

Ministry of Water and Energy

Ethiopia Flood Management Project (P-176327)

Terms of Reference

Consultancy Service for Basin level study for strategic study basins to identify and prioritize physical flood risk reduction investments, feasibility study, and detailed design for prioritized Future investments (2 basins-Genalle-Dawa and Wabishebele).

February, 2026

Preamble

The Ministry of Water and Energy (MoWE), through the Ethiopia Flood Management Project (EFMP) Management Unit, has prepared Terms of Reference (ToR) to engage a qualified consultancy firm for the strategic identification, prioritization, feasibility study, and detailed design of flood risk reduction investments in the Wabi-Shebele and Genale-Dawa River Basins.

This ToR consolidates two originally independent ToRs—one for each basin—while maintaining their distinct objectives, scopes of work, tasks, and deliverables. The purpose of this consolidation is to:

- Optimize procurement efficiency by selecting a single consultancy firm for basins, reducing administrative redundancy and costs.
- Ensure harmonized deliverables, including methodologies, data, hydrological models, flood risk maps, and engineering designs, while maintaining basin-specific technical rigor.
- Enhance institutional capacity through unified knowledge transfer and training for MoWE staff.
- Streamline contract management during implementation by consolidating oversight under a single engagement.

By merging these ToRs, the MoWE aims to adopt a coordinated, cost-effective, and technically robust approach to flood risk management, aligning with Ethiopia's broader goals for climate resilience and sustainable water resource development.

Structure of the ToR

Implementation Approach

- The consultancy firm must ensure consistency between deliverables of two basins for each and every task.
- The consultancy firm must propose appropriate team composition and implementation arrangement to deliver deliverables for two basins within the proposed timeline. If **dedicated teams** with the requisite expertise to execute tasks concurrently for each basin will be deployed, coordination and supervision arrangements should be considered and stated clearly.
- **Separate progress reports** and deliverables will be required for each basin, ensuring clarity and accountability.
- **The assignments are designed for parallel execution within the overall timeframe, optimizing resource utilization.**

This framework ensures a **systematic, transparent, and results-driven process** for mitigating flood risks in Ethiopia's southeastern river basins.

Selection Method and Contract Type

Selection Method

The selection of the Consultant shall be conducted in accordance with the **World Bank Procurement Regulations for IPF Borrowers**, using the **Quality- and Cost-Based Selection (QCBS)** method.

Contract Type

The consultancy services shall be procured under a **Lump-Sum Contract**. The Lump-Sum Contract shall cover all professional services, personnel costs, travel, equipment, data collection, modeling, reporting, and any other inputs required to complete the assignment and deliver the agreed outputs in accordance with this ToR.

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Figure 2. Location Map of Genale Dawa Basin. _____ **Error!**

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1. Context

The Government of Ethiopia (GoE) has an existing pipeline of prospective flood risk reduction projects. Under a previous consultancy assignment, the Wabi-Shebele River Basin in southeastern Ethiopia has been identified as being prone to recurrent flooding, particularly during the July to September rainy season. These floods are primarily caused by heavy rainfall in the highland areas of Oromia, including the Bale and Hararghe zones, which lead to significant water flow into the Wabi-Shebele River.

Flooding in the Wabi-Shebele Basin poses substantial risks to agriculture, infrastructure, and local communities. The floods can damage crops, disrupt livelihoods, and threaten food security in the region.

To address these challenges, several studies have been conducted to understand and manage flood risks in the Wabi-Shebele River Basin. One such initiative is the **Ethiopian Flood Management Project (2023–2028)**, supported by the World Bank. This project includes strategic studies in the Wabi-Shebele Basin and aims to enhance flood resilience through improved risk management and infrastructure development.

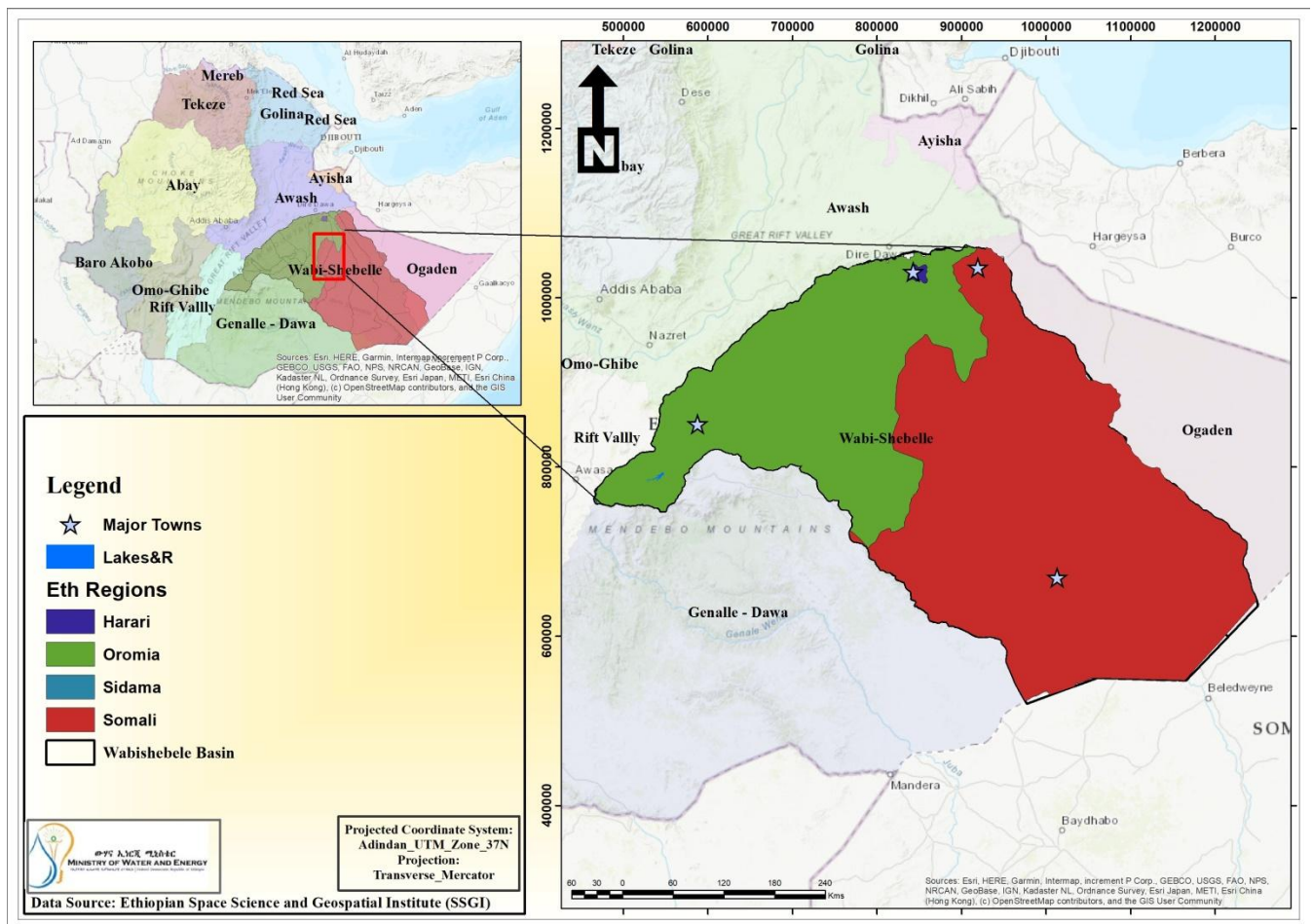


Figure 1. Location Map of Wabi-Shebele Basin.

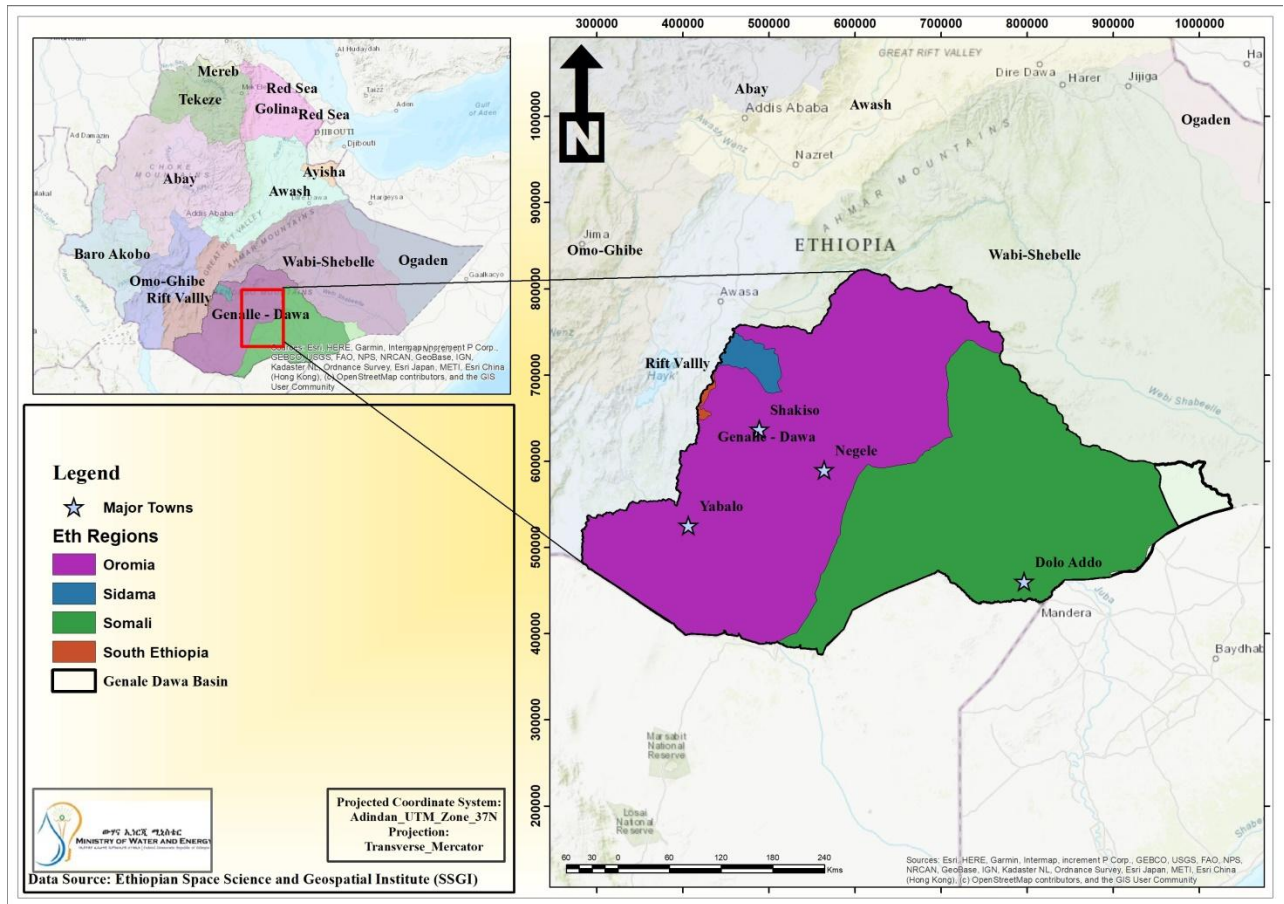


Figure 2. Location Map of Genale Dawa Basin.

1.1.Introduction of the Project Area

The **Genale–Dawa and Wabi-Shebele River Basins** are among Ethiopia’s most flood-prone and ecologically significant areas. The Genale–Dawa Basin, located in southeastern Ethiopia, spans parts of the Oromia, Somali, and Southern Ethiopia Regional States (SERS), supporting millions of people through agriculture, pastoralism, and water-based development. While less intensively developed than the Awash Basin, it has considerable potential for irrigation, hydropower, and water supply. However, recurrent seasonal flooding, particularly during the July to September rainy season, threatens livelihoods, agricultural production, and infrastructure. Heavy rainfall in upstream highlands—such as Bale, Guji, and Hararghe zones—significantly increases runoff into the Genale and Dawa rivers, causing widespread economic and social impacts. Flooding is intensifying due to land-use changes, river morphology alterations, catchment degradation, and climate variability.

The **Wabi-Shebele Basin** similarly experiences significant flood risks, affecting communities, farmlands, and infrastructure along its main course and tributaries. These recurring floods highlight the urgent need for comprehensive flood risk management and mitigation measures to reduce economic losses, protect lives, and support ongoing development initiatives, including irrigation expansion, hydropower, and rural water supply.

In response, the Ethiopian Government, through the Ministry of Water and Energy (MoWE) and the Basin Development Office (BDO), has initiated programs under the **Ethiopian Flood Management Project** to enhance flood resilience in these basins. These efforts focus on improved flood risk assessment, infrastructure development, and sustainable catchment management. The scope of services in this consultancy focuses specifically on targeted flood risk reduction interventions, identified and prioritized based on existing studies and basin assessments, ensuring effective, evidence-based planning and implementation.

1.2.Rationale of the Study

The rationale of the project is to promote sustainable climate resilient, socio-economic development while enhancing protection against flood hazards in the Wabi-Shebele and Genale Dawa Basins. The primary objective of the consultancy is to conduct a feasibility study and prepare the detailed design for flood risk reduction and associated infrastructure in these basins, with the aim of safeguarding lives, community assets, and the business sector that rely on the rivers.

1.3.Purpose

The purpose of this Terms of Reference (ToR) is to invite qualified consultancy firms to submit technical and financial proposals for the Feasibility Study and Detailed Design of flood protection and control projects for the **Wabi-Shebele and Genale Dawa rivers**. The geographic scope of the work encompasses

the main courses of both rivers, from upstream sources to downstream confluence points, including major tributaries within the specified reach lengths. The study shall adopt a basin-wide and systems-based perspective to ensure hydrological, hydraulic, environmental, social, and institutional interdependencies are adequately addressed.

The study aims to refine existing hydrological and hydraulic analyses to inform optimized and technically sound scheme designs that reduce flood risks, minimize economic and life hazards, and enhance socio-economic and environmental benefits, including irrigation, wetland preservation, and broader catchment management. The scope includes advancing feasibility concepts to a higher level of detail, assessing flood risk elements, and preparing engineering designs of physical hydraulic infrastructure that ensure effective flood mitigation while maximizing co-benefits.

In addition to delivering a technically robust design basis, the consultancy provides an opportunity for **capacity building**. The Ministry of Water and Energy (MoWE) and Basin Development Office (BDO) staff will collaborate with the Consultant, applying best-practice approaches in data preparation, hydrological and hydraulic modeling, calibration, and sensitivity analysis. Hands-on training will be provided throughout the assignment, culminating in a workshop to consolidate knowledge and transfer practical skills to Ethiopian water engineers, supporting future flood risk reduction projects.

This ToR provides guidance on the scope of services, expected deliverables, quality standards in line with World Bank requirements, and the duration of the consultancy period.

2. Objectives of the Feasibility Study for Selected Investments in the Wabi-Shebele & Genale Daw

2.1. Main Objective

The main objective of the feasibility study up to Detail design for selected investments in the Wabi-Shebele Basin & Genale Dawa Basin is to evaluate the viability and effectiveness of proposed flood risk reduction interventions, ensuring that they are technically feasible, economically justified, environmentally sustainable, and socially beneficial for the affected communities.

2.2. Specific Objectives

- I. Review and validate existing studies and data** and establish a consistent technical baseline for both basins.
- II. Conduct data audits community consultation and targeted field surveys** to address data gaps and ensure suitability for hydrological, hydraulic, and engineering analyses.
- III. Update hydrological and hydraulic analyses**, including the integration of climate change considerations, flood frequency analysis, overlay flood maps with socio-economic vulnerability

- indices and the preparation of baseline 2D flood inundation maps. The Consultant shall demonstrate the capability to conduct robust 2D hydraulic modeling in data-scarce environments and apply appropriate methods to address data limitations
- IV. **Identify flood risk hotspots and priority intervention sites, environmentally sensitive zones** based on flood risk and socio-economic considerations.
 - V. **Develop, assess, and compare alternative flood risk reduction options**, including structural, nature-based, and hybrid solutions, and recommend preferred options using transparent criteria.
 - VI. **Apply the Strategic Flood Risk Reduction Investment Framework** to update feasibility, economic viability, and environmental and social requirements, stakeholder engagement plan, grievance redress mechanism and gender & inclusion strategy.
 - VII. **Prepare detailed, implementable designs** for selected interventions, including drawings, specifications, and cost estimates.
 - VIII. **Strengthen institutional capacity** through targeted training and knowledge transfer in integrated flood risk management, environmental and social risk mitigation measures, construction phase management plans, occupational plans and community safety measures.
 - IX. **Deliver consolidated, auditable basin-level reports and datasets**, including a final consolidated report.
 - X. Develop **operation and maintenance (O&M) and asset management plans** for flood risk reduction infrastructure, including dykes, retention ponds, and wetlands, covering inspection regimes, performance monitoring protocols, and budget requirements.
 - XI. Prepare **emergency preparedness and response planning**, including flood warning trigger thresholds, community response plans, and evacuation routes, explicitly linked to flood hazard and risk maps.
 - XII. Conduct **permitting, land acquisition, and resettlement due diligence**, including screening and documentation consistent with national legislation and the World Bank Environmental and Social Framework (ESF).
 - XIII. Integrate **accessibility and inclusive design principles**, considering pastoralist mobility patterns, persons with disabilities, and vulnerable groups in the design of crossings, access routes, and flood protection infrastructure.
 - XIV. Design a **Grievance Redress Mechanism (GRM)** and a **Stakeholder Engagement Plan (SEP)** with explicit gender and social inclusion considerations.

3. Scope of Work

The consulting firm shall conduct the Feasibility Study and prepare the Detailed Design for Flood Risk Reduction and associated infrastructure in the Wabisheble and Genale Dawa Basins, in accordance with nationally and internationally recognized standards, as well as those accepted by the World Bank. All tasks shall explicitly incorporate environmental and social considerations, including assessment of ecological impacts, community livelihoods, resettlement, and gender and social inclusion issues.

Trans boundary Considerations

The Wabi–Shebelle and Genale–Dawa river basins are trans boundary systems flowing toward Somalia. The Consultant shall explicitly assess and identify any potential cross-border hydrological, hydraulic, environmental, social, and economic implications of the proposed flood risk reduction interventions. The Consultant shall engage relevant stakeholders, including Somali State, and, where necessary, coordinate through the Ministry of Water and Energy with the Ministry of Foreign Affairs, Somalia counterparts, and other relevant federal institutions. Any identified transboundary risks, opportunities, and coordination requirements shall be clearly documented in the feasibility study and detailed design reports.

Task 1: Inception

At inception the following streams of work shall be mobilized:

- a) Stakeholder engagement mapping, social assessment and security planning: Working with the client, a stakeholder map and plan will be developed outlining goals for the engagement and a schedule, including proposed methods. Security concerns must be scoped and addressed in a risk assessment.
- b) Thorough technical review of all existing feasibility, modeling, data and detailed design reports including review of prior environmental and social assessments for work carried out to date
- c) A high level screening and assessment of available data and refinement of approach: all the main analytical and modeling methods required for studies, the associated data needs and options, and the impact that each will have on accuracy and robustness. To facilitate this, the government of Ethiopia will facilitate a technical workshop between the consultant and relevant technical staff from the government to allow the consultant to familiarize themselves with the data, available models and key staff.
- d) Preparation of a detailed methodology and program for all of following tasks, ensuring integration of social and environmental safeguards.
- e) Development of a refined integration and training plan including, workshop and training components, to be implemented through the project in order for the government of Ethiopia (see Task 3 & 8 for further details).
- f) **Security and Stakeholder Engagement Planning:** The Consultant shall prepare two key plans as part of the inception phase:
 - i. **Project-Specific Security Plan:** All field activities shall be conducted in full compliance with the Ethiopia Flood Management Project Security Management Plan and in accordance with applicable Government of Ethiopia and UN security guidance for field operations. Prior to any field deployment, the Consultant shall coordinate with the Client and relevant stakeholders to assess security risks and confirm necessary security arrangements. The Consultant shall prepare a Project-specific Security Plan for fieldwork and proposed interventions, aligned with the Project

Security Management Framework and national requirements, and submit it for Client review and approval.

- ii. **Stakeholder Engagement Plan (SEP):** The Consultant shall prepare a Stakeholder Engagement Plan (SEP), consistent with the Environmental and Social Framework (ESF) good practice. Developed in consultation with the Ministry and key stakeholders, the SEP shall outline stakeholder identification, consultation methods, disclosure mechanisms, and grievance redress procedures.
- g) **GESI Integration: All work must integrate gender equality and social inclusion. Surveys must use sex-disaggregated data and assess the specific needs of vulnerable groups (women, pastoralists, disabled, etc.).**
- h) **Tailored Engagement: Develop specific strategies to engage pastoralists and other vulnerable groups in consultations.**
- i) **Grievance Mechanism (GRM): Design a project GRM that is accessible, confidential, and culturally appropriate, with special procedures for sensitive complaints (GBV/SEA).**
- j) **Risk Register: Establish and maintain a project risk register, identifying and planning mitigation for all technical, social, environmental, and security risks.**

Task 1 Inception Report deliverables:

The Consultant shall prepare an Inception Report presenting the detailed methodology for carrying out the assignment in the two basins, including the proposed team organization, a comprehensive work plan, and the organizational structure of the Consultant's team.

1. The Draft Inception Report shall include the following key components:
2. A stakeholder engagement map, identification of environmental and social data gaps, consultation plans, and a preliminary social and environmental risk assessment and an overview of available data, identifying critical gaps and proposing strategies for data improvement.
3. A detailed review of existing models, assessing their suitability for upcoming tasks, along with a proposed methodology. This should also include recommendations for any changes or additions to the modeling software to be used.
4. A plan outlining consultation activities, as well as risk management, data management, and program implementation strategies.
5. A plan outlining consultation activities, as well as risk management, data management, and program implementation strategies. This shall include the **Project-Specific Security Plan** and Stakeholder **Engagement Plan (SEP)**.
6. A revised summary of the integration and training plan, including specific action points.

7. Gender, Social Inclusion & Risk Management Framework

The Consultant will develop an integrated framework to ensure equitable, inclusive, and resilient project delivery.

- **GESI Integration:** Mandate sex-disaggregated data and beneficiary assessments to capture the needs of women, pastoralists, persons with disabilities, the elderly, and marginalized groups.
- **Tailored Engagement:** Use GESI analysis to adapt the Stakeholder Engagement Plan (SEP), guaranteeing meaningful participation of vulnerable groups.
- **Grievance Mechanism (GRM):** Propose an accessible, confidential GRM with specialized, survivor-centered procedures for handling Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA) complaints.
- **Risk Register:** Maintain a living document to identify, assess, and mitigate technical, environmental, social (including GBV/SEA), security, financial, and institutional risks, updating it at every project milestone.

The Inception Report, including a detailed work plan, must be submitted within fifteen (30) days from the commencement of the assignment. The work plan should outline the schedule of all planned tasks and provide a detailed description of the Consultant team's intended visits to each intervention areas.

Task 2: Data audit, analysis and survey

This task addresses any requirements for further data collection to facilitate the completion of the hydrological and hydraulic modeling required in subsequent tasks. Specifically, the requirements are to:

- a) Evaluate and test the validity of input data utilized and assess need for data collection and field surveys, with regard to observational data sets
- b) Identify sensitive ecosystems, wetlands, and protected areas, survey Socio-economic of communities potentially affected by flood interventions and assessment access, cultural sites, and livelihood dependencies within project areas.
- c) Assess the completeness of terrain data sets used and/or available to the detailed studies and develop and execute a topographic field survey program that will deliver terrain data that can be utilized for detailed flood risk ,flood intervention projects and dyke alignment optimization studies
- d) Collect and collate information of the storage and operation of all relevant existing and proposed reservoirs that may relate to the design of the river protection or future operational and irrigation considerations of the river protection infrastructure
- e) Evaluate any areas of data analysis that need to be revisited, and carry out the necessary reanalysis
- f) Develop draft scope for technical implementation of required field surveys,
- g) Conduct agreed additional surveys,
- h) Review and quality assurance of deliverables of field surveys

- i) Conduct detailed QA/QC, gap-filling, and bias correction of hydrometeorological (hydromet) data, and document station metadata for subsequent hydrological and hydraulic analyses.
- j) Collect and validate land use and soil data using the latest Copernicus/ESA or national datasets, supplemented with ground truthing to ensure accuracy for hydrological modeling and flood risk assessment.
- k) Data Scarcity Protocol

The Consultant shall include a dedicated section titled “**Dealing with Data Scarcity**” in all relevant reports, describing:

- Assumptions used to compensate for missing or unreliable data
- Regionalization and data transfer techniques applied
- Use of proxy datasets (remote sensing, regional studies, global datasets)
- Uncertainty and sensitivity analyses undertaken
- Implications of data limitations on modeling results and design decisions

l) Data Sharing and Cataloguing

- Ensure proper data sharing arrangements with Ministry-held datasets, including establishing formal data sharing agreements with the Ministry/BDO, the Consultant, and NMA.
- The Consultant shall prepare a data catalog and completeness report documenting all datasets acquired their sources, metadata, and any gaps or limitations.
- The report shall also indicate the status of agreements, data accessibility, and any conditions or restrictions for use, ensuring compliance with MoWE and institutional protocols

The subtasks are to be executed with the active involvement of key technical staff from MoWE and other relevant stakeholders, while the Consultant will conduct the work and deliver independent reports for the two basins. This will be accomplished through a combination of direct engagement, on-the-job training, and workshops. As noted earlier, the Consultant is also expected to refine the proposed training and integration plan, originally scheduled for implementation under Task 7, during the inception phase.

Task 2 deliverables:

The Consultant shall submit a Data Audit and Gap Assessment Report; Field Survey Program and Survey Implementation Report; validated topographic and terrain datasets including maps, DEM/DTM, cross-sections, profiles, benchmarks, and raw survey data; Hydrometeorological Data QA/QC and Metadata Report; validated land use and soil datasets with ground-truthing results; compilation of reservoir storage

and operation data; and a Data Catalog and Completeness Report documenting all datasets, metadata, gaps, and data-sharing arrangements with MoWE/BDO and NMA. All reports shall include a dedicated **Data Scarcity Protocol** section describing assumptions, regionalization methods, proxy data use, and uncertainty analysis to address data limitations.

Task 3: Hydrological and hydraulic analysis, setting target flood events/sites, and base map production

This task aims to reassess the existing hydrological and flood risk analyses for the project area with the full engagement of the Ministry of Water and Energy (MoWE). The need arises because previous reports lack sufficient detail on data, assumptions, and methodologies to allow replication of results. The reassessment will also inform the scoping and implementation of the subsequent capacity-building and training activity (Task 8).

The analysis already conducted shall serve as a baseline, but additional work is required as detailed below.

The Consultant shall carry out the following activities:

1. Design Rainfall Methodology

- a. Provide a detailed description and justification of the methodology used for design rainfall depths.
- b. Ensure consistency in deriving Depth-Duration-Frequency (DDF) or Intensity-Duration-Frequency (IDF) curves across all sub-basins.
- c. Explicitly acknowledge uncertainties and limitations.

2. Critical Storm Duration Analysis

Conduct sensitivity analysis to determine critical storm durations for each catchment. For dam-influenced catchments, account for lag time changes due to reservoirs.

3. Rainfall-Runoff Model Development

- a. Provide detailed documentation of rainfall-runoff model development for design flood estimation and dam feasibility studies.
- b. Specify methods used (e.g., HEC-HMS) and ensure modeling is event-based rather than continuous simulation.

4. Flood Frequency Analysis

- a. Justify selection of statistical distributions using goodness-of-fit measures.
- b. Consider hydrochronology to extend systematic records.
- c. Reconcile statistical estimates with design floods derived from rainfall-runoff modeling at key locations.

5. Climate Change Effects

- a) Assess the impacts of climate change on rainfall, runoff, and flood magnitudes.
- b) Use appropriate climate projections and scenarios (e.g., CMIP6, SSP2-4.5 and SSP5-8.5) for mid-century and end-century horizons.
- c) Document implications for design floods, flood frequency, and flood risk management decisions.
- d) Assess the potential impacts of proposed flood risk reduction interventions on ecosystems, wetlands, and water quality; evaluate how flood events and proposed interventions affect vulnerable communities, agricultural land, and critical infrastructure; and incorporate climate change scenarios that consider ecological sustainability and social resilience.

6. Flow Validation for Ungauged Catchments

Apply consistent approaches using donor basins or empirical methods to validate flows.

7. Volume-Driven Flooding

Consider flooding mechanisms influenced by storage and floodplain characteristics in downstream catchments.

8. Extended Hydrological Modeling

Include additional upstream and downstream areas (wetlands, reservoirs, dam operations) where relevant to improve model representation.

9. Probable Maximum Precipitation (PMP) Analysis

a. Go beyond the Hershfield method by applying comprehensive PMP derivation approaches, either integrated with design rainfall or independently following international best practice.

10. Joint Hydrologic-Hydraulic Modeling

- a. Conduct calibration/validation using hydraulic models (2D or coupled approaches).
- b. Revise flow estimates where necessary after trial applications.

11. Flood Mapping

Develop baseline 2-dimensional flood maps for selected return periods (e.g., 2-, 5-, 10-, 20-, 50-, 100-, 200-, 500-year), and PMP for safety checks.

12. Target Flood Event Setting

- a. Define target design floods (return periods) balancing urban and rural priorities and ensuring upstream-downstream consistency.
- b. Consult MoWE and World Bank (WB) in the process.

13. Sub-project Site Identification

Identify and confirm target sites for flood risk reduction interventions based on risk assessment and socio-economic conditions, referencing previous studies where relevant.

14. Reporting and Documentation

- a. Prepare a comprehensive report documenting methods, calculations, and decisions.
- b. Ensure all work is auditable, with versioned model scripts, parameter sets, and schematics.

Modeling Standards and Requirements

- **Tools:** Use open or widely supported modeling tools (HEC-HMS, HEC-RAS 2D, MIKE, TUFLOW). Preference for software without restrictive licensing.
- **Calibration & Validation:**
 - Apply quantitative performance metrics: Nash–Sutcliffe Efficiency (NSE), Root Mean Square Error (RMSE), bias.
 - Include uncertainty bands and split-sample validation.
- **Climate Scenarios:**
 - Align with CMIP6 projections.
 - Consider at least two scenarios (SSP2-4.5 and SSP5-8.5) for mid- and end-century.
 - Adjust design allowances based on scenario outcomes.
- **Joint Probability:** Define methodology for pluvial/fluviial joint events (e.g., copulas or scenario analysis) and document assumptions.
- **Return Periods:** Typical design floods include 2-, 5-, 10-, 20-, 50-, 100-, 200-, and 500-year; PMP may be applied for robustness/safety checks. Clarify rationale for extreme return periods
- **Auditable Model Repositories:** Require fully **versioned scripts, parameter sets, and model schematics** to ensure full reproducibility, traceability, and independent verification.

The updated hydrological analysis should be linked to a reassessment of the area protected by the proposed project using a suitable hydraulic model and the standard of protection afforded carried forward to update the assessed benefits.

Task 3 deliverables:

The Consultant shall update the hydrological and hydraulic analyses for the Wabisheble and Genale Dawa basins. This shall include comprehensive documentation of methodologies for design rainfall estimation, rainfall–runoff modeling, flood frequency analysis, and validation approaches for ungauged catchments. The analysis shall incorporate sensitivity assessments, the effects of dams and reservoirs, climate change impacts, volume-driven flooding mechanisms, and Probable Maximum Precipitation (PMP) estimation, in accordance with internationally recognized best practices.

The Consultant shall produce baseline two-dimensional (2D) flood maps for return periods ranging from 2-year to 500-year events, define target flood events in consultation with the Ministry of Water and Energy (MoWE) and the World Bank, and identify priority sites for flood risk reduction interventions.

The Consultant shall also produce baseline flood maps with overlays of social and environmental sensitivity zones, including settlements, wetlands, critical habitats, and other environmentally or socially vulnerable areas. Documentation shall be provided on the environmental and social implications associated with baseline and design flood scenarios.

All analyses and outputs shall be fully documented in a comprehensive and auditable report, clearly linking updated hydrological analyses to hydraulic modeling results. The documentation shall include a reassessment of the standard of protection and projected benefits for each basin and shall be accompanied by a complete and auditable model repository, including version-controlled scripts, parameter sets, model configurations, and schematics, sufficient to allow independent review, verification, and replication.

Task 4: Identify multiple options and select recommended option

The consultant shall evaluate multiple design options for each selected flood intervention area and recommend a preferred option for detailed design and cost estimation. This process aims to optimize project costs, ensure good-practice design principles, and incorporate both structural and nature-based solutions for sustainable flood risk management.

➤ Options Development

- Identify a minimum of three alternative options for each flood intervention area.
- For each option, provide a clear concept that includes:
 - Infrastructure type, layout, and alignment
 - Size and dimensional parameters (e.g., dyke height, reservoir/pond area and volume)
 - Beneficiaries and affected land
 - Integration of multi-purpose and co-benefit infrastructure (e.g., wetlands, retention ponds, dykes, bridges, roads, irrigation/intake facilities, community ponds)
 - Energy efficiency considerations and long-term functionality
 - Preliminary cost estimates, including investment and operation & maintenance (O&M)

The options assessment must integrate environmental and social impact criteria. The consultant shall use the criteria;

- ✓ to evaluate ecological impacts of dykes retention ponds, and wetlands
- ✓ to identify options minimizing displacement and negative impacts on communities
- ✓ to include opportunities for nature-based solutions that enhance biodiversity and livelihoods
- ✓ to analyze gender and social inclusion implications, such as equitable access to flood protection benefits

➤ Multi-Criteria Assessment (MCA)

- Develop a transparent MCA framework to assess options based on:
 - Safety and flood risk reduction
 - Multi-sectorial co-benefits (ecological, social, livelihood)
 - Cost-effectiveness (construction, O&M, whole-life cost)
 - Environmental and social impacts (including land acquisition, resettlement screening, number of people potentially relocated)
 - Climate resilience and robustness under extreme flows and heat
 - Nature-Based Solution (NBS) benefits, quantified through evidence-based performance (e.g., storage capacity, attenuation times)
 - Residual risk and design exceedance considerations
- Document the weighting process for each criterion via the first stakeholder workshop and disclose sensitivity tests.
- Integration of Climate and Morphological Considerations
 - Evaluate each option under alternative climate scenarios, including extreme rainfall and heat impacts on infrastructure materials.
 - Assess morphological changes in rivers and floodplains, flagging potential issues for detailed design and cost implications.
- Sustainable Materials and Practices
 - Consider opportunities for locally sourced, sustainable construction materials and methods.
 - Provide preliminary whole-life cost assessments, including construction, maintenance, and replacement.
- Stakeholder Engagement
 - Facilitate two workshops:
 - 1) **Criteria Workshop:** to define assessment criteria, identify key constraints, and integrate stakeholder priorities.
 - 2) **Co-Design Workshop:** to present proposed design concepts, collect feedback, and refine options.
 - Incorporate workshop outcomes into the MCA and design recommendations.
- Land Acquisition and Resettlement Issues
 - Estimate land acquisition footprints at the concept stage.
 - Identify avoidance, minimization, and mitigation measures for resettlement impacts.
- Validation of Data and Assumptions
 - Review and validate previous studies, investigations, and tests to ensure reliability of design assumptions and cost estimates.

Task 4 deliverables:

1. Identification of a minimum of three options for each site specific intervention areas, including a clear concept for each, a multi-criteria comparison, and a rationale for the recommended option.
2. Facilitation of two workshops: the first to develop assessment criteria and identify key constraints and concerns; the second to present proposed design concepts during a co-design session and collect stakeholder feedback. The client will cover the cost of organizing the workshops, while the consultant is expected to cover its own expenses
3. Development of a final design concept for the recommended option.
4. Multi-criteria comparison table incorporating environmental, social, and economic considerations
5. Stakeholder workshop to validate social and environmental dimensions of preferred options

Options Analysis Report

- Minimum of three alternative options per intervention area, with clear conceptual designs.
- Multi-criteria comparison table with documented weighting and sensitivity analysis.
- Rationale for the recommended option, highlighting risk reduction, co-benefits, cost optimization, and sustainability.

Stakeholder Workshops

- Workshop 1: Criteria definition and constraints identification
- Workshop 2: Presentation of design concepts and collection of stakeholder feedback
- Note: Workshop organization costs are borne by the client; the consultant covers its own participation expenses.

Final Recommended Design Concept

- Consolidated design concept for the selected option, incorporating multi-functionality, NBS integration, climate adaptation, social and environmental safeguards, and preliminary cost estimates.

This structure ensures that each basin has an independent, auditable deliverable while maintaining consistency across the project.

Task 5: Hydraulic modeling and hazard mapping

The Consultant shall undertake comprehensive hydrological and hydraulic modeling to assess flood hazards and produce flood hazard maps at the highest practical spatial resolution supported by available data and modeling outputs. At a minimum, the maps shall be of sufficient detail to identify flood “hotspots” and assess risks to communities, infrastructure, and key socio-economic and environmental assets.

Digital Elevation Model (DEM) and Spatial Resolution

For basin-level screening assessments, the Consultant shall use a DEM with a minimum spatial resolution of 30 m. For prioritized flood intervention areas and design zones, a higher-resolution DEM (target 5–10 m, and at minimum 10 m resolution or higher) shall be employed. The Consultant shall document DEM sources, processing steps, and limitations.

Hydrological and Hydraulic Modeling Approach

The hydrological and hydraulic modeling shall consider:

- **Fluvial (Main River) flooding** associated with primary flood risk reduction structures.
- **Pluvial (surface runoff) flooding**, particularly in urban and rural areas benefitting from the primary protection structures.
- **Joint probability analysis** of fluvial and pluvial flooding, including assessment of dependence between flood mechanisms based on available data and system knowledge.

A range of return periods (minimum 2-year to 500-year events) shall be modeled for both fluvial and pluvial flooding, with final return periods and scenarios confirmed during the Inception Phase.

The Consultant shall propose an appropriate rainfall runoff methodology for defining extreme discharge events across the catchments. The methodology shall:

- Be consistent with Section 1 of this ToR and incorporate findings from previous studies and the Consultant's review.
- Account for catchment characteristics with physically based parameters for soil moisture and flow routing.
- Allow representation of land-use change, human interventions, and application to ungauged catchments.
- Realistically simulate spatial and temporal variability in rainfall, topography, soils, and land use.

Hydrological modeling shall be undertaken using industry-standard methods and software, calibrated and validated against the best available local data (e.g., rainfall and flow records). Hydraulic modeling shall be carried out using industry-standard software that is freely available and supported for the foreseeable future, enabling replication and future updates by the Client. Model parameters and final assumptions shall be discussed and agreed with the Client and key stakeholders.

The hydraulic modeling should integrate environmental and social sensitive layers and shall identify flood risk to settlements, critical infrastructure, and ecological zones. Model scenarios that minimize adverse social impacts, such as forced relocation or loss of livelihoods, identify opportunities for hybrid or nature-based solutions for both risk reduction and ecological enhancement

Concept Design and Optimization of Flood Protection Infrastructure

The modeling shall inform concept designs for primary flood protection structures, including optimized dyke alignments and complementary interventions (e.g., wetlands, retention ponds, nature-based solutions). The optimized alignments shall significantly improve upon previous schematic designs and incorporate outcomes from Task 4, considering:

- Local terrain and topography
- Land use and settlement patterns
- Existing infrastructure and wetlands
- Opportunities for ecological enhancement and nature-based solutions

Flood Hazard Mapping Standards and Outputs

Flood hazard mapping shall follow internationally recognized standards and shall include:

Spatial Resolution and Mapping Outputs

- Minimum grid size:
 - 5–10 m for detailed design and priority intervention areas
 - 30 m only for basin-scale screening
- Required flood metrics:
 - Flood depth
 - Flow velocity
 - Hazard index (combined depth–velocity)
 - Flood arrival time
 - Flood duration
- Maps for conditions **before and after proposed interventions**.

Residual Risk and Failure Scenarios

- Residual risk maps for exceedance scenarios (events beyond design standards).
- Dyke breach and failure scenario analysis, including inundation extents and hazard metrics.

Accessibility and Critical Infrastructure Overlays

- Overlay flood hazard maps with:
 - Critical facilities (hospitals, schools, power, water infrastructure)
 - Evacuation routes and safe areas
 - Livestock corridors and key livelihood infrastructure

Metadata and Data Standards

- All spatial outputs shall include metadata documenting:
 - Coordinate system and projection
 - Spatial resolution
 - Model version and date
 - Scenario identifiers (return period, climate scenario, land-use scenario)
 - Legend and symbology standards
- Spatial datasets shall be delivered in GeoTIFF and/or GeoPackage formats, with accompanying PDF map layouts for reporting.

Uncertainty and Sensitivity Analysis

The Consultant shall perform a comprehensive uncertainty and sensitivity analysis, evaluating the influence of input data, assumptions, and model parameters on flood hazard outputs. The robustness and limitations of results shall be documented in accordance with internationally accepted scientific standards or other approaches agreed with the Client during the Inception Phase.

Task 5 Deliverables

For each basin (Wabisheble and Genale Dawa), the Consultant shall prepare:

1. **Draft Hydraulic Modeling and Hazard Results Report**, including updated flood hazard characterization, maps, and graphical outputs for multiple return periods and scenarios (current and future climate and land-use conditions).
2. **Comprehensive modeling database**, including all hydrological and hydraulic inputs, outputs, spatial layers, and metadata.
3. **Optimized flood protection infrastructure alignment and concept designs** (dykes, wetlands, retention ponds, and other interventions) with sufficient detail for high-level cost estimation and concept drawings.
4. **Flood hazard maps before and after proposed interventions**, including residual risk and dyke breach scenario maps.
5. Hazard maps before and after investment of the above infrastructure, highlighting environmental and social hotspots
6. Conceptual infrastructure alignment that maximizes protection while reducing environmental and social risks.

Note: All deliverables shall be prepared separately for each basin (Wabisheble and Genale Dawa).

Task 6 – Application of Flood Risk Reduction Investment Framework

The World Bank recently concluded a consultancy to develop a strategic investment framework for flood risk management in Ethiopia. The application of this framework in this Technical Assistance (TA) is considered an appropriate use of this new strategic tool. The risk-based framework utilizes a range of qualitative and quantitative appraisal metrics (Figure 1) to assess and rank proposed projects, thereby supporting the development of a strategic investment plan for a defined geographical or administrative area.

The framework can be applied both to a portfolio of proposed flood risk reduction projects and to define baseline flood risk at national and woreda levels. For this assignment, the framework will be applied to the Wabe Shbele and Genale Dawa Basin projects, based on the original feasibility studies from the earlier consultancy. It is expected to provide both a starting point and a means to execute the updated flood risk assessment. Based on new flood hazard modeling, the investment case for these projects will be updated.

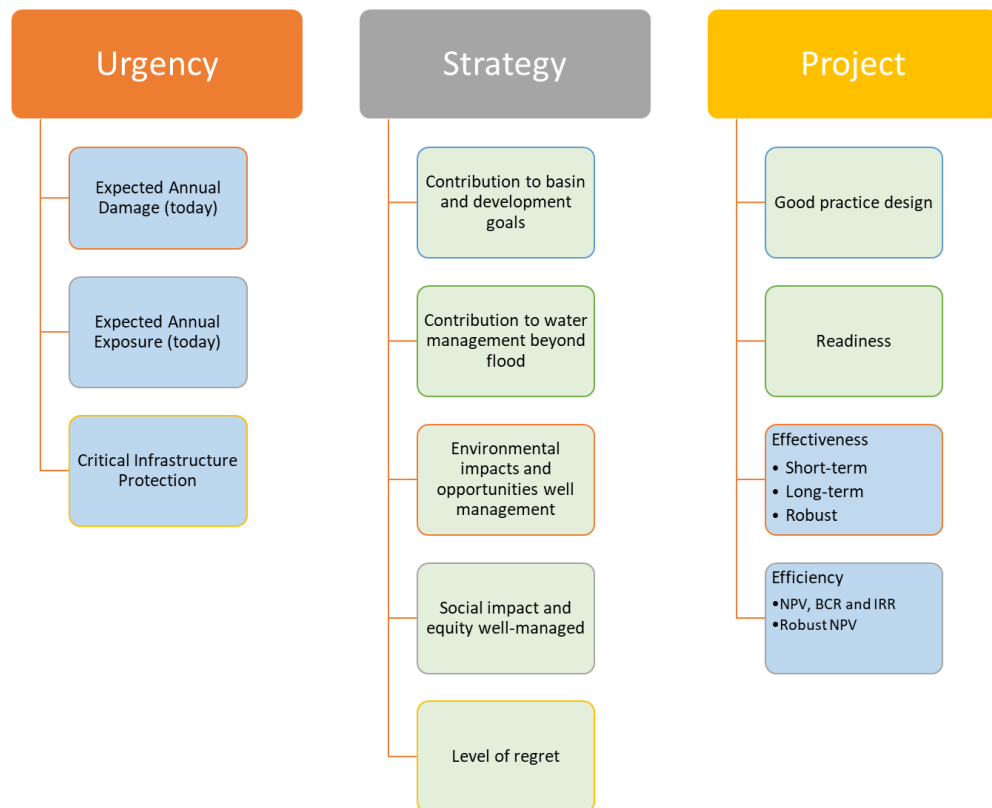


Figure 1: Overview of the strategic flood risk reduction investment framework recently developed for the GoE.

The consultant shall apply the framework to:

- Evaluate the **environmental sustainability** and **social inclusion** of proposed interventions.
- Conduct **ESIA** to inform feasibility and investment decisions, including identification of potential cumulative impacts.
- Ensure that the **economic analysis** of proposed interventions follows accepted methodologies, including **Cost-Benefit Analysis (CBA)** with **shadow pricing**, **sensitivity/stochastic analysis**, and **distributional effects**, and includes computation of **Economic Internal Rate of Return (EIRR)**, **Net Present Value (NPV)**, and **Benefit-Cost Ratio (BCR)**.

The consultant shall also prepare:

- **ESIA and ESMPs:** Prepare Environmental and Social Impact Assessments (ESIA) and Environmental and Social Management Plans (ESMPs) fully consistent with national legislation and the World Bank Environmental and Social Framework (ESF). These instruments shall address, at a minimum, the following ESF standards:
 - **Labor and Working Conditions (ESS2):** Assessment of project labor risks, including child labor, forced labor, occupational health and safety (OHS), and mechanisms for worker grievance.
 - **Community Health and Safety (ESS4):** Identification of risks to community safety from construction and operation, including traffic, structural safety, and vector-borne diseases, with appropriate mitigation measures.
 - **Biodiversity (ESS6):** Screening for impacts on natural habitats, critical habitats, and protected areas, including assessment of ecosystem services and biodiversity offsets where required.
 - **Resource Efficiency and Pollution Prevention (ESS3):** Evaluation of resource consumption (water, energy, materials) and pollution risks (waste, hazardous materials, emissions), with management plans to minimize negative impacts.
 - **Cultural Heritage (ESS8):** Screening for tangible and intangible cultural heritage, including chance find procedures for construction phases.
 - **Stakeholder Engagement and GRM (ESS10):** Development of a project-specific Stakeholder Engagement Plan (SEP) and a functional, accessible, and culturally appropriate Grievance Redress Mechanism (GRM), with special procedures for sensitive complaints (GBV/SEA).

Note:

- A **full, detailed ESIA** will be carried out separately by an independent consultant prior to construction. The study consultant is responsible for undertaking ESIA and ensuring that all environmental and social considerations are assessed in accordance with national law and the World Bank Environmental and Social Framework (ESF).
- The above deliverables are to be prepared **independently for each basin (Wabishebele and Genale Dawa)**.

Task 7: Detailed Design

This task will focus on the detailed design of flood intervention projects, including topographic and bathymetric surveys and other related activities. Under this task, the consultant shall translate the optimized concept designs into complete and implementable technical designs, ensuring that all proposed interventions are practical, durable, and tailored to site-specific conditions.

Scope of Bathymetric and Topographic Surveys

The consultant shall undertake **bathymetric surveys** as part of the detailed design, using **Acoustic Doppler Current Profiler (ADCP)** or **single/multi-beam echo sounders**, depending on site conditions and flow characteristics. Survey parameters shall include:

- **Cross-section spacing:** Typically 50–100 meters along the river or channel, with adjustments based on local hydraulic variability.
- **Flow conditions:** Surveys shall capture both low-flow and high-flow scenarios where feasible, ensuring accurate representation of the riverbed and channel morphology under varying hydrological conditions.
- **Accuracy and resolution:** Data shall be sufficient to support hydraulic modeling, sediment transport analysis, and structural design.

Topographic surveys shall complement bathymetric data, providing detailed ground elevations, embankment profiles, and relevant infrastructure locations within the project area.

Geotechnical Investigations

The Consultant shall undertake a comprehensive geotechnical investigation to characterize subsurface conditions at all proposed flood intervention sites. This shall include borehole drilling, in-situ testing, soil and groundwater sampling, and laboratory testing to determine soil stratigraphy, shear strength, compressibility, and permeability parameters. The results shall be used to inform the design of dykes, retention ponds, foundations, and other earthworks, and to assess stability, settlement, and seepage risks. A Geotechnical Investigation Report shall be prepared, including recommendations for design parameters and construction methods.

The consultant shall prepare and submit an **Initial Draft Detailed Design**, incorporating comments and feedback received from relevant stakeholders during review meetings. Based on these consultations, the consultant shall revise and submit the **Final Detailed Design Report**. The final submission shall be accompanied by a comprehensive Environmental and Social Impact Assessment (ESIA) detail design must integrate environmental and social mitigation measures identified in environmental and social impact assessment (ESIA) to ensure compliance with applicable environmental, social, and sustainability requirements. This includes protection of sensitive habitats & ecosystems, measures to avoid or minimize

displacement and restore livelihoods, use of local, sustainable construction materials & climate resilient designs, and incorporation of multi-functional nature-based solutions.

For planning and resource estimation purposes, the indicative scale of investment for the flood intervention sub-projects is expected to be in the order of **USD 100 to 200 million per basin**. This information is provided to support bidders in estimating the required level of effort and resources and to facilitate effective supervision by the Project Management Unit (PMU).

The Final Detailed Design Report must include:

- Complete technical specifications for all project components,
- Full sets of working drawings (to a level suitable for construction),
- Relevant design calculations and technical justifications where necessary,
- Environmental and social mitigation measures as identified through the ESIA.

The report must clearly and comprehensively present all aspects of the final design, ensuring that the specifications, drawings, and supporting documents are detailed enough to enable construction, procurement, and implementation activities without requiring additional design clarification.

All deliverables must fully comply with applicable national standards, environmental regulations, and align with recognized international best practices for flood risk management and infrastructure development.

Task 7 Deliverables;

1. Draft Design Report
2. Final Detailed Design Report
 - ✓ Complete technical specifications for all project components
 - ✓ Full sets of working drawings suitable for construction
 - ✓ Design calculations and technical justifications where necessary
 - ✓ **Bill of Quantities (BoQ)** and detailed cost estimates, including contingencies
 - ✓ Construction method statements
 - ✓ Operation and Maintenance (O&M) manuals, including inspection checklists, spare parts lists, and maintenance cycles
 - ✓ Environmental and social mitigation measures identified through the ESIA

The final design shall integrate

- ✓ **Safety and resilience measures**, including freeboard criteria, seepage and drainage management, erosion protection, climate allowances, and adaptability features
- ✓ **Construction Environmental, Social, Health, and Safety (ESHS) requirements**, including contractor OHS plans, traffic management, chance find procedures, and site-specific ESMPs

- ✓ **Nature-based and climate-resilient design solutions**, use of local sustainable materials, protection of sensitive habitats, and measures to avoid or mitigate displacement and restore livelihoods
- 3. Stakeholder Workshop – A workshop will be organized to present the Draft Design Report to stakeholders. During the session, the consultant will collect feedback and input to incorporate into the Final Detailed Design Report. The cost of organizing the workshop will be covered by the client; however, the consultant is responsible for covering their own expenses related to participation.

Note: The above deliverables are to be prepared independently for each basin (Wabisheble and Genale Dawa).

Task 8: Training and Capacity building

This will be executed through a policy and gap analysis of existing planning and Integrated Flood Risk Management (IFRM) practices and policies enabling strategic planning. This will include identifying the roles in which institutions play in implementing planning and IFRM in Ethiopia. The project also intends to strengthen Disaster Risk Management (DRM) coordination among federal level agencies and between federal and regional level governments as well as to build the capacities of the DRM offices in regional governments to be able to better implement local level disaster risk management initiatives.

There is a perceived opportunity for strengthening the Government of Ethiopia capacities, knowledge and skills in executing the risk-based analysis needed to implement IFRM. The content of the training component should focus on contemporary thought with regard to best practice IFRM from hazard mapping, the selection of physical measure options (including Nature Based Solution such as retention ponds, wetland improvement), design standards, O&M considerations, community engagement for physical planning and so on.

The capacity building will then be executed through a series of workshops, exposure visit and training of relevant stakeholders identified in the screening exercise. The workshops are expected to focus on themes identified through the screening exercise and based on the consultant's experience and expertise. At the outset, the content of the workshops is expected to include (though are to be refined or revised under this task):

- a) risk-based approaches for flood risk strategic investments aimed at spatial analysts, geographic information system technicians to imbed hard skills, tools and methodologies behind the strategic investment framework
- b) The consultant will conduct of five-day capacity-building training in two rounds in Ethiopia for approximately 60 participants, targeting Ministry professionals. These training aims to enhance flood risk management capabilities, forecasting, modeling structures and inter-agency coordination. The consultant will cover all costs for the training.
- c) This initiative focuses on strengthening institutional capacities through hands-on training and knowledge sharing. By bringing together key stakeholders, the program seeks to improve

collaborative flood management strategies while ensuring cost efficiency through clear delineation of financial responsibilities.

- d) Organize a five-day exposure visit for seven senior officials and experts to a European country with river systems comparable to the Wabisheble and Genale Dawa basins, with the Consultant proposing three potential cities for client selection. Develop a structured learning agenda to maximize knowledge transfer across technical, institutional, and community engagement aspects, ensuring value-for-money, ethical travel policies, and cost-effective arrangements.

Task 8 deliverables:

Preparation of a draft review report outlining observations, identified needs, and recommendations aimed at strengthening the following areas:

1. Institutional and technical capacity to implement a risk-based approach to flood risk reduction.
2. Development of a comprehensive training program for 30 professionals per round, conducted in two rounds, covering topics such as Flood Forecasting, River Modeling, Design of Flood Intervention Projects, Structural Design for Flood Intervention Projects, and related subjects. The Consultant shall provide all training materials and cover all associated costs, including venue, transportation, per diem, and other logistics. Each training session shall last five days (excluding transportation), and the venue for the training will be located in Ethiopia.
3. Handover Packages for on-the-job training including models, data, scripts, and user guides from Tasks 2–5.
4. Delivery of the training program in collaboration with the client, along with the submission of a comprehensive report on the capacity-building activities.
5. Organization of an exposure visit for seven senior officials and experts to a European country with river characteristics similar to the Wabisheble & Genale dawa. The consultant will propose three potential cities, from which the client will select one. The visit will last five days (excluding travel time), with all necessary expenses covered by the consultant.
6. Reports summarizing lessons learned and recommendations for integrating social and environmental safeguards in future projects.

Task 9: Final Reporting

Following the completion of all technical, design, and capacity-building activities under Tasks 1 to 8, the Consultant shall prepare and submit a Final Consolidate Report as a standalone task.

The Final Reporting task shall compile, harmonize, and summarize all outputs produced during the assignment for the Wabi-Shebele and Genale Dawa Basins, ensuring consistency, completeness, and compliance with the Terms of Reference and World Bank requirement.

The **Final Report** shall include, but not be limited to:

- An executive summary highlighting key findings, recommendations, and investment priorities for each basin;
- A consolidated summary of the feasibility study outcomes, selected intervention options, and detailed design conclusions;
- A summary of hydrological and hydraulic analyses, flood hazard and risk mapping results, and climate change considerations;
- A synthesis of environmental and social assessments, including key impacts & risks and proposed mitigation measures;
- Recommendations to improve environmental and social performance of future flood interventions
- Documentation of stakeholder consultations and outcomes;
- A summary of training and capacity-building activities implemented under Task 8, including lessons learned and recommendations for future capacity development;
- A confirmation of all deliverables submitted, with references to basin-specific reports prepared under the assignment.

The Consultant shall submit the **Draft Final Report** for review and comments by the Client. Following receipt of comments, the Consultant shall incorporate all agreed feedback and submit the **Final Report**.

All digital data, hydraulic and hydrological models, GIS layers, drawings, scripts, and supporting technical documents developed under this consultancy shall be compiled and submitted as a **Final Consolidated Digital Archive**, including social, ecological and hydrological data layers organized separately for each basin and in formats agreed with the Client.

The Consultant shall ensure that all intellectual property, including models, scripts, GIS databases, and raw and processed datasets, is fully transferred to the Client upon completion of the assignment. Deliverables shall be provided in open and/or non-proprietary formats where feasible, accompanied by complete metadata, documentation, and user manuals to enable future use and replication.

Where proprietary software or tools are used, the Consultant shall ensure that the Client is provided with appropriate licenses or access arrangements that allow the Client to use, review, and update the models and datasets without restriction.

4. Duration of Contract and deliverables

As per the implementation schedule, the expected duration of the project is **15 months**. During this period, the consultant will be responsible for executing the project's tasks and producing the necessary deliverables and reports in accordance with the agreed timeline. The following deliverables are expected

Table 4.1. Duration and deliverables

S.no	Tasks	Deliverables to be Submitted to MoWE	Deliverables to be submitted to MOWE	Due Date	Remarks
1	Kick off meeting		-	Within 1 week from signing of the contract	To ensure proper inception
1	Inception Report	<ul style="list-style-type: none"> ✓ Shall include thorough review of existing studies, including Wabe Shable River as well as several dam projects, which is time consuming. ✓ E&S regulatory framework analysis, stakeholder mapping, initial E&S screening, outline of required safeguard instrument, GRM concept ✓ To ensure appropriateness of consultancy's inception works, we could organize kick-off meeting 	See detail under task 1	1 month from signing	
2	Data audit, analysis and survey	Environmental and social baseline assessment, identification of environmental sensitive areas, mapping of settlements and	See detail under task 2	4.5 months from signing	
3	Update of hydrological and hydraulic	Updated hydrological and hydraulic analyses, baseline flood maps,	See detail under task 3	6 months from signing	

	analysis and setting target flood events and sites	target flood event definitions, and identification of priority flood risk reduction sites			
4	Identify multiple options, select recommended option, and conceptual design covering associated infrastructures	✓ Requires stakeholder consultations including community engagement, multi-criteria analysis incorporating environmental impact, land accusation and resettlement issue, apply avoidance- first - principle, Biodiversity risk screening, gender & social inclusion considerations	See detail under task 4	8 months from signing	
5	Hydraulic modeling and hazard mapping	Flood hazard maps and modeling outputs for baseline and intervention scenarios	See detail under task 5	10 months	Can be done in parallel
6	Application of Flood Risk Reduction Investment Framework	Investment prioritization and economic/financial evaluation outputs	See detail under task 6	11 months	
7	Detailed Design	Comprehensive ESIA, prepare ESMP, contractor environmental and social requirement	See detail under task 7	15 months	
8	Training and Capacity building	✓ This task should be conducted throughout the consultancy, in align with each deliverables.	See detail under task 8	Submit training and capacity development plan at inception stage, which identifies milestones.	

		<ul style="list-style-type: none"> ✓ Training should include emergency preparedness ✓ Plan for training and capacity building should be approved at the inception stage, and several milestones should be identified by the consultant. ✓ Final deliverable is almost at the end of the consultancy. 		Final report by the end of consultancy (15 months from signing).	
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5. Roles and Responsibilities

5.1. Ministry of Water and Energy has the following responsibilities:

- Provide all reports, data, and maps of relevant previous studies at the beginning of the consultancy;
- Provide access to the project site;
- Schedule and facilitate meetings with partners' organization upon request by the consultant;
- Facilitate the stakeholder participation in situation assessment and preliminary planning and design;
- Ensure inclusive stakeholder engagement (women, vulnerable groups, marginalized communities)
- Ensure compliance with national & World Bank environmental and social regulations.
- Pay the consultancy fee according to agreed mode of payment;
- Resolve any social problem whenever it arises;
- Organize a discussion forum among stakeholder and concerned institution in order to evaluate the proposed planning and detail design;
- Make comments and feedback on design report and check their incorporation or notice of acceptance of justification for rejection;
- Guarantee transparency and public disclosure of key documents.
- Notify the Consultant either to proceed with the subsequent work according to plan or to make modification whenever it deemed necessary;

5.2. The Consultant firm has the following responsibilities:

- The consultant shall demonstrate its in depth knowledge, skill understanding and experience of Both basins social, economic and environmental context;
- Prepare detail and comprehensive technical proposal indicating overview of the basins situation assessment with regards to this term of reference, approach and methodology of the study, level of investigation and study, sampling and data analysis, schedule of activities and financial plan;
- Undertake desk study (document review), prepare strategic plan, study and analyze information and data, investigation surface and sub-surface condition, and submit feasibility report;
- The Consultant shall carry out topographic and bathymetric surveys, as well as conduct geotechnical investigations in accordance with the criteria and site conditions.
- Submit preliminary planning and design report, draft detail design report and final detail design report and engineering/construction drawing album.
- The Consultant shall undertake Environmental and Social Assessment and prepare appropriate safeguard instruments in accordance with national legislation and World Bank ESF.
- The Consultant is expected to prepare a detailed training schedule, outlining the timing, sequence of topics, daily agenda, and logistical arrangements for each session. The schedule should specify session durations, breaks, and responsibilities for trainers and participants, ensuring that all training objectives are met efficiently over the five-day program.
- Except for the Inception Report and Capacity Building activities, the Consultant shall prepare separate reports for each deliverable for each basin.

6. Data Management and Knowledge Transfer

6.1. Data Management Plan (DMP)

The Consultant shall develop and implement a Unified Data Management Plan (DMP) to ensure systematic, secure, and auditable handling of all datasets, models, reports, and geospatial products generated under this assignment.

Within the Inception Phase, the Consultant shall prepare and submit the DMP for approval by the Client.

The DMP shall define:

- a) Data organization and standardized naming conventions for all files, datasets, and reports for both basins;
- b) Version control procedures for models, reports, drawings, and datasets, including change logs and revision tracking;
- c) Backup and data security protocols, including periodic backups, off-site storage, and recovery procedures;
- d) Metadata standards consistent with international standards such as ISO 19115 and INSPIRE, describing datasets, spatial reference systems, data sources, accuracy, and limitations;

- e) Data quality assurance and validation procedures for hydrological, hydraulic, survey, and GIS datasets;
- f) Data sharing and access protocols for MoWE, Basin Development Offices, and the World Bank.

6.2. Data Repository and Access

The Consultant shall establish and maintain an **online data repository** (e.g., secure shared drive, GeoNode platform, or equivalent) for project data exchange. The repository shall:

- Store all raw and processed datasets, GIS layers, models, drawings, scripts, and reports;
- Maintain basin-specific folders for Wabi-Shebele and Genale Dawa;
- Provide controlled access for the Client and relevant stakeholders;
- Ensure regular synchronization and backups.

6.3. Data Deliverables and Formats

All datasets and digital outputs shall be delivered in **open and/or non-proprietary formats where feasible** (e.g., GeoTIFF, Shapefile/GeoPackage, CSV, NetCDF, PDF, DWG/DXF, HEC model files). Where proprietary software is used, the Consultant shall ensure that the Client receives the necessary licenses, viewers, or access rights to use, review, and update the models and datasets.

6.4. Final Digital Archive and Handover

At completion of the assignment, the Consultant shall submit a **Final Consolidated Digital Archive**, organized separately for each basin, containing:

- All raw and processed datasets;
- Hydrological and hydraulic models and calibration files;
- GIS databases and hazard maps;
- Engineering drawings and specifications;
- Reports, manuals, and documentation;
- Scripts, codes, and computational tools;
- Metadata documentation and user guides.

All intellectual property rights to project data, models, and documentation shall be transferred to the Client upon completion of the assignment.

6.5. Knowledge Transfer

The Consultant shall ensure knowledge transfer through:

- Documentation of workflows and methodologies;
- Training sessions on data handling, modeling, and GIS database management;
- Preparation of user manuals for datasets and models;

- On-the-job training for MoWE and Basin Development Office staff.

6.6. Data Privacy and Ethical Considerations

The Consultant shall uphold the highest data privacy and ethical standards for all community-level data.

6.6.1 Informed Consent

Obtain free, prior, and informed consent from all participants. Provide forms in local languages and explain verbally. Clearly state:

- Purpose and use of data
- Access rights
- Voluntary participation and withdrawal rights
- Risks and benefits

6.6.3 Data Security

Use encrypted channels for data transfer. Report any breaches to the Client within 48 hours.

6.6.4 Ethical Use

Use data only for agreed purposes. Acknowledge community knowledge contributions. Share accessible outputs (e.g., risk maps) with communities.

6.7. Data Ownership, Format, and Intellectual Property Rights

To ensure transparency, long-term usability, and unencumbered access to all project outputs, the following principles shall govern data ownership and format:

- **Full Ownership by Client:** All data, models, scripts, software code, GIS layers, engineering drawings, reports, and any other intellectual property (IP) produced, collected, or substantially used during this assignment shall be the sole and exclusive property of the Client (Ministry of Water and Energy). The Consultant shall transfer full ownership of all such materials to the Client upon completion of the assignment.
- **Open and Machine-Readable Formats:** To guarantee future accessibility and use by the Client and its partners without reliance on proprietary software licenses, all final digital deliverables shall be provided in open, machine-readable, and non-proprietary formats wherever feasible. This includes, but is not limited to:
 - ✓ **GIS Data:** GeoPackage, GeoTIFF, or Shapefile.
 - ✓ **Tabular Data:** CSV (Comma-Separated Values).
 - ✓ **Documents and Reports:** PDF/A (Portable Document Format/Archival).
 - ✓ **Models:** Standard input/output files for widely used models (e.g., HEC-HMS, HEC-RAS) along with comprehensive model schematics and user guides.
 - ✓ **Drawings:** DWG (with a commitment to using standard features) and PDF.

- **Comprehensive Metadata:** All data deliverables must be accompanied by complete metadata that documents the data source, creation methods, coordinate system, spatial resolution, accuracy, limitations, and any assumptions used. This documentation must be sufficient to allow a qualified third party to understand and reuse the data without further input from the Consultant.
- **Right to Use, Modify, and Share:** The Client retains the unrestricted right to use, reproduce, adapt, modify, share, or distribute all deliverables for any purpose related to its mandate, including future project design, supervision, research, and policy development, without seeking further permission from or making payments to the Consultant.

7. Quality Assurance and Quality Control (QA/QC)

The Consultant shall establish and implement a Quality Assurance/Quality Control (QA/QC) Plan to ensure that all technical analyses, designs, models, drawings, reports, and deliverables meet internationally accepted engineering and scientific standards and the requirements of this ToR.

The QA/QC Plan shall include:

- Procedures for technical verification and validation of hydrological and hydraulic models, engineering designs, drawings, and cost estimates;
- Documentation of assumptions, data sources, methodologies, and calculation procedures;
- Version control and document management procedures for all reports, drawings, and digital data;
- Roles and responsibilities of key personnel responsible for quality control; and
- Procedures for addressing and correcting identified errors or deficiencies

Internal Peer Review

Prior to submission to the Client, all key deliverables including feasibility study reports, hydraulic and hydrological models, flood hazard and risk maps, concept and detailed engineering designs, technical specifications, and cost estimates shall undergo **internal peer review by senior experts not directly involved in the preparation of the deliverables**.

The Consultant shall document the internal peer review process, including reviewer comments and actions taken to address them, and provide a **Quality Assurance Statement** confirming that the deliverables have been reviewed and comply with this ToR and internationally accepted standards.

Client Review and Acceptance

The Consultant shall submit deliverables to the Client only after completion of internal QA/QC and peer review. The Client reserves the right to request revisions, additional verification, or independent review as deemed necessary. Final acceptance of deliverables shall be subject to satisfactory compliance with the QA/QC requirements.

8. Financial Proposal

The Consultant has prepared a cost estimate for the consultancy services, which includes professional remuneration, non-remuneration costs, reimbursable expenses, and any other expenses required to successfully execute the assignment.

9. Instruction to Consultant

- **Scope of Work Compliance** – The Consultant shall perform all tasks in accordance with the Terms of Reference, ensuring compliance with national and international standards, **and the requirements of the Client and funding agency.**
- **Coordination and Reporting** – The Consultant shall maintain regular communication with the Client, provide timely progress updates, and submit reports in the formats and within the timelines specified in the ToR.
- **Stakeholder Engagement** – The Consultant is expected to engage relevant stakeholders, including government agencies, local authorities, and community representatives, as required for data collection, validation, and feedback.
- **Quality Assurance** – The Consultant shall ensure all deliverables meet high-quality technical, environmental, and social standards, are auditable, and clearly document assumptions, methodologies, and decisions.
- **Use of Data and Equipment** – All data, models, and software used or developed during the assignment shall be made available to the Client. The Consultant shall provide necessary equipment and resources to execute the tasks effectively.
- **Confidentiality** – The Consultant shall maintain confidentiality of all project-related information and shall not disclose any data without prior written approval from the Client.
- **Responsibility for Costs** – The Consultant shall bear all costs related to executing the assignment, including travel, logistics, materials, and other incidental expenses unless otherwise agreed.
- **Adherence to Schedule** – The Consultant shall strictly follow the agreed work plan and schedule, including milestones, reporting deadlines, and training sessions, ensuring timely completion of the assignment.

10. Man power requirement

The consultant is required to engage a multidisciplinary team of key experts and establish dedicated task teams for the execution of the Wabi-Shebele and Genale Dawa basin level studies, as outlined in the Terms of Reference (ToR), to ensure effective implementation.

- ✓ Lead flood risk management Expert (Basin Team Leader)
- ✓ Senior Hydraulics Engineer

- ✓ Senior Hydrologist
- ✓ Dam operation Expert
- ✓ Water Resource/Irrigation Engineer
- ✓ Structural Engineer
- ✓ Infrastructure Engineer
- ✓ Environmental specialist
- ✓ Social safeguard specialist
- ✓ Mechanical Engineer
- ✓ Geotechnical Engineer
- ✓ GIS/Remote sensing specialist
- ✓ O&M/Asset management specialist

Table 8.1 Consultant key expert requirement

No	Required Key experts	Required Number	Qualification	Relevant experience
1	Team Leader & Lead flood risk management Expert (Basin Team Leader)	2	Msc or above in flood risk management, hydraulic engineering, hydrology, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 15 yrs working experience in related task including minimum 8 yrs on project coordinating or leading task
2	Senior Hydraulics Engineer	2	Msc or above in hydraulic engineering, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 10 yrs working experience in related task
3	Senior Hydrologist	2	Msc or above in hydraulic engineering, hydrology, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 10 yrs working experience in related task
4	Dam operation Expert	2	Msc or above in hydraulic, civil engineering, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 8 yrs working experience in related task
5	Water Resource/Irrigation Engineer	2	Bsc or above in hydraulic engineering, hydrology, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 8 yrs working experience in related task
6	Structural Engineer	2	Bsc or above in hydraulic engineering, civil engineering, hydrology, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 8 yrs working experience in related task

No	Required Key experts	Required Number	Qualification	Relevant experience
7	Infrastructure Engineer	2	Bsc or above in hydraulic engineering, civil engineering, hydrology, water resource engineering, Irrigation engineering, soil and water engineering or related field	Minimum 8 yrs working experience in related task
8	Environmental Specialist	2	Bsc or above in Environmental engineering, natural resource management or related field	Minimum 8 yrs working experience in related task
9	Social safeguard specialist	2	Ba/Bsc or above in Sociology, Social Anthropology, social works, or related fields	Minimum 8 yrs working experience in related task
10	Mechanical Engineer	2	Bsc or above in mechanical engineering or related field	Minimum 6 yrs working experience in related task
11	Geotechnical Engineer	2	Bsc or above in Soil science, geology hydrogeology or related field	Minimum 6 yrs working experience in related task
12	GIS/Remote sensing specialist	2	Bsc or above in Geographic Information Systems (GIS), Remote Sensing or related field	Minimum 6 yrs working experience in related task
13	O&M/Asset management specialist	2	Civil Engineering, Water Resources Engineering, Environmental Engineering, Infrastructure Asset Management, or related field	Minimum 6 yrs of professional experience in operation, maintenance, and asset management of civil/infrastructure works, preferably in flood management, irrigation, or water resources projects task

Note:-

One of the two Team Leaders will be assigned a dual role, serving both as the lead for their respective basin and as the overall project coordinator. In this capacity, they will be responsible for harmonizing all activities across both basins, consolidating reports, and managing other cross-cutting assignment.

Table 8.2. Proposed staffing and time allocation for the assignment, specified for each assigned staff member.

No	Required Key experts	Unit	Required Number	Office	Field	Total
1	Lead flood risk management Expert (Team Leader)	Month	1	5	10	15
2	Senior Hydraulics Engineer	Month	2	3	7	10
3	Senior Hydrologist	Month	2	3	6	9
4	Dam operation Expert	Month	2	2	4	6
5	Water Resource/Irrigation Engineer	Month	2	2	5	7
6	Structural Engineer	Month	2	2	4	6
7	Infrastructure Engineer	Month	2	4	5	9
8	Environmental specialist	Month	2	2	8	10
9	Social safeguard specialist	Month	2	2	8	10
10	Mechanical Engineer	Month	2	2	1	3
11	Geotechnical Engineer	Month	2	2	7	9
12	GIS/Remote sensing specialist	Month	2	3	3	6
13	O&M/Asset management specialist	Month	2	2	2	5

- The key experts must be a permanent staff or the consultant shall provide proof of evidence for availability during the project period with hiring contract agreement indicating basic salary);
- The experts must have proven experience in different and diverse projects (design and construction supervision, hydrological analysis, geotechnical study, geological investigation, hydrogeological study, etc.);
- Each key specialist will cover additional related roles: the Infrastructure Engineer will take on Quantity Surveyor duties, the Hydrologist will assume Hydrometeorologist tasks, the Environmental Specialist will cover Climate Specialist responsibilities, and the Social Safeguards Specialist will handle Community Engagement/GRM function
- In case of staff replacement, any proposed substitute must be equally or better qualified, with prior written approval from the Client, and the replacement procedure shall follow the Client’s review and acceptance process before the individual assumes responsibilities.

11. Payment Schedule

Payments to the Consultant shall be made in installments upon submission and **formal acceptance by the Client** of the corresponding deliverables, in accordance with the Terms of Reference and the Contract Agreement. The payment schedule shall be as follows:

Table 9.1 Payment Schedule

Payment No.	Percentage of Contract Amount	Payable Upon
1	15%	Acceptance of Deliverable 1 : Final Inception Report (Task

Payment No.	Percentage of Contract Amount	Payable Upon
		1).
2	20%	Acceptance of Deliverable 2 : Outputs under Task 2 and Task 3 for both basins.
3	15%	Acceptance of Deliverable 3 : Outputs under Task 4 and Task 5 for both basins.
4	25%	Acceptance of Deliverable 4 : Feasibility Study Report (Task 6) and Draft Design Report (Task 7) for both basins.
5	15%	Acceptance of Deliverable 5 : Submission and acceptance of all remaining final outputs, including: <ul style="list-style-type: none"> • Final Detailed Design Report for both basins (Task 7); • Outputs under Task 8; • Final Consolidated Report (Task 9); and • Any other outstanding activities and deliverables specified in the Terms of Reference.
6	10%	Upon completion of data/model handover and approval of QA/QC by the client.

Note:

- With the exception of Task 1 (Inception Report) and Task 8 (Training & Capacity Building Report), all other deliverables shall be prepared and submitted independently for each basin
- The Ministry shall, within fifteen (15) days of receipt, review each deliverable and issue its feedback, which shall include a decision on acceptance.

12. Eligibility and Conduct Requirements

12.1. Eligibility

The Consultant (including all joint venture partners and sub-consultants) must meet the eligibility criteria set forth in Section III of the World Bank Procurement Regulations for IPF Borrowers.

Without limitation, a Consultant will be ineligible if:

- a) They have been declared ineligible by the World Bank or other international financial institutions, either temporarily or permanently, for fraudulent, corrupt, collusive, coercive, or obstructive practices. This includes firms and individuals listed on the World Bank's List of Debarred Firms and Individuals.
- b) They have a conflict of interest as defined in Section 12.2 below.
- c) They or any of their affiliates have been engaged by the Client to provide consulting services for the

preparation or implementation of the project that form the subject of this assignment, where such engagement creates a conflict of interest.

d) They are a government-owned entity, unless they can establish that they are legally and financially autonomous, operate under commercial law, and are not a dependent agency of the Client.

12.2. Conflict of Interest

The Consultant shall provide professional, objective, and impartial advice and at all times hold the Client's interests paramount, without any consideration for future work, and strictly avoid conflicts with other assignments or their own corporate interests.

Consultants shall be considered to have a conflict of interest if they:

a) Conflict with other assignments: Have been involved in the preparation of the project (including feasibility studies, preliminary designs, or environmental and social assessments) that forms the subject of this Terms of Reference. A firm that has prepared the feasibility study, conceptual design, or safeguard instruments for a project shall be disqualified from proceeding to subsequent phases (e.g., detailed design or construction supervision) of the same project unless:

(i) It is a standard continuity of approach required by the nature of the assignment; and

(ii) The participation of the firm is critical to ensure project quality and continuity, with safeguards to avoid bias, as determined by the Client and accepted by the World Bank.

b) Conflict with present or future interests: Have a business or family relationship with a member of the Client's staff or of the project implementing agency who is directly or indirectly involved in any part of: (i) the preparation of the Terms of Reference; (ii) the selection process for the contract; or (iii) supervision of the contract. Such affiliates may be excluded from the assignment unless the conflict is resolved to the satisfaction of the Client and the World Bank.

c) Conflicting relationships with other bidders: Have an arrangement with any other party (or affiliate of such party) submitting a proposal, whereby the consultant (or affiliate) controls, is controlled by, or is under common control with that other party; or has received or given any subsidy or support (direct or indirect) from any other bidder; or shares the same representative for the purposes of the proposal; or has a relationship with any other party that puts them in a position to influence the proposal of another bidder.

d) Biasing the selection process: Engage in any activity that would put them in a position of being able to derive an unfair competitive advantage over other bidders (including access to information not available to the public or the bidders' community).

12.3. Fraud and Corruption

The Client (Ministry of Water and Energy) requires that all Consultants (including all individual personnel, joint venture partners, and sub-consultants) observe the highest standard of ethics during the selection process and throughout the execution of the contract. In pursuance of this policy, the Consultant shall adhere to the following provisions as defined by the World Bank's Anticorruption Guidelines:

Definitions:

- A "**corrupt practice**" is the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party.
- A "**fraudulent practice**" is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation.
- A "**collusive practice**" is an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.
- A "**coercive practice**" is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party.
- An "**obstructive practice**" is:
 - i. deliberately destroying, falsifying, altering, or concealing of evidence material to an investigation or making false statements to investigators in order to materially impede a World Bank investigation into allegations of a corrupt, fraudulent, coercive, or collusive practice; and/or threatening, harassing, or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or
 - ii. acts intended to materially impede the exercise of the World Bank's inspection and audit rights.

Sanctions and Actions:

The Client reserves the right to:

- a) Reject a proposal for award if it determines that the Consultant has been engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for the contract in question.
- b) Declare a Consultant ineligible, either indefinitely or for a stated period, to be awarded a contract financed by the World Bank, if it at any time determines that the Consultant has engaged in such practices.
- c) Terminate the contract if it is determined by the Client or the World Bank that the Consultant has engaged in corrupt, fraudulent, collusive, coercive, or obstructive practices in competing for or in executing the contract.

Audit and Inspection Rights:

The Consultant shall permit the World Bank and/or the Client to inspect all accounts, records, and other documents relating to the submission of proposals and contract performance, and to have them audited by auditors appointed by the World Bank.

Declaration:

By submitting a proposal, the Consultant acknowledges that they understand and accept that the Client and the World Bank reserve the right to sanction (including debarment) any individual or firm, or to take other remedial action as prescribed in the World Bank's Anticorruption Guidelines.