Federal Democratic Republic of Ethiopia

Ministry of Water and Energy

Ethiopia Flood Management Project

Terms of Reference

Consultancy Service for Basin level study for strategic study basins to identify and prioritize physical flood risk reduction investments, and feasibility study for prioritized investments (2 basins-Abay and Baro-Akobo)

March 2026

Addis Ababa

Ethiopia

Contents

1 Project Context

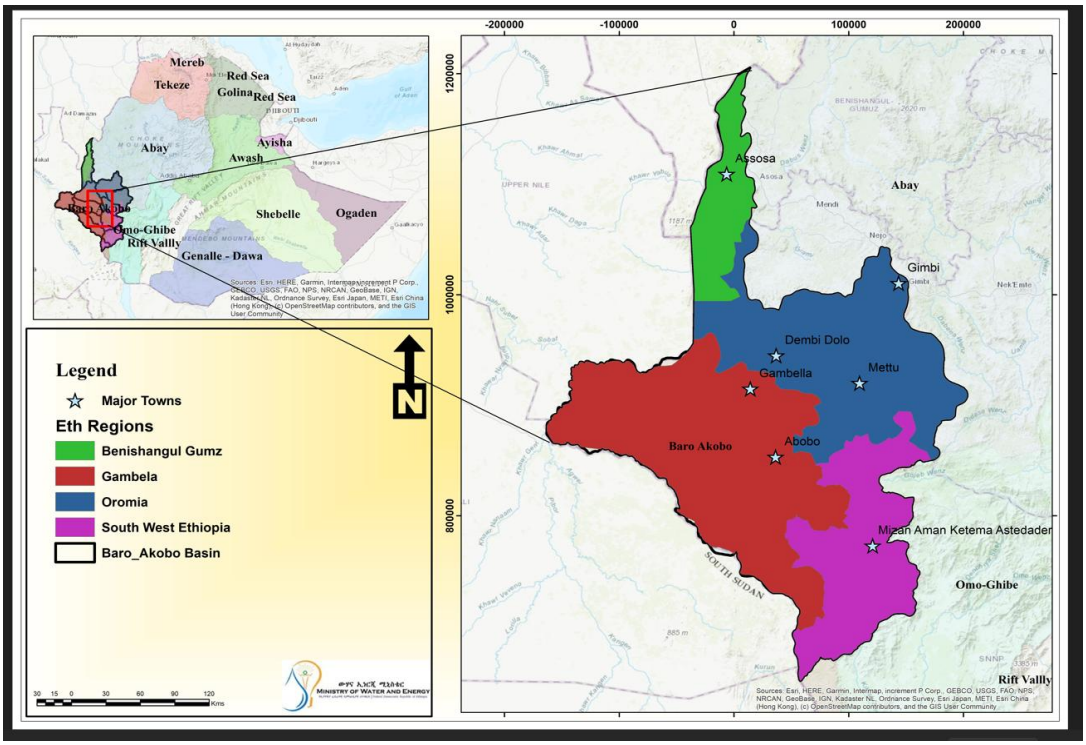
1.1 Geographical Areas of Abay River Basin

The Abay River Basin, situated in northwestern and central Ethiopia, forms part of the larger Nile Basin and is one of the most significant river systems in the country. The Abay River, known internationally as the Blue Nile, originates from Lake Tana in the Ethiopian highlands and flows westward through deep gorges before entering Sudan. The basin covers diverse geographical features, including rugged mountains, extensive plateaus, escarpments, and fertile valleys. Its climate ranges from cool temperate conditions in the highlands to warmer tropical conditions in the lower elevations, marked by pronounced wet and dry seasons.

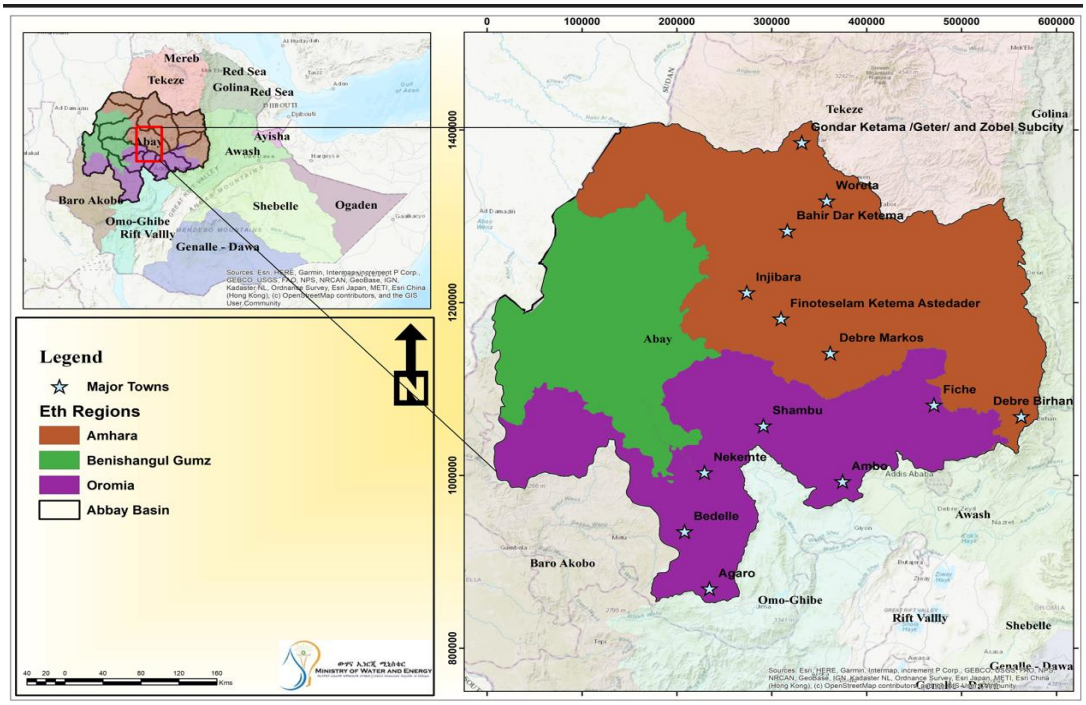
The basin is highly populated and agriculturally productive, supporting rain-fed and irrigated farming as well as livestock rearing. It sustains a wide range of ethnic communities and is a vital source of livelihood, cultural heritage, and hydropower development. Ecologically, the Abay Basin hosts diverse flora and fauna, though it faces mounting challenges such as land degradation, soil erosion, deforestation, and periodic flooding. As the primary contributor to the Nile waters, the Abay River Basin holds strategic environmental and socioeconomic importance both nationally and regionally.

1.2 Geographical Areas of Baro Akobo River Basin

The Baro Akobo River Basin, located in southwestern Ethiopia and extending into South Sudan, encompasses a diverse geographical area characterized by a mix of highlands and lowlands. The Baro River, originating from the Ethiopian highlands, flows through this basin, joined by its tributary, the Akobo River. The region features rolling hills, valleys, and fertile floodplains, with a climate that varies from tropical in the lowlands to temperate in the highlands, experiencing distinct wet and dry seasons. Predominantly agricultural, the basin supports subsistence farming and livestock grazing, inhabited by various ethnic groups, including the Nuer and Anuak. This area is rich in biodiversity, hosting numerous species of flora and fauna, but faces environmental challenges such as flood, deforestation, and soil erosion, making it a vital yet vulnerable ecological and socioeconomic zone.



Map 1: Baro Akobo Basin, Ethiopia



Map 2 Abay basin Map, Ethiopia

The **Abay Basin** and the **Baro Akobo River Basin** are among the river basins in Ethiopia most affected by recurrent flood events, largely influenced by seasonal rainfall patterns, topography, and land use conditions.

In the **Baro Akobo River Basin**, located in the southwest and extending into South Sudan, seasonal flooding is a recurring challenge during the June to September rainy season. Heavy rainfall causes river levels to rise, inundating wide areas. Notable flood events include the 2006 floods, which displaced thousands and damaged infrastructure and agriculture; the 2013 floods that forced mass evacuations in Gambella; and the prolonged flooding of 2020, which exacerbated food insecurity and humanitarian crises.

Similarly, the **Abay Basin** (Blue Nile Basin) has a long history of flood events, particularly in lowland and floodplain areas such as Fogera, Dembia, and Bahir Dar Zuria in the Amhara region. Seasonal floods are often driven by intense monsoon rains in the highlands combined with limited drainage capacity in flood-prone plains. Major flood incidents in recent decades have resulted in loss of lives, destruction of farmlands, and displacement of communities. The recurrent nature of these floods has placed significant stress on livelihoods dependent on rainfed agriculture, while also threatening infrastructure, including roads, bridges, and settlements near the riverbanks.

The impacts of these floods in both basins are profound. Human displacement remains one of the most critical consequences, as thousands of families are forced to abandon their homes for temporary shelters or resettlement areas. Agricultural losses are frequent, with crops and livestock destroyed, leading to food shortages and economic setbacks for farming households. Infrastructure damage disrupts transport, market access, and delivery of essential services. Moreover, health risks increase during flood periods, with outbreaks of waterborne diseases caused by contamination of drinking water sources.

To address these challenges, flood management initiatives have been introduced in both the Abay and Baro Akobo Basins. Early warning systems now track rainfall and river levels to provide timely alerts to at-risk communities. Community-based management practices, such as the construction of temporary dikes, improved drainage channels, and local preparedness committees, have been promoted. Investments in flood-resilient infrastructure—including elevated roads, bridges, and embankments seek to reduce exposure and damages. In addition, government institutions and NGOs are collaborating on integrated flood management strategies focused on risk reduction, emergency response, and recovery. Public awareness and educational programs further strengthen resilience by promoting adaptive practices and preparedness at the community level.

1.3 The Rationale for Study

The rationale for undertaking a strategic flood protection study, extending up to feasibility level, in both the **Baro Akobo and Abay River Basins** is rooted in the urgent need to systematically assess and mitigate flood risks that have repeatedly threatened communities, infrastructure, and economic activities. Both basins have experienced recurrent and often devastating flood events, with Baro Akobo historically impacted by seasonal inundations in the lower Gambella plains, while the Abay Basin faces frequent riverine and flash floods in downstream floodplains and urban centers.

As climate variability and change intensify rainfall extremes, the magnitude and frequency of flooding are projected to increase in both basins, making a basin-wide, evidence-based, and forward-looking flood management strategy essential. This study will therefore:

- **Identify flood-prone and vulnerable areas** through hydrological and hydraulic analysis.
- **Examine socio-economic consequences of flooding** on agriculture, infrastructure, urban centers, and vulnerable communities.
- **Develop a portfolio of strategic interventions**, including structural and non-structural measures, and advance the most viable options to feasibility level.
- **Provide policy and investment guidance** for long-term resilience building and sustainable development in both basins.

The rationale for prioritizing the study in Baro Akobo and Abay Basins is further supported by the following considerations:

- **Marked spatial and temporal variability of rainfall**, with high-intensity rainfall in the upper catchments causing major downstream flooding in low-lying floodplains.
- **Mismatch between high inflows and low irrigation abstraction**, resulting in large uncontrolled flows that could otherwise be regulated for productive use.
- **Limited existing flood protection infrastructure**, leaving livelihoods, recession agriculture, and river-dependent economic activities highly exposed.
- **Critical importance of these basins to national development**, as they host fertile agricultural lands, hydropower potential, and rapidly growing urban settlements, all of which are increasingly at risk from flood hazards.

Through this integrated and forward-looking approach, the study will generate essential data and actionable strategies to inform infrastructure investments, strengthen community resilience, and guide basin-wide water resources and flood risk management.

1.4 Purpose

The government of Ethiopia (GoE) has initiated prospective flood risk reduction projects. This consultancy service is to prioritize investments for reducing physical flood risks in the Baro Akobo & Abay Basins, complemented by a comprehensive feasibility study for the selected interventions. Recognizing the two basins significant vulnerability to recurrent flooding, the consultancy aims to assess flood risk areas by analyzing historical data, climate projections, and socio-economic factors. It will identify and prioritize specific investment opportunities, such as constructing flood control infrastructure, enhancing drainage systems, and restoring natural floodplains. A detailed feasibility study will evaluate the technical, economic, environmental, and social viability of these investments, including cost-benefit analyses and potential funding sources. Engaging local communities and stakeholders will be crucial to ensure that proposed solutions align with their needs and priorities. Ultimately, this consultancy seeks to provide actionable recommendations for implementing effective flood risk management strategies, enhancing the resilience and well-being of communities within the Baro Akobo & Abay Basin.

The overall objective of this study is to comprehensively assess the flood risks faced by communities in the Baro Akobo Basin, aiming to identify key vulnerabilities and inform targeted interventions for flood risk reduction. The desired outcomes of the study include a detailed understanding of the geographical areas most at risk, the socio-economic impacts of flooding, and the effectiveness of potential mitigation strategies. Deliverables will consist of a thorough vulnerability assessment report, a prioritized list of investment opportunities for flood risk reduction, and a feasibility study for selected interventions that evaluates their technical, economic, environmental, and social viability. Additionally, the consultancy will provide actionable recommendations for implementation, ensuring stakeholder engagement throughout the process to align proposed solutions with community needs and enhance overall resilience against flooding.

2 Objectives of the Feasibility Study for Selected Investments in the Baro Akobo and Abay Basins

2.1 Main Objective

The main objective of the study is to prepare a comprehensive **flood protection feasibility assessment** for selected investment projects in the Baro Akobo and Abay Basins. The feasibility study will evaluate the technical soundness, identify environmental and social risks and impacts, institutional arrangements, and economic justification of proposed flood protection interventions. This will ensure that the recommended measures are not only technically viable but also socially acceptable, environmentally sustainable, institutionally manageable, and economically efficient.

The findings will serve as a strategic guide for decision-makers in prioritizing, planning, designing, and mobilizing resources for the implementation of resilient and sustainable flood protection infrastructure in flood-prone areas of both basins.

2.2 Specific Objectives

The Specific objective of the assignment is to **review and update flood risk and investment studies for the Baro Akobo and Abay Basins, and to prepare conceptual designs for priority structural flood mitigation measures**, providing a sound basis for technically feasible, economically viable, and climate-resilient flood risk reduction investments.

The specific objectives of the assignment are to:

I. **Review and Audit Previous Studies and Data**
Assess the quality, reliability, and adequacy of existing studies, data, assumptions, statistical analyses, and modeling approaches, and identify gaps or issues that may affect the validity of findings and proposed designs.

II. **Assess Flood Hazards and Flood-Prone Areas**
Identify and analyze flood-prone areas and assess the extent, frequency, causes, and severity of flooding, including preparation or update of relevant flood hazard maps.

III. **Assess Exposure and Vulnerability**

Evaluate the exposure and vulnerability of communities, infrastructure, livelihoods, and ecosystems to flooding to identify the most at-risk areas and assets.

IV. **Assess Climate Change Impacts**

Examine potential effects of climate change on flood patterns, frequency, and severity, incorporating these considerations into the flood risk assessment and selection of interventions.

V. **Analyze Flood Impacts**

Assess the social, economic, and environmental impacts of flooding, including damages, losses, and disruptions affecting communities, infrastructure, economic activities, and ecosystems.

VI. **Evaluate Structural Flood Mitigation Options**

Assess alternative structural flood risk reduction measures such as levees, drainage channels, retention basins, and river training works, and recommend the most appropriate and cost-effective solutions.

VII. **Prepare Conceptual and Preliminary Technical Designs**

Develop **conceptual designs** and preliminary technical specifications for the recommended structural interventions, sufficient to support feasibility-level decision-making and investment planning.

VIII **.Engage Stakeholders**: Formulate and implement a comprehensive stakeholder engagement plan, including meaningful consultation, disclosure of information, and establishment of a grievance redress mechanism to ensure inclusive participation throughout project planning and implementation

IX. **Undertake Preliminary Environmental and Social Analysis**

To identify and assess potential environmental and social impacts of proposed projects, including direct, indirect, and cumulative effects on ecosystems, biodiversity, communities, and vulnerable groups. Recommend mitigation measures following the mitigation hierarchy and aligned with national regulations and World Bank Standards

X. **Conduct Economic and Financial Analysis**

Undertake economic and financial analysis, including cost-benefit assessment and life-cycle considerations, to determine the viability, affordability, and sustainability of the proposed investments.

XI. **Identify Implementation Arrangements and Funding Considerations**

Assess institutional capacity and implementation requirements, and identify potential financing approaches and funding sources for the recommended investments.

XII. **Develop an Implementation Roadmap**

Prepare a phased implementation plan, including indicative timeline, priority actions, and key milestones for advancing the recommended flood risk reduction investments.

Therefore, while a significant volume of project preparation work has already been undertaken, several aspects of the analyses carried out to date may have been based on questionable input data, statistical analyses, or modeling approaches, which could undermine the validity of the proposed designs. An audit of the work completed so far is required, alongside further detailed feasibility studies to optimize the overall assessment. This includes flood hazard and risk analysis, identification of priority structural mitigation measures, preparation of conceptual designs, and estimation of capital and civil works costs, to ensure the study provides a reliable and actionable basis for investment decisions.

3 Scope of Work

This Terms of Reference outlines the scope of work, timeline, and deliverables for the consultancy service. The consultant is tasked with conducting a comprehensive basin-level study, with particular focus on assessing flood risks and vulnerabilities. In addition, the consultant will prepare feasibility study for prospective flood protection and physical risk reduction interventions, ensuring alignment with nationally and internationally recognized standards, as well as bank-approved guidelines.

Geographical Scope:

The feasibility study will cover both the **Baro Akobo Basin** and the **Abay Basin** in Ethiopia, with a strong focus on identifying flood-vulnerable areas and evaluating viable flood protection measures. The study will provide the foundation for prioritizing, designing, and implementing sustainable interventions that reduce flood risks, safeguard communities, and protect socio-economic assets.

All tasks shall explicitly incorporate environmental and social considerations, including assessment of ecological impacts, community livelihoods, resettlement, and gender and social inclusion issues.

3.1.1 Specific Flood-Vulnerable Areas in the Baro Akobo Basin

The following is a tentative list of flood-vulnerable areas, but not limited and free for the consultant to visualize which will need to be confirmed and potentially refined through the study. Please review and provide any additional clarification as needed.

- **Gambella Plain**
  - Recognized as the most flood-prone zone within the basin due to its flat topography and proximity to the Baro and Akobo rivers.
  - Seasonal flooding is frequent during the rainy season, impacting farmland, infrastructure, and local communities.
  - Areas near the Baro, Akobo, Gilo, and Alwero rivers are particularly at high risk of flooding.
- **Areas Along Riverbanks**
  - Settlements and croplands along the banks of the Baro, Akobo, and their tributaries are highly exposed.
  - Flood risks arise from both seasonal river overflows and sudden flash floods.
- **Wetland Areas**
  - Several wetlands on the Ethiopian side of the basin experience recurrent flooding.
  - Although these wetlands are ecologically significant, they also contribute to local exposure to inundation during peak rainfall periods.

3.1.2 Specific Flood-Vulnerable Areas in the Abay Basin

The following is a tentative list of flood-vulnerable areas, but not limited and free for the consultant to visualize which will need to be confirmed and potentially refined through the study. Please review and provide any additional clarification as needed.

- **Floodplains along the Abay River and Major Tributaries**
  - Low-lying areas adjacent to the Abay (Blue Nile) and its tributaries, including the Dedessa, Beles, and Muger rivers, are highly prone to seasonal flooding.
  - There are flood prone areas in the Tana sub basin which include Dembia, Fogera and Gilgel abay areas
  - Agricultural lands and rural communities in these zones face recurring flood damages.
- **Lake Tana and Surrounding Areas**

- Seasonal water level fluctuations in Lake Tana, combined with heavy inflows from tributary rivers, contribute to flooding around the lake.
- Communities and farmland in the lake's periphery, particularly in low-lying areas, are frequently inundated.

- **Urban and Peri-Urban Settlements**
  - Expanding towns and peri-urban areas situated along the Abay and its tributaries face increasing risks from inadequate drainage systems, land use changes, and encroachment into natural floodplains

3.2 Tasks and Activities

The consulting firm shall undertake the following tasks and activities to support the assessment, planning, and feasibility evaluation of selected and prioritized flood protection projects:

- Task 1: Inception Report
- Task 2: Data Audit, Analysis, and Survey
- Task 3: Update of Hydrological and Hydraulic Analysis
- Task 4: Identify Multiple Options and Select Recommended Option
- Task 5: Hydraulic Modeling and Hazard Mapping
- Task 6: Application of Flood Risk Reduction Investment Framework
- Task 7: Feasibility Study of Prioritized Flood Protection Projects
- Task 8: Training and Capacity Building

Task 1: Inception

At inception, the following streams of work shall be mobilized:

a) Working with the client, the Consultant will develop a stakeholder map and engagement plan outlining objectives, methods, and a schedule. The existing Project Stakeholder Engagement Plan (SEP) will be evaluated, gaps identified, and customized for the Baro-Akobo and Abay Basins context for full implementation throughout the assignment. Security risks will be scoped and addressed through a comprehensive security risk assessment. All stakeholder engagement and social assessment activities will incorporate gender and social inclusion considerations, ensuring participation of vulnerable and marginalized groups and the collection of gender-disaggregated data.

b) Comprehensive technical review of all relevant data and reports for the work completed so far.

c) Reviewing available literature and studies to locate and map areas with a history of flooding.

d) The Consultant shall establish a framework demonstrating how environmental and social (E&S) risks, including gender and vulnerability considerations, will be identified, assessed, managed, and integrated across all project tasks. This shall include assessing differentiated impacts of flooding on vulnerable populations and infrastructure.

e) A high-level screening and assessment of available data and refinement of approach: all the main analytical and modelling 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 GoE 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

f) Preparing an "Issue Analysis" to be carried out for each location, delineating the type of flooding including riverine, urban, depression, storm surge, and others. The analysis should also include the nature of floods, such as their magnitudes and frequencies, and the causal factors that exacerbate their impacts. Such an approach would provide a comprehensive understanding of the flooding patterns and their underlying causes, thereby enabling the development of more effective measures to mitigate the impacts of future floods.

g) Preliminary Flood Risk Assessment and Identification based on available reports/data, which involve evaluating and identifying the level of risk related to potential flooding.

h) Preparation of a detailed methodology and program for all of the following tasks

i) Development of a refined integration and training plan including secondment, workshop, and training components, to be implemented through the project for the GoE (see task 3 for further details).

Task 1 deliverables:

A draft inception report including (1) a stakeholder engagement mapping identification of environmental and social data gaps, consultation plans, and a preliminary social and environmental risk assessment and an overview of data availability, highlighting key issues and possible data improvement strategy; (2) a detailed review of existing models and suitability for forthcoming tasks, as well as a proposed methodology with suggested additional or change in modelling software to be used; (3) a plan for each of consultation actions, program, risk, and data management plans; and (4) a revised integration and training plan summary and actions.

Task 2: Data collection and analysis (hydrological, meteorological, topographic, socioeconomic, etc.)

This task focuses on collecting and organizing all relevant data to support the feasibility study for selected investments in the Baro Akobo & Abay Basin. The aim is to provide a comprehensive understanding of

the basin's hydrological, meteorological, topographic, environmental, and socioeconomic characteristics, providing a foundation for detailed analysis

a) Collect historical and real-time hydrological data, including river discharge, water levels, and flow patterns in the Abay and Baro Akobo Basin.
b) Compile records of historical flood events to identify flood-prone areas.
c) 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.
d) Assess the quality and completeness of existing observational data and determine the need for supplementary field surveys.
e) Obtain high-resolution topographic data (e.g., Digital Elevation Models – DEMs) for basin terrain and elevation mapping.
f) Identify areas potentially prone to flooding, erosion, or landslides.
g) Collect information on the storage and operation of relevant existing and proposed reservoirs to support preliminary considerations for flood protection and Future River infrastructure planning.
h) Gather basic socioeconomic data, including population distribution, livelihoods, land use, and economic activities within the basin.
i) Conduct quality assurance checks of data collected from field surveys.
j) Compile data on ecosystems, biodiversity, and natural resources.
k) Document environmental conditions to support preliminary assessment of potential impacts of flooding and water resource management.

These activities will be executed with the involvement of key technical staff from MoWE and Basin Administration offices, using secondments, on-the-job training, and workshops. The consultant is expected to refine the proposed training and integration plan during the inception phase.

Task 2 deliverable Comprehensive Data Repository:

Centralized database containing collected hydrological, meteorological, topographic, socioeconomic, and environmental data.**Data Collection Report:** Documentation of all sources, methods, and findings from hydrological, meteorological, topographic, socioeconomic, and environmental data collection. **Preliminary GIS Mapping:** High-level maps showing basic topography, river networks, and preliminary identification of flood-prone areas (preliminary, for reference only).**Preliminary Socioeconomic and Environmental Summary:** High-level overview of population, livelihoods, land use, ecosystems, and natural resources.

Integrated Analysis Report: A summary document combining all data and analysis to provide a holistic understanding of the Baro Akobo & Abay Basin and support decision-making for the selected investments.

This task will ensure that all necessary data is collected, analyzed, and presented in a structured manner to inform the feasibility study. The deliverables will provide a solid foundation for identifying risks, opportunities, and priorities for investments in the Baro Akobo & Abay Basin.

Task 3: Hydrologic and Hydraulic Modeling and Hazard Mapping

This task builds on Task 2 by conducting detailed hydrologic and hydraulic analysis and modeling to assess flood hazards, identify vulnerable areas, define target flood events and intervention sites, and produce flood hazard maps. The objective is to provide an evidence-based foundation for flood risk management and investment planning in the Baro-Akobo and Abay Basins.**Key**

a) Model Selection and Setup

- Select and configure suitable hydrologic and hydraulic models.
- Prepare and use Digital Elevation Models (DEMs):
    - **30 m resolution** for basin-level analysis
    - **5–10 m resolution** for priority areas
- Include wetlands, reservoirs, and floodplains.
- Conduct surveys to fill data gaps.

b) Model Calibration and Validation

- Calibrate models using rainfall, flow, and historical flood data.
- Validate results against recorded flood events.
- Perform sensitivity and uncertainty analyses.

c) Scenario Simulations

- Simulate floods for multiple return periods (**2 to 1,500 years**).
- Model different flood types and conditions, including:
    - Fluvial and pluvial flooding
    - Reservoir operations
    - Climate and land-use change impacts

- Extreme rainfall scenarios (including PMP).

d) Hazard Mapping and Spatial Analysis

- Produce GIS-based maps showing:
  - Flood extent, depth, velocity, and duration
- Identify flood-prone areas and vulnerable infrastructure.
- Integrate flood data with population, land use, and infrastructure.

e) Target Flood Event and Site Identification

- Define design flood protection standards with stakeholders.
- Identify priority intervention sites based on risk and vulnerability.

f) Documentation and Reporting

- Prepare detailed reports on modeling methods, assumptions, results, and stakeholder inputs.

Task 3 deliverables:

- ✓ **Hydrological and Hydraulic Modeling Reports:**
  Technical reports covering model development, calibration, validation, scenario simulations, and hydraulic flood analysis results.
- ✓ **Flood Hazard Maps (GIS-Based):**
  2D flood maps showing flood extent, depth, velocity, zones, and vulnerability of communities and infrastructure.
- ✓ **Vulnerability Assessment Report:**
  Detailed assessment of exposure and resilience of communities, infrastructure, and key assets.
- ✓ **Target Flood Event Definition Report:**
  Documentation of selected design flood events and priority intervention sites.
- ✓ **Stakeholder Engagement Summary:**
  Summary of consultations, feedback, and recommendations from **MoWE**, Basin Administrations, and stakeholders.
- ✓ **Integrated Flood Hazard Modeling and Mapping Report:**
  Comprehensive report consolidating methodology, assumptions, results, maps, uncertainty analysis, and appendices.

- ✓ **GIS-Compatible Flood Hazard Database:**
  Digital database including DEM datasets, model outputs, spatial layers, and metadata.

Task 4: Identify Multiple Options and Select a Recommended Option for Each Intervention Site/Area

This task aims to identify, develop, and evaluate feasible flood risk reduction options for each confirmed intervention site. The objective is to recommend optimal solutions that are technically sound, economically viable, environmentally sustainable, and socially acceptable.

Given that the target basins are trans boundary, all options shall explicitly consider trans boundary effects, including upstream and downstream impacts across national boundaries, and ensure that recommended interventions do not adversely affect neighboring countries and, where possible, promote shared benefits.

a) **Identification of Options:**
For each prioritized intervention site identified under Task 3, develop at least at least three distinct alternatives (e.g., structural, nature based, hybrid) including concept layouts.

b) **Concept Development:**
Prepare preliminary design concepts and layouts for each option, including alignment of flood protection infrastructure (e.g., dykes, river training works, retention structures, structural, nature- based, hybrid).

c) **Technical Assessment:**
Evaluate options based on hydraulic performance using outputs from Task 3 (e.g., flood levels, depths, and flow characteristics), ensuring compatibility with target flood protection standards.

d) **Multi-Criteria Analysis (MCA):**
Develop and apply a transparent evaluation framework to compare options, considering:

- Flood risk reduction effectiveness (beneficiaries, protected assets, land area)
- Climate resilience and adaptability
- Multi-sectoral co-benefits (e.g., irrigation, access roads, water supply)
- Operation and maintenance requirements
- Environmental and social impacts (including resettlement implications)
- Constructability and use of local materials
- Cost estimates (capital and O&M) and cost-benefit considerations

e) **Design Optimization:**

Refine options to optimize cost and performance, ensuring:

- Efficient alignment to minimize length and cost while maintaining protection levels
- Design for exceedance (safe performance beyond design events)
- Consideration of river morphology and long-term stability
- Integration of nature-based and hybrid solutions where feasible
- Consideration of climate change impacts (extreme flows, temperature effects on materials)
- Assessment of whole-life costs (construction, maintenance, replacement)

f) **Integration of Reservoir and Catchment Conditions:**

Ensure options account for upstream and downstream influences, including reservoir operations, floodplain storage, and catchment characteristics identified in Task 3.

g) **Stakeholder Engagement:**

Conduct participatory workshops with MoWE, Basin Administration, and key stakeholders:

- Workshop 1: Define evaluation criteria, constraints, and priorities
- Workshop 2: Present and validate proposed options and obtain feedback

h) **Selection of Recommended Options:**

Select the preferred option for each intervention site based on the MCA results and stakeholder input, with clear justification.

i) **Identification of Further Study Needs:**

Highlight additional investigations required at the feasibility and detailed design stages (e.g., geotechnical surveys, detailed environmental and social assessments).

Task 4 deliverables:

1. Identification of at least three options for each flood intervention areas with a clear concept for each flood intervention sites, multi-criteria comparison, and rationale for the recommended option
2. Two workshops, the first of which to develop assessment criteria and understand constraints and concerns with the second as a final study session presenting the proposed flood mitigation measures design concepts and considering feedback,
3. Final design concept of recommended option, and

4. Recommendations for additional feasibility-level investigations/assessments and detailed design requirements.
5. Multi-criteria comparison table incorporating environmental, social, and economic considerations

Task 5 – Application of Flood Risk Reduction Investment Framework

The World Bank recently completed a consultancy to develop a strategic investment framework for flood risk management in Ethiopia. This Study will apply the framework as an appropriate and timely tool for guiding flood risk reduction planning. The framework adopts a risk-based approach, combining both qualitative and quantitative appraisal metrics to evaluate and prioritize proposed projects, ultimately supporting the formulation of a strategic investment plan for specific geographical or administrative areas.

The framework can be utilized to assess a variety of proposed flood risk reduction interventions and to establish baseline flood risk levels at the national and Woreda levels. It has previously been applied to numerous projects using the feasibility studies generated by an earlier consultancy. Consequently, the framework provides both a foundational reference and a practical mechanism for conducting this flood risk assessment. Based on updated flood hazard modeling, the investment cases will be revised to reflect the latest data and risk insights.

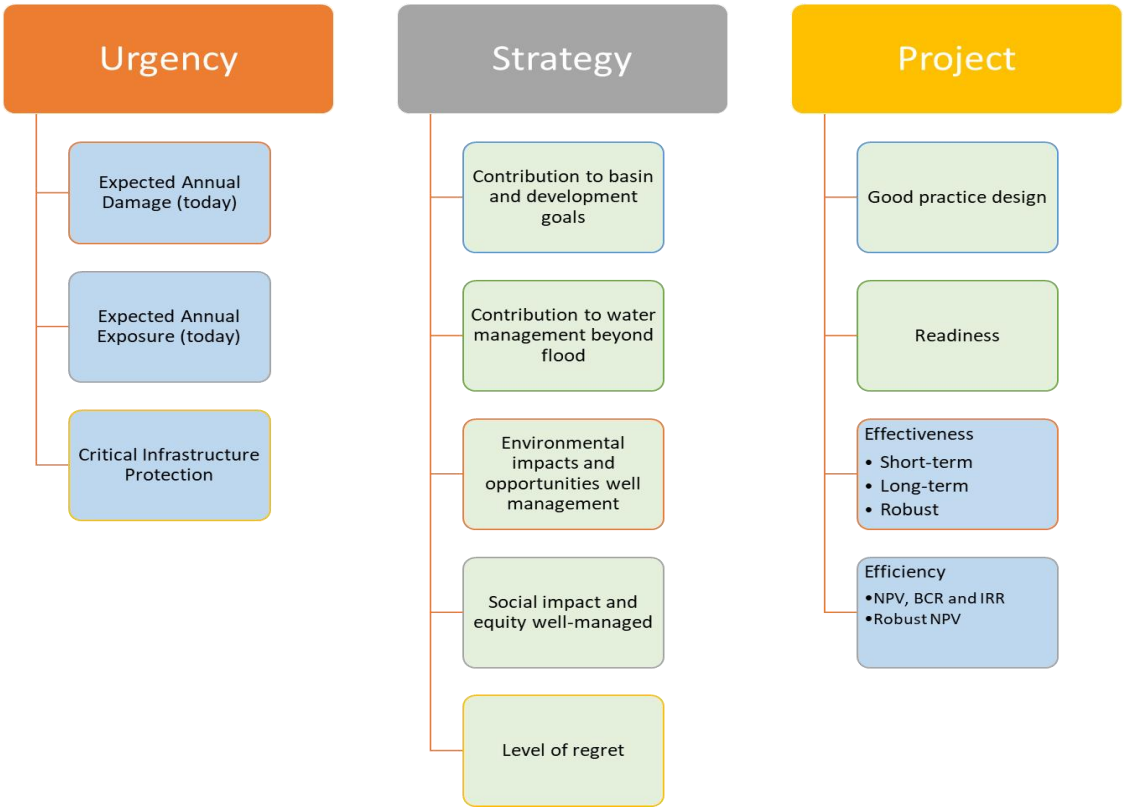


Figure 1: Overview of the strategic flood risk reduction investment framework recently developed for the GoE.

Task 5 Deliverables: A brief assessment report, utilizing the principles, methodology, and structure of the Strategic Investment Framework for Flood Risk Reduction in Ethiopia. The report should outline the technical methodology for the implementation of hard and soft flood control measures and results, including draft floodplain maps and flood forecast models as well as any issues and limitations impacting the implementation of the assignment. The Plan must include a management program which incorporates the establishment of Flood Water Control Zones, related policies and strategies, etc.

The consultant shall apply the framework to evaluate environmental sustainability and social inclusion of proposed interventions and the preliminary environmental and social impact assessment (ESIA) will inform feasibility and investment decisions.

Task 6: Concept Design and Feasibility Study

The Concept Design will present preliminary technical and spatial information for selected flood protection interventions in the Baro Akobo and Abay Basins. It will include conceptual engineering drawings, typical cross-sections, site layouts, and outline design specifications for both structural measures (e.g., dykes, levees, and retention ponds) and nature-based solutions (e.g., wetlands, buffer zones, and riverbank restoration).

The Concept Design shall be supported by a preliminary Bill of Quantities (BoQ), high-level cost estimates, and an implementation phasing plan, providing a clear basis for subsequent detailed design and procurement. Environmental and social considerations shall be fully integrated to ensure that proposed interventions are sustainable, climate-resilient, and socially inclusive.

Given that this task is resource-intensive and dependent on the scale of investment, the Consultant shall assume that the indicative scale of intervention sub-projects may range up to **USD 100–200 million per basin**. This indicative range is provided solely for the purpose of enabling bidders to appropriately estimate the level of effort, staffing, and technical resources required, and to support effective contract management and supervision by the Project Management Unit (PMU).

Feasibility Study Report

The Feasibility Study Report shall consolidate all technical, environmental, financial, and institutional analyses for the proposed interventions across both basins. It shall incorporate the outputs of hydraulic modeling, flood hazard and risk mapping, vulnerability assessments, options analysis, and cost-benefit evaluations, as well as findings from stakeholder consultations.

The report shall define implementation strategies, potential financing mechanisms, and monitoring and evaluation frameworks, together with a phased investment and execution roadmap. All supporting documentation, including GIS datasets, hydraulic and hydrological modeling files, and consultation records, shall be annexed to ensure the report serves as a comprehensive reference for decision-makers, development partners, and financing institution

Task 6 Deliverables

1. **Concept Design Report** the Concept Design Report shall present preliminary technical and spatial information for the identified interventions, including conceptual engineering drawings, site layouts, and outline design specifications for both structural and nature-based solutions. The report shall include a preliminary BoQ, cost estimates, and an implementation phasing plan, together with an assessment of environmental and social considerations to ensure climate resilience and sustainability.

   The report shall explicitly reflect the assumed indicative investment scale of up to **USD 100–200 million per basin**, to ensure alignment between proposed interventions and resource planning.

2. **Feasibility Study Report**

   The Feasibility Study Report shall consolidate all analytical components into a single, comprehensive, and coherent document. It shall present the outcomes of hydraulic modeling, flood hazard and risk assessments, vulnerability analyses, and economic evaluations, together with the results of stakeholder consultations, and shall be fully integrated with the environmental and social mitigation plans.

Task 7 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 MoWE & 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 shall conduct two rounds of five-day capacity-building training in Ethiopia for approximately 60 participants from federal agencies, regional governments, the Ministry of Water and Energy (MoWE), Disaster Risk Management (DRM) offices, and basin authorities. The training shall aim to strengthen flood risk management capabilities, including forecasting, structural modeling, and inter-agency coordination. The Consultant shall bear all costs associated with the training, including trainees' accommodation.
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) 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
e) facilitation workshop among federal level agencies and between federal and regional level governments to build the capacities of the MoWE, DRM offices and Basin management authorities

Subtasks are therefore:

- Screening of institutional awareness and capacity to utilize risk-based approaches in IFRM and strategic planning.
- Based on this screening, the Consultant shall develop a stakeholder engagement and training program comprising three (3) workshops, each lasting three days. The Ministry shall cover the workshop-related expenses, while the Consultant shall bear its own costs associated with participation.
- A 3-day exposure visit abroad, excluding transportation days, will be conducted for five professionals and senior officials to sites of a similar Tran's boundary nature.

Task 7 deliverables: Deliver training and capacity-building workshops.

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. Delivery of the training program in collaboration with the client, along with the submission of a comprehensive report on the capacity-building activities.
4. Organization of an exposure visit for seven senior officials and experts to a European country with river characteristics similar to the Abay & Baro Akobo 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.

Task 8: 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 Abay and Baro Akobo 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 **12 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 1. Duration and deliverables

S.No	Tasks	Deliverables to be Submitted to MOWE	Due (from Contract Signing)	Remarks
1	Kick-off Meeting	Kick-off Meeting Minutes	Within 1 week	To ensure proper inception and alignment of expectations
2	Inception Report	Draft Inception Report	1 month	Shall include thorough review of existing studies, including Abay & Baro Akobo Rivers and several dam projects
		Client Comments on Draft	Within 1 weeks after draft submission	Review by Client (MOWE)
		Final Inception Report (Revised)	1.5 months	Incorporating Client feedback
3	Data Audit, Analysis and Survey	Draft Data Audit and Survey Report	3.5 months	Includes validation of available data and identification of gaps
		Client Comments	Within 1 weeks	
		Final Data Audit and Survey Report	4 months	Revised submission
4	Update of Hydrological and Hydraulic Analysis and Setting Target Flood Events and Sites	Draft Hydrological and Hydraulic Analysis Report	5 months	Includes target flood events and confirmed sites
		Client Comments	Within 1 weeks	
		Final Hydrological and Hydraulic Report	5.5 months	Revised submission
5	Identify Multiple Options, Select Recommended Option, and Conceptual Design Covering Associated Infrastructures	Draft Options Analysis and Conceptual Design Report	7 months	Requires stakeholder consultations including community engagement
		Client Comments	Within 3 weeks	Includes stakeholder validation

S.No	Tasks	Deliverables to be Submitted to MOWE	Due (from Contract Signing)	Remarks
		Final Options and Conceptual Design Report	7.75 months	Revised submission
6	Hydraulic Modeling and Hazard Mapping	Draft Hydraulic Modeling and Hazard Mapping Report	9 months	Can be conducted in parallel with Task 5
		Client Comments	Within 2 weeks	
		Final Hydraulic Modeling and Hazard Mapping Report	9.5 months	Revised submission
7	Application of Flood Risk Reduction Investment Framework	Draft Investment Framework Application Report	10 months	Includes prioritization and screening of interventions
		Client Comments	Within 2 weeks	
		Final Investment Framework Report	10.5 months	Revised submission
8	Concept Design & Feasibility Study	Draft Concept Design & Feasibility Study Report	12 months	Includes preliminary design drawings, cost estimates, and feasibility findings
		Client Comments	Within 3 weeks	Detailed technical review required
		Final Concept Design & Feasibility Report	13 months	Revised submission
9	Training and Capacity Building	Training and Capacity Development Plan	At Inception Stage	Plan should identify milestones and training schedule
		Periodic Training Reports	Throughout consultancy	To align with technical deliverables
		Final Training and Capacity Building Report	13 months	Final submission at end of consultancy

The total duration for completing the Feasibility Study and Detailed Design is thirteen (13) months, commencing from the date the Consultant signs the agreement. The deliverables for Tasks 2 to 8 shall be prepared independently for each of the two basins.

For each major deliverable, the Consultant shall submit a draft. The Client will provide consolidated comments within 10 calendar days of receipt. The Consultant shall submit the final within 10 calendar days after receiving comments.

Conflict of Interest (COI)

Consultants must comply with the **World Bank Procurement Regulations on conflict of interest**. Participation in this assignment **may affect eligibility for related downstream assignments**, including future phases, as outlined in the Regulations. All team members must declare any existing or potential conflicts, and these declarations shall be maintained and monitored throughout the consultancy. Medium-risk COI flags will be assessed, and the Client reserves the right to require mitigation measures or replacement of personnel to maintain procurement integrity.

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;
- 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;

- The Consultant shall undertake Environmental and Social Assessment and prepare appropriate safeguard instruments in accordance with national legislation and World Bank ESF.

- 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 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

a. 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:

- ✓ Data organization and standardized naming conventions for all files, datasets, and reports for both basins;
- ✓ Version control procedures for models, reports, drawings, and datasets, including change logs and revision tracking;
- ✓ Backup and data security protocols, including periodic backups, off-site storage, and recovery procedures;

- ✓ Metadata standards consistent with international standards such as ISO 19115 and INSPIRE, describing datasets, spatial reference systems, data sources, accuracy, and limitations;
- ✓ Data quality assurance and validation procedures for hydrological, hydraulic, survey, and GIS datasets;
- ✓ Data sharing and access protocols for MoWE, Basin Development Offices, and the World Bank.

b. 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 Abay and Baro Akobo;
- Provide controlled access for the Client and relevant stakeholders;
- Ensure regular synchronization and backups.

c. Data, Models, and Digital Outputs Delivery

The Consultant shall deliver all datasets, models, input/output files, scripts, and digital outputs in **open or non-proprietary formats** wherever 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 all necessary **licenses, viewers, or access rights** to review, use, and update the models and datasets. All outputs shall include **documentation sufficient to allow replication** of analyses and modelling.

Any personal or sensitive data collected shall be **minimized, anonymized, and handled in accordance with applicable laws and Good International Industry Practice**, ensuring that no personally identifying information is published or shared in project deliverables.

d. 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.

e. 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.

f. 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, as well as the requirements of this ToR.

QA/QC Plan Requirements:

- **Technical Verification and Validation:** Procedures for verification and validation of hydrological and hydraulic models, engineering designs, drawings, cost estimates, and other analyses.
- **Documentation:** Clear recording of assumptions, data sources, methodologies, calculation procedures, and version control.
- **Roles and Responsibilities:** Defined responsibilities for key personnel overseeing QA/QC.
- **Error Handling:** Procedures for identifying, addressing, and correcting deficiencies or errors.
- **Internal Peer Review:** All key deliverables—including feasibility reports, models, flood hazard and risk maps, engineering designs, technical specifications, and cost estimates—shall undergo internal peer review by senior experts **not directly involved** in preparing the deliverables. Reviewer comments, actions taken, and a **Quality Assurance Statement** confirming compliance with ToR and international standards shall be documented.
- **Client Review and Acceptance:** Deliverables shall be submitted to the Client only after internal QA/QC and peer review. The Client may request revisions, additional verification, or independent review as necessary. Final acceptance is contingent on compliance with QA/QC requirements.

KPIs and Measurable Standards:

- Model performance metrics (e.g., **Nash-Sutcliffe Efficiency ≥ 0.7**, where data allows, with documented calibration/validation).
- Map accuracy consistent with the horizontal resolution and quality of input DEMs.
- Adherence to agreed timelines for internal reviews, Client submission, and feedback cycles.
- Full implementation of QA/QC procedures, including internal peer review, version control, and documented corrections.

Data and Digital Deliverables:

- All datasets, models, input/output files, scripts, and digital outputs shall be delivered in **open or non-proprietary formats** wherever feasible (e.g., GeoTIFF, Shapefile/GeoPackage, CSV, NetCDF, PDF, DWG/DXF, HEC model files).
- Where proprietary software is used, the Consultant shall provide all necessary licenses, viewers, or access rights to enable the Client to use, review, and update models and datasets.
- Deliverables shall include sufficient documentation to allow **replication** of analyses and modelling.

- Personal or sensitive data shall be minimized, anonymized, and handled in accordance with applicable laws and Good International Industry Practice, ensuring that no personally identifying information is published.

8. Financial Proposal

The Consultant is required to prepare 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.

- ✓ **Conflict of Interest Compliance:** Declare any actual, potential, or perceived conflicts of interest immediately. Non-compliance may affect the Consultant's eligibility for downstream assignments or related contracts.

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 Abay and Baro Akobo basin level studies, as outlined in the Terms of Reference (ToR), to ensure effective implementation.

- ✓ Lead flood risk management Expert (Team Leader)
- ✓ Senior Hydraulics Engineer
- ✓ Senior Hydrologist
- ✓ Water Resource/Irrigation Engineer
- ✓ Structural Engineer
- ✓ Infrastructure Engineer
- ✓ Environmental safeguards specialist
- ✓ Social safeguard specialist
- ✓ Mechanical Engineer
- ✓ Geotechnical Engineer

Table 2 consultant key expert requirement

No	Required Key experts	Required Number	Qualification	Relevant experience
1	Lead flood risk management Expert (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	15 yrs working experience in related task including 5 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	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	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	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	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	8 yrs working experience in related task

No	Required Key experts	Required Number	Qualification	Relevant experience
			related field	
7	Environmental safeguards specialist	2	Bsc or above in Environmental engineering, environmental science, natural resource management or related field.	8 yrs working experience in related task
8	Social safeguard specialist	2	Bsc or above in Antropology Social Works, or related field	8 yrs working experience in related task
9	Mechanical Engineer	2	Bsc or above in mechanical engineering or related field	6 yrs working experience in related task
10	Geotechnical Engineer	2	Bsc or above in Soil science, geology hydrogeology or related field	6 yrs working experience in related 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.

The Consultant shall provide CVs and signed statements of availability for the project duration. The proposed team must collectively demonstrate all required competencies.

Table 3. Proposed Staffing and Time allocation for the assignment

No	Required Key experts	Unit	Required Number	Office	Field	Total
1	Lead flood risk management Expert (Team Leader)	Month	2	6	7	13
2	Senior Hydraulics Engineer	Month	2	2	6	8
3	Senior Hydrologist	Month	2	2	6	8
4	Dam operation Expert	Month	2	1	3	4
5	Water Resource/Irrigation Engineer	Month	2	2	3	5
6	Structural Engineer	Month	2	1	2	3
7	Environmental safeguards specialist	Month	2	1.5	3.5	5
8	Social safeguard specialist	Month	2	1.5	3.5	5
9	Mechanical Engineer	Month	2	1	2	3
10	Geotechnical Engineer	Month	2	1	4	5

The allocated man-month schedule for both office and field activities is assigned individually to each professional.

- The experts must have proven experience in different and diverse projects (design and construction supervision, hydrological analysis, geotechnical study, geological investigation, hydrogeological study, etc.);

11.Payment Schedule

The indicative payment schedule shall be:

- **Payment 1 – First Payment (15%)**
    - Payable upon submission and **approval by MoWE** of the **Final Inception Report** (Task 1).
    - The report must incorporate all client comments and include:
        - Detailed methodology and updated work plan
        - Stakeholder engagement and security plan
        - Data availability assessment and improvement strategy
        - **Approved Training & Capacity Building Plan** (Task 8)
- **Payment 2 – Second Payment (25%)**
    - Payable upon submission and **approval by MoWE** of the **Draft Interim Report Package** covering independently for tow Basins:
        - Task 2: Data Audit, Analysis and Survey Report
        - Task 3: **Hydrologic and Hydraulic Modeling and Hazard Mapping**
    -)
- Payment 4-Fouth Payment (20 %)

  Payable upon submission and **approval by MoWE** of the **following deliverable**

    - Task 4: Options Identification & Selection Report (including recommended concept)

  Requires successful completion of the first stakeholder/co-design workshop (Task

- **Payment 3 – Third Payment (25%)**

- Payable upon submission and **approval by MoWE** of the **following deliverable Feasibility Study Report independently for tow Basins** covering:
    - Task 5: Application of Flood Risk Reduction Investment Framework Report
    - Task 6: **Draft Feasibility Study & Concept Design Report** (for prioritized interventions in both basins)

- **Payment 4– Final Payment (15%)**
    - Payable upon submission, approval, and completion of the following and all remaining deliverables, including:
        - **Final Feasibility Report**(hard and soft copies with all data, models, and databases for both basins)-For two Basins Independently
        - **Final Training & Capacity Building Report** (including workshop materials, training records, and exposure visit report as per Task 8).
        - A **Final Consolidated Archive** containing all digital data, models, GIS layers, and project outputs in agreed formats for both basins- For two Basins Independently
        - Final Approval of Remaining tasks listed in the ToR.