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 6 Technical Assessment Report for Abyan LC

Imprint

Published by the
Deutsche Gesellschaft fürInternationale Zusammenarbeit (GIZ) GmbH

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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)

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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 Abyan LC

Abyan LC is serving a catchment area from Al Hisn in the north to Al Kawd in the south of about 105,865 people. 82 % of them are connected to the public water supply system and only less than 50% to the sanitation system. Currently, the LC obtains the water from 39 operating wells distributed in three wellfields. During the Abyan conflict in 2012 the governorate and cities infrastructure suffered considerably, but during the period from 2014 to 2018 the Social Fund of Development and through subsidy from the German development bank KfW carried out major rehabilitation works for the water and sanitation systems of the Abyan LC which improve considerably the water supply and sanitation in the areas under the LC service. But the current crisis, though it did not cause direct damage to the water and sanitation infrastructure, but it indirectly affected the operation and maintenance process as a result of power and fuel shortage, reduced revenues, Absence of employees and lack of security and judicial control. It can be stated that the governorate is in better situation regarding water supply compared to other governorates. The current water production and supply is sufficient for the population. One the other hand the sanitation system is suffering of the lack of wastewater treatment plants. Zinjibar, the capital of the governorate and Ja›ar city has no wastewater treatment plants.

A. Institutional Assessment and Recommended Technical Assistance Measures (TA Plan) for LC Abyan

The Abyan LC, established in 2006 as the public body for serving the urban population in the governorate with save water and sanitation services. The utility employs in its 8 departments and 27sections in total 255 staff members, 106 of them are contracted staff. During the Abyan conflict of 2012 many of the infrastructure of the LC were damaged. The present crisis has also affected the LC operation indirectly through the continuous power cuts, uncollected revenues, high prices of fuel, Absence of a considerable number of employees for various reasons pertaining to security and economic situations.

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-4.

Department	Obstacles	Recommended urgent measures	Recommended non-urgent measures
Governance / Management / Organisational structure / Resilience	BoD does not conduct regular meetings. 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 Women›s affairs department not functional. Lack of Qualified personnel to occupy some specified positions in the approved organisational structure No expansion in service coverage and hence no increase in revenues No updated contingency plan for emergency and disaster Low Revenues and reduction of government support of staff salaries. 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 incomplete equipment of IT systems and data networks.	Allocating funds for BoD to encourage BoD regular meetings. Initiation of regular meetings and coaching platform. Appointing new manager for the women›s affairs department to replace the existing internally displaced manager. Reactivating the women›s affair department. Updating contingency plan for emergency and disasters Acquiring transport vehicles Regular meeting and coordination between LC and BoD.	Ensuring Support to acquire office furniture, equipment and materials. Provide missing equipment for IT and data network system Ensuring a transport mean for the management. Appointing key management staff Qualify through training some candidate staff or employ required qualified people to occupy the vacant positions or to replace unqualified people currently occupying these key positions of the approved organisational structure
Human resource and capacity building management	Low attendance rate of employees. No staffing plan Low qualification or skills of some employees Non-availability of PIIS system	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 Provide PIIS system
Finance management/	Shortage in facilities and equipment. Shortage office equipment and office material non-updated automated software systems (Accounting, Billing, Warehouse management). No business plan. No standardized procedures and processes. Unaware of assets, lack of data. No automatic transfer of billing and accounting.	Support utility with all required furniture and IT equipment including updating accounting, billing and stock software. Implement and update accounting and billing software and respective procedures. Preparation of realistic business plan. Introduce reporting standards and forms for financial reports 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.	Appointment of key management staff with clear job profile 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	No collection centres other than the one in the main office. Un-updated costumer database No automatic transfer of billing and accounting. Billing based on estimation Lack of transport means Lack office equipment, and materials like computers, printers, billing papers and data network. Shortage of work tools	Implement and update accounting and billing software and respective procedures. Preparation of realistic business plan. Introduce reporting standards and forms for financial reports. Regular reporting of customer data to finance department. Establish fair billing system, eliminate discounts. Follow up on unpaid bills customer database. Establishment of legal procedures to prevent vandalism.	Redesign charts of accounts. Introduce GIS system. Follow up on unpaid bills. Increase number of customers. Update customer database. Establish customer complaint unit. Regular reporting of customer data to finance dept. Training for capacity building of the customer department staff and on billing system.
Water and Sanitation Service management	No expansion in water service coverage. High cost of energy and fuel Need to strengthen the sanitation department by staffing, training and equipment	Increase the service coverage Utilising solar power for well pumping and for administrative building requirements	Utilising Solar power for all pumping requirements and for other needs.

IT infrastructure	Lack of IT equipment, printer, server and routers, modems, switch hubs. Lack of data network security Limited electricity supply.	Procurement and installation of hardware and software, server, printer, Solar system, air condition. Office equipment, furniture. Training on applications. Procurement and installation of anti-virus software	Procurement of printer, desktops. Introduction of GIS system and establishing GIS unit. Procurement of network fire wall
Gender perspective	Lack of female employees. Low representation of women in community committees and decision-making circles	Appoint new manager for the women›s department Reactivate the women›s affairs department	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	54,000	0	0	0
TA2	Training Courses	113,000	42,000	18,000	0
TA3	Office equipment and IT	44,000	4,000	0	0
TA4	Coaching and Consultancy services	58,000	361,000	0	0
TA5	Operation Management Support	47,000	287,000	49,000	0
TA6	Public Relation and Awareness	0	34,000	34,000	12,000
Total TA cost:		316,000	728,000	101,000	12,000

Table 0.2: Cost estimates on TA interventions

The total required amount for the technical assistance measures has been estimated to around USD 316,000 for critical priority intervention, USD 728,000 for high priority intervention, 101,000 for medium priority intervention and USD 12,000 for low priority interventions.

B. Infrastructure Assessment and Recommended Rehabilitation Measures (Investment Plan) for Abyan LC

Water Supply system

The LC has 39 operating water wells in three wellfields. It has six service areas of water distribution.

The water supply network of the Abyan LC is 240 km meters long and comprises 21,760 water connections. The water distribution network comprises 143 km of uPVC, GI and HDPE pipes of diameters varying from 15 mm to 300 mm. The Transmission lines has a total length of 97 km with diameter range from 200 mm to 300 mm.

From the 159,243 residents in the LC area of service, about 82% (130,560 people) are supplied through 21,760 water connection from the LC public network. The water supply is regular daily, and the supply cycle is 1 day. According to the LC, the LC has three pumping stations, five ground storage reservoirs with a total storage capacity of 10,950 m3 and six elevated storage tanks with total capacity of 1,400 m3.

The LC is operating the wells and pumps mostly through public electricity grid and diesel generators. The LC owns three diesel generators. The LC is planning to utilise solar power for operating its wells and pumping stations.

The required materials comprise submersible pumps for the wells, solar power systems, and operation and maintenance equipment and tools. Besides a new fully equipped wastewater testing laboratory is needed. The LC also requested vehicles for operation and maintenance of the water and system.

Sanitation system

The LC did not report the data of its sanitation system, but it reports its requirement regarding sanitation system.

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

The requirements include suction and blow sewage tanker trucks, hydraulic excavator and wheel loaders.

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.

The required estimated budget has been calculated for:

- Urgent measures: 3,888,000 USD
- High-priority measures: 2,425,000 USD
- Short-term measures: 453,000 USD
- Long-term measure: 0 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 USD 6,766,000 for the next five years.

Domains	Obstacles	Investment Measures			
		Urgent (0-6 months)	High priority (1-2 years)	Medium-priority (3-5 years)	Low priority (<5 years)
Building and Reservoirs	Damaged/deteriorated Ja›ar administrative & technical office building. Damaged/Deteriorated Al Hisn workshop Damaged/deteriorated Ja›ar warehouse Shortage in office furniture and equipment. Lack of wastewater laboratory.	Rehabilitation of damaged administrative and technical offices at Ja›ar Rehabilitation of damaged workshop at Al Husn pumping station Rehabilitation of damaged warehouse at Ja›ar . Provide the necessary office furniture and equipment		-	-
Water Resource, use and balance	Clogging of water wells Needs reserve submersible pumps for all the wells as the LC has no pump replacement in its stores. Deterioration of well valves, flow meters and pressure gauges,	Carry out Well rehabilitation (Cleaning & Disinfection). Provide reserve submersible pump for the wells. Supply and install Flow meters, Pressure gauges, Check valves and Gate valves at the wells		-	-
Water Pumping/ lifting Stations	Needs reserve pressure pumps for Sheikh Salem, Maraqed and Bajidar. pumping stations Needs Solar power generation system for Bajidar pumping station. Collection reservoir needs cleaning and disinfection. Electronic flow meters needed for the two collection storage reservoirs of Al Hisn pumping station	Procure three pressure pumps for the three pumping stations. Supply and install solar power generation system for Bajidar pumping station. Cleaning and disinfection of the two collection reservoirs of Al Hisn pumping station	Procure three pressure pumps for the three pumping stations. Supply and install solar power generation system for Bajidar pumping station -	-	-
Water sterilization facilities	Needs two chlorination injection system for Ja›ar and Zinjibar distribution systems. Some parts of the chlorination system needed for the three chlorination units of Al Hisn storage reservoirs	Provide two complete chlorination injection systems. Procure the spare parts needed for the three Al Hisn reservoirs chlorination units.	-	-	-

Power generating/ auditing for water system	high Diesel prices.		-	Provide solar energy plant 1.5 MW to supply power to Al Kawd wells of Zinjibar wellfield. Install 500 KW solar power generation system at Ja›ar and Al Hisn wellfields. Provide solar power systems Bajidar -	-
Operation and maintenance process of water infrastructures	Shortage in transport vehicles for operation and maintenance process Needed (Poclain) backhoe. loader. Needed truck mounted crane	Provide 4-Wheel drive pick-up cars for distribution and maintenance operations. Provide a truck mounted-crane for loading-unloading operations. Provide (Poclain) backhoe loader.		-	-
Wastewater collection, treatment and disposal	The LC has no wastewater treatment plants for Zinjibar and Ja›ar cities. Submersible sewage pumps needed at Al Kawd and Qaddar Allah sewage pumping stations. High diesel prices	Install two wastewater plants for the two major cities of Abyan governorate- Zinjibar and Ja›ar. Supply and install two submersible sewage pumps at Al Kawd and Qaddar Allah pumping sewage stations	-		Provide solar power generation system for Qaddar Allah pumping station-

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 Stages VI assessment was carried out through a rapid appraisal, characterizing the situation in 2022. and the results were presented in respective reports. The main findings can be summarized as follows:

- The BOD consists of 8 members.
- The LC has 255 employees and a management team consisting of ten managers.
- The LC has 5 ground storage reservoirs with a total storage capacity of 10,950 m³.
- The main and vital water resource is groundwater The LC has 38 working groundwater wells located in three wellfields-Al Hisn, Ja›ar and Zinjibar wellfields.
- The LC has 97 km of water transmission mains and 143 km distribution network.
- Water supply is available less than 6 hours per day.
- The WWTP is designed to process 24,000 m³ per day and receives only 500 m³/day.
- The wastewater system appears to be free from major damage.

The evaluation of available data led to the following recommendations:

- LC requires a fiscal support mechanism that facilitates salaries to be paid to the working staff during conflict period.
- A more detailed set of financial data based on the actual situation needs to be prepared.
- A more realistic set of data on damaged buildings, infrastructure, vehicles and equipment and respective specifications is required.
- An overview is needed of how the LC has been conducting business since the destruction of its head office in 2011.

Besides the above findings, additional needs for information were identified which have subsequently been assessed within the Stage III and are presented in this Stage III report.

1.2 Methodology of Assessment

In order to obtain an overall and comprehensive overview of the situation of the Local Corporation, the available reports were verified, in particular the recent report of Abyan in DAS Stage I, II, III reports. 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 Abyan LC on March 2023. Part A is covering all institutional subjects and Part B covering technical aspects. The LC had been visited in 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:

- Al Qarna›ah well.
- Al Hisn power generation station.
- Diesel power generators.
- Khanfar storage reservoirs.
- Maintenance workshop at Al Hisn power generating station.

Respective pictures were taken; some of them are presented in Appendix A-1. The focal person for data exchange and support, determined by GIZ Yemen, was Mr Ahmed Al Haidari during the complete project execution. 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 October 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 in Appendix B.

1.3 General Information about Abyan City and Abyan LC

Abyan Governorate with a total population of 0.66 million is located in the south of Yemen facing the Gulf of Aden and comprises a total area of 21,939 km2. It comprises 13 administrative districts. The city of Zinjibar, located next to the Wadi Bana in the Abyan Delta, is the capital of the Governorate. It is 60 km east of Aden on the southern coast of Yemen and is located at 13° 07› 42»N 45° 22› 49» E at an average altitude of 5 masl. Figure 1.1 below shows the location map of Abyan governorate.

Figure 1.1: Location and District Map of Abyan Governorate

Agriculture and fishing are the main economic activities with cotton, vegetables and fruits being the most important crops produced.

The climate in the southern parts of the governorate is hot in summer with temperature reaching 45° C, and moderate in winter where the maximum winter temperature does not exceed 28 C, while the mountainous regions are dominated by a moderate to warm climate in summer and cold in winter.

The Abyan Water & Sanitation Local Corporation (LWSC-Abyan) was established by Republican Decree No. (93) of 2006 as the public body for water supply and sanitation services in urban areas of Abyan Governorate. The LC services covers only Zinjibar district and part of Khanfar district (Ja'ar city Al Hisn, Al Kawd and Al Makhzan), as well as the villages located alongside the water transmission lines from Al Ruwa well field to Ja'ar city and from Ja'ar to Zinjibar.

The population of the area served by Abyan LC includes 159,243 inhabitants (2022) while only 82% of them are covered with public water supply connections and 44% with sewerage service. The main water resource is groundwater, which is obtained from 38 wells: 19 of them are located in the northern Al Hisn (Northern Ruwa) well field, 9 in Ja'ar well field and 10 in Zinjibar well field. The current nominal water production from the Al Ruwa field is 7,257,600 m³ per year, from the Ja'ar well field 2,231,712 m³ per year and from Zinjibar field 3,092,544 m³ per year. The households are served with water through transmission and distribution pipelines with a total length of 240 km.

The sanitation system consists of about 48 km sewer network in the areas served by LCs in particular Zinjibar, Ja'ar, Al Kawd and Al Hisn. There is neither a treatment plant in Zinjibar nor in Ja'ar and Al Hisn and the sewerage is discharged to the big lagoon in Zinjibar and to the wadi in Ja'ar and Al Hisn.

In 2011 Al-Qaida group occupied and governed most of Abyan governorate including the areas served by LC, during this occupation the LC activities were only supply the water to communities based on Al Qaida instructions. In December 2012, the government retrieved the governorate back from Al Qaida by force.

Unfortunately, most of Zinjibar population had displaced to Aden city and some of the LC's infrastructures had been totally destroyed such as the building of the LC head office in Zinjibar. Other facilities were damage partially, like the well›s houses, warehouses and water meter chambers. Furthermore, most of installed house water meters have been destroyed or stolen.

In January 2013, the LC resumed its activities in supplying water with limitation intuitional performance and enumerated staff and finance support of Ministry of finance. Currently the political situation is not critical and no further directs impact is expected.

The table below compares the current key parameters (2022) of the served area with the situation in the year 2017:

Key parameter	2017	2022
Population of Abyan Governorate	658,467	568,000
Total Population of served areas	108,406	159,243
Nos. of water connections	12,347	21,760
Population served (water)	86,429	130,560
Water service coverage	80%	82%
Nos. of wastewater connections	6,816	6,816
Population connected (sanitation)	47,712	N/D
Sanitation coverage	44%	N/D
Non-revenue water	38%	36%

Table 1.1: Key parameters of Abyan LC[2]

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

2. Assessment of LC Organization and Management

The Republican Decree no. (93) for Establishing Abyan Local Water Supply and Sanitation Corporation of 2006 identifies tasks and responsibilities of all involved bodies; MWE, BoD and LC management.

All relevant procedures and processes of the general laws, bylaws and regulations that govern the LCs management are still in operation during the crisis. Brief overview of the content of the laws is outlined in Chapter 3.2 of the Strategy Report (Part 1).

The Board of Directors (BoD) consists of 9 members. The names and positions of the remaining BoD members are described in Appendix 2.

The performance of the BoD has improved compared to its performance during the DAS I, II, III period. During the period from 2019 to 2022 the BoD held 6 meetings with an average of two meetings annually compared. The BoD is now following through its regular meetings the decision and instruction taken by it.

Currently the LC do utilize the BoD power to formulate their policies, plans and strategies as well as the taken decisions. The Board held meetings to approve plans, budgets, investment programs, tariff amendments, and to assist the institution in engaging with donor agencies and the ministry.

The Board of Directors (BoD) is considered complete with 8 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-2.

Governor, Abyan governorate	Chairman of the Board
Director General of the LC	Member
General Manager of Finance, Abyan Governorate	Member
Representative of the Ministry of Water and Environment	Member
General Manager of Planning, Abyan Governorate	Member
Chairman, Chamber of Commerce, Abyan Governorate	Member
Civil Society representative	Member
Director, Abyan Governorate Water Resources Authority	Member
Director, Abyan Governorate Security Directorate	Member

Table 2.1: Structure of Abyan 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

Abyan 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 applied structure does not comply with the current organizational practice.

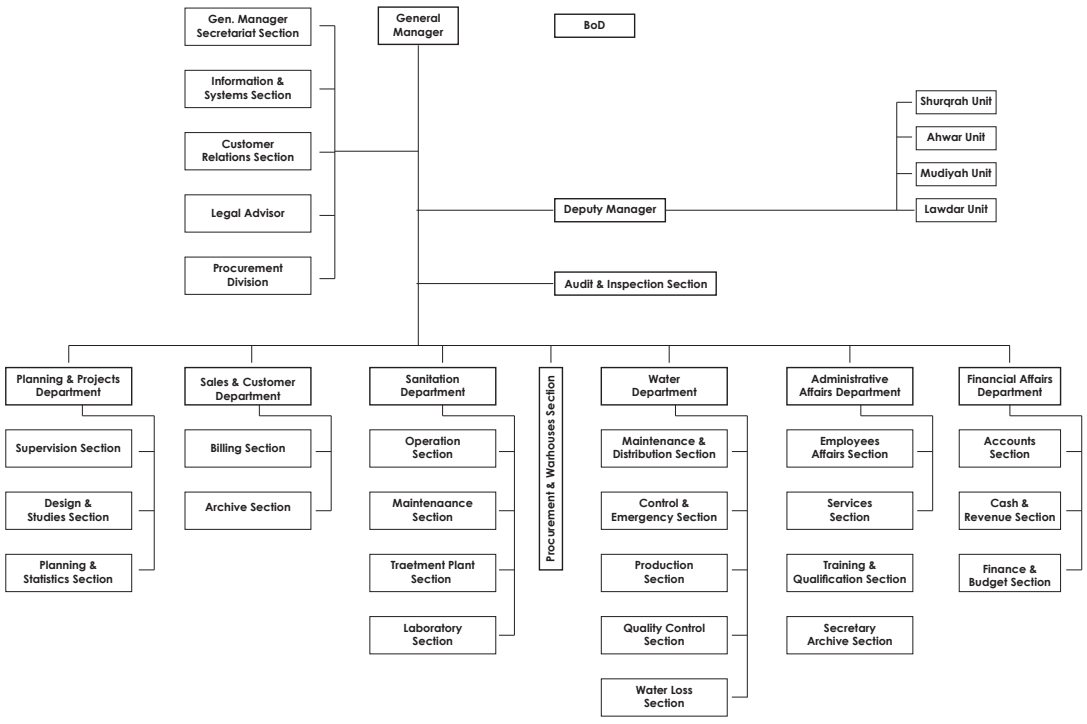


Figure 2.1: Organizational Structure of Abyan LC

The LC has the following departments and sections.

- Human resources (HR) department which is responsible for HR and employees› affairs.
- Financial department, 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.
- Wastewater department which is responsible for technical, operational, and maintenance aspects of the wastewater service.
- Planning and Projects department which responsible for planning, projects and technical design and development affaires.
- Secretary legal affairs section comes directly under the general manager.

The structure review indicated that there are some challenges to be addressed such as:

- Internal rules and regulations need to be prepared and made available at least for the key staff.
- Strengthening of the O&M section to achieve that service facilities are reached within short time and customer complains addressed quickly.
- Lack of Women department to promote women participation in the LC policies making.
- The surplus staff should be utilized efficiently through the restructure.

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

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 The Abyan LC the following issues need to be addressed:

- Add new women department to increase women involvement in the LC activities.
- Development of capacity building plans to LC staff according to department's needs.
- Development/update of job descriptions for staffing.
- Include women in the civil society committee to enable women to participate in the decision-making process.

The LC, tasked with water and sanitation services, faces multiple challenges during ongoing crises. Notable issues encompass fuel shortages, power disruptions, unauthorized connections, and financial constraints. Although lacking formal risk assessment plans, the institution swiftly establishes ad-hoc operations rooms to address immediate exigencies.

The crises have led to stalled projects, revenue shortfalls, and difficulties in procuring maintenance requisites. To sustain operations, the institution actively seeks external support, particularly in augmenting critical resources. Furthermore, the institution strategically redistributes water resources and collaborates with local authorities to meet augmented demand, demonstrating adaptability in the face of adversity.

2.3 Assessment of Staffing Needs

The LC employs a total staff of 255 including 106 contracting staff. The number of employees remains constant since 2018. Nonetheless, the LC is reasonably staffed with 1 employee per 1,000 water connections. The percentage of female staff amounts to 8 % (only 11) of total staff throughout the last 5 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 78 employees work regularly, 177 employees do not come to work at all because they are either retired, assigned to other authorities or due to other reasons.

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[3]

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 (12 Nos.) represents less than 5 % of total staff, which seems to be reasonable for the size of the Abyan 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.

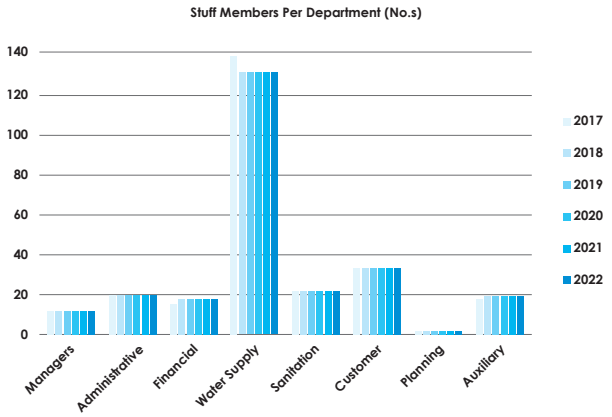


Figure 2.2: Staff Distribution Across Departments (2017-22)[4]

The staff distribution seems reasonable to some extent except that the sanitation department seems to be understaffed (8.6 %) while the water supply department is overstaffed (51 %). Staffing requirements for future sanitation service should be addressed as soon as possible. The staff of technical departments (water supply, sanitation and planning) represents 61 % of total staff which reflects that the Lc is aware of the importance of these key departments although the planning department is understaffed. Financial department is representing less than 7 % of the total staff while customer department represents only 13 %. It seems that the numbers of staff in the customer and financial departments are reasonable and proportionate to the size of the LC.

The total monthly salary for the 255 employees of the Abyan LC is YER 188,606,364.

2.4 HR Procedures and Reporting

The LC follows the general procedure of public civil law and national salary scheme for employment and salary payment.

Nonetheless, there are no job descriptions available for the different positions, which indicate that the employees may not be always aware of their tasks and responsibilities. Furthermore, there is no cooperation with other LCs in terms of HR support or exchange of staff.

The workflow procedures of human resource department are not documented in any way, but the annual vacation and attendance and payroll is reported monthly. In addition, the LC applies the fingerprint system for automatic attendance control and absence of employees.

The LC applies the shiftwork for the technicians in order to minimize the operation cost during the crisis such as overtime and overnight allowances.

The LC cooperates with Aden LC in terms of HR support of expert engineers.

2.5 Staff Qualification and Gender

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

[3] Source: Appendix B- Questionnaire Forms A-3.1

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

Staff qualification	2017		2018		2019		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	43	18	43	17	43	17	43	17	43	17	43	17
Staff professional level (university degree) female	3	1	3	1	3	1	3	1	3	1	3	1
Staff technical level (high school. VT certificate etc.) male	98	41	98	38	98	38	98	38	98	38	98	38
Staff technical level (high school. VT certificate etc.) female	12	5	12	5	12	5	12	5	12	5	12	5
staff male lower qualification	75	32	93	36	93	36	93	36	93	36	93	36
staff female lower qualification	6	3	6	2	6	2	6	2	6	2	6	2
Total	237	100	255	100	255	100	255	100	255	100	255	100

Table 2.3: Staff qualification and gender data[5]

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 18% of the total employees. The employees with secondary degree and lower qualification represent subsequently 82 % of the workforce.

Within the last year the LC has conducted training courses financed by the World Bank via the Urban Towns Project in the field of pump maintenance and planning and assessment of projects. The LC gives priority to qualified employees to attend the available courses and grant the trainees financial rewards. 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

The LC has exerted enormous efforts to maintain its functionality during the crises., it is struggling to maintain its operations running utilising the available scarce resources and the subsidies of the donor agencies. The following technical assistance measures related to strategic resilience were planned by the LC in the period 2017-2022:

- Identifying and approaching donor organisations to ensure provision of fuel, diesel generators and O&M tools and materials requirement.
- Provision of spare parts through the UNOPS.
- Maintenance of wells and pumps of the wellfields through subsidy from Kuwaiti Fountains of Goodness foundation.
- Rehabilitating the central laboratory through subsidy from UNOPS.
- Provision of a sewage suction tanker through subsidy from the UNICEF.
- Provision of work tools and materials required by the wastewater staff through subsidy from UNOPS.
- Provision of a solar power module to ensure power for the IT department equipment through subsidy from GIZ.
- Provision of Chlorine for water disinfection through subsidy from UNICEF.

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

Measure	Year
Operated some wells using diesel provided by some donor agencies to ensure water supply to certain neighbourhoods during the crisis	2017-2022
Hiring a temporary office building for the LC as its administrative building was damaged and looted during the conflict.	2017
Intervention through implementing some emergency water supply rehabilitation projects to some components of the affected public water supply network through the UAE Red Cross during the conflict.	2017
Preparing plans and studies to rehabilitate and rebuild damaged water supply system.	2017
Utilising solar power for pumping and IT department	2022
Provision of diesel fuel through UNICEF subsidy	2017-2022
Provision of Chlorine for water disinfection through UNICEF subsidy	2019
Conducting 2 training courses various fields related to technical and administrative requirement	2022

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

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

The LC proposed the following measures related to strategic resilience:

TA Measure	Priority
Provision of two wastewater submersible pump sets.	1
Provision of three water booster pumps.	1
Cleaning sewerage lines and repairing sewer manholes in Ja›ar and Zinjibar.	1
Installing air valves at valve chambers of Al Hisn Zinjibar transmission line.	1
Provision of 18 submersible pump sets.	1
Provision of sewage suction truck and a lorry	
Provision of wastewater workshop equipment and safety tools	
Provision of the missing equipment in the IT department including computers servers and printers.	1

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

3. Financial Capacity

The key points regarding budget management and expenditures for the Abyan LC can be summarized as follows:

- Budget Inclusion: The institution/branch consistently includes its expenses in the annual budget, following the financial regulations of the state.
- Capital and Investment Costs: The budget encompasses both capital and investment costs.
- Revenue Adequacy: Current revenues do not adequately cover the rising production and operational costs. The total revenues in 2022 accounts to only 26% of the total expenses of the LC excluding depreciation.
- Tariff Adjustments: The tariff has been adjusted two times within the last ten years, indicating a degree of flexibility in financial planning.
- Savings for Short-Lived Assets: The institution does have saved funds to cover costs for short-lived assets for the next two years, including items like prepaid rent.
- Capital Improvement Plan: The institution employs a multi-source funding approach (self, government, external) for sustainable projects. Close collaboration with funding entities is a key strategy to bolster infrastructure.

Overall, the information reveals a comprehensive financial management approach, addressing budgeting, revenue generation, and strategic planning for capital improvement projects. The LC is actively engaged in seeking diverse funding sources for sustainable development initiatives.

3.1 Financial Data, Procedures and Reporting

The financial department of Abyan 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 received subsidies for its recurrent budget from the Ministry of Finance and from the local authority of the governorate during the last six years. The LC also report a total operation and maintenance subsidy of YER 668,494,511 from donor organisations during the last six years.

The LC adheres to the consolidated accounting principle and procedures as outlined in the 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.

The LC prepares annual financial report in addition to the periodic financial reports (Monthly, quarterly and semi-annual)

The LC has an updated record of the fixed assets, but it did not report when the record was last updated.

The LC utilizes financial and accounting software covering areas such as accounts, assets, warehouses, collections, invoices, salaries, and wages.

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 latest financial statement of the LC was for the year 2022.

The financial reports, which the LC is still preparing during crisis, consist of the monthly and annual balance sheets. The latest balance sheet was for December 2022.

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	412,154,000	515,182,186	643,616,000	643,616,000	643,616,000	383,997,364
Total recurrent budget approved in YER	283,616,000	515,182,186	643,616,000	643,616,000	643,616,000	383,997,364
In % of requested	69	100	100	100	100	100
Total recurrent budget received in YER	139,048,584	475,763,536	188,606,364	188,606,364	183,891,205	146,547,220
In % of requested	34	92	29	29	29	38
Total recurrent budget disbursed in YER	155,025,584	475,763,536	207,209,405	241,976,985	255,915,144	198,299,360
In % of received	111	100	110	128	139	135

Table 3.1: Recurrent budget for the last six years[6]

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	17,777,000	48,915,080	4,673,575	24,484,751	38,667,835	51,832,748
Total cost without depreciation in YER	147,389,170	200,182,486	207,209,405	241,976,985	255,915,144	198,299,360
% total cost versus total revenue	829	409	1412	988	662	383
Salaries, allowances, incentives and others in YER	139,048,584	160,763,836	88,606,364	188,606,364	188,606,364	188,606,364
% Salaries, etc. of total revenue	782	329	1285	770	488	364
% Salaries, etc. of total cost	94	80	91	78	74	95
Fuel, oil in YER	1,459,000	5,352,664	4,525,096	8,273,077	38,185,112	654,000
% Fuel, oil, of total revenue	8	11	31	34	99	1
% Fuel, oil, of total cost	1	3	2	3	15	0.33
Electricity in YER	N/D	N/D	N/D	N/D	1,520,000	2,500,000
% Electricity total revenue	N/D	N/D	N/D	N/D	8	2.6%
% Electricity of total cost	N/D	N/D	N/D	N/D	N/D	0.6%
Maintenance, spare parts, other O&M expenses in YER	6,881,586	34,065,986	14,077,945	45,097,544	29,123,668	,038,996
% Maintenance, other O&M of total revenue	39	70	96	184	75	17
% Maintenance, other O&M of total cost	5	17	7	19	11	5
Other expenses in YER	39	70	96	184	75	17
% Other expenses of total revenue	N/D	N/D	N/D	N/D	N/D	N/D
% Other expenses of total cost	N/D	N/D	N/D	N/D	N/D	N/D
Depreciation in YER	N/D	N/D	N/D	N/D	N/D	N/D
% Depreciation of total revenue	N/D	N/D	N/D	N/D	N/D	N/D
% Depreciation of total cost	N/D	N/D	N/D	N/D	N/D	No Data

Table 3.2: Revenues, recurrent costs and depreciation[7]

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

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

Revenues

- During the year 2017 there were no revenues from water distribution but there was YER 17,777,000 reported as revenue from ‹other sources› that were not specified. There was also high revenue from other sources in 2018 as well as up-normally high revenue from water sales and sanitation fees compared to the proceeding and subsequent year. From 2019 onward there is a steady increase in revenues.

Revenues versus Expenses

- The total expenses are very high compared to revenues. The total expenses reached a maximum percentage of 1412% in 2019 and a minimum of 383% of the total revenue in 2022. Fuel represented 0.33 % of the expenses and 1 % of the revenues in 2022.
- 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	125,811,202	37%
Other dues for employee	0	29%
Indebtedness of electricity	N/D	N/D
Fuel and oil	0	0%
Insurance	0	0%
Taxes	0	1%
Local councils	0	0%
Other financial obligation	214,507,758	63%
Total	340,318,960	100%

Table 3.3: Financial liabilities in YER[8]

3.4 Financial Efficiency and Support

Compared to the year 2017, the revenue in 2022 increased by about YER 34.1 million which represents 192 % of 2021 revenue. The LC is not able to cover the operating expenses through the revenues.

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

Description	2017 (YER)	2018 (YER)	2019 (YER)	2020 (YER)	2021 (YER)	2022 (YER)
Total revenue	17,777,000	48,915,080	14,673,575	24,484,751	38,667,835	51,832,748
Total cost without depreciation	147,389,170	200,182,486	207,209,405	241,976,985	255,915,144	198,299,360
Depreciation	N/D	N/D	N/D	N/D	N/D	N/D
Total cost with depreciation	N/D	N/D	N/D	N/D	N/D	N/D
Deficit / savings with depreciation	N/D	N/D	N/D	N/D	N/D	N/D
Deficit / savings without depreciation	-129,612,170	-151,267,406	-192,535,830	-217,492,234	-217,247,309	-146,466,612
Support	N/D	N/D	N/D	N/D	N/D	N/D

Table 3.4: Financial Overview for the last two years[9]

It is obvious that the LC is unable to cover the operation and maintenance cost even without depreciation, since the financial deficits are YER 129.6, 151.3,192.5, 217.5, 217.3 and 146.5 million in 2017, 2018, 2019, 2020, 2021 and 2022, respectively. Considering the depreciation amount, which was not reported by the LC, the deficit will be even higher.

The LC is highly dependent on the subsidy from the government and the support from humanitarian organizations. The central government covers the salary and UNICEF provide subsidy for the fuel.

3.5 Financial subsidies

The LC did not report the yearly financial subsidies in the past six years from the various sources. Rather, it reports the total yearly subsidy lumped up into two categories as government subsidy and subsidy from local authorities and others. It also reported the O&M subsidy total amounts received from various sources of support. The two table below present an overview of the received financial subsidy and the O&M funding subsidies respectively in the past six years.

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

[9] Source: Appendix 4- Questionnaire Forms, Form A-4.2

Funding Source	2017 (YER)	2018 (YER)	2019 (YER)	2020 (YER))	2021 (YER)	2022 (YER)
Government-Ministry of Finance	137,248,584	160,763,836	188,606,364	188,606,364	183,891,205	146,547,220
Donor Organisations	0	0	0	0	0	0
Local Authorities and Others	5,300,000	7,139,000	6,255,575	11,611,751	4,598,760	6,974,085
Total	142,548,584	167,902,836	194,861,939	200,218,115	188,489,965	153,521,305

Table 3.5: O&M subsidies from donor relief organizations and local authorities[10]

Source of Subsidy	Type of Subsidy	Year	Amount of Subsidy YER
UNICEF	Fuel Support	2017-2022	27,000,000
UNICEF	O&M Support	2020	65,916,500
UNICEF	O&M Support	2019	12,143,591
UNICEF	O&M Support	2021	18,210,000
UNICEF	O&M Support	2020	185,413,000
UNOPS	O&M Support	2019	258,834,000
UNOPS	O&M Support	2019	58,600,000
Local Authorities of Zinjibar and Jaʿar Districts	O&M Support	2018-2022	34,667,420
Kuwaiti Springs of Goodness	O&M Support	2019	7,710,000
Total (YER)			668,494,511

Table 3.6: O&M subsidies from donor relief organizations and local authorities[11]

3.6 Investment Subsidies and Stopped/ Terminated Projects

The LC did not report the obtained a total Investment subsidy during the period from 2017 to 2022. It also did not report the projects stopped or terminated during this period.

3.7 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 Abyan LC

No amount has been disposed in the connection account as no new house connections had been implemented in the six years.

The total cash deposit of YER 181.3 million from connection and income resulted in the average monthly cash flow of YER 15.1 million in 2017.while in 2022, the total cash deposit of YER 199.5 million from connection and income resulted in the average monthly cash flow of YER 16.6 million in 2022

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

Bank account data for the period from 2017 to 2022 is shown in Table 3.7 below.

Year	Account Type	Connections Account	Income Account	Expenditure Account	Depreciation Account
2017	first period balance (YER)	25,500	0	19,370	0
	Total Deposits (YER)	0	181,321,900	187,157,100	0
	Total withdrawals &E transfers (YER)	0	181,308,730	187,137,730	0
	end period balance (YER)	0	13,170	19,370	0
2018	Total Deposits (YER)	0	180,784,549	175,312,206	0
	Total withdrawals & transfers (YER)	0	180,670,875	175,292,836	0
	end period balance (YER)	0	23,670	19,370	0
2019	Total Deposits (YER)	0	204,931,609	204,579,309	0
	Total withdrawals & transfers (YER)	0	204,562,939	204,559,939	0
	end period balance (YER)	0	358,670	19,370	0
2020	Total Deposits (YER)	0	217,291,160	202,201,074	0
	Total withdrawals and transfers (YER)	0	215,161,467	202,191,738	0
	end period balance (YER)	0	1,867,693	9,336	0

١٠ Source: Appendix ٤ - Questionnaire Forms, Form A ,٤,٣-A ,٤,٤

١١ Source: Appendix ٤ - Questionnaire Forms, Form A ,٤,٣-A ,٤,٤

2021	Total Deposits (YER)	0	220,450,485	220,414,570	0
	Total withdrawals & transfers (YER)	0	220,405,034	220,410,634	0
	end period balance (YER)	0	45,451	3,936	0
2022	Total Deposits (YER)	0	199,510,512	199,386,740	0
	Total withdrawals & transfers (YER)	0	199,384,554	199,381,804	0
	End period balance (YER)	25,500	125,950	4,936	0

Table 3.7: Bank account details[12]

3.8 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-4.

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.

3.9 LC Financial Actions

According to the information collected from the questionnaire forms, Abyan LC implemented the following actions to improve the financial management.

- Activating the various software systems used by the LC (Billing, Accounting, etc.).
- Preparing plans to improve the efficiency of billing collection.
- Introducing performance reports and put them into application.
- Preparing the annual closure accounts and the financial statements of the LC.
- Submitting data to audit and control parties.
- Allocating annual operational budgets
- Revising water tariff
- Allocate operational budget.
- Conduct financial and administrative training to improve staff working efficiency.
- Approached local authorities and donor organisation to provide investment and O&M subsidy for the LC.

4. Assessment of Customer Management

4.1 Customer Management Procedures and Reporting

The LC has OMS system or central customer database. But customer data base is not regularly updated.

The LC has not established yet a GIS department and customer support centre.

Customer meters are manually read after each month by the meter readers.

Furthermore, invoices are issued monthly and regularly.

No data supplied by the LC about when the latest invoices were collected.

The LC has no collection/customer service centres anywhere other than the one at Head office. But the LC has authorized some representatives to distribute the invoices and collect the fees.

There is no complaint procedure for clients, meaning that any complaints from customers are not realized or addressed. The applied complaints system consists basically of staff receiving by phone the customer complaints and registering them. However, there is no procedure for how the complaints are dealt with.

There is documented procedure for customers› new applications for water connection or for adding new meters or for change of name.

There is no documented billing procedure available.

4.2 Customer and Connection Data

The LC did not report any data related to sanitation. Hence only water connections and customers are considered here.

The table below summarizes the number of connections per customer category for the water system in 2022.
The total number of water connections in 2022 is 12,621

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

connections, most of which are in the domestic sector (11,453 connections).

Connections	Domestic connections	Government connections	Commercial connections	Total connections
No of Water connections in 2022	11,453	175	843	12,621
No of Water connections 2017	11,335	175	837	12,347
Water connections ± 2017 & 2022	118	0	6	274
No of installed water meters 2022	11,150	81	427	11,744
%installed water meter to total connection	13,000	85	513	13,688
No of functional water meters	13,000	85	513	13,688
% of functional water meter to total	100 %	100 %	100 %	100 %
No of zero Reading	N/D	N/D	N/D	608
% of zero Reading water meter to total	N/D	N/D	N/D	5 %

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

The total number of installed water meters amounts to 11,744 meters with 100 % functioning water meters.

In addition, there exist 608 zero-reading water meters, representing 5 % of the total connections which indicates that the respective customers are charged only for the minimum consumption of 5 m³ per month.

The LC charges 95 % 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 month.

The domestic sector is the largest sector in water sales, with 91 %, of the total connections (11,453 out of 12,621). No data reported by the LC on the total amount.

The government sector represents 1.4 % of total customers, only 175 customers. The commercial sector represents 6.6 % 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.

Out of165600 bills issued in 2022 only 36821 were collected while in 2017 and 2018 no bills issued or collected.

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	2019			2020			2021			2022		
	Number of bills	Water and wastewater	% of collected bills	Number of bills	Water and wastewater	% of collected bills	Number of bills	Water and wastewater	% of collected bills	Number of bills	Water and wastewater	% of collected bills
	No	YER	%	No	YER	%	No	YER	%	No	YER	%
Domestic billing	143,976	No Data	3%	151,536	No Data	73%	154,356	No Data	73%	156,000	No Data	73%
Domestic collection	4,479	8,201,480		28,911	38,830,975		31,473	48,512,512		32,838	53,479,154	
Governmental billing	1,020	No Data	0%	996	No Data	46%	1,020	No Data	46%	1,020	No Data	46%
Governmental coll.	0	0		0	167,000		0	479,690		0	2,453,900	
Commercial billing	5,556	No Data	70%	0	No Data	85%	6,024	No Data	85%	6,156	No Data	85%
Commercial collection	864	956,980		1,008	9,657,518		1,104	16,447,900		1,476	23,734,155	

٥,١-Source: Appendix B - Questionnaire Forms, Form A ١٣

Total billing	152,340	244,033,920	4%	160,284	245,863,860	20%	163,560	266,982,480	21%	165,600	494,462,126	22%
Add 10% service fees		268,437,312			270,450,246			293,680,728			543,908,339	
Total collection	113,949	11,625,870		137,769	49,947,553		137,769	66,284,162		137,769	84,217,459	
Receivable amount in crisis (debts)		232,408,050			195,916,307			200,698,318			410,237,862	

Table 4.1: Billing and collection amount per customer category

Customer Category	Consumption m3/month	Water Tariff YER/m3	Sanitation Tariff YER/m3	Other Fees YER/month	No. of Consumers
Domestic	0-5	150	NA	50	1110
	6-10	30	NA	50	104
	11-20	60	NA	50	228
	21-30	90	NA	50	11196
	31-40	120	NA	50	86
	>40	120	NA	50	276
Government	0-5	3180	NA	180	47
	>5	636	NA	180	38
Schools	0-5	3180	NA	180	20
	>5	636	NA	180	5
Hospitals	0-5	3180	NA	180	2
	>5	636	NA	180	4
Mosques	0-5	150	NA	180	10
	>5	120	NA	180	49
Commercial	0-3	1908	NA	180	68
	>3	636	NA	180	745
Industrial	0-5	3910	NA	NA	NA
	>5	782	NA	NA	NA
Construction sites, Others	0-5	4760	NA	180	67
	>5	952	NA	180	45
IDPs Camps	Free	Free	NA	Free	5400

Table 4.2: Approved tariff structure[14]

The high numbers of customers are the domestic which represents 66.6 % of all customers). The current tariff is insufficient to cover the total operation cost. as stated hereinafter.

Production cost and tariff efficiency

The current tariff is insufficient to cover the total operation cost. Hence it is recommended to revise the tariff and tariff structure to ensure sufficient revenues that enable the LC to run using its own resources and to stop relying on government and donor organisations.

4.5 Quality of Customers Services

The LC has no customers care centre for complaints and service quality. Moreover.

The LC is not updating its customer database regularly.

The LC utilises 30 meter-readers to manually read the customers water meter readings. They do not use any digital meter reading devices.

The LC has no customer billing collection centres other than those at the main offices, but the LC utilises 30 field collectors to collect billing amounts from customers.

The LC has a documented procedure for service connection application and for billing and collection.

5. Assessment of IT Infrastructure and Management

5.1 IT Management

The IT department of Abyan 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 OXFAM, GIZ and the Social Fund for Development (SFD), the department managed to acquire certain resources in recent years. The LC acquired a server through a subsidy from OXFAM and six desk top computers and a bill printer from SFD in addition to 9 solar panels from GIZ. Presently, the IT department comprises a team of five staff members.

5.2 IT Equipment (Hardware) Condition

The LC reported the IT the following IT equipment:

- 1 hp E5-2620V3 server with dual 2.4 GHZ processor, 64 MB RAM and 1500 GB hard disk. It was acquired 2018 and is in good condition.
- 3 hp corei5 desk top computers with 2GB RAM and 1 TB hard disk. They were acquired in 2017 and are in good condition.

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

5.3 IT Systems

The available software is for billing, accounting, inventory control, Performance Information Indicator System (PIIS) and payroll (salaries). The database is Oracle 9i and the applications (forms and reports) are by oracle software developer 6i under operating system MS windows 2003 server. The system last update was in 2018. System Data pack-up is done daily. There is no qualified person for the system maintenance available at the LC.

5.4 Needs for IT and Related Office Equipment

During the onset of the crisis, the LC experienced significant damage and looting. As a result, the IT department and other departments are currently in need of extra computer facilities, office furniture, and data networks components. Urgent provision of computer facilities is required in these departments to enable recording, analysis, reporting of performance progress, and completion of tasks.

Furthermore, there is an immediate need for data backups. To prevent accidental 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 in other LCs. It is recommended to assign two staff members to oversee the backup procedure.

Currently, the public grid only provides power supply for approximately less than 8 hours a day. Therefore, it is necessary to procure extra 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 majority of the population works in agriculture, Military, livestock, beekeeping and trade. There is a considerable number of expatriates whose financial transfer 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.

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.

About 82% of the urban population of serviced area by Abyan LC have access to water through LC service connections. The remaining population obtains water from private tankers or from the water distribution points.

According to the Humanitarian Response the IDP and host community of Abyan Governorate face similar problems regarding the access to water service.

6.2 Population Issues

The estimated population of Abyan governorate is 618,892. The population structure as of December 2021 for Abyan Governorate is as following[15]:

Estimated total population	618,892
Residents	582,857
Persons with disabilities	92,833
IDPs	36,035
Men [%]	28 %
Women [%]	27 %
Boys [%]	23 %
Girls [%]	22 %

Most of the IDPs came from outside the governorate.

[15] population_dataset.xlsx - Humanitarian Data Exchange_٢٠٢١_Yemen: Humanitarian Needs Overview - yemen_HNO ١٥ (humdata.org

Only one special gathering / camp with about 300 IDP families has been reported to live in the area and further 200 poor marginalized families. These camps are lacking on water tanks, septic tanks and separate bathrooms for women.

The number of IDPs decreased dramatically from about 12,990 in 2017 to 36,035 in 2022. The majority of IDP live with relatives or in rented accommodation and would therefore have same infrastructure service as the urban citizens.

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

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 design of public buildings does not address the needs of women and people with special needs, like for praying, bathrooms, eating places.

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

There are only 11 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 has a women Department, but it is not functional because the department female manager is displaced to Aden and hence cannot attend duty at Zinjibar.

Community committees include only men.

Women are not participating at any level of decision making.

6.4 General Situation of Water Supply and Sanitation

The water supply situation is relatively good compared to other LCs. The LC serves a population of 159,243. representing only 82 % of the population.

The water consumption is approximately 98 lpcd for customers with house connection to the public network. According to the LC the supply or consumption during the crisis remained constant.

The people are in general satisfied with the public water supply. The opinion in terms of trust in service provision, quality, quantity, regularity and access are generally very good. The pricing of public water is stated to be excellent with 30-150 YER/m³ depending on the consumption. However, the satisfaction of the private water supply is very low. Especially quality, quantity, regularity, pricing and therefore also the trust in service provision is bad.

The LC did not supply data regarding the sanitation service in its area of service. But it is known from the DAS III study that the sewerage networks coverage is less than 50%.

6.5 Public Water & Sanitation Services and Special Needs

Public Institutions and Places: Schools

There are about 30 public schools in Zinjibar City and vicinity, seven schools only have water connection from the LC. For schools, the water supply is sufficient, but they are lacking on water.

tanks and pumps to fill the roof tanks. The power cuts prevent them to pump water to the roof tanks. Three schools are not connected to the public sewer system; they discard their wastewater in cess pits.

The schools have different categories for the bathrooms: for teachers and administration, for students and one for pupils with special needs. Some bathrooms were closed, due to lack of water and some of them are damaged during the conflicts.

Public Institutions and Places: Hospital

Zinjibar Hospital is the only governmental hospital in Abyan governorate. It covers about 500,000 patients per year serving Zinjibar and nearby areas. The building is very old. The problem with the water service is the lack of water tanks. For sanitation service within the hospital there is a maintenance department which takes care of the sanitation and bathrooms. Therefore, any problems the hospital is facing are maintained directly, including the bathrooms.

[16] Source: https://Statistica.com/statistics/524137/gross-domestic-product-gdp-per-capita-in-yemen

There are no separate bathrooms for the female staff. There are only two bathrooms for the administration staff. The employees use the bathroom at the emergency department. Females use in urgent case the bathroom in the doctor's room. There are bathrooms in sections classified for women and men patients to be used.

Water distribution points

There are three public water distribution points in Zinjibar city.

7. Assessment of Water and Sanitation

The 2012 conflict in Abyan infected a great damage to the water infrastructure, causing water scarcity to reach unprecedented levels. As a result of that conflict, the following the infrastructure components of the Abyan LC were damaged or destroyed:

- LC main office completely destroyed.
- Reservoirs partly and completely destroyed.
- Store building completely destroyed.
- Valve chambers completely/partially destroyed.

Fortunately, the German Credit Institute for Reconstruction KfW financed a construction of a new administrative building for the LC in Zinjibar. The Social Fund for Development SFD implemented rehabilitation projects for LC water supply and sanitation during the Years from 2013 to 2016 which comprises rehabilitation of the vital components of the water supply and sanitation systems of the LC including storage reservoirs, transmission and distribution lines, sanitary sewerage networks and supply of vehicles and heavy machinery.

On the other hand, the present conflict caused many indirect negative impacts resulting from the 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 Section 1.2 of this report. The questionnaire forms for Part B, attached 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. 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.

7.1 Water Production

The LC has only one kind of water resources which is groundwater. As of 2022, 38 out of the 39 existing water wells are operational (see Appendix A-6 for details). In comparison, only 26 of these wells were operating in 2017. This increase in the number of operational wells over the years has significantly improved the current water production capacity. To elaborate, in 2017 the actual water production reached 2,840, m3/ day, whereas in 2022 water production increased significantly to 16,960 m3/day. Understandably, the nominal water production capacity is higher than the actual water production capacity. In 2022, the nominal water production is estimated to be about 34,000 m3/day.

The assessments show that the LC has no problem with water resources as its present water resources are sufficient to supply the population water demand until 2030. water consumption.

7.2 Water Quality

Water quality, laboratories and disinfection data. From the DAS III assessment the LC had one sterilization facility and one water testing laboratory. available for the testing and control of water quality. However, the laboratory lacks necessary equipment, chemicals, and reagents, required for conducting proper testing and ensuring that the water is safe for potable use.

7.2.1 Water Disinfection and Treatment Units

According to DAS III assessment, there is one water sterilization facility to maintain the quality of water at acceptable standards in the control room of Al Ruwa wellfield located in the town of Al Hisn, which uses gas Chlorination as a disinfection method. The sterilization facility was not damaged during conflict and remained intact.

7.2.2 Laboratories

From the DAS III assessment the LC had one one water laboratory. for the testing and control of water quality. However, the laboratory lacks necessary equipment, chemicals, and reagents, required for conducting proper testing and ensuring that the water is safe for potable use.

7.3 Water and Wastewater System

The LC did not report the essential data of the wastewater system. Hence the section presents only the LC water 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	3	3
Main source of water supply (SW or GW)		GW	GW
Number of distinct supply zones	No	6	6
Total number of boreholes	No	39	39
Boreholes in operation (=borehole pump no)	No	26	38
Ground Reservoirs	No /m3	2/550	5/10950
Elevated Tanks	No /m3	3/5050	6/1400
Nominal water production capacity	m3/d	32,334	34,470
Water sterilization facilities	No.	1	1
Current water production capacity	m3/d	2,840	16,960
Total no. of domestic water meters installed	No	11,150	13,000
Total no. of functioning domestic water meters	m	11,150	13,000
Nos. of new/ functional water meters in stock	No	-	-
Length of the water supply network	km	190	240
Total nos. of bulk water meter	No	38	38
Water Laboratory	No	1	1

Table 7.1: Overview of available water infrastructure[17]

The water supply network has transmission and distribution pipelines with a total length of 240 km, 11 ground and elevated reservoirs, 3 pumping stations, 1 chlorination units and 2 diesel generators.

The water production wells are located in three Wellfields: Al Hisn wellfield, Ja›ar wellfield and Zinjibar wellfield.

The number of wells in Al Hisn wellfield is 19 operational and one out of service. The number of wells in Ja›ar well field are 9 operating wells and in Zinjibar well field 11 operating wells. The total water production during the year 2022 from the two operating wells in this well field was 6,189,863 m3 indicating an average rate of 16,960 m^3/day while the nominal production from t all the operating wells in the three wellfields is 34,000 m^3/day. The LC reported that the total water production capacity of the LC from all the wells (Operating and non-operating) is 49,000 m^3/day, but it did not report any data on the non-operating wells in the questionnaire forms. This leads to the conclusion that total number of wells exceeds 39. This conclusion is supported by the LC reported number of pumps installed on wells, which was quoted as 41.

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

Technical details of the 39 wells reported by the LC in the Questionnaire B-form B-2.2.4 are presented in Appendix A -6.

The LC has 3 pumping stations; all located in Zinjibar. They are:

- Bajidar pumping station, which pumps water from zingiber network to Bajidar area elevated distribution reservoir. It has a capacity of pumping 400 m3/d. It is operated by electricity obtained from the public electricity grid. The LC asked for subsidy to provide solar power unit for the pumping station to reduce operation cost and to resort to in case of public grid power cuts.
- Sheikh Salem pumping station, which pumps water from zingiber network to Sheikh Salem area elevated distribution reservoir. It has a capacity of pumping 150 m3/d. It is operated by electricity obtained from the public electricity grid. The LC asked for subsidy to provide solar power unit for the pumping station to reduce operation cost and to resort to in case of public grid power cuts.
- Al Maraqed pumping station, which pumps water from zingiber network to Al Maraqed area elevated distribution reservoir. It has a capacity of pumping 150 m3/d. It is operated by electricity obtained from the public electricity grid. The LC asked for subsidy to provide solar power unit for the pumping station to reduce operation cost and to resort to in case of public grid power cuts.

he LC has 6 ground storage reservoirs with a total storage capacity of 10950 m3 and five elevated storage tanks with a total storage capacity 1400 m3. The total storage capacity all the storage reservoirs of the LC is 12350 m3.

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-7.

7.3.1 Water Consumption Service Areas Data

The LC has six consumption service areas. They are Zinjibar area (4094 connections), Ja›ar area (5195 connections), Al Hisn area (1246 connection), Al Kawd area (1518 connections), Al Makhzan area (1096 connections) and Al Jawl area (380 connections).

Figure 7.1: Abyan Water Transmission and Distribution Network

There are 38 bulk water meters installed on the distribution network and 38 water meters are installed at the reservoirs and wells. The average water consumption in the year 2022 is 98 lpcd. Compared to the average consumption in Yemen with 49 lpcd, the supply situation in Abyan is one of the best. However, the table below shows that the water losses fluctuating during the last six years with maximum value of 31% at 2018 and a minimum of 26 % in 2022.

Description	2017	2018	2019	2020	2021	2022
water production m^3	1,036,577	1,072,426	4,347,802	5,079,192	5,452,796	6,189,863
water consumption m^3	740,412	739,604	3,220,594	3,576,896	3,894,854	4,585,084
No of connections	12,347	14,500	15,400	17,350	20,600	21,760
Nos. of supplied population connection	74,082	87,000	92,400	104,100	123,600	130,560
water coverage %	68%	75%	74%	78%	85%	82%
water consumption lpcd	28	24	97	95	88	98
NRW m3/year	296,165	332,822	1,127,208	1,502,296	1,557,942	1,604,779
% of total water losses	29%	31%	26%	30%	29%	26%

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

7.3.2 Ground And Elevated Water Reservoirs

The LC has 5 ground storage reservoirs with a total storage capacity of 10,950 m3 and 6 elevated storage tanks with total capacity of 1,400 m3. Detailed data of the reservoirs are given in Table (3.4) below.

Reservoir No.	Location	Type	Construction Material	Storage Capacity m^3	Current Condition	Operational Status
1	Al Hisn Station	Ground-Collection Reservoir	Steel	5,000	Intact	Operational
2	Al Hisn Station	Ground-Collection Reservoir	Steel	5,000	Intact	Operational
3	Ja'ar Wellfield	Ground-Distribution Reservoir	Concrete	500	Intact	Operational
4	Ja'ar Wellfield	Ground-Distribution Reservoir	Concrete	500	Intact	Operational
5	Bajdar	Tower-Distribution Reservoir	Concrete	150	Intact	Operational
6	Al-Kawd	Tower-Distribution Reservoir	Concrete	150	Intact	Operational
7	Zinjibar, Education Faculty Yard	Tower-Distribution Reservoir	Steel	500	Intact	Operational

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

8	Abur Othman	Tower-Distribution Reservoir	Concrete	150	N/D	Out of service
9	Al Makhzan	Tower-Distribution Reservoir	Concrete	150	N/D	Out of service
10	Al-Kawd	Tower	Steel	200	N/D	Out of service
11	Al Maraqed	Ground-Collection	Concrete	50	N/D	Out of service

Table 7.3: Abyan LC Reservoirs data

7.3.3 Water Supply Network

The water supply network of the Abyan LC is 240 km meters long and comprises 21760 water connections. The water distribution network comprises 143 km of uPVC, GI and HDPE pipes of diameters varying from 15 mm to 300 mm. The Transmission lines has a total length of 97 km with diameter range from 200 mm to 300 mm. Layout of the network is shown in Figure 3.1

Water Distribution

From the 159,243 residents in the LC area of service, about 82% (130,560 people) are supplied through the LC public network. The water supply is regular daily, and the supply cycle is 1 day. According to the LC 100 % of water meters are functioning.

The Abyan LC has six consumption service areas. They are:

- Zinjibar area: It comprises 4,136 water connections in Zinjibar city and its surrounding. It has five distribution zones:
  - Zinjibar City Distribution Zone: water is pumped from Zinjibar wellfield directly into distribution network and the elevated reservoir at the Faculty of Education, from which water is supplied by gravity to the distribution network.
  - Husn Shadad Distribution Zone: the water is pumped from Sheikh Abdullah well to the distribution elevated reservoir in Husn Shadad. From there it supplies water by gravity to Husn Shadad and Sheikh Abdullah areas which represent about 10% of the customers in Zinjibar district.
  - Al Maraqed Distribution Zone: the water is pumped from wellfield to Al Maraqed collection reservoir, from which water is supplied to the distribution network of Al Maraqed area through booster pumping. Bajidar
  - Bajidar Distribution Area: the water is pumped from the wellfield to the Bajidar elevated storage reservoir, from which the distribution area is supplied by gravity.
  - Sheikh Salem Distribution Zone: the water is pumped from the Zinjibar distribution network to Sheikh Salem elevated storage reservoir, from which this distribution zone is supplied by gravity.
- Ja›ar Service Area: It comprises 5,195 water connections in Ja›ar city and its surrounding. It comprises four distribution zones:
  - Ja›ar city Distribution Zone: This zone is supplied from Al Hisn storage reservoir by direct pumping.
  - Al Haroor Area Distribution Zone: This distribution zone is supplied directly through pumping from Al Hisn collection reservoir.
  - Al Makhzan East Distribution zone: This distribution zone comprises Al Makhzan east and Obar Othman. It is supplied from Al Makhzan elevated reservoir by gravity.
  - Al Makhzan West Distribution Zone: This zone comprises Al Makhzan west and Al Jawl areas. It is supplied directly from Ja'ar wellfield through pumping.
- Al Hisn Service Area: It comprises 1,246 water connections in the town of Al Hisn and its surrounding. Water is pumped from Al Hisn wellfield to Al Hisn collection storage reservoir, from which water is pumped to Al Hisn elevated storage reservoir which supplies the distribution zone by gravity.
- Al Kawd area: It comprises 1,518 water connections in town of Al Kawd. water is pumped from Al Dawajen, Al Mahlajj wells to the elevated reservoir in Al Kawd and then by gravity to the distribution zone.
- Al Makhzan area: It comprises 1,096 water connections in Al Makhzan area and its surrounding.
- Al Jawl area: It comprises 380 water connections in Al Jawl area. It is supplied from Al Jawl distribution reservoir.

Figure 7.2 shows the service areas in Abyan district. Larger scale map of the service areas can be found in Appendix A-7.

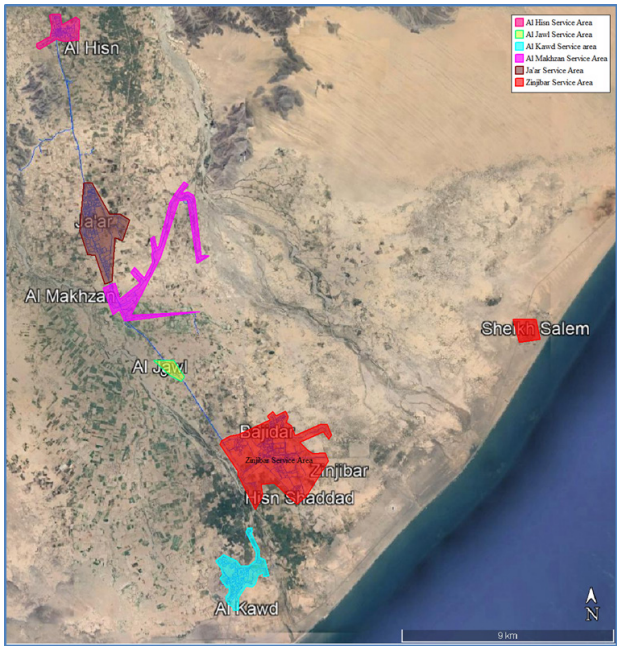


Figure 7.2: Service Areas of Abyan LC in Abyan District

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.

Service Area	Areas covered	Area (km²)	No. of Connections	Distribution Network Length (km)
Zinjibar	Zinjibar city, Husn Shaddad, Al Maraqed, Bajidar and Sheikh Salem	11	4,136	143-
Ja›ar	Ja›ar city, Al Haroor, Al Makhzan east and Al Makhzan west	4.7	5,195	
Al Hisn	Al Hisn town and surroundings	1.3	1,246	
Al Kawd	Al Kawd town	2.7	1,518	
Al Makhzan	Al Makhzan area	4	1,096	
Al Jawl	Al Jawl area	0.5	380	
Total	-		13,571	

Table 7.4: Details on the water supply zones.

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

The LC has three pumping stations. They are all located in Zinjibar. They are Bajidar pumping station with a pumping capacity of 150 m3/d which pump water from Zinjibar to Bajidar elevated storage, Sheikh Salem pumping station with a pumping capacity of 150 m3/d which pumps water from Zinjibar network to Sheikh Salem elevated storage and Al Maraqed pumping station with a pumping capacity of 400 m3/d. The LC did not report electromechanical data of the pumping stations.

The LC has 39 operating water wells equipped with pumps. 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-6.

Well data				Pump data						
Well, No / ID	Location	Depth	Static water level	Dia. of riser pipe	Installation depth	Head H	Quantity Q	Physical Status	Power P	Power Source
		m	m	mm	m	m	m³/h		kW	
Al Hisn Wellfield										
Well-01	Al Hisn	89	2.8	150	45	33.77	42	operational	22	electricity grid
Well-02	Al Hisn	99	4.16	150	45	24.35	61	operational	26	electricity grid
Well-03	Al Hisn	81	2.7	150	40	34.42	65	operational	0	electricity grid
Well-04	Al Hisn	70	6.17	150	55	38,28	48	operational	26	electricity grid
Well-05	Al Hisn	170	3.88	150	55	0	52	operational	0	electricity grid
Well-06	Al Hisn	88	4.47	150	40	33.76	47	operational	0	electricity grid
Well-10	Al Hisn	60	11.9	150	55	38.87	54	operational	26	electricity grid
Well-11	Al Hisn	70	15	150	55	35.75	72	operational	37	electricity grid
Well-12	Al Hisn	76	12	150	55	50.17	95	operational	22	electricity grid
Well-13	Al Hisn	76	9.8	150	55	51.02	72	operational	26	electricity grid
Well-14	Al Hisn	72	8.7	150	50	51.02	60	operational	0	electricity grid
Well-15	Al Hisn	66	11.16	150	55	55.1	60	operational	0	electricity grid

Well-19	Al Hisn	89	11	150	55	25.82	62	operational	0	electricity grid
Well-20	Al Hisn	77.5	8.5	150	50	62.84	90	operational	0	electricity grid
Well-21	Al Hisn	78	8.5	150	50	61.85	68	operational	0	electricity grid
Well-22	Al Hisn	101	7.71	150	55	64.33	148	operational	0	electricity grid
Well-23	Al Hisn	86	6.9	150	55	63.79	144	operational	0	electricity grid
Well-24	Al Hisn	98	6.36	150	45	64.9	140	operational	37	electricity grid
Well-25	Al Hisn	100	13	150		0	60	operational	0	electricity grid
Ja›ar Wellfield										
Well-1	Ja›ar	65	22.6	100	42	120	54	operational	26	electricity grid
Well-2	Ja›ar	70	22.8	100	47	120	61.2	operational	26	electricity grid
Well-3	Ja›ar	68	23.6	100	44	120	64.8	operational	26	electricity grid
Well-4	Ja›ar	70	23.8	100	46	120	75.6	operational	37	electricity grid
Well-5	Ja›ar	65	23.6	100	41	120	61.2	operational	26	electricity grid
Well-6	Ja›ar	60	23.2	100	37	120	50.4	operational	22	electricity grid
Well-8	Ja›ar	70	23.5	100	47	120	57.6	operational	26	electricity grid
Well-9	Ja›ar	70	22.3	100	48	120	43.2	Stop	22	electricity grid
Well-11	Ja›ar	65	22.5	100	45	120	25.2	Stop	18	electricity grid
Zinjibar Wellfield										
Al Sammah 1	Zinjibar	70	18	100	50	120	50.4	operational	37	electricity grid
Al Sammah 2	Zinjibar	72	18	100	50	120	50.4	operational	37	electricity grid
Al Sammah 3	Zinjibar	68	18	100	50	120	50.4	operational	37	electricity grid
Al Sammah 4	Zinjibar	70	18	100	50	120	50.4	operational	37	electricity grid
Al Seleaty	Zinjibar	80	18	100	50	120	50.4	operational	37	electricity grid
Al Edon	Al Edon	75	20	100	42	80	54	operational	26	electricity grid
Al Mahlajj 1	Al Kawd	60	18	100	50	100	64.8	operational	26	electricity grid
Al Mahlajj 2	Al Kawd	80	18	100	55	100	54	operational	26	electricity grid
Al Dawagen	Zinjibar	80	18	100	50	100	64.8	operational	26	electricity grid
Sheikh Abdullah	Sheikh Abdullah	65	18	100	38	80	54	operational	26	electricity grid

Table 7.5: well pumps and motors data

The LC did not report Pumping stations, but it reported its electro-mechanical requirements for the pumping stations. The table below presents the data of the pumping stations supplied by the LC.

PS Name	Location	Purpose	Establishment Year	No. of Pumps	Capacity m3/d	Power Source	Remarks
Sheikh Salem PS	Zinjibar	Pumping water from Zinjibar network to Sheikh Salem Area	2009	1	150	Public Grid	Needs pump & motor
Maraqed PS	Zinjibar	Pumping water from Zinjibar network to Maraqed Area	2009	1	150	Public Grid	Needs pump & motor
Bajidar PS	Zinjibar	Pumping water from Zinjibar network to Bajidar Area	2009	1	400	Public Grid	Needs pump & solar power system

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-8. 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-4.

7.4 Non-Revenue Water

Water meters are installed at the wells and reservoirs. The average water consumption in year 2022 is around 98 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 during the last six years ranges from a minimum 26% in 2022

to a maximum of 31% in 2018. This figure is considered moderately 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 LC did not report operation and maintenance data as required by Questionnaire B Form B-5.2, but it reported its requirements of technical and logistic support in the field of operation and maintenance. Hence assessment of operation and maintenance in the Abyan could not be carried out. However, based on the DAS III study and the data on other fields reported in the DAS IV questionnaires as well as on the data available from the Social Fund for Development which implements several major rehabilitation projects for the water and sanitation systems in the LC area of service, it can be said that the LC is in better situation than most of the other LCs included in the DAS IV study, thanks to the implemented rehabilitation works carried out in the period from 2014-2018. Some general constraints the LC may face in operation and maintenance of water supply facilities can be summarized as follows:

- The LC has to carry out an additional task of power generation due to the interrupted power supply from the public electricity grid.
- High prices of diesel and other operation and maintenance cost.

Besides, like most of other LCs there is no regular preventive maintenance procedure in place, due to lack of O&M material, and also because of inadequately resourced LC.

The needed material and equipment and O&M material comprises as reported by the LC only vehicles and heavy machinery (Poclain loaders, Truck mounted cranes and hydraulic excavator/shovel)

It is recommended to support the LC by a trench excavator, mobile crane as detailed in in Appendix A-8.

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

- Suction and blowing tanker.
- 4-Wheel drive cars
- 15-ton Mounted-on-truck crane
- Hydraulic excavator
- Poclain back hoe loader

All proposed rehabilitation measures as well as the required materials and equipment are outlined in the Investment Plan in Appendix A-8.

7.6 Energy Supply

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

Abyan governorate districts of Zinjibar and Khanfar where the LC operates 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. During the power cuts the LC relies on its diesel and solar generators to provide the required electric supply for the well and pumping stations. The LC has three working diesel generators. One 1250 KVA at the central power generation plant at Al Hisn wellfield, the second is 400KVA the power generation plant of at Ja›ar wellfield, and the third is 100 KVA installed at Al Dawajen Well in Al Kawd. However, the technical check list of the consultant field visit reported two 500 KVA out of service installed at Al Hisn power generation plant.

The table below summarizes the available electricity equipment and related materials for the last six years as reported by the LC.

Description / Facility	Unit	2017	2018	2019	2020	2021	2022
Total electrical capacity required	kW	128,772	12,392,772	12,392,772	12,392,772	12,392,772	12,567,972
Total electrical capacity provided by public grid. (only for water)	kW	10,731,000	10,731,000	10,731,000	10,731,000	10,731,000	10,884,300
Total number of existing diesel generators	Nos	3	3	3	3	3	3
Generator set installed for water supply	Nos	2	2	2	2	2	2
Generator set in operation for water supply	Nos	2	2	2	2	2	2
Generator set in operation for sanitation system	Nos	1	1	1	1	1	1
Current annual fuel consumption for water system	l/y	120,000	120,000	120,000	120,000	120,000	120,000
Current annual fuel consumption for sanitation system	l/y	N/D	N/D	N/D	N/D	N/D	N/D
Capacity of storage fuel tanks at the site	l	N/D	N/D	N/D	N/D	N/D	N/D
Capacity of mobile fuel tanks	l	-	-	-	-	-	-
Transformer	Nos	44	44	44	44	44	44

Table 7.7: Electrical capacities and available equipment[19]

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

Over the period of 2017 to 2022, the public electricity grid contributed 87% to the LC's total electrical capacity required by the water supply system. No data reported regarding sanitation system power consumption.

The LC has in total five diesel generators out of which only three are operational. The LC did not report details of the generator specifications.

The main energy consumption occurs in the pumping stations and wellfields.

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.

The average daily rate of energy consumption in 2022 is 34,080 KWh/d.

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.

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

The LC has two power generation The LC did not report the operational data of energy generation stations as required by the Questionnaire B, Form B-4.3.

7.6.3 Energy Consumption Data

The LC did not report the energy consumption as required by the form B-4.4 of Questionnaire B. Hence energy consumption for water pumping, treatment and distribution for the Abyan LC cannot be presented. However, from general energy data supplied by the LC in the Form B-4.1 of Questionnaire b, a collective energy consumption data for the entire water supply, treatment and distribution combined could be presented as shown in the following Table.

Power source	Description	Unit	Quantity/ Amount
Public grid	Total annual elect. energy consumption	KWh	10,884,300
	Annual electric cost	YER	
Diesel-powered generating energy	Total annual elect. energy consumption	m3	1,533,000
	Annual diesel consumption	litre	120,000
	Annual diesel cost	YER	150,000,000

Table 7.8: Energy consumption data[20]

7.6.4 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 available only for few hours a day, hence the LC has to continue relying on diesel generators and solar power generator for its energy requirement. The average annual diesel requirement is 120,000 litres.

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, Abyan has favourable climate condition, and it should be possible to produce between 5 to 6 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-8 such as:

[20] Source: Appendix B - Questionnaire Forms, Form 4.4

- Solar power for well pumps
- Solar power for pumping 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.

7.7 Buildings, Administrative and Technical Facilities

7.7.1 Information on Administrative Buildings

The LC has a 500 m2 two-storeyed reinforced concrete framed administrative building at Zinjibar. It was constructed in 2014 through subsidy from the German KfW development bank. It contains 14 office rooms. It is in good condition. The LC has also another administrative building for it J›a›ar branch. It is two-storeyed reinforced concrete framed building with a floor area of 120 m2. It contains eight office rooms and is in good condition. The LC has about six administrative office rooms within the 220 m2 single storeyed reinforced concrete framed building of Al Hisn pumping station.

Moreover, the LC has a rented building in Zinjibar which is used by the LC as a collection centre.

7.7.2 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	Type	Current Status
1	Al Hisn pumping station	Al Hisn	Reinforced concrete framed building	Intact
2	Zinjibar main warehouse	Zinjibar	Hangar	intact
3	Ja›ar main warehouse	Ja›ar	Hangar	Partially damaged
4	Al Hisn pumping station workshop	Al Hisn	Hangar	Partially damaged
5	Ja›ar technical and administrative office building	Ja›ar	Reinforced concrete framed building	Severely damaged

Table 7.9: Information of the LC technical buildings

7.7.3 Investment Requirements for Buildings, Administrative and Technical Facilities

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

- Rehabilitate the Ja›ar technical and administrative office building (plastering and finishings).
- Provide furniture and office equipment to the Ja›ar technical and administrative office building after its rehabilitation.
- Rehabilitate Ja›ar Main Warehouse and provide it with electric crane.
- Repair the electrical wiring and installation of Al Hisn pumping station workshop.
- Build and equip a complete wastewater laboratory as the LC has no such facility.

7.8 Wastewater System: Infrastructure and Management

The LC is operating wastewater collection and disposal systems, but it did not report data regarding wastewater system. It is also known that the LC has on treatment plant for Al Kawd town. The two major cities of the Abyan governorate have no wastewater treatment plants.

8. Technical Assessment (TA) and Investment Plans

8.1 Recommendations and Costs for TA Measures (TA Plan)

8.1.1 Methodology and Structure of TA Plan

The assessment on the institutional situation of Abyan 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-8. 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-4.

8.1.2 Governance, Management and Staff

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

Shortcoming	Recommendation	Implementation Priority
BoD does not conduct regular meetings. 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-4.)	Urgent
Lack of Qualified personnel to occupy some specified positions in the approved organisational structure. Overlapping authority due to absence of some key staff due displacement because of the conflicts	Qualify through training some candidate staff or employ required qualified people to occupy the vacant positions or to replace unqualified people currently occupying these key positions of the approved organisational structure. Making attendance of all key position staff mandatory and appointing new persons in the positions of those who are still displaced.	Urgent
Absence of Women Affairs manager who is internally displaced by the conflict	Appoint new manager for the Women Affairs department	Urgent
Not utilising automated systems of performance assessment and control	Provide and utilise PIIS system and its required equipment. Provide training on PIIS system and other related software packages.	High
Slow communication and data flow within the LC and between the LC and other parties.	Provide and install communication and data transfer equipment to link the LC units and facilitate communication with other parties.	Medium
Missing of some Financial and administrative regulations	Searching for missing financial and administrative regulation and making all regulations available and effective.	Urgent
Missing updated contingency plan for Emergency and disaster	LC management to update 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-4.)	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-4.)	Urgent+ high + Medium + Low
	Appointment of key management staff with clear job profile. (Ref. TA package 4 Appendix A-4)	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-4. 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.

8.1.3 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 the Table below.

Shortcoming	Recommendation	Implementation Priority
Shortage in facilities and equipment in the financial and costumer departments	Support utility with all required furniture and IT equipment including updating accounting, billing and stock software.	Urgent
Shortage office equipment and office material in the financial and costumer departments	Support utility with all required office equipment and materials and IT equipment including updating accounting, billing and stock software.	Urgent

non-updated automated software systems (Accounting, Billing, Warehouse management). No business plans. No standardized procedures and processes. Unaware of assets, lack of data. No automatic transfer of billing and accounting. Billing based on estimation. Low revenue collection. Inability to cover operating costs. Incomplete and inaccurate customer database.	Implement and update accounting and billing software and respective procedures. Preparation of realistic business plan. Introduce reporting standards and forms for financial reports. Regular reporting of customer data to finance department. Establish fair billing system, eliminate discounts. Follow up on unpaid bills. (Ref. TA Package 3, Appendix A-4.)	Urgent
	Redesign charts of accounts. Introduce GIS system. Follow up on unpaid bills. Increase number of customers. Update customer database. Establish customer complaint unit. (Ref. TA Package 3, Appendix A-4.)	High
Low 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-4)	Urgent
Low capacity and knowledge of customer department staff	Training for capacity building of the customer department staff and on billing system (ref. TA Package 2 Appendix A-5.)	high

Table 8.2: Recommendations to improve financial and customer management.

4.1.8 IT and Office Requirements

The table below summarizes the shortcomings and recommendations leading to procurement of equipment and materials for the Abyan 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-4, TA Package 3 while the specifications of some main equipment are attached in Appendix A-5.

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
Interrupted power supply	Needs continuous and low-cost power supply. Provide the department with a voltage regulator, Battery pack and electric charger. Utilise solar power	Urgent and High (As specified in TA Package 3 Appendix A-4)
Lack of some office equipment & materials and air-conditioners	Provide the necessary office equipment & materials and air conditioners	Urgent
No Line printer	Needs new line printers	Urgent
Lack of laptops	Provide laptops	Urgent
No plotter printer	Provide plotter printer to print maps	Urgent
Insufficient network and communication equipment	Provide required modems, routers and switch hubs	Urgent
Weak data Network security	Provide and install Network firewall	high
No antivirus software protection	Provide Antivirus software to protect data network and users› terminals.	Urgent

Table 8.3: Recommendations on IT and office requirements

8.1.5 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

8.4.6 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 15 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.

8.1.7 Technical Assistance Plan

The required TA support for the Abyan 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 six 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 Abyan LC is attached with this report in Appendix A-4.

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

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	54,000	0	0	0
TA2	Training Courses	113,000	42,000	18,000	0
TA3	Office equipment and IT	44,000	4,000	0	0
TA4	Coaching and Consultancy services	58,000	361,000	0	0
TA5	Operation Management Support	47,000	287,000	49,000	0
TA6	Public Relation and Awareness	0	34,000	34,000	12,000
Total TA cost:		316,000	728,000	101,000	12,000

Table 8.4: Cost estimations on TA interventions

The total required amount for the technical assistance measures has been estimated to around USD 316,000 for critical priority intervention, USD 728,000 for high priority intervention, 101,000 for medium priority intervention and USD 12,000 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-8. 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, vast 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	0	0	130,000	0	130,000
2	Well rehabilitation and new construction	1,386,000	0	0	0	1,386,000
3	Water pumping station	68,000	0	0	0	68,000
4	Water network rehabilitation and extension	30,000	0	15,000	0	45,000
5	Wastewater collection, disposal and Treatment	1,460,000	0	0	0	1,460,000
6	Generators and spares	0	2,425,000	0	0	2,425,000
7	Vehicles, machines, tools	910,000	0	200,000		1,110,000
8	Electric materials and solar systems	0	0	82,500	0	83,000
9	Laboratory equipment	33,750	0	25,000	0	59,000
Total investment		3,888,000	2,425,000	453,000	0	6,766,000

Table 8.5: Cost estimate for prioritized investment measures

The required estimated budget has been calculated for:

- Urgent measures: 3,138,000 USD
- High-priority measures: 2,425,000 USD
- Short-term measures: 435,000 USD
- Long-term measure: 0 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 6,016,000 USD for the next five years.

Appendices to Annex6

Assessment Report for Abyan LC

Appendix A-1: Pictures of of Abyan LC Buildings

Picture 1: View of the LC Administrative Building at Zinjibar

Picture 2: LC Administrative Building at Zinjibar

Picture 3: LC's Zinjibar Warehouse

Picture 4: Al Hisn Water Wells Station

Picture 5: Al Hisn Power Generation Station

Picture 6: Al Hisn Power Generation Station

Picture 7: Al Kawd Sewage Pump Station

Picture 8: LC's Workshop

Picture 9: Al Kawd Distribution Storage Reservoir

Picture 10: Hisn Shaddad Distribution Storage Reservoir

Picture 11: Faculty of Education Elevated Storage Reservoir

Picture 12: Ground Storage Reservoir at Al-Ruwa

Appendix A-2:
Contact Details of the LC and BoD

Name of Local Corporation (LC)	Local Corporation for Water Supply & Sanitation Abyan
General Director Name	Eng. Saleh Mohammed Saleh Bel›eedi
Year of Establishment	2006
Address of the LC	Abyan - Zinjibar
Telephone	00967 777243624, 733693339
Fax	not available
E-mail	not available
Focal Person (name and mobile No.)	Ahmad Haidara Mohammad 777864516
Members of Board of Directors (BoD)	Major General Abu Bakr Hussain Salem - Governor, Chairman of the Board
	Eng. Saleh Mohammad Bel›eedi - Member - Director General of the LC
	Khalid Abdulrhab Al-Huthari - Member - Director of Finance
	Waddhah Hammas - Member - Director of Planning
	Mohammad Al-Wali - Member - President of the Chamber of Commerce
	Dr. Mansoor Jomia› - Member - Civil Society
	Eng. Hussain Al Fadhli - Member - Water Resources
	Brigadier Abu Mish›al Al Kazmii - Member - Director of Security in the province
	Eng. Faisal Al-Baadani - Member - Representative of the Ministry of Water

Appendix A-3:
Staff Situation and Qualification

Staff according to Qualification	2017	2018	2019	2020	2021	2022
Total no. of staff male actual working	30	40	47	39	67	68
Total no. of staff male not actual working (state reasons)	186	194	187	195	167	166
Total no. of staff female actual working	8	5	5	4	7	10
Total no. of staff female not actual working (state reasons)	13	16	16	17	14	11
Staff professional level (university degree) male	43	43	43	43	43	43
Staff professional level (university degree) female	3	3	3	3	3	3
Staff technical level (high school, VT certificate etc. male	90	90	90	90	90	90
Staff technical level (high school, VT certificate etc.) female	12	12	12	12	12	12
Staff according to Section	2017	2018	2019	2020	2021	2022
Managers	12	12	12	12	12	12
Adminstrative	7	7	7	7	7	7
Financial	15	17	17	17	17	17
Water Supply	138	130	130	130	130	130
Sanitation	0	22	22	22	22	22
Commercial	33	33	33	33	33	33
Planning & Projects	2	2	2	2	2	2
Procurement & Warehouse	3	3	3	3	3	3
Internal Audit	1	1	1	1	1	1
Legal Affairs	1	1	1	1	1	1
Women	8	8	8	8	8	8
IT	2	4	4	4	4	4
Auxilliary	15	15	15	15	15	15

Total	237	255	255	255	255	255
Staff according to Type	2017	2018	2019	2020	2021	2022
Total No. of regular staff	151	149	149	149	149	149
Total No. of contractors staff	86	106	106	106	106	106
Total No. of dayworkers (not employed)	0	0	0	0	0	0
Actual working hours per week admin. Staff	40	40	40	40	40	40
Actual working hours per week techn. Staff	40	40	40	40	40	40

Appendix A-4:

Technical Assistance Plan for Abyan L C

Package	TA intervention	Estimated TA cost in USD			
		Urgent	High Priority	Medium Priority	Low Priority
TA1	Financial Support	54,000	0	0	0
TA2	Training Courses	113,000	42,000	18,000	0
TA3	Office Equipment and IT	44,000	4,000	0	0
TA4	Coaching and Consultancy Services	58,000	361,000	0	0
TA5	Operation Management Support	47,000	287,000	49,000	0
TA6	Public Relation and Awareness	0	34,000	34,000	12,000
Total TA cost :		316,000	728,000	101,000	12,000

TA Package 1: Financial Support (Status: Jan. 2022)

ID	Financial support	Requirements	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
1.1	Energy supply and consumables	Financial support	54,107	0	0	0
Total TA Package 1:			54,000	0	0	0

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 support	8,000	46,000	0	0
4.2	Consultancy services	Update design, Feasibility study	50,000	250,000	0	0
4.3	External Auditor	Re-evaluation of audits and accounts	0	64,900	0	0
Total TA Package 4:			58,000	361,000	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	795	21,600	0	0
2.2	Management & HR subjects	General Directors, Deputies, Planning and Project Manager, Financial Manager, HR Manager	17,280	3,550	15,620	0
2.3	Technical subjects	Deputy, Director of main departments, Key staff, engineers	53,905	7,810	0	0
2.4	Finance subjects	Finance department staff, Procurement department, Supervision & Inspection	4,260	4,260	0	0
2.5	Customer Relations and Services subjects	General director, director of main departments	21,580	0	2,840	0
2.6	IT, PIIS	IT manager, Finance, Planning department key staff	6,310	4,420	0	0
2.7	On-Job training	HR & IT department, Audit Section and Accounting Sections, Warhouse and procurement management staff	9,000	0	0	0
Total TA Package 2:			113,000	42,000	18,000	0

TA Package 3: Office Equipment and IT

ID	Intervention	Material / Equipment	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	PC, laptop, printer	29,500	4,000	0	0
	Software	National Water Sector software	1,000	0	0	0
3.3	Electric equipment	Charger, solar system, AC, fingerprint scanner	11,000	0	0	0
3.4	Furniture	Chairs, desks	2,350	0	0	0
Total TA Package 3:			44,000	4,000	0	0

TA Package 4: Coaching and Consultancy services TA Package 5: Operation Management Support /GIS

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, GIS software, customer survey, Customer Service Centre	46,875	50,000	49,388	0
5.2	Consultancy services	Team leader, experts, draughtsman	0	237,000	0	0
Total TA Package 5:			47,000	287,000	49,000	0

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	27,000	27,000	0
6.2	Public awareness campaign	Workshops, meetings, publications, media	0	7,190	7,190	12,000
6.3	Gender related awareness	Workshops for women, visit of marginalized, school visits	0	0	0	0
Total TA Package 7:			0	34,000	34,000	12,000
Total TA measures in USD:			316,000	728,000	101,000	12,000

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

TA Package 1.1: Energy supply and Consumables

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)
1.1.1	Fuel support	34,433	29,820	2/1	10,100	6	9,018	54,107
1.1.2	Filter and lubricant				0	6	0	0
	Sub-Total						9,018	54,107
	Total:						9,018	54,107

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

ID	Training Course Subject1)	Target Staff	Number of participants	Number of training days/ hours	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	Board of Directors Secretary program	Secretary of BoD	1	8 hours for 3 days	795	795			
2.1.2	Certified Board Member Program	Board of Directors	8	8 hours for 8 days	2,700		21,600		
	Sub-total:					795	21,600	0	0
2.2	Management & HR Subjects								
2.2.1	Leadership skills	Director General , Planning and project manager, Financial Manager, HR manager and specialists of Planning department (2 No.)	10	8 hours for 5 days	710			7,100	
2.2.2	Crisis management and emergency planning	Director General , Planning and project manager, Financial Manager, HR manager	4	8 hours for 5 days	710	2,840			
2.2.3	Water supply, sanitation and hygiene according to Sphere standards	Director General , Deputies , Technical Directors and Project department	4	8 hours for 2 days	435	1,740			
2.2.4	Modern basics in the preparation of organizational structures and job descriptions	General Director, Deputy and Administrative Affairs and Human resource department key staff	5	8 hours for 5 days	710	3,550			
2.2.5	Financial Management for Non-Financial Managers	Director General, Deputy of Technical Affaires, Audit and wages	6	8 hours for 5 days	710			4,260	
2.2.6	Institutional Loyalty	Director General , Deputy , Directors of main departments and Directors of Areas	10	8 hours for 4 days	560	5,600			
2.2.7	Human Resources Management	Administrative Affairs and Human resource department managers	2	8 hours for 5 days	710	1,420			
2.2.8	Personnel Administration & Management of Salaries & Wages	Administrative Affairs and Human resource management	3	8 hours for 5 days	710	2,130			
2.2.9	Staff Control and performance assessment	Administrative and financial managers	2	8 hours for 5 days	710		1,420		
2.2.10	Planning concepts	Head of planning section	1	8 hours for 5 days	710		710		
2.2.11	Strategic planning	Director General , planning and project manager, Financial Manager, HR manager and specialists of Planning department (2 No.)	6	8 hours for 5 days	710			4,260	
2.2.12	Manpower planning	HR manager and Head of personnel section	2	8 hours for 5 days	710		1,420		
	Sub-total:					17,280	3,550	15,620	0

ID	Training Course Subject1)	Target Staff	Number of participants	Number of training days/hours	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	Technical Subjects								
2.3.1	Preparation of reagents and standard solutions	Laboratory staff	2	8 hours for 3 days	495	990			
2.3.2	Chlorination	Water Operation and Maintenance Management	3	8 hours for 3 days	495	1,485			
2.3.3	First Aid and Fire Fighting	Work Safety Section staff	3	8 hours for 5 days	710	2,130			
2.3.4	Management of Maintenance and Occupational Safety	Operation and Maintenance department, Water Management	6	8 hours for 5 days	710	4,260			
2.3.5	Operation and Maintenance of Control Panels	Technical department staff	5	8 hours for 5 days	710	3,550			
2.3.6	Maintenance and Repairs of Water Meters	Water department staff	2	8 hours for 3 days	495	990			
2.3.7	Water Distribution Networks (Basic)	Water Network Operating & Troubleshooting Section	8	8 hours for 3 days	495	3,960			
2.3.8	Water Distribution Networks (Advanced)	Water Network Operating & Troubleshooting Section	8	8 hours for 3 days	495	3,960			
2.3.9	Water Leakage Control	Water Network Operating & Troubleshooting &Water Distribution Sections	5	8 hours for 4 days	560	2,800			
2.3.10	Safety requirements for work in confined areas	Technical department staff and Work Safety Section	5	8 hours for 5 days	710	3,550			
2.3.11	Safety in Labs	Laboratory staff and Safety Section	2	8 hours for 4 days	560	1,120			
2.3.12	Quality control and Quality Assurance in Chemical Labs	Laboratory staff	1	8 hours for 5 days	710	710			
2.3.13	Water and Wastewater Analysis	The laboratory staff of water and wastewater	6	8 hours for 5 days	710	4,260			
2.3.14	Design, installation and maintenance of solar electric power	Technical department	2	8 hours for 5 days	710	1,420			
2.3.15	Ground Water flow and Transport Fundamentals	water department	2	8 hours for 5 days	710	1,420			
2.3.16	Sewer analysis and modelling using SewerGEMS/SewerCAD software	Project department	2	8 hours for 10 days	1,420		2,840		
2.3.17	Water Network analusis and modelling using WaterGEMS/WaterCAD software	Project department	2	8 hours for 10 days	1,420		2,840		

ID	Training Course Subject1)	Target Staff	Number of participants	Number of training days/ hours	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.3.18	Water Chemistry and Quality Standards	Laboratory staff	2	8 hours for 5 days	710	1,420			
2.3.19	Operation and Maintenance of Diesel Generators (diesel power stations)	Technical department	3	8 hours for 5 days	710	2,130			
2.3.20	Maintenance and Operating of Wells, Pumps , Water Reservoirs	Technical department	3	8 hours for 4 days	560	1,680			
2.3.21	Rainwater harvesting	Technical department, Mangers and planners	4	8 hours for 5 days	710	2,840			
2.3.22	Water conservation	Decision makers, Sanitary engineers, Water managements engineers	3	8 hours for 5 days	710	2,130			
2.3.23	Appropriate wastewater treatment for reuse	Sanitary engineers, public health officers, Wastewater treatments plants designers	3	8 hours for 5 days	710	2,130			
2.3.24	Wastewater treatment for small communities	Sanitary engineers, public health officers, Wastewater treatments plants designers	3	8 hours for 6 days	710	2,130			
2.3.25	Low-cost sanitation / sustainable sanitation	Sanitary Engineers Water supply personnel, public health officers	4	8 hours for 6 days	710	2,840			
2.3.26	Methods and technology on energy saving /renewable energy in water and sanitation systems	Technical department	3	8 hours for 5 days	710		2,130		
	Sub-total:					53,905	7,810	0	0
2.4	Finance Subjects								
2.4.1	Unified accounting system	Financial department manager and its sections	4	8 hours for 5 days	710	2,840			
2.4.2	Planning and Control of Budgets	Financial Director and heads of budget, expenditure and revenue sections	3	8 hours for 5 days	710		2,130		
2.4.3	Procurement and Store Management	Procurement department	3	8 hours for 5 days	710		2130		
2.4.4	Internal Auditing Guidelines Implementation	Supervision and Inspection department	2	8 hours for 5 days	710	1420			
	Sub-total:					4,260	4,260	0	0

ID	Training Course Subject1)	Target Staff	Number of participants	Number of training days/ hours	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.5	Customer relations and services								
2.5.1	Instant Follow up of commercial accounts activation	Head of Commercial Section	1	8 hours for 3 days	495	495			
2.5.2	Customer services workflow	Managers of Customer and IT departments	2	8 hours for 5 days	710	1,420			
2.5.3	Water Meter Reading	Water meter readers	15	8 hours for 3 days	495	7,425			
2.5.4	Using billing system applications	Finanacial & Planning and customers department	4	8 hours for 2 days	435	1,740			
2.5.5	Technical aspects and data input into billing system	Billing data entryists	2	8 hours for 5 days	710	1,420			
2.5.6	Collection of the receivable amounts	Director of Customer Service and its sections	4	8 hours for 3 days	495	1,980			
2.5.7	Tariff Structure Design	General director and deputies ,financial, technical, customer department .	5	8 hours for 5 days	710	3,550			
2.5.8	Preparation of Awareness Plans & campaigns	Women department , customer service , public relationship department and technicians & engineers	5	8 hours for 5 days	710	3,550			
2.5.9	Customer Relations Management and Communication skills	Head of Customer Relation section, Customer relations and services, Women›s department	4	8 hours for 5 days	710			2,840	
	Sub-total:					21,580	0	2,840	0
2.6	IT Courses								
2.6.1	Computer system maintenance and data security	Heads, Programming and Revenue Sections	2	8 hours for 5 days	710	1,420			
2.6.2	Electronicl Archiving and Secretariat	Head of Archive Section and General Manager›s Office Manager	2	8 hours for 5 days	710	1,420			
2.6.3	Introduction to Power Point presentations software	General Manager›s Office Manager and Procurement Manager	2	8 hours for 3 days	430	860			
2.6.4	Introduction to GIS applictions	Technical Manager and IT Manager .	2	8 hours for 2 days	435		870		
2.6.5	Oracle SQL	IT Management	1	8 hours for 5 days	710		710		
2.6.6	Oracle PLSQL	IT Management	1	8 hours for 10 days	1,420		1,420		
2.6.7	Training on network maintenance + maintenance of computers	IT Management	2	6 hours for 5 days	710		1,420		
2.6.8	Training on Performance information indicator system (PIIS)	Finanacial department and Planning department	6	8 hours for 2 days	435	2610			
	Sub-total:					6,310	4,420	0	0

ID	Training Course Subject1)	Target Staff	Number of participants	Number of training days/hours	Cost (USD / person)2)	Urgent - total cost (USD)	High Priority- total cost (USD)	Medium Priority - total cost (USD)	Low Priority - total cost (USD)
2.7	On-Job training								
2.7.1	Secretariat and office management skills development	HR department employees	7	4 hours for 5 days	500	3,500			
2.7.2	Basics of Audit and control of account systems	Audit Section and Accounting Sections	4	4 hours for 5 days	500	2,000			
2.7.3	Basics of Internet and E-mail	Personnel section and IT department	4	4 hours for 5 days	500	2,000			
2.7.4	Basics of Internet and E-mail	Warhouse and procurement management	3	4 hours for 5 days	500	1,500			
	Sub-total:					9,000	0	0	0
	Total					113,130	41,640	18,460	0

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	Billing Line Printer	see Appendix A-5	1	15,000	15,000			
3.1.2	Desktop PC	see Appendix A-5	5	900	4,500			
3.1.3	Laptop	see Appendix A-5	2	1,500	3,000			
3.1.4	Server	see Appendix A-5	1	7,000	7,000			
3.1.5	Network Firewall	SonicWall TZ	1	4,000		4,000		
	Sub-total				29,500	4,000	0	0
3.2	Software							
3.2.1	Software update	Upgrade database	1	1,000	1,000			
	Sub-total				1,000	0	0	0
3.3	Electric equipment							
3.3.1	Wireless Modems		2	500	1,000			
3.3.2	Routers		2	2,000	4,000			
3.3.3	Voltage regulator	10 KVA to 20KVA Automatic Voltage regulator 2 Phases	1	2,000	2,000			
3.3.4	Battery back-up	Deep cycle battery 12v-200ah	1	500	500			
3.3.5	Electric Charger	OnLine UPS 5KVA	1	3,000	3,000			
3.3.6	Switch hub	Switch Hub Dell powerconnect 2816 16Gbe	2	250	500			
	Sub-total				11,000	0	0	0
3.4	Furniture							
3.4.1	Air conditioners	Split unit 1 Ton	2	300	600			
3.4.2	Desk	PC Tables 120 * 90 cm	5	300	1,500			
3.4.3	Chairs	Swivel chairs	5	50	250			
	Sub-total				2,350	0	0	0
Total					43,850	4,000	0	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 Services during Conflict and Post-Conflict

TA Package 4.1: Coaching

ID	Requirement	Intervention	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	3	10,000		30,000		
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					8,000	46,000	0	0

TA Package 4.2: Consultancy Services

ID	Requirement	Intervention	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	Update detailed design	Update the available detailed design of the extension of the water and sanitation system	LS	1	150,000		150,000		
4.2.2	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	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	250,000	0	0

TA Package 4.3: External Auditor

ID	Requirement	Intervention	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	Re-evaluation of assets and auditing of accounts of previous years	External auditor	LS	1	15,000		15,000		
		Allowance for core committee	Nos	6	1,200		7,200		
		Allowance for technical committee	Nos	22	850		18,700		
		Audting and closing the LC accounts for the previous years by external auditor	Year	6	4,000		24,000		
	Sub-Total					0	64,900	0	0
	Total					58,000	360,900	0	0

TA Package 5: Operation Management system Support /GIS

ID	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)
5.1	Establish Pre-Conditions							
5.1.1	Procure satellite images	km^2	75	85	6,375			
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	Procure and install Maintenance Management software (MMS)	nos	1	15,000	15,000			
5.1.4	Comprehensive Customer Subscriber Survey (CSS) for all house connections	nos	12,347	4			49,388	
5.1.5	Establish Customer Service Centre room with IT and furniture	LS	2	25,000		50,000		
	Sub-total:				46,875	50,000	49,388	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	6	7,000		42,000		
5.2.4	MMS expert	mm	4	7,000		28,000		
5.2.5	CSS expert	mm	6	5,000		30,000		
5.2.6	Customer management expert	mm	6	5,000		30,000		
5.2.7	Draughtsman	mm	22	2,500		55,000		
	Sub-total:				0	237,000	0	0
	Total				46,875	287,000	49,388	0

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

TA Package 6: 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.	15	1,000		15,000	15,000	
	Sub-Total					0	27,000	27,000	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.	24,000	0.01		240	240	
		Posters at public institutions and places	nos.	30	15		450	450	
		Conference, workhops, meetings	nos.	4	1,000		4,000	4,000	
		Distribution of Customer Services Guide.	nos.	12,000	1				12,000
	Sub-Total					0	7,190	7,190	12,000

TA Package 6: Public Relation and Awareness
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	39,190	39,190	12,000

Notes:

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

Appendix A-5 :

Specification of Proposed IT Equipment

PC Desktop Specifications

Type	TOWER
Processor	
CPU Type	Intel 6th generation Core i7 Quad Core
Memory	
Memory Size	8 GB 1600MHz DDR3 SDRAM
Storage	
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

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

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

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

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

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

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

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

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 A-6:

Wells and Pumps Parameters

	Borehole data						Pump data						Operation hours/ day		Production m³/ day		Area served
Item	Well No / ID	Location	Physical Status	Depth	Static water level	Dia. of riser pipe	Installation depth	Head H	Quantity Q	Physical Status	Power P	Power Source					
				m	m	mm	m	m	m3/h		kW		nominal	current	nominal	current	
Al-Rwa well field																	
1	Well-01	Al Husn	Good	89	2.8	150	45	33.77	42	operational	22	electricity grid	20	14	840	588	Jaʿar and Al Hisn
2	Well-02	Al Husn	Good	99	4.16	150	45	24.35	61	operational	26	electricity grid	20	14	1,220	854	Jaʿar and Al Hisn
3	Well-03	Al Husn	Good	81	2.7	150	40	34.42	65	operational	0	electricity grid	20	14	1300	910	Jaʿar and Al Hisn
4	Well-04	Al Husn	Good	70	6.17	150	55	38,28	48	operational	26	electricity grid	20	14	960	672	Jaʿar and Al Hisn
5	Well-05	Al Husn	Good	170	3.88	150	55	0	52	operational	0	electricity grid	20	14	1040	728	Jaʿar and Al Hisn
6	Well-06	Al Husn	Good	88	4.47	150	40	33.76	47	operational	0	electricity grid	20	14	940	658	Jaʿar and Al Hisn
7	Well-10	Al Husn	Good	60	11.9	150	55	38.87	54	operational	26	electricity grid	20	14	1,080	756	Jaʿar and Al Hisn
8	Well-11	Al Husn	Good	70	15	150	55	35.75	72	operational	37	electricity grid	20	14	1,440	1,008	Jaʿar and Al Hisn
9	Well-12	Al Husn	Good	76	12	150	55	50.17	95	operational	22	electricity grid	20	14	1,900	1,330	Jaʿar and Al Hisn
10	Well-13	Al Husn	Good	76	9.8	150	55	51.02	72	operational	26	electricity grid	20	14	1,440	1,008	Jaʿar and Al Hisn
11	Well-14	Al Husn	Good	72	8.7	150	50	51.02	60	operational	0	electricity grid	20	14	1200	840	Jaʿar and Al Hisn
12	Well-15	Al Husn	Good	66	11.16	150	55	55.1	60	operational	0	electricity grid	20	14	1200	840	Jaʿar and Al Hisn
13	Well-19	Al Husn	Good	89	11	150	55	25.82	62	operational	0	electricity grid	20	14	1240	868	Jaʿar and Al Hisn

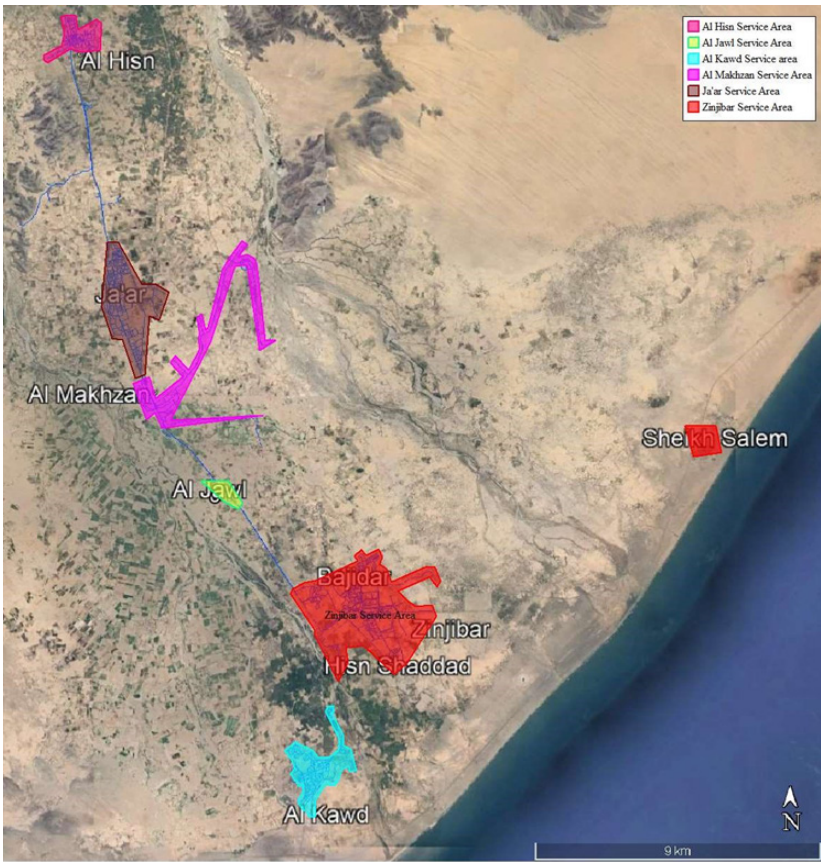
14	Well-20	Al Husn	Good	77.5	8.5	150	50	62.84	90	operational	0	electricity grid	20	14	1800	1260	Jaʾar and Al Hisn
15	Well-21	Al Husn	Good	78	8.5	150	50	61.85	68	operational	0	electricity grid	20	14	1360	952	Jaʾar and Al Hisn
16	Well-22	Al Husn	Good	101	7.71	150	55	64.33	148	operational	0	electricity grid	20	14	2960	2072	Jaʾar and Al Hisn
17	Well-23	Al Husn	Good	86	6.9	150	55	63.79	144	operational	0	electricity grid	20	14	2880	2016	Jaʾar and Al Hisn
18	Well-24	Al Husn	Good	98	6.36	150	45	64.9	140	operational	37	electricity grid	20	14	2,800	1,960	Jaʾar and Al Hisn
19	Well-25	Al Husn	Good	100	13	150		0	60	operational	0	electricity grid	20	14	1200	840	Jaʾar and Al Hisn
Total Al-Rwa								1440		222				28,800	20,160		

	Borehole data						Pump data						Operation hours/ day		Production m^3/day		Area served
Item	Well No / ID	Location	Physical Status	Depth	Static water level	Dia. of riser pipe	Installation depth	Head H	Quantity Q	Physical Status	Power P	Power Source					
				m	m	mm	m	m	m3/h		kW		nominal	current	nominal	current	
Jaʾar well field																	
1	Well-1	Jaʾar	Good	65	22.6	100	42	120	54	operational	26	electricity grid	20	14	1,080	756	Jaʾar Al Mukhzan
2	Well-2	Jaʾar	Good	70	22.8	100	47	120	61.2	operational	26	electricity grid	20	14	1,224	857	Jaʾar Al Mukhzan
3	Well-3	Jaʾar	Good	68	23.6	100	44	120	64.8	operational	26	electricity grid	20	14	1,296	907	Jaʾar Al Mukhzan
4	Well-4	Jaʾar	Good	70	23.8	100	46	120	75.6	operational	37	electricity grid	20	14	1,512	1,058	Jaʾar Al Mukhzan
5	Well-5	Jaʾar	Good	65	23.6	100	41	120	61.2	operational	26	electricity grid	20	14	1,224	857	Jaʾar Al Mukhzan
6	Well-6	Jaʾar	Good	60	23.2	100	37	120	50.4	operational	22	electricity grid	20	14	1,008	706	Jaʾar Al Mukhzan
7	Well-8	Jaʾar	Good	70	23.5	100	47	120	57.6	operational	26	electricity grid	20	14	1,152	806	Jaʾar Al Mukhzan
8	Well-9	Jaʾar	Good	70	22.3	100	48	120	43.2	Stop	22	electricity grid	20	14	864	604.8	Jaʾar Al Mukhzan
9	Well-11	Jaʾar	Good	65	22.5	100	45	120	25.2	Stop	18	electricity grid	20	14	504	352.8	Jaʾar Al Mukhzan
Total Jaʾar								493.2		229				9,864	6,905		
Zinjibar wells field																	
1	Al sammah 1	Zinjibar	Good	70	18	100	50	120	50.4	operational	37	electricity grid	20	14	1,008	706	Zinjibar

2	Al sammah 2	Zinjibar	Good	72	18	100	50	120	50.4	operational	37	electricity grid	20	14	1,008	706	Zinjibar
3	Al sammah 3	Zinjibar	Good	68	18	100	50	120	50.4	operational	37	electricity grid	20	14	1,008	706	Zinjibar
4	Al sammah 4	Zinjibar	Good	70	18	100	50	120	50.4	operational	37	electricity grid	20	14	1,008	706	Zinjibar
5	Al seleaty	Zinjibar	Good	80	18	100	50	120	50.4	operational	37	electricity grid	20	14	1,008	706	Zinjibar
6	Al edon	Al edon	Good	75	20	100	42	80	54	operational	26	electricity grid	20	14	1,080	756	Zinjibar
7	Al Mahlajj 1	Al Kood	Good	60	18	100	50	100	64.8	operational	26	electricity grid	20	14	1,296	907	Al Kood
8	Al Mahlajj 2	Al Kood	Good	80	18	100	55	100	54	operational	26	electricity grid	20	14	1,080	756	Al Kood
9	Al dawagen	Zinjibar	Good	80	18	100	50	100	64.8	operational	26	electricity grid	20	14	1,296	907	Al Kood
10	Al Saikh Abdullah	Al Saikh Abdullah	Good	65	18	100	38	80	54	operational	26	electricity grid	20	14	1,080	756	Zinjibar

	Borehole data						Pump data						Operation hours/day		Production m³/day		Area served
Item	Well No / ID	Location	Physical Status	Depth	Static water level	Dia. of riser pipe	Installation depth	Head H	Quantity Q	Physical Status	Power P	Power Source					
				m	m	mm	m	m	m3/h		kW		nominal	current	nominal	current	
11	AL salidi	Al Kawdd	Good	65	22	100	42	100	64.8	operational	37	electricity grid	20	14	1,296	907	Zinjibar
Total Zinjiar								489.6		289				9,792	6,854		
Total wells					2,423	740	11840	48,456 33,919									

Appendix A-7:
Network and Service Areas Maps



Appendix A-8:

Investment Plan for Abyan LC

Overview of required investment packages for LC Abyan

Package	Measures	Urgent (0-6mths) (USD)	High priority (6-12mths) (USD)	Short-term (1-3 years) (USD)	Long-term (3-5 years) (USD)
		2024	2024-2025	2025-2027	2027-2031
1	Civil works on buildings and structures			130,000	0
2	Well rehabilitation and new construction	1,386,000			
3	Water pumping station	68,000	0	0	0
4	Water network rehabilitation and extension	30,000	0	15,000	0
5	WWTP and sewage pumps	1,460,000	0	0	0
6	Sewer network rehabilitation and extension	0	2,425,000	0	0
7	Vehicles, machines, tools	910,000	0	200,000	
8	Electric materials and solar systems	0	0	82,500	0
9	Laboratory equipment	33,750	0	25,000	0
Total	3,888,000	2,425,000	453,000	0	

Investment Plan for LC Abyan

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									130,000	
1.1	Buildings				√	70,000					
1.2	Warehouses				√	20,000					
1.3	Workshops				√	40,000					
2	Well rehabilitation and new construction									1,386,000	
2.1	Al Husn Wellfield		√		√	703,000					
2.2	Ja›ar Wellfield		√		√	333,000					
2.3	Zinjibar Wellfield		√		√	350,000					
3	Water pumping station									68,000	
3.1	High and low pressure pumps				√	68,000					
4	Water network rehabilitation and extension									45,000	
4.1	Reservoirs (urgen)				√	30,000					
4.2	Reservoirs (Short term)				√	15,000					
5	WWTP and sewage pumps									1,460,000	
5.1	Wastewater treatment plants	√				1,400,000					
5.2	Sewage pumps	√				60,000					
6	Sewer network rehabilitation and extension									2,425,000	
6.1	Rehabilitation sewer line - Al Shuhada Square, Al Quds Street, Ja›ar Old city incl. manholes and all works.				√		2,400,000				
6.1	Rehabilitation of the sewage network - the governor›s house in Alsama				√		5,000				

6.1	Rehabilitation sewer line - Al Shuhada Square, Al Quds Street				v		20,000				
7	Vehicles, machines, tools									1,110,000	
7.1	Vehicles	v				910,000		200,000			
8	Electric materials and solar systems									83,000	
8.1	Solar systems		v					82,500			
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									59,000	
9.1	Chlorination Plant equipment		v			33,750		25,000			
Total						4,033,000	2,425,000	308,000	0	6,766,000	

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

Package 1: Civil Works on buildings and structures

ID	Measure	Requirement	Unit	Quantityx	Unit cost (USD)	Total (USD)	Priority
1.1	Buildings						
1.1.1	Rehabilitation of damaged administrative and technical offices	Rehabilitation of damaged adminstrative and technical offices at Ja›ar	LS	1	70,000	70,000	1
1.2	Warehouses						
1.2.1	Rehabilitation of damaged warehouse	Rehabilitation of damaged warehouse at Ja›ar	LS	1	20,000	20,000	1
1.3	Workshops						
1.3.1	Rehabilitation of damaged Workshops	Rehabilitation of damaged workshop at Al Husn pumping station	LS	1	40,000	40,000	1
Sub-total Priority 1 - Urgent (0-6 months)						130,000	1
Total Package 1:						130,000	

Package 2: Well rehabilitation

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
2.1	Al Husn Wellfield							
2.1.1	Well-U22	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 101 m	LS	1	37,000	37,000	1
2.1.2	Well-U23	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 86 m	LS	1	37,000	37,000	1
2.1.3	Well-U24	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 98 m	LS	1	37,000	37,000	1
2.1.4	Well-UA11	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 70 m	LS	1	37,000	37,000	1
2.1.5	Well-UA13	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 76 m	LS	1	37,000	37,000	1
2.1.6	Well-UA21	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 78 m	LS	1	37,000	37,000	1
2.1.7	Well-UA12	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 76 m	LS	1	37,000	37,000	1

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
2.1.8	Well-UA20	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 77.5 m	LS	1	37,000	37,000	1
2.1.9	Well-UA14	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 72 m	LS	1	37,000	37,000	1
2.1.10	Well-UA10	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 60 m	LS	1	37,000	37,000	1
2.1.11	Well-UA4	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 70 m	LS	1	37,000	37,000	1
2.1.12	Well-UA5	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 170 m	LS	1	37,000	37,000	1
2.1.13	Well-UA6	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 88 m	LS	1	37,000	37,000	1
2.1.14	Well-UA15	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 66 m	LS	1	37,000	37,000	1

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
2.1.15	Well-UA3	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 81 m	LS	1	37,000	37,000	1
2.1.16	Well-UA19	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 89 m	LS	1	37,000	37,000	1
2.1.17	Well-UA2	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 99 m	LS	1	37,000	37,000	1

2.1.18	Well-AU25	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 100 m	LS	1	37,000	37,000	1
2.1.19	Well-UA1	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 89 m	LS	1	37,000	37,000	1
Sub-Total Priority 1 - Urgent (0-6 months)							703,000	1
2.2	Ja›ar wellfield							
2.2.1	Well-1	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 65 m	LS	1	37,000	37,000	1
2.2.2	well-2	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 70 m	LS	1	37,000	37,000	1

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
2.2.3	well-3	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 68 m	LS	1	37,000	37,000	1
2.2.4	well-4	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 70 m	LS	1	37,000	37,000	1
2.2.5	well-5	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 65 m	LS	1	37,000	37,000	1
2.2.6	well-6	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 60 m	LS	1	37,000	37,000	1
2.2.7	well-8	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 70 m	LS	1	37,000	37,000	1
2.2.8	well-9	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 70 m	LS	1	37,000	37,000	1

2.2.9	well-11	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 65 m	LS	1	37,000	37,000	1
Sub-Total Priority 1 - Urgent (0-6 months)							333,000	1

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
2.3	Zinjibar wellfield							
2.3.1	As Samma 1	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 90 m	LS	1	35,000	35,000	1
2.3.2	As Samma 2	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 85 m	LS	1	35,000	35,000	1
2.3.3	As Samma 3	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 95 m	LS	1	35,000	35,000	1
2.3.4	As Samma 4	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 80 m	LS	1	35,000	35,000	1
2.3.5	As Saleaty	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 80 m	LS	1	35,000	35,000	1
2.3.6	aledon	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 75 m	LS	1	35,000	35,000	1
2.3.7	Al Mahlajj 1	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 60 m	LS	1	35,000	35,000	1

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
2.3.8	Al Mahlajj 2	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 80 m	LS	1	35,000	35,000	1
2.3.9	Al dawagen	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 80 m	LS	1	35,000	35,000	1
2.3.10	Al Saikh Abdullah	-Well rehabilitation (Cleaning & Disinfection); -Supmersible pump; -Flow meter, Pressure gauge, Check valve and Gate valve.	Pump power= 37 KW, Well Dia.= 12 Inch, Well depth= 65 m	LS	1	35,000	35,000	1
Sub-Total Priority 1 - Urgent (0-6 months)							350,000	1
Total Package 2:							1,386,000	

Package 3: Water Pumping Stations

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
3.1	High and low pressure pump (Urgent)							
3.1.1	Reserve for Al-Sheikh Salem	High pressure pump	Q=30 m^3/hour, H= 120 m Motor capacity =37 kw	nos.	1	25,000	25,000	2
3.1.2	Reserve for Al-Maraked	Low pressure pump	Q=15 m^3/hour, H= 75 m Motor capacity =12kw	nos.	1	18,000	18,000	2
3.1.3	Reserve for Bajidar	High pressure pump with solar power system	Q=30 m^3/hour, H= 120 m Motor capacity =37 kw	nos.	1	25,000	25,000	2
Subtotal: Priority 2 (6-12 months)							68,000	2
Total Package 3: Priority 2 (6-12 months)							68,000	2

Package 4: Water network rehabilitation and extension

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
4.1	Reservoirs (Urgent)							
4.1.1	Al Husn pumping station storage reservoir 1	-Reservoir Cleaning and disenfiction -Electronic flow meter	Standard cleaning and disenfiction of the reservoir; Supply and install electronic flow meter	LS	1	15,000	15,000	1
4.1.2	Al Husn pumping station storage reservoir 2	-Reservoir Cleaning and disenfiction -Electronic flow meter	Standard cleaning and disenfiction of the reservoir; Supply and install electronic flow meter	LS	1	15,000	15,000	1
Sub-total Priority 1 - Urgent (0-6 months)							30,000	1
4.1	Reservoirs (Short term)							
4.1.3	Ja›ar wellfield storage reservoir 1	Reservoir Cleaning and disenfiction	Standard cleaning and disenfiction of the reservoir	LS	1	3,000	3,000	3
4.1.4	Ja›ar wellfield storage reservoir 2	Reservoir Cleaning and disenfiction	Standard cleaning and disenfiction of the reservoir	LS	1	3,000	3,000	3
4.1.5	Bajidar storage reservoir	Reservoir Cleaning and disenfiction	Standard cleaning and disenfiction of the reservoir	LS	1	3,000	3,000	3
4.1.3	Al Kod storage reservoir	Reservoir Cleaning and disenfiction	Standard cleaning and disenfiction of the reservoir	LS	1	3,000	3,000	3
4.1.4	Faculty of Eduction elevated storage tank	Reservoir Cleaning and disenfiction	Standard cleaning and disenfiction of the reservoir	LS	1	3,000	3,000	3
Sub-total Priority 3 - Short term (1-2 years)							15,000	3
Total Package 4:							45,000	

Package 5: Wastewater treatment plant and sewerage pumps

ID	Measure	Requirement	Specifications	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
5.1	Wastewater treatment plants							
5.1.1	Zingibar	New wastewater treatment plant	Oxidation pond type	LS	1	700,000	700,000	1
5.1.2	Ja›ar	New wastewater treatment plant	Oxidation pond type	LS	1	700,000	700,000	1
Sub-total	Priority 1 - Urgent (0-6 months)					1,400,000	1	
5.2	Sewage pumps							
5.2.1	Al Kod lifting station	Sewage ubmersible pumps	Q=45 m3/h, H=10 m	LS	2	20,000	40,000	1
5.2.2	Qaddar Allah neighborhood lifting station, Ja›ar	Sewage ubmersible pump	Q=45 m3/h, H=10 m	LS	1	20,000	20,000	1
Sub-total	Priority 1 - Urgent (0-6 months)						60,000	1
Total Package 5: Urgent (0-6 months)							1,460,000	1

Package 6: Sewer network rehabilitation and extension

ID	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
6.1	Rehabilitation sewer line - Al Shuhada Square, Al Quds Street, Ja›ar Old city incl. manholes and all works.	m	48,000	50	2,400,000	2
6.2	Rehabilitation of the sewage network - the governor›s house in Alsama	L.S	1	5,000	5,000	2
6.3	Rehabilitation sewer line - Al Shuhada Square, Al Quds Street	L.S	1	20,000	20,000	2
Total Package 6 - High priority (6-12 months)					2,425,000	

Package 9: Vehicles, Equipment and Tools

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
9.1	Vehicles						
9.1.1	For wastewater O&M	Compact truck suction and blowing sanitation Combination Sewer Cleaner, Capacity 12000 litres.	nos.	1	160,000	160,000	1
9.1.2	For water supply O&M	Poclain Backhoe Loader medium size	nos.	1	250,000	250,000	1
9.1.3	For water supply O&M	Pick-up (Hilux) cars	nos.	6	25,000	150,000	1
9.1.4	For water supply O&M	Truck-mounted crane 15 ton	nos.	1	150,000	150,000	1
9.1.5	For water supply O&M	Wheel loader (shovel)	nos.	1	200,000	200,000	1
Sub-Total Priority 1 - Urgent (0-6 months)				910,000	1		
9.1.6	For Wastewater O&M	Wheel loader (shovel)	nos.	1	200,000	200,000	3
Sub-total Priority 3 - Short-term (1-3 years)						200,000	3
Total Package 9:						1,110,000	

Package 10: Electric Equipment and Solar System

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
10.1	Solar systems Short term (1-3 years)						
10.2.1	Zinjibar- Al Kod wellfield	Providing solar energy plant 1.5 MW Att	nos.	1	350,000	350,000	3
10.2.1	Al Husn wellfield	Providing solar energy system 500KW:to operate the wells pumps	nos.	1	350,000	350,000	3
10.2.1	Ja›ar wellfield	Providing solar energy system 250 KW to operate the wells pumps	nos.	1	75,000	75,000	3
10.2.1	Bajidar PS-Abuan University	Providing solar energy system 22 KW	nos.	1	350,000	350,000	3
10.2.1	Ja›ar Qadar allah Neighborhood PS	Providing solar energy system 3 KW	nos.	1	75,000	75,000	3
Sub-total Priority 3 - Short term (1-3 years)						82,500	3
Total Package 10:						82,500	

Package 11: Laboratory Equipment

ID	Measure	Requirement	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
11.1	Chlorination Plant equipment						
11.1.1	Chlorination and disinfection for Ja›ar water distribution	V-notch chlorine injection system with horizontal pumps and power supply. Dose 500 grams per hour.	nos.	1	25,000	25,000	1
11.1.2	Chlorination unit at Al-Husn reservoir	Automatic gas switch over valve	nos.	1	2,900	2,900	1
11.1.3	Chlorination unit at Al-Husn reservoir	Chlorinator/injector	nos.	1	850	850	1
11.1.4	Chlorination unit at Al-Husn reservoir	online Multi-functions Analysis system	nos.	1	5,000	5,000	1
Subtotal Priority 1 - Urgent (0-6 months)					33,750		
11.1.5	Chlorination and disinfection for Zinjibar water distribution	V-notch chlorine injection system with horizontal pumps and power supply. Dose 500 grams per hour.	nos.	1	25,000	25,000	3
Subtotal Priority 3 - Short term (1-3 yearss)						25,000	
Total Package 11						58,750	

Investment Plan for Abyan LC

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		
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 Abyan city and Al Sawda				√	√				80,000	
1.7	Sanah					√				50,000	
1.8	Abyan city-Extension of the existing office building		√			√				100,000	
1.9	Sanah-Office Furniture and equipments for Adminstrative building		√			√				30,000	
1.10	Abyan 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 Abyan city periphery well field				√		√			100,000	
2.6	Drilling and equiping wells in Abyan 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	Abyan 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 Abyan 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				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		
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 Abyan 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	Abyan 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	Abyan 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

ID	Measure	Requirement	Specification	Unit	Quantity	Unit cost (USD)	Total (USD)	Priority
1.11	Sanah-Extension building to the administrative building.	New single storey extension building beside the administrative building to meet the LC expansion requirement	Reinforced concrete and concrete blocks.	LS	1	120000	120000	2
1.12	Baja Pump Station-Store for material.	New stone masonary warehouse (Hangar)	Sone masonary	LS	1	15000	15000	2
Sub-total Priority 2 - High Priority (6-12 months)							135,000	2
Total Package 1:							655,000	

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	Abyan city periphery well field	Deepening 2 wells (No.2 & No. 5) to increase yield	No.	2	50,000	100,000	2
2.6	Abyan 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	Abyan 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 Abyan city	Construct Wastewater collection and disposal network for Greater Abyan 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	