's offices) and agenda shall be agreed upon by the Consultant's and the Client's project managers.

For ensuring organizational and stakeholder wide appreciation and ownership of the proposed recommendations, the consultant shall be required to organise coordination workshops for presentation of key reports after each project milestone to a representative group of stakeholders that is to be agreed with the Client. A minimum of 2 workshops is proposed and shall include presentation of the inception and draft design reports. Both workshops will be held in Kasese District.

The Consultant will be required to include a provisional sum of US\$ 40,000 to meet the cost of holding the Workshops. The workshops will be facilitated by the Client. During the workshop, the consultant will make PowerPoint presentations, provide concise background documents for discussion and prepare workshop report to document the proceedings. The cost of holding the workshops and stakeholder consultations must be included in the consultant's proposal.

For costing purposes, it shall be assumed that each workshop will be attended by 30 people.

8. DATA, SERVICES AND FACILITIES TO BE PROVIDED BY THE CLIENT

To the extent possible, the Client will provide free of charge all existing information, data, reports and maps in the custody of the Client and will assist the Consultant in

obtaining other relevant information and materials from other government institutions as far as possible.

The key data and information shall include but not be limited to:

- (i) Water resources data and information for the river Nyamwamba including the rainfall and discharge data.
- (ii) Situational analysis report for the preparation of the Catchment Management Plan for river Nyamwamba (catchment description, Water Resources Assessment, Strategic Social and Environmental Assessment, Stakeholder Analysis, and Delineation of intervention areas).
- (iii) River Nyamwamba Catchment Management Plan.
- (iv) Concept note for the proposed Project.
- (v) Designs and drawings for the Egyptian grant phase 1 flood protection works on river Nyamwamba (2016).
- (vi) Designs and drawings for the Emergency Maintenance of River Nyamwamba for Flood Mitigation against Damage of Critical Infrastructure and Loss of Livelihoods in Kasese District (2021)
- (vii) Construction progress reports for the Egyptian grant phase 1 flood protection works on river Nyamwamba (2017).
- (viii) Construction progress reports for the Emergency Maintenance of River Nyamwamba for Flood Mitigation against Damage of Critical Infrastructure and Loss of Livelihoods in Kasese District (2022).

The Client will also assist the Consultant in obtaining work permits for the projects' Key Experts.

9. 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:

- (i) Suitable office space necessary for the Consultant's team engaged on the assignment.
- (ii) Office furniture and other related equipment including desk top computers complete with printers, auxiliary power units, and modern plan reproduction equipment all to be purchased by the Consultant through the contract as a reimbursable expenditure.
- (iii) Office supplies, as required for the period of services.
- (iv) Utility services and costs.
- (v) Long term accommodation for the Consultant's staff while in Uganda and hotel accommodation for short term experts.
- (vi) Subsistence (or per diem) payments for official travel for Consultant's staff.
- (vii) Secretarial and administrative support staff.
- (viii) International and local telephone services for official communication only.
- (ix) Transport for the duration of the lump sum contract.
- (x) Aerial photographs and maps, meteorological and geological data.

10. CODE OF CONDUCT

The code of conduct attached in Annex 3 has been set out to take into account considerations of Environment, Social and Health issues, Occupation Health and Safety of experts, Client's and Contractor's personnel and the community.

The Code of Conduct should be signed by each Expert to indicate that they have:

- (i) Received a copy of the code;
- (ii) Had the code explained to them;
- (iii) Acknowledged that adherence to this Code of Conduct is a condition of employment; and
- (iv) Understood that violations of the Code can result in serious consequences, up to and including dismissal, or referral to legal authorities.