Terms of Reference for IUCN Consultancy

Title: Environmental impact study for the Augusto Maponesse and Inchope 3 dams in Manica Province.

Objective of the Consultancy

This consultancy has the following objective(s):

General

To prepare the detailed Project and Environmental Impact Study for the construction of Agusto Maponesse and Inchope dams in Manica Province.

Specific

a) Prepare Project Management Plan.
b) Prepare technical and economic feasibility study.
c) Develop Environmental and Social Impact Study.
d) Draw up project design criteria.
e) Prepare detailed Project.
f) Prepare dam safety management Plan.

Background

Project Reference: P04620
Donor reference: DR04620

About IUCN

IUCN is a membership Union uniquely composed of both government and civil society organisations. It provides public, private and non-governmental organisations with the knowledge and tools that enable human progress, economic development and nature conservation to take place together.

Created in 1948, IUCN is now the world's largest and most diverse environmental network, harnessing the knowledge, resources and reach of more than 1,400 Member organisations and around 15,000 experts. It is a leading provider of conservation data, assessments and analysis. Its broad membership enables IUCN to fill the role of incubator and trusted repository of best practices, tools and international standards.

IUCN provides a neutral space in which diverse stakeholders including governments, NGOs, scientists, businesses, local communities, indigenous peoples organisations and others can work together to forge and implement solutions to environmental challenges and achieve sustainable development.

Working with many partners and supporters, IUCN implements a large and diverse portfolio of conservation projects worldwide. Combining the latest science with the traditional knowledge of local communities, these projects work to reverse habitat loss, restore ecosystems and improve people's well-being.

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About the Project

The Mainstreaming and Integrated Water Resources Management approach for More Resilient Basins in Mozambique [MozWateR] is a geared project towards achieving water security and safety by supporting Mozambique in developing its capacity to implement effective integrated water resources management (IWRM) in key basins in the northern and central water administration regions and improve capacity at a national level. This project is a collaborative effort where joint action on the ground will produce critical lessons from tried best practices that inform policy which strengthen business approaches, institutions, and rules around the sustainable use of land and water. MozWateR is being implemented collaboratively with the Northern Regional Water Administration (ARA-Norte), Central Regional Water Administration (ARA-Centro) and the National Directorate for Water Resources Management (DNGRH) as primary Implementing Partners (IPs) to combat several challenges in the national water sector

Description of the Assignment

The main purpose of dams is to supply water to the population, irrigate fields and generate electricity. The availability of water for irrigation will certainly contribute to economic growth and improved health conditions. Since the forests in the region where the Augusto Maponesse dam will be built are still quite dense and unspoilt, executing this project could provide an opportunity to preserve them. Agricultural planning could minimize the rate at which new fields are opened, and forests are destroyed.

Augusto Maponesse dam is in central region of Mozambique, more specifically in Manica Province, Gondola district, alongside the Mudamba River, a tributary of Messinge (sub-basin of middle lower Pungué). The coordinates are: 18 52 19.7S 33 28 54.7E.

Inchope 3 dam is also located in central region of Mozambique, more specifically in Manica Province, Gondola district, alongside Metuchira River, a tributary and sub tributary of Metuchira (sub-basin of lower Pungué). The coordinates are: 19 09 27.6S 33 54 30.00E

Description of services to be carried out by the consultant

1. **Project Management Plan**

The Project Management Plan (PMP) should contain, but not be limited to, the agreed scope of work, the project organization, the Work Breakdown Structure including the need for resources, the detailed approach and methodology, the product delivery milestones, the timetable and the budget.

The PMP should list the main contacts, describe the communication and archive plans, as well as the quality management and health, safety and environmental management systems and protocols, establish the schedule of meetings and workshops between the Consultant and the Client and also define the reporting requirements. At a minimum, monthly progress reports should be drawn up covering: the work carried out in the month, the work planned for the month and other aspects.

The Project Management Plan will be submitted to the Client for review and approval prior to implementation.

2. Technical and economic feasibility study

Technical feasibility

The dam's technical feasibility study must include, but is not limited to, the following contents:

a) Report on the basic elements obtained, namely:

i. Topographical work.

ii. Report on the surface geological reconnaissance visit.

b) Analysis of technical constraints and characterization of alternative solutions for the dam.

c) Analysis of technical constraints and characterization of alternative solutions for the dam.

d) Analysis and pre-dimensioning (geotechnical, structural and hydraulic) of the works associated with the dam, namely (dam and hydraulic operating and safety bodies).

i. Dam body.

ii. Flood spillway.

iii. Water intake/bottom discharge.

iv. Temporary diversion.

v. Other ancillary operating and safety infrastructures.

e) Hydrological studies (characterization of the river basin, average inflows, flood flows).

f) Demand studies (irrigation, urban water supply or other).

g) Studies on the exploitation of exploitation (criteria and simulation of exploitation).

h) Analysis and pre-dimensioning (geotechnical, structural and hydraulic) of the water supply, distribution and treatment works.

i) Definition and pre-dimensioning of accesses (layout, earthworks and drainage).

j) Estimating the main quantities of work (civil construction and equipment).

The study should analyse the engineering solutions under consideration, carrying out a preliminary comparative analysis of alternatives, both regarding the dam and the complementary water intake infrastructures for supply and irrigation or power generation.

3. Economic Viability

The aim of economic analysis will be to assess the economic viability of development, providing the basis for requesting concession and possible financing for its construction.

It is suggested that the economic study be carried out at constant prices and should include the calculation of the following indicators (not restrictive):

1. Internal rate of return.

2. Net present value.

3. Benefit-cost ratio.

4. Average cost of installed power (if applicable).

5. Unit cost of water supplied.

6. Gross payback period or capital recovery period.

Various discount rates should be adopted and a reasonable period of analysis considered, including the construction period, or another duly justified period.

Regarding investment, operation and maintenance costs, a sensitivity analysis should be carried out considering a decrease and increase in costs in relation to the estimate made. About revenue, decreases and increases should also be considered in relation to the base estimate.

4. Environmental and Social Impact Assessment

The consultant will develop the Environmental and Social Impact Assessment as well as the Environmental Management Plan and should include, but not be limited to:

A preliminary environmental and social assessment of the said project with the aim of identifying and evaluating the environmental and social risks and impacts during each phase of the sub-project cycle. The assessment should be proportionate to the possible risks and impacts of the project, and will evaluate, in an integrated manner, all relevant direct, indirect and cumulative environmental and social risks and impacts throughout the life cycle of the project.

Evaluate and identify the possible environmental and social risks and impacts of the project, as well as examining alternative solutions such as location and technical solutions, in order to adopt the hierarchy of mitigating negative environmental and social impacts and maximizing the positive impacts of the project.

The ESIA should be based on current information, including an accurate description and outline of the project and any associated aspects and environmental and social baseline data,

at an appropriate level of detail to inform the characterization and identification of risks and impacts and mitigation measures, relating to the project implementation area.

The ESIA will include stakeholder engagement as an integral part of the assessment.

The preparation of the ESIA/ESMP and the PAR should be based on the provisions of the relevant Mozambican legislation.

5. **Detailed Project Design Criteria Report**

Prepare a draft design criteria report that will include key data, assumptions and a complete list of standards and guidelines that will be used in the development of the Project design. The report includes, but is not limited to, the following aspects: Hydrology, Geology/Geotechnics, Materials, Sedimentation, Seismicity, Structural Design, Hydraulics and Hydromechanical Engineering.

6. **Drawing up detailed Project**

The Executive Project must be made up of easily and unequivocally interpretable elements that will enable the construction of the work and must comprise, among other things:

• General and Descriptive Memory.

• Written and drawn parts.

• Stability and structural sizing calculation reports.

• Report on topographical surveys and studies.

• Geological and geotechnical surveys and studies report.

• Laboratory test reports.

• Physical and physical-financial chronogram of the work.

• Work Execution Plan;

• List of materials and equipment.

• Technical Specification of Materials and Services for civil works;

• Technical Specification of Materials and Services for equipment and;

• Other documents providing the necessary details for the complete and proper implementation of the works, including dam instrumentation (type, characteristics, location of application, bill of quantities, manufacturer's catalogues, etc.).

The Executive Project consists of the execution of all project details necessary for the execution of works, and among others, the following major items should also be covered, but not limited to:

Access project, including geometric project, any containments, drainage, paving, vertical and horizontal signalling and lighting (if necessary);

River diversion project, including definition of its stages, construction materials, dimensions, execution methodology and equipment (if necessary);

Geotechnical projects, including the definition of construction materials, dimensions and characteristics, execution methodology, equipment and instrumentation.

Structural and foundation design, including the definition of materials, drilling studies, finishes, joints, types and classes of concrete, support devices, steel reinforcement and other devices, instrumentation plan, etc.

Urbanization projects and details (Owner's camp) covering paving and drainage.

Electrical projects that include lighting installations, electrical network extensions, substations, transformers, emergency generators, control panels, protection, command, power supply for electric motors, lighting for external and urbanized areas, among others, with a breakdown of all its components.

Landfill and soil compaction project.

Any other projects and studies required for the full and proper execution of the works.

The work relating to the Preparation of the Executive Project must be presented and delivered in Volumes and Bodies, as follows:

VOLUME 1 - GENERAL REPORT

VOLUME 2 - DAM AND COMPLEMENTARY WORKS

PART 1 - Descriptive Memorandum

PART 2 - Drawings

PART 3 - Specialized studies

Part 3.1 - Hydrological, energy and exploitation studies of the project

Part 3.2 - Geological, Geotechnical and Seismological Studies

Part 3.3 - Hydraulic Dimensioning

Part 3.4 - Sizing the Landfill Work

Part 3.5 - Structural Design of Concrete Works

Part 3.6 - Observation Plan

PART 4 - Quantity Estimates

PART 5 - Technical Specifications for Hydromechanical and Electrical Equipment

VOLUME 3 - ROAD ACCESS

PART 1 - Layout and Earthworks

PART 2 - Engineering Structures

PART 3 - Quantity Estimates

VOLUME 4 - WATER INTAKES

PART 1 - Descriptive Memo

PART 2 - Drawings

PART 3 - Technical Specifications

Before proposing any projects and/or services, it is essential that the consultant observes and is guided by the base project and other available documentation. INNOVATION IS NOT PERMITTED without the client's approval.

The Studies, Surveys, Investigations, Projects, Structural Calculations and Drawings, among others, that may be carried out must follow current and up-to-date Technical Standards, in force in Mozambique and internationally accepted.

When providing the services, the Consultant must present the Executive Project and a final report, which must provide all the relevant technical aspects of the Executive Project and include:

All data, such as field notes and observations, inspection reports, geological mapping, the results of laboratory tests, photographs, all structural, hydraulic, geotechnical and geological data and calculations

The Consultant must deliver the completed Executive Project to the Client, ready for implementation, as well as the Bill of Quantities and Prices in digital and physical format, along with all relevant technical information.

Prepare dam safety management plan

Construction Supervision and Quality Assurance Plan

The Consultant should prepare a specific Construction Supervision and Quality Assurance Plan for project, reflecting key aspects and elements related to the organization, staffing levels, procedures, equipment and qualifications to supervise the construction of project following best practice recommendations on dam safety.

Dam instrumentation plan

The consultant should prepare the instrumentation plan following the recommendations of good practice in dam safety.

Operation and Maintenance (O&M) Plan

Within the scope of this task, the consultant should, but not necessarily be limited to:
i. Specify requirements for daily, monthly, annual and periodic safety inspections (period to be recommended by the Consultant);

ii. Prepare draft operation and maintenance plan following the recommendations on good dam safety practices.
iii. Ensure the presence and institutionalization of sediment management plan, electronic flow management plan and ESMP (and other related plans).
iv. Develop and recommend staffing levels, technical expertise, tools and equipment needed for dam maintenance and operation procedures, including safety inspections, as well as necessary training.

Emergency Preparedness Plan (EPP)

The aim of EPP is to provide a predetermined plan of actions that dam operator must implement in the event of a dam safety emergency. This plan will be drawn up by consultant in close collaboration with Contractor and authorities responsible for emergency management.

As part of this task, the Consultant will identify possible emergency situations, including a possible dam failure. The Consultant will draw up a plan describing the role of the parties (stakeholders) in dealing with these possible emergencies, including situations in which dam failure is imminent.

In preparing the plan, the Consultant's activities will include preparing descriptions, atlases and associated flowcharts for the parties concerned but not necessarily limited to the following situations:

a. Abnormal behaviour of the dam.
b. Dam failure (structural failure).
c. Severe and extreme floods.
d. Controlled release of water that could endanger human lives and property downstream
e. Seismic waves.
f. Cyclones.
g. Water contamination.
h. Terrorism and sabotage.

Preparing the EPP framework will require simulations of severe/extreme flooding and dam failure scenarios with induced flood wave propagation downstream. Dam failure inundation maps should show inundation areas at sufficient scales for the identification of risk areas and include inundation tables showing the arrival time of the peak discharge, water elevation, velocity, etc. at key locations.

The emergency preparedness framework plan and associated flood maps should be drawn up in accordance with the recommendations in Appendix 4 of the WB's Good Practice Note (GPN) on dam safety.

The study to be carried out will last **11 months** and will include the activities listed in the previous chapter. The consultant responsible must ensure the necessary coordination and phasing of the intervention of his technicians and the available resources to achieve the proposed work development objectives.

Duration of the Assignment

The consultancy will have a total duration of 11 months.

Deliverables and Activities

The consultant will provide the following deliverables and carry out the following activities:

Deliverable/Activity	Description	Deadline
1. Management Plan	The Project Management Plan (PMP) should contain, but not be limited to, the agreed scope of work, the project organization, the Work Breakdown Structure including the need for resources, the detailed approach and methodology, the product delivery milestones, the timetable and the budget.	7 January - 7 February 2026
2. Technical and Economic Report	The dam's technical feasibility report must include, but is not limited to, the following contents: Report on the basic elements obtained, namely: Topographical work; Report on the surface geological reconnaissance visit	7 January - 24 March 2026
3. Environmental and social assessment report	The report must include the identification and evaluation of environmental, social risks and impacts. The assessment should be proportionate to the possible risks and impacts of project, and will evaluate, in an integrate manner, all relevant direct, indirect and cumulative environmental and social risks and impacts throughout the life cycle of the project.	24 March - 24 June 2026
4. Engineering design report	The report includes, but is not limited to, the following aspects: Hydrology, Geology/Geotechnics, Materials, Sedimentation, Seismicity, Structural Design, Hydraulics and Hydromechanical Engineering.	24 June - 24 July 2026
5. Dam safety report	The report includes the event of dam safety emergency.	24 September - 24 October 2026

Payment Schedule

The Timetable below summarizes the chronological order of deliverables and indicates milestones at which IUCN will pay the Consultant.

Deliverable	Payment
1. Management Plan	10%
2. Technical and Economic Report	15%
3. Environmental and social assessment report	20%
4. Engineering design report	40%
5. Dam safety report	15%

Skills and Experience

The Consultant responsible for carrying out the services must have technical capacity and proven experience to deal with issues related to water resources, hydraulic works, the environment, socio-economics and all the disciplines and subjects important to the development of the work, with a minimum of 15 years in the exercise of consultancy services and involvement in at least 3 dam construction and/or rehabilitation projects. Specifically, the consultant team should:

- Understand water resources in Mozambique.
- Have been involved in hydraulic works studies and projects.
- Have experience in preparing studies and projects for dams and multi-purpose hydroelectric schemes.
- Have experience in drawing up environmental and social management plans.

11.2 Requirements for the consultant's technical team

The consultant must provide key personnel with adequate qualifications and experience to carry out the work described herein effectively and efficiently and must have qualifications and/or experience as described in these Terms of Reference:

Non-key personnel should be mentioned in the technical proposal as non-key experts (CVs are not required), with a brief biography of each. Their involvement must be clearly indicated in the technical proposal forms.

i. Team Leader

Qualifications: Post graduate qualification in hydrologist and geo-engineer
Experience: 15 years' experience in leading multidisciplinary teams to carry out feasibility studies, detailed designs, preparation of tender documents, supervision and contract management for dam projects, being involved in design, construction/rehabilitation, of at least 5 dams.
Have had, in the last ten (10) years, specific experience in managing consulting teams working on feasibility studies and detailed engineering design on at least three dam projects of similar size and complexity or greater.
Proven experience of managing multi-disciplinary teams and the ability to operate in multi-sector, multi-cultural and multi-skilled teams and demonstrate flexibility in working style.
Demonstrate an understanding of internationally accepted dam safety guidelines, such as those of the International Commission on Large Dams (ICOLD) and be registered with international dam safety organizations.
Be familiar with Mozambican legislation on water resources, the environment and dam safety will be an advantage.

ii. Geotechnical

Qualifications: Post graduate qualification in civil/geotechnical engineering

Skills: 10 years' experience in geotechnics, carrying out feasibility studies, preliminary and detailed studies and tendering for dam projects.
Be involved in the construction/rehabilitation of dams (at least 3 dams).
Be familiar with internationally accepted dam safety guidelines, such as the International Commission on Large Dams (ICOLD) and be registered with international dam safety organizations.
Be familiar with Mozambican legislation on water resources, the environment and dam safety will be an advantage.

iii. Hydrologist/Hydrologist

Qualifications: Post graduate qualification in engineering/Hydrology, /Water Resource
Skills: The hydrologist must have experience in carrying out feasibility, preliminary design or detailed design studies for dam and hydropower projects, including hydrological and hydraulic design and modelling, dam break analysis and reservoir sedimentation, with at least 10 years' experience in the areas mentioned, and must have been involved in at least three similar projects.
Be involved in hydrological studies of dam-related projects (at least 3 projects).
Be familiar with internationally accepted dam safety guidelines, such as the International Commission on Large Dams (ICOLD) and be registered with international dam safety organizations.
Be familiar with Mozambican legislation on water resources, the environment and dam safety will be an advantage.

iv. Structural Engineer

Qualifications: Post graduate qualification in civil engineering
Skills: Have 10 years' proven experience in carrying out feasibility studies, preliminary studies, detailed studies and tenders for dam projects.
Have had personal responsibility for the design of at least four (03) dams or dam rehabilitation projects of comparable size or larger.
Be familiar with Mozambican dam safety regulations and internationally accepted dam safety guidelines, such as the International Commission on Large Dams (ICOLD).

v. Environmental Specialist

Qualifications: Post graduate qualification in environmental engineering, environmental management, or related field.
Skills: Have 10 years' experience in developing inclusive consultative processes and engaging with different stakeholders, including community beneficiaries and women.
Experience in carrying out feasibility studies, preliminary studies, detailed studies of dams.
Experience in drawing up environmental and social management plans for infrastructure projects (at least 03 projects).
Knowledge of national legislation and relevant experience in other countries in the region with similar socio-economic and environmental characteristics.

vi. Hydromechanical Specialist

Qualifications: Post graduate qualification in Mechanical Engineering, Hydromechanics or Electromechanical Engineering.
Skills: Have 10 years' proven experience in carrying out preliminary and detailed studies for dam projects of similar or greater complexity.
Have personal responsibility for the design of at least three (03) dam construction/rehabilitation projects or the supervision of works of comparable or greater complexity, in the hydromechanical, electromechanical and/or hydroelectric specialties.
Be familiar with internationally accepted dam safety guidelines, such as the International Commission on Large Dams (ICOLD) and be registered with international dam safety organizations.
Be familiar with Mozambican legislation on water resources, the environment and dam safety will be an advantage.

vii. Social Specialist

Qualifications: Post graduate qualification in sociology, social sciences or related field.
Skills:10 years of cumulative experience related specifically to social issues.
Participation in a minimum of 3 similar projects in the preparation of ESIA and RAP, preferably for Water Resources projects.
Have in-depth knowledge of social safeguards policies and guidelines, in particular resettlement safeguards policies and guidelines, especially the Involuntary Resettlement Policy and the social provisions of other safeguard policies.
Experience in developing inclusive consultative processes and engagement between different stakeholders, including community beneficiaries.

viii. Dam Specialist

Qualifications: Post graduate qualification in the engineering field, preferably in civil engineering.
Skills: Must have experience in carrying out feasibility studies, preliminary design or detailed design of dams, including the dam monitoring system, with at least 10 years' experience in the areas mentioned, and must have been involved in at least three major dam projects.
Be familiar with internationally accepted dam safety guidelines, such as the International Commission on Large Dams (ICOLD) and be registered with international dam safety organizations.
Be familiar with Mozambican legislation on water resources, the environment and dam safety will be an advantage.

ix. Hydraulic Specialist

Qualifications: Post graduate qualification engineering/hydraulics/water resources.
Skills: 10 years' experience in carrying out preliminary and detailed studies of dam projects of similar or greater complexity.
Experience in analysing dam failure and reservoir sedimentation.

Be involved in the hydraulic design of projects related to the construction/rehabilitation or supervision of dam works (at least 03 projects); specifically with the hydraulic design aspects of the spillway, outlet works and the dissipation basin, to determine the impact of the sediment load.
Be familiar with internationally accepted dam safety guidelines, such as the International Commission on Large Dams (ICOLD) and be registered with international dam safety organizations.
Be familiar with Mozambican legislation on water resources, the environment and dam safety will be an advantage.

x. Economics Specialist

Qualifications: Post graduate qualification in economics and finance.
Skills: 10 years' experience and knowledge of water resources management would be an advantage.
Experience in economic and financial analysis and prioritization of water projects.
Working experience in financial and economic modelling of water projects, especially water resources.
Experience in leveraging private sector commercial loans is desirable.
Proven work experience in Africa, especially southern Africa, will be an advantage.

DOCUMENTS TO BE CONSULTED

The following documents are relevant to the consultancy and should be compiled by the consultant:

1. Mozambique Dam Safety Regulations
2. Mozambique's Dam Safety Standards
3. Environmental and social impact studies
4. Masterplan

WORKING LANGUAGE

English will be the language used in all contacts with the client and the other entities involved, as well as for the presentation of documents.

Supervision and coordination

The consultant will report to and work under the supervision of Direçao Nacional de Gestao de Recursos Hídricos (DNGRH) and IUCN technical lead.