



**REPUBLIC OF MOZAMBIQUE
MINISTRY OF PUBLIC WORKS, HOUSING AND WATER RESOURCES**



IDA Grant No. D110

TERMS OF REFERENCE

FOR

**CONSULTANCY SERVICES FOR THE PREPARATION OF A MASTER
PLAN FOR PEMBA AND NACALA WATER SUPPLY SYSTEMS**

Contract Nr. FIPAG/WASIS-II/CON-33/20

APRIL 2021

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PEMBA AND NACALA WATER SUPPLY SYSTEMS**

1 BACKGROUND

1.1 General

FIPAG, on behalf of the Republic of Mozambique, has received a financing from the World Bank toward the cost of Water Services and Institutional Support Project II (WASIS II) and intends to apply part of the proceeds toward payments under the contract to develop a **Water Supply Master Plan for:**

- i) Pemba (including districts of Metuge and Mecufi), and**
- ii) Nacala (including Nacala Porto and Nacala Velha).**

1.2 Institutional context in Mozambique

The Government of Mozambique (GoM) is implementing reforms in the urban water supply sector aimed at improving coverage, quality and efficiency of services. The reform program has involved the reorganization of sector Governance mechanisms, which have facilitated a transition towards decentralized water supply operations and management, including service regulation, investment planning and private sector participation in operations.

The GOM has taken steps to provide for:

- Reduced operating costs and increased efficiency, particularly through involving private sector in operations for water supply services in 21 major cities; Maputo, Matola, Boane, Beira, Quelimane, Nampula, Pemba, Dondo, Chokwe, Xai-Xai, Inhambane, Maxixe, Tete, Moatize, Chimoio, Manica, Gondola, Lichinga, Cuamba, Angoche and Nacala;
- Tariff adjustments that support financial sustainability; and
- Establishment of a Regulatory Board for the sector, which considers both service quality and financial performance.

The program for urban water supply also includes investments in rehabilitation and extension of systems. The GoM's implementation agency for the new urban water program is Fundo de Investimento e Património do Abastecimento de Água– FIPAG (Investment Fund and Water Supply Asset Holder).

FIPAG is responsible for the fixed assets of the water in 21 major cities' supply systems of cities under delegated management. It has the mandate to ensure that the public receives an adequate and safe water supply service that meets Mozambique standards for health and hygiene (the public service obligation), and is empowered to ensure these systems achieve autonomous, efficient and profitable water operations.

FIPAG received in 1999 the responsibility for 5 cities: Maputo (Matola and Boane), Beira (Dondo), Quelimane, Nampula and Pemba. In 2004, four additional cities were included under FIPAG management: Chókwè, Xai-Xai, Inhambane & Maxixe, in 2006 five additional cities: Tete, Chimoio, Manica, Moatize and Gondola and in 2009 four new ones fell under FIPAG's responsibility: Angoche, Nacala, Cuamba and Lichinga.

FIPAG is temporarily directly managing the operations of the water supplies and preparing new delegation contracts for all the cities under its responsibility, with the support of technical assistance for some of the cities.

1.3 WASIS II Project

The WASIS II Project, funded by the World Bank, has the objectives to (i) improve the performance, sustainability and coverage of water supply services in the six cities of Beira, Dondo, Tete, Moatize, Nacala and Pemba; and (ii) strengthen institutional and regulatory capacity for water supply services in the Northern, Central and Southern regions of Mozambique.

The project includes the following components:

Component 1: Rehabilitation and Expansion of Water Supply Production and Distribution

The proposed project will finance priority water supply investments in three major systems, serving six urban areas in the Northern and Central regions: (i) Pemba, (ii) Nacala, (iii) Beira and Dondo, (iv) and Tete and Moatize. The proposed production and distribution investments will enable an increase in coverage and will address key infrastructure issues towards improving efficiency and quality of services. Furthermore, the proposed water supply infrastructure will support and leverage institutional objectives, which include the creation of the Regional Water Utilities.

Component 2: Institutional Support

The focus of institutional support activities to be implemented under component 2 will be on supporting the decentralization of FIPAG operations by creating and strengthening three regional operating companies. This reform process will enhance the separation of function and corporate Governance structures, enable further autonomy, local accountability and efficiency in service delivery, and promote financial sustainability.

Component 3: Output-Based Payments for Connections for Low-Income Households

The objective of this component is to increase access to piped water for low-income households in the project cities and the Maputo Region by providing an output-based payment to the utility operator(s).

Component 4: Rapid Response funds

The objective of this component is to support disaster recovery actions in FIPAG systems. This component is a zero-budget disaster recovery contingency component that could be triggered in the event of a natural disaster through formal declaration of a national or municipal state of emergency, or upon a formal request from the Government in the wake of a disaster.

Component 5: Capacity Building and Operational Support to AURA – Autoridade Reguladora de Águas (Water Regulation Authority) formerly CRA-Conselho de Regulação do Abastecimento de Água (Water Supply Regulation Council)

The objective of this component is to expand and refine service quality and financial regulatory mechanisms for urban water supply in Mozambique.

1.4 Pemba Water Supply

Pemba is the capital of the Province of Cabo Delgado. It is a port city situated on a peninsula between the Indian Ocean and the Bay of Pemba.

The water supply to Pemba is based on groundwater pumped from the Metuge aquifer which is located along the Muaguide River. The Metuge wellfield is located some 50 km west of the city. The

existing 10 boreholes pump through 2 lines to the treatment plant at point A which are in the vicinity of the well field. Additionally, the city benefits from small wellfields (Murrebue and Chuiba) with 7 additional wells that contribute to availability of water in the city. The new 20 boreholes drilled under WASIS II are expected to provide another 18,000 m³/day, bringing the total ground water-based supply to 30,000 m³/day.

An iron and manganese removal plant was constructed, in 2007, under the project NWDP-II (Second National Water Development Project), close to the existing well fields. The present production capacity of the plant is around 12,000 m³/day, but under WASIS II project it will be rehabilitated to reach the nominal capacity of 15,000 m³/day. Apart from that, a new water treatment plant will be constructed with a capacity of 20.000 m³/day.

The existing transmission main from treatment plant, with 50 km and 450 mm diameter, with 2 intermediate pumping stations (points A and D) delivers water to the main distribution reservoirs located near the city (point F). The water is supplied along the route of the main to the villages of Metuge, Nangua, Mieze, Murrebue and Mutxara. In 2019, the existing DI transmission main (DN450mm) was rehabilitated and a new DI pipe DN 500 mm was constructed.

Under WASIS-II project it has also been planned (i) rehabilitation of existing distribution centers, (ii) construction of new distribution centers and (iii) rehabilitation and expansion of the distribution network.

The Pemba water supply system includes a total of eleven ground level reservoirs and five elevated towers with a total capacity of 15,000 m³ creating big challenges to operation particularly when electricity supply is not stable. The distribution network consists of approximately 406 km of pipes (including the transmission main), 19 252 domestic connections until 2020.

The table below presents a summary of the main connection categories for Pemba, including coverage and daily hours of distribution.

Description	Unit	Performance Indicators (Up to August 2020)
Active domestic connections	Nr	19,252
Standposts	Nr	107
Total Population	People	246,392
Population served	Nr	128,954
Coverage	%	52
Hours of Supply	hr	16

Table 1 – Summary of Pemba Water Supply Performance Indicators

One of the pre-conditions to be met in order to achieve high economic growth is the presence of good quality basic infrastructure, of which the availability of water is very important. At this moment, many industries demand from FIPAG a better water supply service, but unfortunately, they cannot be fully served, leading to a loss of economic potential. Beside this economic perspective, the population is expected to increase rapidly which will increase the water supply service needs to provide them with safe and affordable drinking water.

Pemba has enormous potential for development, driven by the discovery of gas deposits in the province of Cabo Delgado, expecting to place Mozambique as one of the main producers and exporters of gas worldwide. Therefore, Pemba, being the capital of the province of Cabo Delgado, and presenting a bay with the potential for the enlargement of the current existing port, which is

foreseen to be used as the main platform for the export of gas produced in the province. It is therefore expected a great growth population and industry, requiring better planning of the water supply infrastructure to meet the respective economic and social development.

Both economic and demographic developments will result in a substantial demand for good quality drinking water. Improvements in the current system and considerable expansions of the existing infrastructure are, therefore, required.

The schematic of Pemba Water Supply System is provided on the next page:

Esquema Altimétrico da Cidade de Pemba



LEGENDA

Grupo A Pemba
 Ano 2007-2011
 T1: 3125m³ e 1050ev
 B1: 3175m³ e 1050ev
 B2: 3275m³ e 1050ev
 T2: 3125m³ e 1050ev
 B3: 3175m³ e 1050ev
 B4: 3275m³ e 1050ev
 F: 3250m³ e 1050ev

ETA
 Ano 2012
 Demais: 3000m³ e 1450ev
 Reserva: 2000m³ e 1450ev
 Demais: 3000m³ e 1450ev
 Reserva: 2000m³ e 1450ev

Ponto B
 Ano 1992
 Demais: 3600m³ e 1050ev
 Reserva: 2000m³ e 1050ev
 Reserva: 2000m³ e 1050ev
 Demais: 3600m³ e 1050ev

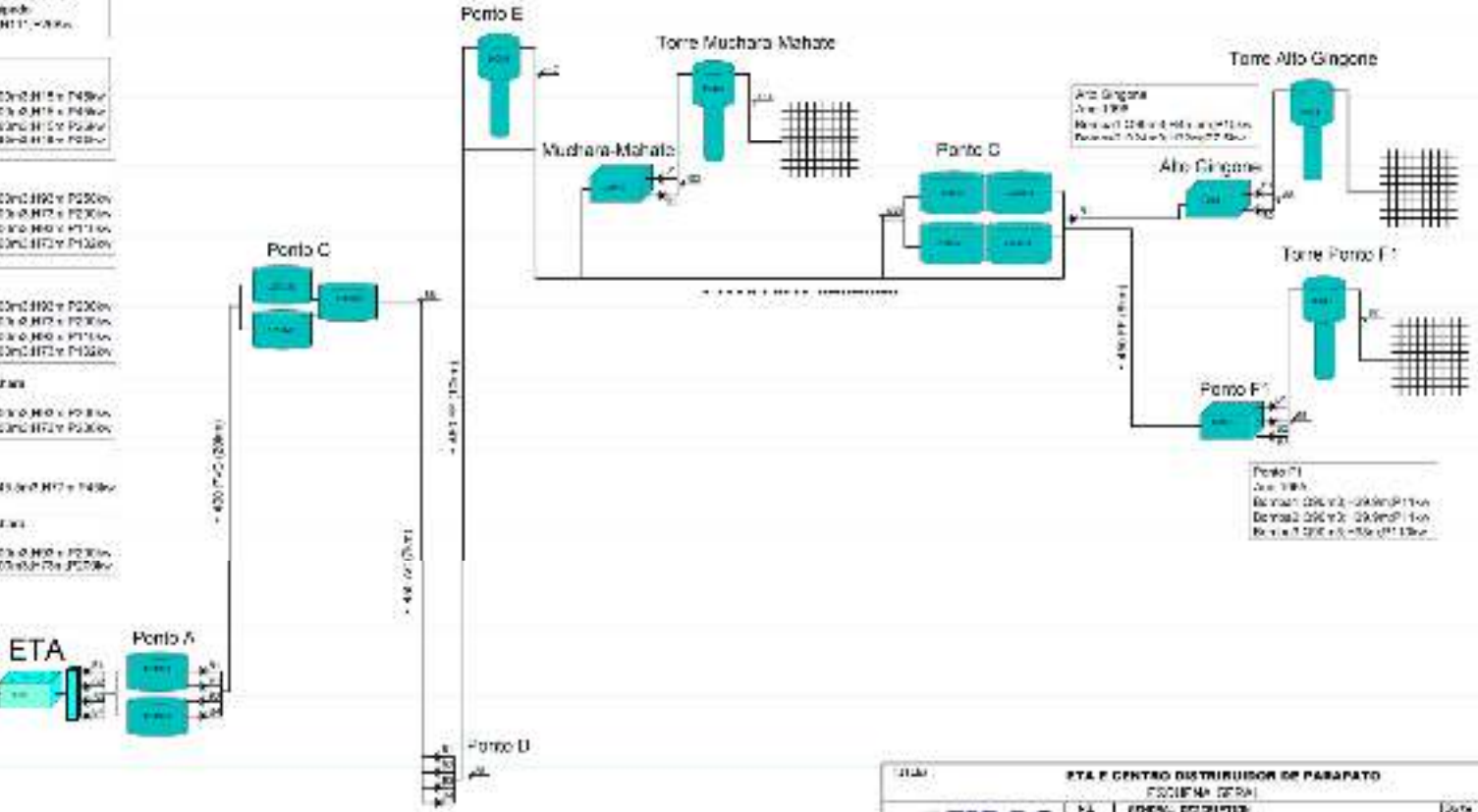
Ponto C
 Ano 1992
 Demais: 3600m³ e 1050ev
 Reserva: 2000m³ e 1050ev
 Reserva: 2000m³ e 1050ev
 Demais: 3600m³ e 1050ev

Torre Muchara Mahala
 Ano 1992
 Reserva: 2000m³ e 1050ev
 Demais: 3600m³ e 1050ev

Muchara Mahala
 Ano 1992
 Reserva: 2000m³ e 1050ev
 Demais: 3600m³ e 1050ev

Torre Alto Gingone
 Ano 1992
 Reserva: 2000m³ e 1050ev
 Demais: 3600m³ e 1050ev

Torre Ponto F1
 Ano 1992
 Reserva: 2000m³ e 1050ev
 Demais: 3600m³ e 1050ev



		ETA E CENTRO DISTRIBUIDOR DE PARAPATO (ESQUEMA DE REDE)	
Nº 1	DATA 15/05/2012	DATA 15/05/2012	DATA 15/05/2012
ESCALA 1:1000		Nº 01	
DATA 15/05/2012		DATA 15/05/2012	

1.5 Nacala Porto Water Supply System

The city of Nacala is currently served by a combination of surface water and ground water sources, namely:

- Muecula River dam – located about 30km southwest of the city,
- Wellfields at Mpaco, Mutuzi 1 and 2 – located about 10 km to the east of the city.

The first source is a dam on the Muecula River about 30 km south west of the city. The reservoir had an original storage capacity of about 4.2 million m³. The dam was recently rehabilitated and raised to expand the capacity of the reservoir to 6.6 million m³, approximately, to facilitate a supply increase from 7,200 to 25,000 m³/day.

The second source for the distribution system is the Mpaco and Mutuzi I and II wellfields. These well fields had a total of ten boreholes with flows between 1,080 and 2,400 m³/day each, resulting in a combined capacity of about 13,920 m³/day. Subsequent to the groundwater investigations that indicated an estimated sustainable capacity of this second source at 23,000 m³/day, FIPAG has recently completed a construction of additional ten (10) boreholes to utilize the full capacity, which has confirmed an additional capacity of 10,820 m³/day. The works for equipment and connections of the additional ten (10) boreholes were completed and handed over on 30th April 2020.

At present a total of 90.534 people in Nacala Town have access to safe water from a network of around 275 km and 13.508 connections. Based on the Burnside feasibility study of 2009, the 2017 demand was estimated to be 35,000 m³/day, substantially more than the present available supply. The development of 10 additional boreholes, recently equipped and connected to the water supply system, is essential to secure an increase to the supply in order to feed the additional network of 121 km (total network extension of 275 km), add additional 1,501 connections (total of 13,508 connections). Through the IGPP Project recently completed, FIPAG has also undertook to make available 3,000 m³/day for Industrial usage in the Nacala Special Economic Zone (SEZ).

The combined quantity of water currently available from the system's two sources is therefore 16,200 m³/day. Consequently, through the investments under IGP Project to expand the capacities of the existing Mpaco and Mutuzi 1 wellfields together with the commissioning of Mutuzi II wellfield and to develop transmission and distribution facilities to increase the supply of water to the city the production capacity of the system was increased to 30.200 m³/day. It is also improved the operational control of the supply system.

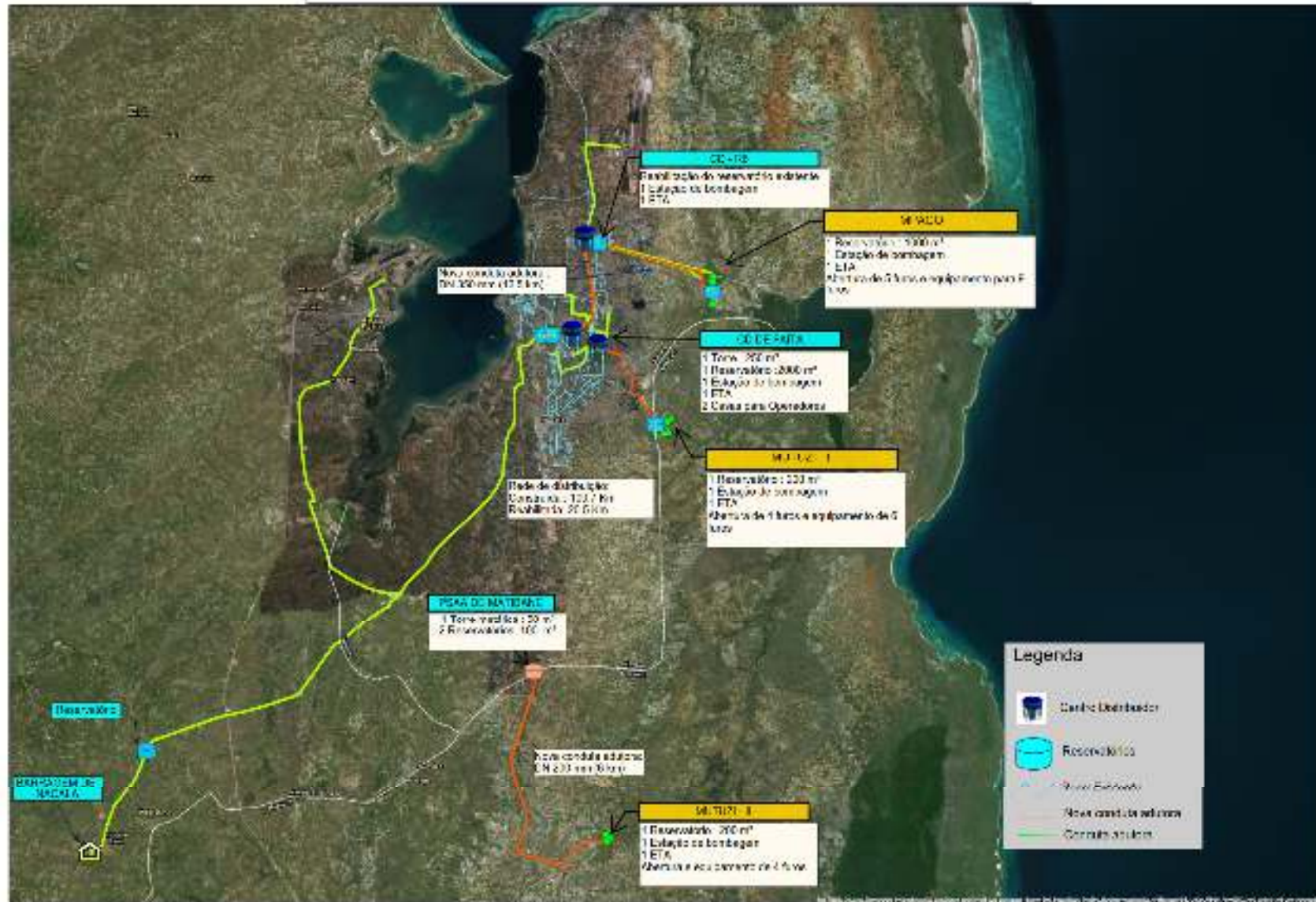
The table below presents the summary of main connection categories for Nacala, including coverage and daily hours of distribution.

Description	Unit	Performance Indicators (Up to August 2020)
Active domestic connections	Nr	12,639
Standposts	Nr	124
Total Population	People	309,212
Population served	Nr	97,845
Coverage	%	31,6
Hours of Supply	hr	12

Table 2 – Summary of Nacala Water Supply Performance Indicators

The sketch of the existing Nacala surface water supply system applicable to this service, is presented on the next page.

SISTEMA DE ABASTECIMENTO DE ÁGUA DE NACALA



1.6 Past and Existing Studies

1.6.1 Pemba Water Supply Studies

The most recent existing relevant study for this assignment that is available at FIPAG is the Feasibility Study, Environmental & Social Impact Assessment, Design and Supervision in Three Water Cities: Pemba, Nampula and Quelimane, prepared by R.J. Burnside International Limited in association with Austral-COWI and Consultec (August 2012).

The National Directorate of Water Resources Management (DNGRH) is currently undertaking a feasibility study for construction of Megaruma River Dam, including a system intake, water treatment plant and transmission main from the source to the city of Pemba. Therefore, the Consultant should contact DNGRH database to gather and compile data on water resources availability and quality. Additional data may be consulted at INAM- Instituto Nacional de Meteorologia (National Meteorology Institute) databases which include records on rainfall, temperature and evaporation. Historical water resource availability and quality data may be obtained from ARA-Norte database and also from past studies that should be available at these institutions.

1.6.2 Nacala Water Supply Studies

The most recent existing relevant study for this assignment that are available at FIPAG is the Feasibility Study, Environmental & Social Impact Assessment of Nacala water supply system, prepared by R.J. Burnside International Limited in association with Austral-COWI and Consultec (December 2010).

The Consultant may also access the Saline intrusion study developed by Emphos 24 under IGP project, which includes groundwater management plant of aquifer of Nacala, namely Mpaco and Mutuzi 1 and 2. Under IGP project were also developed EPANET models of the network recently constructed as well as the detailed design for equipment of boreholes, rehabilitation and construction of distribution centers in Nacala.

The Consultant should consult DNGRH database to gather and compile data on water resources availability and quality. Additional data may be consulted at INAM- Instituto Nacional de Meteorologia (National Meteorology Institute) databases which include records on rainfall, temperature and evaporation. Historical water resource availability and quality data may be obtained from ARA-Norte database and also from past studies that should be available at these institutions.

The Consultant shall obtain all necessary data and information from relevant authorities including the Ministry of Public Works, Housing and Water Resources (MOPHRH), The Ministry of the Land, and Environment (MTA), Municipality of Pemba, Municipality of Nacala, roads, telecommunication, electricity authorities, etc. FIPAG will provide assistance if required.

The Consultant shall obtain from Pemba and Nacala Municipalities as well as from Metuge, Mecufi and Nacala-a-Velha districts, data and information regarding the urban planning, land use requirements for the port, the industrial and commercial areas and residential and public areas. These land use requirements shall be visualized on maps and will be used in this scoping study as a layout for future investment needs and the elaboration of technical scenarios.

1.7 On-going and recently completed Works

1.7.1 Pemba Water Supply Projects

The ongoing and recently completed Water Supply Projects in Pemba are those funded by World Bank under the Water Services and Institutional Support Project II (WASIS II) which includes the activities listed below.

- Construction of 20 boreholes, Pemba – Completed.
- Design and construction for rehabilitation of existing transmission main and construction of 50 km of transmission main DN 500 mm – Completed.
- Equipment of boreholes, rehabilitation and expansion of the existing Water Treatment Plant and pumping stations – On going.
- Rehabilitation and construction of Distribution Centers and network - To start.

Another important study is the feasibility study for medium and long-term water supply in the city of Pemba, considering the Megaruma dam as a potential safe source for this purpose. This study included the elaboration of the preliminary project for the dam and the water transmission main from the future dam to the city of Pemba, and it was carried out by DNGRH, in a public-private partnership. Therefore, this study can be considered key taking in consideration that the current source from ground water seems to be reaching its maximum capacity, and due to its location, it is vulnerable to saline intrusion, and it is not recommended an excessive use.

1.7.2 Nacala Water Supply Projects

The ongoing and recently completed Water Supply Projects in Nacala are summarized below:

Recently completed works under IGP project

- Construction and equipment of 10 boreholes in Nacala (Mpaco, Mutuzi 1 and 2).
- Rehabilitation of 10 km transmission main in Nacala.
- Construction of 29.5 km of transmission main to connect the new boreholes to the water supply system.
- Construction of 121 km network (20.5 km rehabilitation and 100.7 km expansion).
- Rehabilitation of existing Distribution centres
- Construction of new Faíta Distribution centres composed by: reservoir (2.000 m³), water tower (250 m³) and pumping station.

Works under preparation, co-financed by RVO and World bank

- Electromechanical equipment of the intake, new WTW, pumping station and storage, comprising:
 - 2 km, DN 750 mm of raw water TM from the intake to the WTW.
 - New WTW with 25,000 m³/d capacity including pumping station EB1 and 400 m³ clear water reservoir.
 - Rehabilitation of reservoir R0.
 - 21 km of clear water transmission main DN 500 mm from WTW to R8 Distribution Centre.
- **New DC and network, comprising:**
 - New booster station at EB2.
 - New DC composed by 2 ground reservoirs with 4,000 m³ each, 250 m³ elevated tower and pumping station EB3.
 - 12 km of main distribution mains.
 - Rehabilitation and construction of distribution network.

Institutional Support/ DRIVE (Capacity building)

- Inventory of the distribution network in a GIS database;
- Organizational NRW management capacity building.

-
- A hydraulic model of the network, including a pressure management strategy;
 - PHC linked to the DMA's, and a leak registration App NRW reduction project FIPAG Nacala;
 - Meter replacement program, and improved NRW monitoring dashboard;

1.8 Justification for Developing of the Master Plan for Pemba and Nacala Water Supply Systems

1.8.1 Pemba

About 50% of the population in the city of Pemba does not have access to drinking water, and works are underway to reduce this figure. The current source of water supply to Pemba is groundwater, with limited availability to address the future demand, considering the continuous population growth. The National Directorate for Water Resources Management, based on a public-private partnership, developed a feasibility study for the construction of the Megaruma dam, including a system Intake, water treatment and transmission main from the source at Metuge District to the City of Pemba, however, funds are yet to be mobilized for the implementation of this important investment.

In addition, there is the new neighborhoods or settlements that arise due to the displacement of populations from the northern areas of Cabo Delgado Province, affected by the malevolent actions of the terrorists who sow mourning and disgrace in those areas, forcing the removal of these populations to safe places such as the city and Pemba and surrounding peri-urban areas. With this massive settlement, the population growth in Pemba, Metuge and Mecufi is potentially accelerated and could soon surpass the projections made in the last population sense in 2017. Clearly this population exodus could increase the number of inhabitants therefore, increasing the percentage of the population without access to safe drinking water, transposing the current 50% of the population. Therefore, in the Master Plan to be prepared, this issue should be assessed and duly addressed.

The logistical platform for the export of the gas produced from Palma in the province of Cabo Delegated is being planned to be built in the city of City of Pemba and an accelerated economic growth associated to this investment is expected as well.

1.8.2 Nacala

The City of Nacala Porto and the District of Nacala-a-Velha are located close to the largest natural deep-water port, declared by the government of Mozambique as an Industrial Free Economic Zone, and is the largest Industrial Park in the province of Nampula.

In addition to the high number of inhabitants, the city of Nacala has an important tourism potential, presenting itself as the region of the province of Nampula with the greatest potential for economic and social growth, and therefore the increase on demand for water supply services.

The water source for supplying the city of Nacala Porto and Nacala-a-Velha district is limited and a new source will have to be identified to address the future demand, requiring a yield assessment and investments planning.

With this as Background, FIPAG identified the need to structure the water system development in the same way by developing a Water Services Master Plan, one for City of Pemba and districts of Metuge and Mecufi (Output 1), and another one for City of Nacala Porto and Nacala-a-Velha (Output 2).

Both Master Plans will assist FIPAG and the Government of Mozambique to fine tuning the present needs and water demands and how it will evolve until the horizon of 25 years (2050) as well as the development required regarding the water source abstraction, treatment, transmission, storage and

distributions in the most effective way, in way to achieve the government and sustainable development goals meeting the universal access to safe water from the year 2030.

2 SCOPE OF SERVICES

2.1 Overview

The overall scope of this consultancy assignment is to deliver a Water Supply **Master Plan for:**

- i) Pemba (including districts of Metuge and Mecufi); and**
- ii) Nacala Porto and Nacala-a-Velha.**

2.2 General Objectives of the Assignment

- **Master Plan:** Develop a required Master Plan for 2050 years' horizon and formulate appropriate action plans to implement the Master Plan.
- **Preliminary Design:** Develop a Preliminary Design Report of the identified projects for 2035 year's' horizon.
- **Environment and Social Assessment:** Develop an Environmental and Social pre-assessment for the identified project (EPDA).

2.3 Specific objectives of the assignment

The study on formulation of the Master Plan, preliminary design and ES pre-assessment aims at achieving the following specific objectives:

a) Analysis of the current Situation.

The Consultant shall obtain information on the current water supply situation by collecting and analysing data on existing water supply infrastructure and their performance with the objective to develop a sound understanding of the City and its water supply system.

b) Beneficiary and Socio-economic Assessment

Assess the family income for different client's category, social groups, low-income people and obtain qualitative information on the level of satisfaction users express for each level of service and with regards to different Suppliers/Operators as input to the strategy for water billing and money collection.

c) Water Demand Assessment

Domestic, industrial and institutional water consumption change over time, linked to factors like growth and affordability. This specific objective is to gather information in order to assess the current water demand as well as the projected demand at the planning horizons of 2035 and 2050

d) Evaluation of Existing Infrastructure and future Capacity

The objective is to, from a technical and operational viewpoint, find the actual capacity, remaining economic life and possibility to extend its life and restore its design capacity through rehabilitation. This will be the foundation on which additional infrastructure will be motivated.

e) Source Assessment regarding yield and Quality

The objective of this component is to be able to confirm if the existing water sources will stay sufficient up to the design horizons of 2035 and 2050, in term of both, yield and quality.

f) Climate Change and Resilience Assessment

The purpose of this task is to provide general climate change and resilience assessment of all alternative sources of water supply.

g) Financial Analysis of the current water system

The specific objective of this component is to confirm the present financial status of the water system, but more important to ensure that the water system will become financially self-sufficient and sustainable to the extent that it will become a viable proposition for the private sector to operate. In this regard, it is not only the cost of development of various standards of service delivery and to ensure effective operation that is important, but also the affordability of the various service levels and the willingness of the population to pay for this service.

h) Master Plan with a Propose Investment Programme for 2050

The objective is to develop a Masterplan for the development of the water systems that will be able to meet 100% of water coverage up to 2050, in a cost effective and sustainable way, based on the findings of the previously mentioned specific objectives. Different scenarios (low, medium and high) as well as water supplied by Household connections shall be considered. The findings will culminate into an Investment Programme to serve the Cities of Pemba and Nacala up to 2050.

The master plan should be split in two separate reports, one for Pemba City and Districts of Metuge and Mecufi, and other one for the City of Nacala Porto and Nacala-a-Velha Village.

i) Financial cash flow analysis of the proposed Investment Programme

The financial sustainability of the proposed Investment Programme must be demonstrated by means of financial projections for the 2022-2035 and 2035-2050 periods.

Based on the results and options, the Client will at this stage decide the extent of infrastructure implementation that shall go ahead and those that could not go ahead. It was in principle agreed that the infrastructure to go ahead shall be to meet the shorter demand of 2035. In this regard it is expected from the Consultant to abstract from the master plan those components required to meet the 2035 demand and to motivate their acceptance and implementation. A list of the expected/anticipated infrastructure is stated later in this TOR, which should be assessed under this assignment in order to formulate the final list of the infrastructure to be implemented.

j) Preliminary Design of 2035 Infrastructure Needs

The objective of this activity is to undertake the preliminary design of all components of the water supply system required to meet the 2035 demand in accordance with the latest relevant standards and methodology to the satisfaction of FIPAG. To achieve this, the Consultant shall first submit a priority investment package, brochures and based on the approved projects and cost estimate should be presented in way to facilitate disseminations and mobilization of funding.

k) Environmental and Social Safeguards

The objective of this component is to meet the legal requirements of the Government of Mozambique and the World Bank Safeguards Polices regarding the ESMF (Environmental and Social Management Framework) and RPF (Resettlement Polices Framework), since there is possibility of replacement and/or compensation of people that may be affected by the project. The project will probably be Categorised as A and all environmental and social pre-assessment (EPDA) shall be developed.

2.4 Form of Contracts for Consultancy Services

A single Consultancy Contract will be awarded to cover the scope of services described above, at a lump sum ceiling price payable percentages per Phase and per deliverable as indicated in section 6.2.

Ref	Consultancy Contract Nr	Description	Form of Contract
1	FIPAG/WASISII/CON-33/20	Consultancy Services for: Phase 1: Preparation of a Master Plan for Water Supply Systems of Pemba and Nacala Cities including Environmental and Social Assessment. Phase 2: Preparation of Preliminary Design Report for Water Supply Systems of Pemba and Nacala	Lump Sum

The Consultant will be selected in accordance with the procedures set out in the World Bank's [Procurement](#) Regulations for IPF Borrowers July 2016 revised November 2017 and August 2018, which can be found at the following website: www.worldbank.org.

3 CONSULTANT'S RESPONSIBILITIES

The Consultant is expected to carry out the following, but not limited to the tasks described below:

3.1 Phase 1: Master Plan

The development of the Master Plan shall consist but not restricted to the following:

3.1.1 *Analysis of Previous Studies and Current Situation*

Review the existing studies in order to obtain the background of how the existing systems evolved as well as its present status. Assess the current water supply situation by collecting and analysing data on existing water supply infrastructure and their performance include at least the following data:

- Current state, age, performance of all components of the water supply system, also considering the works in progress and planned.
- Population served, level of service and water consumed per level of service, using the Operator's data.
- Water flow and consumption by other sectors apart from domestic use.
- Non-billed water, water losses.
- Maintenance required and done as well as line sections prone to leak.
- Conformity with quality and environmental standards.
- Assess the current stand-post management strategy including their contribution and impact on the system effectiveness of cost recovery.
- Obtain information and assess current water availability, sources, levels of service, tariffs, usage and demand (including peak hourly, daily and seasonal influences) figures, per supplier, type of customer (domestic, standpost, commercial, industrial and public), area.

3.1.2 *Beneficiary and Socio-Economic Assessment*

Taking in consideration previous studies, available data from FIPAG and field data regarding to water consumption and different client category, the assessment shall develop solid recommendations and strategies. The assessment shall include, but not restricted to:

- Assess the family income and different client's category, social groups, low-income people and the strategy for water billing and money collection.
- Obtain qualitative information on (i) the level of satisfaction users express for each level of service and with regards to different Suppliers/Operators (including for users of illegal/informal connections) and (ii) the proposal users may express to improve the quality of service.
- Assess the preference for connection category in each neighbourhood, particularly in peri-urban areas regarding potential clients per category.
- Assess the behaviour change in costumers regarding to service level and need for improvement.
- Mapping of information in a format suitable for use or reuse by FIPAG staff will be required (e.g. GIS or other IT solution); The information for Mapping shall include:
 - Population census data (per neighbourhoods/ population density and socio-economic criteria), family income and expenditures.
 - Network distribution data, number of connections, water consumption level, water required preventative measures.
- Define priorities for service improvement for FIPAG.
- Assess the water selling process (formal and informal and urban and pre-urban, including regular and ad-hock clients in the harbour).

3.1.3 Water Demand Assessment

- Acquire, review and examine all available data, information, records, urban plans and reports as required for the study.
 - Work closely with the appropriate institutions (DNGRH, DNAAS, ARA-Norte, AURA, FIPAG Pemba and FIPAG Nacala, Municipalities of Pemba and Nacala, Metuge, Mecufi and Nacala-a-Velha local Government Authorities, Ministry of Health, INE, etc.), preliminary design to avoid duplication of work (census, socio-economic studies, beneficiary assessments, water resources assessments, system designs, urban development plans, national statistics).
 - Assess information quality and define information gaps.
 - Prepare and carry out required investigations and surveys.
- Note:** The Consultant should therefore in its technical proposal recommend appropriate methodology to ensure consistent investigations and surveys to guarantee the robustness and reliability of the acquired data. It is expected that citywide information will be updated by the consultant through field surveys, as required.
- Assess the future land requirements of industries and their expected water usage.
 - Forecast evolution of population and income level per area. The Consultant shall pay attention to the IDP (displacement people) that arise specially in the city of Pemba as well as in districts of Metuge and Mecufi, due to the displacement of populations from the northern areas of Cabo Delgado Province, affected by the malevolent actions of the terrorists.
 - Assess the need for new house connections and how they are being done, including assessment of the reasons for disconnection, including why, where and when disconnections are taking place. This shall consider other client's category and urban and peri-urban area as well.
 - Develop effective water demand patterns per level of service, area and income level on a 1year interval for the first 5 years, and 5 years interval for the following 25 years (global

horizon of 25 years). This will become the base scenario. The mathematical projection model shall be developed in a format to be suitable for subsequent use by FIPAG.

- Conduct sensitivity analysis on the base scenario, based on key factors variation (including level of service, unaccounted-for water levels, tariffs, conservation, population and economic growth).
- Assess the influence of changes in water supply and costs (due to new investment, improved management or changes in operational costs) on customers' demand, access and actual consumption.

3.1.4 Evaluation of Existing infrastructures and future Capacity (Condition Survey)

The Consultant shall conduct a condition survey study to determine the capacity, performance, reliability and operational condition of all the main elements of the existing water supply system in each of the two cities. Where appropriate, the assessment of the condition and performance shall differentiate between civil, mechanical and electrical components. This work will include, but not be limited to:

- Assess the reliable and sustainable yield of each source, in terms of quantity and quality of the water available.
- Assess whether the treatment processes are suitable for the range of raw water quality, determine and evaluate the overall capacity of the plants to treat raw water, particularly during peak demand periods and rain seasons
- Determine the capability of the systems to distribute sufficient amounts of water to meet the 2050 demand, including during peak demand periods, assess existing water quality control and sampling systems.
- Determine the coverage of distribution networks, the numbers of connections of different types, the number of metered connections, and the levels of service (supply hours, reliability of supply, occurrence of low pressures, etc.) in different parts of the network.
- Estimate, to the extent possible the number and extent of illegal connections in the system;
- Assess risks to the supply and whether storage in the system is adequate both to meet peak demands and to maintain supplies to consumers in the event of potential outages occurring.
- Determine the need for refurbishment or replacement of existing infrastructure, and the need for new works to eliminate any bottlenecks or increase capacity, meet water quality standards, increase the reliability of the system and improve operational efficiency. In determining future investment needs in the existing system, allowance may need to be made for any ongoing or planned projects.

3.1.5 Water Sources Investigations Report

The consultant is required to assess the yield and quality of all alternative sources of water supply for the proposed projects.

The Consultant should obtain from DNGRH, ARA-Norte, FIPAG and other GoM entities relevant data and information on existing and potential sources of water, including topographical, geological, and hydrogeological maps, satellite imagery, aerial photography and past reports including past hydrogeological assessments. Past reports are to be critically reviewed and all existing and potential new sources of raw water are to be identified.

To assess the potential for water source (mainly surface water) development the Consultant shall undertake the following work:

- Collect details of existing water source for the public water supply.
- Identify potential new water source and Intake sites and recommend any necessary further investigations.

- Identify and visit potential intake sites to confirm their suitability as locations for river intakes. Using available mapping, determine catchment areas at each existing and proposed intake site.
- Assess the likely safe yield (reliable output) of existing and proposed water source.
- Assess the quality of the water from potential intake sites and describe the nature and frequency of treatment that would be required to bring the water up to GoM potable water standards.
- In the case where a potential site lacks accurate data or records, the Consultant shall estimate the reliable yield of the source by correlation with the nearest suitable gauged catchment on the basis of catchment areas and rainfall.

3.1.6 Climate Change and Resilience Assessment

The purpose of this task is to provide general climate change and resilience assessment of all alternative sources of water supply for the proposed projects that is likely to influence short- and long-term water availability and quality and likely impact on the findings of the source assessment and identification of alternative for Pemba, Metuge, Mecufi, Nacala Porto and Nacala-a-Velha water supply. Under this task, the Consultant shall assess the general climate change and resilience that is likely to influence short- and long-term water availability and likely impact on the findings of the source assessment and identification of alternatives for supply.

3.1.7 Financial Analysis of the current water system

The purpose of this task is to assess whether FIPAG will have the financial capacity to fully support its operations. The consultant shall undertake the following tasks:

- Assess the financial status of the systems, considering operational costs, loan repayments, cost recovery and the potential for sustainable operation by the private sector.
- Assess the financial performance of Pemba and Nacala Water supply systems based on the following ratio analysis: Profitability Sustainability, Operational Efficiency, Liquidity, Leverage (Funding – Debt, Equity, Grants)

3.1.8 Identification of Alternatives and Selection of Optimum Combinations

The Consultant shall identify alternatives, if applicable, for water supply improvements that include all physical and institutional actions required until the end of the planning period. This will include possible alternative water sources and/or abstraction points or methodology; alternative methods of sedimentation; placement of treatment works and alternative treatment processes; Positions and size of storage; Position of DCs and supply areas; supply zones/districts and water loss management; phasing out of communal standpipes and phasing in individual metered yard connections; Cost recovery methods based on Socio-Economic profile and willingness to pay; etc.

To select optimal combinations, the Consultant shall identify:

- The specific conditions of the local populations, and in particular, women and issues regarding access to new services (results from the gender and water assessment);
- The existing infrastructure and possible constraints on development;
- The need to develop new water resources to meet increasing demand;
- The technical convenience criteria such as skills requirements of a technology; and,
- The financial considerations, parameters and criteria, including appropriate discount rates for discounted cash flow analysis, based on the findings of the Financial Analysis,
- The alternative options and combinations shall be clearly identified so that the cost and social/environmental benefits may be clearly assigned,

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- The form of presentation shall include maps, layout and flow diagrams with sufficient dimensioning to facilitate reasonably accurate costing to enable acceptance or rejection of alternatives and then prioritization of preferred options.

3.1.9 Financial cash flow analysis of the proposed Investment Programme

Consultant should prepare a financial and economic analysis consistent with international IFI standards for cost-benefit analysis (CBA). The financial (cash-flow) analysis should estimate investment and O&M costs over time and any direct financial revenues related to operating interventions.

The purpose of this task is to assess whether FIPAG will have the financial capacity to fully support its operations and to finance the project and to comment on the financial viability of the project. The financial viability of the project must be demonstrated by means of financial projections for the 2022-2035 and 2022-2050 periods.

- The consultant shall assess the financial impacts of the investment plan by comparing the costs (capital and recurrent) of the current infrastructure and the proposed investment with the revenues Pemba and Nacala Water Supply systems will generate.
- The consultant shall calculate the financial IRR (Internal Rate of Return) and NPV (Net Present Value).
- The financial analysis shall include a calculation and discussion of sensitivity to changes in key variables like income, demand and expenditures.
- Assess and recommend about any issues and threats for sustainability, cost reduction, etc (including tariffs).
- Assess the financial status of the system, considering operational cost, loan repayment, cost recovery and the potential as well as conditions required for sustainable operation by the private sector.

3.1.10 Needs assessment for 2035 Infrastructure

Based on the assessment carried out and according to the different scenarios defined the Consultant shall provide, as part of a discussion document, the following in relation to the short term 2031 (10 years horizon) needs and demands, but with the longer term 2050 (25 years horizon) proposals in mind, in order to motivate what investment is required now to meet the shorter-term demand and what could be postponed to a later date:

- Address the strengths, weaknesses and gaps in the existing and planned distribution infrastructure.
- Propose actions to improve usage of existing system (type of water source, supply areas for DCs, distribution zoning, production and transmission patterns, etc), including water demand management and conservation measures.
- Assess, based on the relevant studies reports, the short-term water sources, looking at capacity, location, usage horizon and other perspectives for their utilization.
- Assess needs and resources for upgrading and development of the system (water sources, production, transport, storage and distribution), including the proposed location of the key infrastructure, the possible mode of operation of the systems (e.g. single or multi-level of operators, decentralization, privatization, etc.) and formulate appropriate action plans, including proposals for sequencing their mobilization, and potential schedule of capital investment requirements (at pre-feasibility level).
- Estimate investment and additional O&M costs of the proposed options and cost recovery scenarios taking in account affordability constraints and the recommended mode of operation.
- Propose priority works required for the first 10 years and identify those that will be required for the longer term.

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- Present the preliminary results of the study in a stakeholder’s workshop.
 - Finalize the Investment Program integrating the relevant comments and selection (needs assessment) decisions document.

3.2 Phase 2: Preliminary Design of 2035 Infrastructure Needs

The preliminary design will be shall be undertaken for all the infrastructure proposed as priority works required for the first 10 years which should include rehabilitation and expansion of production, transmission, storage and distribution systems, as detailed in the 3.1.10.

3.2.1 Design Steps Required

In the Preliminary Design, the Consultant is expected to carry out, but not limited to the following tasks:

- **Verification**

- The Consultant shall acquire, review and examine all the available data, information, records and reports for proper design and execution of works.
- The Consultant shall verify design information provided by FIPAG, in the context of the projected yields of the water resources and projected water demands, including confirmation of suitability of the proposed site locations and infrastructure requirements, as well as consultation with other entities (Municipalities, EDM, and the Statistic Institute etc.) regarding the proposed implementation plan, to meet the stated objectives.

- **Approvals and Licenses Related to this Assignment**

The Consultant shall obtain all necessary approvals and licenses to carry out their activities and maintain documentary records of such. This should include all necessary permissions from relevant authorities including the Ministry of Public Works, Housing and Water Resources (MOPHRH), The Ministry of the Land and Environment (MTA), Municipality of Pemba, Municipality of Nacala, roads, telecommunication, electricity authorities, etc. FIPAG will provide assistance if required. The preliminary designs must be approved by FIPAG and in compliance with relevant Mozambique regulations.

- **Topographical surveys and bench marks**

Accurate detailed surveys tied to terrestrial reference points and geo-coordinates for all structures, roads and pipelines, with locations of all existing structures. Permanent benchmark stations with levels accurately related to mean sea level to be established within the site area together with subsidiary stations of sufficient durability at the sites of all main structures.

- **Geotechnical Surveys**

Test pits, in-situ and laboratory testing at preliminary stage including penetrometer, and moisture density tests are to be carried out under the direction of a specialist geotechnical engineer as part of the Consultant’s team. Copies of all reports and design recommendations are to be provided to FIPAG.

- **Structural Inspection**

Structural stability and inspection of foundations, walls, roofs, etc., are to be carried out under the direction of a specialist structural engineer. Copies of all reports and design recommendations are to be provided to FIPAG.

- **Technical Design**

In carrying out the preliminary design the Consultant shall:

- Inspect all relevant installations and components of the existing systems;

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- Collect and verify all available data (including that provided by FIPAG), drawings and plans. The Consultant shall be responsible for collecting all other data needed to complete the work;
 - Consult with FIPAG and other authorities (including roads, telecommunications, municipalities, power supply, etc) as necessary. It is particularly important that the Consultants takes cognisance of the organisational and functional requirements of FIPAG and work with them to ensure that the new works are compatible with their work environment and planning;
 - Take account of optimisation of the available space;
 - Take account of the need for continues supply of water from the systems during rehabilitation;
 - Take account of the health and safety of the occupiers of the site and buildings;
 - Ensure designs comply with environmental and social safeguard policies;

4 OUTPUTS

The Consultant outputs shall consist of:

- (i) Inception Report.
- (ii) Beneficiary Assessment and Water Demand Assessment Report.
- (iii) Water Sources Investigation Report.
- (iv) Climate Change and Resilience Assessment
- (v) Needs Assessment Report for 2050 Infrastructure
- (vi) Master Plan Report including Financial Analysis of the current water system and Financial cash flow analysis of the proposed Investment Program
- (vii) Preliminary Design Reports.
- (viii) E & S Pre-Assessment Report (EPDA).
- (ix) Project packages brochures.

Note that separate sets of reports will be required for each water supply system namely, (1) Pemba (2) Nacala, except to the inception report.

4.1 Inception Report

Within **1.5 month** from the starting date of the assignment, the contractor shall present to FIPAG an inception report presenting the initial findings regarding the analysis of the current situation and existing infrastructure. The Consultant shall reflect his understanding of the Services to be rendered, update his methodology for the implementation of the assignment, the staff to be allocated and the updated program to complete the services.

The updated program to be included in the Report shall clearly all of the activities to be undertaken, the anticipated schedule of submission of the outputs as well as recommendations/comments on the Master Plan development process and the Preliminary Design principles and criteria.

Additionally, the Consultant shall advise the Client of any data collection activities that may be needed for completion of the implementation of the assignment. Moreover, the Inception Report chart address any challenges the Consultant may have encountered or anticipates to face in the implementation of the assignment and the approach the Consultant intend to enforce in order to address these challenges.

The Consultant shall submit an **Inception Report** in **2** hard copy and an electronic copy on a flash drive.

4.2 Beneficiary Assessment Study and Water Demand Assessment Report

The Consultant shall submit a **Water Demand Report** in 2 hard copies and an electronic copy on CD in MS Word, Excel and PDF. The report shall cover but not restricted to subjects defined in 3.2. The Beneficiary Assessment Study and Water Demand Assessment Report shall be submitted within three (3) months from the starting date, covering:

On the Beneficiary Assessment Study

- The family income and different client's category, social groups, low-income people and the strategy for water billing and money collection. Capacity and willingness to pay for different service levels/category/social groups.
- The level of satisfaction users for each level of service and their proposal to improve the quality of service. This shall also include the behaviour change in costumers regarding to service level and need for improvement.
- The pattern of preference for connection category in each neighbourhood, particularly in peri-urban areas.
- Definition of priorities for service improvement for FIPAG.
- Assessment of the water selling process (formal and informal and urban and pre-urban, including regular and ad-hock clients in the neighbourhood).

On the Water Demand Assessment

- Assessment of the future land requirements of industries and their expected water usage.
- Projected evolution of population and income level per area.
- Assessment of the need for new house connections, including assessment of the reasons for disconnection, including why, where and when disconnections are taking place.
- Water demand patterns per level of service, area and income level on a 1year interval for the first 5 years, and 5 years interval for the following 25 years.
- Assessment on the influence of changes in water supply and costs on customers' demand, access and actual consumption.

The Beneficiary Assessment Study and Water Demand Assessment Report shall cover all of the tasks and sub-tasks and requirements outlined in 3.1.2 and 3.1.3 for this activity.

Meetings shall be organized in FIPAG (Maputo, Pemba and Nacala) for the presentation of the Report by the Consultant and additional contribution shall be incorporated in the version. Representatives of FIPAG and other stakeholders will attend the meeting. This Final Report, after incorporation of the meeting comments, shall be submitted within three (3) months from the starting date.

4.3 Water Sources Investigation Report

Within 5 months from the starting date of the assignment, the Consultant shall submit a **Water Resources Investigation Report** including Climate Change and Resilience Assessment in 2 hard copies and an electronic copy on a flash drive in MS Word, Excel and PDF. The report shall address the assessment of the potential for water source, covering but not restricted to:

- Detailed assessment of the existing water sources.
- Identification and preliminary assessment of potential new water source and intake sites and recommendation of further investigations for development of new sources.
- Identification of potential intake sites.
- Assessment and recommendation of the yield of the existing and proposed water source.

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- Assessment of the quality of the water from potential intake sites, including preliminary recommendation on the nature and frequency of treatment that would be required to bring the water up to GoM potable water standards.
 - Proposed or recommended actions to capitalize the potential of NRW (No Revenue Water).

A meeting shall be organized in FIPAG Nacala and Pemba with involvement of ARA Norte and DNGRH (National Directorate of Water Resources Management) for the presentation of the Report by the Consultant, from which additional contribution shall be gathered and incorporated in the revised version of the report. Representatives of FIPAG and other stakeholders will attend the meeting. The Final Report, after incorporation of the meeting comments, shall be submitted within (5) months from the starting date.

4.4 Needs Assessment for 2035 Infrastructures

The Consultant shall submit a **Needs Assessment Report** for both time horizon 2035 and 2050 Infrastructures in 2 hard copies and an electronic copy on a flash drive in MS Word, Excel and PDF. The report shall be submitted within seven (7) months from starting date and shall address the assessment of the infrastructures required to address the 2035 needs, and with the longer term 2050 horizon proposals in mind, covering but not restricted to:

- Assessment of the strengths, weaknesses and gaps in the existing and planned distribution infrastructures;
- Proposed/recommended actions to improve usage of existing systems, including water demand management and conservation measures;
- Assessment of the short-term water sources, considering their capacity, location, usage horizon and other perspectives for their utilization;
- Needs and resources for upgrading and development of the systems (water sources, production, transport, storage and distribution), including the proposed location of the key infrastructure.
- Action plans potential schedule of capital investment requirements (at pre-feasibility level);
- Estimated investment and additional O&M costs of the proposed options and cost recovery scenarios.
- Proposed prioritization of the works or interventions required for the first 10 years and identification of those that will be required for the longer term.
- Preliminary Investment Program.

4.5 Master Plan

The Consultant shall submit separate (one for Pemba and another one for Nacala) **Drafts of Master Plans** in 5 hard copies and an electronic copy on a flash drive in MS Word, Excel and PDF, including, study of beneficiaries and capacity and willingness to pay for different service levels/category/social groups, water demand assessment, evaluations of existing works, water resources investigations and climate change and resilience assessment, identifications of alternatives, financial analysis of the proposed 25 years horizon (long term) investment program. This shall be submitted within nine (9) months from starting date.

Two workshops shall be organized by the Consultant, one in Pemba and another in Nacala for the presentation of the Draft of Master Plan Report for around 30 people consisting of Technical, Social and Environmental representatives from FIPAG Head Office, FIPAG Northern Region and representatives of FIPAG Pemba for Pemba workshop and FIPAG Nacala for Nacala workshop, ARA Norte, Pemba Municipality, Nacala Municipality, NGO's operating in the water field and Community Representatives, etc. Additional contributions made in the workshop shall be incorporated in the revised Report. The Consultant should prepare the minutes of the presentation meeting.

Within thirty (30) days, the Consultant shall receive comments from FIPAG, which, shall be taken into account in the preparation of the **Final Master Plans**, along with the comments from the Workshop. The Final Report shall be submitted in **5** hard copies and three electronic copies on a flash drive in MS Word and Excel and PDF. The Final Report shall be available within eleven (11) months from the start date.

4.6 Preliminary Design Reports

The preliminary design for 2035 horizon must be based on the contract requirements, international standards and actual site data obtained from detailed site surveys. preliminary designs submitted for Client approval must be accompanied by certification by a registered engineer in the relevant discipline. The Client or its representative may ask for corrections and changes in the preliminary design report based on the actual site conditions or other evident parameters. The Consultant will be liable for the correction of any such changes and for the submission of a complete and acceptable final preliminary design report without additional cost to the Client.

A meeting shall be organized in FIPAG Pemba and Nacala for the presentation of the Preliminary Design Report and additional contribution shall be incorporated in the revised Preliminary Design Report.

The Consultant shall provide the **Preliminary Design** Report in electronic format in a flash drive and 5 sets of hard copies. Drawings shall be prepared in A1 size with an electronic version in AutoCAD and PDF. This Report shall be submitted within fourteen (**14**) months starting date.

The Preliminary Design Report shall be submitted in electronic format, in editable format (AutoCAD, ArchiCAD, word, excel, etc.) in a flash drive and **5 sets** of hard copies and PDF. The report shall be submitted within eleven and half (11.5) months from start date.

4.7 E & S Pre-Assessment Report

The objective of this component is to meet the GOM legal requirements regarding the environment and the possible replacement and/or compensation of people affected by the development. The project will probably be Categorized as a Component A and all environmental and social impact pre-assessment (EPDA) shall be developed for the selected 2035 infrastructure options.

The Decree Nr. 53/2015, of 31 December, which approves the Regulation for the Process of Environmental Impact Assessment, applies to all public and private activities that may direct or indirectly influence the environmental components, in accordance with Article 3 of the Environment Law. The Water Extension Project as defined in this scope study poses different environmental and social issues both in construction as in operational phase. Part of those impacts are related to its scale (e.g., length of transmission pipeline), but also to the construction of infrastructures (urban and rural contexts), land occupation and to the natural and social conditions.

It is expected that the project will be classified as Category A, given the significant adverse environmental impacts likely resulting from the construction, therefore being mandatory to present an Environmental Impact Assessment (EIA), a pre-assessment for the environmental and social impact will be required in way to assist identification of impacts, classification and category of each project.

4.8 Project packages brochures

The Consultant shall submit a project packages brochure including investment Program, cost estimate and expected key outcome indicators in 20 hard copies and an electronic copy on a flash drive. This Brochure shall be available within eighteen (18) months from the start date.

5 QUALIFICATIONS AND RESOURCE REQUIREMENTS

5.1 Consultants Qualifications

The Consultant shall be a reputable Consulting Engineering (CE) firm with at least 15 years' experience in urban water engineering, planning and management. Specific experience with water supply master planning, surface and ground water sources investigation, water conservation and demand management, with experience in Africa (preferably southern Africa) is required, including design of water supply system components.

The Consultant shall develop its methodology and work plan and shall propose appropriate qualified and experienced full time and part-time staff to fulfil the requirements of the assignment and the Terms of Reference. Combination of international and local consultants in the team is encouraged.

5.2 Level of Effort

The Consultant shall propose appropriate full time and part-time staff with the proposed time inputs for the assignment. The professional inputs required for the Study and Design Services are estimated at **40 person months**, excluding support staff. All Key Staff must be able to demonstrate that they are fluent in English and had successfully work in at least two English based water system planning and design projects. The minimum requirements for each individual key staff are as detailed below:

(Note, level of effort for individual positions)

Position	Description	Level of Effort (person-month)
Team Leader/ Water Supply Specialist	<ul style="list-style-type: none"> • Degree in Hydraulic or Water Supply Engineering or Civil Engineering, • At least 20 years general appropriate experience in water engineering, planning, design and management for urban water supply systems. • Specific experience with the preparation of at least two similar Urban Master Plans as well as detail design of three similar urban water supply systems, including water treatment and transmission mains. • Fluency in English. 	18
Hydro-geological Engineer	<ul style="list-style-type: none"> • Degree in Hydro-geological Engineering. • Relevant experience in water engineering based in urban water supply systems. • At least 15 years appropriate experience in surface and ground water source investigation. • Two similar assignments • Fluency in English. 	1.0
Water quality /Treatment Plant Design Specialist	<ul style="list-style-type: none"> • Degree in Water Supply Engineering or similar. • Relevant experience in water engineering based in urban water supply systems. • At least 15 years appropriate experience in design of drinking water treatment plant. • Two similar assignment 	1.0

	<ul style="list-style-type: none"> • Fluency in English. 	
Structural Design Engineer	<ul style="list-style-type: none"> • Degree in Civil Engineering, specialization in Structural Engineering. • Experience in design of water related structural engineering in urban water supply systems. • At least 15 years appropriate experience in the design of water retaining structures for water treatment, storage, pumping stations and buildings facilities., • Two similar assignments • Fluency in English. 	1.0
Socio-economist	<ul style="list-style-type: none"> • Degree in Socio-economy. • Experience in water engineering projects based in urban water supply systems. • At least 15 years of experience in compiling and presenting socio-economic data for water operations. • Two similar assignments. • Fluency in English and ability to communicate in Portuguese and in local languages shall be an advantage. 	3.0
Water supply operations engineer	<ul style="list-style-type: none"> • Degree in Hydraulic Engineering or similar. • Relevant operational design experience of urban water supply systems. • At least 15 years of experience in urban water supply systems within a water supply company/ Municipality in roles including hands-on operation and management of the supply system, including the preparation of manuals for the training of Operators. • Two similar assignments. • Fluency in English. The ability to communicate in Portuguese shall be an advantage. 	2.0
Economic/Financial Specialist	<ul style="list-style-type: none"> • Degree in Economic /Financial, Management or similar. • Experience in urban water supply systems. • At least 10 years' experience in determining the financial viability of water supply projects, including their sustainability. • Two similar assignments. • Fluency in English. The ability to communicate in Portuguese shall be an advantage. 	3.0
Hydrologist	<ul style="list-style-type: none"> • Degree in Hydrology or Hydraulic or Civil Engineering. • At least 10 years experience in hydrology, water resources planning and modeling • Two similar assignments. • Fluency in English. 	3.0
Surveyor	<ul style="list-style-type: none"> • Higher Technical Diploma or higher education in Surveying or Topography. • Experience in water engineering including urban water supply systems. • At least 10 years' experience in surveying and field investigations for basic services assessments and planning transmission main alignment, both in urban and peri-urban areas. • Two similar assignments. 	3.0

	<ul style="list-style-type: none"> • Fluency in English and ability to communicate in Portuguese and in local languages shall be an advantage. 	
Environmental Specialist	<ul style="list-style-type: none"> • Degree in Environmental Engineer. • Experience in water engineering based in urban water supply systems. • At least 10 years of experience in environmental assessments and planning related to the provision of basic infrastructure. • Two similar assignments. • Fluency in English. The ability to communicate in Portuguese and in local languages shall be an advantage. 	2.5
Social Specialist	<ul style="list-style-type: none"> • Degree in Social Science • At least 10 years experience in social assessment for infrastructure projects • Two similar assignments. • Fluency in English. The ability to communicate in Portuguese and in local languages shall be an advantage. 	2.5
Total		40.0

It should be noted that an individual can be offered for more than one position if he/she meets all qualifications and experience and can produce the service within the stated time limit.

To complement the above-mentioned staff, the Consultant shall propose additional appropriate qualified and experienced full and/or part-time support staff to fulfill the requirements of the assignment and this Terms of Reference.

6 OTHER REQUIREMENTS AND CONSIDERATIONS FOR THE SERVICES

6.1 General Reporting Requirements

All documents, correspondence, instructions, communications, etc. related to the project shall be in English, but the environmental related submissions to the GoM in accordance with the World Bank Environmental and Social Safeguards as well as Decree Nr. 54/2015, of 31 December, which approves the regulation for the process of Environmental Impact Assessment, shall also be translated to Portuguese.

All other reports shall first be submitted in draft form for review and comments. Draft reports shall be submitted in English. The final detailed design report should be presented as two A4 size volumes (executive summary and main report) accompanied by separate volumes of appendices together with a set of A1 size drawings.

The Consultant will report formally to FIPAG's Director General, Mr. Victor Taucale or his designated representative and the FIPAG's Project and Investments Director and his designated representative and counterpart.

6.2 Payments and Duration

Payments shall be made on the basis of agreed percentage of the Lump Sums for each completed milestone of the assignment. The relative milestone payments in proportion to the total sum for the assignment is given below:

Output (approved versions)	Percentage of Lump Sum	Duration (months)
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Phase 1: Master Plan	60%	SD + 8 months
Inception report	5.0%	SD + 1 month
Beneficiary Assessment and Water Demand Assessment Report	15.0%	SD + 3 months
Water Sources Investigation regarding to Yield and Quality including Climate Change and Resilience Assessment	15.0%	SD + 5 months
Needs Assessment Report for 2035 and 2050 Infrastructures	10.0%	SD + 7 month
Draft of Master Plan Report	N/A	SD + 9 months
Final Master Plan Report	15.0%	SD + 11 months
Phase 2: Concept Design Report	40%	SD + 15 month
Draft Report	N/A	SD + 14 month
Final Report	25%	SD + 16 months
E & S Pre-Assessment Report (EPDA).	10.0	SD + 18 months
Project packages brochures.	5.0	SD + 18 month
TOTAL	100.0%	18 months after SD

Note: SD=Start Date

The consulting services are therefore expected to be implemented over a period of **18** months and to commence in January, 2022.

6.3 Facilities provided by the Client

FIPAG will not provide any accommodation, transportation or other related facilities and the Consultant should make provision for all such costs in their financial proposal.

All available project information as well as the reports and documents as mentioned in Section 1.5 will be made available to the winning Consultant by FIPAG.