Federal Ministry
for Economic Cooperation
and Development

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Terms of Reference

Consultancy for: Technical feasibility study for rehabilitation of 2 earthen dams
Project Title: Dam Rehabilitation and Food Security in North Darfur.
Project Number: SDN 1164 - BMZ

Welthungerhilfe (formerly German Agro Action) is seeking to contract the services of a consultant/firm with technical expertise in dam construction and rehabilitation.

I. Introduction

Welthungerhilfe is registered with the Government of Sudan as a foreign voluntary organization and is currently operational in North Darfur, Kassala, Red Sea and in Gedaref states. Welthungerhilfe is one of the largest German Non-Governmental Organizations and it was founded as the National Committee for the Freedom from Hunger Campaign of the Food and Agricultural Organization of the United Nations (FAO) in 1962 as a non-profit, non-political and non-denominational organization. Currently, Welthungerhilfe has operations in about 38 countries worldwide (Asia, Africa and Latin America).

Welthungerhilfe has been operating in North Darfur since 2004 implementing humanitarian assistance and developmental projects. Welthungerhilfe receives funding from the Federal German Government, DFID, the European Union, the United Nations and other donors.

Within the scope of its project number SDN 1164, Welthungerhilfe received funding from the German Foreign Ministry BMZ in 2019 to rehabilitate two earthen dams in Al Kuma and El Fasher rural localities in North Darfur State, in collaboration with the national organisation IRDS.

II. Project description:

Overall Objective:
Improved food and nutrition security and resilience for returnees, IDPs and host communities

Intended project impact:

- The target population uses improved and safe water supplies.
- The population has an improved nutrition status and livelihood strategies.

The project will directly benefit over 13,000 persons which are permanent residents of the targeted communities (host communities, pastoralists, Agro pastoralists), IDPs and returnees, whereas 25% of the direct target group are women (TG 3). Indirectly, the project will benefit residents of host communities and IDPs in Abushok and Alsalam camps.

The project will improve the nutrition status and livelihoods of the target population through provision of agricultural inputs to farmers and farmer capacity building on conservation agriculture, post-harvest management, grain storage provision and home vegetable production. Additionally, farmers will be organised to diversify their livelihood options leading to income through trainings on food processing and agribusiness, animal husbandry and breeding, animal treatment and training on production of fuel-efficient stoves.

Rehabilitation of Um Marahik dam and Al Kuma dam:

The selection of those two dams has been informed by a reconnaissance study in December 2018. **Darfur region heavily depends on spate water harnessing and storing of flash-flood and seasonal water** mainly in the rainy season (June - October). Therefore, **construction of small earth-filled water storage dams** is commonplace in the Darfur region. These small earth-filled dams across the seasonal and ephemeral wadis are inherently significant tools of water resources management and an important factor of water supply for irrigation, drinking, and groundwater recharge in Darfur region.

Initially, **Um Marahik dam** was built in 2008 and its sub-catchment area measures 127 km^2. It is mainly for recharging ground water and enabling irrigation of farmlands exist north and north east of the dam. The dam is a homogeneous earth fill embankment with a length of 1,200 m. The dam failed in the rainy season of 2010 and three breaches of varying widths occurred in the embankment. Main cause of the failure was internal erosion and/or sloughing of foundation. The embankment was homogenous and didn't have selected soil (clay) layer at the center. This layer helps to lower the seepage line and then resists erosion. This study shall reveal the main reasons for failure and recommend suitable solutions.

Al Kuma dam`s sub-catchment measures 760 km^2 and is a main part of Kuma-Rakaz agricultural project, which was implemented in late 1980's. Al Kuma dam has earth fill embankments with a length of 4,900 m. Both spillways of the middle and downstream dams collapsed in first operation years and in the years to follow which caused the suspension of the agricultural project. The dam´s main purpose is water harvesting and spreading in order to retain water in the ground and distribute water over the agricultural development area, known to be one of the fertile lands in North Darfur.

Site Location

The feasibility study is for two dams:

1) Um Marahik dam in El Fasher Rural locality, North Darfur, 14.0008 latitude and 25.9188 longitude.
2) Al Kuma dam in Al Kuma locality in North Darfur State. The location of the dam is at 13.8276 latitude and 25.4570 longitude, 70 km north east of the city of El Fasher.

Project Stakeholders

The project target group (as described above) are the main stakeholders, local authorities including Humanitarian Aid Commission, Ministry of Production and Economic Resources (MoPER), the State Water Corporation.

Objectives of the study

To conduct a detailed feasibility study and technical design for the rehabilitation of Al Kuma dam (in Al Kuma locality, North Darfur State) and Um Marahik dam (in El Fasher Rural locality, North

Darfur State). The study will include but not limited to site investigation, soil study, recurrent flow calculation, mass flow estimation, produce unit hydrograph, technical drawing/designing and calculation/specification of bills of quantities for the rehabilitation of two (2) dams in Al Kuma and El Fasher rural localities of North Darfur.

Scope of the study

Specifically, the consultant will be required to:

- Review secondary data and similar previous studies in the area, including reconnaissance study commissioned by WHH in 2018.
- Investigate and identify the main reasons for dam failures and provide technical recommendations along with new findings;
- Gather and analyze data to determine the number of people, livestock and cultivation area in the area surrounding the dams, and estimate water demand (for both current & future needs of human, livestock & agriculture) and estimated supply and reach of the enhanced water capacity using crop water requirement formula (CropWAT), and domestic water supply estimation
- Assess land use and agriculture practices in the area (soil types, land ownership, types of crops grown, and livestock kept, and their respective water demands, seasonality etc.)
- Analyze meteorological and hydrological data (including historical, hydrograph and unit hydrograph) on rainfall, surface runoff (flood estimation), vegetation cover & infiltration rates, temperatures, humidity, evaporation, sedimentation rate etc.
- Complete an assessment on the environmental and social impact (risks, opportunities & recommendations) according to standard ESIA methodology.
- Conduct a geotechnical study of sites (in situ tests on soil nature, seepage analysis etc.)
- Conduct a thorough topographic investigation & tests on the sites e.g. contours, embankments, rock foundation etc, using Global Mapper or similar GIS tools.
- Survey the type and availability of selected material to be used for the dam rehabilitation;
- Analysis of the carrying capacities of the dam based on water supply rate, recommended basin design (depth/width), flood rate, estimated usage, evaporation etc.)
- Review the local material/labour availability, operational and policy/legal requirements etc.
- Specification of designs notes and guidelines for a cost-effective construction modality & maintenance with clear division of works to be sub-contracted and accomplished by community labour work.
- Analysis and recommendations on requirements for optimum use of the dam.
- Prepare a final technical document (design specifications using suitable design tools, and BOQ bill of quantities).
- Prepare a tender dossier with clear technical specifications and other guidelines for contractors.

Duration of the feasibility study

The technical feasibility study is expected to last for a maximum period of **40 days,** tentatively starting from **January 1**. It is estimated that this will include 5 days for the preparation or desk phase, 15 days for field work and twenty days for reporting. The final report will be submitted by the consultant not later than 20 days after end of the field mission, tentatively around **10 February** 2020.

Study Team
The team should consist of the following professional functions, but is not limited to the following disciplines. The CVs of the positions shall demonstrate relevant educational and professional qualifications and adequate experiences.

- Hydrologist
- Watershed expert
- Surveyor
- Geologist
- Hydraulic or related Engineer
- Agronomist
- Soil analyst

Outputs of the Assignment
Key outputs of the assignment include the following (but not limited to):

- Detailed design, including: Topographic survey of the embankment area and surroundings using a 'Total Station'.
- Production of a detailed contour plan in electronic format.
- Building of a hydrological catchment model.
- Running analysis of catchment model.
- Confirmation of embankment length and elevation.
- Soil testing and burrow pit identification.
- Design solution optimization. including dam structural, hydraulic
- Detailed technical drawings and BoQs
- ESIA report.
- Relevant pictures and graphs
- Detailed narrative report including descriptions (of findings, construction methodologies, work inputs etc.), structural analysis, quarry sites with material properties, conclusions and recommendations
- Annexes including paraphs, pictures, maps etc..

In addition, the following will be required:

- Final technical feasibility and design report in hard and soft copies (2 bound colored) or soft copies.
- Annexes (electronic and hard copies where applicable) to the report including but not limited to:
  - Hydrological and geological map with geological sections.
  - Topographic data.
  - Catchment models for the dam.
  - Technical/engineering design and specifications for the dam including excavation. plan, typical cross section design, cut off trench cross section, spillway plan and profile.
  - Bill of quantity for the rehabilitation of the earth dam.
  - A tender dossier with clear specifications/guidelines for contractors to be produced according to agreed format and standards.
  - Technical design notes and guidelines for future repairs/expansions.

<u>Outline of the report</u>
The final report should include but not limited to the following

1) Executive summary.

- Summary of findings and feasibility analysis. This a concise summary of the key findings of the feasibility study, with precise recommendations, which can be shared with project stakeholders.
- Summary of conclusions and recommendations regarding the economic, social, legal, technical, and environmental feasibility of the project.

2) Background and purpose of the study.
   - Owner of the project;
   - Purpose of the project;
   - Description of study location;
   - Details of site visits and investigations.

3) Methodology of the study

4) Summary of team composition

5) The findings of the study by component

5.1 Analysis of alternative options to meet project objectives.
5.2 Analysis of water requirements to meet project objectives.
   - Impact on water resources in the area, including volume and quality.

5.3 Site investigations.
   - Topography.
   - Soils and geotechnical.

5.4 Environmental and Social Impact Analysis (ESIA).
   - Detailed ESIA summary.
   - Stakeholders.
   - Legal implications.

5.5 Hydrological analysis.
   - Estimated inflow and design flood.
   - Risk of sedimentation.

5.6 Identification of design issues
   - Criteria.
   - Estimated spillway sizes.
   - Ancillary structures.

5.7 Project construction plan
   - Approach – labour based, mechanised, etc.
   - Project construction plan should identify the key steps and expected duration of the project going forward. It should cover the project from design through construction to certification.

5.8 Cost estimate
   - A budget for each option should be produced based on the BoQ and estimated rates.

5.9 Economic analysis
   - A cost/benefit analysis should be conducted even if the scale of the project and the detail at this stage does not warrant a detailed analysis. However, the total project cost, covering design, construction, supervision, and all environmental and social mitigation measures and be estimated. This may not reflect the true cost of

all the impacts but assumptions regarding the estimation process can be described.
- The benefits of the project should be described and estimated and compared to the costs. The intention is to avoid making investments in projects that cannot be justified due to the cost.

5.10 Project financing
- Identification of financing sources and issues.

5.11 Analysis of risks and proposed mitigation measures

6) Conclusions

III. Contractor Qualifications

- The contracted firm must be registered and licensed, with demonstrated experience of at least five years in the hydraulic sector, especially in dams, haffirs, reservoirs and other water harvesting/storage infrastructure in rural areas of developing countries.
- Experience in remote sensing for water resource engineering an added advantage.
- Excellent oral and written communication skills in English; knowledge of Arabic is an asset.
- Good knowledge of the cultural, geographic and political context of Darfur is an asset.

IV. Evaluation criteria and passing mark

Applicants for this feasibility study will be evaluated based on technical and financial criteria. The technical part amounts to 60 points and the financial part amounts to 40 points for a total of 100.

The **TECHNICAL POINTS** will be determined as follows:

a) 15 points for educational background and experience of the study team;
b) 10 points for organizational capacity, evidenced by experience:
    a. the number of similar projects managed/completed before
    b. technical/ managerial capacity (organizational structure)
    c. financial capacity (audit reports)
    d. available equipment (own or leased)
c) 15 points for adequacy & quality of proposed methodology (15 points),
d) 10 points for understanding the TOR/assignment;
e) 5 points for work schedule and 5 points for quality of the proposal.

The **FINANCIAL PROPOSAL POINTS (FPP)** will be analyzed with the following formula.

$$(A/B) \times 40 = FPP$$

Where:
A = lowest bid among all bids received (from financial proposals)
B = bidder's financial proposal (from financial proposal)

The bidder with the highest points (the sum of Technical & Financial Points) out of 100 wins the contract. The proposals will be opened on the bid opening date and read out in the presence of the bidders at the WHH office in Khartoum. Further analysis will be done by Welthungerhilfe technical team/procurement committee.

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V. Application Guidelines

Applications should be submitted by email directly to info.sudan@welthungerhilfe.de

Or, applications can be submitted in person to:

Welthungerhilfe
Attn: Country Director
Street 25, Block 12HE, House 8
Al Amarat, Khartoum

Application should contain the following:

- Technical proposal (including work plan & methodology)
- Financial proposal (proposed budget)
- Profiles of firm/consultants (CVs)
- Letter of Interest explaining your understanding of the project
- List of previous similar projects, include (where possible) outputs such as project reports, maps, specifications, technical drawings etc. of previous works
- References (at least three)

Deadline for applications:

The deadline for applications is 4:00 P.M. on December 17, 2019.