**GOVERNMENT OF TANZANIA**

**Ministry of Water**

**Terms of Reference**

**Consultancy for the assessment of the feasibility, design and construction supervision of a Managed Aquifer Recharge (MAR) system to increase water resilience of the City of Dodoma**

# I. BACKGROUND and ConeXt

* 1. The City of Dodoma is experiencing water stress. Located in a semi-arid area with no perennial rivers nearby. At this state the city is entirely relying on groundwater pumping. Although Dodoma is the administrative capital of Tanzania since 1974, only three years ago, Ministries started relocating from Dar es Salaam to Dodoma. The current population is around 500,000 inhabitants but it is expected that due to the Government relocation to Dodoma, the population will grow significantly in the coming years. Water demand is increasing for domestic use as well as economic activities expected due to the growing population.
  2. The current water source for the City of Dodoma is the Makutupora Aquifer. The well field is located 27 km north of Dodoma and produces around 50,000 m3/d. Due to the shift of the seat of the Government to Dodoma, water available for the city is getting close to its limit. To meet the expected increase in water demand, the government also plans to do a bulk water transfer from Mtera dam about 140 Km away from the city and construct a new storage at Farkwa, located 116 km from the City of Dodoma. However, increased water supply through integrated urban water management, enhanced natural storage and improved aquifer recharge would continue to be backbone of the water supply for Dodoma city which among other things would keep the water tariff affordable.
  3. **Makutupora Aquifer and Well Field**. The Dodoma Urban Water and Sanitation Authority (DUWASA) owns and operates the Makutupora well field, pipeline from well field to the city and the city water supply distribution network. Several hydrogeological studies have been conducted to learn more about the capacity and behaviour of the Makutupora Aquifer. The most important studies are Shindo (1990), Rwebugisa (2008), Taylor (2013), Maurice (2018) and Kashaigili (2019).
  4. These studies indicate that Makutupora Aquifer is a semi-confined fault aquifer consisting of highly fractured basement (granite and gneiss). The upper part of the fractured basement consists of weathered basement material (saprolite) on top of which, sand and gravel layers can be found. The sand and gravel layers in turn are covered by clay (Mbuga Clay). In the well field, the thickness of the layers vary considerably.
  5. The Makutupora Basin is bordered in the north-east by the Chenene Hills. Run-off, generated at the Chenene Hills, partly infiltrates at the foot of the hills and downstream pediments and floodplain and partly flows through the Kinyasungwe River draining into the area located south-east of the Makutupora Well Field. This area (wetlands) consists of clay (Mbuga Clay), which prevents infiltration into lower layers. The wetlands contain water for about 3-4 months per year most of it evaporating or draining through the Little Kinyasungwe River towards the Hombolo Dam. Besides the Kinyasungwe River, also the lesser Madihi River and Nzuga River are contributing to the wetlands.
  6. The Makutupora Well Field contains twelve production boreholes, which currently produce around 50,000 m3/d. Four boreholes are stand-by and if utilized, the production of the well field could be increased to 61,500 m3/d. The yield of each of the production boreholes is above 100 m3/h. In general, transmissivities are less than 1 m2/d and rarely greater than 10 m2/d in weathered crystalline bedrock aquifers, but the Makutupora Well Field is exceptional with transmissivities around 1,000 m2/d. However, within the well field, transmissivities may vary considerably from one location to the other.
  7. The most recent studies concluded that significant recharge takes place through ephemeral streams, but only during intensive rainfall events or a period of consecutive rainfall events of medium to high intensity. Historical groundwater levels show several years with zero recharge, compensated by a few years with high recharge.
  8. Groundwater production from the Makutupora Well Field started around 1950, but from 1980 onwards the abstraction increased considerably. There is a linear relationship between abstraction and drop of the groundwater level. With a current abstraction of 50,000 m3/d and without recharge, the groundwater level in the centre of the well field drops 2.6 meter a year. This means that the aquifer should be replenished completely every 4-5 years to avoid substantial depletion of the aquifer.

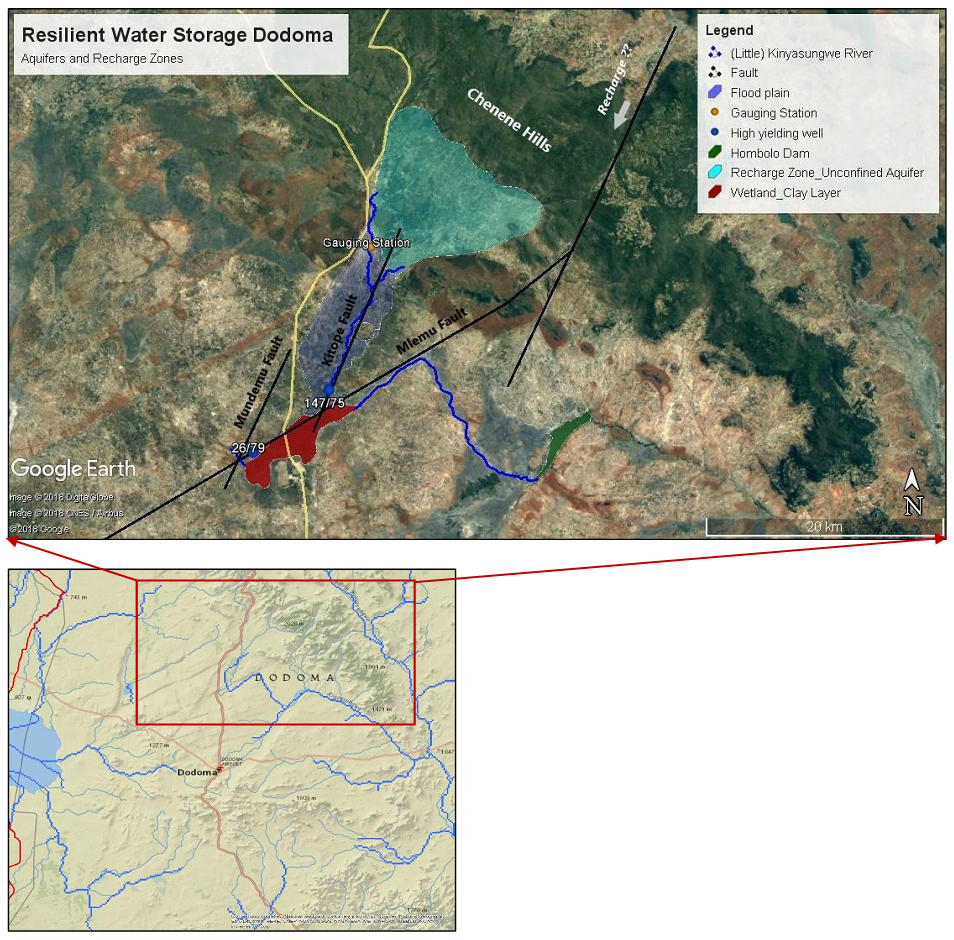


Figure 1: Makutupora Fault Aquifer and Recharge Zone

* 1. In general, the groundwater quality is good, but in 2008 a field study reported high nitrate concentrations near the Makutupora Well Field. Various agricultural land uses caused high nitrate concentrations in groundwater (exceeding 150 mg/l). To avoid further pollution of the water source for the City of Dodoma, a total protection zone was established in 2012. The delineation of the protection zone was based on the extent of the well field and the recharge zones.
  2. The Ministry of Water (MoW) and DUWASA collect the following data regularly:
* Rainfall and evaporation records from the weather station at the Makutupora Well Field
* Rainfall data from a weather station downstream Meia-Meia
* Rainfall data from the weather station in Dodoma City (data available since 1922)
* Rainfall data from a weather station at Itiso behind the Chenene Hills (data available since 2008)
* Runoff data from a gauge at Meia-Meia (AWLR, functioning) in the Kinyasungwe River upstream of the well field (inflow) and runoff from a gauge in the Little Kinyasungwe River at Chihanga (AWLR, functioning) downstream of the well field and wetlands.
* Groundwater levels and Electrical Conductivity from monitoring wells in and around the well field. Groundwater level recording started in 1955. 11 boreholes are used for monitoring (in general, abandoned production boreholes or low-yielding boreholes), but not all boreholes are monitored simultaneously (only a few wells at a time).
* Pumping tests have been conducted in 2014 in seventeen (17) boreholes, situated in and near the Makutupora Well Field.

**II. Scope of Work**

1. The main objective of the consultancy is to improve the long-term yield from the Makutupora aquifers by enhancing natural recharge to these aquifers, improve management of the existing Makutupora aquifers and identify additional aquifers that can supply water for Dodoma. Develop structural and non-structure measures and interventions to achieve these objectives, prepare their detailed designs and bidding documents, and also carry out construction supervision of the works included in the project. The consultancy would consist of the following tasks.
2. **Task A.** **Delineation of the recharge areas for the Makutupora aquifer and collection of data, identification of interventions.** This would include, but not limited, to the following:
3. **Review, collect and document all the existing information** and examine all the available reports and data relevant to the Makotupora aquifers, recharge tracer studies done in the past, their management, pumping systems and water transfer system for Dodoma city;
4. **Review, update and carryout hydro-geological assessment** of the Makotupora Basin using long term hydrological data, geological studies, provide an assessment of the water recharge and safe yield, and carry out additional studies to identify and delineate the areas for new groundawater developement or recharge to the existing aquifers;
5. **Develop, full understanding of characteristics of the Makutupora aquifers.** This would include following activities:
   * 1. check the GPS coordinates and depths and measure the altitudes (ground level and reference point at the borehole for groundwater level measurement) of all existing boreholes in and around the Makutupora Well Field by means of differential GPS or theodolite. Map all existing boreholes.
     2. Map the extent of the Mlemu Fault and Kitope and Mundemu Faults, which are intersecting the Mlemu Fault, based on the lithological data, specific capacities (and/or transmissivity and storativity data, if available), collected during drilling works of the boreholes in and around the Makutupora Well Field. It is important to determine the exact location and extent of the faults, because of the complexity of the aquifer system (parallel faults, which may or may not be interconnected).
     3. the thickness and extent of the overlying sediments (sands and clay) with the help of the lithological data collected during the drilling works of the boreholes in and around the Makutupora Well Field.
     4. Execute a well inventory in and around the well field, making use of all available boreholes. The well inventory should also cover the phreatic aquifer between wellfield and Chenene Hills, within and beyond the limits of the geological structure delimited to its West by the Mundemu Fault and to the East by the Kitope fault. At least the following parameters should be measured: groundwater levels, Electrical Conductivity, Chloride and Nitrate. Map the groundwater levels and the Electrical Conductivity values in and around the well field and draw isolines. This information should be used for the interpretation of the geophysical measurements.
     5. Map aquifer geometry including extent of portions of the Mlemu fault, these should be supplemented by geophysical survey to confirm the extent of the Mlemu Fault and Kitope and Mundemu Faults, which are intersecting the Mlemu Fault (to determine the extent of the Mlemu Fault, some geophysical measurements should be conducted on the eastern side of the Chenene Hills);
     6. confirm the nature of the geological structure comprised between Mundenu and Kitope Faults and map the thickness and extent of the overlying sediment layers and depth of bedrock across this structure. The geophysical survey should cover the area between the wellfield and the Chenene Hills and include profiles/soundings on both sides of the lower ridge running parallel to the Chenene Hills some 10 km to the South. The sediment layers will be mapped with greater detail around the wellfield, including the thickness and extent of the Mbuga clay layer and sand and gravel layers, calcrete and weathered basement;
     7. determine depth of Mlemu Fault and advise on the potentiality to find water at greater depth (current max. depth of boreholes is 130 m);
     8. Adjust the map with the Mlemu Fault and Kitope and Mundemu Faults and overlying sediments and elaborate hydrogeological profiles including the area from the aquifer zone and wetlands till the Chenene Hills.
     9. **Determine the recharge areas,** the land use in the areas, land tenancy and the nature of structural and non-structural measures required for enhancing recharge to the existing as well as additionally identified aquifers;
     10. **Carry out stakeholder consultations and workshops** on findings of the Task A.
6. **Task B:** **Feasibility Studies for interventions to enhance the recharge in the Makutupora Aquifer, improving management of the Makutupora Aquifer and other potential aquifers near Dodoma City.** This would include, but not limited to the following activities:

**Task B1: Identify interventions for enhancing natural recharge to Makutupora aquifer**

1. In the areas identified for enhancing recharge to the Makutupora acquifer, carry out surveys and mapping to fully understand the land use, nature, land tenure system, social economic conditions, agriculture, and flora and fauna, etc,
2. Based on information collected and understanding identify structural measures such as rain water harvesting structures, retention dams, ponds, small reservoirs, and non-structural measures that can help to enhance natural recharge to the Makutupra and other aquifers identified in the Task B2. Identify the various interventions (Batch I) with approximate cost of US$20 million;
3. Using a multi-objective criterion possibly consisting of economic, social, and environment prepare ranking or the proposed set of structural and non-structural interventions (Batch II) for approximately US$10 million that would be carried out under this project;
4. Recommend key aspects of an institutional framework under-which the interventions may be implemented, including legal, regulatory, monitoring and protection measures, Land tenure;
5. Prepare feasibility level studies, covering technical, engineering, environment, social and economic aspects for the interventions proposed to be undertaken to meet the objectives and package then into implementable packages.

**Task B2: Identify potential aquifers in the vicinity of Dodoma City**

1. Carry out hydro-geological studies to identify other aquifers in the vicinity of Dodoma City that can be used for pumping water for supply to Dodoma city;
2. Execute a detailed geophysical study in and around these most promising fault zones.
3. Drill test boreholes and execution of pumping tests, to determine the capacity of these potential aquifers. Describe the lithological logs and estimate depth of water strikes, depth of the aquifer(s), installation depth of the screens (if required) and supervise the test pumping and interpret the data (step drawdown test (4 steps of 60 minutes each), constant discharge test (minimum of 24 hours) and recovery test), using an interpretation method for fault zones.
4. Rapid recharge assessment: If a potentially suitable aquifer is found, the potential recharge should be estimated based on the type of aquifer (fault zone and overlying sediments), presence of streams and catchment area.

**Task B3:** **Improvement of Makatupora pumping system.**

1. Identify and propose measures to improve the performance of current water pumping and transfer system from Makutupora wells that can improve water accounting, management, efficiency of operation modernize is using SCADA system for the whole operation.
2. Prepare detailed designs and bidding documents for the interventions to be included in the project for implementation.
3. **Task C: Preparation of Environmental Assessment and Environmental Management Plan, Social Impact Assessment and Resettlement Action Plan and Environmental and Social Management Plan (ESMP)** This would include, but not limited to the following activities:

**Task C1:** **Environmental Assessment and Environmental Management Plan.** Consultants would undertake Environmental Assessment (EA) and prepare and Environment Management Plan (EMP) for each sub-project, in this case each contract. EA/EMP would make part of the design reports and summary reports would be included in the main design report. The EA/EMP should be consistent with the procedures for conducting the Environmental Assessment and in conformity with the clearance requirements of the Government of Tanzanian, and the World Bank Operational Policies on Environmental Assessment. The sub-project/contract EA/EMP would be prepared in line with overall Environment Management Framework (EMF) prepared for the Project. The EA/EMP should cover potential environmental adverse impacts of the construction activities as well as of the operation of the Project. EMP would consist of mitigation measures, a monitoring program, an institutional development/strengthening program for the implementation of the EMP and cost estimate for its implementation. Prepare scope of work, terms of reference and a plan of how various mitigating measures would be implemented either through making them part of the construction contracts for project facilities or through additional works or consultancy contracts. The EMP would be incorporated to the extent possible in the construction contract where it is not possible additional works would be deigned. As part of the EA process, carry out, but not limited to the, following activities:

1. Collect and update information on Physical Environment. Physiography, climate, geology and seismology, soils, hydrology, groundwater, flooding, water quality, air quality, noise, and others.
2. Collect and update information on Biological Environment. Forests; natural vegetation i.e., trees, shrubs, herbs, scrub, grasses, medicinal plants, and others; fauna i.e., mammals, birds including migratory birds, reptiles, amphibians, insects, red listed species, fish species; biodiversity including carrying capacity; protected and non-protected areas including hunting, poaching, illegal fishing, benthic flora and fauna;
3. prepare the inventory of the trees to be cut for construction and a plan for tree plantation plan;
4. prepare inventory and maps of the protected areas including games reserves, wildlife sanctuaries, wetlands and other natural habitats within the irrigated areas, and particularly in the sub-Project areas;
5. assess possible impact of project works on adjacent protected areas or areas of ecological significance and include these in the design report. If necessary, propose and design alternatives and/or remedial works in such circumstances through detailed protected area management plan;
6. assess the effectiveness of on-going pest management plan and recommend measures to bridge the gaps in its implementation and enhancing benefits for the betterment of environmental conditions associated with improved irrigation.
7. prepare cumulative environment assessment considering all ongoing, in planned and future schemes and their possible impacts.
8. assist in review and clearance of EA/EMP from the monitoring and evaluation consultants, Tanzania NEMC (Tanzania EPA) and other relevant authorities and the World Bank,
9. Propose Institutional Arrangements: provide assessment of the institutional arrangements with clear role and responsibilities of implementation agencies including MoW, DUWASA, Supervision Consultant and Contractors. Identify capacity building needs related to environment, health, safety and social aspects within the implementing entity and project staff. In particular, the occupational health and safety (OHS) practices during construction as well as O&M phases will be studied. Formulate recommendations for capacity enhancement based upon above assessment.
10. The Legislative and Regulatory Framework: The report on the Legislative and Regulatory Framework should include review of the national and provincial environmental requirements. Indicate relevant international environmental agreements to which the country is a party. Review WB Environmental and Social Framework (ESF) as well as Environmental and Social Standards (ESS) relevant to the Project and state the actions taken/planned in response to each ESS and review of World Bank Group Environmental, Health and Safety (EHS) Guidelines. As per initial assessment, ESS1, ESS2, ESS3 and ESS10 of WB ESF is relevant to the project and consultant is expected to review the requirements under these ESSs. This section should also include analysis of legislation on labor and working conditions, as well as any regulations on public consultation and dissemination of information.
11. Analysis of Alternatives: Analysis of Alternatives should systematically compare feasible alternatives to the proposed project site, technology, design, and operation--including the "without project" situation--in terms of their potential environmental and social impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; their suitability under local conditions; and their institutional, training, and monitoring requirements. For each of the alternatives, quantify the environmental and social impacts to the extent possible, and attach economic values where feasible. State the basis for selecting the particular project design proposed and justify recommended emission levels and approaches to pollution prevention and abatement
12. Findings of Detailed Baseline Studies and Analysis: Detailed baseline studies and analysis should assess the dimensions of the study area and review relevant physical, biological, and socioeconomic conditions, including any changes anticipated before the project commencement. Study current and proposed development activities within the project area but not directly connected to the project. Also analyze the trends in the key environmental and social parameters of the area. Data should be relevant to decisions about project location, design, and operation.
    1. **Task C2:** **Social Impact Assessment and Resettlement Action Plan.** Consultants would prepare sub-project specific social assessment in accordance with the overall Social Impact Management Framework (SIMF) of the project and Bank Guidelines and include in the design report. In this regard, Consultants would undertake, but not limited to the, following activities:
13. Collect information about the social environment. Population and demography; socioeconomic characterization of the population household size, age, gender (existing country gender diagnostics; country-wide and region-specific data violence against women; data and/or information on cultural practices vis-à-vis women (early marriage, physical practices); existing services available from gender-based violence (GBV) services providers, quality, accessibility and gaps), ethnicity, language, literacy/education; social organizations and dynamics and types of vulnerability; health and education levels; access to basic services and facilities such as healthcare, education, drinking water and sanitation etc.; income and occupation; assets; sources of livelihood (particularly for women); land use and natural resources including agriculture, livestock, grazing, forestry; land tenure system; occupations structure; household income and expenditure; economic activities e.g. quarrying of minerals, tourism, fisheries, trade, services; social infrastructure and services including education, health, communications, others; vehicular traffic particularly used for commercial activities; access, law and order and security situation; community organizations; vulnerable groups and poverty situation; gender aspects; recreation areas/potential; cultural heritage; archaeology; objects of special interest, e.g. graveyards and monuments; and others.
14. undertake social assessment of the Project and its sub-projects; carry out social impact assessment due to possible changes in canal operation and/or closure during construction. Prepare construction methods and propose measures to minimize the disruption to canal supplies/operation during construction and propose mitigation measures to address any negative impacts;
15. undertake surveys to determine any “cultural property” (according to definition of United Nations) including sites having archeological, paleontological, historic, religious, and unique natural values in the project area and prepare proper documentation for such a cultural property. Determine the effect, if any, the Project may have on the cultural property and develop a plan for its preservation;
16. also develop procedure for handling any “chance find” during construction;
17. quantify the social impact of the project works on the project affected persons (PAPs) and prepare appropriate mitigation plans and Resettlement Action Plan (RAP) according to the Government policies and the World Bank Guidelines on involuntary resettlement and provisions of the Project social framework;
18. Consultants would prepare full Resettlement Action Plan (RAP) when applicable and in this context major activities to be carried out would include, but not limited to the following:
    1. Collect basic data needed for preparation of RAP; this would include (i) full census of affected persons—landowners (resident and non-resident), family members; (ii) full inventory of assets affected—land, structures, crops, productive trees; (iii) estimate of impact of loss on income of each household; (iv) compilation and analysis of laws pertaining to land valuation, acquisition and expropriation; (v) analysis of standard practices for land valuation, acquisition and expropriation; (vi) documentation of efforts made to minimize land acquisition/resettlement; and (vii) fully articulated options available to affected persons.
    2. establish a bench mark situation, sketch out property, houses, and other structures, trees vegetation, geo-profile in a map covered by the project works. Video-tapping may be used to support the bench mark situation;
    3. prepare alternatives to minimize land acquisition, the resettlement and displacement, prior to project start as well as during project implementation;
    4. design and implement a program to involve beneficiaries in project conceptualization, planning and implementation and to facilitate public awareness of the project and enhance its ownership;
    5. identify sites for relocation, involve PAPs in preparing alternatives for relocation sites, and preparing strategy for site and housing replacement;
    6. describe entitlements for each category of impact and specify that resettlement implementation will be based on specific provisions of agreed framework and the RAP; describe method of valuation used for affected structures, land, trees, and other assets; and prepare entitlement matrix; describe grievance redress procedures, for registering complaints, mechanisms for appeal, and process for approaching the civil courts;
    7. prepare a resettlement plan entitlement and policy matrix;
    8. propose institutional and organizational arrangement for the implementation of RAP including linkages with the Project implementing, local administration, NGOs and other related entities;
    9. prepare cost estimates of RAP implementation separately identifying the administrative costs, consulting services, equipment, and compensation under major categories, such as land, houses, trees, other property, cost of preparation of alternative sites, etc; and
    10. prepare RAP implementation arrangements and identify critical path actions for timely implementation of the project.

**Task C3:** **Preparation of Environmental and Social Management Plan (ESMP**). Combining the EMP and SMP (including RAP if required) Consultants would prepare combined ESMP that should include mitigation plan, compliance monitoring plan, effects monitoring plan including pollution prevention plan, construction camp management plan, occupational health and safety management plan, community health and safety management plan, traffic management plan, emergency response and preparedness plan, labor influx management plan, SEA/SH action plan (prevention and mitigation actions, awareness raising strategy targeting workers and communities, SOPs in the light of government instructions, World Health Organization (WHO), and World Bank for management of risks related to COVID-19, institutional arrangements for implementation and monitoring, training needs, documentation and communication protocol, grievance redress mechanism, cost of implementing ESMP, and mechanism to integrate ESMP with the project (e.g., through contractual clauses).

1. Environmental and social management plan should be prepared in such a way that the maximum items in mitigation and monitoring plan can be later incorporated in the bidding document as part of the Bill of Quantities (BoQ). The ESMP should follow the World Bank (WB) ESF, WBG EHS, Labor Influx, and SEA/SH Guidelines.
2. **Institutional Arrangement and Budgetary Estimates** should identify the institutional mechanisms, responsibilities, and budget, including monitoring and inter-agency coordination needed to implement the ESMP and ensure all environmental and social considerations, as well as prevention, mitigation and management aspects are properly operationalized.
3. **Capacity Building discussion** should include an assessment of institutional capacity to ensure proper environmental, social, health and safety management of the project, including implementation of sub-project environmental and social management and monitoring plans, and propose capacity.
   1. **Task D:** **Determine Cost Estimates, (Benefits and Economic and Financial Analysis) and Operation and Maintenance (O&M) - Cost Recovery and Water Tariff).** The activities under this would include, but not limited to, the following:

**Task D1: Determine Cost Estimates, Benefits and Economic and Financial Analysis**

1. based on the detailed analysis, studies and using appropriate methods to extrapolate various parameters prepare cost estimate of the Project (engineer’s cost estimate for the contract) including all costs, engineering, social and environmental as well as construction management and supervision;
2. Estimate total project costs, benefits and economic and financial returns for the total project. Identify project risks and carry out sensitivity analysis and impact on the economic rate of return; and
3. Propose optimal design considering economic returns.

**Task D2: Determine Operation and Maintenance (O&M), Cost Recovery and Water Tariff.**

1. Estimate O&M requirements of the Project and breakdown by its various facilities over its life;
2. Propose effective institutional arrangements, cost recovery, water rates/tariff for ensuring the proper O&M of the Project;
3. identify equipment, office and other facilities required for O&M of the project facilities; and
4. Review the prevailing recovery system for capital and O&M costs and water tariffs; and determine a rational method for allocating the cost and estimate water tariff required to recover cost of the project and overall water rates for managing Dodoma water system in a sustainable manner.
   1. **Task E:** **Preparation of detailed designs and preparation of bidding documents for proposed interventions.** The activities, under this task would consist of, but not limited to:
5. Prepare optimal contract packing for procurement and construction using World Bank Standard Bidding documents for large Works;
6. Prepare detail designs with suitable details required for bidding, Bill of Quantities (BoQs), engineering drawings, etc. technical specifications of all materials and equipment, and prepare the bidding documents for the optimal/agreed water transfer scheme and all of its components;
7. Prepare optimal procurement packaging, a procurement plan, method of procurement of various types of works in the Project;
8. Support Government in managing procurement website, assist and provide training operation of STEP (World Bank System managing procurement process) and prepare a procurement strategy;
9. prepare bidding (and other procurement) documents, based on current World Bank Standard Bidding Documents and forms of contracts;
10. prepare detailed engineer’s cost estimates for each contract package, construction period, warranty period etc;
11. prepare pre-qualifications documents for large contracts as agreed with the Government and the World Bank.
    1. **Task F –** **Supervision of construction and drilling works;** The Consultant would be responsible for supervision of construction and drilling works contracts and, in this context, would carry, but not limited to the following activities:
12. Consultants would be designated as the Engineer (or Project Manager) in the civil works, goods, and equipment supply and installation contracts and would be responsible for inspection and supervision of the construction works, installation of equipment and testing of construction material, in order to ensure that the works are implemented and goods supplied in accordance with the deigns, specifications and terms and conditions of the relevant contracts and standards. As mentioned above, Consultants would ensure that procurement of goods, services, civil works contracts is in accordance with the World Bank Polices and guidelines, the contract are signed, and managed properly including any changes or variation orders during implementation.
13. In the context of contract management, the Consultants would carry out, but not limited to, the following activities
14. Contract administration and management;
15. Inspection of construction activities, measurement of construction quantities;
16. Testing of materials on site, off-site testing when needed, as necessary the in-factory testing and inspection of good and materials;
17. Review of contractor’s submittals, verification of progress and interim payment requests;
18. Determination of final construction quantities, prepare as built drawings;
19. Preparation of monthly progress reports;
20. Maintenance of records;
21. Contract/works or goods acceptance and close of contract;
22. Preparation of operation, maintenance and management manuals for the facilities constructed under the project;
23. The consultants would carry out all obligations provided for the Engineer in the Civil Works contracts. In the event of contractual dispute which may result in legal action, adjudication or arbitration, between the contract and the employer, on the instruction the Consultants will collate and prepare factual documentation which describes the circumstances of the dispute. If required the Consultants would attend hearings.

**III. Implementation Arrangements**

* 1. **Consultancy Period and Reporting and staffing.** The consultants would report to MoW on day-to-day basis who would be the employer. The consultants would establish offices in Dodoma with sufficient staff for managing close coordination and working throughout the Project Consultancy service period and post adequate staff in the field to manage field activities during the preparation and construction supervision. Consultants would coordinate their work with other concerned entities responsible such as DUWASA, Agriculture, Forestry, Fisheries, Livestock, etc.

* 1. **Total period of consultancy services would be 30 months.** However, Task A would be completed in 2 months from start of the assignment; Task B would be completed in 4 months from start of the assignment; Task C and D in 7 months from start of the assignment; Detailed design in 9 months from start of the assignment. Some work under Task C and D would be carried out concurrently; Task E will be done for 15 months, other Tasks such as capacity building and knowledge transfer will be carried out concurrently in all tasks and continue until the end of the consultancy. The Reporting schedule and nature of reports is given in the Table below. The Consultants would prepare quarterly and annual reports describing progress of activities major issues and alternative solution to address them. They would also prepare mid-term review report and completion reports. Other report may be prepared time to time as required depending upon the issue. The Client will issue acknowledgment and acceptance letter for all reports submitted within two weeks after submission.

Table 3.2 reporting and timelines

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| **S/N** | **Type of Report** | **From Start the Consultancy** |
|  | Inception Report (covering all phases) | 1st Month since Start of Consultancy |
|  | Report defining scope of recharge area, possible interventions to manage recharge (Task A) | 2nd Months Start of consultancy |
|  | Pre - Feasibility Study report for interventions and/or sub projects to enhance the recharge in the Makutupora Aquifer, improving of Makutopora pumping operation and other potential aquifers near Dodoma City (Task B) | 4th Month since start of the consultancy |
|  | Feasibility studies for the Batch-II of the interventions and/or sub-projects of construction contracts, covering technical, environment and social (EMF and EMP, and SMF and SMP), and cost benefit analysis along with implementation plans and procurement procedure (Task C and Task D) | 7th Month since start of the consultancy |
|  | Detailed design of the Batch II of the subproject or construction contracts, biding documents, engineer’s cost estimates; along with updated EMP and SMP. (Task C, D and E of the Project) | 9th months since start of the consultancy. |
|  | Procurement of contracts for Batch II and award of contracts. | 10th – 15th months since of the consultancy |
|  | Construction supervision report, contract management, monthly and quarterly progress reports (Task F) | Throughout supervision consultancy |
|  | Project Management Assistance and support, technical assistance and training and capacity building (Task F) | Throughout supervision consultancy period |
|  | Prepare implementation completion report (Task F) | 30th months since start of Consultancy |

* 1. **Access to Data.** The Government of Tanzania its Ministries, Departments or Agencies will give the consultants access to all available data relevant to their task as per Government rules. The data shall include, but not be limited to, the following:

1. reports prepared by/for the government relating to the development of water sector projects including Dodoma water transfer from various sources, available groundwater assessment reports;
2. development of irrigation, drainage, flood control, fisheries, forestry and salinity control programs, extension services as well as supporting data;
3. plans of water projects, standard maps and surveys, aerial photographs, surface and ground water resources and monitoring data such as flood levels, groundwater table observation maps, water quality data, lithologic logs, hydraulic conductivity information, planning reports of relevant projects and so on;
4. Maps showing location of infrastructure, markets, roads, and other important features topographic and soil classification maps, land use, socio‑economic and environmental indicators;
5. Hydrologic data of the concerned river basins, design and operational reports of all water systems in eth area;
6. Information about the Makutupora well field and pumping operation;
7. Information about the Dodoma water supply network and storages etc,
8. relevant ordinances, legislation, regulations and administrative orders; and
9. any other data, information and maps necessary for carrying out the assignment
   1. **Staffing Requirements (Task A, B, C, D & E).** The multi-disciplinary project team, required for carrying out activities under Task A, B, C and D, shall have qualifications and experience in Hydrogeology, Geophysics, Economic Analysis, Environmental Management, Design Engineer and Hydrologist. The project team shall have past working experience in Sub-Saharan Africa and preferably in Tanzania. Fluency in English is essential for all team members. Working knowledge of Swahili is an advantage. The consulting firms is expected to be composed of key experts and person months indicated in the table below. However, the Consulting Firms are free to propose other appropriate staffing plans to meet the scope of the services. For the key-experts, at least 50% of the working days will be spent in the project area.

| Expert Ref/No | Team Member | Proposed No. of Staff | Input (Person Month) |
| --- | --- | --- | --- |
| K-1 | Team Leader/ (Civil Engineer) | 1 | 9 |
| K-2 | Hydrogeologist | 1 | 9 |
| K-3 | Geophysicist | 1 | 6 |
| K-4 | Design Engineer Expert | 1 | 6 |
| K-5 | Environmental Expert | 1 | 4 |
| K-6 | Community Development Expert | 1 | 4 |
| K-7 | Hydrologist | 1 | 2 |
| K-8 | Economist | 1 | 1.5 |
| K-9 | Financial Expert | 1 | 1.5 |

* + 1. Team Leader/Civil Engineer - Should have Master’s degree in Civil Engineering with extensive experience in managing multidisciplinary teams for water resources. S/he should have specific experience of working in senior techno-managerial position with at least 5 years as Team Leader on relevant projects. The incumbent should have minimum experience of 12 years with at least 5 years in related activities and international experience of working on projects in at least three countries. S/he should be able to lead the team of the consultants and assists Client in timely completion of the Services with a quality output.
    2. Hydrogeologist – Should have Master’s degree in Hydrogeology with extensive experience in Groundwater Management Projects and Studies. S/he shall have a minimum experience of at least 10 years of relevant experience, of which 5 years are international experience.
    3. Geophysicist – S/he should have at least a Graduate Degree in Geophysics, Hydrogeology or other related discipline and sound knowledge of execution and interpretation of geophysical survey in weathered crystalline basement. S/he shall have a minimum experience of at least 10 years of relevant experience, of which 5 years are international experience in conducting geophysical surveys.
    4. Design Engineer - S/he should at least be Graduate Degree in Civil Engineering or other related engineering disciplines from a recognized university. Master's degree in related discipline will be given additional weightage. S/he shall have a minimum experience of 10 years in and design of urban water supply projects with at least 5 years in the design of structures for water supply, pump stations, and tanks/reservoirs, water harvesting structures, irrigation and flood control structures, and international experience of working on projects in at least three countries.
    5. Environmental Expert - S/he should have at least graduate degree in Environmental Engineering or other relevant discipline. The incumbent must have an experience on preparation of Environment Management Plan and Environment Monitoring Plan. S/he should have a minimum overall experience of 10 years with at least 5 years exposure to the related activities. Association with similar work on similar projects will be preferred and international experience of working on projects in at least three countries
    6. Community Development Expert - S/he should have at least Master’s degree in Social Science or other relevant discipline and sound knowledge of the social safeguard policies and guidelines of the World Bank and Government. S/he should possess a minimum experience of 10 years with at least 5 years exposure to the related activities including preparing the Resettlement Action Plans (RAPs), social assessments, social safeguard analyses and relevant documentation, and in their implementation and monitoring in development sector. Experience with similar work on similar projects will be preferred and international experience of working on projects in at least three countries.
    7. Hydrologist - S/he should have at least Master's degree in Hydrology/Sediment or related discipline from a recognized university. S/he should have at least overall experience of 10 years with 5 years exposure to the related activities and international experience of working on projects in at least three countries
    8. Economist – S/he should have at least Graduate Degree in Economics or related discipline. S/he shall have a minimum of 10 years’ experience of which 5 years are international experience in determining project operation and maintenance (O&M), Cost Recovery and Water Tariff including MCA and CBA.
    9. Financial Analyst Expert – S/he should have at least Graduate Degree in Accounts or related discipline. S/he shall have a minimum of 10 years’ experience of which 5 years are international experience in determining project operation and maintenance (O&M), Cost Recovery and Water Tariff including MCA and CBA.
  1. **Staffing Requirements (Task F).** The project team required for Task F – Supervision stage shall have qualifications and experience in Civil Engineer, Hydrogeologist, Social and environmental safeguard. The project team shall have past working experience in Sub-Saharan Africa and preferably in Tanzania. Fluency in English is essential for all team members. Working knowledge of Swahili is an advantage. The Consultant will decide on the required support staff to implement the Consultancy Service, the following key-experts will be required:

1. **Team Leader (Civil Engineer):** S/he should have Graduate Degree in water resources engineering, civil engineering or any other related engineering disciplines. Team Leader will be responsible for the coordination of the supervision of all the construction of all infrastructural works. S/he shall have at least 15 years of relevant experience, of which 10 years international experience in the design of related water infrastructures.
2. **Hydrogeologist:** S/he should have a graduate degree in Hydrogeology or any other related discipline. Hydrogeologist will be responsible for supervision of the construction of the additional well fields. The expert shall have at least 15 years of relevant experience, of which 10 years international experience in conducting hydrogeological studies, including relevant working experience in sub-Saharan Africa.
3. **Social Safeguard:** S/he should have at least graduate degree in social science or any other related discipline. The Social Safeguard is responsible for ensuring proposed appropriate social mitigation measures from ESIA are met. The expert shall have at least 15 years of relevant experience, of which 10 years international experience in supervision of major construction work of similar nature, including relevant working experience in sub-Saharan Africa.
4. **Environmental Safeguard:** S/he should have at least graduate degree in Environmental Science or any other related discipline. The Expert is **r**esponsible for ensuring proposed appropriate environmental mitigation measures from ESIA are met. The expert shall have at least 15 years of relevant experience, of which 10 years international experience in supervision of major construction work of similar nature, including relevant working experience in sub-Saharan Africa.

Table 4. Required Key Personnel for Construction Supervision

| **Expert Ref/No** | **Team Member** | **Proposed No. of Staff** | **Input (Person Month)** |
| --- | --- | --- | --- |
| K-1 | Civil Engineer (Team Leader) | 1 | 15 |
| K-2 | Hydrogeologist | 1 | 10 |
| K-3 | Social Safeguard | 1 | 3 |
| K-4 | Environmental Safeguard | 1 | 3 |

* 1. **Recruitment of Consultant.** The consultants would be recruited using Consultant Quality and Cost Based Selection (QCBS) and the international firms would participate in the bidding. The international firms would be encouraged to make joint ventures with the national firms and institutes for carrying out this assignment. A short list of the qualified firms would be prepared and the technical and financial proposals would be invited for the Assignment at the same time.
  2. **Procurement Of Goods.** Purchase of Equipment, transport and vehicles including software if needed will be carried out according to the need of consultants using their own budget and cost included in the financial proposals. The Consultants shall maintain inventory list of all purchased equipment, vehicles and items etc. and submit details in quarterly reports. All these items shall be returned to MoW upon completion of contract with fair wear & tear condition.

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