german cooperation
DEUTSCHE ZUSAMMENARBEIT

Published by
giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

STAGE FOUR

Yemen Water Sector

Yemen Water Sector - Damage Assessment Report of the Urban Water Supply and Sanitation Situation in Yemen – Stage IV

Part 2: Situational Assessment Report

Annex 3 Technical Assessment Report for Al Dhalea

Imprint

Published by the
Deutsche Gesellschaft fürInternationale Zusammenarbeit (GIZ) GmbH

Registered offices
Bonn and Eschborn, Germany

Friedrich-Ebert-Allee 36 + 40
53113 Bonn
T +49 228 44 60 - 0
F +49 228 44 60 - 17 66
Dag-Hammarskjöld-Weg 1 – 5
65760 Eschborn
T +49 6196 79 - 0
F +49 6196 79 - 11 15
info@giz.de
www.giz.de

Institutional Development of the Water Sector, Yemen
Office Hadda Area, Str. 21
T +967 1 434 428 - Ext. 408
F +967 1 412 387
johannes.stork@giz.de
www.giz.de/yemen

Author
GOPA Infra GmbH

Edited by
GIZ-IDWS, Team of MWE

Design and layout
Hussam Al-Kherbi, Yemen

As at
Dec 2023

GIZ is responsible for the content of this publication.

On behalf of the
Federal Ministry for Economic Cooperation and Development (BMZ)

Table of Content

Tables

Figures

Appendices

Abbreviations

ABR	Anaerobic Baffled Reactor
BMZ	German Ministry of Economic Cooperation and Development
BoD	Board of Directors
BoQ	Bills of Quantities
CAC	Cooperative Agricultural Credit (Bank)
CBO	Community Based Organization
COCA	Central Organization for Control and Auditing
DAS	Damage Assessment Study
DCI	Ductile Cast Iron
DI	Ductile Iron
EM	Electro-mechanical
USD	USD
FC	Financial Cooperation
GI	Galvanized Iron
GDP	Gross Domestic Product
GIZ	Gesellschaft für Internationale Zusammenarbeit GmbH
GoY	Government of Yemen
HR	Human Resources
HRDU	Human Resource Development Unit
INGO	International Non-Governmental Organisation
ICRC	International Committee of the Red Cross
IDP	Internally Displaced People
IT	Information Technology
JAR	Joint Annual Review
KfW	Kreditanstalt für Wiederaufbau
LAC	Local Advisory Committee
LC	Local Corporations
MoCS	Ministry of Civil Service
MoF	Ministry of Finance
MoM	Minutes of Meeting
MWE	Ministry of Water and Environment
NRC	Norwegian Refugee Council
NRW	Non revenue water
NWRA	National Water Resource Authority
NWSA	National Water and Sanitation Authority
NWSSIP	National Water Sector Strategy and Investment Plan
OMS	Operation Management Support
O&M	Operation and Maintenance
PIIS	Performance Indicator Information System
PVC	Polyvinylchloride
QF	Questionnaire forms (DAS Stage III)
St, ST	Steel
TA	Technical Assistance
TFPM	Task Force on Population Movement
UN	United Nations
USD, U$	American Dollar
WASH	Water, Sanitation and Hygiene
WFP	World Food Programme
WSP	Water Sector Programme in the Republic of Yemen

WSLC	Water and Sanitation Local Corporation
WU	Water Utilities
WWTP	Wastewater Treatment Plant
YER, YR	Yemen Rial

Units

LS	lump sum
m	meter
Mio	million
masl	meter above sea level
mg/l	Milligram per litre
m^3/d	Cubic meters per day
lpcd	litre per capita per day

no, nosnumber (numerical figure)

Executive Summary for Al-Dhalea' LC

Al-Dhalea' LC is serving a catchment area of about 80,000 people. 34 % of them are connected to the public water supply system. Till now Sanitation service has not been transferred to the responsibility of the Al-Dhalea' LC but still under the responsibility of the Hygiene and Improvement Fund of the Ministry of Public Works and Municipalities. Currently, the LC obtains the water from only three wells which are still operational. During the crisis the water pumping stations of Sanah and Al Sawda were damaged, and they are still out of service. The new administrative building in Sanah got damaged and looted. The offices of the LC in the Al-Dhalea' city also were looted and vandalised. The LC was visited by the Consultant in June 11th-13th 2023.

A. Institutional Assessment and Recommended Technical Assistance Measures (TA Plan) for LC Al-Dhalea'

The Al-Dhalea' LC, established in 2008, is managed by the General Director, Omer Abdul Aziz Al-Ahmedi. The utility employs in its 8 departments in total 117 staff members, 20 of them are contracted workers and dayworkers. During the conflict all the computerized systems for management, operation and accounts as well as its paper documents and archive were lost or destroyed.

The identified shortcomings and respective recommendation for urgent and non-urgent measures to tackle these shortcomings are summarized in the following table. A Technical assistance plan based on the identified measures showing the amounts needed for the urgent, high, medium and low priorities is attached as Appendix A-5.

Department	Obstacles	Recommended urgent measures	Recommended non-urgent measures
Governance / Management / Organisational structure / Resilience	BoD conducts no meetings since 2014. Missing of some Financial and administrative regulations as the LC archive was looted in 2015 war. Lack of governance, accountability, guidance by the BoD. Limited cooperation among LC management and BoD Organisational structure Lacks Departments of Sanitation, Women and Statistical & research Legal Affairs Department is under staffed (only the manager alone) and cannot operate effectively. Low service coverage and hence revenues No contingency plan for emergency and disaster Low Revenues and reduction of government support of staff salaries. Administrative building and pumping station locations are at considerable distance from employee›s residence locations. LC lacks transport vehicles Missing of some administrative and financial regulations as result of LC archive destruction/looting Weak data flow and technical and administrative performance due to looting/ damage/destruction of data and IT systems/networks and assets.	Allocating funds for BoD to encourage Bod to be reactivated. Initiation of regular meetings and coaching platform. Preparation of contingency plan for emergency and disasters Acquiring transport vehicles Regular meeting and coordination between LC and BoD.	Ensuring Support to acquire office furniture and equipment. Establishing IT and data network system Ensuring a transport mean for the management. Appointing key management staff
Human resource and capacity building management	Overstaffed administration and management Low qualification or skills of some employees	Capacity training of management and BoD. Training for key staff on technical and customer issues.	Analyses of staffing to determine detailed HR requirements. Preparation of staffing plan Introducing incentive scheme Control of staff attendance
Finance management/	No financial manager until 2021. Non availability of accounting system/software Non availability of data system, computers, data network and printers. Destruction/looting of documents, records, computers and digital storage during crisis. Lack of standardized procedure and reporting Lack of capacity and experience Lack of qualified accounts auditor and reviewer	Inventory on assets. Identify debts and follow up collection. Utilization of governmental liabilities for financing of LC expenses. Introduction of standardized forms and reports. Installation of accounting /assets software. Introduction of improved archiving system. Training of finance staff. Conduction of awareness programme.	Regular updating of asset register. Assignment of legal accountant for assistance. Restoration of lost files and data. Redesign of procedures and processes.
Customer service and relation management	Considerable domestic customers without meters Lack of costumer database Customer records were looted/destroyed during the conflict. Community committees operate some wells and collect the revenues. Lack of transport means Lack office equipment, computers, printers, data network. Shortage of work tools No workshop for meter maintenance	Building new customer database. Training of customer and relation management staff. Establishment of legal procedures to prevent vandalism.	Restoration of lost files and data. Update of customer database. Identifying debts and follow up collection. Introduction of GIS system with link to customer database. Installing water meters for all customers Establishment of customer complaint unit and procedures. Regular reporting of customer data to finance dept. Acquiring vehicles for transport Install meter maintenance workshop.
Water and Sanitation Service management	LC has no sanitation department. Water service coverage is extremely low. No. of Supply waters wells is so small compared to population of the area of coverage. Absent/limited electric supply from the Public Network.	Drilling and developing new wells. Utilising solar power for well and booster pumping and for administrative building requirements	Drilling more wells in the existing well fields and exploring new water resources Utilising Solar power for all pumping requirements and for other needs.
IT infrastructure	Lack of IT equipment, printer, server and furniture. Lack of data network Limited electricity supply.	Procurement and installation of hardware and software, server, printer, Solar system, air condition. Office equipment, furniture. Training on applications.	Procurement of printer, desktops. Introduction of GIS system and establishing GIS unit.

Gender perspective	Lack of female employees. Absence of women representation in community committees		Giving priority for female recruitment Improve awareness of the importance of women participation in community committee

Table 0.1: Obstacles and recommendations for institutional measures

To enable the implementation of the above proposed recommendations the following Technical Assistance interventions grouped into six packages with related cost estimates have been identified[1]:

Package	TA intervention	Estimated TA cost in USD			
		Urgent (0-6 months)	High priority (6 months-1 year)	Medium priority (2-3 years)	Low priority (3-5 years)
TA1	Financial Support	85,000	0	0	0
TA2	Training Courses	56,000	122,000	30,000	10,000
TA3	Office equipment and IT	78,000	48,000	23,000	0
TA4	Coaching and Consultancy services	74,000	134,000	50,000	0
TA5	Operation Management Support	0	36,000	227000	21,000
TA6	Public Relation and Awareness	0	76,000	76,000	26,000
Total TA cost:		293,000	416,000	406,000	57,000

Table 0.2: Cost estimates on TA interventions

The total required amount for the technical assistance measures has been estimated to around USD 293,000 for critical priority intervention, USD 416,000 for high priority intervention, 406,000 for medium priority intervention and USD 57,000 for low priority interventions.

B. Infrastructure Assessment and Recommended Rehabilitation Measures (Investment Plan) for Al-Dhalea' LC

Water Supply system

As the LC administrative building and facilities lies very close to a war zone in the ongoing conflict, its doors, windows, office furniture, data/computer networks and archives as well as the sanitary system were totally or partially damaged during the conflict. The old administrative building at Al-Dhalea' City suffers major looting during the conflict where its Doors, windows, office furniture, air conditioners, Computers, printers, and archive were looted. Sanitary system components were also looted or damaged. The damage incurred to the LC infrastructure and looting during the conflict, made it completely non-functional till mid 2022 where the LC resumed functionality using the negligible available resources and the few functional assets.

The LC currently is operating only in Al-Dhalea' district. The LC used to operate also in Hussein-Khalla area of Al Hussein district where the old water source exists. But as the yield of the old wells of Khalla-Hussein well field have deteriorated, The LC stopped operating the water supply in this area and a local community committee assumed responsibility for operating the water supply and distribution. The LC is planning to drill new wells in the Khalla-Hussein well field and resume its operation in this distribution area in the future.

Currently the LC is supplying water to four distribution areas located within the Al-Dhalea' district. The other two distribution zones located in Al Hussein district are now operated by a community committee. The LC currently has only 4 operating wells with a total yield of about 58 m3/h. It supplies water to 27000 inhabitants out of the 80000 inhabitants living in the 15 km2 service area of the LC through 135 km of transmission and distribution network and about 4156 water connection. The LC has 5 pumping/booster stations with a combined capacity of 60 m3/h. Three pumping stations/boosters are in operation while two are in-operational. The LC has 13 ground storage reservoirs with a total storage capacity of 3850 m3 and 2 elevated storage tanks of 200 m3 combined storage capacity.

The LC has groundwater wellfields, Bajah-Hajr, Al-Dhalea' city periphery and Khallah-Al Hussein Wellfields. Khalla-Hussein well field is the oldest wellfield used to supply water to Al-Dhalea' city, but currently its wells have been depleted and the LC stopped its operation in this wellfield as mentioned earlier. Currently the LC abstracts water from only 4 operating wells, two of them are located in the Bajah-Hajr wellfield and the other two are located in the Al-Dhalea' city periphery well field. The total water production during the year 2022 was 118, 000 m3 from three water wells only as the fourth well was operated only by the end of the year 2022.

The LC has five pumping stations, three operational (Bajah-Hajr collection and pumping station, Al Sawda booster pumping station, Sanah booster pumping stations)

[1] Details on TA measures with cost estimation are given in Appendix A-5 (TA plan)

and two non-operational as their equipment were looted during the conflict (Al Shafa›i booster pumping station and Khallah pumping station).

The LC has five distribution zones, four lies within the Al-Dhalea' district which are served currently by the LC, and one lies within Al Hussein district and is served through Community committee. The distribution zones are:

- Zone I: Supplied through Dar Al Heid Distribution Reservoir. It includes Al-Dhalea' city the capital of Al-Dhalea' governorate.
- Zone II: Supplies through Jabal Al Sawda Distribution Reservoir. It Includes Al Jaleela, Al Wa›ara, Kawkabah, Al Rubat and Ghawl Sumeid.
- Zone III: Supplied through Sanah Distribution Reservoir. It includes Sanah area.
- Zone IV: Supplied through Bajah Distribution Reservoir. It includes the villages around the Bajah wellfield.
- Zone V: Supplied from Al Hussein Hill distribution reservoir. It includes Al Hussein town the capital of Al Hussein district. Currently operated by a community committee.
- Zone VI: Supplied from Khallah-Al Hussein distribution reservoir. Currently operated by a community committee. It includes Khallah-Hussein region.

The LC is operating the wells and pumps mostly through diesel generators. Only well No. 7 in Bajah-Hajr is equipped with solar power generator. The LC owns eight diesel generators, two of them are totally defected and are out of service. The LC is planning to utilise solar power for operating its wells and pumping stations.

The LC faces huge problems due to lack of power supply. In 2022 the LC produced through diesel generators 532,300 KWh using 190,000 litres of diesel. There is lack of equipment and spare parts for the O&M of the water network. The LC is therefore not able to perform the regular maintenance of the facilities and equipment. The result is failure of some generators, wells and pumping equipment. As the LC was non-operational for about seven years, the pipes remain dry during this period which leads to corrosion and blockage.

The required materials comprise vertical pumps for the pumping station, solar power systems, Fluoride reduction units and operation and maintenance tools. Besides a new fully equipped water and wastewater testing laboratory is needed. The LC also requested vehicles for operation and maintenance of the water system.

Sanitation system

The LC has not yet assumed responsibility for operating sanitation systems in the area of its water supply service.

Investment needs

The identified shortcomings and respective recommendation for crisis and post crisis scenario can be summarized as presented in Table 0.3 below.

The identified measures have been prioritized according to feasibility and urgency in urgent measures, high priority, short-term and long-term measures grouped into eleven investment packages as shown in Table 0.4. The period indicates the proposed commencement of the investments, starting from 2024. For unforeseen additional measures a contingency of 10 % has been incorporated.

The required estimated budget has been calculated for:

- Urgent measures: 4,925,000 USD
- High-priority measures: 415,000 USD
- Short-term measures: 0 USD
- Long-term measure: 10,500,000 USD

The total needed amount for the rehabilitation, restoration and extension of the water and sanitation system, provision of solar systems and supply of required operation and maintenance materials has been estimated to about 15,840,000 million USD for the next five years.

Domains	Obstacles	Investment Measures			
		Urgent (0-6 mths)	High-priority (1-2 years)	Medium-priority (3-5 years)	Low-priority (<5 years)
Building and Reservoirs	Damaged administrative building. Lack of office furniture and equipment. Lack of laboratory. Insufficient office work space. Insufficient material storage space. Leak and deterioration of some storage reservoir New distribution storage needed	Rehabilitation of reservoir leaks. Construction of new distribution storage reservoirs at Al Sawda and at kalamata al Dooki. Adding a new storey to the administrative building at Sanah. Provision of office furniture for Sanah administrative building and Al-Dhalea' city offices.	Construct new single storey extension building beside the administrative building to meet the LC expansion requirement. New stone masonry warehouse (Hangar)	-	-

Water Resource, use and balance	Shortage in water supply wells. Low yield of the wells No. 2 and no. 5 of the Al-Dhalea' city periphery well field	-	Drilling and equipping 11 new wells at Bajah, Sanah, Hussein and Khallah. Deepening of Wells No. 2 and No 5. of Al-Dhalea' city periphery well field	-	-
Water pipelines	Dilapidated water distribution network of Al-Dhalea' city. Uncompleted rehabilitation of distribution networks of Bajah-Hajr, Lakamat Al Dooki and Habil Al Souq. Aging and dilapidation of the distribution networks of Khallah and Hussein. Bad condition of Sanah area and Al Kabar-Dar Al Sameen. Aging and corrosion of the pumping line from Khallah_Hussein wellfield to Al Sawda pumping station.	Rehabilitate Al-Dhalea' city distribution network. Complete the rehabilitation of distribution network for Bajah-Hajr, Lakamat al Dooki and Habil Al Souq villages. Rehabilitate the old distribution networks of Hussein and Khallah	Rehabilitate Sanah area and Al Kabar-Dar Al Sameen distribution networks. Rehabilitate the pumping line from the Khallah-Hussein well field to Al Sawda pumping station.	-	-
Water Pumping/ lifting Stations	Insufficient pumping capacity of Al Sawda, Sanah and Bajah pumping stations.	Supply and install 2 vertical pumps in each pumping station of Al Sawda, Sanah and Bajah pumping stations	-	-	-
Water sterilization facilities	High Floride content in ground water. Lack water and wastewater testing laboratory. Lack of measuring kits for residual chlorine.	Provide fluoride reduction units at Al Sawda and Sanah pumping stations. Provide portable residual chlorine measurement kits. Provide new water and wastewater testing laboratory.	-	-	-
Power generating/ auditing for water system	Diesel power generator of Al Sawda pumping station out of service and needs rehabilitation. Raise of Diesel prices.	Rehabilitate existing 200 KVA Diesel Generator at Al Sawda pumping station. Install solar power generation system at Al Sawda, Sanah and Bajah-Hajr pumping stations. Provide solar power systems for Sanah and Bajah wells.	-	-	-
Operation and maintenance process of water infrastructures	Lack of transport vehicles. Lack of repair and maintenance tools for pipe works, pump and motor works. Lack of tools and instruments for electrical works. Lack of trench excavation equipment. Lack of water meter maintenance workshop. Lack of pump lifting equipment/ wenches	Provide 4-Wheel drive cars for distribution and maintenance operations. Provide motorized tricycles (Tuk-Tuks) for personnel and material deployment and transport. Provide a truck mounted-crane for loading-unloading operations. Provide small trench excavator. Provide maintenance tools for pipe works, pump and motor works. Provide tools and instruments for electrical works. Establish water meter maintenance workshop.	Provide electric pump lifting winches at the three pumping stations of Al Sawda, Sanah and Bajah-Hajr.	-	-
Wastewater collection, treatment and disposal	The LC is not providing sanitation service. The area of service of the LC lacks wastewater collection, treatment and disposal infrastructure.	-	-	Implement wastewater collection, treatment and disposal system for Greater Al-Dhalea' (Al-Dhalea' city and the adjoining main neighbourhoods and villages along the Al-Dhalea' city-Sanah main road.	-

Table 0.3: Shortcomings and recommendations for Investment measures.

Package	Measures	Urgent (0-6 months) (USD)	High priority (1-2 years) (USD)	Medium priority (3-5 years) (USD)	Low priority (<5 years) (USD)	Total (USD)
Package 1	Civil Works on buildings and structures	520,000	135000	0	0	655,000
Package 2	Well rehabilitation and new construction	1,600,000	160000	0	0	1,760,000
Package 3	Water pumping station	360,000	0	0	0	360,000
Package 4	Water network rehabilitation and extension	700,000	0	0	0	700,000
Package 5	Wastewater collection, disposal and Treatment	0	0	0	10,500,000	10,500,000
Package 6	Generators and spares	3,000	0	0	0	3,000
Package 7	Vehicles, machines, tools	900,000	120,000	0	0	1,020,000
Package 8	Electric materials and solar systems	442,000	0	0	0	442,000
Package 9	Laboratory equipment	450,000	0	0	0	450,000
Total investment		4,975,000	415000	0	10,500,000	15,890,000

Table 0.4: Cost estimate on investment measures

Background

1. Damage Assessment Study

The Damage Assessment Study (DAS) has been initiated by MWE and was carried out with support of GIZ in 4 stages aiming to restore the water supply and sanitation services for the urban population in eight southern Yemeni Governorates and to strengthen the resilience of the respective eleven Water & Sanitation Local Corporations and their two affiliated branches and utilities in maintaining the water and sanitation.

The DAS Stage IV assessment was carried out through a rapid appraisal, characterizing the situation in 2022 and the results were presented in respective reports[2]. The main findings regarding the Al-Dhalea' can be summarized as follows:

- The board of directors (BoD) consists of eight members.
- The LC has 117 employees and 1 manager.
- As the LC Administrative building and facilities lies very close to a war zone, its doors, windows, office furniture, data/computer networks and archives as well as the sanitary system were totally or partially damaged during the conflict.
- The old administrative building at Al-Dhalea' City suffers major looting during the conflict where Doors, windows, office furniture, air conditioners, Computers, printers, and archive were looted. Sanitary system components as well as some diesel generators and other equipment were also looted or damaged.
- The damage incurred to the LC infrastructure and looting during the conflict, made it completely non-functional till mid 2022 where the LC resumed functionality utilising whatever infrastructures remains and its very limited human and financial resources.
- The LC relies primarily on groundwater as the main water resource. It has five groundwater wells, including one well that is not operational due to low yield. Another well started operating at the end of 2022.
- The LC has 89 km long distribution network and 46 km transmission mains according to information known to the administration. In fact, some other old networks do exist but due to lack of records, data about them are missing.
- The LC does not have a sanitation system for the areas it serves. Al-Dhalea' city Hygiene and Improvement is currently responsible for Al-Dhalea' city sewerage network which suffers serious disposal and coverage problems.
- Operation and maintenance tools and vehicles have been partially damaged or lost.

Based on the analysis of available data, the following recommendations have been made:

- The LC and its utilities require a fiscal support mechanism that facilitates LC, and its utilities require a fiscal support mechanism that facilitates salaries to be paid to the working staff during conflict period.
- Doors, Windows of the administrative building as well as office furniture, equipment and computers and data network need to be provided.
- The LC needs support to excavate and develop new groundwater wells to ensure meeting the vital needs of the population in the served areas.
- The LC needs support to implement a wastewater collection, treatment and disposal system for Al-Dhalea' city to enable the LC to assume its responsibility of the sanitation of the areas under its water service.
- Old distribution networks of Al Hussein district need to be replaced and extended.

1.2 Methodology of Assessment)

As Al-Dhalea' LC was not among the LCs covered by the previous DAS studies, no previous reports available to help in carrying out the assessment. Hence the assessment is mainly based on the institutional and technical questionnaires, site visits and their respective technical and institutional checklist. In order to obtain an overall and comprehensive overview of the situation of the Local Corporation, institutional and technical questionnaire forms (Part A and Part B) were prepared and sent to Al-Dhalea' LC on March 2023. Part A is covering all institutional subjects and Part B covering technical aspects. The LC had been visited on June 2023. Interviews have been conducted with the General Manager, Deputy General Manager, the Financial Manager, administrative affairs Manager, the Technical Manager, the Customer Manager. During the visits the consultant also investigated the condition and obtained data of the following:

- LC administrative offices in Al-Dhalea' and Sanah.
- Bajah well field and inspected Well No. 6 and Well No. 7.
- Bajah power generation station and inspected the five diesel generators of the station.
- Deisel generator at Sanah pumping station.
- Bajah storage reservoir.
- Habeel Al Souq distribution reservoir.
- Bajah repumping station and inspected the condition of the electromechanical equipment.
- LC Sanah head quarter to assess the water testing conditions and assess laboratory equipment needed.

[2] Yemen Water Sector – Damage Assessment Report of Thirteen Urban Local Water Supply and Sanitation Corporations in Yemen – Stage IV (December 2023, GIZ)

Respective pictures were taken; some of them are presented in Appendix Appendix .. The focal person for data exchange and support, determined by GIZ Yemen, was Mr Ahmed Saleh Al-Bishtreh during the complete project execution and for the LC and utilities. Data regarding contact and address of the LC and the utilities are attached in Appendix A-2.

The filled forms and revisions were received between March and September 2023. Numerous additional files regarding water facilities have been provided and needed verification and assessment. In addition, the Consultant team held several telephone conferences with the responsible members of the LC respectively to ask for clarification of data. All provided data were analysed and respective results incorporated in this report. The final versions of the filled questionnaire forms were translated into English and are attached Appendix B.

1.3 General Information about Al-Dhalea' City and Al-Dhalea' LC

Al-Dhalea' (also spelled Dhala, Ad Dali› or Ad Dhali›) Governorate with a total population in 2022 of 881,437 is located inland in the south-west of Yemen, with a total area of 4786 km2. Al-Dhalea' city is the capital of Al-Dhalea' Governorate. It lies on the main highway connecting Aden to Sana'a at about 240 km south of the city of Sana'a the Capital of the Republic of Yemen and at 120 km north of Aden, the Temporary Capital of the Yemen Republic. The city is located at Latitude 13°42' N and Longitude 44°43' E. It is situated on a plateau at an altitude ranging between 1400 m and 1975 m above sea level. It is an important market town and an administrative centre surrounded by fertile land. Figure 1.1 shows a location and district map of Al-Dhalea' Governorate

Figure 1.1: Location and District Map of Al-Dhalea' Governorate

The climate is subtropical highland climate, the summers are warm and mostly cloudy while the winters are cool, dry, and mostly clear. Over the course of the yea, the temperature typically varies from 11°C to 33°C and is rarely below 9°C or above 35°C.The average annual rainfall is 400 mm with two rainy seasons one from March to May and the other from July to September.

Al-Dhalea' Local Water & Sanitation Corporation (LWSC-D) was established by Republican Decree No. (37) of 2008 as the public body for water supply and sanitation services in urban areas of Al-Dhalea' Governorate. However, the LC services currently covers four distribution areas out six. The two distribution zones of Al Hussein district are out of service due to groundwater depletion and deterioration of the distribution networks. In addition, The LC has two branches, one in the town of Qa'atabah the capital of Qa'atabah District and the other in the town Damt the capital of the Damt District. This report relates only to the condition of Al-Dhalea' LC only excluding Qa'atabah and Damt branches.

Currently the population of the area served by Al-Dhalea' LC comprises 80000 inhabitants living in Al-Dhalea' district. 34 % of them are covered with public water supply connections. The main water resource is groundwater, which is currently obtained from 4 operating wells one of them is located in the Baja well field and the other wells are located in Al-Dhalea' city periphery wellfield. In the year 2022 only three wells were operational, one in Baja well field and two in the of Al-Dhalea' City periphery wellfield (Well No.5 at Wa'arah and Well No. 6 at Jaleelah) The total water produced from these three wells during about eight months of operation in the year 2022 was 118000 m3. The LC has 135 km of transmission and distribution network in operation. Additional distribution and transmission network do exist, but they are very old and deteriorated and the LC lack data regarding those as the records and databases of the LC were destroyed or lost during the beginning of the.

Generally, no public wastewater collection, treatment and disposal exist in Al-Dhalea' city and surroundings except a small sewerage network with about 2000 connections covering just 12% of Al-Dhalea' city the capital of the Governorate Till now Sanitation service has not been transferred to the responsibility of Al-Dhalea' LC but still under the responsibility of the City Hygiene and Improvement Fund of the Al-Dhalea' Governorate Public Works and Municipalities office.

DAS IV reflects the impact of the existing crisis on the LC performance in Al-Dhalea' city, excluding the Qa›atabah and Damt branches. Al-Dhalea' governorate in general is war zone during the ongoing conflict which divided the governorate into two parts: a northern part under Sana'a authority and a southern part under Aden authority. Moreover, Al-Dhalea' LC Administrative building and the Baja well field is close to the still active battle frontline. Al-Dhalea' LC incurred considerable damage to its infrastructure and complete looting of its store, office furniture, Archive, computers and data network and some generators as well as losing of operation and maintenance tools.

The conflict renders the LC totally non-functional till February 2022, where it resumes some of its administrative functions starting nearly from zero as no digital backup were saved for its data systems. Water production and distribution resumed gradually starting from April 2022.

In addition to the direct affects caused by the conflict significant indirect impact influenced the LC performance, such as:

Full stoppage of the water supply services all over the service area of the LC.

Cut off the power from the public network and increase of diesel cost and other operation and maintenance expenses.

Over the past years, the LC has not received any investment programs from the national budget (Ministry of Finance). This lack of investment has affected the LC›s ability to procure spare parts, operation and maintenance materials, and equipment.

The table below compares the key parameters of the service area of the LC which include Al-Dhalea' City and some principal villages close to the LC water sources prior to the crisis with the current situation:

Key parameter	2015	2022
Population of Al-Dhalea' Governorate	690,669	881,473
Population of Al-Dhalea' LC service area	N/D	83,200
NNos. of water connections	N/D	4213
Population served (water)	N/D	27000
Water service coverage	N/D	34%
Nos. of wastewater connections	N/D	2050
Population connected (sanitation)	N/D	N/D
Sanitation coverage	N/D	N/D
Non-revenue water	N/D	26%

Table 1.1: Key parameters of Al-Dhalea' LC[3]

Situation in 2018

Being located in a war zone with its administrative building and its main well field located close to an active frontline The Al-Dhalea' LC suffered considerable damage to its infrastructure and complete looting of its office furniture, operation and maintenance tools, computers and networking system, printers and administrative archive and records. No investment program from the national budget (Ministry of Finance) introduced in the past years which would help the LC in providing spare parts and other operation and maintenance material and equipment. Thus, the Al-Dhalea' LC remains completely non-functional throughout the conflict years from 2015 to 2021.

Current Situation

The LC resumed water services in 2022 after 7 years of stoppage due to the damage and looting suffered in the conflict as the Al-Dhalea' Governorate witnessed prolonged combat, especially in the early years of the conflict. Currently, the LC is supplying water to the Al-Dhalea' city and some villages near the water sources. It has three operating wells capable of producing about 300 m3/day. It supplies water to 27,000 inhabitants out of the 80,000 inhabitants 10,723 internally displaced people living in the 15 km2 service area of the LC through 135 km of transmission and distribution network and about 44,213 water connections. The LC has five pumping/booster stations with a combined capacity of 60 m3/h. Three pumping stations/boosters are in operation while two are non-operational. The LC has 13 ground-level storage reservoirs with a total storage capacity of 3,770 m3 and two elevated storage tanks with a combined storage capacity of 200 m3.

2. Assessment of LC Organization and Management

The establishment Republican Decree no. (37) for the year 2008 identifies the task and responsibilities of all involved bodies; MWE, BoD and LC management.

The legal procedures and laws are partially in operation during the conflict; the LC is following the Financial and Civil Service laws. Additionally, the Yemen law for procurement is applied as well as the water law. Brief overview of the content of the laws is outlined in Chapter 3.2 of the Strategy Report

The republican decree to establish the Al-Dhalea' LC was issued only in 2008. The political and security situation was deteriorating in the governorate in the consequent years before the 2015 crises. Consequently, the LC could not establish itself to carry out the tasks and responsibilities entrusted to it but continued to operate as a branch affiliated to the Aden LC with its service limited only to water supply covering only a very small area of the old Al-Dhalea' city and the Khalla and Hussein region. The real start of the LC occurred in 2022. Hence this LC is still in the phase of establishment. This LC was not part of the earlier DAS strategies studies. Moreover, it was totally non-functional during the crisis with all its archive and records missing, damaged or looted It was reactivated only in the year 2022. The assessment of this LC will rely only on the year 2022 data collected in addition to some information that can be extracted from other general reports concerning the WASH sector in Yemen.

No records of the BoD meetings before the crisis available. During the crisis till date the BoD has not conducted

[3] Source: Appendix B - Questionnaire Forms, Part A

a single meeting due to security conditions and non-availability of funds for the BoD activities.

The LC is supposed to provides the BoD with its plans and reports for discussion in the regular meetings. It is assumed that the BoD was conducting its regular meetings on monthly basis before the crisis. The LC states that there is a mechanism to follow up the decisions and instructions issued by the BoD, but they did not provide details about it. The BoD should resume its meetings to insure regular monitoring and assessment of the LC performance.

The Board of Directors (BoD) is considered complete with 6 members in addition to the Director General. The BoD structure is shown in Table 2.1 below. The names and positions of all BoD members are described in Appendix A-2Appendix .

Governor of Al Dhalea› governorate	Chairman of the Board
Director General of the LC	Member
BoD Secretary General	Member
Al-Dhalea› Governorate General Manager of Finance	Member
Representative of the Ministry of Water and Environment	Member
Al-Dhalea› Governorate General Manager of Planning	Member
Civil Society representative	Member

Table 2.1: Structure of Al Dhalea› LC BoD.

The LC emphasizes on the good interaction of the Ministry of Water and Environment and the Local Council cooperation during the crisis.

2.1 Organizational Structure and Governance

Al-Dhalea' LC organizational structure is shown in Figure 2.1. The LC has an administrative procedure which was prepared for the water sector in year 2000. The LC has the following organizational entities.

- Administrative department which is responsible for HR and employees› affairs.
- Financial directorate, which is responsible for accounting, funds, loans, assets affaires.
- Technical department which is responsible for water production, water distribution, water connections, operation and maintenance, water quality, laboratory, wells and pumping stations affaires.
- Customers and Public Relations department which is responsible for customers services, public relations and customer accounts sections.
- Legal affairs department which is responsible for the legal affairs of the LC.
- Audit and Inspection department which is responsible for internal auditing and inspection within the LC.
- Planning and Projects department which responsible for planning, projects and technical design and development affaires.
- Branches Department which is responsible for coordinating and supervising the LC branches activities.

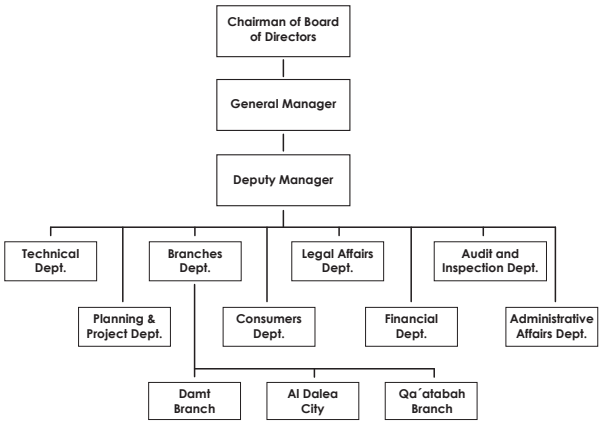


Figure 2.1: Organizational Structure of the Al-Dhalea' LC

- The structural review indicated that there are some challenges to be addressed such as:
- Organizational structure needs an update to include new departments or sections.
- Internal rules and regulations need to be prepared and made available.
- The LC buildings are not enough to accommodate all departments and sections.
- Lack of office furniture and equipment such as: computers, printers, cameras and inspection tools.
- Lack of a Women's department to promote women's participation in the LC policymaking.
- The technical department is currently responsible for water issues only. It needs to be extended to include sanitation to enable the LC to take charge of sanitation service in within its areas of operations.

The departments have to be properly sized in accordance with the size of the LC and the needs for operation and maintenance of water and sanitation facilities. An administrative expert is required to review the organizational structure of the institution as well as to prepare new job descriptions.

2.2 Governance and Management

According to its establishment decree, the Al-Dhalea' LC is responsible for water supply and sanitation services in the urban areas of the Al-Dhalea' governorate. But till now the LC only providing water services only. Southern districts of Al-Dhalea' governorate lacks public wastewater, collection, Treatment and disposal systems. Only A small part of the Al-Dhalea' city the capital of the governorate is has a public sewerage network covering less than 12 % collecting sewage into a septic tank of insufficient capacity and frequently overflows.

Till now the LC only operates water supply service and did not assume responsibility to the Sanitation service. Sanitation services is still managed by the Al-Dhalea' city Hygiene and Improvement Fund of Al-Dhalea' office of the Ministry of Public Works.

The LC manage the water supply service through its seven departments and the higher management (General and Deputy manager of the LC). The LC lacks documented standard operation procedures (SOP) to be followed in each department including the operation and maintenance procedure.

- In order to improve the governance and management within Al-Dhalea' LC the following issues need to be addressed:
- Add New department or section in the technical department to be responsible for wastewater service so as to enable the LC to assume its responsibility to manage sanitation in addition to water supply as stipulated by its establishment decree.
- Add new women directorate to increase women involvement in the LC activates.
- Development of capacity building plans to LC staff according to directorates needs.
- Development of job descriptions for staffing
- Include women in the civil society committee to enable women to participate in the decision-making process.

2.3 Assessment of Staffing Needs

The LC employs a total staff of 117 including 20 contracting staff. The number of employees remains constant since 2017. Nonetheless, the LC is overstaffed with 38 employees per 1,000 water connections. The percentage of female staff amounts to about less than 3 % (only 3) of total staff throughout the last 6 years.

The table below summarizes the staff according to gender, working condition and in relation to the number of water connections. Comprehensive details on the assessment of staffing situation of the LC are given in Appendix A-3.

Currently only about 70 employees work regularly, 39 employees do not come to work at all because they are either retired, assigned to other authorities or they cannot afford the transport cost as the working locations are too far from their residence.

All the existing departments of the LC are still in operation; below figure presents the distribution of staff for the different departments reflecting the figures obtained from the LC.

The number of managers represents less than 1 % of total staff, which seems to be too low for the size of the Al-Dhalea' LC.

From Figure 2.2 below it can be further concluded that the number of staff members per department is appropriate considering that the LC has not yet assumed responsibility of sanitation service as stated by the establishment decree. The LC must establish a section within the technical department or a separate department for sanitation and assume responsibility for sanitation in all areas covered by its water service.

The staff distribution seems reasonable to some extent except that the customer department seems to be understaffed compared to the administrative and financial departments. Staffing requirements for future sanitation service should be addressed as soon as possible. The staff of technical departments (water supply and planning) represents 50.5 % of total staff which reflects that the Lc is aware of the importance of these key departments. Financial department is representing 9.4 % of the total staff while the customer department represents only 7.7 %. It seems that the customer department is understaffed and needs to be strengthened.

In 2022, the combined monthly salary of 117 employees amounted to 12,494,773 million YER, with an average of 106,792 thousand YER per employee.

Staff situation	2017	2018	2019	2020	2021	2022
Total no. of permanent staff	97	97	97	97	97	97
Total nos. of contracting staff	20	20	20	20	20	20
Total nos. of day workers (temporary worker)	0	0	0	0	0	0
Total no. of staff	117	117	117	117	117	117
Total nos. of staff male actual working	70	70	70	70	70	70
Total nos. of staff male not actual working	39	39	39	39	39	39
Total nos. of staff female actual working	0	0	0	0	0	0
Total nos. of staff female not actual working	3	3	3	3	3	3
% of female to total	2.6	2.6	2.6	2.6	2.6	2.6
Nos. of water connections	N/D	N/D	N/D	N/D	N/D	4213
Nos. of staff per 1,000 connections	N/D	N/D	N/D	N/D	N/D	36

Table 2.2: Staff number and attendance[4]

[4] Source: Appendix B- Questionnaire Forms, Form A-3.1

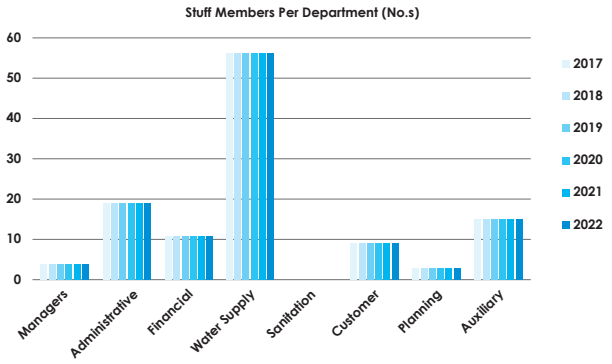


Figure 2.2: Staff Distribution Across Departments (2017-22)[5]

2.4 HR Procedures and Reporting

The conflict in 2015 greatly impacted the administrative buildings at Sanah and Al-Dhalea' city. The new administrative building at Sanah suffered extensive war damages, while the old administrative building at Al-Dhalea' city was looted. As a result, all the documents and databases were destroyed, preventing the LC from restoring any of the data or recovering the stolen records.

Due to the loss of documents and the lack of furniture and office equipment, employees face significant challenges in carrying out their work and often do not attend office regularly. Since the crisis began in 2015, the LC has been completely non-functional until 2021. Even after resuming functionality in 2022, only 61% of employees have returned to work, but their attendance is irregular and based on when they are needed. All human resources procedures and reporting, excluding monthly payroll processing, have been suspended.

Furthermore, there are no job descriptions available for different positions currently, as they were lost in the destruction and looting of the LC›s archives and databases during combat operations in 2015. This lack of job descriptions has resulted in employees being unaware of their tasks and responsibilities.

Recruitment in previous years did not follow any criteria or standards, leading to many employees lacking the qualifications required for their jobs, which continues to be a problem. To minimize operational costs during the crisis, the LC has implemented shiftwork for technicians, reducing overtime and overnight allowances.

Additionally, the LC faces a fiscal deficit, making it unable to afford incentives for employees to improve their performance or increase revenue collection. To navigate this situation, the LC cooperates with Aden LC for HR support from expert engineers.

2.5 Staff Qualification and Gender

The table below summarizes the LC employees regarding gender and qualification for the last six years.

Staff qualification	2017		2018		1019		2020		2021		2022	
	Nos.	% of total	Nos.	% of total	Nos.	% of total	Nos.	% of total	Nos.	% of total	Nos.	% of total
Staff professional level (university degree) male	18	15.4	18	15.4	18	15.4	18	15.4	18	15.4	18	15.4
Staff professional level (university degree) female	1	0.85	1	0.85	1	0.85	1	0.85	1	0.85	1	0.85
Staff technical level (high school. VT certificate etc.) male	71	60.7	71	60.7	71	60.7	71	60.7	71	60.7	71	60.7
Staff technical level (high school. VT certificate etc.) female	0	0	0	0	0	0	0	0	0	0	0	0
staff male lower qualification	25	21.4	25	21.4	25	21.4	25	21.4	25	21.4	25	21.4
staff female lower qualification	2	1.7	2	1.7	2	1.7	2	1.7	2	1.7	2	1.7
Total	117	100%	117	100%	117	100%	117	100%	117	100%	117	100%

Table 2.3: Staff qualification and gender data[6]

The qualification is considered as important indicator for the employee performance. Based on the analysis result, the staff with university and higher degree represents only 16.25% of the total employees. The employees with secondary degree and lower qualification represent subsequently 83.75 % of the workforce.

Within the last year the LC has conducted 19 training courses in various areas related to the staff capacity building including maintenance, HR, GIS and mapping, wastewater treatment, strategic planning, water quality, system design, project management, leakage, Solar pumping systems, chlorination and Tariff structure design. 14 of these training courses were financed by UNICEF and 3 courses by OXFAM.

The LC gives priority to qualified employees to attend the available courses and grant the trainees financial rewards.

[5] Source: Appendix B - Questionnaire Forms, Form A-3.1

[6] Source: Appendix B - Questionnaire Forms, Form A-3.1

The LC nominates individuals or groups of employees to attend available courses depending on their skills and area of specialization.

The LC requires various training for their key staff, management and employees but it has not prepared a Training Need Plan for the year 2023.

2.6 Strategic Resilience

Al-Dhalea' governorate was badly hit by the ongoing crises and combat operations. A war front line divided the Governorate into southern territory controlled by the Aden authorities and northern territory controlled by Sana›a authorities. The LC service area witnessed heavy fighting and non-functionality of the local authorities for a considerable period during the crises. The LC suffers considerable war damage in its administrative building and other facilities as well as looting of equipment, furniture and documents. Hence the LC remains unfunctional from the beginning of the crises till 2021 when it starts resuming partial administrative activities. Water supply operations resumed only in 2022, thanks to the large efforts exerted by the newly appointed young management of the LC. The LC is struggling to survive within a very difficult situation. It has to deal with various crises and problems such as:

- Infringement by private parties on the well fields and the ground water aquifers
- Aging and depletion of the water wells.
- Water source scarcity
- Multi-stage pumping requirement as the water sources are quiet far from the distribution areas which leads to high operation cost.
- Increased prices of fuel
- Lack of financial support to initiate development projects and develop or rehabilitate the assets.
- Lack of response from support agencies to offer subsidies for strengthening water resources.

Strategic resilience for this LC which has to start its operation from scratch and in the present circumstances requires a considerable administrative effort as well as a considerable financial resources and subsidies.

2.7 Measures Related to Strategic Resilience

As the LC has just started its functionality, it is struggling to maintain its operations running utilising the available scarce resources. The following measures related to strategic resilience were planned by the LC in 2022:

- Strengthening water resources by drilling new wells.
- Provision of office furniture and office equipment to the administrative building in Sanah and the old office building in the Al-Dhalea' city.
- Provision of transport means.
- Provision of work machinery and equipment.
- Provision of tool kits for operation and maintenance of the water networks.
- Provision of Solar power for pumps

The LC has implemented few measures related to strategic resilience as follows.

Measure	Year
Revising the internal regulation of subscription and connection fees	2022
Raising water tariff for the various categories	2022
Utilising solar power for pumping in Sanah Well	2022
Collecting cumulative dues from governmental and other subscribers	2022
Provision of diesel fuel through UNICEF subsidy	2022
Conducting 20 training courses various fields related to technical and administrative requirement	2022

Table 2.4: Measures related to strategic resilience implemented by the LC.

The LC proposed the following measures related to strategic resilience:

Measure	Priority
Strengthening water resources by drilling new wells.	1
Provision of office furniture and office equipment to the administrative building in Sanah and the old office building in the Al-Dhalea' city.	1
Provision of transport means.	1
Provision of tool kits for operation and maintenance of the water networks	1
Provision of tool kits for operation and maintenance of the water networks.	1
Provision of Solar power for pumps	1

Table 2.5: Measures related to strategic resilience proposed by the LC.

3. Financial Capacity

3.1 Financial Data, Procedures and Reporting

The financial department of Al-Dhalea' LC is a key component of the organization›s structure, handling all financial matters ranging from staff salaries to project funds and related expenses. The department has been operational since the establishment of the LC, although the evaluation of assets has not been conducted yet. This evaluation is crucial for establishing the financial system, as it forms the primary requirement for determining the LC›s opening balance sheet as stipulated in the LC decree, specifically Articles no. 7 and 8.

The LC has not received any subsidies for its recurrent budget from the Ministry of Finance either before or during the ongoing conflict. Instead, it relies on its own revenues and subsidies from donor agencies. The LC's computerized accounting system and equipment were destroyed or looted at the beginning of the crisis, forcing the financial department to rely on manual accounting procedures.

The LC adheres to the consolidated accounting principle and procedures as outlined in the Resilience Strategy Report, Chapter 3.2.6. The LC is subject to the auditing and inspection of the Central Organization for Control and Auditing (COCA). The current accounts of the LC in the Central Bank of Yemen were opened in November 2021, following the completion of repair works for the administrative building in July 2022.

Due to the destruction of the computerized accounting system at the onset of the crisis, the LC has been unable to issue financial statements for the years 2021 and 2022. Instead, the LC has had to rely on manually prepared annual closing balance sheets. The LC also failed to conduct an annual inventory of assets, stock, and cash since the start of the crisis.

The LC has been preparing financial reports since the crisis began. These reports include monthly and annual balance sheets. The latest balance sheet was for December 2022. The collected financial data in questionnaire A covers the followings.

- Recurrent annual budget.
- Revenues, expenses and liabilities.
- Financial efficiency and support
- Financial subsides.
- Bank account data and cashflow
- Cashflow requirements

3.2 Recurrent Budget

The annual total recurrent budget overview is used as monitoring tool to identify the LC's performance in utilizing the allocated and received budget.

The table below provides an overview of the recurrent requested budget and received amounts from the government.

Recurrent budget	2017	2018	2019	2020	2021	2022
Total recurrent budget requested in YER	933,156,000	933,156,000	933,156,000	1,233,156,000	1,291,332,900	1,089,376,234
Total recurrent budget approved in YER	0	0	0	0	0	527,059,250
In % of requested	0	0	0	0	0	48.4
Total recurrent budget received in YER	0	0	0	0	0	NO DATA
In % of requested	0	0	0	0	0	NO DATA
Total recurrent budget disbursed in YER	0	0	0	0	0	429,602,736
In % of received	0	0	0	0	0	NO DATA

Table 3.1: Recurrent budget for the last six years[7]

3.3 Revenues, Expenses and Liabilities

The table below presents an overview of the annual amount of operation and maintenance cost for the LC according to different categories for the past six years.

Revenues / Expenses	2017	2018	2019	2020	2021	2022
Total revenue in YER	No Data	No Data	No Data	No Data	19,039,100	92,373,601
Total cost without depreciation in YER	No Data	No Data	No Data	No Data	158,967,408	429,602,736
% total cost versus total revenue	No Data	No Data	No Data	No Data	No Data	465.1%

[7] Source: Appendix B - Questionnaire Forms, Form A-4.2

Salaries, allowances, incentives and others in YER	104,000,000	104,000,000	129,670,541	129,670,540	140,842,933	149,937,272
% Salaries, etc. of total revenue	No Data	No Data	No Data	No Data	13.5	61.6%
% Salaries, etc. of total cost	No Data	No Data	No Data	No Data	No Data	34.9%
Fuel, oil in YER	No Data	No Data	No Data	No Data	10,755,520	213,178,442
% Fuel, oil, of total revenue	No Data	No Data	No Data	No Data	56.5	230.8%
% Fuel, oil, of total cost	No Data	No Data	No Data	No Data	No Data	49.6%
Electricity in YER	No Data	No Data	No Data	No Data	1,520,000	2,500,000
% Electricity total revenue	No Data	No Data	No Data	No Data	8	2.6%
% Electricity of total cost	No Data	No Data	No Data	No Data	No Data	0.6%
Maintenance, spare parts, other O&M expenses in YER	No Data	No Data	No Data	No Data	5,818,125	52,101,672
% Maintenance, other O&M of total revenue	No Data	No Data	No Data	No Data	30.6	56.4%
% Maintenance, other O&M of total cost	No Data	No Data	No Data	No Data	No Data	12.1%
Other expenses in YER	No Data	No Data	No Data	No Data	30830	11885350
% Other expenses of total revenue	No Data	No Data	No Data	No Data	0.2	9.8%
% Other expenses of total cost	No Data	No Data	No Data	No Data	0.0	2.7%
Depreciation in YER	No Data	No Data	No Data	No Data	No Data	No Data
% Depreciation of total revenue	No Data	No Data	No Data	No Data	No Data	No Data
% Depreciation of total cost	No Data	No Data	No Data	No Data	No Data	No Data

Table 3.2: Revenues, recurrent costs and depreciation[8]

Revenues

- The LC stays non-functional since the beginning of the conflict. Data regarding revenues were supplied only for the years 2021 and 2022.

Revenues versus Expenses

- The total expenses are very high compared to revenues. They reached a percentage of 465% in 2022. Fuel represents the highest percentage of the total expenses. It represented 49.6 % of the expenses and 230.8 % of the revenues.
- The salary represents the next highest percentage of the total expenses. It represented about 34.9% of the total expenses and about 61.6 % of the revenues in 2022. The salary is considered as fixed costs which are not affected by increase or decrease in water production.

Financial Liability (Payable amount)

To identify the financial liabilities of the LC, the accumulated debts until 2022 have been assessed and are presented in the table below.

Financial liability	2022(YER)	% of total
Salaries and wages	0	0%
Other dues for employee	19,488,000	29%
Indebtedness of electricity	45,700,350	69%
Fuel and oil	0	0%
Insurance	0	0%
Taxes	923,750	1%
Local councils	0	0%
Other financial obligation	0	0%
Total	66,112,100	100%

Table 3.3: Financial liabilities in YER[9]

3.4 Financial Efficiency and Support

As the LC was non-functional from 2015 till 2021, and starts water production only in mid-2022, it is impossible to assess the financial efficiency of the LC.

Compared to 2021, the revenue in 2022 increased by 485 % million which presents only 485 % of 2021 revenue. The LC is not able to cover the operating expenses through the revenues. The LC is almost entirely dependent on the subsidy from the government and the support from humanitarian organizations. The central government covers the salary. In 2022 the LC received support of 186 million YER from UNICEF for fuel support.

The table below summarizes the financial overview of the LC since 2017.

[8] Source: Appendix B - Questionnaire Forms, Form A-4.2

[9] Source: Appendix B - Questionnaire Forms, Form A-4.2

Description	2017 (YER)	2018 (YER)	2019 (YER)	2020 (YER)	2021 (YER)	2022 (YER)
Total revenue	No data	No data	No data	No data	19,039,100	92373601
Total cost without depreciation	No data	No data	No data	No data	158,967,408	429,602,736
Depreciation	No data	No data	No data	No data	-	-
Total cost with depreciation	No data	No data	No data	No data	158,967,408	429,602,736
Deficit / savings with depreciation	No data	No data	No data	No data	139,928,308	337229135
Deficit / savings without depreciation	No data	No data	No data	No data	139,928,308	337,229,135
Support	104,000,000	104,000,000	129,670,540	129,911,380	125,688,595	291,755,132

Table 3.4: Financial Overview for the last two years[10]

3.5 Financial subsidies

The table below presents an overview of the received funding subsidies in the past six years.

Funding organization	Kind of support	Year	Amount (YER)
Any	Any	2017	0
Total 2017	0		
Any	Any	2018	0
Total 2018	0		
Any	Any	2019	0
Total 2019	0		
Any	Any	2020	0
Total 2020	0		
Any	Any	2021	0
Total 2021	0		
UNICEF	Fuel Support	2022	168,000,000
Total 2022	168,000,000		
Total			168,000,000

Table 3.5: Financial subsidies from donor relief organizations[11]

Investment Subsidies

During the period from 2017 to 2022 the LC obtained a total Investment subsidy of about YER 3 milliard There is not projects stopped or terminated during this period.

These subsidies targeted rehabilitation of existing networks, constructing new distribution networks, construction of a reservoirs, Supply and installation of pipes, building new pump rooms, rehabilitation of administrative buildings, drilling new wells and installation of solar power systems.

During the period from 2017 to 2022 Investment subsidies from the following organizations.

- UNICEF
- The Kuwaiti Yemeni Committee for Relief
- OXFAM
- Mercy Corps
- Emirates Red Crescent
- Social Fund for Development
- Kuwaiti response
- ACTED
- Al-Dhalea' Governorate Local Council

The details of these subsidies are presented in Appendix A-4.

Stopped/ Terminated Projects Since 2010

There are not projects stopped or terminated during this period 2017 to 2022 for the Al-Dhalea' LC.

3.6 Bank Account Data and Cash Flow

All LC financial activity is through the Central Bank of Yemen. The table below presents an overview of the accounts for the last six years for the Al-Dhalea' LC. As the LC remains non-functional from the beginning of the conflict till 2021, there is no cash flows or bank account activity before 2021.

The total cash deposit of 108 million YER from connection and income resulted in the average monthly cash flow of 9 million YER in 2022

No amount has been deposited in the depreciation account. Subsequently, there is no budget for investment or major maintenance available.

[10] Source: Appendix B- Questionnaire Forms, Form A-4.2

[11] Source: Appendix B - Questionnaire Forms, Form A-4.3, A-4.4

Year	Account Type	Connections Account	Income Account	Expenditure Account	Depreciation Account
2017	first period balance (YER)	0	0	0	-
	Total Deposits (YER)	0	0	0	-
	Total withdrawals and transfers (YER)	0	0	0	-
	end period balance (YER)	0	0	0	-
2018	Total Deposits (YER)	0	0	0	-
	Total withdrawals and transfers (YER)	0	0	0	-
	end period balance (YER)	0	0	0	-
2019	Total Deposits (YER)	0	0	0	-
	Total withdrawals and transfers (YER)	0	0	0	-
	end period balance (YER)	0	0	0	-
2020	Total Deposits (YER)	0	0	0	-
	Total withdrawals and transfers (YER)	0	0	0	-
	end period balance (YER)	0	0	0	-*
2021	Total Deposits (YER)	0	1,384,500	1,384,500	-
	Total withdrawals and transfers (YER)	0.00	1,384,500	1,298,700	-
	end period balance (YER)	0.00	0.00	96,885	-
2022	Total Deposits (YER)	15,844,109	92,383,601	193,651,327	-
	Total withdrawals and transfers (YER)	5,500,000	91,372,250	193,172,223	-
	End period balance (YER)	10,344,109	1,001,351	479,104	-

Table 3.6: Bank account details[12]

3.7 Cash Flow Requirements

The LC did not provide data on the cash flow requirements. The financial support has been calculated according to the financial capacity of the utility and is reflected in the Technical Assistance Package 1, Appendix A-5.

The unexpected and unreasonable fluctuation of the economic situation and unpredictable end of crisis does not allow providing reliable cash flow figures for the post-conflict era. Once post-conflict condition applies, the actual situation (particular regarding physical damage) of the LC has to be reviewed and the cash flow requirements updated respectively. In addition, the financial support has to be controlled through the MoF and in accordance with their regulations.

3.8 LC Financial Actions

According to the information collected from the questionnaire forms, Al-Dhalea' LC implemented the following actions to improve the financial management.

- increased water tariff
- Started revenue collection which was collected during the conflict through the community committees.
- Increased the use of solar energy in water production to reduce the production cost.

In addition, the LC implemented several measures to improve the financial management such as.

- Allocate operational budget.
- Conduct financial and administrative training to improve staff working efficiency.
- Approached local authorities and donor organisation to provide subsidy to activate the consumers and IT department by providing computers, billing software and printers.
- Provide financial and administrative staff with needed computers and facilities to analysis financial data and prepare financial reports.

[12] Source: Appendix B - Questionnaire Forms, Form 4.2

4. Assessment Of Customer Management

4.1 Customer Management Procedures and Reporting

Al-Dhalea› LC faces several challenges that hinder its ability to effectively manage customer operations. Firstly, due to the current security situation and poor employee attendance, the LC is unable to follow the regular customer management procedures. Furthermore, community committees are assigned to manage and operate the production, distribution and revenue collection of the old distribution zone of Khalla-Hussein.

The absence of an Operation Management System (OMS) or computerized central database further exacerbates the problem. To make matters worse, the LC lacks essential facilities, such as a GIS department and a customer support centre. This absence prevents the LC from providing efficient services to its customers. The billing process is also inefficient, as meter reading data is manually entered into simple spreadsheets using Microsoft Excel software. Moreover, customer meters are manually read after each water supply cycle, further contributing to operational inefficiencies.

The issuance of invoices is irregular, with no fixed monthly schedule. Unfortunately, the LC does not provide any information regarding the latest invoice collection dates. Furthermore, the LC lacks collection/ customer service centres outside of the main head office. While some representatives are authorized to distribute invoices and collect fees, this limited coverage may cause inconvenience for customers.

In two distribution zones comprising 18 villages in the outskirts of Al-Dhalea› city, collection is carried out by 18 field collectors who also serve as meter readers. However, there is no established complaint procedure, meaning that customer complaints go unrecognized and unresolved. Similarly, there are no documented procedures for customers to apply for new water connections, add new meters, or request a change of subscription. Additionally, the LC lacks a documented billing procedure, further contributing to the overall operational challenges.

4.2 Customer And Connection Data

The LC currently offers only water supply service. Sanitation service still offered by municipal authorities or community committees. Hence only water connections and customers considered here. Water connections data are available only for the year 2022.

The table below summarizes the number of connections per customer category for the water system in 2022.

[13] Source: Appendix B - Questionnaire Forms, Form A-5.1

The total number of water connections in 2022 is 4213 connections, most of which are in the domestic sector (4156 connections).

Connections	Domestic connections	Government connections	Commercial connections	Total
No of Water connections in 2022	4156	30	10	4213
No of Water connections 2017	N/D	N/D	N/D	N/D
Water connections ± 2017 & 2022	N/D	N/D	N/D	N/D
No of installed water meters 2022	4156	30	10	4213
%installed water meter to total connection	100 %	100 %	100 %	100 %
No of functional water meters	4156	30	10	4213
% of functional water meter to total	100 %	100 %	100 %	100 %
No of zero Reading	0	0	0	0
% of zero Reading water meter to total	0 %	0 %	0 %	0 %

Table 4.1: Water and Sewer connections per customer category[13]

The total number of installed water meters amounts to 4213 meters with 100 % functioning water meters.

In addition, there exist 0 zero-reading water meters, representing 0 % of the total connections which indicates that the respective customers are charged only for the minimum consumption of 5 m^3 per month.

The LC charges 100 % of the customers for the consumption from the actual water meter readings.

4.3 Billing and Collection

The LC takes water readings and issues bills each pumping cycle according to the procedure described above.

The domestic sector is the largest sector in water sales, with 98.6 %, of the total connections (4156 out of 4213). No data reported by the LC on the total amount.

The government sector represents 0.71 % of total customers, only 30 customers. The commercial sector represents 0.24 % of consumers.

This indicates that the LC relies on the domestic sector in increasing or decreasing the collection efficiency. No data regarding billed operational revenues or issued billed amounts or collected billed amounts. Hence it is impossible to assess the collection.

Since the LC was non-functional during the period from 2015 to 2021, no billing and collection carried out during the last six years. The LC did not report any billing and collection data for the year 2022 in which it starts producing water and supplying customers.

4.4 Tariff Structure According to Customer Type and Consumption

The currently applied tariff is shown in the table below. No data available on when it was approved. The tariff adopts only two different rates one for domestic, Governmental, mosques and hospitals and the other for commercial and industrial categories. It did not take into account the poor customers or rationalization of consumption.

Table 4.2 shows the adopted tariff structure for the LC and presents the tariff rate per m3 water consumed.

Customer category	Water Tariff (YER/m3)	Number of customers
Domestic, Government, schools & Mosques	2000	4203
Commercial & Other	2000	10
Industrial	3000	0

Table 4.2: Approved tariff structure[14]

The high numbers of customers are the domestic, government, schools and mosques which represents 99.8 % of all customers). Obviously, the current tariff is insufficient to cover the total operation cost as stated hereinafter.

Production cost and tariff efficiency

As result of the lack of provided data from the LC it is not possible to assess full life cycle cost and evaluate the water tariffs, and whether it is adequate to recover O&M costs or not.

4.5 Quality of Customers Services

The LC has no customers care centre for complaints and service quality. Moreover, the LC stopes its water supply operation since the beginning of the conflict and operates only for part of the year 2202. Thus, it is impossible to assess quality of service offered by the LC.

5. Assessment of IT Infrastructure and Management

5.1 IT Management

The IT department of Al-Dhalea› LC holds a significant position within the organization, reporting directly to the General Manager. Unfortunately, at the onset of the crises, the department experienced a complete loss of equipment due to fighting and looting activities. However, with assistance from UNICEF, the department managed to acquire certain resources in recent years. In 2021, they obtained one data server and three desktop computers, followed by two printers, one data show, and two monitors in 2022. Despite these acquisitions, none of the equipment is currently operational due to the lack of technical expertise and financial resources required for installation and operation. Presently, the IT department comprises a team of four staff members.

5.2 IT Equipment (Hardware) Condition

All the available IT equipment are obtained only recently (2021-2022) through support from the UNICEF and all are not yet functional. These include:

- 1 new server obtained 2021, but not yet installed.
- 3 desktop computers obtained in 2022.
- 1 new on-line printer supplied 2022 by the UNICEF.
- 1 new laser printer for document printing obtained 2022.
- 2 monitors obtained in 2022.
- 20 external hard disks obtained in 2022.

5.3 IT Systems

The LC currently lacks all the necessary components of IT systems, requiring it to start from scratch in acquiring and installing new systems. This includes the absence of an Ethernet network in the main office buildings, and a lack of software packages for billing, accounting, inventory control, Performance Information Indicator system (PIIS), and payroll management. Furthermore, there is an absence of Geographic Information System (GIS) or mapping software packages.

5.4 Needs for IT and Related Office Equipment

During the onset of the crisis, the LC experienced significant damage and looting. All the furniture and office equipment were either stolen or damaged, including the desktops. As a result, all departments are currently lacking computer facilities, office furniture, and data networks. Urgent provision of computer facilities is required in these departments to enable recording, analysis, reporting of performance progress, and completion of tasks.

[14] Source: Appendix B - Questionnaire Forms, Form A-6

Furthermore, there is an immediate need for data backups. To prevent complete data loss, it is crucial to maintain at least two copies of backups in different locations, as exemplified by the loss experienced during the crisis. It is recommended to assign two staff members to oversee the backup procedure.

Due to the crisis, the public grid only provides power supply for approximately four hours a day. Therefore, it is necessary to procure solar power generators to ensure a continuous supply of power for the IT equipment.

6. Assessment of Gender Situation

6.1 Public Services, Gender Issues and Special Needs

The present crises divided the Al-Dhalea' governorate into two parts one in the north and is under control of the Sana›a government, while the other part is in the south and is under the Aden government control. The Main office of the Al-Dhalea' LC is in Al-Dhalea' district, which is under the Aden Authorities control, while the two branches of Qa›atabah and Damt are in the districts of Qa›atabah and Damt respectively which are under control of the Sana›a authorities. The border line between the Al-Dhalea' and Qa›atabah districts is a frontline in the ongoing conflict. The LC only supplied data related to its service areas and not for the entire governorate. Therefore, the assessment here only applies to the southern districts of the governorate, namely Al-Dhalea', Al Hussein, Al Shaeeb, Jehaf and Al Azareq districts.

The majority of the population works in agriculture, Military, livestock, beekeeping and trade. There is a considerable number of expatriates whose financial transfers to their families forms on of the major sources of living for a considerable portion of the population. In urban areas people including a considerable number of women also work in government administrations, educational sector and Health and medical sectors. Considerable number of girls get Basic and secondary education. Few girls reach to university education.

A considerable urban and rural expansion occurred in the last 20 years thanks to the large number of expatriates especially from the districts Al-Dhalea', Al Sha›eeb and Al Hussein. But these districts lack to a great extent public services like piped water supply, sewerage networks and dependable communication and internet services

Water is scares and consumes a large share of the budget of the families. Public water supply service covers only a very small percentage of the population, the majority of the population depends on costly private water tankers. Poor families have to bring water in tins generally carried and transported long distances by women.

6.2 Population Issues

The estimated population of Al Dhalea› governorate is 818,507. The population structure as of December 2021 for Al-Dhalea' Governorate is as following[15]:

Estimated total population 818,507

Residents	656,529
Persons with disabilities	122,776
IDPs	161,978
Returnees [Persons]	31,764
Men [%]	24 %
Women [%]	22 %
Boys [%]	28 %
Girls [%]	26 %

There is no notable increase in population of the governorate due to the crisis escalation in 2015 as most of the displaced are internally displaced within the governorate. Very few IDPs come from outside the governorate.

The majority of IDP live with relatives or in rented flats and would therefore have same infrastructure service as the Al-Dhalea' citizens. There are no camps or special gatherings for the displaced who are involved in the host society.

The major problem of the IDP but also the host community is to secure the daily food; the prices for food increased by more than 100 % in Yemen, compared to the pre-crisis situation, but with strong fluctuation in price depending on the availability of commodities.

At the same time the GDP per capita decreased from 1,574 U$ in 2014 to 620 U$[16] in 2022 in Yemen.

6.3 Gender Issues within the LC/AU/ Branch

The traditional role of women is to take care of the household and educate their children, assisted by their daughters. Her outside contacts are limited to family and relatives. Particular women of poor families are not in the position to complain. Women are neither actively involved in any decision-making process nor in the allocation of investment funds regarding the water and sanitation services. Therefore, their needs and ideas for improvement of such services are not communicated to the LC.

The women shall participate actively in decision making processes at LCs regarding improved water and sanitation measures. Thus, the LC would be aware of the problems

[15] Yemen: Humanitarian Needs Overview - yemen_HNO_2021_population_dataset.xlsx - Humanitarian Data Exchange (humdata.org

gross-domestic-product-gdp-per-capita-in-yemen/٥٢٤١٣٧/Source: https://Statistica.com/statistics ١٦

and needs of the vulnerable groups of the community and could tackle the shortcomings.

There are only 3 female employees in the LC. They do not participate in WASH cluster meetings or in in any Women Network and no one of them occupy any leading position in the LC. The LC lacks a Women Department. Only men are members of community committees.

6.4 General Situation of Water Supply and Sanitation

The water supply situation is very miserable. The LC water service is limited to Al-Dhalea' and Hussein districts whose population in 2022 were about 150,299 and 170,872 respectively. The number of served population in those two districts is only 27000 representing only 8.4 % of the population.

The per capita water supply available for consumers is only 17 litres/c/d. The supply is only periodic with an average of once per 3 months. Hence consumers have to have sufficient storage at their houses to store the 3-month period requirement of water supply.

Most of the population rely on private tankers for their water supply and rainwater harvesting. Supplied Water prices are extremely high. The LC tariff for a cubic meter of supplied water for domestic and public institutions categories is YER 2000 and for other categories YER 3000. While the rate of private tankers supply ranges from YER 10,000 to YER 15,000.

Till now the LC has not yet assumed responsibility for sanitation, and instead, sanitation services are operated by the Hygiene and Improvement Fund of the Public Works Office of the Al-Dhalea' Governorate

Generally, there are no sewerage systems in the LC water-served areas except a small municipal sewerage network at the old city of Al-Dhalea' and it has no treatment plant and dispose sewage into a septic tank which is highly over loaded and frequently overflows creating a large sewage swamp within the city near the main educational and health premises of the city. The existing sewerage system of has 2500 residential connections and 350 commercial connections. It serves just 18% of the city population and about 12% of the city area. The remaining population discard their wastewater to private cesspits. It is expected that this practice causes environmental problems and diseases. Detailed investigation is needed on the extension of the public sewer system and possibilities for increase of service coverage and on alternative wastewater disposal and treatment measures for those not connected to the network.

The major problem regarding sanitation is the lack of wastewater collection, treatment and disposal systems in the governorate and the lack of hygiene facilities.

6.5 Public Water & Sanitation Services and Special Needs

Public Institutions and Places: Schools

There are more about 64 public schools in the Al-Dhalea' District, four schools only have water connection from the LC. Few schools are having ground storage reservoirs which are filled through private water tankers when resources collected from charity or community become available. Other schools have no water supply at all. Thus, the sanitation situation in most schools is very bad as most of bathrooms are closed due to lack of water and non-availability of funds to hire cleaners.

Public Institutions and Places: Hospital

There are two public hospitals in the Al-Dhalea' city. They have water connection. One is connected to the sewerage network without pre-treatment.

As the LC water production is very low compared to the demand. Most of the time hospitals need to get water through private tankers. This requires funds which are generally not available. Hospitals are forced to close many of the bath rooms due to lack of sufficient water supply which makes the already bad sanitation situation worse.

Water distribution points

The LC has no water distribution points at all. There are no special communities or camps for the displaced people since they are involved in the host society.

7. Assessment of Water and Sanitation Infrastructure

In the conflict of 2015, some facilities were damaged or vandalised; the most affected facility was the administrative building, along with the pumping stations. The LC indicated that partially damage occurs in buildings and the office furniture and equipment as well as some diesel generators and operation and maintenance tools were looted or vandalised during the conflict.

On the other hand, there are many indirect negative impacts caused by the crisis: power cuts, financial constraints (lack of revenues), increase of the operation and maintenance cost and lack of materials due to the lack of an investment program granted from the national budget (Ministry of Finance) during the last 6 years.

The methodology for the data collection and assessment has been presented already in Chapter 1.3 in this report. The questionnaire forms for Part B, attached in Appendix B comprised questions regarding the technical condition, availability, parameters and physical status of the utilities› infrastructure. The assessment focused on the following infrastructure:

- Water resources wells
- Water supply network
- Water pumping stations and chlorination units
- Ground and elevated water reservoirs
- Water and wastewater testing facilities
- Electricity generators

Based on the provided data from the LCs, the site visit, direct discussions with the LC managers and through the feedback from the managers all the available information had been assessed and respective results are presented below. The subsequent requirements and investment needs for rehabilitation and restoration of services have been identified by the LC and were verified and completed by the Consultant. The comments from the LC on the draft investment plan were taken into consideration for the preparation of the final version as summarized in Chapter 3.9.

7.1 Water Production

The LC has only one kind of water resources which is groundwater. As of 2022, three of the five existing water wells are operational in Al-Dhalea' district. Wells in Al Hussein-Khallah wellfield are excluded as they are depleted and currently operated by a community committee. One more well was put into operation by the end of the year 2022. Since the LC was non-functional from 2015-2021, production data is only available for the year 2022. The LC produced 118,000 m3 in 2022. The average water production capacity of the LC is around 300 m3/d:

7.2 Water Quality

Regarding water quality, the LC has no water testing laboratory, and it did not provide any data regarding the water quality but described the water quality of all the wells as ‹good›.

Additionally, there are three water sterilization units installed in the three main pump stations at Bajah-Hajr, Al Sawda and Sanah, which use drip chlorination as a disinfection method.

According to the LC groundwater of the wellfields contains high fluoride content and needs to be reduced through installing reduction units at the three main pumping stations.

Most of the city population is not drinking from tap water, they buy drinking water from private water desalination plants, or they use bottled water.

Water Disinfection and Treatment Units

There are three water sterilization units installed in the three main pumping stations at Bajah-Hajr, Al Sawda and Sanah, which use drip chlorination as a disinfection method. The sterilization facility was not damaged during the conflict and remained intact, so there are no health problems due to bad water quality in the three stations.

According to the LC groundwater of the wellfields contains high fluoride content and needs to be reduced through installing reduction units at the three main pumping stations.

Laboratories

The LC has no water and wastewater testing laboratory. It is recommended to support the LC to build and equip a standard water and wastewater laboratory in Sanah. Details of the recommended investment measures for water and wastewater laboratory are presented Appendix A-11..

7.3 Water and Wastewater System

The following table is an overview of the available water infrastructure and facilities as of 2022. No data supplied by the LC for previous years.

Description / Facility	Unit	2017	2022
Public water distribution points	No	0	0
Main source of water supply (SW or GW)		GW	GW
Number of distinct supply zones	No	4	4
Total number of boreholes	No	5	5
Boreholes in operation (=borehole pump no)	No	0	4
Ground Reservoirs	No /m3	13/3850	13/3850
Elevated Tanks	No /m3	2/200	2/200
Nominal water production capacity	m3/d	-	300
Water sterilization facilities	No.	3	3
Current water production capacity	m3/d	0	118,000
Total no. of domestic water meters installed	No	4213	4213
Total no. of functioning domestic water meters	m	-	4213
Nos. of new/ functional water meters in stock	No	-	-
Length of the water supply network	km	135	135
Total nos. of bulk water meter	No	10	10-
Water Laboratory	No	0	0

Table 7.1: Overview of available water infrastructure[17]

The water supply network has transmission and distribution pipelines with a total length of 135 km, 15 ground and elevated reservoirs, 5 pumping stations (two out of service), 3 chlorination units and 8 diesel generators.

The water production wells are located in two Wellfields: in Bajah-Hajr Wellfield about 25 km north of the city and in Al-Dhalea' city periphery well field. Khalla-Al Hussein well field located in Al Hussein district about 15 km east of the Al-Dhalea' city is currently not utilised by the LC.

The number of wells in Al-Dhalea' city periphery wellfield is four; Three are operational and 1 out of services due to low yield. Well No. 4 did not start operation until the end of the Year 2022. The LC resumes water production and distribution only in April 2022. The total water production during the year 2022 from the two operating wells in this well field was 100,00 m3 indicating an average rate of 274 m^3/day while the nominal production from the four wells of this field is 1100 m^3/day.

Currently only one well in the Baja-Hajr is operated by the LC. The LC did not report the status of other wells in this wellfield. During the year 2022 this well produced 1800 m3 which is equal to an average production rate of 75 m3/day while the nominal production from the four wells of this field is 260 m^3/day. Technical details of wells are presented in Appendix A -7Appendix .

The LC has five pumping stations. Three are operational (Bajah-Hajr, Al Sawda and Sanah Pumping stations) and two (Al Shafa›i and Khallah-Al Hussein Pumping stations) are out of service. Baja-Hajr pumping station with a total pumping capacity of 400 m3/day. It pumps collected water from the wells of Baja-Hajr wellfield to Sanah booster pumping station located at Sanah 15 km north of Al-Dhalea' city. Sanah pumping station with a total pumping capacity of 500 m3/day pumps water to Al Sawda pumping station. Al Sawda pumping station with a total pumping capacity of 500 m3/day pumps water to Al Sawda Hill distribution reservoir, Al Shafa›I booster pumping station and to Dar Al Heid hill distribution reservoir at Al-Dhalea' city. Al shafa›I pumping station was established in 1975. It accommodates two pumps with a total pumping capacity of 120 m3/day and is currently out of service. It was used to pump water coming from Al Sawda pumping station to Al Arashi hill distribution reservoir at Al-Dhalea' city. Khallah-Al Hussein pumping station is currently out service and was used to pump water collected from Khallah-Al Hussein wellfield to the Al Hussein hill distribution reservoir serving Al Hussein city and to the Khallah-Hussein distribution reservoir supplying the Khallah-Al Hussein distribution zone.

The LC has 13 ground storage reservoirs with a total storage capacity of 3850 m3 and 2 elevated storage tanks of 200 m3 combined storage capacity.

A layout map of the water transmission and distribution system showing the main transmission and distribution lines and locations of pumping stations and reservoirs is shown in Figure 7.1 below. Larger scale map is also attached in Appendix A-9.

Water Consumption Service Areas Data

The conflict created a very difficult situation for the LC as it loses all its office furniture and equipment, Archive and documents as well as all its electronic data and management systems. The LC resumes water production and distribution in 2022. Currently it has no regular records on water production, consumption and losses. There are 10 bulk water meters installed on the distribution network and 16 water meters are installed at the reservoirs and wells. The average water consumption during the 8 months of operation in the year 2022 is only 17 lpcd. Compared to the average consumption in Yemen with 49 lpcd, the supply situation in Al-Dhalea' is one of the worst. However, the table below shows that the water losses are high and reached 34 % in 2022.

[17] Source: Appendix B - Questionnaire Forms, Form B-0

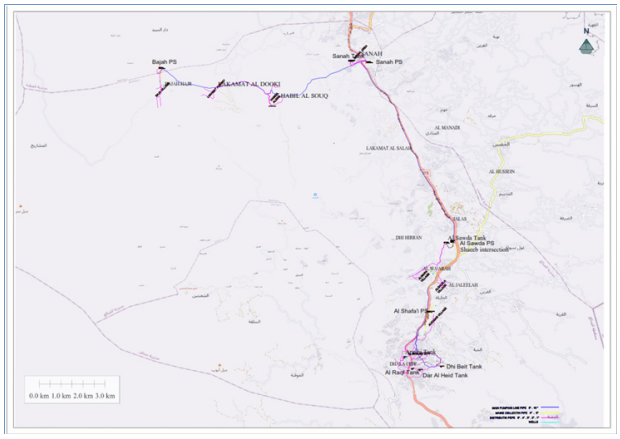


Figure 7.1: Al-Dhalea' Water Transmission and Supply Network

Description	2017	2018	2019	2020	2021	2022
water production	0	0	0	0	0	118,000
water consumption (billing)	0	0	0	0	0	78,200
Nos of connection	4,213	4,213	4,213	4,213	4,213	4,213
Nos. of supplied population	0	0	0	0	0	27,000
water consumption lpcd	0	0	0	0	0	17
NRW in m3/year	0	0	0	0	0	33,800
% of total water losses	0	0	0	0	0	34%

Table 7.2: Water balance for the last six years[18]

Ground And Elevated Water Reservoirs

The LC has 13 ground storage reservoirs with a total storage capacity of 3850 m3 and 2 elevated storage tanks of 200 m3 combined storage capacity. Detailed data of the reservoirs are given in Table (3.4) Below.

No.	Location	Capacity (m3)	Type	Current Condition	Operational Status
1	Bajah-Hajr PS	400	Ground/ Collection/ Concrete	Intact	Operational
2	Habil Al Souq	200	Ground/ Distribution/ Stone masonry	Totally Damaged	Out of service
3	Sanah	150	Tower/ Distribution/ Concrete	Intact	Operational
4	Sanah PS	500	Ground/ In-interim/ Concrete	Intact	Operational
5	Al Sawda PS	500	Ground/ In-interim/ Concrete	Intact	Operational
6	Al Sawda Hill	400	Ground/ Collection/ Concrete	Intact	Operational
7	Al Jaleelah	50	Ground/ Distribution/ Stone masonry	Intact	Operational
8	Al Shafa›I PS	200	Ground/ In-interim/ Concrete	Totally Damaged	Out of service
9	Dhi Beit, Al-Dhalea' city	500	Ground/ Distribution/ Concrete	Intact	Operational
10	Dar Al Heid Al-Dhalea' city	200	Ground/ Distribution/ Concrete	Intact	Operational
11	Al Arashi Hill, Al-Dhalea' city	500	Ground/ Distribution/ Concrete	Intact	Operational
12	Al Raqf, Al-Dhalea' city	100	Ground/ Distribution/ Concrete	Intact	Operational
13	Al Hussein	100	Ground/ Collection/ Concrete	Intact	Out of service
14	Al Hussein Hill	150	Ground/ Distribution/ Concrete	Totally Damaged	Out of service
15	Khallah	100	Ground/ Distribution/ Concrete	Totally Damaged	Out of service

Table 7.3: Al-Dhalea' LC Reservoirs data

Water Supply Network

The data supplied by the LC did not report the old supply and distribution networks due to the loss of database and records at the early years of the conflict. Hence the figures presented hereafter did not include the old non-operating networks whose data records or database are lost.

The water supply network of the Al-Dhalea' LC excluding the network of Al Hussein city and Khalla-Al Hussein area which are currently operated by community committees is 135 km meters long and comprises 4213 water connections. The water distribution network comprises 89 km of uPVC, GI and HDPE pipes of diameters varying from 15 mm to 250 mm. The Transmission lines ranges in diameter from 200 mm to 250 mm. Layout of the network is shown in Figure 3.1

The Khallah-Al Hussein networks are very old and totally deteriorated. They are out of service. The community committees are supplying water from the wells to the consumers via private tanker vehicles. These networks need to be replaced and extended to meet the high-rate urban expansion in this distribution area.

Water Distribution

From the 80000 residents in Al-Dhalea' district, only about 34% (27000 people) of the population of the district are

[18] Source: Appendix B - Questionnaire Forms, Form A-6.1

supplied through the public network. The water supply is highly interrupted, and the supply cycle may reach to 3 months. According to the LC 100 % of water meters are functioning.

The Al-Dhalea' LC has three water service in Al-Dhalea' district areas comprising four working and one non-working water supply zones and one service area in Al Hussein district comprising two out of operation distribution zones since the beginning of the conflict.

Currently the LC is supplying four distribution zones all lies within the Al-Dhalea' district. These are:

- Zone I: Supplied by gravity through Dhi Beit Distribution Reservoir. It includes Al-Dhalea' city the capital of Al-Dhalea' governorate.
- Zone II: Supplied by gravity through Jabal Al Sawda Distribution Reservoir. It Includes Jaleela, Wa›ara, Kawkabah, Rubat and Ghawl Sumeid.
- Zone III: Supplied through Sanah Distribution Reservoir. It includes Sanah area.
- Zone IV: Supplied through Bajah Distribution Reservoir. It includes the villages around the Bajah wellfield.

The non- working water supply zone in Al-Dhalea' district is Zone V of Sanah service area which is supplied from Habeel Al Souq distribution reservoir which is badly damaged.

LC sixth and seventh distribution zones lie in Al Hussein district and currently due depletion of khallah-Al Hussein wellfield wells and the dilapidation of the very old distribution networks, these distribution zones are operated by community committee which supply the water to the consumers through private tanker vehicles. These zones are:

- Zone VI: Supplied by gravity from Al-Hussein hill reservoir. It includes the town of Al Hussein the capital of Al Hussein district.
- Zone VI: Supplied by gravity through Khallah-Al-Hussein reservoir. It includes Al-Hussein Khallah Area of Al-Hussein district.

Figure 7.2 shows the service areas in Al-Dhalea' district. Larger scale map of the service zones can be found in Appendix A-9.

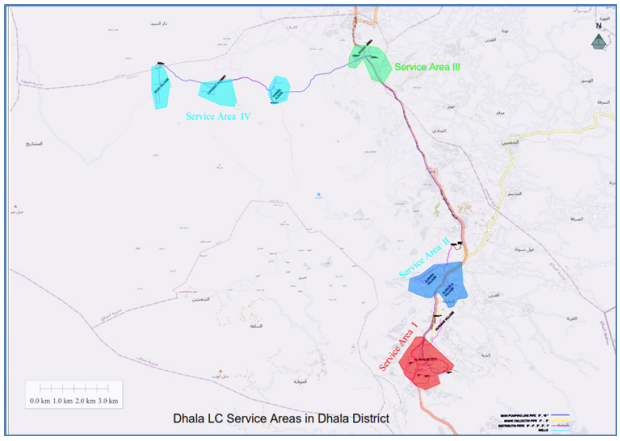


Figure 7.2 Service Areas of Al-Dhalea' LC in Al-Dhalea' District

Residents not connected to the public water system are supplied by private tankers. Regarding private water supply, the Consultant did not receive further details than those provided by the LC.

Distribution Zone	Areas covered	Area (km²)	Supplied population	Network Length (km)
Al-Dhalea' District Distribution Zones				
Zone I	Al-Dhalea' city	3.5	2000	89
Zone II	Jaleelah, Wa›arah, Kawkabah, -Rubat and Ghawl Sumeid	3.2	1350	
Zone III	Sanah region	1.9	80	
Zone IV	Bajah-Hajr, Lakamat Al Dooki and Habeel Al Souq	3.6	726	
Sub Total	12.2	12.2	4156	89
Al Hussein District Distribution Zones (Out of service, very old-deteriorated networks)				
Zone V	Al Hussein town	-	-	-
Zone VI	Khallah-Al Hussein area	-	-	-
Sub Total	-	-	-	-
Total	-	-	-	-

Table 7.4: Details on the water supply zones.

Electro-Mechanical (EM) Facilities for the Water Supply System (Water Resources and Pumping Station)

The LC has five pumping stations. Three are operational (Bajah-Hajr, Al Sawda and Sanah Pumping stations) and two (Al Shafa›I and Khallah-Al Hussein Pumping stations) are out of service. Baja-Hajr pumping station which was established in 2005 is located at Bajah-Hajr wellfield 18 km north-west of Al-Dhalea' city. It accommodates five pumps with a total pumping capacity of 400 m3/day. It pumps collected water from the wells of Baja-Hajr wellfield to Sanah booster pumping station located at Sanah 15 km north of Al-Dhalea' city. Sanah pumping station was established in 2005. It accommodates three pumps with a total pumping capacity of 500 m3/day. It pumps water to Al Sawda pumping station. Al Sawda pumping station was established in 2005. It accommodates six pumps with a total pumping capacity of 500 m3/day. It pumps water to Al Sawda Hill distribution reservoir, Al Shafa›I booster pumping station and to Dar Al Heid Hill distribution reservoir at Al-Dhalea' city. Al shafa›I pumping station was established in 1975. It accommodates two pumps with a total pumping capacity of 120 m3/day and is currently out of service. It is used to pump water coming from Al Sawda pumping station to Al Arashi hill distribution reservoir at Al-Dhalea' city. Khallah-Al Hussein pumping station is currently out service. It was established in 1975. It accommodates two pumps which were used to pump water collected from Khallah-Al Hussein wellfield to the two distribution reservoirs serving Al Hussein city and Khallah-Al Hussein area.

Data about the pumps and motors of the wells that are equipped with pumping equipment are listed in Table (7.5) below. More details are also presented in Appendix A-7.

Well No /ID	Pump data				Motor data						
	Dia. of riser pipe, mm	Installation depth, m	Head H, m	Discharge Q, m^3/h	Brand	Power, KW	Years in operation	Cable diameter, mm	Cable Length, m	Power Source	Current condition
5	63.5	722	700	10	Franklin	75	5	70	2100	Diesel Generator	Bad
6	80	630	600	18	Lowara	75	6	95	1900	Diesel Generator	Good
7	80	462	350	18	General	55	1	50	360	Solar Power	Solar Power

Table 7.5: well pumps and motors data

Pumping stations data are listed in Table (7.6) below. More details can be found in Appendix A-8Appendix .

Pump No.	Location	Model	Head H, m	Discharge, m^3/h	Motor Capacity, KW	control Panel, KW	Starting Mode	Current status	Power source
1	Bajah station	Lowara, Italy	120	70	55	55	Star-Delta	Excellent	Diesel generator
2	Bajah station	Lowara, Italy	120	70	55	55	Star-Delta	Bad	Diesel generator
3	Bajah station	Grandfos	120	15	55	55	Star-Delta	Excellent	Diesel generator
4	Bajah station	Valiadis	120	80	55	55	Star-Delta	Partially damaged	Diesel generator
5	Bajah station	Valiadis	120	80	45	45	Soft Starter	Bad	Diesel generator
6	Bajah station	Valiadis	120	80	45	45	Soft Starter	Bad	Diesel generator
7	Bajah station	Valiadis	120	80	12	5	Operation	Totally damaged	Diesel generator
8	Sanah station	Valiadis	120	90	37	45	Star-Delta	Good	Diesel generator
9	Sanah station	Valiadis	120	90	37	45	Star-Delta	Totally damaged	Diesel generator
10	Al Sawda station	Grandfos	180	72	37	45	Soft Starter	Partially damaged	Diesel generator
11	Al Sawda station	Grandfos	180	72	45	45 -18	Star-Delta Double	Partially damaged	Diesel generator
12	Al Sawda station	Grandfos	180	72	45	45 -18	Star-Delta Double	Good	Diesel generator
13	Al Sawda station	Landini	180	72	45	45 -18	Star-Delta Double	Good	Diesel generator
14	Al Sawda station	Rovatti	180	50	18	55 -55	Star-Delta Double	Good	Diesel generator
15	Al Sawda station	Rovatti	180	70	18	55	Star-Delta	Bad	Diesel generator
16	Al Shafa›I station	Rovatti	120	70		55- 55	Star-Delta Double	Totally damaged	Diesel generator

17	Al Shafa›I station	Rovatti	120	70		55- 55	Star-Delta Double	5	Diesel generator
18	Khalah-Al Hussein station	Rovatti	150	70		START-DELTA	Star-Delta Double	5	Diesel generator
19	Khalah-Al Hussein station	Rovatti	150	70		START-DELTA	Star-Delta Double	5	Diesel generator

Table 7.6: Pumping stations data

All proposed rehabilitation measures as well as the required materials and equipment are outlined in the Investment Plan in Appendix A-11. Further measures to improve especially the water and sanitation service situation for women, children and the marginalized have been assessed with detailed respective recommendations in in the Technical Assistance Package 6 of Appendix A-5Appendix .

7.4 Non-Revenue Water

water meters are installed at the wells and reservoirs. The average water consumption in year 2022 is around 17 lpcd under normal supply condition compared to the average consumption in Yemen which is around 49 lpcd.

Based on the available 2022 figures on the production and consumption, the estimated none- revenue water ranges from 34%. This figure is considered high and requires more efforts to reduce it and save the lost water for water supply. This can be achieved through improvement in the water networks, and water meters and control of illegal connections.

7.5 Operation and Maintenance

The constraints the LC faces in operation and maintenance water supply facilities can be summarized as following:

- Water resources are insufficient to meet the demand; new wells need to be drilled in all the three wellfields.
- The service areas of the LC in Al Hussein district are currently out of service due to depletion of existing wells and aging of the distribution networks.
- The LC has to carry out an additional task of power generation due to the lack of supply from the public network.
- High prices of diesel and other operation and maintenance cost.
- The difficulties to implement the contingency plan in case of crisis escalation since all the wells are far away of the cities supply is by pressurized system.
- Inability to supply water by pumping from Al Shafa›I pumping station as the station is out of service.
- Khallah Al-Hussein pumping station is completely deteriorated and need to be rehabilitated.

Besides, the LC staff maintains the equipment and network only after failure of pumps, pipes or after appearance of leaks etc. There is no preventive maintenance procedure in place, due to lack of O&M material, but also because of inadequately resourced LC.

The needed material and equipment and O&M material comprises:

- submersible pumps for wells and spare parts
- horizontal centrifugal pumps for water pumping stations and spare parts
- new diesel generators and spare parts
- domestic water meters.
- pipes of different material and diameters.
- valves of different sizes and types.
- bulk water meters of different types and diameters.
- wide range of workshop tools.
- new equipment and spare parts.
- transformers.
- laboratory equipment; and disinfection unit.
- vehicles.

Only with adequate material and equipment the utility will be able to carry out effective maintenance of the network and EM equipment. The new EM equipment and spare parts are needed for the efficient operation of pumps and transformers.

The LC has no heavy automotive machinery or equipment except one destroyed hydraulic excavator (Poclain). It is recommended to support the LC by a trench excavator, mobile crane as detailed in in Appendix A-11Appendix ..

The LC reported its needs of logistic support. They include:

- 4-Wheel drive cars
- 20-ton Mounted-on-truck crane
- small trench excavator
- Motorized tricycle (Tuk-tuk)
- complete Kit of electric tools needed for maintenance works.
- complete Pump and maintenance Workshop
- complete maintenance workshop for water meters
- Instruments and devices to test the electrical isolation and batteries.

All proposed rehabilitation measures as well as the required materials and equipment are outlined in the Investment Plan in. Appendix A-11. Further measures to improve especially the water and sanitation service situation for women, children and the marginalized have

been assessed with detailed respective recommendations in in the Technical Assistance Package 6 of Appendix A-5Appendix .

7.6 Energy Supply

General Information and Data on Energy Sources for Water and Sanitation Systems

Al-Dhalea' governorate southern districts are supplied electricity from the Aden governorate electric network. During the first four years of the conflict the electricity supply was completely cut off. Currently electricity is available only for 6 to 8 hours a day. The LC is currently relying on its diesel and solar generators to provide the required electric supply for the well and pumping stations.

The table below summarizes the available electricity equipment and related materials for 2022 compared to 2017 situation.

Description / Facility	Unit	2017	2018	2019	2020	2021	2022
Total electrical capacity required	kW	0	0	0	0	0	1230
Total electrical capacity provided by public grid	kW	0	0	0	0	0	0
Total number of existing diesel generators	Nos	8	8	8	8	8	8
Generator set installed for water supply	Nos	8	8	8	8	8	8
Generator set in operation for water supply	Nos	0	0	0	0	0	8
Generator set in operation for sanitation system	Nos	0	0	0	0	0	0
Current annual fuel consumption for water system	l/y	0	0	0	0	0	190,000
Current annual fuel consumption for sanitation system	l/y	0	0	0	0	0	0
Capacity of storage fuel tanks at the site	l	-	-	-	-	-	-
Capacity of mobile fuel tanks	l	-	-	-	-	-	-
Transformer	Nos	5	5	5	5	5	5

Table 7.7: Electrical capacities and available equipment[19]

Over the period of 2017 to 2022, the public electricity grid contributed 0% to the LC's total electrical capacity required.

The LC has in total 8 diesel generators. All are operational. Details of the generator specifications are shown in Appendix A-10Appendix .

The main energy consumption occurs in the pumping stations and wellfields where the abstracted water needs to be pumped through a number of stages from the source wells to the he distribution reservoirs through a five repumping/booster stations High amount of energy is consumed through the process as the distance from the most remote wellfield to the distribution reservoirs at Al-Dhalea' city exceeds 25 Km and the pumping heads required at the booster pumping stations exceeds 70 m.

There is a contradiction in provided data regarding the energy expenses and the energy consumption figures, this can be justified due to the unstable fuel price, inefficient documentation, continuous decreasing of motors efficiency with time.

As the LC starts water production from the wells at different dates of the year 2022, it is difficult to assess the average daily rate of energy consumption and consequently the average daily energy requirement for the water sector of the LC. The LC had received subsidies from humanitarian relief organizations with regard to improving the power supply as follows:

- Provide diesel for operating generators.
- Procure new solar generators.

In fact, this support was helping the LC considerably by continuing supplying water to customers.

Operational Data of the LC / AU/ Branch Energy Generation Stations)

The operational data of the energy generation stations of the Al-Dhalea' LC are listed in Table 3.10 below. As the LC was non-operational from 2015 to 2021, and it reactivates its water production and distribution operations gradually within a transition period from February to May 2022, it is extremely difficult using the data submitted by the LC to assess the average daily, monthly or even yearly rates of energy generation by the LC electric generation stations. The Bajah-Hajr station was operated only on November 2022. Sanah station also remains non-operational till the year 2022 end.

Installation	2017-2021			2022		
	Fuel consumption (l)	Energy produced (kWh)	Operation hours (h)	Fuel consumption (l)	Energy produced (kWh)	Operation hours (h)
Well No. 5, Al Jalila area	0	0	0	38,000	104,500	1,900
Well No. 6 Al Werah	0	0	0	108,000	307,800	5,400
Al Sawada pumping station	0	0	0	43,200	118,800	2,160

[19] Source: Appendix B - Questionnaire Forms, Form 4.1

Sanah pumping station	0	0	0	0	0	0
Beja Hajar collection and pumping station	0	0	0	800	1,200	55

Table 7.8: Operational data of the energy generation stations [20]

Energy Consumption Data

The energy consumption data for water pumping, treatment and distribution for the Al-Dhalea' LC is listed in Table 9.1 below.

Power source	Description (Unit)	Ground/ surface water wells	Water disinfection/ treatment units	Water pumping/ lifting/ booster stations
Public grid	Annual water pumping/ treating volume (m3)	0	0	0
	Total annual elect. energy consumption (kWh)	0	0	0
	Annual electric cost (YER)	0	0	0
Diesel-powered generating energy	Annual water pumping/ treating volume (m^3)	100,000	0	132,000
	Annual diesel consumption (l)	146,000	0	44,000
	Annual diesel cost (YER)	175,200,000	0	52,800,000

Table 7.9: Energy consumption data[21]

Required Investment Measures for the Improved Efficiency and Expansion of Existing Energy Sources

Support in Electricity Supply and Fuel

Currently the electricity from the public grid is not available, hence the LC has to continue relying on its diesel generators and solar power generator for its energy requirement. The average annual diesel requirement could not be assessed as the LC starts operation only in the year 2022 and was functional only for the entire year. Moreover, the LC is in the process of activating and developing new water resources and planning to increase its water production and extend its distribution networks by rehabilitating old deteriorated distribution networks of Al-Hussein-Khalla distribution zones in Al Hussein district which are currently out of service.

For the LC to continue water production and distribution operations, diesel subsidy should continue till the revenues become sufficient to cover the operation and maintenance costs.

The support for fuel is assessed for 12 successive months. The further support has to be re-assessed after one year, since the needed amount depend on:

- the future financial capacity of LC.
- actual fuel needs with regards to energy saving potential and population development.
- fuel price development.

Use of Alternative Energy Sources and Increase of Energy Efficiency

The most feasible optional energy source to be implemented within short time is the solar energy. The Yemen water sector has already gained some experience with the system and the equipment is readily available on the local market. Besides, Al-Dhalea' has favourable climate condition and it should be possible to produce between 6 to 7 kWh per square meter solar panel nearly throughout the year.

The LC wellfields and pumping stations are located out of the city with favourable conditions to use solar energy due to the shallow depths of the wells and the available area.

Utilising solar power for well pumps and for pumping stations will contribute to reducing considerably the fuel expenditure amount. Also, the energy consumption and therefore the fuel consumption could be reduced by increasing the energy efficiency of the electro-mechanical (EM) equipment.

With regards to energy saving, the installation of proposed and required materials and equipment outlined in the Investment Plan in Appendix A-11Appendix such as:

- Solar power for well pumps
- Solar power for pumping stations.
- Rehabilitation of non-functioning pump stations.
- repair and spare parts for diesel generators.
- new electrical equipment and spare part.

will reduce the cost of energy considerably and reduce to some extent the energy consumption.

It is further proposed to carry out an energy audit through specialized consultant to identify the possible energy saving potential and related needed measures in the water supply system of the LC.

[20] Source: Appendix B - Questionnaire Forms, Form A-4.3

٤,٤ Source: Appendix B - Questionnaire Forms, Form ٢١

7.7 Buildings, Administrative and Technical Facilities

Information on Administrative Buildings

The LC has a new administrative building at Sanah and an old one at Al-Dhalea' city. The Sanah administrative building is a two-storey building. As it is located very close to a combat operation area, it suffers damages and/or looting to its doors, windows, air conditioners, office furniture and equipment including computers, printers and network components. The entire archive and documents were also lost, damaged or vandalized. printers as well as the archive and documents. The building sanitation system was largely damaged.

The old administrative building is located in the Al-Dhalea' city. It suffered looting and vandalism during the conflict. All contents were looted or vandalized including office furniture and equipment and stored materials. The building is old and begins to deteriorate.

Information on Technical Buildings

The LC has five technical buildings/installations, they were affected by the conflict as described in the table below:

No.	Building / Installation	Location	Components	Conflict Impact	Current Status
1	Collection and pumping building	Bajah-Hajr	Collection storage reservoir, Pumps room, Generator room and Guard room	All diesel generators looted	Partially damaged
2	Booster pumping station	Sanah	Collection storage reservoir, Pumps room, Generator room and Guard room	Collection reservoir partially damaged. Diesel generator looted	intact
3	Booster pumping station	Al Sawda	Collection storage reservoir, Pumps room, Generator room and Guard room	Nil	intact
4	Booster pumping station	Al Shafa›i	Collection storage reservoir, Pumps room, Generator room and Guard room	looting and demolishing the pumps and motors. Damage or illegal construction on the transmission pipeline	intact
5	Collection and pumping building	Al Hussein	Collection storage reservoir, Pumps room, Generator room and Guard room	looting and demolishing the pumps and motors.	intact

Table 7.10: Information of the LC technical buildings

Investment Requirements for Buildings, Administrative and Technical Facilities

The following investment requirements for buildings, administrative and technical facilities were identified by the LC.

- Adding another extension building to the Sanah administrative building to accommodate future expansion of the departments.
- Furnishing and equipping the offices of the Sanah administrative building.
- Building and equipping a complete water and wastewater laboratory as the LC has no such facility.
- furnishing the offices of the old administrative building at Al-Dhalea' city
- Constructing additional floor at the Al-Dhalea' city old administrative building to meet the future expansion requirements.
- Providing iron shelves to the Sanah store.
- Building and equipping a new storage hangar at Baja-Hajar pumping station for material storage.

Wastewater System: Infrastructure and Management

The LC till now has not started to assume its responsibility on the sanitation services in its area of water service, as stated by its establishment decree. A small sewerage network exists only in the old Al-Dhalea' city, which dispose the sewage into a septic tank of insufficient capacity causing a sewage flooding of a large area in the centre of the city very close to the main educational and health institutions.

General Data of the Wastewater System, Sewer Network, Pumping Stations and Treatment Plants

Generally, there are no sewerage systems in the LC water-served areas except a small municipal sewerage network at the old city of Al-Dhalea' and it has no treatment plant and dispose sewage into a septic tank which is highly over loaded and frequently overflows creating a large sewage swamp within the city near the main educational and health premises of the city.

The existing sewerage system of has 2500 residential connections and 350 commercial connections. It serves just 18% of the city population and about 12% of the city area. The remaining population discard their wastewater to private cesspits. It is expected that this practice causes environmental problems and diseases.

Detailed investigation is needed on the extension of the public sewer system and possibilities for increase of service coverage and on alternative wastewater disposal and treatment measures for those not connected to the network.

The major problem regarding sanitation is the lack of wastewater collection, treatment and disposal systems in the governorate and the lack of hygiene facilities.

8. Technical Assessment (TA) and Investment Plans

8.1 Recommendations and Costs for TA Measures (TA Plan)

Methodology and Structure of TA Plan

The assessment on the institutional situation of Al-Dhalea' and the water and sanitation condition of selected public institutions and places lead to the conclusions and recommendations summarized in the tables below and the Technical Assistance Plan presented in Appendix A-11Appendix . The "Shortcomings" in the tables below provide an overview of the identified problems the LC is facing, and which have been outlined in previous chapters above. The "Recommendations" next to the "Shortcomings" explain the proposed measures in order to remedy the problems. For those recommendations where external support is required, reference is made to respective TA package. The period for the realization of the respective recommended activities is in the "Implementation" column.

The estimated costs for the proposed supportive measures are presented in the Technical Assistance Plan in Appendix A-5.

Governance, Management and Staff

Identified shortcomings and recommended measures to improve the governance, management and staff of the Al-Dhalea' LC are listed in Table 8.1 below.

Shortcoming	Recommendation	Implementation Priority
No proper work place for management and staff àUnavailability of staff for work	Provide complete office furniture and equipment for the administrative building and other utilities and work tools. The offices have no furniture at all and work tools unavailable. (ref. TA Package3 Appendix A-5)Appendix .	Urgent
BoD does not conduct meetings since 2014. Lack of cooperation between BoD and LC Insufficient capability of the BOD in governance, accountability, guidance.	Allocate budget for the BoD activities. Improve cooperation between the LC management and BoD. Regular meeting (once per month) must take place. The Minister of Water and Environment must urge the BoD to hold the meetings. Additionally, the LC management should call for BoD regular meetings. In order to activate the Board of Directors in taking responsibility and understand their function, its members and secretary must participate on training courses on the concept of governance, duties, major roles of members and their legal responsibilities. (ref. TA package 2 Appendix A-5Appendix .)	Urgent
Missing of some Financial and administrative regulations	Searching for missing financial and administrative regulation and making all regulations available and effective.	Urgent
No proper organizational chartà Missing some departments necessary for the LC to fully undertake its responsibilities as dictated by the decree of its establishment	Prepare organizational chart on the bases of the LC responsibilities, considering the tasks and duties of the LC, as well as actual needs of the LC to improve its operational efficiency and extend its service to sanitation as well. This may require establishing new department for sanitation and women. Determine required staff level and set targets for future human resource organization. (ref. TA package 4 Appendix A-5Appendix .)	High
Missing contingency plan for Emergency and disaster	LC management to prepare contingency plan. To improve emergency and prepare disaster plans. Support can be provided by the humanitarian organizations (UN agency or ICRC, etc.). (ref. TA package 2 Appendix A-5Appendix .)	Urgent
LC management and key staff lacking on specialized knowledge for efficient LC operation throughout all departments.	Training must be given to the management and key staff on: Good leadership and management principles. Crisis management / Emergency plan. Financial Management / Business planning / Budget planning and control. Customer management /relation, procedures. Operation and maintenance; procedures and technical training. Joint training with other LC managers / key staff for exchange of experience shall be envisaged. The required training measures have been assessed and are summarized in (TA Package 2 Appendix A-5.Appendix)	Urgent+ high + Medium + Low
	Appointment of key management staff with clear job profile. (ref. TA package 4 Appendix A-5.Appendix)	High
No job descriptions à employees are not aware of actual tasks and responsibilities.	Analyses of current staffing level for each department by applying benchmarks of national and international water companies. (ref. TA package 4 Appendix A-5.Appendix) Develop training plans. (ref. TA package 4 Appendix A-5.Appendix)	High

Improve the capacity of key staff in knowledge for efficient utility operation throughout all departments.	Capacity training must be given to the management and key staff. The required training measures have been assessed and are summarized in TA package 2 Appendix A-5Appendix . Courses are classified in urgent, high, medium and low priorities). The training shall be on following main themes: Good leadership and management principles Crisis management / Emergency plan Financial Management / Business planning / Budget planning and control Customer management /relation, procedures Operation and maintenance; procedures and technical training Joint training with other LC managers / key staff for exchange of experience shall be envisaged.	Urgent à urgent training Courses High, Medium and Low à Other training courses (As specified in TA Package 2)

Table 8.1: Recommendations to improve management performance and staff capacity.

Customer and Financial Management

The shortcomings identified in the field of customer and financial management were identified and proper measures were recommended to improve the customer and financial management of the LC as presented in Table 2.12 below.

Shortcoming	Recommendation	Implementation Priority
No facilities and equipment in the financial and costumer departments	Support utility with all required furniture and IT equipment including accounting, billing and stock software. Conduct an intensive plan to help the utility. resume all their activities. (ref. TA Package 3, Appendix A-5Appendix)	Urgent
Poor functioning of finance and customers departments	The finance and customer departments should resume its activities by installation of updated accounting assets and stock software (ref. TA Package 3, Appendix A-5Appendix)	Urgent
Lack of capacity and knowledge of Finance department staff.	Training of the financial staff (accounting, software, financial statements) => Capacity building / Staff recommendation (ref. TA Package 2 Appendix A-5Appendix)	Urgent and high (As specified in TA Package 2 Appendix A-5)
Incapacity of staff in use of billing software or to be able to use new software.	Training of staff from customer department regarding billing system => Capacity training (ref. TA Package 2 Appendix A-5Appendix .)	Urgent and high (As specified in TA Package 2 Appendix A-5)
No realistic business plan established.	LC management to discuss the financial situation and envisaged investments and budget for the following year. Preparation of annual business plan to control and then monitor the annual planned versus actual expenses.	urgent
Absence of standardized procedures and processes	Introduce customized procedures and reporting standards. Application of standardized forms for financial statements to prepare consolidated financial reports. Redesign of charts of accounts: cost centres, profit centres, consider commercial and management requirements, define fixed cost, recurrent cost, direct / indirect expenses. Amend accounting procedures to recognize / allocate revenues, expenses to identify assets and respective depreciation. Revision of balance sheets to separate long term liabilities from current liabilities. (ref. TA Package 2, 3 and 4 Appendix A-5Appendix .)	Urgent and high (As specified in TA Package 2,3 and 4 Appendix A-5)

Table 8.2: Recommendations to improve financial and customer management.

IT and Office Requirements

The table below summarizes the shortcomings and recommendations leading to procurement of equipment and materials for the Al-Dhalea' LC offices. The installation of the new equipment and training on new or updated software shall be provided through an IT expert. The respective details for the equipment and related cost estimates are presented in Appendix A-5Appendix , TA Package 3 while the specifications of some main equipment are attached in Appendix A-6Appendix .

Shortcoming	Recommendation	Implementation Priority
Lack of servers, desktop computers, Network accessories and software	Provide all required equipment needed to build a complete IT system	Urgent
No power supply	Needs continuous and low-cost power supply. Utilise solar power	Urgent and High (As specified in TA Package 3 Appendix A-5)
Some IT equipment supplied as subsidy from donor organisations but not installed yet	Install the supplied equipment	Urgent
No external data storage Devices	Provide external storage devices for data back-up	Urgent
Lack of office furniture and air-conditioners	Provide office furniture and air conditioners	Urgent
No Line printer	Needs new line printers	Urgent

Lack of laptops	Provide laptops	Urgent
No server for fingerprint data	Provide server for fingerprint data	Urgent
No plotter printer	Provide plotter printer to print maps	Urgent
Insufficient Laser, colour ink jet and dot matrix printers A4/A3	Provide additional laser printers, a colour inkjet printer and a dot matrix printer A4/ A3 to meet the daily work requirement	Urgent
No copier machine	Provide a copier machine	Urgent
Lack of data projector	Provide data projector for training and presentations	Urgent
No antivirus software protection	Provide Antivirus software to protect data network and users› terminals.	Urgent

Table 8.3: Recommendations on IT and office requirements

Gender Related Requirements

The LC did not report any gender related requirements. However, the assessment on schools and the hospital on one hand and discussion with the education office and local council on the other hand, revealed the urgent need for equipment as shown below. The provision and installation of these materials would improve the water supply and sanitation situation of children, IDPs, marginalized and women.

For schools:

- Procurement and installation of water pumps
- Installation of solar systems
- Ground water tanks and roof tanks
- Septic tanks
- Maintenance works
- Bathroom facilities

For Hospitals:

- Septic tank for heavy polluted water

Awareness Building

Due to the ongoing crisis the international donor organizations suspended their support on awareness campaigns. In order to resume the training and education activities on water and sanitation issues, it is important to establish awareness committees. The committee should be formed of a selected group of 20 members to be trained by specialized Consultant who is experience in the preparation of awareness plans and holding of campaigns. The awareness interventions shall be discussed with the LC, the local council and possibly donor organizations involved in such activities.

The campaigns shall be in form of media announcement / publication, distribution of brochures and leaflets and workshop meetings at public institutions. The training and information brochures should cover the following subjects:

- Importance of rain water harvesting
- Water saving in households.
- Considered use of sanitation facilities regarding water saving and pollution.
- Personal hygiene, food and household hygiene, health issues.
- Education of children (for mothers) with regards to hygiene, considered water use, sanitation.
- Safe waste and wastewater disposal.
- Importance of water and sanitation service and related subjects

Individual campaigns shall be held for schools, women and marginalized families with respective visits to inform them on above themes. The committee shall consult the attendees obtain their opinion about the quality of water and sanitation services and how improvements can be achieved. The feedback of such campaigns has to be compiled and discussed with the LC and donor organization.

The performance of this committee shall be observed and evaluated by the Consultant. The impact of the awareness campaigns should be assessed according to the goals set to enable the identification of further additional or amended awareness measures.

Technical Assistance Plan

The required TA support for the Al-Dhalea' LC has been determined based on the outlined recommendations in above chapters. The respective needs for the improvement of the resilience of the LC have been grouped into the following seven individual Technical Assistance Packages:

TA Package 1: Financial Support (Support for salary and energy supply)

- TA Package 2: Training Courses
- TA Package 3: Office Equipment and IT
- TA Package 4: Coaching and Consultancy Services
- TA Package 5: Operation Management Support (OMS) including GIS.
- TA Package 6: Public Relation and Awareness

The LC needs to implement some urgent and high-priority measures as soon as possible and within the next two years to strengthen their capacity and resilience. These measures include an integrated package of actions that should be carried out in parallel. Some medium-priority measures, such as additional training courses, office/ IT equipment, further coaching and consultancy support, OMS and additional awareness campaigns, can

be implemented within the next three to five years. These measures are less urgent but still important for the long-term development of the LC.

The detailed TA plan with its packages for the Al-Dhalea' LC is attached with this report in Appendix A-5Appendix .

The following table summarizes the estimated cost for the seven TA packages:

Package	TA intervention	Estimated TA cost in USD			
		Urgent	High priority	Medium priority	Low priority
		(0-6 months)	(6 months-1 year)	(2-3 years)	(3-5 years)
TA1	Financial Support	85,000	0	0	0
TA2	Training Courses	56,000	122,000	30,000	10,000
TA3	Office equipment and IT	78,000	48,000	23,000	0
TA4	Coaching and Consultancy services	74,000	134,000	50,000	0
TA5	Operation Management Support	0	36,000	227000	21,000
TA6	Public Relation and Awareness	0	76,000	76,000	26,000
Total TA cost:		293,000	416,000	406,000	57,000

Table 8.4: Cost estimations on TA interventions

The total required amount for the technical assistance measures has been estimated to around USD 293,000 for critical priority intervention, USD 416,000 for high priority intervention, 406,000 for medium priority intervention and USD 57,000 for low priority interventions.

8.2 Prioritized Investment Plan

The condition and requirements of water and sanitation facilities has been assessed and the needs are listed in the individual investment packages of the Investment Plan in Appendix A-5.Appendix . The packages contain the prioritization as well as the cost estimation for the recommended measures

All measures are required due to direct and indirect impact of the crisis and concerns rehabilitation works and the procurement of materials and equipment. The major works, e.g., restoration /construction of structures, big network or well rehabilitation has to be carried out by contractors. The supplied O&M materials would be utilized by the O&M staff of the LC for small maintenance work on the water system.

According to the assessment results the commencement and implementation of measures are prioritized as follows:

- Urgent measures: within 6 months (in 2024)
- High priority measures: within one year (2024-2025)
- Medium priority measures: 1-3 years (2025-2027)
- Low priority measures: 3-5 years (2027-2031)

The table below presents the summary of recommended measures with respect to priority, implementation / procurement category and related cost estimates including 10% contingency.

Package	Measures	Urgent (0-6mths) (USD)	High priority (6-12mths) (USD)	Short-term (1-3 years) (USD)	Long-term (3-5 years) (USD)	Total (USD)
		2024	2024-2025	2025-2027	2027-2031	
1	Civil Works on buildings and structures	520,000	135000	0	0	655,000
2	Well rehabilitation and new construction	1,600,000	160000	0	0	1,760,000
3	Water pumping station	360,000	0	0	0	360,000
4	Water network rehabilitation and extension	700,000	0	0	0	700,000
5	Wastewater collection, disposal and Treatment	0	0	0	10,500,000	10,500,000
6	Generators and spares	3,000	0	0	0	3,000
7	Vehicles, machines, tools	900,000	120,000	0	0	1,020,000
8	Electric materials and solar systems	442,000	0	0	0	442,000
9	Laboratory equipment	450,000	0	0	0	450,000
Total investment		4,975,000	415000	0	10,500,000	15,890,000

Table 8.5: Cost estimate for prioritized investment measures

The required estimated budget has been calculated for:

- Urgent measures: 4,975,000 USD
- High-priority measures: 415000 USD
- Short-term measures: 0 USD
- Long-term measure: 10,500,000 USD

The total needed amount for the rehabilitation, restoration and extension of the water and sanitation system, provision of solar systems and supply of required operation and maintenance materials has been estimated to about 15,890,000 USD for the next seven years.

Appendices to Annex 3

Assessment Report of Al-Dhalea' LC

Appendix 1:
Pictures of of Dhala LC Buildings

Dhala LC Administrative Building at Sanah

Dhala LC Administrative Building at Sanah

Solar Pannels at Bajah-Hajr

Solar Pannels at Bajah-Hajr

Storage Reservoirs

Storage Reservoirs

Booster pumping stations

Booster pumping stations

Appendix 2:
Contact Details of the LC and BoD

Name of Local Corporation (LC)	Local Water & Sanitation Corporation- Dhala (LWSC-D)
General Director Name	Omer Abdul Aziz Al-Ahmedi
Year the LC was formed	2008
Address of the LC	Main Street, Sanah, Al Dhala District, Dhala Governorate
Telephone	□□□ □
Fax	□□□ □
E-mail	omerbanalli@gmail.com
Focal Person (name and mobile No.)	Ahmed Saleh Qassem Al Bishterah Mobile: 778930108
Governance - Board of Director (BOD)	
Governor Chairman of the Board	Major-General Ali Muqbil Saleh
Director General of the LC	Omer Abdul Aziz Al-Ahmedi
BoD Secretary General	Saleh Abdo Yehya
Dhala Governorate General Manager of Finance	Abdullah Mohammed Al Beidahi
Representative of the Ministry of Water and Environment	Qaid Ahmed Al Derweesh
Dhala Governorate General Manager of Planning	Nabeel Qassem Al Afeef
Abdul Alem Saeed Othman	Civil society representative

Appendix 3:
Staff Situation and Qualification

Staff according to Qualification	2017	2018	2019	2020	2021	2022
Total no. of staff male actual working	70	70	70	70	70	70
Total no. of staff male not actual working (state reasons)	39	39	39	39	39	39
Total no. of staff female actual working	0	0	0	0	0	0
Total no. of staff female not actual working (state reasons)	3	3	3	3	3	3
Staff professional level (university degree) male	18	18	18	18	18	18
Staff professional level (university degree) female	1	1	1	1	1	1
Staff technical level (high school, VT certificate etc. male	71	71	71	71	71	71
Staff technical level (high school, VT certificate etc.) female	0	0	0	0	0	0
auxiliary / other staff female	25	25	25	25	25	25
auxiliary / other staff female	2	2	2	2	2	2
Total	117	117	117	117	117	117
Staff according to Section	2017	2018	2019	2020	2021	2022
Total No. of managers	4	4	4	4	4	4
Staff of administrative / management section	19	19	19	19	19	19
Staff of financial section	11	11	11	11	11	11
Staff of water supply section	56	56	56	56	56	56
Staff of sewerage section	0	0	0	0	0	0
Staff of customer relation section	9	9	9	9	9	9

Staff of planning / statistics section and project	3	3	3	3	3	3
Staff of auxiliary positions (guards of drivers ... etc)	15	15	15	15	15	15
Total	117	117	117	117	117	117
Staff according to Type	2017	2018	2019	2020	2021	2022
Total No. of regular staff	97	97	97	97	97	97
Total No. of contractors staff	20	20	20	20	20	20
Total No. of dayworkers (not employed)	0	0	0	0	0	3
Actual working hours per week admin. Staff	20	20	20	20	20	20
Actual working hours per week techn. Staff	20	20	20	20	20	20

Appendix 4:
Support of LC by Donor Organizations

Organisation	Year	Details	Amount (USD)
UNICEF	2022	Diesel for Water generators	146,087
Local council-Dhala district	2020	Water network maintenance	1,000
The Kuwaiti Yemeni Committee for Relief	2017	Reconstruction of the reservoir of the house of the city of Dali	25,000
The Kuwaiti Yemeni Committee for Relief	2017	Reconstruction of the reservoir of the house of the city of Dali	25,000
The Kuwaiti Yemeni Committee for Relief	2017	Restoration of Dar Al-Haid tank, Al-Dhalea city	6,000
The Kuwaiti Yemeni Committee for Relief	2017	Restoration of Al-Arashi cistern, Al-Dhalea city	6,000
Oxfam	2017	Construction of a tower tank of 50 m3 capacity, with the supply and installation of a 3-inch diameter pumping line for the Al-Jalila area	59,850
Oxfam	2019	Conducting studies and carrying out civil and electromechanical maintenance works	918,517
The Kuwaiti Yemeni Committee for Relief	2019	Completion of work on the main line 250 mm long, 2.5 km long, in Hajar area, which was stalled due to political necessity	12
Oxfam	2019	Conducting the study and rehabilitating the network of Korba Beja Hajar	43,860
Oxfam	2019	Rehabilitation of a network and construction of a reservoir for the Sanah area	165,000
Oxfam	2019	Conducting a study and announcing the tender, supplying and installing pumping lines to connect wells No. 5-6 to the black pumping station	70,000
Mercy Corps	2019	Supply and installation of 4-6 diameter polyethylene oipelines	126,000
Emirates Red Crescent	2019	Building and constructing a pumping room + supplying and installing a generator capacity of 220 + a submersible pump with its accessories	121,000
Social Fund for Development	2019	Rehabilitation of the LC buildings in Sanah + Al-Dhalea city	77,813
Oxfam	2021	Supply and installation of the internal network for the regions of Al-Jalila, Al-Wara, Kawkabah and Gul Samid, the first phase	243,000
Oxfam	2022	Supply and installation of the internal network for the regions of Al-Jalila, Al-Wara, Kawkaba and Gul Samid, the second phase	99,000
Kuwaiti response	2022	Drilling of an artesian well with the construction of a pumping room and the installation of a pump line, as well as the supply and installation of solar energy	119,880
ACTED	2022	Supply and installation of a solar energy system for Well No. 6 Al-Warah	60,638
ACTED	2022	Supply and installation of a generator for Well No. 5 Al Jalila	31,550
ACTED	2022	Implementation of parts of the internal network of the city of Dali	69,494
Oxfam	2022	Supply and installation of a solar energy system for well No. 5, Al Jalila area	87,090
Oxfam	2022	Supply and installation of a solar energy system for Al Sawda pumping station	107,210

Organisation	Year	Details	Amount (USD)
Local council-Dhala district	2022	Drilling two wells in the Beja Hajar field	106,250
Government-Ministry of Finance	2017	Concurrent budget deficit subsidy	104,000
	2018		104,000
	2019		129,671
	2020		128,911
	2021		125,689
	2022		123,756
Total			3,431,277

Appendix 5:

Technical Assistance Plan for Dhala LC

TA Package 1: Financial Support

ID	Intervention	Requirement	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
1.1	Salary, pension, incentives	Financial support	0	0	0	0
1.2	Energy supply and consumables	Financial support	84,820	0	0	0
Total TA Package 1:			85,000	0	0	0

TA Package 2: Training Courses

ID	Training Subject	Target Staff	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
2.1	Board of Directors Program	Board of Directors, Secretary of BoD	0	22,395	0	0
2.2	Management & HR subjects	General director, deputy, managers of main department, HR and Admin. Affairs	15,940	9,940	18,680	10,080
2.3	Technical subjects	Key staff of technical department, General director, Managers of main department	40,075	31,240	11,360	0
2.4	Finance subjects	Manager of Finance department, Procurement, Supervision and Inspection department	0	15,685	0	0
2.5	Customer Relations and Services subjects	Manager of Customer service, General director, deputy, key staff women department	0	32,900	0	0
2.6	IT, PIIS	IT manager, General director, Managers of main departments	0	9,940	0	0
Total TA Package 2:			56,000	122,000	30,000	10,000

TA Package 3: Office Equipment and IT

ID	Intervention	Requirement	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
3.1 3.2	IT equipment	Desktop, laptop, server, printer, copier	41,380	9,800	23,000	0
	Software	Replace Yemen Software	1,500	30,000	0	0
3.3 3.4	Electric equipment	Solar system, voltage regulator, charger, fingerprint scanner	24,280	7,900	0	0
	Furniture	Desks, chairs	9,820	0	0	0
3.5	Office material	not required	580	0	0	0
Total TA Package 3:			78,000	48,000	23,000	0

TA Package 4: Coaching and Consultancy Services

ID	Intervention	Requirement	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
4.1	Coaching support	Institutional development expert, NRW and tariff expert	24,000	20,000	0	0
4.2	Consultancy services	Update water network extension and sanitation system design, study on alternative power sources and energy saving	50,000	50,000	50,000	0
4.3	External Auditor	Re-evaluation of audits and accounts	0	63,800	0	0
Total TA Package 4:			74,000	134,000	50,000	0

TA Package 5: Operation Management Support

ID	Intervention	Requirement	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
5.1	Establish pre-conditions	Satellite images, software installation, customer survey, establish Customer Service Centre	0	35,850	75,000	21,224
5.2	Consultancy services	Team leader, experts, draughtsman	0	0	151,500	0
Total TA Package 5:			0	36,000	227,000	21,000

TA Package 6: Public Relation and Awareness

ID	Intervention	Requirement	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
6.1	Consultancy and committee support	Engage consultant, establish and maintain awareness committee	0	62,000	62,000	0
6.2	Public awareness campaign	Workshops, meetings, publications, media	0	8,810	8,810	26,000
6.3	Gender related awareness	Workshops for women, visit of marginalized, school visits	0	5,000	5,000	0
Total TA Package 6:			0	76,000	76,000	26,000
Total TA measures in Euro:			293,000	416,000	406,000	57,000

TA Package 1: Financial Support-(Urgent Priority only)

ID	Intervention	Required electricity (kWh/day)	Provided by public grid (kWh/day)	Operational generators (water/sanitation)	Fuel requirement (l/month)	Support duration (months)1)	Required amount (USD/ month)2)	Total amount (USD)2)
1.1	Fuel support	1,460	0	4	15,833	6	14,137	84,820
1.2	Filter and lubricant				0	6	0	0
Sub-Total							14,137	84,820
Total:							14,137	84,820

Notes:

[1)] The support for fuel is calculated for 6 successive months, further support and it's amount depends on financial capacity of LC, fuel price and needs re-assessment. 2) Exchange rate assumed YER 1150Per ! USD

TA Package 2: Training Courses

ID	Training Course Subject1)	Target Staff	Number of participants	Number of hours / training days	Cost (USD/ person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.1	Board of Directors								
2.1.1	Certified Board Member Program	Board of Directors	8	8 hours for 8 days	2,700		21,600		
2.1.2	Board of Directors Secretary program	Board of Directors Decision	1	8 hours for 3 days	795		795		
	Sub-total:					0	22,395	0	0
2.2	Management & HR Subjects								
2.2.1	Leadership skills	Director General, Deputy, managers ofmain departments	10	8 hours for 5 days	710			7,100	
2.2.2	strategic planning	Director General, Deputy, managers ofmain departments	10	8 hours for 5 days	710			7,100	
2.2.3	Crisis management, and contingency planning	Director General, Deputy, managers ofmain departments	10	8 hours for 5 days	710	7,100			
2.2.4	Water supply, sanitation and hygiene according to Sphere standards	Director General, Deputies, managers of Technical and Project department	4	8 hours for 2 days	435	1,740			
2.2.5	stress management	Director General, Deputy, managers ofmain departments	10	8 hours for 5 days	710	7,100			
2.2.6	Modern bases in the preparation of organizational structures and job descriptions	Director General, Deputy, AdministrativeAffairs and HR manager	5	8 hours for 5 days	710		3,550		
2.2.7	Human Resources Management	Director General, Deputy, AdministrativeAffairs and HR manager	5	8 hours for 5 days	710		3,550		
2.2.8	Reports writing Skills	Managers of departments	8	8 hours for 4 days	560			4,480	
2.2.9	Institutional Loyalty	Director General, Deputy, managers ofmain departments	10	8 hours for 4 days	560				5,600
2.2.10	Personnel Administration &Management of Salaries & Wages	Administrative Affaires and Human Resource department	4	8 hours for 5 days	710		2,840		
2.2.11	Business Planning	Deputy, Directors of main departments	8	8 hours for 4 days	560				4,480
	Sub-total:					15,940	9,940	18,680	10,080
2.3	Technical Subjects								
2.3.1	Preparation of Reagents and Standard solutions	The laboratory staff	2	8 hours for 4 days	565	1,130			

ID	Training Course Subject1)	Target Staff	Number of participants	Number of hours / training days	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.3.2	Wastewater Collection Systems	Sewage department	3	8 hours for 4 days	565	1,695			
2.3.3	Management of Maintenance andOccupational Safety	Technical department and Work SafetySection	4	8 hours for 5 days	710	2,840			
2.3.4	Safety requirements for work inconfined areas	, Sewage Management and WorkSafety Section	4	8 hours for 5 days	710	2,840			
2.3.5	First Aid and Fire Fighting	Work Safety Section	3	8 hours for 5 days	710	2,130			
2.3.6	Water Distribution Networks (Basic)	Technical department	8	8 hours for 3 days	495	3,960			
2.3.7	Water Distribution Networks(Advanced)	Technical department	8	8 hours for 3 days	495	3,960			
2.3.8	Quality control and QualityAssurance in Chemical Labs	The laboratory staff	2	8 hours for 5 days	710	1,420			
2.3.9	Ground Water Fundamentals	technical department	3	8 hours for 5 days	710	2,130			
2.3.10	Water and Wastewater Analysis	The laboratory staff	2	8 hours for 5 days	710	1,420			
2.3.11	Wastewater Treatment method	WWTP &Sewage Network Operating	2	8 hours for 5 days	710	1,420			
2.3.12	Water Production (Basic)	Technical department	2	8 hours for 3 days	495	990			
2.3.13	Water Production (Advanced)	Technical department	2	8 hours for 4 days	560	1,120			
2.3.14	Sampling	The laboratory staff	2	8 hours for 3 days	495	990			
2.3.15	Operation and Maintenance ofControl Panels	Technical department	2	8 hours for 5 days	710	1,420			
2.3.16	Design, installation and maintenanceof solar electric power	Technical department	2	8 hours for 5 days	710	1,420			
2.3.17	Maintenance and Repairs of WaterMeters	Technical department	8	8 hours for 3 days	495	3,960			
2.3.18	Sewer network designs SewerCad	Project department	4	8 hours for 10 days	1,420			5,680	
2.3.19	Water Network Designs by WaterCad	Project department	4	8 hours for 10 days	1,420		5,680		

ID	Training Course Subject1)	Target Staff	Number of participants	Number of hours / training days	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.3.20	Drawing and design - AutoCAD D3	Project department	4	8 hours for 10 days	1,420		5,680		
2.3.21	Project management and planning using software (Prima Vera)	Project department	4	8 hours for 10 days	1,420			5,680	
2.3.22	Operation and Maintenance of Diesel Generators (diesel power stations)	Technical department	3	8 hours for 5 days	710	2,130			
2.3.23	Water Leakage Control	Technical department	3	8 hours for 4 days	560	1,680			
2.3.24	Rainwater harvesting	Technical department, Managers and planners	5	8 hours for 5 days	710		3,550		
2.3.25	Water conservation	General Director, Deputy, Managers ofmain departments	5	8 hours for 5 days	710		3,550		
2.3.26	Appropriate wastewater treatment and reuse of reclaimed wastewater	Sanitary engineers, public healthofficers, wastewater treatment plants designers	5	8 hours for 5 days	710		3,550		
2.3.27	Wastewater treatment for small communities	Sanitary engineers, public healthofficers, Wastewater treatments plants designers	6	8 hours for6 days	710		4,260		
2.3.28	Low-cost sanitation / sustainable sanitation	Sanitary engineers, Water supply personnel, public health officers	5	8 hours for 5 days	710		3,550		
2.3.29	Management of Operation and Maintenance of Motors and Pumps	Technical department	2	8 hours for 5 days	710	1,420			
2.3.30	Methods and technology on energysaving /renewable energy in water and sanitation systems	Technical department	2	8 hours for 5 days	710		1,420		
	Sub-total:					40,075	31,240	11,360	0
2.4	Finance Subjects								
2.4.1	Unified accounting system	Finance Department manager and itssections	6	8 hours for 5 days	710		4,260		
2.4.2	Procurement and Store Management	Procurement and Store department	6	8 hours for 5 days	710		4,260		
2.4.3	Planning and Control of Budgets	Director Financial and heads of budget, expenditure and revenue sections	4	8 hours for 5 days	710		2,840		
2.4.4	Cost Accounting	Financial Department	3	8 hours for 3 days	495		1,485		

ID	Training Course Subject1)	Target Staff	Number of participants	Number of hours / training days	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.4.5	Internal Auditing Guidelines Implementation	Supervision and Inspection Department	4	8 hours for 5 days	710		2,840		
	Sub-total:					0	15,685	0	0
2.5	Customer Relations and Services								
2.5.1	Water Meter Reading)	Head Water meter section, Watermeter readers and its supervisors.	35	8 hours for 3 days	495		17,325		
2.5.2	using billing system applications	Financial and customers department	4	8 hours for 2 days	435		1,740		
2.5.3	Collection the receivable amounts	Customer Service department and itssections	5	9 hours for 3 days	495		2,475		
2.5.4	Tariff Structure Design	General manager and deputes,financial, technical, customer department .	5	8 hours for 5 days	710		3,550		
2.5.5	Preparation of Awareness Plans & campaigns	Women department , customer service ,public relationship department and technicians & engineers	5	8 hours for 5 days	710		3,550		
2.5.6	Customer Relations Management	Customer Relationship department ,Customer Service department andWomen's department	6	8 hours for 5 days	710		4,260		
	Sub-total:					0	32,900	0	0

ID	Training Course Subject1)	Target Staff	Number of participants	Number of hours / training days	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.6	IT Courses								
2.6.1	Oracle SQL	Information technology department	2	8 hours for 5 days	710		1,420		
2.6.2	Oracle PLSQL	Information technology department	2	8 hours for 10 days	1,420		2,840		
2.6.3	Windows Server 2012 Setup ,Configuration and ServerADMINISTRATION	Information technology department	2	8 hours for 5 days	710		1,420		
2.6.4	GIS ArcMap	GIS Unit	3	8 hours for 10 days	1,420		4,260		
	Sub-total:					0	9,940	0	0
	Total					56,015	122,100	30,040	10,080

TA Package 3: Office Equipment and IT

ID	Intervention	Requirement	Quantity (nos)	Unit Cost (USD)1)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
3.1	IT Equipment							
3.1.1	Desktop PC	see Appendix 9	10	900	9,000			
3.1.2	Laptop	see Appendix 9	3	1,500	4,500			
3.1.3	Server	see Appendix 9	1	7,000	7,000			
3.1.4	Billing Printer	see Appendix 9	1	15,000	15,000			
3.1.5	Plotter Printer A0	see Appendix 9	1	9,000		9,000		
3.1.6	Laser Printer A4	HP LaserJet 400 M401DN	2	700	1,400			
3.1.7	Laser Printer A4 Ink	HP LaserJet 400 M401DN Ink	4	60	240			
3.1.8	Color Printer	HP LaserJet 400 M451DN ColorPrinter	1	800		800		
3.1.9	Laser Printer A4/A3	Hp LaserJet 700 M712dn	1	3,000	3,000			
3.1.10	Laser Printer A4/A3 Ink	Hp LaserJet 700 M712dn Ink	4	60	240			
3.1.11	Dot Matrix Printer A4/A3	Epson Fx-2190N	1	1,000	1,000			
3.1.12	iPad or Handheld units	see Appendix 9	10	2,300			23,000	
	Sub-total				41,380	9,800	23,000	0
3.2	Software							
3.2.1	Install the "National watersector" software by adding cost centers application	Supply and install the applicationsfor cost centers and profit centers to separate direct and indirect cost. Update database, link to other applications.	1	30,000		30,000		
3.2.2	Upgrade Software	Set up Server and upgrade database	1	1,500	1,500			
	Sub-total				1,500	30,000	0	0
3.3	Electric equipment							
3.3.1	Air Condition	Air Conditioner Split Unit ,1 Ton	1	500	500			
3.3.2	Voltage regulator	10KVA Servo motor AutomaticVoltage regulator 2 Phases	1	2,500		2,500		
3.3.3	Online UPS	Online UPS 5KVA with battery Min.backup 2 hours in Max load	1	2,000		2,000		
3.3.4	Online UPS	Online UPS 5KVA with battery Min.backup 2 hours in Max load	1	2,000	2,000			
3.3.5	Switch Hub 48	Dell power connect 2848 48Gbe	1	680	680			
3.3.6	Projector	see Appendix 9	1	3,000		3,000		
3.3.7	Money Safe	A small, metal money safe	1	400		400		
3.3.8	Scanner	HP Officejet 7612	1	400	400			
3.3.9	Copier Machine	see Appendix 9	1	3,000	3,000			
3.3.10	Switch hub	Switch Hub Dell power connect2816 16Gbe	2	250	500			
3.3.11	External HD	External Hard desk 2 TB	2	100	200			
3.3.12	Solar power system	see Appendix 9	1	17,000	17,000			
	Sub-total				24,280	7,900	0	0
3.4	Furniture							
3.4.1	Desk	Desks are L-shaped and fourinclusion	19	300	5,700			
3.4.2	Chairs	Large swivel chair	10	50	500			
3.4.3	Chairs	Medium swivel chair	10	40	400			

ID	Intervention	Requirement	Quantity (nos)	Unit Cost (USD)1)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
3.4.4	Chairs	Fixed chair	6	30	180			
3.4.5	Cupboard	Three-chamber wooden cupboard	5	270	1,350			
3.4.6	Cupboard	Two-chamber wooden cupboard	5	250	1,250			
3.4.7	Table	Table + 4 fixed chairs	2	220	440			
	Sub-total				9,820	0	0	0
3.5	Office Material							
3.5.1	A4 Paper	A4 Paper	5	18	90			
3.5.2	A3 Paper	A3 Paper 80gm	5	38	190			
3.5.3	Paper US Std FanfoldContinuous, 1 Part	Paper US Std Fanfold Continuous, 1Part	5	60	300			
	Sub-total				580	0	0	0
	Total				77,560	47,700	23,000	0

Note:

[1)]The estimated unit cost includes the procurement and installation support of the equipment as well as training on new software.

TA Package 4: Coaching and Consultancy

TA Package 4.1: Coaching Support

ID	Intervention	Requirement	Unit	Quantity	Unit cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
4.1.1	Institutional development expert	Coaching of HR department in development of job description, introduce employment procedure, prepare incentive schemes, develop annual training need plans incl. workshop requirements, organizational restructuring.	mm	2	10,000		20,000		
4.1.2	NRW expert	Coaching in administrative water losses	mm	2	8,000	16,000			
4.1.3	Tariff expert	Coaching in tariff structure and adjustment of tariff structure	mm	1	8,000	8,000			
	Sub-Total					24,000	20,000	0	0

TA Package 4.2: Consultancy Services

ID	Intervention	Requirement	Unit	Quantity	Unit cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
4.2.1	Study on alternative power sources	Conduct a feasibility study for alternative power sources such as: Wind energy, Geothermal energy and Biogas and investigation on restoring /improving public power grid supply.	LS	1	50,000	50,000			
4.2.2	Study for new well field aquifer	Conduct a feasibility study for additional water resources	LS	1	50,000			50,000	
4.2.3	Study on energy saving potential	Investigation on energy saving potentials with respective proposals for implementation for water supply and sanitation system.	LS	1	50,000		50,000		
	Sub-Total					50,000	50,000	50,000	0

TA Package 4.3: External Auditor

ID	Intervention	Requirement	Unit	Quantity	Unit cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
4.3.1	Re-evaluation of assets and auditing of accounts of previous years	external auditor	nos.	1	15,000		15,000		
		allowances for core committees	nos.	5	1,200		6,000		
		allowances for technical committees	nos.	8	850		6,800		

		Auditing and closing the LC accounts for the previous Years by external auditor	Year	9	4,000		36,000		
	Sub-Total					0	63,800	0	0
	Total					74,000	133,800	50,000	0

Note: for details see Part 2, Chapter 3.2.4

TA Package 5: Operation Management Support

ID	Requirement	Unit	Quantity	Unit cost (USD)	Urgent - total cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
5.1	Establish Pre-Conditions								
5.1.1	Procure satellite images	km^2	110	85		9,350			
5.1.2	Procure and install GIS Software (ArcInfo, ArcView) and the linked application to others sofware	nos	1	25,500		25,500			
5.1.3	Install open source Maintenance Management software (MMS)	nos	1	1,000		1,000			
5.1.4	Comprehensive Customer Subscriber Survey (CSS) for all house connections	nos	5,306	4				21,224	
5.1.5	Establish Customer Service Centre room with IT and furniture	LS	3	25,000			75,000		
	Sub-total:					35,850	75,000	21,224	0
5.2	Consultancy Services								
5.2.1	Team Leader	mm	4	7,000			28,000		
5.2.2	Administration	mm	6	4,000			24,000		
5.2.3	GIS expert	mm	4	7,000			28,000		
5.2.4	MMS expert	mm	2	7,000			14,000		
5.2.5	CSS expert	mm	4	5,000			20,000		
5.2.6	Customer management expert	mm	2	3,750			7,500		
5.2.7	Draughtsman	mm	12	2,500			30,000		
	Sub-total:					0	151,500	0	0
	Total					35,850	226,500	21,224	0

Note: the cost include training on the software and on related procedures

TA Package6: Public Relation and Awareness

TA Package 6.1 Consultancy and Committee

ID	Intervention	Requirement	Unit	Quantity 1)	Unit cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
6.1.1	Prepare Public Awareness Program including plans and reports, follow-up and evaluation of training impact.	Engage specialized consultant	mm	2	4,000		8,000	8,000	
6.1.2	Conduct training for established awareness campaign Committee in: communication, awareness building, giving presentations, water, sanitation and hygiene issues.	Engage specialized consultant	LS	1	4,000		4,000	4,000	
6.1.3	Allowance for awareness campaign Committee	Monthly allowance of 100 USD for each Committee member for ten months within two years, subject to LC needs.	nos.	50	1,000		50,000	50,000	
	Sub-total:					0	62,000	62,000	0

TA Package 6.2 Public Awareness Campaigns

ID	Intervention	Requirement	Unit	Quantity 1)	Unit cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
6.2.1	Public awareness campaigns in water saving, water cost and payment, importance of LC services, illegal water use, environmental protection, safe waste and wastewater disposal, hygiene issues, provided services and conduct during emergency situation.	Publication in Press and Media	LS	1	2,500		2,500	2,500	
		Distribution of Brochures	nos.	156,000	0.01		1,560	1,560	
		Posters at public institutions and places	nos.	50	15		750	750	
		Conference, workhops, meetings	nos.	4	1,000		4,000	4,000	
		Distribution of Customer ServicesGuide.	nos.	52,000	1				26,000
	Sub-total:					0	8,810	8,810	26,000

TA Package 6.3 Gender related awareness

ID	Intervention	Requirement	Unit	Quantity 1)	Unit cost (USD)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
6.3.1	Workshop meetings only for women at public institutions (e.g. school) to obtain feedback on special women's needs, organized through Committee.	Monthly allowance of 100 USD for each Committee member for two months within 2 years.	nos.	10	200		2,000	2,000	
6.3.2	Visit of (marginalized) families, camps by Committee to provide information and obtain feedback on special needs.	Monthly allowance of 100 USD for each Committee member for two months within 2 years.	nos.	5	200		1,000	1,000	
6.3.3	Providing lessons to children at schools in water saving, personal hygiene, food hygiene, through Committee	Monthly allowance of 100 USD for each Committee member for two months within 2 years.	nos.	10	200		2,000	2,000	
	Sub-Total					0	5,000	5,000	0
	Total					0	75,810	75,810	26,000

Notes:
[1)] Quantities may be the same for high and medium Priorities

Appendix 6:

Specification of Proposed IT Equipment

1. PC Desktop Specifications

Type		TOWER
Processor		
CPU Type		Intel 6th generation Core i7 Quad Core
Memory		
Memory Size		8 GB 1600MHz DDR3 SDRAM
Stor ge a		
Hard drive		1TB Hybrid , OPAL SED
Networking		
NIC		Intel Ether Net LAN 10/100/1000
Software		
Operating System		Windows 8 Pro 64-bit (Includes Windows 10 Pro License)
Power Supply		
Video Card		Integrated Intel® HD Graphics 4600
I/O Devices		
Optical Drive		CD/DVD+RW
Monitor		LCD 19" Monitor
Keyboard		USP A/E Keyboard and Mouse
AUDIO		Built in Sound Card and speaker.
Manufacturer Warranty		
Parts		2 years limited
Labor		1 years limited

2. Laptop Specifications:

Type	Laptop
Processor	
CPU Type	7Gen Intel Core i7 Quad Core
Memory	
Memory Size	32 GB 2400MHz DDR4
Storage	
Hard drive	1TB Hybrid , OPAL SED
Networking	
NIC	Integrated Giga bet Net LAN 10/100/1000, Bluetooth, Wireless Ethernet ....
Software	
Operating System	Windows 10 Pro 64-bit
Power Supply	
Video Card	Intel® HD Graphics 630
Other specifications	
Optical Drive Screen Keyboard Laptop Bag	DVD+/-RW Dual Layer 15” A/E Keyboard Backlight Included
Manufacturer Warranty	
Parts	2 years limited
Labor	1 years limited

3. Server Specifications:

Type	Rack
Server Scalability	2-Way
Processor	
CPU Type	1 x Intel Xeon E5-2690 v3 2.6GHz,30M Cache,9.60GT/s QPI, Turbo, HT,12C/24T
Memory	
Installed Memory Size	128GB 8 x 16GB RDIMM, 2400 MT/s
Storage	
Hard drives	6 x 600GB 15K RPM SAS 12Gbps 2.5in Hot-plug Hard Drive
RAID Controller	Integrated RAID Controller, 2GB Cache RAID 0 / RAID 1 / RAID 5 / RAID 10 / RAID 50
Networking	
Embedded NIC	Broadcom 5720 Quad Ports 1Gb Network Daughter Card
Remote management	Yes
Systems management	Yes
Software	
Operating System	Original Microsoft Windows Server 2012 Standard Edition R2, 64bit, Media
Power Supply	
Power Characteristics	Device Type: Power supply - hot-plug Power Redundancy: Yes Power Redundancy Scheme: 1+1 Installed Qty: 2 Power Provided: 750 Watt
Other Specifications	
Server Cabinet	Server Cabinet for this RACK Server
Internal Optical Drive	DVD+/-RW, SATA

Monitor	LCD 19" Monitor
Keyboard	USP Keyboard and Mouse
Documentation	Electronic System Documentation and Open Manage
Manufacturer Warranty	
Parts	3 years limited
Labor	1 years limited

4. Line Printer Specifications:

Type	Heavy Duty Line Matrix Printer, Enclosed Quiet Cabinet.
Printer Speed (line/minute)	
High Speed (draft)	2000/1700
Data Processing	1500/1200
Near Letter Quality	800/615
Graphics Speed	
60 * 48 dpi	250 (6350)
60 * 72 dpi	167 (4242)
90 * 96 dpi	83 (2108)
Paper Feed Speed	
Speed	39 (991)
Interfacing	
Connection	USP, Serial and Ethernet 10/100 Base T.
Drivers	
Driver	Win2000, XP, WIN7, WIN8 32bit and 64 bit.
Manufacturer Warranty	
Parts	3 years limited
Labor	1 years limited

5. Plotter Specifications

Type	Plotter A0, Low Cost per Print
Print Specification	
Print Width	42 inch
High speed	48 seconds per A0
High resolution	2400 x 1200 dpi
Paper Feed	
roll feed	Automatic
sheet feed	Single
cutter	Automatic
Memory & HD	
RAM	1GB
Interfacing	
Connection	Built in Ethernet Card.
Drivers	
Driver	Win2000, XP, WIN7, WIN8 32bit and 64 bit.
Manufacturer Warranty	
Parts	3 years limited
Labor	1 years limited

6. IPADs or Handheld Unit

Items	Descriptions
TYPE	Tablet
Cache	8MB
Display	10.5" (267.2mm)
Memory	3GB RAM, 16/32GB Memory
Connectivity	Wi-Fi Direct
GPS	Integrated GPS
Operating System	Android Or IOS
Connectors	USB 2.0, 3.5mm

7. Copier Machine Specifications:

Type	Monochrome Laser Multifunctional Copy, Print , Scan
General	
Print & Copy speed	Min. 30 ppm (A4) Min. 15 ppm (A3)
Resolution	Scan 600dpi x 600dpi Copy 1200 x 600dpi Print 1200dpi x 1200dpi
Paper Size & Weight	Cassettes: A5R-A3, 64-80 gsm Bypass: A5R-A3, 64-80 gsm
Paper Capacity	2 x 550 sheets (Cassettes), 100 sheets (Bypass) Maximum: 2,300 sheets
Automatic Duplex	A5R-A3, 64-80 gsm
Control Panel	color touch panel LCD
Memory	Secure HDD 160 GB / 1 GB RAM
Interface	10/100/1000BaseT (RJ-45), High Speed USB 2.0
Supported systems	MS Windows 10/8/7/Vista/XP/Server 2008/Server 2003 (32/64 bit), Windows Server 2012/Server 2008 R2 (64 bit)
Scan to File Format	JPEG, Multi/Single Page TIFF/XPS/PDF, (and other formats like DOCX, XLSX, RTF, TXT, PDF/A)
Power Supply	220-240V AC, 50/60Hz
	Manufacturer Warranty
Parts	3 years limited
Labor	1 years limited

8. Solar Power System Specifications:

Type	10KW 96V off grid solar power system supply and installation
Solar Panel Quantity 40	
Solar Panel	Type: mono solar panel Max power :250w Bus Bar: at least 4 Bypass Diodes: exists Vmp:30.8V Imp:8.11Amp Operating temp: (°C) -40 to +80 NOCT:(°C) 45±2
PV Array Box Quantity 2	
PV Array Box	Applicable for outdoor PV systems >4/6/8/10 PV string inputs with max current 10-15a >With PV dedicated high voltage lightning protection device >Waterproof terminals
>Lighting Protection, it can reduce solar cable solar mppt controller Quantity 2	

solar MPPT controller	96V, 40A, can be in parallel. Micro CPU controlled with MPPT. Fully automatic operation and protections. Unit size: 340*300*110mm. N.W.: 7.7KG. Package size: 410*365*200mm. G.W.: 8.5KG
Battery	
Battery	Deep cycle battery Quantity 16 12v-200ah, span life can reach 8years. Weight:60KG Warranty:2years
10KW Battery case Quantity 1	
10KW Battery case	Battery case can install 16pcs 12V- 200Ah batteries, come with connect cable, battery switch Size:1250*550*1300mm
Inverter Quantity 1	
Inverter	Off grid inverter 96V-10000W Pure sine wave 3.Output Voltage (V): 110/120/220/230VAC IGBT Protections: against short-circuit, overload, low voltage, and over-voltage protection, etc. 6. Weight:110KG
solar panel mounting brackets Quantity 10 set	
Solar panel mounting brackets	Pitched roof title racking and Ground mounting two installation Material:Al6005-T5 Extruded Aluminum Section High Class Anodized Aluminum one set brackets can mount 4pcs solar panels
solar cable Quantity 260m	
Solar cable	(1): 1m, from MC4 female connector to PV Array box (2): 5m, from MC4 male connector to PV Array box (3): 6m, from MC4 female connector to PV Array box (4): 10m, from MC4 male connector to PV Array box (5): 11m, from MC4 female connector to PV Array box (6): 15m, from MC4 male connector to PV Array box (7): 16m, from MC4 female connector to PV Array box (8): 20m, from MC4 male connector to PV Array box (9): 21m, from MC4 female connector to PV Array box (10): 25m, from MC4 male connector to PV Array box (11):1m, from MC4 female connector to PV Array box (12): 5m, from MC4 male connector to PV Array box (13): 6m, from MC4 female connector to PV Array box (14): 10m, from MC4 male connector to PV Array box (15): 11m, from MC4 female connector to PV Array box (16): 15m, from MC4 male connector to PV Array box (17): 16m, from MC4 female connector to PV Array box (18): 20m, from MC4 male connector to PV Array box (19):21m, from MC4 female connector to PV Array box (20): 25m, from MC4 male connector to PV Array box
$10mm^2$ battery cable Quantity 18	
$10mm^2$ battery cable	Conductor Material: 100% Copper Insulation Material: PVC
Connector Quantity 4 Sets	
connector	MC4 connector (male and female, for 4mm2 cable) N.W.: 23g/set

9. Fingerprint scanner

MODEL	FingerTec Face ID 2
SURFACE FINISHING	Acrylonitrile butadiene styrene (ABS) & acrylic
TYPE OF SCANNER	High resolution infrared camera & fingerprint
scanner	
MICROPROCESSOR	800 MHz
MEMORY	256 MB Flash Memory & 128 MB SDRAM
ALGORITHM	Face BioBridge VX 8.0, Fingerprint BioBridge VX 9.0 / VX 10.0
PRODUCT DIMENSION (L X W X H),	207 x 120 x
mm 145 STORAGE	
• Fingerprint templates	10000
• Face templates	1200
• Cards	10000
• Transactions	200000
ENROLLMENT & VERIFICATION	
• Methods	Face (1:1, 1:N), fingerprint (1:1, 1:N), card & password
• Recommended fingerprint per user ID	< 2
• Fingerprint placement	Any angle
• Verification time (sec)	Face < 2, Fingerprint < 1
• Fingerprint	FAR < 0.0001%, FRR < 0.1% < 1
• Face	FAR < 0.01%, FRR < 0.1%
CARD TECHNOLOGY	
• RFID: 64-bit, 125kHz, RF output power (EN300-330)	Yes
• MIFARE: MFIS50/S70, 13.56MHz	Make to order
• HID: HID 1325, 26-bit, 125kHz	Make to order
COMMUNICATIONS	
• Method	TCP/IP, RS232, RS485, USB disk
• Baud rates	9600, 19200, 38400, 57600, 115200
• Wiegand	26-bit output
VOICE / DISPLAY LANGUAGE (TERMINAL)	English (Standard), Arabic

Appendix 7:
Specification of Well Pumps

Item	Location	Model	Type	Installation depth	Head H	Quantity	Riser Pipe	Motor Capacity	Motor Brand	control Panel	Starting Mode	Current status	Power source	Notes
				m	m	m^3/h	mm	KW		KW				
1	Well No. 5	AITEC, Poland	Submersible	722	700	10	65	75	Franklin	75	Star-Delta	Bad	Diesel generat	
2	Well No. 6	Lowara, Italy	Submersible	630	600	18	75	75	Lowara	75	Star-Delta	Good	Diesel generat	
3	Well No. 7	AITEC, Poland	Submersible	462	350	18	75	55	General	75	Inverter	Good	Solar	

Appendix 8:
Specification of Booster Pumps

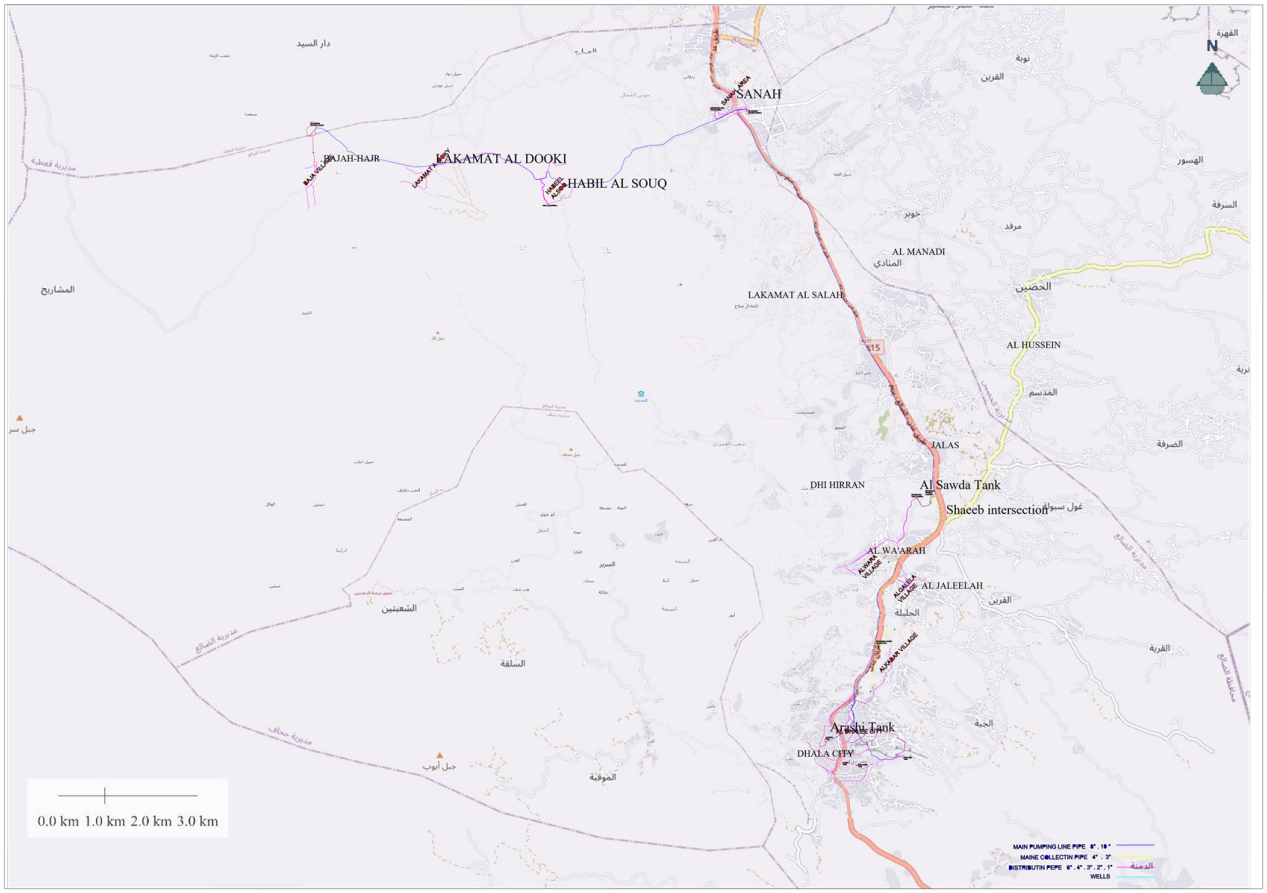
Item	Location	Model	Head H	Quantity	Motor Capacity	control Panel	Starting Mode	Current status	Power source	Notes
			m	m^3/h	KW	KW				
1	Bajah station	Lowara, Italy	120	70	55	55	Star-Delta	Bad	Diesel generator	
2	Bajah station	Lowara, Italy	120	70	55	55	Star-Delta	Good	Diesel generator	
3	Bajah station	Grandfos	120	15	55	55	Star-Delta	Good	Diesel generator	
4	Bajah station	Drikes Polims	120	80	55	55	Star-Delta	Good	Diesel generator	
5	Bajah station	Drikes Polims	120	80	45	45	Soft Starter	Good	Diesel generator	
6	Bajah station	Drikes Polims	120	80	45	45	Soft Starter	Good	Diesel generator	
7	Bajah station	Drikes Polims	120	80	12	5	Operation	Good	Diesel generator	
8	Sanah station	Grandfos	120	90	37	45	Star-Delta	Good	Diesel generator	
9	Sanah station	Grandfos	120	90	37	45	Star-Delta	Good	Diesel generator	
10	Sanah station	Grandfos	180	90	37	45	Soft Starter	Good	Diesel generator	
11	Al Sawda station	Grandfos	163	64	45	45 -18	Star-Delta Double	Good	Diesel generator	
12	Al Sawda station	Grandfos	163	64	45	45 -18	Star-Delta Double	Good	Diesel generator	
13	Al Sawda station	Grandfos	163	64	45	45 -18	Star-Delta Double	Good	Diesel generator	
13	Al Sawda station	Grandfos	66.7	64	18	46 -18	Star Delta Double	Good	Diesel generator	

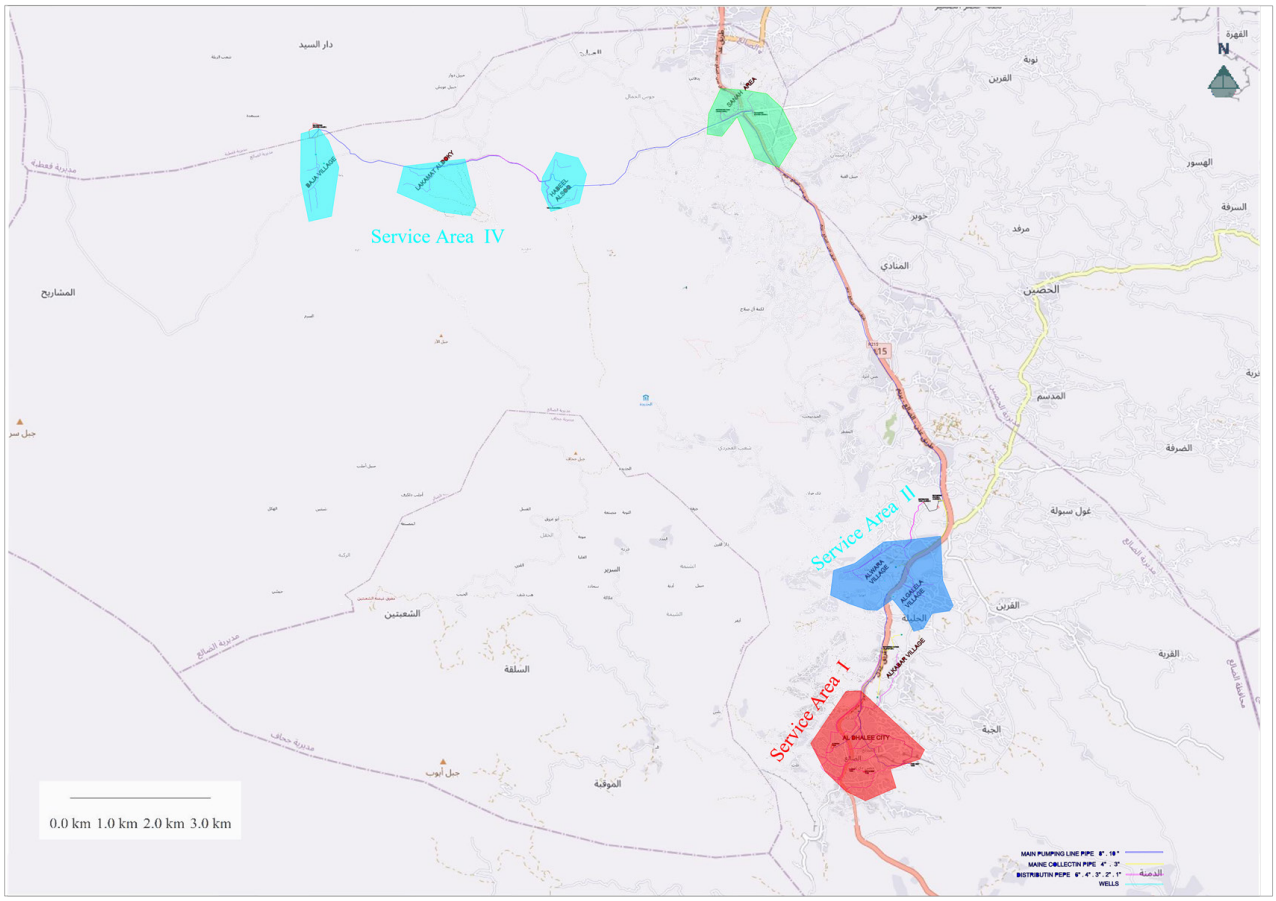
Item	Location	Model	Head H	Quantity	Motor Capacity	control Panel	Starting Mode	Current status	Power source	Notes
14	Al Sawda station	Grandfos	66.7	64	18	47 -18	Star Delta Double	Good	Diesel generator	
15	Al Sawda station	Grandfos	66.7	64	18	48 -18	Star Delta Double	Good	Diesel generator	
16	Al Sawda station	Landini	120	50	55	55	Star Delta	Good	Diesel generator	

17	Al Sawda station	Rovatti	120	70	55	55-55	Star-Delta Double	Good	Diesel generator	
18	Al Sawda station	Rovatti	120	70	55	55-55	Star Delta Double	Good	Diesel generator	
19	Al Sahafa'I station	Rovatti	120	70	55	55- 55	Star-Delta Double	Good	Diesel generator	
20	Al Sahafa'I station	Rovatti	120	70	55	55- 55	Star-Delta Double	Good	Diesel generator	
21	Khalah-Al Hussein station	Rovatti	150	70	55	55- 55	Star-Delta Double	Good	Diesel generator	
22	Khalah-Al Hussein station	Rovatti	150	70	55	55- 55	Star-Delta Double	Robbed	Diesel generator	

Appendix 9:

Network and Service Zones Maps





Appendix 10:

List of Diesel and Solar Generators

Diesel Generators

Item	for Location/ Facility	Type /Model	Power KVA	Total Load KW	Diesel consumption l/h	Physical Status	Notes
1	Bajah collection and pumping stat	Main/John Deer	320	135	15	Good	
2	Bajah pumping station	Main/Volvo	500	135	-	Good	station out of service
3	Bajah pumping station	Main/Perkinz	20	15	-	Good	station out of service
4	Sanah Booster pumping station	Main/FPT	170	45	-	Good	station out of service
5	Al Sawda Booster pumping statio	n Main/John Deer	200	110	-	Totally Damaged	station out of service
6	Al Sawda Booster pumping statio	n Main/Perkinz	165	110	20	Totally Damaged	
7	Well No. 6- Al wa'arah	Main/Perkinz	200	75	20	Good	
8	Well No. 5- Al Jaleelah	Main/Tucson	220	75	20	Good	

Solar Power systems

Item	for Location/ Facility	Type	Total Power KVA	Inverter Power KW	Total Load KW	Physical Status	Notes
1	Well No. 7 Bajah Hajr	Only source/Main	66.24	75	50	Excellent	

Appendix 11:
Investment Plan for Dhala LC

ID	Measures	Work Category1)				Priority2) / Estimated Cost in USD					Remarks
		New		Maintenance		Urgent	High priority	Short-term	Long-term	Total	
						0-6 mths	6-12 mths	1-3 years	3-5 years		
		supply	supply & installation	supply	supply & installation	2018	2018-2019	2019-2021	2021-2025		
1	Civil works on buildings and structures									655,000	
1.1	Ground Reservoir of Al Shafa'I Booster Pumping Station				√	√				30,000	
1.2	Khallah-Al Hussein Distribution Zone Reservoir				√	√				30,000	
1.3	Distribution Reservoir at Habil Al Souq				√	√				15,000	
1.4	New Elevated Distribution Reservoir for Lakamat Al Dooki		√			√				100,000	
1.5	New Ground Reservoir for Al Sawda Distribution zone		√			√				70,000	
1.6	Leak repairs for for interim reservoirs atHajr, Sanah and Al Sawda and distribution reservoirs of Dhala city and Al Sawda				√	√				80,000	
1.7	Sanah					√				50,000	
1.8	Dhala city-Extension of the existing office building		√			√				100,000	
1.9	Sanah-Office Furniture and equipments for Adminstrative building		√			√				30,000	

1.10	Dhala city-Furniture for existing office building		√			√				15,000	
1.11	Sanah-Extension building to the administrative building.		√				√			120,000	
1.11	Baja Pump Station-Store for material.		√				√			15,000	
2	Well rehabilitation and new construction									1,760,000	
2.1	Drilling New Wells at Baja Well field		√		√	√				700,000	
2.2	Drilling New Wells at Sanah		√			√				300,000	
2.3	Drilling New Wells at Hussein		√			√				300,000	
2.4	Drilling New Wells at Khallah		√			√				300,000	
2.5	Deepening wells at Dhala city periphery well field				√		√			100,000	
2.6	Drilling and equiping wells in Dhala city perephery wellfield		√		√		√			60,000	

ID	Measures	Work Category1)				Priority2) / Estimated Cost in USD				Total	Remarks
		New		Maintenance		Urgent	High priority	Short-term	Long-term		
						0-6 mths	6-12 mths	1-3 years	3-5 years		
		supply	supply & installation	supply	supply & installation	2018	2018-2019	2019-2021	2021-2025		
3	Water pumping station									360,000	
3.1	Vertical pumps at Al Sawda PS		√			√				300,000	
3.2	Vertical pumps at Baja-Hajr PS		√			√				30,000	
3.3	Vertical pumps at Sanah PS		√			√				30,000	
4	Water network rehabilitation and extension									700,000	
4.1	Dhala distribution network rehabilitation				√	√				350,000	
4.2	Completing the rehabilitation of distribution network for Bajah-Hagr, Lakamt al Dooki and Habil Al Souq villages				√	√				70,000	
4.3	Al Hussein distribution network rehabilitation				√	√				100,000	
4.4	Khallah distribution network rehabilitation				√	√				50,000	
4.5	Sanah area distribution network rehabilitation				√	√				50,000	
4.6	Al Kabar and Dar Al Sameen distribution network rehabilitation				√	√				30,000	

4.7	Rehabilitation of pumpimg line from HusseinKhallah well field to Al Sawda distribution reservoir				√	√				50,000	
5	Wastewater collection, disposal and Treatement									10,500,000	
5.1	Wastewater collection and disposal network for Greater Dhala city					√			√	10,500,000	
6	Generators and spares									3,000	
6.1	Rehabiltation of existing Diesel Generator-Al Sawda pumping station				√	√				3,000	
7	Vehicles, machines, tools									1,020,000	
7.1	4-Wheel drive cars	√				√				100,000	
7.2	Mounted-on-truck crane, 20 ton	√				√				150,000	
7.3	small trench excavator	√				√				50,000	
7.4	Motorized tricycle (Tuk Tuk) 200-250 cc,passenger and cargo, Max speed 60 km/h	√				√				50,000	
7.5	complete Kit of electric tools needed for maintenance works	√				√				50,000	

ID	Measures	Work Category1)				Priority2) / Estimated Cost in USD					Remarks
		New		Maintenance		Urgent	High priority	Short-term	Long-term	Total	
						0-6 mths	6-12 mths	1-3 years	3-5 years		
		supply	supply & installation	supply	supply & installation	2018	2018-2019	2019-2021	2021-2025		
7.6	complete Pump and maintenance Workshop		√			√				200,000	
7.7	complete aintenance workshop for water meters	√				√				100,000	
7.8	Set of instruments and devices to test the electrical isolation and batteries including clip voltameter and ammeter	√				√				200,000	
7.9	Electrica wenches for pumping stations maintenance		√				√			120,000	
8	Electric materials and solar systems									442,000	
8.1	Solar Inverter for Al Sawda Pumping Station		√			√				12,000	
8.2	Solar power system for Sanah Pumping Station		√			√				100,000	
8.3	Solar power system for Sanah Wells		√			√				30,000	
8.4	Solar power system for Bajah-Hajr Wells		√			√				200,000	
8.5	Solar power system for Bajah-Hajr Pumping Station		√			√				100,000	

ID	Measures	Work Category1)				Priority2) / Estimated Cost in USD					Remarks
		New		Maintenance		Urgent	High priority	Short-term	Long-term	Total	
						0-6 mths	6-12 mths	1-3 years	3-5 years		
		supply	supply & installation	supply	supply & installation	2018	2018-2019	2019-2021	2021-2025		
9	Laboratory equipment									450,000	
9.1	Flouride reduction unit for Al Sawda PS		√			√				100,000	
9.2	Flouride reduction unit for Sanah PS		√			√				100,000	
9.3	Complete standard water and wastewater testing lab including lab building	√				√				200,000	
Total										15,890,000	

Notes:

[1)] Work category identifies if investment is for new measures or for maintenance purpose. Supply & installation indicates that implementation through contractor may be needed

[2)] The priority (1 Urgent, 2 High,3 Short-term,4 Long-term) identifies when items shall be supplied respectively when civil works contract shall commence

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
1.1	Ground Reservoir of Al Shafa'I Booster Pumping Station	Complete rehabilitation for the structure, pipes and fittings	Interim storage 500 m3 masonary ground reservoir	LS	1	30000	30000	1
1.2	Khallah-Al Hussein Distribution Zone Reservoir	Complete rehabilitation for the structure, pipes and fittings	Distribution storage 100 m3 reinforced concrete ground reservoir	LS	1	30000	30000	1
1.3	Distribution Reservoir at Habil Al Souq	Complete rehabilitation for the structure, pipes and fittings	Distribution storage 200 m3 reinforced concrete ground reservoir	LS	1	15000	15000	1
1.4	New Elevated Distribution Reservoir for Lakamat Al Dooki	Construction of new elevated ditribution reservoir	150 m3 Reinforced concrete elevated storage distribution reservoir	LS	1	100000	100000	1
1.5	New Ground Reservoir for Al Sawda Distribution zone	Construction of new ground ditribution reservoir	Reinforced concrete elevated storage distribution reservoir 200 m3	LS	1	70000	70000	1
1.6	Leak repairs for for interim reservoirs atHajr, Sanah and Al Sawda and distribution reservoirs of Dhala city and Al Sawda	Repair leaks and replace overflow and wash-out pipes	Cement Grouting and application of standard epoxy coating and replace overflow and washout pipes GI 16 bar for 5 reservoirs	LS	1	80000	80000	1
1.7	Sanah	Metal Shelves in the administrative building	supply and install Metal shelves in various offices.	nos.	100	500	50000	1
1.8	Dhala city-Extension of the existing office building	Additional one storey to the existing building	Single storey reinforced concrete and Stone masonry	LS	1	100000	100000	1
1.9	Sanah-Office Furniture and equipments for Adminstrative building	Supply of complete standard office furniture for all offices in the Sanah adminstrative building of the LC	Complete Standard office furniture, office equipments and other office requirements	LS	1	30000	30000	1

1.10	Dhala city-Furniture for existing office building	Supply of office furniture (4 office desks, 4 rotating chaires, 10 simple chaires and 1 safe)	Standard office furniture	LS	1	15000	15000	1
Sub-total Priority 1 - Urgent (0-6 months)							520,000	1

Package No. 2: Well rehabilitation and new construction

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total Cost USD	Priority
2.1	New Wells at Baja Well field	Drilling new wells and equiping with pump,riser pipes,Cable, panel and all other requirements	No.	5	140,000	700,000	1
2.2	New Wells at Sanah	Drilling new wells and equiping with pump,riser pipes,Cable, panel and all other requirements	No.	2	150,000	300,000	1
2.3	New Wells at Hussein	Drilling new wells and equiping with pump,riser pipes,Cable, panel and all other requirements	No.	2	150,000	300,000	1
2.4	New Wells at Khallah	Drilling and equiping with pump,riser pipes,Cable, panel and all other requirements	No.	2	150,000	300,000	1
Sub-total Priority 1 - Urgent (0-6 months)				1,600,000	1		
2.5	Dhala city periphery well field	Deepening 2 wells (No.2 & No. 5) to increase yield	No.	2	50,000	100,000	2
2.6	Dhala city periphery well field	Drilling and equiping with pump,riser pipes,Cable, panel and all other requirements 5 new well	No.	1	60,000	60,000	2
Sub-total Priority 2 - Short term (6-12 years)				160,000	2		
Total Package 2:					1,760,000		

Package 3: Water Pumping Stations

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Cost (USD)	Priority
4.1 Al Sawda Pumping Station								
4.1.1	Al Sawda	Supply and install vertical pumps	According to design and study	No.	2	150,000	300,000	1
4.2 Bajah-Hagr Pumping Station								
4.1.1	Bajat Hajr	Supply and install vertical pumps	According to design and study	No.	2	15,000	30,000	1
4.3 Sanah Pumping Station								
4.1.2	Sanah	Supply and install vertical pumps	According to design and study	No.	2	15,000	30,000	1
Sub-total Priority 1 - Urgent (0-6 months)							360,000	1
Total Package 3:							360,000	

Package No. 4: Water network rehabilitation and extension

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
4.1	Dhala distribution network rehabilitation	Supply and install 0.5 t0 4 inch 16 bar HDPE, uPVC and GI pipes with all installation accessoiries including bulk and customer meters	L.S	1	350,000	350,000	1
4.2	Completing the rehabilitation of distribution network for BajahHagr, Lakamt al Dooki and Habil Al Souq villages	Supply and install 0.5 t0 4 inch 16 bar HDPE, uPVC and GI pipes with all installation accessoiries including bulk and customer meters	L.S	1	70,000	70,000	1
4.3	Hussein distribution network rehabilitation	Supply and install 0.5 t0 4 inch 16 bar HDPE, uPVC and GI pipes with all installation accessoiries including bulk and customer meters	L.S	1	100,000	100,000	1
4.4	Khallah distribution network rehabilitation	Supply and install 0.5 t0 4 inch 16 bar HDPE, uPVC and GI pipes with all installation accessoiries including bulk and customer meters	L.S	1	50,000	50,000	1
Sub-total Priority 1 - Urgent (0-6 months)				570,000	1		
4.5	Sanah area distribution network rehabilitation	Supply and install 0.5 t0 4 inch 16 bar HDPE, uPVC and GI pipes with all installation accessoiries including bulk and customer meters	L.S	1	50,000	50,000	2
4.6	Al Kabar and Dar Al Sameen distribution network rehabilitation	Supply and install 0.5 t0 4 inch 16 bar HDPE, uPVC and GI pipes with all installation accessoiries including bulk and customer meters	L.S	1	30,000	30,000	2
4.7	Rehabilitation of pumpimg line from Hussein-Khallah well field to Al Sawda distribution reservoir	Supply and install 36 bar GI pipes with all installation accessoiries	L.S	1	50,000	50,000	2
Sub-total Priority 2 - High Priority (6-12 months)						130,000	2
Total Package 4:						700,000	

Package No. 5: Wastewater collection, disposal and Treatement

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
7.1	New Wastewater collection and disposal network for Greater Dhala city	Construct Wastewater collection and disposal network for Greater Dhala city	LS	1	10,500,000	10,500,000	4
	Subtotal Priority 1:					10,500,000	1
Total Package 5:						10,500,000	

Package No. 6: Generator and spares

ID	Measure	Brand	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
7.1	Rehabiltation of existing Diesel Generator-Al Sawda pumping station	John Deer 200 kVA Diesel Generator,	Rehabilitation of the recently acquired generator (2021)	LS	1	3,000	3,000	1
	Subtotal Priority 1:						3,000	1
Total Package 6:							3,000	

Package No. 7: Vehicles, Machines and Tools

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
9.1	For distribution and maintenance	4-Wheel drive cars	nos.	4	25,000	100,000	1
9.2	For well maintenace material and equipment loading and unloading	Mounted-on-truck crane, 20 ton	nos.	1	150,000	150,000	1
9.3	For pipe trench excavation	small trench excavator	nos.	1	50,000	50,000	1
9.4	For transport of materials and personnel	Motorized tricycle (Tuk Tuk) 200-250 cc,passenger and cargo, Max speed 60 km/h	nos.	10	5,000	50,000	1
9.5	Tools for electric works maintenance	complete Kit of electric tools needed for maintenance works	Kit	1	50,000	50,000	1
9.6	For pump and motor maintenance	complete Pump and maintenance Workshop	nos.	1	200,000	200,000	1
9.7	For water meters repair and maintenance	complete aintenance workshop for water meters	nos.	1	100,000	100,000	1
9.8	tools and instruments for electric technicians	Set of instruments and devices to test the electrical isolation and batteries including clip voltameter and ammeter	sets	10	20,000	200,000	1
Sub-total Priority 1 - Urgent (0-6 months)				900,000	1		
9.9	For pumping stations maintenance	Electrical wenches	nos.	3	40,000	120,000	2
Sub-total Priority 2 - High Priority (6-12 months)						120,000	2
Total Package 7:						1,020,000	

Package No. 8: Electric equipment and solar systems

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
10.1	Al Sawda Pumping Station	Supply and install solar power invertor	According to design and study	nos.	1	12,000	12,000	1
10.2	Sanah Pumping Station	Supply and install complete set solar power system	According to design and study	nos.	1	100,000	100,000	1
10.3	Sanah Wells	Supply and install complete set solar power system	According to design and study	nos.	2	15,000	30,000	1
10.4	Bajah-Hajr Wells	Supply and install complete set solar power system	According to design and study	nos.	2	100,000	200,000	1
10.5	Bajah-Hajr Pumping Station	Supply and install complete set solar power system	According to design and study	nos.	1	100,000	100,000	1
Sub-total Priority 1 - Urgent (0-6 months)							442,000	1
Total Package 8:							442,000	

Package No. 9: Laboratory Equipment

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
11.1	Water Flouride reduction-Sanah Pumping station	Supply and installFlouride reduction unit	nos.	1	100,000	100,000	1
11.1	Water Flouride reduction-Al Sawda Pumping station	Supply and install Flouride reduction unit	nos.	1	100,000	100,000	1
11.2	Lack of water and wastewater laboratory facility	Supply and installComplete standard water and wastewater testing lab including lab building	Nos.	1	200,000	200,000	1
11.3	Check water quality	Supply Portable set for residual chlorine measurement	Sets	10	5,000	50,000	1
Sub-total Priority 1 - Urgent (0-6 months)						450,000	
Total Package 9:						450,000	