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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 5 Technical Assessment Report for Marib

Imprint

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Abbreviations

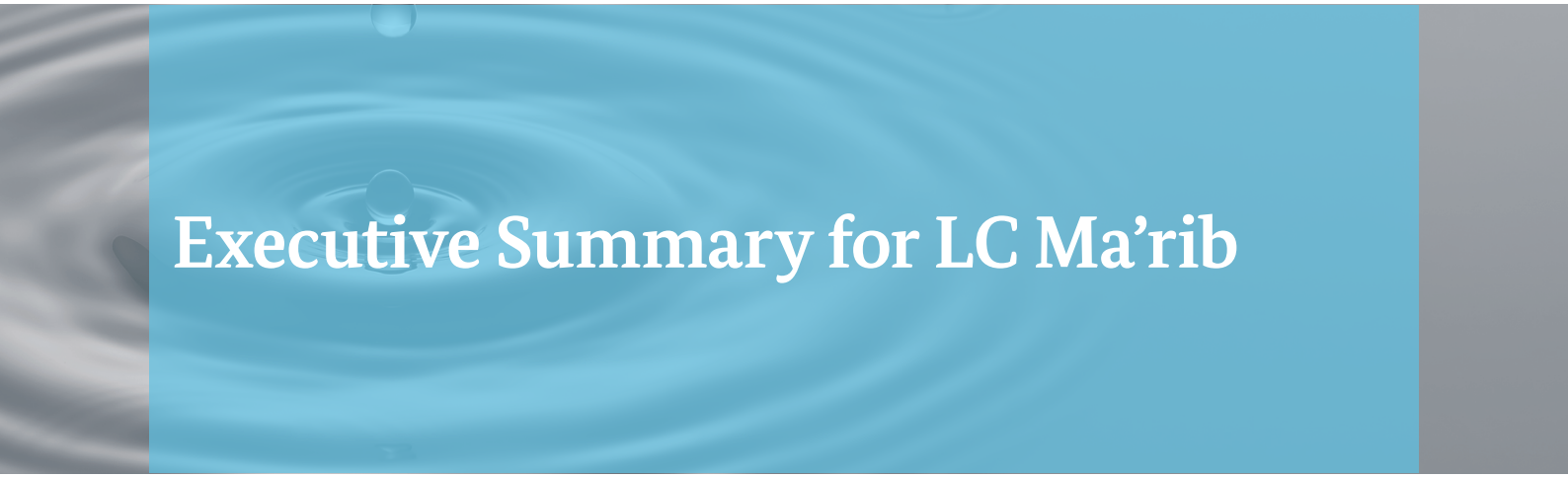
ABR	Anaerobic Baffled Reactor
BMZ	German Ministry of Economic Cooperation and Development
BoD	Board of Directors
BoQ	Bills of Quantities
CAC	Cooperative Agricultural Credit (Bank)
CBO	Community Based Organization
COCA	Central Organization for Control and Auditing
DAS	Damage Assessment Study
DCI	Ductile Cast Iron
DI	Ductile Iron
EM	Electro-mechanical
EUR	Euro
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 LC Ma'rib

In 2022, LC Ma'rib is serving 1,739,092 residents, about 55.2 % respective Ma'rib people through the public network and there are no statistics for whom served by private sector with 1400 house connections and 8 hours per day of water supply. While 22 % are served through the public sewer network and 78 % are served by other providers. The LC obtains the water from the currently 11 operating wells. The LC was visited by the Consultant on 24 -27 /5/2023.

A. Institutional Assessment and Recommended Technical Assistance Measures (TA Plan) for LC Ma'rib

The LC Ma'rib, established in 2006. The utility employs in its 11 departments plus auxiliary unit in total 71 staff members. Customer complaint procedure is installed and used through the Maintenance Management System application.

The identified shortcomings and respective recommendation for urgent and non-urgent measures can be 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-1.

Department	Obstacles	Recommended urgent measures	Recommended non-urgent measures
Governance/ Management/ Organizational structure/ Resilience	The organizational structure needs updating. Internal regulations and policies need updating. Internal and external control and inspection procedures are to be reviewed. Addressing general administrative problems, including employee settlements Challenges in adopting modern technology for administrative procedures. Deficiency in automation systems Board meetings and follow-up mechanisms are considered non-applicable. The branch acknowledges a deficiency in automation systems. Implementing electronic data flow is deemed not essential	Capacity building of management and BoD Implementing an automation system Implementing internal networks	-Regular meeting and coordination between LC and BoD - Qualifying and training the technical staff
Human resource and capacity building management	Shortage of qualified staff Insufficient support for regular training courses for employees Weak internet in Ma'rib Governorate Absence of an institution-specific network The current system is not effective in combating inflation	Improving the recruitment process and increasing salaries Offering regular training courses and promoting experience exchange	Revising the incentive system and providing monthly cash incentives Improving internet services and establishing an internal network for the institution
Finance management	Suspension of government support and investment programs. Need for completing office automation. Need for training and qualifying the financial staff.	Specialized training courses for both internal and external employees Establishing a network connection between financial administrative departments Training employees on various accounting systems, particularly in the accounts department, is included in the plan	Training workshops were conducted for employees to enhance their financial management skills.
Customer service and relation management	Evaluation and improvement of the entire billing process, including meter reading, data entry, review, invoice issuance, and distribution.	Network Connection between Centers and Collection Offices Raise the community awareness of the important of paying the bills of water consumption	Providing training to the workforce Policies and strategies of developing and strengthening the relationship between the LC/AU/Branch and the Consumers
	Urgent need for enhancements in the collection process and effective monitoring of various types of debts.	Implementing automated programs for procedures related to service requests in subscriber accounts. - Conducting training courses for employees in subscriber accounts	-Developing automated programs for taking readings. -Implementing automated field collection programs along with providing associated devices.
	High priority for optimizing the delivery of services to subscribers		
	Urgent attention required for issues related to subscriber meters and their operational status.		
	Medium priority area for improving the flow of work processes and data exchange within the institution		
	Medium priority for enhancing planning and monitoring mechanisms to ensure efficient performance		
	Urgent need for implementing automation and modern technology in management operations and procedures		
	Low priority area focused on assessing and enhancing the qualifications and capabilities of employees involved in management		
Water and Sanitation Service management	No sanitation network system Shortage of equipment, emergency vehicles and assembly parts Operating system for some wells and a GIS program	Find the necessary support to complete the construction of the stalled wastewater treatment plant	Establish GIS unit.

IT infrastructure	Provide the branch with meter reading systems and link them to subscriber accounts. Provide the branch with quantity measurement devices and link them to the central computer. Absence of development plan of the IT Department and the used systems. Provide computers and printers for collection offices and link them to subscriber accounts. Provide the branch with any technological systems that contribute to performance improvement	Inclusive training of staff Capacity building for IT department	IT management procedures and operations
Gender perspective	The need for initiatives aimed at promoting gender diversity and ensuring equal opportunities for women. There is no specific budget allocated for the Women›s Management	Giving priority for female recruitment	

Table 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	32,000	0	0	0
TA2	Training Courses	68,000	25,000	11,000	0
TA3	Office equipment and IT	27,000	3,000	0	0
TA4	Coaching and Consultancy services	35,000	200,000	0	0
TA5	Operation Management Support	29,000	170,000	30,000	0
TA6	Public Relation and Awareness	0	20,000	20,000	7,000
Total TA cost:		191,000	418,000	61,000	7,000

Table 2: Cost estimates on TA interventions

The total required amount for the technical assistance measures has been estimated to around USD 191,000 for critical priority intervention, USD 418,000 for high priority intervention, 61,000 for medium priority intervention and USD 7,000 for low priority interventions.

B. Infrastructure Assessment and Recommended Rehabilitation Measures (Investment Plan) for LC Ma'rib

The buildings and reservoirs are facing some damage through age deterioration and lack of maintenance. The LC faced indirect damage, mostly through the electricity price rise, economic crisis, and displaced people.

Water supply system

The water infrastructure comprises 13 wells, 11 of them operational, 2 ground reservoirs with total capacity of 700 m3, 6 elevated tanks, 3 water sterilization facilities, 1 water laboratory and 100 km of water supply network. According to the LC, of the 1,398 house water connections, almost 100 % have functional water meters installed. Water production increased since 2017 by 29 % to currently 3,013 m3/day on average. The customers are supplied by the 1 distribution zone through the pumping station interconnected with the ground and elevated reservoirs. The water supply is continuous and one of the best in the country considering the provided amount of 150 lpcd. The LC is operating the wells and pumps mostly through the power plant of 7 and in addition by generators. LC owns 5 fuel generators, all of them are used for the water supply system and none for sanitation. The LC asked for solar power for office and well pumps.

There is a lack of equipment and spare parts for the O&M of the water network. The LC is therefore not able to perform the regular maintenance of the facilities and equipment. The result is the failure of generators, wells and pumping equipment. Due to the high content of dissolved salts the pipes are regularly blocked and need to be cleaned.

The required materials comprise submersible and centrifugal pumps for the water supply, new generators, water meters and various small materials for the

\-Details on TA measures with cost estimation are given in Appendix A \

maintenance of the network and facilities. Besides transformers for well operation and laboratory equipment is needed. The LC also requested vehicles for operation and maintenance of the water system.

Sanitation system

There is no wastewater treatment plant except Ma'rib Mini Station which is out of service due to overload, but there is sewer transmission and collection network ended with collection ponds.

Investment needs

The identified shortcomings and respective recommendation for post crisis scenario can be summarized in Table 2 below.

The identified measures have been prioritized according to feasibility and urgency in urgent measures, high priority, medium and low term measures grouped into 9 investment packages as shown in Table 3. The period indicates the proposed commencement of the investments, starting from 2024.

The required estimated budget has been calculated for:

- Urgent measures: 35,766,975USD
- High-priority measures: 613,000 USD
- Short-term measures: 0 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 36,379,975 million USD for the next 5 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	Laboratory is unavailable. Insufficient office workspace. Insufficient material storage space.	- Involves constructing walls for tanks and providing accommodation for guards across multiple locations, including Al-Mintaqa, Al-Jufeina, and Al-Arba›een. - The construction of a one-story laboratory building in the city - The completion of the second floor in Marib›s Al-Rawdha area - Rehabilitation of the branch building - Supply and installation of office furniture		-	-
Water Resource, use and balance	Shortage in water supply - Low yield of the wells	- Implementing new reservoirs, drilling new wells,	-		-
Water pipelines	- Dilapidated water distribution network. - Uncompleted rehabilitation of distribution networks	-Supplying maintenance tools and equipment for the network - Expanding and implementing new water networks for several regions -Supply and installation of new meters, valves and replacement of existing ones	-Supplying information systems for the branch	-	-
Water Pumping/ lifting Stations	Insufficient pumping capacity	- Supply and installation of several submersible pumps -Pumps and motors -Electrical transformers -Electric generators	-		-
Water sterilization facilities	- Lack water testing laboratory. - Lack of measuring kits for residual chlorine.	-Providing reagents for testing - Providing manual inspection devices	-Supplying injection unit & Chlorine injection unit	-	-
Power generating/ auditing for water & wastewater system	-Diesel power generator pumping station out of service and needs rehabilitation. - Raise of Diesel prices.	Implementing Integrated system for energy generation (solar energy system) - Supply and installation of generators, electrical networks, and furniture	-	-	-

Operation and maintenance process of water infrastructures	-Lack of transport vehicles. -Lack of repair and maintenance tools for pipe works, pump and motor works. -Lack of tools and instruments for electrical works. -Lack of trench excavation equipment. -Lack of water meter maintenance workshop. - Lack of pump lifting equipment/ wenches	-Provide a welding machine 2 "- 12 " - Build a maintenance workshop and supply all requirements -Supply a PC bucket loader - Double cab Hilux emergency cars -Administration cars (sedan + two Prado cars)	- Buying Dina Winch - Buying Mobile maintenance car - Buying bus with 34 passenger capacity	-	-
Wastewater collection/ transportation pipelines	-Lack of repair and maintenance tools for pipe works, pump and motor works	Build a maintenance workshop and supply all requirements			-
Wastewater treatment facilities	- Unavailability of Wastewater treatment plant	-Implementing a station for the city	-		-
Operation and maintenance process of wastewater facilities	- Poor logistics for operation & maintenance	-Buying Sewage Suction Unit (12000 liters) - Supply of Japanese GP Excavator - Supply of Japanese Loader		-	-
Water & wastewater Laboratories	- lack of adequate space -Poor logistics for operation and limitations in consumables and chemicals - Need for solar energy systems	Buying chemicals such as SON &Fe&NO3&CU&Ni&F Hach Device Reagents, TDS & EC& PH Measurement, R.O droppers, Safety Tools, Laboratory Car, Laptop, Sterilization Papers and Petri Dishes, Nutrient Media, Microscope, Stain, and Slides	Buying ICP Device, GC Device, Measurement Solutions for Each Element	-	

Table 3: Brief description of recommended rehabilitation measures for water and sanitation infrastructures

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)
1	Civil Works on buildings and structures	520,000	N/A	N/A	N/A	520,000
2	Well rehabilitation and new construction	1,168,000	N/A	N/A	N/A	1,168,000
3	Water pumping station	328,500	N/A	N/A	N/A	328,500
4	Water network rehabilitation and extension	739,225	N/A	N/A	N/A	739,225
5	Wastewater collection, disposal and Treatment	32,250,000	N/A	N/A	N/A	32,250,000
6	Generators and spares, Electric materials and solar systems	200,000	N/A	N/A	N/A	200,000
7	Vehicles, machines, tools	508,000	40,000	N/A	N/A	548,000
8	Laboratory equipment	49,750	513,000	N/A	N/A	562,750
9	Water sterilization facilities	3,500	60,000	N/A	N/A	63,500
Total investment		35,766,975	613,000	N/A	N/A	36,379,975

Table 4: Cost estimation on investment measures

Background

1. Ma'rib Governorate

Marib Governorate is located northeast of the Yemeni capital, Sana›a, and is approximately 173 kilometers (107 miles) away from it. It covers an area of 17,405 square kilometers (6,720 square miles) and is administratively divided into 14 districts. The capital of the governorate is the city of Marib. According to the 2004 census, it had a population of around 238,522 people, and it was estimated to have around 306,000 inhabitants in 2014. During the Yemeni Civil War, hundreds of thousands of citizens fled to Ma'rib, causing its population to increase to three million people.

The climate in the governorate varies according to the diversity of its terrain. The mountainous and elevated areas, which constitute the western half of the governorate, experience a moderate to hot climate in the summer and relatively cold winters. As for the low-lying and plain areas, the prevailing climate is hot in the summer and moderate in the winter. In the desert areas, a semi-arid tropical climate prevails, characterized by hot summers and cold, dry winters.

Summer rains fall on most parts of the governorate, and often the amount of rainfall is low and infrequent, especially in the eastern parts. It is one of the governorates that suffer from drought in most of its areas due to the scarcity of rainfall.

1.2 General information of the LC Ma'rib

The utility/branches under the management of (the LC/NWSA).	Name of the utility/ branch
National Water and Sanitation Authority - Marib	Marib Branch
National Water and Sanitation Authority - Marib	Harib Branch

Table 1.1: List of affiliated utilities and branches to NWSA/LC serving in the same geographical area (governorate)

The population growth through period from 2017 to 2022 in LC Ma 'rib with the displaced people is shown in Table 1.2.

Year	2017	2018	2019	2020	2021	2022
Population	370,000	520,000	680,000	830,000	940,000	1,150,000
Population growth rate (%)	12	13	15	14	16	20
The cumulative number of displaced persons	1,359,274	1,544,630	1,775,437	2,088,749	2,400,862	2,504,368

Table 1.2 : Population Growth in LC Ma'rib

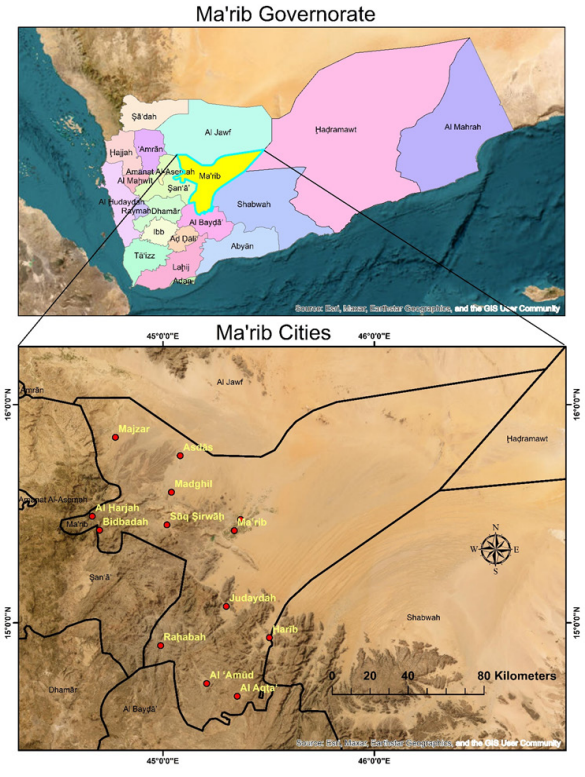


Figure 1.1: Ma'rib Location Map

1.3 Methodology of assessment

The water and sanitation authority NWSA is responsible for the water and sanitation services in LC Ma'rib, and administratively belongs to the general water and sanitation corporation. The main objectives of the situational assessment report for NWSA in Ma'rib are as follows.

- Assessment of the current water and sanitation services; this covers both technical (water and sanitation infrastructure) and institutional (offices, staffing and equipment) aspects.
- Prepare list of actions to improve the water and sanitation services with cost estimate.
- Prepare investment plan for GIZ and other donors.

For this purpose, two questionnaires were prepared based on DAS IV list of required information: Questionnaire A for institutional issues while questionnaire B for technical issues. In addition, the field team prepared a checklist for the problems and challenges faced by the LC.

The questionnaires were prepared with close coordination with GIZ and the NWSA representatives through carried out the workshops in Yemen. The questionnaires were distributed to LC's and NWSA for filling the requested data

and the consultant field team was working with LC and NWSA representatives on filling gaps and getting the LC and NWSA certification for collected data.

Part A covers all institutional subjects: management, governance, human resources, customer management, financial management, and IT management while Part B covers water supply, water and wastewater infrastructure, and management. The questionnaires were distributed in March 2023. Interviews were conducted with the General Manager, Deputy General Manager for technical affairs, the Financial Manager, the Human Resource Manager, the Technical Manager, the Customer Manager and IT Manager. The field team verified and certified the questionnaires from LC and NWSA in August 2023.

In addition, the field team held several telephone conferences with the responsible members of the LC and NWSA respectively to ask for clarification of data. All provided data were analyzed and respective results incorporated in this report. The final version of the filled questionnaires forms was translated into English and are attached in Appendix B.

The sections below summaries the assessment outcomes of the water and sanitation services of LC and NWSA management capacity. The outcomes are summarized into an investment plan which includes actions and measures to improve the services with cost estimate.

2. Assessment of LC Organization and Management

The LC'S in Yemen were established based on Republican Decree no. (02) for the year 2001. The legal procedures and laws are still in operation during the conflict; the LC is following the financial and civil service laws, law for procurement and water law.

2.1 Organizational Structure

There is an approved organizational structure in place, endorsed by the relevant authorities. However, there is no alternative organizational structure currently being implemented without official approval. Importantly, there is no significant disparity between the approved organizational structure and the current operational setup. Additionally, the institution or branch lacks specific executive regulations governing internal procedures. This summary highlights the adherence to approved organizational frameworks while pointing out areas where formalized procedural guidelines are needed.

2.1.1 Board of Directors/Advisory Committee

The branch is under the supervision of the central management in Aden, which is responsible for overseeing and monitoring the branch›s activities and performance. This is done in partnership with the local authorities, the financial office in the governorate, and the central authority for auditing and accounting.

2.1.2 Organization Structure and Governance

The organization assesses compliance with various laws and regulations, and there is a strong commitment to adhering to legal requirements and decisions related to establishment, financial matters, public companies, civil service, job positions, public money collection, insurances and pensions, tenders and auctions, and water regulations. The organization demonstrates a comprehensive adherence to these legal frameworks.

The institution/branch has several active departments and sections in operation during the period of 2017-2022.

- These departments include Administrative, Financial, Water, Sanitation, Commercial (Subscribers› Services), Purchases and Stores, and Internal Audit.
- The Water department is responsible for tasks such as water production and distribution, conduits, operation and maintenance, laboratory work, wells, pumping stations, and distribution.
- The Sanitation department handles tasks related to conduits, operation and maintenance, laboratory work, network management, and stations. Additionally, the institution received the sanitation network in 2020.
- The IT Department is also active, dealing with information technology matters.
- There are departments like Projects, Planning, and Statistics; Legal Affairs; and Women›s Department, but their operational status is not specified (N/A).
- For any other departments or sections, specific job titles and operational status need to be provided.

2.1.3 The most important problems related to governance and organizational structure.

- The institution identifies several pressing governance and organizational issues.
- Board meetings and follow-up mechanisms are considered non-applicable.
- The current organizational structure is viewed as inadequate due to expanding operations.
- There is a recognized need to update internal regulations and policies.
- Implementing electronic data flow is deemed essential.
- Activation of control devices is required.
- The branch acknowledges a deficiency in automation systems.
- Challenges in adopting modern technology for administrative procedures are noted.
- Internal and external control and inspection procedures are under review.
- Addressing general administrative problems, including employee settlements and cash incentives, is emphasized.

Investment measures related to governance and organizational structure implemented.
Supply and installation of office furniture

- Rehabilitation of the branch building
- Supply and installation of generators
- Supply and installation of several submersible pumps
- Supply and installation of new meters and replacement of existing ones
- Implementation of various training courses for employees.

2.1.4 Planned technical assistance related to governance and organizational structure.

- Staff training
- Implementing an automation system

2.1.5 Interaction of authorities with institution/ branch

The institution/branch is actively engaged with both the Ministry of Water and Environment and local authorities in tackling challenges and barriers associated with delivering water and sanitation services amid ongoing crises. This collaborative effort aims to effectively address and alleviate these obstacles, demonstrating a proactive approach to ensuring essential services during challenging times.

2.1.6 Governance criteria

- The establishment/branch demonstrates a strong commitment to compliance with legal and regulatory frameworks, including financial laws and statutes governing public institutions.
- They undergo regular audits and inspections by relevant authorities, ensuring transparency and accountability in their operations.
- The establishment/branch has established mechanisms to engage with stakeholders, addressing their needs and providing timely, accurate information.
- While they have a documented strategic plan, they do not possess a dedicated website for public disclosures.
- The establishment/branch operates with clear policies regarding conflicts of interest.
- They serve as the sole provider of potable water in their jurisdiction, which influences their approach to certain governance aspects.
- Overall, the establishment/branch takes a proactive approach to governance and strives to uphold the highest standards of conduct and accountability in their operations.

2.1.7 Strategic resilience

The institution places a strong emphasis on consistently assessing and anticipating consumer needs, undertaking initiatives such as expanding water sources and networks, and renewing aging projects. It identifies challenges including power outages, fuel price hikes, and reduced purchasing power among consumers. The institution proactively evaluates potential risks associated with current crises, with detailed plans in place. These crises have significantly impacted costs and stability in the water supply, affecting employee income and necessitating increased service demand. The institution›s response includes seeking external funding and collaborating with local authorities. However, due to the suspension of the state›s investment program, it currently requires support for new expansions, staff training, and incentives. Notably, the institution employs effective mechanisms like installment plans to accommodate subscribers facing financial difficulties. Moreover, it actively participates in programs and training sessions for recovery and capacity-building. Looking forward, the institution has comprehensive post-conflict reconstruction plans at the local authority level, spanning across all sectors.

Implemented investment measures related to the resilience strategy.

- Supply of Generators, electrical networks, and furniture
- Implementing new reservoirs, drilling new wells, implementing new water networks, expanding them, and replacing new assets

Planned investment measures related to the resilience strategy.

- Expanding the provision of water resources
- Expanding and implementing new water networks for several regions
- Providing machinery and equipment for the branch
- Supplying information systems for the branch
- Providing a variety of diameter meters for replacement in case of malfunction and installation in new areas
- Supplying maintenance tools and equipment for the network
- Providing a number of sewage suction pumps for draining sewage
- Implementing a sewage network and station.

Proposed technical investment measures related to improving resilience strategy (all are critical except the last two which are of high priority)
Providing solar energy

- Rehabilitation of tanker pumping plans
- Implementing internal networks
- Drilling additional wells to meet the increasing demand.
- Adopting cash incentives for citizens
- Qualifying and training the technical staff
- Connecting the center to a network with collection offices
- Introduction of automation system
- Providing maintenance equipment and sewage hoods
- Providing transportation to the branch

2.2 Assessment of human resource management

2.2.1 Staff Situation and Salary

The LC employs a total staff of 71 in 2022 including 21-day (temporary) workers and 20 contracting staff. The number of employees increased by 50 % since 2017, with 26.72 employees (incl. day workers) per 1,000 water connections. The percentage of female staff amounts 2.4 % in 2019 to 1.4 % in 2022 of total staff.

The table below summarizes the staff according to gender, working conditions and in relation to the number of water connections. Comprehensive details on the assessment of the staffing situation of the LC are given in Table 2.1.

Staff situation	2017	2018	2019	2020	2021	2022
Total no. of permanent staff	27	29	30	30	30	30
Total nos. of contracting staff	8	12	12	12	20	20
Total nos. of day workers (temporary worker)	0	0	0	5	15	21
Total no. of staff	35	41	42	47	65	71
Total nos. of staff male actual working	15	21	22	24	44	49
Total nos. of staff male not actual working	20	20	20	20	20	20
Total nos. of staff female actual working	0	0	1	1	1	1
Total nos. of staff female not actual working	0	0	0	0	0	0
% of female to total	0	0	2.4	2.1	1.5	1.4
Nos. of water connections	1310	3460	3996	4422	5272	6428
Nos. of staff per 1,000 connections	26.72	11.85	10.51	10.63	12.33	11.05

Table 2.1: Staff number and attendance

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

Figure 2.1: Share of staff members (in No.) per department

The number of managers, 5 represents 7.1 % of total staff, which is acceptable for the size of the LC.

From the figures above it can be further concluded that the number of staff per department is appropriate. The staff of the technical departments (water supply, sanitation, planning) represents 53 % of total staff and the finance department – customer service - is representing 4.3 % of the total staff. Thus, the main departments represent 70 % of the total staff which indicates that the LC is aware of the importance of these departments, and this conclusion can be generalized on the period 2017 to 2021.

The total monthly salary for 71 employees is 7.28 million YER.

2.2.2 HR general information, procedures and reporting

The institution/branch provided outlines for various aspects of human resource management. It indicates that while job descriptions are not formally documented, traditional values, as well as gender diversity, are taken into account in the recruitment process. However, due to constraints such as limited funding and the challenging war environment, collaboration with other institutions for HR support or employee exchanges is not in place. Additionally, the absence of an annual training plan is attributed to financial constraints. The absence of printed or electronic copies of certain procedural documents is also noted, with reasons ranging from the nature of recruitment to limited resources. Despite these challenges, the institution/branch has successfully implemented several key procedures and systems over the period from 2017 to 2022.

2.2.3 Staff qualification, training needs, and capacity development

The table below summarizes the LC employees regarding gender and qualification for 2022.

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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11	16
Staff professional level (university degree) female	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	1.5
Staff technical level (high school. VT certificate etc.) male	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	33	46.5
Staff technical level (high school. VT certificate etc.) female	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0
staff male lower qualification	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	26	36
staff female lower qualification	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0	0
Total	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	71	100%

Table 2.2: Staff qualification and gender data

Qualification is considered as important indicator of employee performance. Based on the analysis result, the staff with university and higher degree represents only 17 % of the total employees. The employees with secondary degree and lower qualification represent subsequently 72 % of the workforce.

The application of training is made through candidates specialized in the field of the course in terms of the number required for training and coordination with the branches for that, but currently it has been stopped due to the lack of financial funds to hold courses and training programs, whether at the level or institution, the ministry and other parties, for the course programs unless any funding body adopts the implementation.

2.3 Capacity Building Plan

2.3.1 The most important problems related to improving human resources capabilities:

These challenges are categorized into five main areas:

Employment:

- Shortage of qualified staff.
- Lack of cash salaries for employees.

Incentive Plans:

- The current system is not effective in combating inflation.
- Absence of support for monthly cash incentives for employees.

Experience Exchange or Work Groups with Ministry/ Local Institutions/Other Branches:

- Insufficient support for regular training courses for employees.

Available Resources/Equipment (Computers - Servers - Printers - Stationery):

- Shortage of office tools and equipment.

Internet Connection for Participating in Online Meetings and Training:

- Weak internet in Ma'rib Governorate.
- Absence of an institution-specific network.

Recommended changes include:

- Improving the recruitment process and increasing salaries.
- Revising the incentive system and providing monthly cash incentives.
- Offering regular training courses and promoting experience exchange.
- Providing necessary office equipment and supplies.
- Improving internet services and establishing an internal network for the institution.
- Implemented technical assistance needs and investment measures related to human resources.
- Qualification and Training:

2.3.2 Implemented various training courses in collaboration with donor organizations.

- Equipment and Supplies:
- Supplied various office devices such as computers, printers, and desks.
- Automation:
- The institution requires both internal and external automation systems.
- Training and Qualification:
- Staff members need medium-term training, including diplomas and internal/external courses.
- Cash Incentives:
- The institution needs to implement cash incentives for employees due to inflation and low salaries.

- Transportation:
- Transportation for employees to and from the institution is needed.
- Employee Housing: There is a need to provide housing for employees, particularly because many of them are displaced individuals.

2.3.3 Planned technical assistance needs and investment measures related to human resources.

- Recruitment: Hiring 15 Water Network Technicians, 2 Accountants, 2 Administrators, 2 IT Specialists, 4 Collectors, 2 Meter Readers, and 2 Engineers.
- Incentive Plans: Implementing a monthly cash incentive system for technical and administrative teams to encourage performance improvement and prevent staff turnover.
- Experience Exchange: Conducting visits between branches to exchange experiences and organizing joint training courses between branches and the institution.
- Available Resources/Equipment: Addressing the shortage of office tools and equipment such as computers, printers, and servers.
- Internet Connectivity: Providing a strong internet network and necessary devices and equipment for seamless participation in online meetings and training sessions.

2.3.4 Proposed technical assistance needs and investment measures related to improving human resources capabilities:

Priority	Targeted Categories / Details
critical	Technical - Administrative - Financial Training Courses
High priority	Providing Equipment and Devices
critical	Implementing a Cash Incentive System
Medium priority	Providing Transportation
High priority	Enhancing Automation

Table 2.3: Proposed technical assistance.

2.3.5 Capacity building and training

Training Program Name	Month/Year	Held at (Institute/ Organization)	Number of Participants from the Institution/Branch	Training Duration (Days)	Funding Entity
Maintenance and Operation	Oct-22	Institution	18 (Male) 0 (Female)	2 days	Water Foundation
Maintenance and Operation	Nov-22	Institution	14 (Male) 4 (Female)	2 days	Family Care
UNICEF Financial Procedures	Aug-18	Health Office	2 (Male) 2 (Female)	2 days	UNICEF
Participatory Planning	Jun-22	Marib + Sayun	1 (Male) 0 (Female)	6 months	UNDB
Operation Plan	Jun-22	Peace Hotel	4 (Male) 0 (Female)	1 month	Social Fund
Maintenance and Operation	Feb-22	-	5 (Male) 1 (Female)	1 week	CARE Organization
Experience Transfer from Rwanda	Aug-22	Rwanda	1 (Male) 0 (Female)	1 month	UNDB

Table 2.4: Implemented training program.

2.3.6 Education and Required Training Courses

Training Area	Targeted Positions	Expected Number of Participants		Period (Month)
		Male	Female	
Short-term Training Courses				1
Operational Plan	Technical	2	2	1
Solar Energy	Technical	6	-	1
Monitoring and Evaluation	Administrative	3	3	1
Electronic Archiving	Secretarial	2	2	1
Websites	Secretarial	1	1	1
Long-term Training Courses				
Experience Exchange	Financial	6	3	2
Financial Analysis	Financial	2	-	6
Internal Audit	Financial	2	-	6
Accounting Systems	Financial	2	-	6
Financial Management with ERP System	Financial	2	-	6
Vocational Training/ Diploma (1)				
Water Supplies	Technical	4	0	
Human Resource Training	Administrative	2	2	
Project Management	Technical	3	3	
International Computer Driving License	Financial, Administrative, Technical	8	2	
On-the-Job Training (1)				
Communication and Networking	Secretarial	2	2	

Planning	General Manager, Financial Manager, Administrative Manager	2	2	

Table 2.5: Required training courses

3. Financial Capacity

3.1 Financial management

3.1.1 General data on financial management

The institute/branch applied key financial management practices. Here are the main points:

- The financial management of the institution/branch prepares audited annual financial reports, including profit and loss statements.
- There are periodic financial reports (monthly, quarterly, semi-annually) prepared by the institution/branch.
- However, there are no supervisory reports on financial and accounting activities due to the cessation of the Central Control and Accounting Authority›s work since 2015.
- There is no detailed register for fixed assets preserved and updated to show the current status and actual values of the assets owned by the institution/branch.
- The institution/branch uses financial and accounting computer programs.
- These programs are currently in use, and data is updated systematically.

Implemented technical assistance needs related to financial management.

The institution/branch has implemented measures to improve financial management from 2017 to the present, through:

- They recruited new staff to enhance financial management.
- Equipment and tools were provided for financial administration.
- Training workshops were conducted for employees to enhance their financial management skills.

Proposed and planned urgent technical assistance needs and investment measures related to financial management.

- Specialized training courses for both internal and external employees.
- There is a plan to add specialized staff members, particularly accountants, to enhance financial management.
- Providing necessary equipment and tools for the financial department is part of the plan.
- Procurement of computers, laptops, and printers is also in consideration.
- Establishing a network connection between financial administrative departments is on the agenda.
- Implementing cash incentives for employees in the financial management department is part of the planned measures.
- High priority for training employees on various accounting systems, particularly in the accounts department, is included in the plan.

Here are the key points regarding budget management and expenditures for institution or branch:

- The institution/branch prepares annual financial statements.
- The budget includes expected capital or investment costs.
- Current revenues do not cover both current and future costs for service provision, attributed to the central auditing authority›s halt in operations since 2015.
- The tariff has been adjusted once in the institution/branch in the past ten years.
- The institution/branch does not have sufficient liquidity to cover monthly expenses.
- There are no financial reserves or emergency funds to cover the most expensive component of operation and maintenance.
- The institution/branch does not have sufficient saved funds to cover expected costs for the next two years for short-lived assets.
- In the case of desiring to develop and expand water and sanitation systems in the long term, the primary relied-upon sources are government grants and donor organizations.
- There is a plan specifying projects and providing funding for long-term capital improvement.

3.2 Budget (Revenues, expenses, Aid and Liabilities)

3.2.1 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 years (2017 – 2022).

Revenues / Expenses	2017	2018	2019	2020	2021	2022
Total revenue in YER	1,778,764	-52,612,083	-1,045,229	-446,991	26,338,284	28,719,731
Total cost in YER	35,383,953	94,672,863	58,326,353	71,241,425	93,075,926	110,592,136
Salaries, allowances, incentives and others in YER	26,581,896	31,479,543	45,995,225	56,996,967	56,996,967	87,314,636
% Salaries, etc. of total revenue	1,494	-60	-4,400	-12,751	216	304
% Salaries, etc. of total cost	75	33	79	80	61	79
Fuel, oil in YER	3,671,072	6,172,315	3,222,285	801,000	2,617,600	2,805,200
% Fuel, oil, of total revenue	206	-12	-308	-179	10	10
% Fuel, oil, of total cost	10.37	6.52	5.52	1.12	2.81	2.54
Electricity in YER				1,479,996		361,000
% Electricity total revenue	xxx	xxx	xxx	-331.10	xxx	1.26
% Electricity of total cost	XXX	XXX	XXX	2.08	XXX	0.33
Maintenance, spare parts, other O&M expenses in YER	2,927,283	56,078,005	6,025,373	8,431,779	29,680,813	14,577,300
% Maintenance, other O&M of total revenue	165	-107	-576	-1,886	113	51
% Maintenance, other O&M of total cost	8.27	59.23	10.33	11.84	31.89	13.18
Other expenses in YER	2,203,702	943,000	3,083,470	5,011,679	3,780,546	5,895,000
% Other expenses of total revenue	1.24	-0.02	-2.95	-11.21	0.14	0.21
% Other expenses of total cost	6.23	1.00	5.29	7.03	4.06	5.33

Table 3.1: Revenues, recurrent costs

Revenues

- Data regarding revenues clarify that LC began making profits in 2021 and 2022.

Revenues versus Expenses

- The total expenses are very high compared to revenues in 2017 to 2020. They reached a percentage of 384 % in 2022.
- The salary and maintenance represent the highest percentage of the total expenses. It represented about 90 % of the total expenses. The salary is considered as fixed costs which are not affected by increase or decrease in water production.
- The branch was closed due to the war in 2017.

Regarding the electricity, the institution was exempted until 2022, in exchange for providing water to the displaced camps for free. However, in 2023, the invoice amount was charged to the branch. During the first half of the year, it amounted to 20,000,000 (twenty million) Yemeni Riyals.

3.2.2 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	6,441,550	10.14
Other dues for employee	5,260,400	8.28
Indebtedness of electricity	1,378,593	2.17
Fuel and oil	2,150,300	3.38
Insurance	9,944,735	15.65
Taxes	11,571,591	18.21
Local councils	1,464,714	2.31
Other financial obligation	25,320,000	39.85
Total	63,531,883	100 %

Table 3.2: Financial liabilities in 2022

3.3 Financial Data

3.3.1 Financial Efficiency and Support

Compared to 2017, the revenue in 2022 increased by 26.94 million which presents 1515 % of revenue in 2017. 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	1,778,764	-52,612,083	-1,045,229	-446,991	26,338,284	28,719,731
Support (USD)	-	-	(900,000)	-	-	(1,369,000)

Table 3.3: Financial Overview for the years (2017-2022)

Bank Account Data and Cash Flow

The table below presents an overview of the accounts for Ma'rib:

Account Type		Connections Account	Income Account	Expenditure Account	Depreciation Account
2017	first period balance (YER)	1,119,952	240,402	34,674,743	N/A
	Total Deposits (YER)	39,000	8,410,291	42,380,788	N/A
	Total withdrawals and transfers (YER)	500,000	8,505,000	76,941,494	N/A
	end period balance (YER)	658,952	145,693	114,036	N/A
2018	Total Deposits (YER)	374,000	8,991,258	33,345,672	N/A
	Total withdrawals and transfers (YER)	700,000	8,474,000	33,400,915	N/A
	end period balance (YER)	332,952	662,951	58,793	N/A
2019	Total Deposits (YER)	1,038,000	17,272,352	44,702,794	N/A
	Total withdrawals and transfers (YER)	0.00	17,210,000	4,378,610	N/A
	end period balance (YER)	1,370,952	725,303	992,977	N/A
2020	Total Deposits (YER)	2,503,000	28,760,179	59,674,385	N/A
	Total withdrawals and transfers (YER)	3,500,000	29,481,000	60,537,573	N/A
	end period balance (YER)	373,952	4,482	129,788	N/A
2021	Total Deposits (YER)	1,300,000	4,953,343	76,343,513	N/A
	Total withdrawals and transfers (YER)	0	49,354,000	79,390,126	N/A
	end period balance (YER)	1,673,952	183,525	83,174	N/A
2022	Total Deposits (YER)	3,055,000	62,021,885	88,798,160	N/A
	Total withdrawals and transfers (YER)	0	62,085,000	888,839,609	N/A
	end period balance (YER)	4,728,952	120,410	41,725	N/A

Table 3.4: Bank account details

Once post-conflict condition applies, the actual situation (particularly 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.

Financial sources, subsidies and support

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

Funding organization	Kind of support (USD)	Year
Local authority or other sources	98,573	2017
Total 2017	98,573	
Local authority or other sources	106,564	2018
Total 2018	106,564	
PFD	reservoir & network construction 800,000	2019
Kuwaiti-Yemeni Authority	Tower reservoir construction 100,000	2019
Local authority or other sources	106,564	2019
Total 2019	206,564	
Local authority or other sources	106,564	2020
Total 2020	106,564	

Local authority or other sources	106,564	2021
Total 2021	106,564	
UNDP	Supplying laboratory equipment Rehabilitation of the institution's building 386,000	2022
UNICEF	Water network 700,000	2022
Family care	Tower reservoir construction 100,000	2022
Relief and Construction Coalition	Drilling well & reservoir construction 100,000	2022
Muslim hands	Water network 83,000	2022
Local authority or other sources	106,564	2022
Total 2022	1,475,564	

Table 3.5: Financial subsidies from donor relief organizations

4. Customer Services

4.1 Customers Data and Reporting

Customer and Connection Data

The table below summarizes the number of connections per customer category for the water and sewer system. The total number of water connections in 2022 is 1,428 connections, with an increase of 318 (22 %) connections over the year 2017, most of which are in the domestic sector (1,398) connections.

The total number of sewerage connections in 2022 is 161 with zero connections in 2017.

Connections	Domestic connections	Government connections	Commercial connections	Total
No. of Water connections	1293	58	74	1428
No. of Public points connection for Displaced people	xxx	xxx	xxx	5000
No. of installed water meters	1293	58	74	1428
% installed water meter to total connection	100	100	100	100
No. of functional water meters	1293	58	74	1428
% of functional water meter to total	100	100	100	100
No of zero Reading	0	0	0	0
No of Sewer connections	150	15	40	161

Table 4.1: Water and Sewer connections per customer category in 2022

The total number of installed water meters amounts to 1428 meters with 100 % functioning water meters.

4.2 Invoicing, Collection, and Complaint Procedures:

Customer Database Maintenance:

- The customer database is maintained and updated.
- The General Computer Manager is responsible for updating the data and system.

External Collection Centers:

- There are external collection centers in addition to the main center in the general administration.
- There are four such centers, and exchange offices are also utilized.

Field Meter Readers:

- There are three field meter readers.

Field Revenue Collectors:

- There are five field revenue collectors.

Use of Digital Collection Device:

- Digital auxiliary collection devices are not used in the revenue collection process.

Incentive System for Field Staff:

- The institution or branch does not have an incentive system for field service and customer relations employees.

Documented Service Delivery Guidelines:

- The institution/facility/branch has documented guidelines for service delivery procedures.
- A copy of the guide is available.

Procedure Effectiveness in 2022:

- The procedures were in effect in 2022.

Availability of Billing Procedures:

- The institution/branch has electronic and printed copies of billing and collection procedures.
- Copies of the procedures are available.

Handling Complaints and Grievances:

- The institution/branch has specific procedures for handling customer complaints and grievances.
- Copies of the procedures are available.

4.2.1 Billing and Collection Procedures

Meter Reading Cycle:

- Meter readings are taken monthly when invoices are issued.
- A meter reading statement is generated for distribution.

Billing Issuance and Distribution:

- Invoices are issued monthly and distributed by readers within three days.

Payment Methods:
- Payment options include collection offices and exchange companies.
- Other means may include mail, banks, and similar services.

Dispute Resolution:
- Invoices are reviewed, and significant amounts may be arranged for installment payments.

Addressing Subscriber Issues:
- Complaints about invoices are received and forwarded to customer relations for review.

Resolving Service Issues:
- Complaints about low service levels or non-receipt of services are forwarded to the technical department for investigation and resolution.

Violation Inspection:
- Violations related to consumption, such as meter tampering or misuse, are addressed.
- This may involve disconnection and reporting to security authorities, with fines for non-compliance.

Meter Maintenance:
- Replacement, repair, and calibration of meters are managed.
- Zero-value meters are disconnected from subscriber accounts, and the technical department handles retrieval and maintenance.

4.2.2 The key steps and responsibilities involved in service interruption or disconnection procedures:

Customer Notification:
- Customers are notified about service availability or interruptions through the institution›s website and Facebook page.

Outstanding Balance Notification:
- Customers receive notifications about their outstanding balances through invoices and text messages.

Service Interruption Due to Non-Payment:

Service may be interrupted if customers have overdue payments or unpaid bills. They receive an official notice.
- Responsibility for Service Disconnection:

The technical department is responsible for executing service disconnections.

Legal and Appeals Procedures:
- Customers are informed of the necessity to settle their dues within a specified period after service disconnection.
- If not settled, the matter is escalated to security authorities for regulation.

4.2.3 The pressing problems and development needs related to subscriber management procedures.

Billing Process:
- Evaluation and improvement of the entire billing process, including meter reading, data entry, review, invoice issuance, and distribution.

Collection Process and Debt Monitoring:
- Urgent need for enhancements in the collection process and effective monitoring of various types of debts.

Subscriber Meters:
- Urgent attention required for issues related to subscriber meters and their operational status.

Service Provision to Subscribers:
- High priority for optimizing the delivery of services to subscribers.

Workflow and Data Exchange:
- Medium priority area for improving the flow of work processes and data exchange within the institution.

Planning and Performance Monitoring:
- Medium priority for enhancing planning and monitoring mechanisms to ensure efficient performance.

Automation and Technology Integration:
- Urgent need for implementing automation and modern technology in management operations and procedures.

Employee Qualifications and Capabilities:
- Low priority area focused on assessing and enhancing the qualifications and capabilities of employees involved in management.

General Administrative Issues:
- Urgent attention required for any other significant general administrative problems identified by the institution or branch.

4.2.4 The planned and proposed technical assistance and investment measures needs for improving the management of customer services:

Priority: Critical

- Training of Staff
- Providing training for the workforce is considered critically important.

Priority: Critical

- Provision of Modern Devices, Printers, and Servers
- Supplying modern devices, printers, and servers is seen as a high-priority need.

Priority: Critical

- Network Connection between Centers and Collection Offices
- Establishing network connections between centers and collection offices is identified as a medium-priority requirement.

4.2.5 Billing & Collection data

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

The domestic sector is the largest sector in water sales, with 91 % of the total connections, while it represents 68 % of the total amount billed in 2022.

The government sector represents 4 % of total customers, only 58 connections, however it represents 17 % of the total amount billed in 2022. The commercial sector represents 5 % of consumers while it represents 15 % of the billed amount.

This indicates that the LC should relies on the governmental sector and domestic sector in increasing the collection efficiency, whereas in 2022 the collection efficiency of government was 39 % and the total efficiency presented of 52 %, the biggest rate of collection efficiency is 60 % in 2019. This figure decreased in 2022 to 52 %.

The LC billed amount approximately 76,572,846 YER in 2022 From the issued bills, only 39,852,674 bills were paid.

The details for the billing and collection for the last six years and depending on the customer type can be seen in the table below.

Customer category	2017			2018			2019			2020			2021			2022		
	Number of bills	Water and wastewater	coll. Eff.	Number of bills	Water and wastewater	coll. Eff.	Number of bills	Water and wastewater	coll. Eff.	Number of bills	Water and wastewater	coll. Eff.	Number of bills	Water and wastewater	coll. Eff.	Number of bills	Water and wastewater	coll. Eff.
	No	YER	%	No	YER	%	No	YER	%	No	YER	%	No	YER	%	No	YER	%
Domestic billing	1123	9,484,590	61	1150	16,892,520	45	1245	20,231,350	71	1407	23,433,400	53	1534	30,182,550	62	1712	45,924,146	54
Domestic collection		5,753,055			7,595,230			14,311,250			12,518,650			18,616,546			24,773,104	
Governmental billing	27	1,529,000	1	37	3,119,550	74	40	5,861,750	29	43	61,396,900	4	43	9,825,700	12	45	18,901,600	39
Governmental coll.	xxx	19,338		xxx	2,300,490		xxx	1,671,596		xxx	2,573,895		xxx	1,147,320		xxx	7,421,064	
Commercial billing	50	503,440	107	63	1,066,770	44	65	3,317,750	55	70	5,436,650	73	73	9,122,350	75	73	11,706,850	65
Commercial collection		539,738			474,125			1,816,289			3,946,949			6,858,804			7,658,506	
Total billing	1200	11,533,620	56	1250	21,086,340	49	1340	29,430,100	60	1520	90,286,950	21	1650	49,151,600	54	1830	76,572,846	52
Total collection		6,486,132			10,369,845			17,799,136			19,039,494			26,622,671			39,852,674	

Table 4.2: Billing and collection amount per customer category

The accumulated debts of the three main categories are as follows:

- Domestic: 319,507,088 YER, corresponds to 72 months
- Governmental: 141,113,969 YER, corresponds to 72 months
- Commercial: 29,554,952 YER corresponds to 72 months

4.3 Tariff structure according to customer type and consumption

This tariff took into account the poor customers or rationalization of consumption in the tariff of the domestic sector and mosques.

As shown in the table below the tariff is structured in different subcategories for each category of customer and presents the monthly fee per m3 of water consumed.

Customer category	Amount of Consumption in m3/month	Water Tariff (YER/ m3)	Sewerage Tariff (YER/ m3)	Total Tariff YER
Domestic	(0 -5)	150	-	150
	(6 - 10)	200	-	200
	(11 - ...)	250	-	250
Government	(0 - 5)	300	-	300
	(6 - 10)	350	-	350
	(11 - ...)	400		400
Commercial & Other	(0 - 5)	200	-	200
	(6 - 10)	250	-	250
	(11 - ...)	300		300

Table 4.3: Approved tariff structure

Obviously, the current tariff is insufficient to cover the total operation cost as stated hereinafter.

Production cost and tariff efficiency

The table below presents the analysis of the average production cost of water versus the average tariff charged for customers:

Description	2017	2018	2019	2020	2021	2022
Average cost of water produced YER/ m^3	338.10	499.98	260.01	270.44	242.05	243.78
Average cost of water sold YER/ m^3	834.98	997.36	545.43	541.55	503.45	415.94
Tariff recovery of water billed (%)	40.3	50.1	47.67	49.9	48.1	58.6

Table 4.4: Water production cost versus tariff

The current tariff does not cover operation and maintenance costs. The losses decreased to 42 % per cubic meter of water billed in 2022. The figures for losses must be correct since the operation and maintenance cost decreased and subsequently the water production cost.

The LC should aim to increase its revenues and therefore improve their financial capacity through:

- Gradual increase of tariff structure.
- Increase number of connections.
- Minimize the Non-revenue water.
- Increase the collection efficiency from all customers and collected bills of domestic customers.

5. Assessment of IT infrastructure and management

5.1 IT and Office Resources

The Information Technology network status is as follows:

- There is no internal LAN network available in the main building, nor external network connection with the other sites.

Status of communications networks is as follows:

- Available communication networks in the area include Yemen Mobile.
- Yemen Mobile is identified as the network providing higher quality services and better coverage.
- Mobile phone companies in the area offering 4G internet services include Yemen Net, Yu, Sabafone, Yemen Mobile, and others, with Yemen Mobile being selected.
- Wired/Wireless internet service is not available.
- The quality of communications allows for participation in online meetings and training courses.
- The available power supply system is a private generator, considered a reliable source.
- The systems have access to electricity for 15 hours per day.
- The power supply does have an impact on the communication network.
- Not all employees/departments/services have unrestricted internet access.

Information Technology Applications and Software

System Details and Specifications	Invoicing	Accounts	Payroll	Warehouses	Fixed Assets
Name and Version					
System Type	Windows	Windows	Windows	Windows	Windows
Developers Name	Khaled Al-Ashwal	Khaled Al-Ashwal	Khaled Al-Ashwal	Khaled Al-Ashwal	
Source Code, Documents, User Guide availability	Yes	Yes	Yes	Yes	
system License Cost (USD per year)	0	0	0	0	

Regular License Costs Paid? (If yes, specify who pays)	N/A	N/A	N/A	N/A	
Last System Update (Month/ Year)	Oct-22	Oct-22	Oct-22	Oct-22	
Technical Support and Maintenance Availability	Contact in case of problem	Contact in case of problem	Contact in case of problem	Contact in case of problem	Contact in case of problem
Average Time to Resolve Maintenance Issues	More than 5 days	More than 5 days	More than 5 days	More than 5 days	More than 5 days
Number of Laptops Running the System	2	2	2	2	2
Number of Desktops Running the System	2	2	2	2	2
System Start Year (e.g., 2005 or 2010)	2006	2006	2006	2006	
System Database Type (e.g., Access, Oracle, SQL, etc.)	Oracle	Oracle	Oracle	Oracle	
Database Size (e.g., 500 MB or 40 GB)	4	4	4	4	
Hosting Device Model for the Database	2018	2018	2018	2018	
Hosting Device Operating System for the Database	Windows	Windows	Windows	Windows	
Hosting Device Location for the Database	Computer	Computer	Computer	Computer	
Database Backup Frequency (e.g., Every day, Every week, Every month)	Every month	Every month	Every month	Every month	
Hosting Device Status (Good, Working with Issues, Stopped)	Good	Good	Good	Good	
Last Exported Cycle from the System (Month/Year)	Aug-23	Sep-23	Sep-23	Sep-23	
Number of System Shutdowns in the Last 12 Months	Once	Once	Once	Once	
Main Functions of the System (List)	None	None	None	None	None
Departments and Units Associated with System Functions (List)	None	None	None	None	None
Does the System Significantly Improve Work Efficiency?	Yes	Yes	Yes	Yes	Yes
Is the Current System Subject to Updates and Modifications?	Yes	Yes	Yes	Yes	Yes
System Status (Good, Working with Issues, Stopped)	Good	Good	Good	Good	Good
System Deficiencies (List)	Delay	Delay	Delay	Delay	Delay
Descriptive Explanation of System Deficiencies	None	None	None	None	None

Table 5.1: Information Technology Applications and Software

5.2 Data security and management

The institution›s IT infrastructure is equipped with an antivirus program, ensuring the security of the network. This program is utilized by all computer users, and its usage is closely monitored to guarantee comprehensive protection.

Surge protectors or voltage regulators are not employed in the system. Backup operations are managed by two authorized personnel, with backups stored in three different locations, primarily in the computer and general administration departments.

The backup process is conducted manually, allowing for careful control and management. The most recent data restoration from a backup was executed on May 5, 2023, demonstrating a consistent commitment to data integrity.

The institution has a designated individual responsible for user management, ensuring that user accounts are effectively administered. Additionally, a specific person is tasked with overseeing user permission management, further enhancing security measures.

In the event of emergencies or disasters, the institution has established plans for IT system restart, exemplifying a proactive approach to handling unforeseen circumstances. These plans are available for review, highlighting the institution›s dedication to ensuring the continuity of IT services even in challenging situations.

5.3 Needs for IT and related office equipment

Item	Request Reasons	Description/ Specifications	Quantity	Priority
Desks	Shortage	-	10	Medium Priority
Chairs	Shortage	-	30	Medium Priority
Split Air Conditioners	Shortage	-	10	Medium Priority
Desktop Computers	Shortage	-	10	High Priority
Laptop Computers	Shortage	-	6	Medium Priority
Servers	Shortage	-	2	Critical Priority
Invoice Printers	Shortage	-	1	Critical Priority
Electrical Organizers	Shortage	-	10	Medium Priority
Backup Batteries	Shortage	-	15	High Priority
Electrical Chargers	Shortage	-	10	Medium Priority
Routers for linking between Branch and Main Center	Shortage	-	6	Medium Priority
Local Network Switches in the Branch	Shortage	-	5	Medium Priority
Internal Wireless Modems	Shortage	-	3	Medium Priority
Network Firewall	Not Available	-	-	-
Software Updates	Not Available	-	-	-
New Software or Replacement	Not Available	-	-	-
Other Requirements for IT Infrastructure, Hardware, Software, etc.	Not Available	-	-	-

Table 5.2: Information technology and office needs for devices and equipment

Proposed TA and investment measures for improving IT management.

Proposed Technical Assistance Measures for Improving IT Management Procedures and Operations	Priority Level
Provide the branch with meter reading systems and link them to subscriber accounts	Critical Priority
Provide the branch with quantity measurement devices and link them to the central computer	Critical Priority
Provide the branch with servers	Critical Priority
Provide computers and printers for collection offices and link them to subscriber accounts	Critical Priority
Provide the branch with any technological systems that contribute to performance improvement	Critical Priority

Table 5.3: Proposed TA and investment measures

6. Gender Cross Cutting Issues

Administrative and organizational status of gender

- The administrative and organizational status of the Women›s Management within the water institution is as follows:
- The organizational structure of the water institution does not currently include Women's Management.
- The branch is small in scale, with its responsibilities primarily focused on financial and technical aspects.
- There is no existing job description available for positions within the Women›s Management, as the branch is in the process of transitioning into a local institution.
- The Women›s Management is not currently active and is not engaged in any specific activities.

There is no participation of the Women›s Management in strategic planning and policy updates at this time.

6.2 Presence of Women in Decision-Making Positions in the Institution/Branch

In terms of gender representation in decision-making positions within the institution or branch, the current scenario reflects a noticeable gender imbalance. There is a limited presence of women in key leadership roles. Specifically, there is one woman serving as the head of the

IT department and another woman holding the position of secretary. However, in broader leadership positions such as General Manager, Department Manager, and Chief Accountant, women are currently underrepresented. This highlights the need for initiatives aimed at promoting gender diversity and ensuring equal opportunities for women to assume leadership roles within the organization.

6.3 Special Services and Facilities for Women within the Institution/Branch

- The institution/branch has dedicated restrooms for female employees and individuals with special needs.
- However, there is no prayer room for female employees, and there is no daycare facility for the children of female employees during working hours.
- Additionally, there is no dedicated complaints office for female beneficiaries within the institution/branch.

7. Assessment of Water and Sanitation

7.1 Water Supply and Infrastructure System

General Situation

There are many indirect negative impacts caused by the crisis: power cuts, financial constraints (decrease in 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) since 2015.

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

Water Supply and Infrastructure System

- Water Production and Distribution
- Infrastructure
- Water Quality
- Non-Revenue Water

Sanitation System

- Wastewater Collection
- Wastewater Treatment

Operation and Maintenance

Energy Supply

Based on the provided data from the LCs, the site visit, direct discussions with the LC managers and through the feedback from the managers all the available information had been assessed and respective results are presented in the below Chapters 7.1 to 7.4. The subsequent requirements and investment needs for rehabilitation and restoration of services have been identified by the LC and were verified and completed by the Consultant. The comments from the LC on the draft investment plan were taken into consideration for the preparation of the final version as summarized in Chapter 8.

7.1.1 Water production, distribution, supply system

As of 2022, 11 of the 13 existing water wells are operational. Production data overall was consistent in the way it was provided in part B of the questionnaire forms. It does not reflect any effect caused by the crisis. On the contrary, the water produced quantity increased in 2022 by 80 % compared to 2017.

Additionally, the nominal water production capacity ranged from 2880 m3/d in 2017 to 5200 m3/d in 2022 throughout the years. The average nominal water production capacity provided by the LC is 2365 m3/d in the six evaluated years.

The chart below demonstrates the increase in the actual/ current water production over the years.

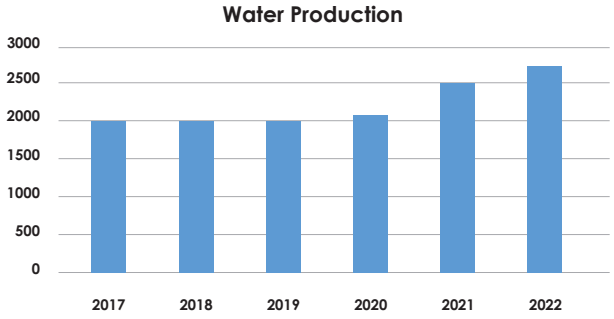


Figure 7.1: Average water production in m3/day for the years (2017 - 2022)

There is one water laboratory available for the testing and control of water. However, the laboratory lacks necessary equipment, chemicals, and reagents, required for conducting proper testing and ensuring that the water is safe for its intended use.

The pumping station of Ma'rib consists of two high pressure pumps with total pump quantity of 200 m^3/hour used public electricity.

The LC keeps regular records on water production, consumption and losses. Several water meters are installed at the wells and reservoirs. Furthermore, 9 bulk water meters are installed in the network.

7.1.2 Infrastructure

Buildings, administrative and technical facilities

Purpose/ Description of Building	Location/ Address	Ownership	Construction Material	Area (m2)	Number of Floors	Number of Offices	Operational Status	Current Condition
Main Building	Al Rawdah	Owned	Stone	1550	2	9	Regularly used	Good condition
Warehouse	Al Rawdah	Owned	Hangar	500	1	1	Regularly used	Good condition
Pump Rooms	Various Sites	Owned	Concrete	480	1	Many	Regularly used	Good condition

Table 7.1: Information on administrative buildings

Investment requirements for buildings, administrative and technical facilities

The first entry pertains to the completion of the second floor in Marib›s Al-Rawdha area, estimating a total cost of $200,000 with high priority. The second entry involves constructing walls for tanks and providing accommodation for guards across multiple locations, including Al-Mintaqa, Al-Jufeina, and Al-Arba›een. This project, with a total estimated cost of $60,000, also holds high priority. Lastly, entails the construction of a one-story laboratory building in the city, equipped with biological, physical, and chemical laboratories, as well as an administrative section. This project is estimated to cost $130,000 and is designated as a high priority. These investments are crucial for enhancing the infrastructure and operational capabilities of the respective facilities.

Water supply infrastructure and management

The following table is an overview of the available water infrastructure and facilities as of 2017 compared to 2022.

Description / Facility	Unit	2017	2022
Public water distribution points	No	0	0
Main source of water supply (SW or GW)		GW	GW
Number of distinct supply zones	No	5	8
Total number of boreholes	No	8	13
Boreholes in operation (=borehole pump no)	No	8	11
Ground Reservoirs	No. /m3	1/500	2/700
Elevated Tanks	No. /m3	1/250	5/965
Nominal water production capacity	m3/d	2,880	5,200
Water sterilization facilities	No.	0	3
Current water production capacity	m3/d	2,128	3,013
Total no. of domestic water meters installed	No	1100	1400
Total no. of functioning domestic water meters	m	43	52
Length of the water supply network	km	70	100
Total nos. of bulk water meter	No	3	9
Water Laboratory	No	xxx	1

Table 7.2: Overview of available water infrastructure

Ground and elevated water reservoirs

The 7 reservoirs consist of 2 ground reservoirs with total capacity of 700 m^3 and 5 elevated reservoirs with total capacity of 965 m^3. These reservoirs play a crucial role in water collection and storage across different locations. They are primarily constructed with concrete materials, ensuring their durability and longevity. The majority of these facilities are reported to be in good condition and are utilized regularly for their intended purpose. Construction years span from as early as 2002 to the most recent facility completed in 2020. These storage facilities represent a vital component of the water infrastructure, contributing to the reliable supply and distribution of water resources in their respective areas.

Water Distribution

Of the 3,150,000 residents in LC Ma'rib, about 55.2 % respective Ma'rib people are supplied through the public network and there are no statistics for whom served by private sector. The water supply is 8 hours per day. According to the LC the number of functioning water meters is 42.

In LC Ma'rib, there are one water supply zones in the city which called Al-Madinah

Water supply network

The water supply network at LC Ma'rib is 100 Km (transmission and distribution) long with diameters of 6" to 12" 500 and comprises 1,400 water house connections for distribution lines.

The network and transmission line from 1986 are suffering from repeated blockages because the pipes are almost dilapidated. The following table presents the details of the water supply network.

Distribution area	Water Network Components	Pump Lines / Distribution Lines	Installation Date	Diameter	Material	Unit	Quantity (Km)	Operational Status	Physical Condition
Al-Mojam'a	Supply lines and household connections	12» / 6» Polyethylene lines + 8» / Pump lines	2002	6»	UPVC	Count	30	Working well	Good
Al-Rawdah	Supply lines and household connections	6»	2019	6»	Polyethylene	Count	10	Working well	Good

Table 7.3: Details of existing water supply network

Electro-mechanical (EM) facilities for the water supply system (water resources and pumping station)

All water supply systems utilize a direct supply method and are equipped with European-manufactured motors. They operate on electricity supplemented by generators. The motors have varying power outputs, ranging from 22 to 37.5 kW. Voltage requirements are consistent at 380 volts, with cable diameters measuring (16-25) mm. The current status being categorized between levels excellent too good as well as for their performance levels. These systems play a vital role in providing water supply, with some stations exhibiting minor operational challenges.

Water disinfection and treatment units

General data for water sterilization units

Unit Name or Number	Unit 1	Unit 2	Unit 3
Installation Location	Street Tank Serwah	Fao	Attra
Used Disinfection System Type (2)	Injection	Injection	Injection
Model	c713-36852	c713-36853	c713-36854
Manufacturer	Miton Roy	Miton Roy	Miton Roy
Service Duration or Operation Date	2 years	1 year	1 year
Average Sterilized Water Quantity per Month (m3/month)	15000	288	288
Maximum Sterilization Unit Capacity (m3/hour)	9.5L	9.5L	9.5L
Chemicals Used	Chlorine	Chlorine	Chlorine
Condition of Used Chemicals (Powder/Liquid/Gas)	Powder	Powder	Powder
Added/Consumed Chemicals (mg/L)/ (L/m3) or (g/m3)	0.4g/L/m3	0.4g/L/m3	0.4g/L/m3
Electric Motor Capacity (kW)	37	37	37
Power Source	Public Electricity	Public Electricity	Public Electricity
Current Status (4)	Excellent	Deteriorated	Deteriorated
Performance Level (5)	Excellent	N/A	N/A

Table 7.4: Details of water sterilization units

The water treatment and disinfection system face several challenges. Insufficient units for water disinfection, limited monitoring procedures, and infrequent water quality checks in distribution areas are prominent issues. Additionally, chlorine residue testing is sporadic due to material scarcity. Safety measures for handling disinfection materials are only partially implemented. Control systems for disinfection units are inadequate, and routine maintenance is hindered by resource constraints.

Furthermore, daily operation records fail to comprehensively track chemical usage, indicating a need for improved record-keeping. Biological contaminants like coliforms and fungi pose risks to water quality. Physically and chemically, substances such as fluoride, calcium, and bacteria can adversely impact water quality. The primary method for biological improvement is disinfection, typically employing chlorine or ozone. Additionally, comprehensive approaches including treatment, testing, and control measures are vital for maintaining water quality standards.

Addressing these challenges requires an allocation of resources, training for chlorine teams, and budgetary support for laboratory management. A systematic and multifaceted approach is crucial to ensure the safety and quality of water for the community.

Laboratories

Water laboratories information and operational capacity

The institution has a water laboratory. However, there is a lack of adequate space. While equipment and tools are generally available, but face limitations in consumables and chemicals. Power supply is insufficient across the board, indicating a need for solar energy systems. Specialized staff are present in all facilities, ensuring proficient laboratory operations. Adequate safety tools and emergency supplies are in place. Waste disposal primarily relies on incineration. Equipment calibration is a standard practice. Both biological and chemical testing are conducted on water samples, utilizing various methods for thorough analysis. The assessment underscores the need for improvements in space allocation, power supply enhancement, and a consistent supply of consumables. Ongoing staff training is also recommended to bolster laboratory operations. These areas should be prioritized for effective and sustainable water quality assessments.

Sanitation laboratories information and operational capacity

There are no sanitation laboratories.

Required investment measures for water and wastewater laboratories.

Statement	Required for/ Installation Location	Technical Specifications	Unit	Quantity	Estimated Unit Cost (in USD)	Total Estimated Cost (in USD)	Priority
Palintet F&T. A &T.H &SON &CL &CA &K&NO3 Device Reagents	Laboratory	Filter Membrane 0.45mm	Number	500	375	3000	Critical
SON &FE&NO3&CU&NI&F Hach Device Reagents	Laboratory	Filter Membrane 0.45mm	Number	500	375	2250	Critical
TDS&EC&PH Measurement Devices	Laboratory	Acid + Base British Type	Number	10	400	4000	Critical
ICP Device	Laboratory	Attached Specifications	Number	1	250000	250000	High
GC Device	Laboratory	Attached Specifications	Number	1	200000	200000	High
Measurement Solutions for Each Element	Laboratory	British Type	Number	200 (per test)	1000	3000	High
R.O droppers	Laboratory	British Type	Number	3	9	3000	Critical
Laboratory Building	Laboratory	Completing the Second Floor	Number	1	200000	200000	Critical
Safety Tools	Laboratory	English	Number	50 (per type)	40	2000	Critical
First Aid Tools	Laboratory	Egyptian	Number	50	20	1000	Critical
Laboratory Car	Laboratory	Salon 2020	Number	2	30000	60000	Critical
Laptop	Laboratory	DEL	Number	4	1000	4000	Critical
Sterilization Papers and Petri Dishes	Laboratory	European	Number	1000	2	2000	Critical
Nutrient Media, Microscope, Stain, and Slides	Laboratory	European	Number	2	12500	25000	Critical

Table 7.5: Investment needs for water laboratories

7.1.3 Quality and management

Water Production Monitoring

LC Ma'rib confirms that water production is accurately measured using functional meters. The produced water is entirely accounted for. The quantity of water produced is well-documented through various means including meters, operation plans, logs, and records.

There is an active search for additional water sources, as current sources may not meet both present and future demand. This includes exploring options for drilling new wells. Moreover, there is a recognized need for an additional water source due to a decrease in production. The organization is actively seeking supplementary sources to address this concern.

Lastly, there is sufficient information available regarding groundwater status and its rate of change. This data enables effective planning, development, and management of water resources.

Water source quality and monitoring

- Location and Protection: LC states that there are wells belonging to the institution in close proximity to specific protected wells.
- Contamination Risks: The response indicates that there are no such risks.
- Water Quality Suitability: water quality is deemed appropriate, indicating that it meets required standards.
- Plans for Water Quality Improvement: It acknowledges a proactive approach, as there are plans to address any decline in water quality, such as the need for new sources or changes in treatment methods, particularly for sources with high salinity levels.
- Flood Vulnerability: The sites of the well fields are confirmed to be susceptible to flooding, which is a crucial consideration for maintenance and protection measures.
- Routine Well Maintenance: Regular maintenance of the wells is ensured, which is essential for their continued functionality and water quality.

Water resource management

LC indicates that there are no conflicts related to water in the well fields. Additionally, there is no established

coordination between the institution/branch and the General Authority for Water Resources in the governorate, as there is no branch for the authority in the region. Moreover, there are no community-participated watershed committees, and there is no specific regulatory body overseeing groundwater legislation. The water service providers primarily rely on private wells as their water source. Furthermore, there are no other sectors identified as beneficiaries of the current water sources.

7.1.4 Non-Revenue Water

Water consumption service areas data

There was considerable change in the water production during the assessed years which increased by 77 %, but the impact of crisis is not considerable on the consumption per capita per day which increased from 130 lpcd in 2017 to 150 lpcd in 2022, Compared to the average consumption in Yemen with 49 lpcd, the supply situation in Ma'rib is one of the best. The water losses decreased from 60 % in 2017 to 41 % in 2022. According to LC Ma'rib, the main reason for the high values of losses is due to providing free produced water to displaced camps.

However, the table below shows water balance for the years (2017-2022).

Description	2017	2018	2019	2020	2021	2022
water production(m3/year)	777,000	777,000	777,000	800,500	950,000	1,100,000
water consumption (m3/year) (billing)	42,377	94,923	106,936	131,552	184,878	265,882
Nos of connection	1,100	1,150	1,200	1,250	1,300	1,400
Nos. of supplied population	1,100,000	1,355,000	1,533,601	1,625,032	1,774,584	1,739,092
water consumption lpcd	130	130	130	140	140	150
NRW in m3/year	62278	94431	117388	131873	199648	187772
% of total water losses	94	88	85	84	80	76

Table 7.6: Water balance for the years (2017-2022)

7.2 Sanitation system

1.2.1 General data of the wastewater system, sewer network

Of the 1,150,000 residents in LC Ma'rib, about 21.74 % respective Ma'rib people are served through the public sewer network and 78 % are served by other providers. Details are provided in the Table 7.7

Description / Facility	unit	2017	2018	2019	2020	2021	2022
Total Population	No.	370,000	520,000	680,000	830,000	N/A	1,150,000
Population served by the institution/branch	No.	0	0	0	194,000	225,000	250,000
Total area covered by the services provided by the institution/branch	Km^2	0	0	0	18	18	18
Total area served by the institution/branch	Km^2	0	0	0	18	18	18
Average number of people in water connections	No.	0	0	0	14	14	14
Total population served by other service providers	No.	0	0	0	636,000	715,000	900,000
Area served by other service providers	Km^2	0	0	0	23	23	23
Number of connections served by the institution/branch through the sewage network	No.	0	0	0	400	500	600
Number of connections served by the institution/branch through septic tank trucks (whitats)	No.	N/A	N/A	N/A	N/A	N/A	N/A
Number of connections served by the institution/branch through digestion tanks (septic tanks)	No.	N/A	N/A	N/A	N/A	N/A	N/A
Number of people served by private sector suction trucks (whitats)	No.	0	450,000	450,000	500,000	500,000	500,000
Number of people using absorption pits (septic tanks)	No.	0	450,000	450,000	500,000	500,000	500,000
Number of people served through special digestion tank	No.	0	N/A	N/A	500,000	500,000	500,000
Number of people served through dry toilets	No.	0	N/A	N/A	N/A	N/A	N/A
Number of people served through other methods, please specify the type in the comments	No.	0	N/A	N/A	N/A	N/A	N/A

Number of people served by civil society organizations and funded organizations	No.	0	N/A	20,000	25,000	30,000	30,000
Current Sewage Water Quantity at the Inlet of All Sewage Treatment Stations	m^3/day	N/A	N/A	N/A	400	500	600
How is Sewage Water Collected and Disposed?	-	N/A	Absorption Pit and Swamp	Absorption Pit and Swamp	Absorption Pit and Swamp	Absorption Pit and Swamp	Absorption Pit and Swamp

Table 7.7: General data of the sewerage system

There is no wastewater treatment plant except Ma'rib Mini Station which is out of service due to overload, but there is sewer transmission and collection network ended with collection ponds.

The sewer collection and transmission network in the Ma'rib area has the following components:

Components of Sewage Network	Sewage System	Collection Lines / Transmission Lines	Installation Date	Installation Area	Diameter	Material	Quantity	Operational Status	Current Status
Pipes	Common	Transmission	2020	Al-Mojam'a	12"	PVC	300	Partially used	Almost dilapidated
Manholes	Common	Transmission	2020	Al-Mojam'a	12"	Concrete	45	Partially used	Almost dilapidated

Table 7.8: Sewer network components

Investment needs for the sewerage network (pipes, accessories, manholes, etc.)

Required Sanitary Sewer Network	Installation Area	Diameter	Material	Operational Pressure (bars)	Estimated Total Cost (USD)	Priority	Remarks
Network	Entire City	According to Study	According to Study	Needs for implementing a complete network	N/A	Critical	Replace all lines
Treatment Plant	Outside the City	According to Study	According to Study	Implementing a station for the city	N/A	Critical	

Table 7.9: Investment needs for the sewer network

7.3 Operation and Maintenance

7.3.1 Operation and Maintenance (O&M) management:

Water Supply Operations Management:

- No formal production plan based on demand management due to irregular electricity supply.
- The specified procedures in the water production plan are not consistently followed for the same reason.
- There are procedures in place for monitoring and supervising the water production and distribution system.
- A documentation system exists for the operation of machines and equipment, maintained through records and logs.
- No automated systems like SCADA are in use for controlling machine operations.
- Currently, there is a need for qualification courses for staff to effectively operate and manage equipment.
- The operating team faces challenges such as frequent power outages and the absence of a central maintenance workshop.

Overall, the water production and distribution system face operational challenges primarily due to unreliable electricity supply. There is a need for improved training and automation to enhance operational efficiency. Additionally, addressing power supply issues and establishing a central maintenance workshop could significantly benefit the system›s performance.

Water Supply Maintenance Management:

This report evaluates the maintenance management practices in the water production and distribution system. Key findings are as follows:

Documentation System: There is currently no historical documentation system for various maintenance operations. It is recommended to include this in the future plans of the institution.

Emergency Maintenance Response: The average response time for emergency maintenance operations related to the water system is approximately 3 days.

Preventive Maintenance: Preventive maintenance operations related to the water system are carried out in a timely manner.

Adherence to Quality Standards: Quality, efficiency, and effectiveness standards are consistently followed in maintenance operations within the water system.

Safety Measures: While there is a need for safety materials, equipment, and tools, the high cost presents a challenge. The institution should explore cost-effective options.

Occupational Safety Compliance: Occupational safety rules and instructions are consistently observed when performing maintenance work in the water system.

Challenges Faced: The maintenance team faces challenges such as distance between wells, limited transportation means, and the necessity for specialized maintenance tools.

These findings provide valuable insights for enhancing the maintenance management practices in the water production and distribution system. Recommendations include implementing a documentation system, exploring cost-effective safety solutions, and addressing logistical challenges faced by the maintenance team. These measures will contribute to a more efficient and effective operation of the water system.

Sewage System Operation and Maintenance Management

Does not exist due to absence of Wastewater treatment plant.

7.3.2 Technical and logistical support needs for operating and maintaining the water supply system (equipment, machinery and means of transportation)

Statement	Technical Specifications	Unit	Quantity	Estimated Unit Cost (USD)	Estimated Total Cost (USD)	Priority
Provide a welding machine 2 "- 12 "	German	Count	1	9,000	9,000	Critical
Build a maintenance workshop and supply all requirements	Room 3*6	Count	1	25,000	25,000	Critical
Supply a PC bucket loader	Japanese	Count	1	120,000	120,000	Critical
Dina Winch	Japanese 10-ton capacity	Count	1	70,000	70,000	High
Mobile maintenance car	Japanese 2024 model	Count	1	30,000	30,000	High
Double cab Hilux emergency cars	Japanese 2024 model	Count	3	38,000	114,000	Critical
Administration cars (sedan + two Prado cars)	Japanese 2024 model	Count	3	60,000	180,000	Critical
Bus with 34 passenger capacity	Japanese 2024 model	Count	1	40,000	40,000	High

Table 7.10: Technical and logistical support needs for operating and maintaining the water supply system.

7.3.3 Technical and logistical support needs for operating and maintaining the sewage collection, transportation and treatment system.

Statement	Technical Specifications	Unit	Quantity	Estimated Unit Cost (USD)	Estimated Total Cost (USD)	Priority
Sewage Suction Unit (12000 liters)	Japanese Model 2024	Unit	3	120,000	360,000	Critical
Supply of Japanese GP Excavator	Japanese	Unit	1	120,000	120,000	Critical
Supply of Japanese Loader	Japanese	Unit	1	140,000	140,000	Critical

Table 7.11: Technical and logistical support needs for operating and maintaining the sewage system.

7.4 Energy Supply

7.4.1 General information and data on energy sources for water supply system

Statement	Unit	2017	2018	2019	2020	2021	2022
Number of Electric Motors and Pumps Installed for Water Supply System	No.	3	3	3	7	7	7

Total Capacity of Electric Motors and Pumps Installed for Water Supply System	Kilowatts	111	111	111	259	259	259
Total Electrical Energy Requirement for All Water Production and Distribution Systems	Kilowatt-hours	N/A	N/A	N/A	N/A	N/A	N/A
Total Number of Generators Installed for Water Supply System	No.	2	2	2	5	5	5
Total Capacity of Generators Installed for Water Supply System	Kilovolt-Amperes	300	300	300	500	500	500
Number of Operating Generators for Water Supply System	No.	2	2	2	5	5	5
Total Capacity of Operating Generators Installed for Water Supply System	Kilovolt-Amperes	100	100	100	100	100	100
Number of Hours of Operation for Operating Generators for Water Supply System	Hour	N/A	N/A	N/A	N/A	N/A	N/A
Total Electrical Energy Produced by Institution/Branch Generators for Water Supply System	Kilowatt-hours	N/A	N/A	N/A	N/A	N/A	N/A
Quantity of Diesel Consumed by Operating Generators for Water Supply System	Liters	N/A	N/A	N/A	N/A	N/A	N/A
Total Cost of Diesel Consumed for Generators for Water Supply System	Riyals	N/A	N/A	N/A	N/A	3,750,000	4,320,000
Number of Solar Power Systems for Water Supply System	Number	N/A	N/A	N/A	N/A	N/A	N/A
Total Capacity of Solar Power Systems for Water Supply System	Kilowatts	N/A	N/A	N/A	N/A	N/A	N/A

Table 7.12: Electrical power of water supply system

7.4.2 Energy sources for water sources and wells - diesel generators

Installation Location / Facility Name or Number	Facility Type Water/ Sanitation	Generator Number or Code	Generator Type (Primary/Backup)	Service Life/Start Date	Model	Manufacturer	Generator Capacity (Kilovolt-Amperes)	Equipment or Units Loaded on the Generator	Total Load Capacity of Working Equipment via Generator (Kilowatts)	Current Status	Performance Level
Al-Faw 1	GW	G1	Backup	2021	2020	Perkins	100	Submersible Pump	22	Good	Good
Al-Faw 2	GW	G2	Backup	2017	2014	AGCO Power	100	Submersible Pump Number 2	56	Good	Good
Attaran 1	GW	G3	Backup	2020	2019	Perkins	150	Submersible Pump Number 2	60	Good	Good

Table 7.13: Energy sources for water sources (diesel generators)

7.4.3 Operational data of the LC energy generation station

Operating Hours and Power Generation: For "Faw 2 well" it shows 1440 operating hours and 30KW power generated. In subsequent years, the operating hours vary, with increasing power generation over the years.

Diesel Consumption: The diesel consumption data is present for "Faw 2 well "showing 7200 liters in 2017. However, it is absent for the other two locations (« Faw 1 well" and "Attran 1 well") in 2017. In later years, these two locations also show diesel consumption, which increases over time.

2018 to 2022: For "Faw 1 well "operating hours start in 2018, with increased power generation and diesel consumption until 2022." Faw 2 well "demonstrates stable performance in power generation and an increase in diesel consumption." B-4.3.1.3» starts in 2019 and gradually increases both power generation and diesel consumption over the years.

In conclusion, this data offers into the operational performance of 100KW diesel generators across different locations. Further analysis is required to understand the reasons for insights into the variations and to make informed decisions regarding maintenance and fuel efficiency.

7.4.4 Energy consumption data

The table below summarizes the electricity and Diesel consumption for 2022 compared to 2017 situation:

Energy Source	Description	Unit	2017 Quantity	2022 Quantity (till June)	Change (%)
Public Electricity Supply	Water Pumped or Treated	m^3	777,000	1,091,000	28.8
	Total Electricity Consumed	kWh	The electric power has not been quantified due to the absence of electric meters	The electric power has not been quantified due to the absence of electric meters	-

	Cost of Electricity Consumption	YER	Free of charge according to the local authority›s decision	Free of charge according to the local authority›s decision	-
Diesel Generators	Water Pumped or Treated	m^3	0	9,000	100
	Diesel Consumption	Liters	0	7,200	100
	Diesel Cost	YER	0	4,320,000	100
Private Sector Electricity	Water Pumped or Treated	m^3	0	0	-

Table 7.14: Energy consumption for 2017 and 2022

7.4.5 Required Investment measures for the improved efficiency and expansion of existing energy sources

Requirements	Installation Location	Technical Specifications (Brief)	Unit	Quantity	Estimated Total Cost (USD)	Priority
Solar Energy System	Marib Old City	Integrated system for energy generation	Number	1	50,000	critical
Solar Energy System	Al-Rumaila	Integrated system for energy generation	Number	1	50,000	critical
Solar Energy System	Khuza›nat Al-Madina	Integrated system for energy generation	Number	2	100,000	critical

Table 7.15: Proposed needs to increase the efficiency of energy sources.

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 LC Ma'rib with the water and sanitation condition of selected public institutions led to the conclusions and recommendations summarized in the tables below and the Technical Assistance Plan. The "Shortcomings" in the tables below provide an overview of the identified problems the LC is facing. 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 the respective TA package. The period for the realization of the respective recommended activities is in the "Implementation" column which refers to the urgency criteria outlined in the questionnaires as follows:

- Urgent: no time frame; measures to be implemented as soon as possible
- High: to be implemented within 1-2 years
- Medium: to be implemented within 3-5 years
- Low: to be implemented as long-term planning more than 5 years for development.

The estimated costs for the proposed nine investment measures are presented in Table 8.3.

8.1.2 TA measures.

Institutional Assessment and Recommended Technical Assistance Measures (TA Plan) for LC Ma'rib

The identified shortcomings and respective recommendations for post crisis scenario can be summarized as follows.

Department	Obstacles	Recommendations	Implementation
Governance/Management/ Organizational structure/ Resilience	■ The organizational structure needs updating. ■ Internal regulations and policies need updating. ■ Internal and external control and inspection procedures are to be reviewed. ■ Addressing general administrative problems, including employee settlements ■ Challenges in adopting modern technology for administrative procedures. ■ Deficiency in automation systems ■ Board meetings and follow-up mechanisms are considered non-applicable. ■ The branch acknowledges a deficiency in automation systems. ■ Implementing electronic data flow is deemed not essential	■ Capacity building of management and BoD ■ Regular meeting and coordination between LC and BoD ■ Implementing an automation system ■ Implementing internal networks ■ Qualifying and training the technical staff	■ Urgent ■ High ■ Urgent ■ Urgent

Human resource and capacity building management	▪ Shortage of qualified staff ▪ Insufficient support for regular training courses for employees ▪ Weak internet in Ma'rib Governorate ▪ Absence of an institution-specific network ▪ The current system is not effective in combating inflation	▪ Improving the recruitment process and increasing salaries ▪ Revising the incentive system and providing monthly cash incentives ▪ Offering regular training courses and promoting experience exchange ▪ Improving internet services and establishing an internal network for the institution	▪ Urgent ▪ High ▪ High ▪ Urgent
Finance management	▪ Suspension of government support and investment programs. ▪ Need for completing office automation. ▪ Need for training and qualifying the financial staff.	▪ Training workshops were conducted for employees to enhance their financial management skills. ▪ Specialized training courses for both internal and external employees ▪ Establishing a network connection between financial administrative departments ▪ Training employees on various accounting systems, particularly in the accounts department, is included in the plan	▪ High ▪ High ▪ Urgent ▪ High
Customer service and relation management	▪ Evaluation and improvement of the entire billing process, including meter reading, data entry, review, invoice issuance, and distribution. ▪ Urgent need for enhancements in the collection process and effective monitoring of various types of debts. ▪ High priority for optimizing the delivery of services to subscribers. ▪ Urgent attention required for issues related to subscriber meters and their operational status. ▪ Medium priority area for improving the flow of work processes and data exchange within the LC. ▪ Medium priority for enhancing planning and monitoring mechanisms to ensure efficient performance. ▪ Urgent need for implementing automation and modern technology in management operations and procedures. ▪ Low priority area focused on assessing and enhancing the qualifications and capabilities of employees involved in management	▪ Providing training to the workforce ▪ Network Connection between Centers and Collection Offices ▪ Raise the community awareness of the importance of paying the bills for water consumption. ▪ Policies and strategies of developing and strengthening the relationship between the LC/ AU/Branch and the Consumers ▪ Implementing automated programs for procedures related to service requests in subscriber accounts. ▪ Developing automated programs for taking readings. ▪ Implementing automated field collection programs along with providing associated devices. ▪ Conducting training courses for employees in subscriber accounts	▪ Medium ▪ High ▪ Urgent ▪ High ▪ High ▪ High ▪ High ▪ High
Water and Sanitation Service management	▪ No sanitation network system ▪ Shortage of equipment, emergency vehicles and assembly parts ▪ Operating system for some wells and a GIS program	▪ Establish GIS unit. ▪ Find the necessary support to complete the construction of the stalled wastewater treatment plant	▪ High ▪ Urgent
IT infrastructure	▪ Provide the branch with meter reading systems and link them to subscriber accounts. ▪ Provide the branch with quantity measurement devices and link them to the central computer. ▪ Absence of development plan of the IT Department and the used systems. ▪ Provide computers and printers for collection offices and link them to subscriber accounts. ▪ Provide the branch with any technological systems that contribute to performance improvement	▪ Inclusive training of staff ▪ Capacity building for IT department ▪ IT management procedures and operations	▪ High ▪ High ▪ High
Gender perspective	▪ The need for initiatives aimed at promoting gender diversity and ensuring equal opportunities for women. ▪ There is no specific budget allocated for the Women›s Management	▪ Giving priority for female recruitment	▪ Mid

Table 8.1: Obstacles and recommendations for institutional measures

8.1.3 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.

8.1.4Technical Assistance Plan

The required TA support for the LC Ma'rib has been determined based on the outlined recommendations in above section. The respective needs for the improvement of the resilience of the LC have been grouped into the following four individual Technical Assistance Packages:

- TA Package 1: Financial Support
- 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)
- TA Package 6: Public Relation and Awareness

Most of the recommended measures are proposed to be implemented as an integrated package and in parallel to strengthen the LC and increase their resilience within the next one to two years. Less pressing measures, 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 following table summarizes the estimated cost for the TA packages:

Package	TA intervention	Estimated TA cost in USD			
		Urgent	High priority	Medium priority	Low priority
		(0-6 months)	(6 months -1 year)	(2-3 years)	(3-5 years)
TA1	Financial Support	32,000	0	0	0
TA2	Training Courses	68,000	25,000	11,000	0
TA3	Office equipment and IT	27,000	3,000	0	0
TA4	Coaching and Consultancy services	35,000	200,000	0	0
TA5	Operation Management Support	29,000	170,000	30,000	0
TA6	Public Relation and Awareness	0	20,000	20,000	7,000
Total TA cost:		191,000	418,000	61,000	7,000

Table 8.2: Cost estimates on TA interventions

The total required amount for the technical assistance measures has been estimated to around USD 191,000 for critical priority intervention, USD 418,000 for high priority intervention, 61,000 for medium priority intervention and USD 7,000 for low priority interventions.

8.2 Prioritized Investment Plan

Infrastructure Assessment and Recommended Rehabilitation Measures (Investment Plan) for LC Ma'rib

Domains	Obstacles	Investment measures			
		Urgent (0-6 months)	High priority (1-2 years)	Medium priority (3-5 years)	High priority (>5 years)
Building and Reservoirs	Laboratory is unavailable. Insufficient office workspace. Insufficient material storage space.	Involves constructing walls for tanks and providing accommodation for guards across multiple locations, including Al-Mintaqa, Al-Jufeina, and Al-Arba›een. The construction of a one-story laboratory building in the city The completion of the second floor in Marib›s Al-Rawdha area Rehabilitation of the branch building Supply and installation of office furniture		-	-
Water Resource, use and balance	Shortage in water supply Low yield of the wells	Implementing new reservoirs, drilling new wells,	-		-
Water pipelines	Dilapidated water distribution network. Uncompleted rehabilitation of distribution networks	Supplying maintenance tools and equipment for the network Expanding and implementing new water networks for several regions Supply and installation of new meters, valves and replacement of existing ones	Supplying information systems for the branch	-	-
Water Pumping/lifting Stations	Insufficient pumping capacity	Supply and installation of several submersible pumps Pumps and motors Electrical transformers Electric generators	-		-
Water sterilization facilities	Lack water testing laboratory. Lack of measuring kits for residual chlorine.	Providing reagents for testing Providing manual inspection devices	Supplying injection unit & Chlorine injection unit	-	-
Power generating/ auditing for water & wastewater system	Diesel power generator pumping station out of service and needs rehabilitation. Raise of Diesel prices.	Implementing Integrated system for energy generation (solar energy system) Supply and installation of generators, electrical networks, and furniture	-	-	-
Operation and maintenance process of water infrastructures	Lack of transport vehicles. Lack of repair and maintenance tools for pipe works pump and motor works. -Lack of tools and instruments for electrical works. -Lack of trench excavation equipment. -Lack of water meter maintenance workshop. - Lack of pump lifting equipment/ wenches	Provide a welding machine 2 "- 12 " Build a maintenance workshop and supply all requirements. Supply a PC bucket loader. Double cab Hilux emergency cars Administration cars (sedan + two Prado cars)	Buying Dina Winch Buying Mobile maintenance car Buying bus with 34 passenger capacity	-	-
Wastewater collection/ transportation pipelines	Lack of repair and maintenance tools for pipe works pump and motor works	Build a maintenance workshop and supply all requirements			-
Wastewater treatment facilities	Unavailability of Wastewater treatment plant	Implementing a station for the city	-		-
Operation and maintenance process of wastewater facilities	Poor logistics for operation & maintenance	Buying Sewage Suction Unit (12000 liters) Supply of Japanese GP Excavator Supply of Japanese Loader		-	-
Water & wastewater Laboratories	Lack of adequate space Poor logistics for operation and limitations in consumables and chemicals Need for solar energy systems	Buying chemicals such as SON &Fe&NO3&CU&Ni&F Hach Device Reagents, TDS & EC& PH Measurement, R.O droppers, Safety Tools, Laboratory Car, Laptop, Sterilization Papers and Petri Dishes, Nutrient Media, Microscope, Stain, and Slides	Buying ICP Device, GC Device, Measurement Solutions for Each Element	-	

Table 8.3: Obstacles and recommendations for Infrastructure Assessment and Rehabilitation Measures

Investment needs

The identified measures have been prioritized according to feasibility and urgency in urgent measures, high priority, short-term and long-term measures grouped into 9 investment packages. The period indicates the proposed commencement of the investments, starting from 2024.

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)
1	Civil Works on buildings and structures	520,000	0	0	0	520,000
2	Well rehabilitation and new construction	1,168,000	0	0	0	1,168,000
3	Water pumping station	328,500	0	0	0	328,500
4	Water network rehabilitation and extension	739,225	0	0	0	739,225
5	Wastewater collection, disposal and Treatment	32,250,000	0	0	0	32,250,000
6	Generators and spares, Electric materials and solar systems	200,000	0	0	0	200,000
7	Vehicles, machines, tools	508,000	40,000	0	0	548,000
8	Laboratory equipment	49,750	513,000	0	0	562,750
9	Water sterilization facilities	3,500	60,000	0	0	63,500
Total investment	35,766,975	613,000	0	0	36,379,975	

Table 8.4: Cost estimation on investment measures

The required estimated budget has been calculated for:

- Urgent measures: 35,766,975 USD
- High-priority measures: 613,000 USD
- Medium- priority measures: 0 USD
- Low- priority 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 36,379,975 million USD for the next 5 years.

Appendices to Annex 5

Assessment Report of Ma'rib LC

Appendix A-1:

Package	TA intervention	Estimated TA cost in USD			
		Urgent	High priority	Medium priority	Low priority
		(0-6 months)	(6 months -1 year)	(2-3 years)	(3-5 years)
TA1	Financial Support	32,000	0	0	0
TA2	Training Courses	68,000	25,000	11,000	0
TA3	Office equipment and IT	27,000	3,000	0	0
TA4	Coaching and Consultancy services	35,000	190,000	0	0
TA5	Operation Management Support	29,000	170,000	30,000	0
TA6	Public Relation and Awareness	0	20,000	20,000	7,000
Total TA cost:		191,000	418,000	61,000	7,000

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	32,000	0	0	0
Total TA Package 1:			32,000	0	0	0

TA Package 2: Training Courses

ID	Training Subject	Target Staff	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
2.1	Board of Directors Program	Board of Directors, Secretary of BoD	480	13,000	0	0
2.2	Management & HR subjects	General Directors, Deputies, Planning and Project Manager, Financial Manager, HR Manager	10,500	2,130	9,300	0
2.3	Technical subjects	Deputy, Director of main departments, Key staff, engineers	32,343	4,670	0	0
2.4	Finance subjects	Finance department staff, Procurement department, Supervision & Inspection	2,550	2,550	0	0
2.5	Customer Relations and Services subjects	General director, director of main departments	12,950	0	1,700	0
2.6	IT, PIIS	IT manager, Finance, Planning department key staff	3,780	2650	0	0
2.7	On-Job training	HR & IT department, Audit Section and Accounting Sections, Warhouse and procurement management staff	5,400	0	0	0
Total TA Package 2:			68,000	25,000	11,000	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	17,700	3,000	0	0
	Software	National Water Sector software	1,300	0	0	0
3.3	Electric equipment	Charger, solar system, AC, fingerprint scanner	6,600	0	0	0
3.4	Furniture	Chairs, desks	1,400	0	0	0
Total TA Package 3:			27,000	3,000	0	0

TA Package 4: Coaching and Consultancy services

ID	Intervention	Requirement	Urgent - total cost (USD)	High priority - total cost (USD)	Medium priority - total cost (USD)	Low priority - total cost (USD)
4.1	Coaching support	Institutional development support	5,000	50,000	0	0
4.2	Consultancy services	Update design, Feasibility study	30,000	100,000	0	0
4.3	External Auditor	Re-evaluation of audits and accounts	0	40,000	0	0
Total TA Package 4:			35,000	190,000	0	0

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	29,000	30,000	30,000	0
5.2	Consultancy services	Team leader, experts, draughtsman	0	140,000	0	0
Total TA Package 5:			29,000	170,000	30,000	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	15,000	15,000	0
6.2	Public awareness campaign	Workshops, meetings, publications, media	0	5,000	5,000	7,000
6.3	Gender related awareness	Workshops for women, visit of marginalized, school visits	0	0	0	0
Total TA Package 7:			0	20,000	20,000	7,000
Total TA measures in USD:			191,000	418,000	61,000	7,000

Appendix A-2:
Investment Plan for Ma'rib LC

Overview of required investment packages for LC Ma'rib

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)
1	Civil Works on buildings and structures	520,000	N/A	N/A	N/A	520,000
2	Well rehabilitation and new construction	1,168,000	N/A	N/A	N/A	1,168,000
3	Water pumping station	328,500	N/A	N/A	N/A	328,500
4	Water network rehabilitation and extension	739,225	N/A	N/A	N/A	739,225
5	Wastewater collection, disposal and Treatment	32,250,000	N/A	N/A	N/A	32,250,000
6	Generators and spares, Electric materials and solar systems	200,000	N/A	N/A	N/A	200,000
7	Vehicles, machines, tools	508,000	40,000	N/A	N/A	548,000
8	Laboratory equipment	49,750	513,000	N/A	N/A	562,750
9	Water sterilization facilities	3,500	60,000	N/A	N/A	63,500
Total investment		35,766,975	613,000	N/A	N/A	36,379,975

Investment Plan for LC Ma'rib

ID	Measures	Work Category(1)				Priority(2) / Estimated Cost in USD					Remarks
		New		Maintenance		Urgent	High priority	Medium	Low	Total	
						0-6 mths	1-2 years	3-5 years	3-5 years		
		supply	supply & installation	supply	supply & installation						
1	Civil works on buildings and structures									520,000	
1.1	Completing the second floor		√			200,000					
1.2	Building fences and guard housing (Al-Mintaqa, Al-Jufeina, and Al-Arba›een)		√			60,000					
1.3	A one-floor building with a hall for a biological, physical, and chemical laboratory, along with a management office for the laboratory		√			40,000					
1.4	Guardhouse for WWTP		√			20,000					
1.5	Building a laboratory		√			200,000					
2	Well rehabilitation and new construction									1,168,000	
2.1	Jaw Al-Naseem Wellfield		√		√	112,000					
2.2	Faw Wellfield		√			56,000					
2.3	Ma'rib Dam		√			1000,000					
3	Water pumping station									328,500	

3.1	Integrated pumping unit (pump-fans-pipes-cables-dashboard) for Al-Fao Field, Marib Old Field, Al-Rumaila Field, Athran Field, and Jaw Al-Naseem Field		√		√	144,000					
3.2	Generators for Al-Fao Field, Marib Old Field, Al-Rumaila Field, Athran Field, and Jaw Al-Naseem Field				√	126,000					
3.3	Electrical transformers for wells		√			44,500					
3.4	Generators for the institution›s building		√			14,000					
4	Water network rehabilitation and extension									802,725	
4.1	Building fences and guard housing (Reservoirs in Al-Mintaqa)		√			50,000					
4.2	Building fences and guard housing (Reservoirs in Al-Jufeina)		√			50,000					
4.3	Water marks & Vavles				√	500,900					
4.4	Fittings & Reducers				√	138,325					
4.5	Water sterilization facilities					3,500	60,000				
5	WWTP and sewage pumps									31, 200,000	
5.1	Implementation of a treatment station behind Al-Ruwaishan Farm		√			1,500,000					
5.2	Protective fence		√			100,000					
5.3	Sewage lifting station for the treatment plant		√			500,000					
5.4	Integrated sanitation project		√			29,000,000					
5.5	Screens for sewage solid materials		√			100,000					
6	Sewer network rehabilitation and extension									1,050,000	
6.1	Pumps and motors of all types		√		√	1,050,000					
7	Vehicles, machines, tools									548,000	
7.1	Vehicles	√				354,000	40,000				
7.2	maintenance workshop and supply of all workshop requirements	√				25,000					
7.3	Welding machine	√				9,000					
7.4	GP-C excavator	√				120,000					
8	Electric materials and solar systems									200,000	
8.1	Solar systems in Old Marib, Al-Rumaila, and City reservoirs		√			200,000					
9	Laboratory equipment									562,750	
9.1	Chlorination Plant equipment				√		60,000				
9.2	Total Alkalinity, PH,TDS			√		3500					
9.3	Palintet F&T.A &T.H &Son &Cl &Ca &K&NO3 - Detectors for the device	√				5,250					
9.4	Lab instruments	√				38,000	453,000				
9.5	Safety tools	√				3,000					

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