SEURECA VEOLIA

Digital enterprise transformation in Water Establishments

Focus on North Lebanon Water Establishment (NLWE)

DIGITAL TRANSFORMATION ACTION PLAN

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GENERAL INFORMATION[1]

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VERSIONS

n°	Date	Comments	Author	Verified	Approved
1	October 27th 2023	Digital Transformation Action Plan Assessment phase	L. Bargheon	V. Soulard	F.Lacour
2	January 18th 2024	Digital Transformation Action Plan Final Report	L. Bargheon	V. Soulard	F.Lacour
3	January 26th 2024	Digital Transformation (10-year) Action Plan - Final Report	L. Bargheon	V. Soulard	F.Lacour

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ACRONYMS

AFD	Agence Française de Développement (French Development Agency)
AG	Above Ground
AMI/AMR	Advanced Metering Infrastructure/Automatic Meter Reading
BMLWE / EBML	Beirut Mount Lebanon Water Establishment / Eaux de Beyrouth et du Mont-Liban
BWE	Bekaa Water Establishment
CAPEX	Capital expenses
CCTV	Closed-circuit television
CD	Compact disc
CIM	Computer Integrated Manufacturing
CMMS	Computerised maintenance management system
CRM	Customer Relation Management
DMA	District Meter Area
DMS	Document Management System
DMZ	Demilitarised zone
DSP	Data Service Provider
EAM	Enterprise Asset Management
EDL	Electricité du Liban
ERP	Enterprise Resource Planning
EXCOM	Executive committee
GIS	Geographic Information System
HMI	Human-Machine Interface
HR	Human Resource
HSE	Health, Safety, and Environment
IT	Information Technology

LAN	Local Area Network
LIMS	Laboratory information management system
MIS	Management of Information System
NLWE	North Lebanon Water Establishment
NRW	Non-Revenue Water
NVR	Network Video Recorder
O&M	Operation & Maintenance
OPEX	Operating expenses
PLC	Programmable Logic Controller
QMS	Quality Management System
SCADA	Supervisory Control and Data Acquisition
SOP	Standard Operating Procedure
SWOT	Strengths, Weaknesses, Opportunities, and Threats
UG	Underground
UPS	Uninterruptible power supplies
VFD	Variable Frequency Drive
WAN	Wide Area Network
WE	Water Establishment
WWTP	WasteWater Treatment Plant

EXECUTIVE SUMMARY

AFD is implementing a program entitled "Technical assistance program to support reforms in Lebanon's water and sanitation sector" which aims to strengthen water and sanitation management capacities in Lebanon, including North Lebanon Water Establishment (NLWE) - 639 employees providing water to 130 000 customers, with a total turnover (collection) of 16.2 BLL in 2020[2]. This document presents the results of the **digital maturity diagnostic and assessment** carried out in September 2023, as well as the **digital transformation roadmap** that will enable the establishment to improve overall performance and deliver an ambitious level of service.

- It provides a detailed digital maturity diagnostic per business process. It highlights the key strengths and weaknesses, summarised in a SWOT.
- It suggests high level areas for improvement.
- It suggests a stepwise roadmap, with an associated budget.

OVERALL STRENGTHS AND WEAKNESSES OF NLWE REGARDING DIGITALISATION

As main findings, the diagnosis showed:

- The NLWE relies on a very strong ERP despite the **absence of a governance or strategic vision on digital**. While the Customer, Finance and Administration departments are clearly embarked on their digital transformation journey with the help of this ERP system, the Operations and Technical departments are lagging behind. Their procedures are not properly documented, access to IT equipment is very limited and they lack operational tools (CMMS).
- The water establishment benefits from the **strong support of USAID,** not only on the ERP development, but also by financing hardware in the HR and customer service area (Hand punch for worker time control, on-field printers for billing). However, financial stress prevents NLWE from renewing digital tools licence by its own especially on the Customer department side with the impossibility to maintain the app, and to publish the customer web portal (CRP2).
- While IT projects are in progress and **overall motivation and implication** of staff is very high, the **project management processes are not formalised** and sometime non existent preventing some projects from progressing. The problem isn't so much programming and configuring the tools, but rather change management and training.
- This does not allow it to provide a sufficient response to the **current challenges** faced by NLWE that digital transformation could address. They can be summed up as **a critical lack of**:

[2] Water Sector 2021… Sustain and grow! Ensure Water Services Sustainability & Continuity, Needs and Forecast 2021-2024 - June 2021

- **A strategic vision of digital as a lever for improving service levels**,
- **A reliable operational feedback from the field,**
- **An integrated management of the different business processes** (O&M, commercial, finance, etc.), based on a fluid flow of information between softwares.

Strengths	Weaknesses
• Implemented internal reporting procedures (mensual reports)Integrated ERP (Finance, Customer), used by the offices in the branches and consolidated in the Tripoli main office; • High implication of the staff to fulfil their essential mission despite the difficult context; • Clear appetite of the staff for digital; • Strong financial contribution of USAID support by skilled external staff (DAI: ERP); • High Quality of GIS Data (Tripoli only).	• Limited OPEX budget impacting renewal software licence fees, correct maintenance of hardware; • No digital governance, nor digital strategy (except by finance); • No focal point within NLWE regarding IT projects and lack of project monitoring processes; • Reported existence of tool documentation (ERP) in USAID, but not available within NLWE; • Lack of SOPs; • Low digitalisation level of intervention requests (complaints, maintenance, …); • Lack of systematic database update processes → out-of-date databases, • No preventive maintenance, no updated inventory of AG Assets, no asset lifecycle monitoring (even in paper form).
Opportunities	**Threats**
• Development of the existing GIS best practices in Tripoli for all offices; • Continuous improvement of of ERP module, with the regular support of USAID; • Willingness to digitalise maintenance interventions monitoring process; • Ongoing creation of the call centre fully integrated in the ERP; • Implemented use of social media for external communication; • Existing mobile app that could be updated to integrate mobile/online payment; • Willingness to integrate the tools (ERP- GIS-SCADA); • On-going project to implement hand-held devices for cash collection; • On going project for a second datacenter as part of risk management plan.	• Inequality between Tripoli offices and branch offices, especially on O&M (lack of hardware for example); • Inherent resistance to the transition to a paperless system (subscription, purchase…); • Lack of instrumentation for process automation and supervision; • Lack of standardisation of the PLC (hardware and program), and necessity to own the information (documentation and access) in NLWE; • Centralization of the IT service which makes it difficult to ensure the helpdesk on field (lack of gas for the cars); • Residual duration of USAID support not contractually established; • Difficulty to cover licences, maintenance & support fees due to the economic crisis and LBP inflation; • Incoming necessity to integrate sanitation facilities which could interfere with the implementation of digitalisation measures; • Difficulty retaining trained staff, due to lack of financial incentives.

Table 1: NLWE overall SWOT

Focus on SCADA assessment

The Overall SCADA evaluation has come to three main findings:

- NLWE has **very few Instrumentation and control equipment** deployed on the establishment. As the project was funded by different donors, the control methods and equipment used became various, and almost **no documentation or PLC credentials** were transmitted to NLWE management. The **maintenance being expensive**, it was decided to progressively disable the control functionality to be able to continue the operations without the PLCs.
- NLWE has now a major challenge to **implement a new centralised SCADA and maintain** it. The principal issue is to properly assess the existing equipment, and **define the strategy for future implementation** (typical schematics, cybersecurity rules, control philosophy, etc.)
- There are currently very **few skills in automation** available in the establishment, and the training/hiring of a **Instrumentation & Control referent** will become a necessity for NLWE to undertake the SCADA deployment.

Digital maturity assessment of NLWE and identified target states

The diagnostic phase leads to **a digital maturity grid** presenting the current digital maturity levels and a **target state** that SEURECA proposes to achieve at mid and long term.

It is important to remember that **digital technology must be at the service of the business**, so it **is necessary to tailor the targeted level of digital maturity to the real needs** of the service and to the key improvements that will enable it to meet its strategic objectives: **to supply water in sufficient quality and quantity to users**, and to be **self-sustainable**.

On this basis, the proposed 5-year digital vision for NLWE is as follows:

- A **reliable feedback of operational information from the field**, to improve service quality and financial performance: SCADA volume monitoring, water balance calculation, monitoring of customer payments and debts, etc;
- **Optimised day-to-day operations** to improve their impact on service levels (e.g. works order management system, preventive maintenance in CMMS, digitization of the customer journey, etc.) and reduce time wasted on low value-added actions (digitization of purchase requisitions, HR management, etc.);
- **A top management with a 360° vision of the water establishment** (integration of all information in the ERP, implementation of performance monitoring tools) enabling strategic planning and continuous improvement;
- **An organisation enabling this digital transformation** to be carried out (strengthening of the IT department, development of a digital strategy, etc.).

The ultimate goal is **to make NLWE a self-sustaining enterprise** using the digital tools and a modern organisation to ensure efficient processes in the utility. The target state has been suggested taking into consideration this vision.

Regarding this map, the main gap observed is in O&M process, on which to focus efforts in order to align with the level of digitization of other processes, and to improve their monitoring and performance.

It is especially true for **Operation management** due to lack of digital tracking and operation tools (CMMS, ERP inventory module, SCADA). The ERP is used and declined in the different departments through **customised modules centralising the data** that can be easily shared between the departments. However, despite the use of a powerful ERP in customer department, this maturity assessment focuses on the **digitisation of the customer journey**, still mainly paper-based, which explains the poor performance in this axis.

In order to be fully effective and resilient, this approach should rely on a **solid and advanced IT department** which is currently not the case. Moreover **infrastructure security** is not fully addressed by dedicated processes and staff.

Digital transformation roadmap

Based on the initial assessment and the target state previously defined, a **tailored 10-years action plan** was developed to guide NMLWE on the various steps to be implemented to pursue its digital transformation journey. The key actions of this strategy are the following:

- **Revision of the current organisation** to create a robust foundation for the WE's digital transformation: Digital strategy drafting, ICT department structuring, SCADA activities strengthening, etc;
- Progressively **implement a centralised SCADA system** in line with a Regional SCADA strategy, and **secure skilled internal and external human resource** to operate it. Overcome the current lack of visibility on basic indicators such as production volumes or energy consumption;
- **Implementation of a CMMS** to overcome the current lack of vision on O&M activities and to ensure sustainable asset management;
- **ERP enhancement** (creation of new modules, integration with other business software) to facilitate day-to-day operations and ensure integrated management of information from different business processes (O&M, sales, etc.).
- **Overall improvement of commercial management processes and of the customer experience by strengthening existing digital solutions** (CRM, customer database) and **introducing new ones** (e-payment, shared debt management dashboard within the districts, customer service portal, mobile application for on-the-field customer information update).

Specifically for NLWE, SEURECA recommends building on strengths and previous successful actions by :

- **Consolidating the success factors that enabled the implementation of the ERP financial modules**, with the very strong involvement of the department manager, who took ownership of both the issues and the objectives, as well as the operational deployment of the ERP solutions/modules with the support of USAID;
- **Adopting, streamlining and improving some of the working methods used in the Tripoli district**, which has partially succeeded by maintaining volume-based invoicing.

The **involvement of district managers in the digitalisation processes remains essential**. They may be primarily trained in the core ERP modules already deployed in the finance department (e.g. cash collection performance indicators, purchasing processes, etc.).

It is also essential to provide an **enabling environment for SCADA and metering ambitions**. SEURECA considers that remote metering as a part of NLWE's ambitions may seem too high

regarding the other challenges. At the very least, **remote metering must be the subject of a robust long-term financing plan and be sufficiently spread over time**.

The prioritisation of actions and their phasing over time have been designed as follows:

- **Actions that are necessary for BMLWE to reach a "competent" level of digital maturity** - i.e. to ensure a level of service that meets international standards - and those enabling rapid gains are considered to be carried out in the next few years **(2025-2029)**.
- **Complementary actions, which should enable performance gains but represent a major investment that is best spread out over time, or are less essential to the efficient day-to-day operation** of the water service, are considered to be carried out as a continuation of the previous actions, during the following years **(2030 - 2034)**.

The support of a 2-3 years **technical assistance project** is also highly recommended moving forward to support NLWE on different levels and help managing the transition:

- Guidance on initiating the various steps of the strategy;
- Support of international digital experts from the water business while NLWE recruits its own experts;
- Knowledge transfer and organised capacity building;
- Support on preparation of technical specification and tendering processes that may be required for the implementation of the various activities;
- Etc.

Necessary investments

The implementation of this ambitious transformation roadmap will require external financial support and the resources currently generated by the utility are not sufficient to self-finance the proposed improvement. Hence, SEURECA provided a quick estimate of the budgets related to each of the main initiatives proposed in order to assist NLWE in initiating discussions with its financial partners.

The budgets required for the action plan implementation includes:

- **CAPEX** which are mostly consultancies and procurement of hardware;
- **Yearly OPEX** which are mostly purchase of licences and additional maintenance costs due to the new equipment. *Please note that the cost of the works of NLWE internal staff is not included in the yearly OPEX estimates presented below.*

The necessary **CAPEX investments** for NLWE action plan implementation are up to **28,000 k$ (including 18,000 k$ for remote meter reading)**. The **yearly additional OPEX** associated with the implementation of the action suggested are up to **1,780 k$** (in 2034, considering that all actions have been implemented, this includes 860 k$ for remote meter reading).

The graph below presented the disbursements (OPEX and CAPEX) required during the next 10 years to implement the action plan.

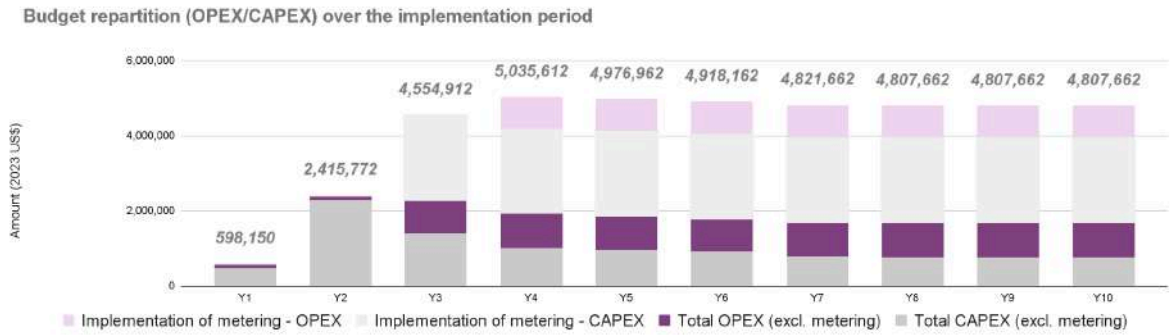


Figure 1: Action plan budget repartition over the 10-years implementation period

Between years 8 to 10, investments are planned to stabilise at 765 k$ for the finalisation of the extension of SCADA to all NLWE sites, with the additional yearly investment of 2,257 k$ related to the implementation of the remote meter readings.

The **most capital intensive actions** are:

- The extension of the SCADA to all NLWE's installations (following the feasibility study);
- The implementation of metering for large customers;
- The implementation of a CMMS;
- The campaigns of customer regularisation to update customer database;
- The implementation of the measures resulting from the audit of the Business Continuity Plan
- The update of the ERP.

Remote reading of water meters responds to an ambitious objective of the WE to achieve operational efficiency, high-quality service, and economic sustainability. However, there are important aspects to consider. Currently, less than 50% of customers are metered. A major issue is the problematic customer database and the lack of a robust updating process. The large number of meters will require significant operational expenses and skilled manpower, so that the deployment needs a very robust action plan and a previous cost/benefit analysis can be recommended to assess this option. **Intermediate solutions could be advised, such as deploying remote reading only in the Tripoli sector or deploying walk-by solutions that are less expensive and easier to operate.**

IMMEDIATE NEXT STEPS

Among all the actions identified, SEURECA strongly advises to begin with the ones identified below which offer quick-wins and are considered critical success factors of the Digital Transformation.

In order to create the ideal environment for NLWE's digital transformation, SEURECA recommends to start by implementing the re-organisation of the WE, the structuring of the IT department (roles, policies, etc.) and of the SCADA team (roles, strategy), the implementation of change management practices.

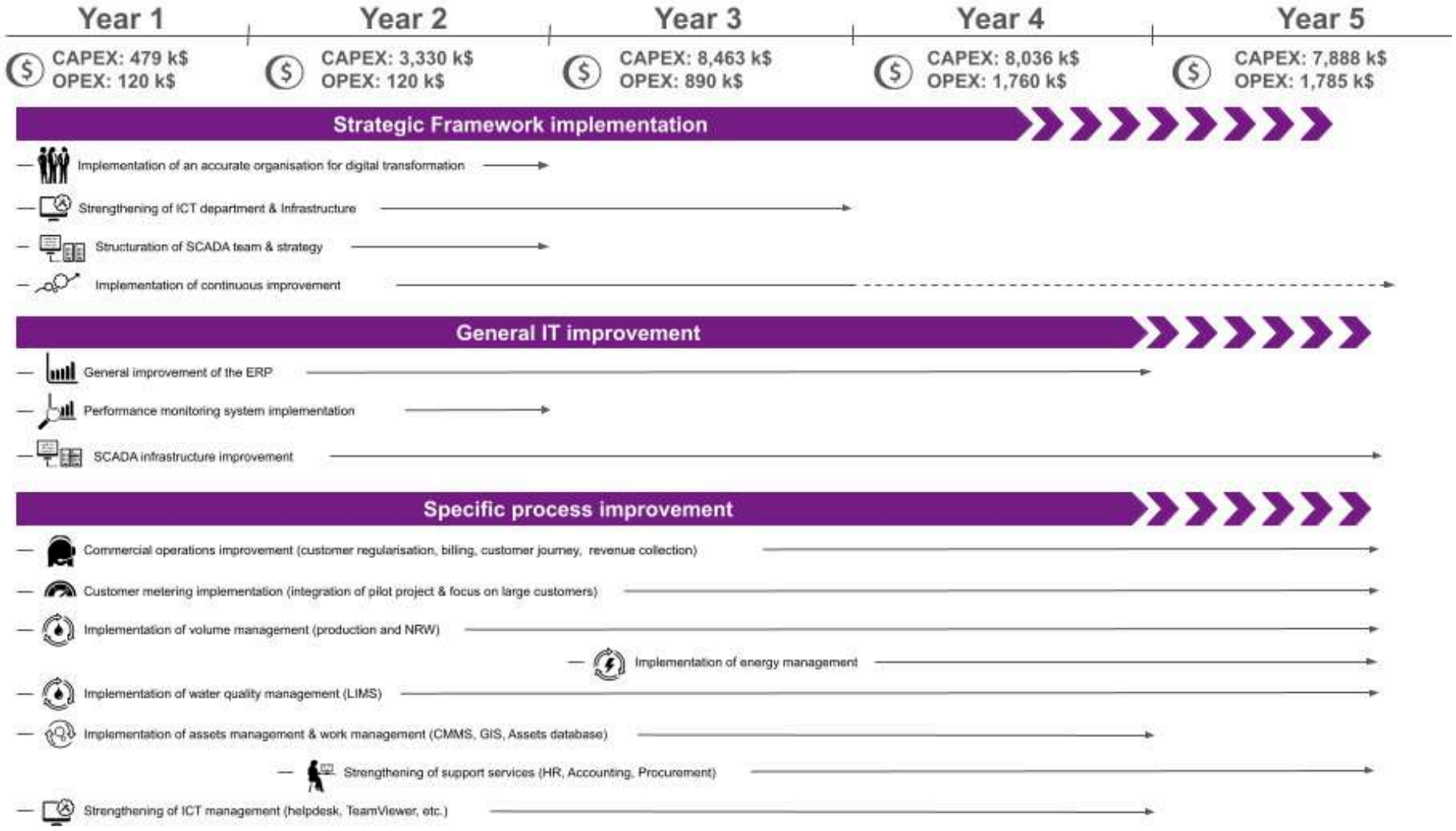
To provide a **framework for the contracting of external technical support and the purchase of software/hardware**, and to ensure that the **solutions are fully tailored to NLWE's needs**, SEURECA recommends to start by drafting an expression of needs for the ERP improvement

(e.g.technical specifications of the relevant modules), and a feasibility study to bring the SCADA back into service.

SEURECA recommends to **address the critical shortcomings observed in O&M** management, by structuring the overall O&M reporting (digital tools & procedures), carrying out an inventory of all assets of the WE, and launching the implementation of a CMMS, by developing the technical specifications in line with the assessment of the WE's needs.

Finally, SEURECA recommends **implementing the actions that could trigger quick wins for the service**, such as the database update, by carrying out field-surveys, but also by using the methods already in place to prevent illegal connections in Tripoli.

The figure below summarise the priority actions (short-term) of the digital transformation action plan:



1. Introduction

1.1. Context

AFD is implementing a Programme, fully funded by the European Union, entitled “Technical Assistance Programme to support reforms in the water and wastewater sector in Lebanon” which aims to strengthen the Lebanese stakeholders in their respective functions as service operators (through the Water Establishments) and tutelage (through the Ministry of Energy and Water) as well as to support institutional and sectoral dialogue.

We understand that, following the positive experience of supporting the South Lebanon Water establishment, AFD intends to support the **Beirut Mount-Lebanon Water Establishment** (BMLWE), the **Bekaa Water Establishment** (BWE), and the **North Lebanon Water Establishment** (NLWE) in improving their operational performance through a ***Digital Enterprise Transformation*** program. It will support the development process of the Water Establishments into self-sustaining enterprises that are adequately financed via an adequate tariff structure based on optimised business, engineering, operations, management, and financial principles.

To that purpose, and as part of the signed AFD framework contract for audit-diagnosis of water and wastewater services, SEURECA has therefore been tasked with the following objective:

- Carrying out, in close coordination with those 3 Water Establishments, a diagnosis of needs and prerequisites of their current digitalisation maturity level for each business process;
- Developing an action plan for the modernization and digitalisation of each Water Establishment's operations.

1.2. Objectives of the report

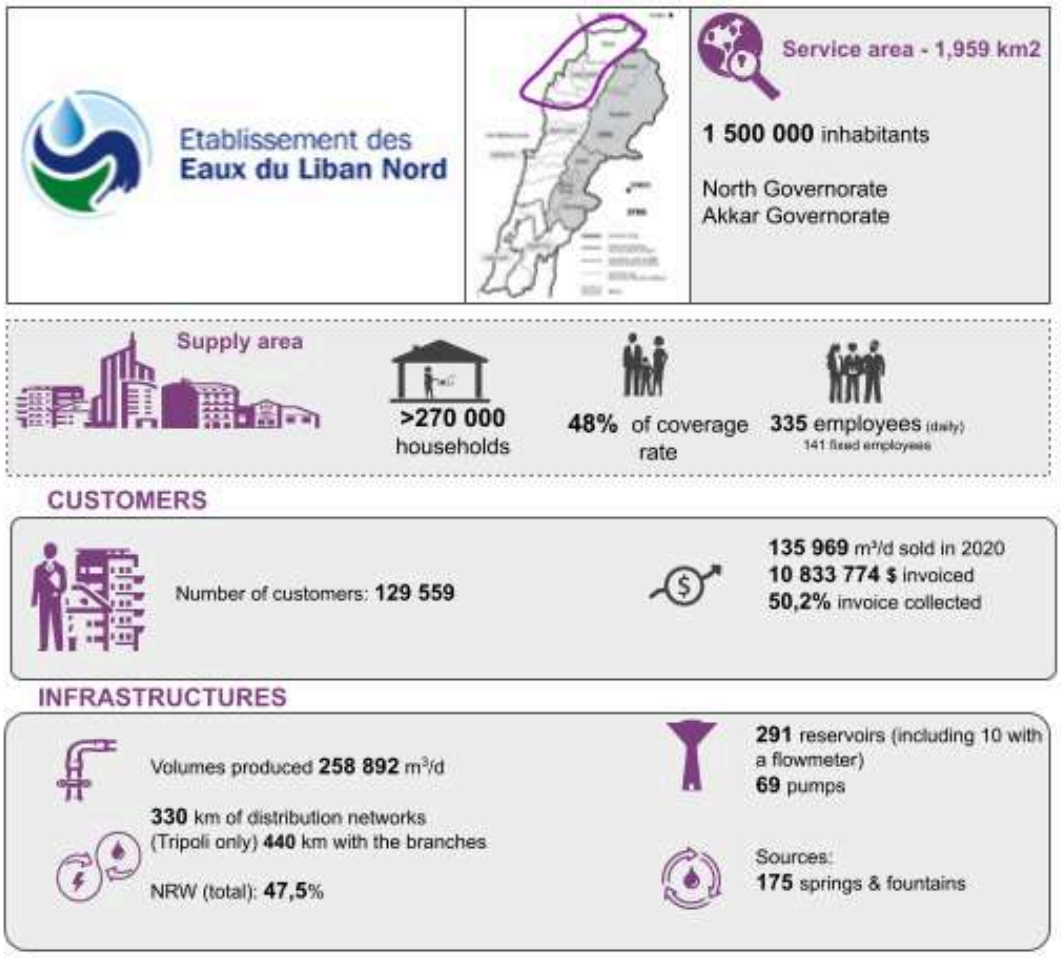
Based on the initial diagnostic mission, this report aims at **giving a vision of the current situation of NLWE in terms of Digital maturity**, that could **lay the foundations of the recommendations for Digital transformation of the utility**. To this end,

- it gives first an overview of the Digital maturity of the overall NLWE;
- then it focuses on each business process (IT, Customer management, O&M, etc) in order to provide more details on their organisation and Digital tools.

This report presents a **suggestion of target state at mid- and long-term**, based on the discussion with NLWE’s management at the end of the mission.

1.3. Overview of the NLWE

1.3.1. Main information on NLWE



1.3.2. NLWE's mandate & organisation

The creation of the North Lebanon Water Establishment (NLWE) in 2005 is a result of the merging of various water establishments.

NLWE is in charge of the Drinking Water and Wastewater operation and maintenance. It includes:

- the treatment plants (potable water and wastewater);
- the pumping station;
- the network (potable water and wastewater).

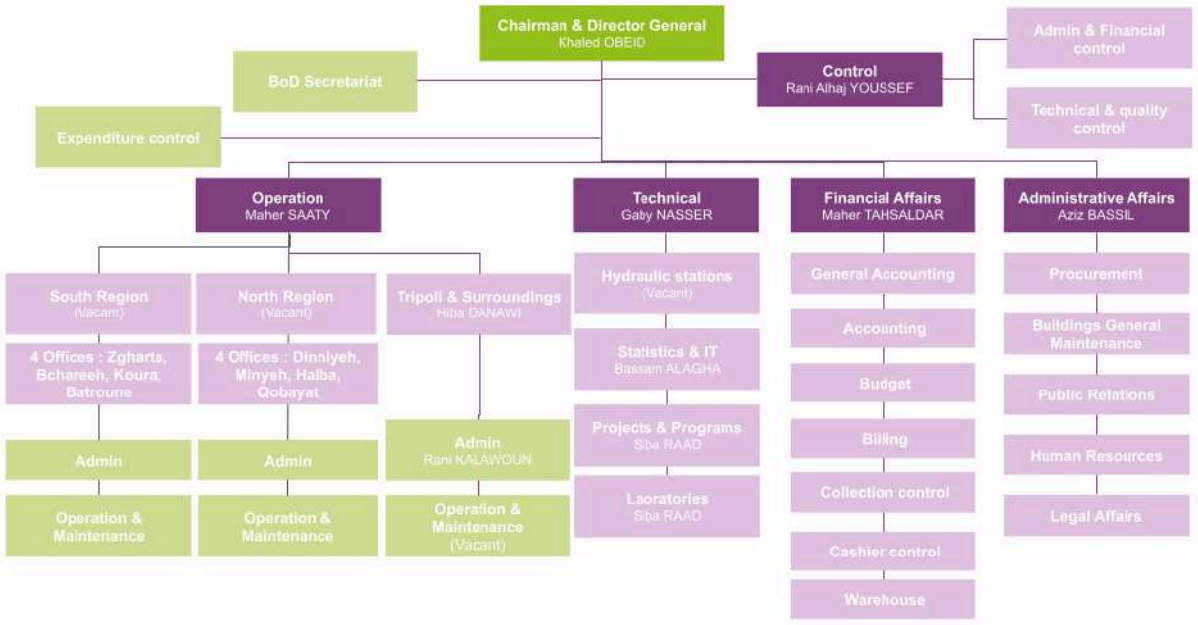


Figure 2*: Organisational chart of NLWE*

According to SEURECA's understanding, the organisation of NLWE is both geographical and functional.

Functional organisation: the departments are divided by function:

- The Operation Department is in charge of the O&M of the water and wastewater distribution network and customer management;
- The Technical Department is in charge of Projects management, O&M of stations and IT;
- The Department of Financial Affairs is in charge of finance & accounting, including billing and revenue collection overall monitoring;
- The Department of Administrative Affairs is in charge of HR management and legal affairs;
- The Department of Control is in charge of the administrative, financial, technical and quality control.

If all support services (finances, legal, HR) and Project & studies management are centralised, customer management and operations are managed mainly by the offices in the different branches.

Geographical organisation: The supply area of NLWE is divided into 9 districts grouped in 3 branches (South region, North region and Tripoli and surroundings). Each district has an office, and each office carries out:

- Customer management activities (front office, revenue collection, water connection installation & repairs, domestic water meters reading, etc.);
- O&M of the distribution network (opening and closing of sub-DMA valves for instance).

However there is no centralised directorate for customer management activities, which raises the question of the coordination of the commercial strategy of NLWE.

An Executive Committee has been set up to oversee NLWE's strategic vision. It is composed of the General Director and the heads of the Operations, Technical, Financial Affairs and Administrative Affairs departments.

It is worth highlighting that the maturity level varies significantly between Tripoli and the regional offices, with notable disparities.

Additionally, it is essential to emphasise that several positions within this organisation remain vacant to date.The current organisation is far from complete compared to what was envisioned in 2005:

- 1256 positions identified;
- 639 vacant positions (50.9%);
- 254 permanent positions filled, 370 temporary positions.

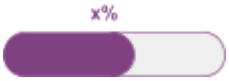
However, it is important to note that technical assistance is in progress to review the current organisation, by the Ministry of Energy and Water, and the AFD.

2. Focused diagnostic by business process

This chapter focuses on each business in order to provide a more detailed assessment of each one. The business processes corresponds to the main categories of activity of the WE, so they include various of its units, as presented below:

Business process	NLWE's units
IT management	IT
Operations & Maintenance	Stations
	Laboratories
	All distribution maintenance units
	Stores
Customer management	Customers
Financial & accounting	Administrative & Accounting
	Financial Accounting
	General Accounting
Administrative, legal, HR (incl. HSE/QMS)	Secretariat
	Human Resources
	Legal affairs & Transactions
	Control
Technical & Studies	Programs & studies
	Execution monitoring

Table 2: Business process repartition



In the detailed diagnosis described in the following paragraphs, the level of digitisation is assessed according to the criteria mentioned in the table below:

Oral only	Standardised forms and data collection in paper form	Sheet / Excel	Dedicated Software	Integrated software / links	Hypervision
					
(incl. phone...)	"Digitalisable" processes	(inc. standard database)	ex. GIS, CMMS, CC&B	ex. integrated ERP	Digitalisation from field to dashboard
0%	20%	40%	60%	80%	100%

Table 3: Digital scale

This diagnosis is carried out from a theoretical point of view, aimed at analysing the existence and capacity of the tools. However, it does not take into account the concept of user competence. This aspect of change management will be assessed in the Chapter 3 “Overall digital maturity diagnostic of NLWE”.

2.1. Diagnostic of the IT management business process

2.1.1. Mandate

The IT department is responsible for overseeing:

- The governance and strategy of the IT;
- the management of the IT projects;
- the management of the network and of the security;
- the management of the hardware and software;
- the data management;
- the user support (helpdesk);
- the management of vendors and suppliers;
- the disaster recovery and business continuity;
- the training and skill development on digital tools.

Furthermore, the IT team is part of the SCADA project, in charge of ensuring the server capacity, data transfer, etc (the main governance of the project is under the Operation, and covered in chapter 2.3).

Regarding the ERP, the IT team only installs the software on the computer but does not maintain it. It is completely maintained by the Finance department (3 persons). The development of the ERP is handled by an external specialist (DAI) financed by USAID.

2.1.2. Organisation

The IT unit is part of the Technical department. It is organised as shown below:

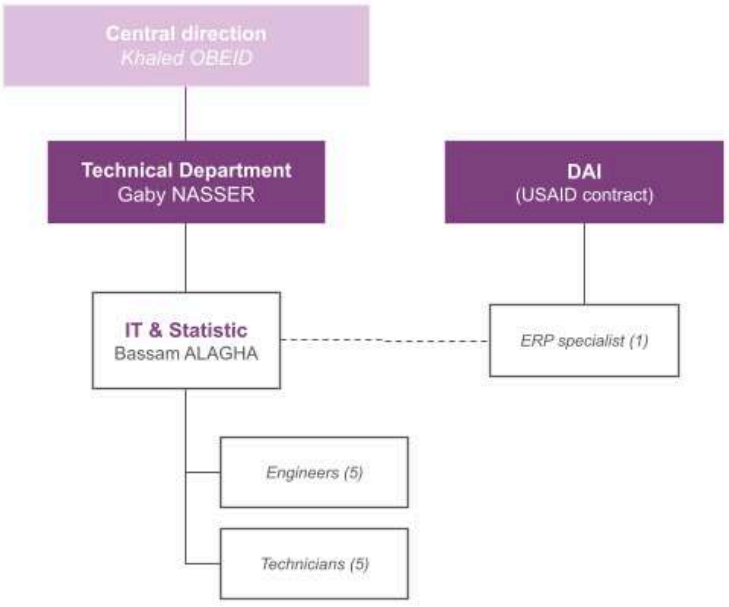


Figure 3*: Organisational chart of IT unit*

The team is composed of 5 people:

- 2 engineers: management, following all new systems, infrastructure;
- 3 technicals: helpdesk, maintenance, network maintenance, software installation and update.

An DAI external staff is commissioned by USAID for ERP management (business evolution, correction of bugs raised by NLWE ERP specialists), but mainly communicates directly with the finance department.

2.1.3. Assessment of sub-processes digitalisation status

Based on the interviews and on the on-the-job observations, an assessment of the digital tools used in each sub-processes was carried-out, as presented in the tables below, in order to identified the status of digitalisation of each one and the main shortcomings in the current situation:

Governance and strategic planning	
Tool	-
Users	Technical Department (IT unit)
Uses and Shortcomings ● There is no IT strategy nor digital roadmap. ● The IT policies do not exist.	
% of Digitalisation of the process	0%

Project management	
Tool	-
Users	Technical Department (IT unit)
Uses and Shortcomings ● Many IT projects are outsourced: the ERP is outsourced to DAI (an American company) by USAID, the customer app project is carried out by UNICEF… ● All IT-related projects are referred to the IT team to ensure the feasibility of integrating the tools into the servers, as well as the various interoperability constraints → interoperability principles have not yet been developed and it could be good practice to initiate at this stage. ● The IT team did not provide SEURECA with a list of all ongoing IT projects (ERP, etc. → The absence of such a list results in a lack of visibility, coordination, and an inability to prioritise efforts.	

Main IT projects known by the Unit:

- Remote readings (SCADA system) to simplify the monitoring and control of operation processes.
- Implementation of a MMS solution within the ERP to track interventions, operations and maintenance.
- Integrating ERP with GIS, to map customers and interventions.

% of Digitalisation of the process	0%

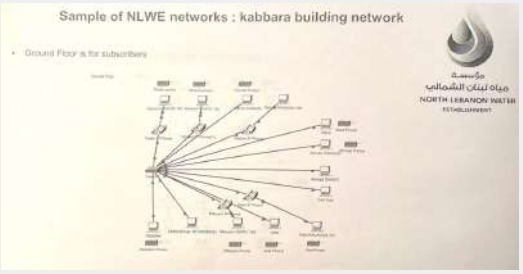
Network and security Management	
Tool	Firewalls, Sophos
Users	Technical Department (IT unit)

Uses and Shortcomings

Network management:

- All offices are connected to the Tripoli main office through iWAN.
- There are recurring problems with the internet connection in the second building in Tripoli, as access to the connection is via antenna installed on top of the buildings in 2017, but it does not work properly → the system needs to be changed to allow users in the second office to access their email/ERP addresses for their day-to-day tasks.
- The Internet speed is currently sufficient (10 MB), but only accessible for a few employees (managers and engineers) → if all employees were to have access to it, the speed would have to be 10 times higher (100 MB).
- A project is ongoing to connect all the offices, given that each one already has a LAN. If the connection had been reliable, the choice would have been for a Cloud solution.

Figure 4*: NLWE network representation*



Cybersecurity:

- Existence of an Active Directory controller (identity and access management service developed by Microsoft) → it is essential to ensure the security of NLWE's computers.
- Security policies are implemented such as domain password, antivirus and firewall rules, and restriction on employees' computers to prevent installation of unauthorised software.
- Only a limited number of employees have Internet access on their work computers (managers and engineers) → it limits the risks of hacking and fishing.
- No attacks have been identified yet, only viruses.

- Sophos firewall and antivirus still require to contact the vendor regarding the integration of new technologies. The system was replaced in July 2023 - thanks to USAID - and training was given to one of the employees to increase his skills, but he is not yet 100% autonomous.

Site security:

- CCTV is installed in the server room, and linked to NVR.
- In the branch offices, each camera has its own software.

% of Digitalisation of the process	

Hardware and Software Management - Asset Management	
Tool	Word
Users	Technical Department (IT unit)

Uses and Shortcomings

There is no budget allocated for the IT department, whereas an estimate of 24k$ has been made to cover hardware, licensing and maintenance costs. Most hardware and software is donated by NGOs → the first year of maintenance/licence is often covered by the NGO, but not the following years, which is problematic because it is then impossible to cover these costs.

Hardware:

- All hardwares is listed in a Word file, with the name of the users (cf Network documentation above), however there is no tracking of the valuation of IT assets in this file → this type of listing is not suitable for inventory-type monitoring; an Excel list would be more appropriate.
- All the hardware has been donated by USAID for the last 2 years (before that it was donated by UNICEF).
- Hardware maintenance is carried out by the IT teams, except where a maintenance contract is still running (e.g. on printers).

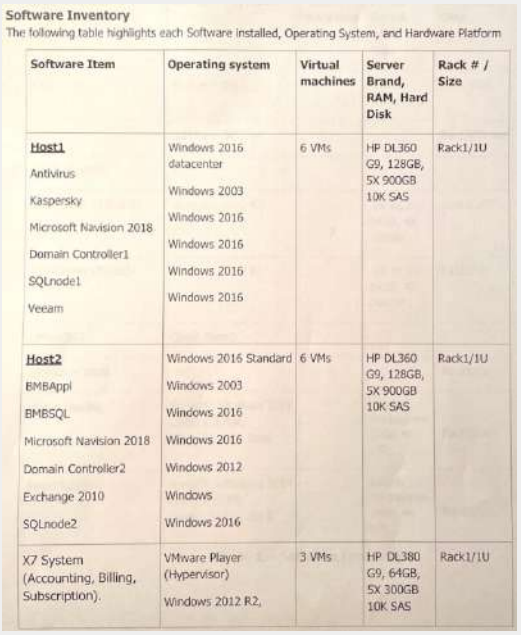
RESPONSIBLE & SUSTAINABLE DIGITAL

Best practice in responsible digital use encourages the **replacement of computers every 8 years** (minimum 5 years).
It is recommended to avoid mass renewal and segment the **renewal in tranches of 20% of the existing equipment**. It should be noted that hardware replacement should only be encouraged in the event of a failure and if repair is impossible.
Another good practice is to carry out a **complete update of the PC every year**, with cleaning etc. (when the employee is on holiday, for example), so that the hardware is up to date in terms of software, licences and security, while extending its lifespan as much as possible.

Software & Licences:

- The software is also listed in a World file (cf screenshot below) that details the localisation of their storage in the server → the format used (Word) to keep track of software is light

because it is limited (lack of structured data organisation and filtering capabilities, which makes it difficult to track and manage information effectively).



Software Inventory

The following table highlights each Software installed, Operating System, and Hardware Platform

Software Item	Operating system	Virtual machines	Server Brand, RAM, Hard Disk	Rack # / Size
Host1 Antivirus Kaspersky Microsoft Navision 2018 Domain Controller1 SQLnode1 Veeam	Windows 2016 datacenter Windows 2003 Windows 2016 Windows 2016 Windows 2016 Windows 2016	6 VMs	HP DL360 G9, 128GB, 5X 900GB 10K SAS	Rack1/1U
Host2 BMBAppl BMBSQL Microsoft Navision 2018 Domain Controller2 Exchange 2010 SQLnode2	Windows 2016 Standard Windows 2003 Windows 2016 Windows 2016 Windows 2012 Windows Windows 2016	6 VMs	HP DL360 G9, 128GB, 5X 900GB 10K SAS	Rack1/1U
X7 System (Accounting, Billing, Subscription).	VMware Player (Hypervisor) Windows 2012 R2,	3 VMs	HP DL380 G9, 64GB, 5X 300GB 10K SAS	Rack1/1U

Figure 5*: Existing software inventory*

Note that this software list is based on the server description and is not up to date anymore.

- The yearly licence cost is estimated at 14k$ (usually around 16% of the cost of the tool) → this amount, in dollars, became impossible to pay due to the inflation.
- Thus, most of the licences are paid by the NGOs covering only the first year. In the case of Microsoft 365, most of the employees do not have access to their email address anymore since the licence has not been paid.
- The software maintenance as user support, virtual machine management, software updates and patches, etc. is carried out by the IT teams, except for the ERP. Regarding the user support, refer to the User Support section for more details.

Servers management:

- Some digital tools, such as the ERP or the GIS, are hosted on local servers (located in Tripoli) and made available for all required staff in NLWE offices (see Figure 4 above).
- This service and infrastructure is managed by the IT department. Three server racks are installed in an air-conditioned room with backup batteries and gas based fire extinction system.
- The current server storage capacity is sufficient.
- The UPS service contract could not be renewed in 2023, as the contract was in Lebanese pounds, and the devaluation of the currency makes it unattractive for the supplier → it can have various impacts such as, no technical support or troubleshooting assistance which can imply an increase of the downtime, no maintenance which increase the risk of failure, and no more warranty. A new set of inverters with 18h autonomy batteries were purchased and installed which will allow work-around the UPS contract issue.

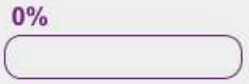
SEURECA has not found a list that allows tracking of existing hardware and software with user name → the lack of tracking inevitably has an impact on the efficiency of management and optimization.

% of Digitalisation of the process	30%

Data Management, documentation and SOPs	
Tool	-
Users	All NLWE staff

Uses and Shortcomings

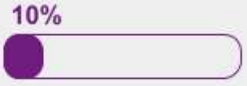
- There is no dedicated data governance.
- Data is either stored on the personal computer or in a shared folder on the servers.
- There is no documentation for the tools, either on paper or electronically on the server.
- There is no SOP corresponding to IT team operation.

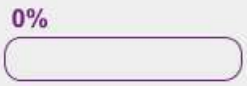
% of Digitalisation of the process	

User support	
Tool	Phone, email, TeamViewer, Whatsapp
Users	Technical Department (IT unit)

Uses and Shortcomings

- The IT team doesn't cover the support for the ERP (covered by the Finance team and USAID).
- The user with an issue can contact the IT team by phone (call or Whatsapp), by email or by letter (approximately 10 to 20 calls per day)
  → The helpdesk monitoring process is not formalised and everything is done verbally, which complicates the follow-up of resolutions and is detrimental to the team's efficiency. In addition, the lack of a structured system makes it difficult to analyse and improve performance.
- The IT team can take control of the computer remotely (through TeamViewer or TightVNC) or if it requires, the support teams travel to the sites and offices;
  → The fact that the IT team is centralised and that there is no help desk management tool has a real impact on the resolution time. In addition, it was mentioned that TeamViewer is not up to date, which represents a cybersecurity risk. Plus the current lack of gas makes the site travel complicated.
- To request the provision of a computer, the user needs to submit a written request, stamped by the hierarchy → the dematerialisation of the process and acceptance of the eSignature would accelerate the procedure.

% of Digitalisation of the process	

Vendor and supplier management	
Tool	-
Users	Technical Department (IT unit)
Uses and Shortcomings ● Communications to vendors and suppliers are made by emails or official letters. ● Contracts are handled by the procurement department.	
% of Digitalisation of the process	

Disaster Recovery and Business Continuity	
Tool	Veeam Backup & Replication 10
Users	Technical Department (IT unit)

Uses and Shortcomings

Disaster recovery:

- All servers and backups are currently located in the Tripoli building. A project is ongoing with USAID to deploy a Disaster Recovery plan.

Backups:

- **Daily**: Veeam Backup & Replication 10 is widely used, but it does not perform incremental backups. Instead, it overwrites the data, resulting in only one day's worth of recorded backups.
  Thus, every day, a full backup is scheduled in the afternoon automatically.
  All software, including ERP and SCADA, are backed up with Veeam software. These backups include the databases.
  The team verifies daily that the backup data is complete.
- **Weekly**: Every week, an external backup is created (including SQL and ERP) as a precaution in case the daily backup becomes corrupted.
  The external backup process takes approximately 2 hours and is performed solely by the IT manager. There is no specific day scheduled for the backup, and it can be done using the phone (through the TeamViewer app).
- **Monthly**: Every month an external backup is made for the ERP and servers in case the daily and weekly backups are corrupted.
- **Yearly**: Every year an external backup is made for the ERP and servers in case the daily, weekly and monthly backups are corrupted.

% of Digitalisation of the process	

Training and Skill Development (on digitals tools)	
Tool	-
Users	All NLWE staff
Uses and Shortcomings ● ERP specialists had a light training at the time of deployment, but the skills development was self-taught. There was no training on the ERP backend, which made the team dependent on the DAI ERP expert. ● No eTraining available. ● Training guides are not stored on the server → keeping these user guides in a common area would allow employees to have detailed documentation to refer to, whether in the event of a problem or in the case of a new arrival.	
% of Digitalisation of the process	0%

2.1.4. Summary

The digitization assessment of sub-processes can be summarised as shown below. It is important to note that this representation does not define digital maturity, but it contributes to the overall understanding of the role of digitalization in the business.

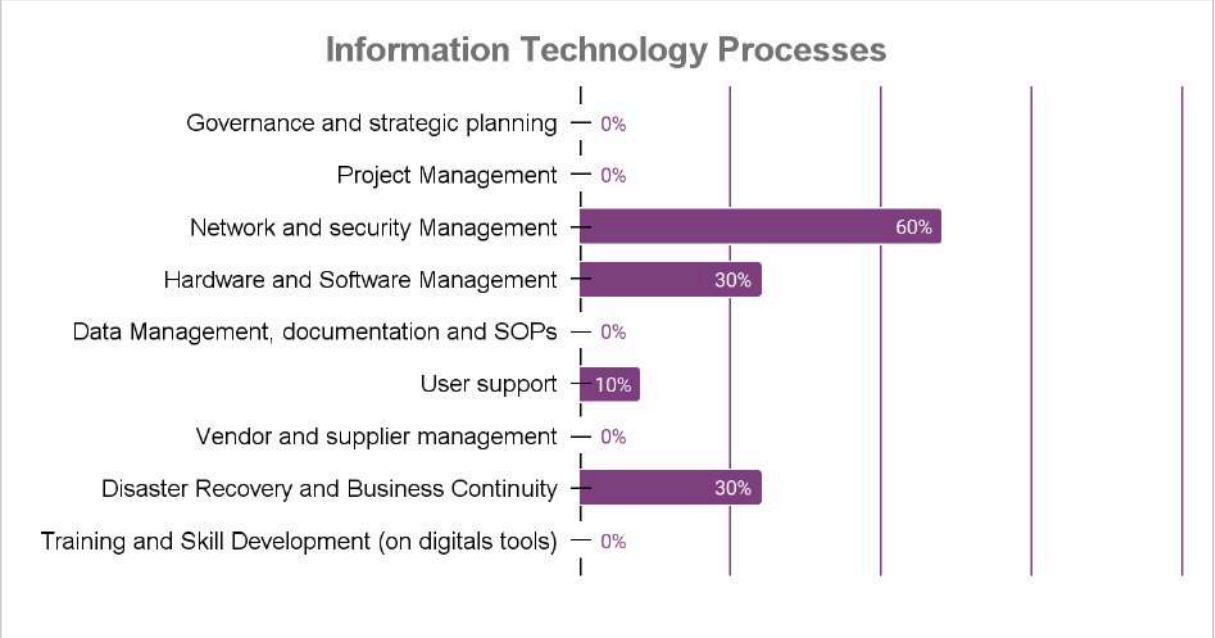


Figure 6*: Digitalisation overview of the IT subprocesses*

2.1.5. Main shortcomings identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the diagnostic performed at a department/unit level:

Strengths	Weaknesses
• Use of TeamViewer/TightVNC (solve 60% of the users issues); • Strong financial contribution of USAID (software, licences, hardware, training…); • Hardware in good condition; • Appetite for new technologies; • External experts (DAI for the ERP).	• Lack of overall documentation (SOPs, training, user manual…); • IT project management within the WE is not the subject of mission statements / roadmaps / formalised steering; • Connection between the 2 buildings in Tripoli is unstable; • Unavailability of computers and internet connection to most employees (only for manager and engineers).
Opportunities	**Threats**
• On going project for a second datacenter in a different location to provide consistency and continuity of work and a backup as part of risk management plan.	• The centralization of the IT service makes it difficult to ensure the helpdesk has it required to go on field (lack of gas for the cars); • Residual duration of USAID support is not properly established; • All licences, maintenance & support fees are in USD and hard to handle due to the economic crisis and LBP inflation (WAN connection, mobile app subscription, web development and hosting, UPS maintenance, photocopier maintenance…); • TeamViewer is an old version which is not secured.

2.1.6. Main recommendations

The diagnosis of the level of digitalisation of the process has led to a number of recommendations, categorised as:

- “organisation”: reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- “skills”: training to be provided;
- “tools”: need for new software or hardware, licences, software improvements, etc;
- “processes”: formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Organisation	Appoint an IT resource responsible to track the different IT project	1
Skills	Improve the tool usage by sharing with the end users all the tool documentation (ERP…)	1
	Strengthen the cybersecurity awareness by providing training to employees using computers	1
Tools	Organise the helpdesk by creating a module in the ERP to track the requests/intervention of the team	2
	Update TeamViewer for a more secure connection	1
	Improve the connection for the second building in Tripoli	1
	Pay the Microsoft 365 licence to restore access to employee emails	1
	Provide computers with an internet connection for relevant employees (especially in the branches)	1
Processes	Create a list to track the existing software, with the version, number of licence, usernames and rights	1
	Create a list to track the existing hardware, with the date of installation, last update, and usernames	1
	Create a list to track the ongoing projects, with the description of the objective, the key contacts, the CAPEX, the OPEX, the delivery date and progress.	1
	Streamline the management of IT assets: it is recommended to integrate them into an asset management module within the ERP system	2
	Create SOPs for all processes (helpdesk, disaster recovery…)	1 to 2
	Create a renewal plan for hardware (every 4 years has been mentioned but need to be challenged to follow the Responsible and Sustainable Digital best practices)	1
	Initiate interoperability principles	2
	Perform of a cybersecurity audit	2
	Create the missing IT policies (eg Security Awareness and Training Policy, Remote Access Policy, Data Protection and Privacy Policy, Password policy…)	2
	Encourage NGOs to cover OPEX in their project proposals,	1

	or refuse projects that do not have the necessary OPEX funding	
	Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule	1

Table 4: List of IT management business process recommendations

2.2. Diagnostic of the Operations & Maintenance business process

2.2.1. Mandate

The operation and maintenance of technical facilities (production, distribution and wastewater treatment facilities) are carried out by 2 departments:

- The **Technical Department,** in charge of the main Water Treatment Plants and main Pumping stations;
- The **"Investments" department (for the sake of clarity, we will refer to as "Operations" in this report)**, which includes the main activities relating to technical interventions in the customer area, in charge of the smaller pumping stations and of the network.

The two departments cooperate on a daily basis.

This organisation is partly due to the history of the formation of the water establishments, which merged in 2005. The Tripoli region's utility was operated until 2007 under a delegated contract (ONDEO-Degrémont), whose staff and methods were transferred to WE.

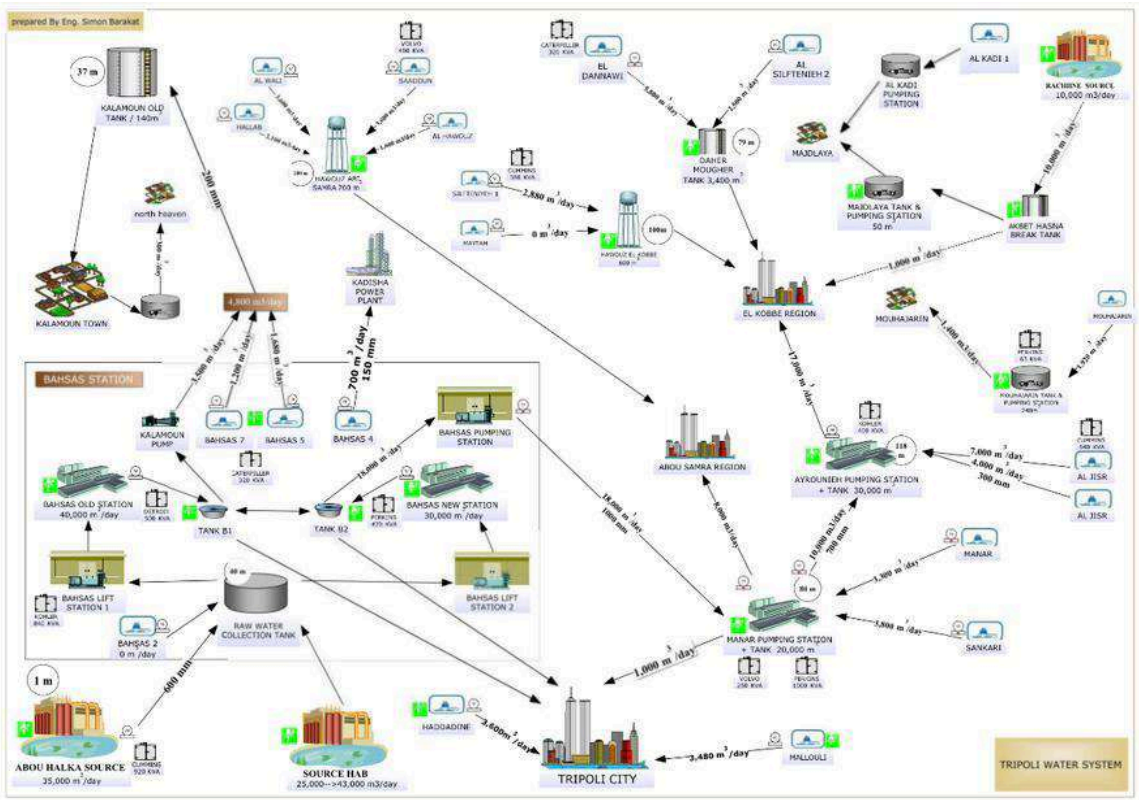


Figure 7*: Drinking water supply main installation for the Tripoli region*

The main tasks of the **Technical Department** are:

- Operation and maintenance of Water Treatment Plant in Tripoli Region;
- Operation and maintenance of Pumping Stations in Tripoli Region;
- Operation and maintenance of Tanks in Tripoli Region;
- Water quality monitoring (laboratories).

Figure 8*: Tripoli Water Treatment Plant*

This department is also in charge of 9 laboratories and monitors the water quality of the whole establishment. It is also responsible for the IT and Statistics unit and the Projects unit (previously addressed in the Chapter 2.1. “Diagnostic of the IT management process”).

The **Operation Department** has a total of 217 permanent employees and 350 contract workers ("daily workers"), with the Tripoli branch having a total of 42 employees. The department employs a diverse workforce, comprising both permanent employees on long-term contracts and contract workers hired for specific projects or periods.

The main tasks of the Operation Department are:

- Operation and maintenance of AG Assets, except for the Tripoli Region. The assets are mainly composed of wells and tanks,
- Operation and maintenance of UG Assets (networks): leak repair, construction of new connections…,
- Warehouses are under control of the financial department,
- Technical intervention in customer area such as:
    - Meter reading
    - New meter installation
    - Cash collection
    - Illegal connection tracking
    - New customer registration incl. technical survey…

Except Tripoli and Batroun city, most areas use sequenced supply.

Sewerage systems:

The wastewater treatment facilities have been transferred back to the establishment. To date, there is no department or staff dedicated to their operation.

2.2.2. Organisation

Those departments report to the General Director. There are organised as shown below:

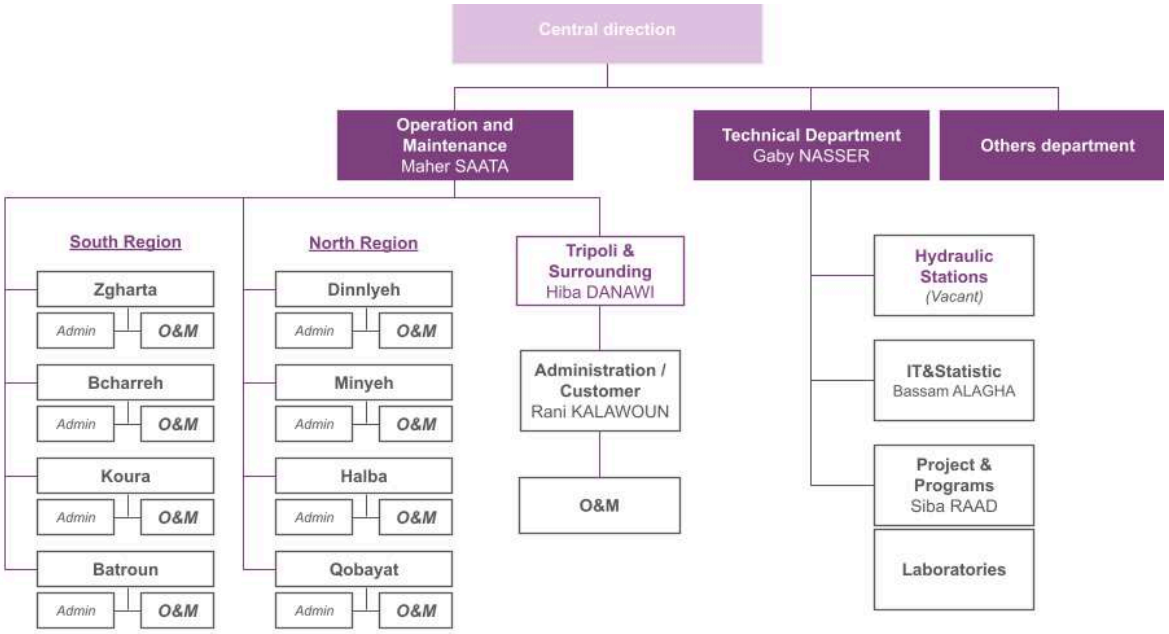


Figure 9*: Organisational chart of the departments involved in Operations & Maintenance*

Organisation shortcoming

The existing organisation was implanted in 2005 and has not changed since then. Until 2007, the Tripoli Water Utility had been operated under a delegated contract with the private company ONDEO-Degrément (Suez group). There are still major organisational differences and very different levels of maturity between the various offices.

As the digital development of each region is also dependent on support services from Top management and IT and Finance departments, a coherent organisation of the WE should improve the development of IT Projects.

2.2.3. Assessment of sub-processes digitalisation status

During the on-site mission, SEURECA took a closer look at the Batroun and Tripoli sites (2 offices over the 9). The main findings described below are based on the interviews led on these 2 sites.

For the Batroun office, the following specific features emerged:

- The number of dedicated staff has fallen from 77 in 2009 to 65 in 2023, while the number of customers almost doubled to reach 14,000.
- Of the 65 staff, 57 are dedicated to technical operations.

Based on the interviews and on the on-the-job observations, an assessment of the digital tools used in each sub-processes was carried-out, as presented in the tables below, in order to identified the status of digitalisation of each one and the main shortcomings in the current situation:

Manage work tasks - Above Ground Assets / Water Treatment Plant	
Tool	None
Users	-
Uses and Shortcomings **The tasks to be carried out are communicated exclusively by telephone**. The team leader collects these tasks and dispatches them on a daily basis according to human and material requirements. There is an intervention register on the sites, but the information is not consolidated in a tool. There is no preventive maintenance. No paper culture for installation rounds, oral communication is generalised. Thus, there is no history kept regarding the assets. In the treatment plants, the production figures are accurate; however, in the secondary wells, they are approximate due to the absence of meters for each well. Tripoli is an exception, as meters exist and are read daily. Every month, a report on the volume of production is received. Analysis and water sampling schedules are drawn up (see Laboratory management below).	
% of Digitalisation of the process	0%

Manage work tasks - Underground Assets	
Tool	GIS Arcview
Users	GIS Technician (Technical Department) Meter reader (Operation Tripoli) Illegal Connection surveys (Operation Tripoli)

Uses and Shortcomings

Asset description:

- **The GIS database is regularly updated**
- **Tripoli is the only region using GIS. There is no plan (even paper form) for other offices.**
- Existence of an AG Asset layer with “conditions” (obsolete or not) but not updated since 2018 (data from master plan)

Interventions:

- Leaks/interventions are triggered by telephone (oral culture),
- New connections are registered, initially in paper format,
- The local manager (which belongs to the operation department) reports monthly to the GIS Department (paper form) on leaks and new connections,
- The GIS Department (which belongs to the Technical department) registers **leaks and new connections into the GIS** on a monthly basis.

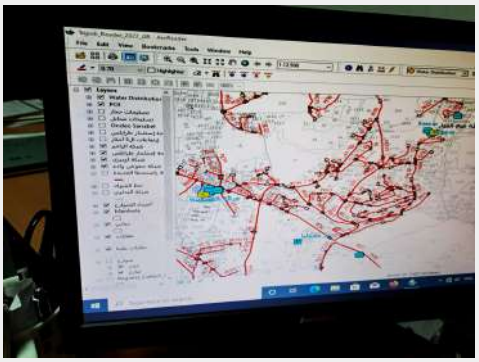


Figure 10*: NLWE existing GIS interface*

Maintenance Program:

- Although the high level of information set up in GIS, the WE does not carry out an asset management program,
- A layer of meter reading zone exists and is well maintained.

Only one person is dedicated to GIS. The GIS technician trained an additional person who left the company.

The version of GIS has not been updated since 2021 due to the fact that the licence has expired (lack of budget).

% of Digitalisation of the process	50% for Tripoli 0% For the other offices

Alarm Management	
Tool	None
Users	-

Uses and Shortcomings

Apart from alerts coming directly from customers, there is no system to alert the operation staff of any malfunction or failure impacting the operation.

Refer to Chapter 2.3. “Focus on SCADA” for more details

% of Digitalisation of the process	0%

Manage stocks & warehouse	
Tool	ERP Microsoft Dynamics NAV 2016
Users	Finance Department

Uses and Shortcomings

When a part is needed, it is usually given to the intervention team immediately. The update of stock inventories is carried out retrospectively and includes:

- A part request is issued with a standard paper form;
- The form is submitted to the hierarchy, Finance department and Head of the establishment;
- After validation, the stock status is updated in the ERP (output) by a specific person from the Finance department;
- The Operation department is in charge of regular inventory. The ERP update database is made by the Financial department.

When the part requested requires a financial contribution from the customer (e.g. new connection), the work will only be started once payment and the necessary administrative documents have been received by the WE.

The paper circuit remains completely in place despite the possibility offered by the ERP. This could be explained by the following:

- Access to the ERP is not systematised within the offices, particularly within the operations teams;
- The retention of forms signed by management is maintained.

The process for restocking the warehouse by purchasing from suppliers is described in Chapter 2.6 “Administrative, HR and Procurement business process”.

% of Digitalisation of the process	20% Traceability of stock is ensured by the ERP which enables the full digitalisation of the process. However, use in the field remains very low or non-existent.

Monitor energy consumption	
Tool	-
Users	-

Uses and Shortcomings

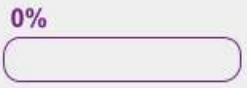
Energy consumption is not monitored (neither daily, nor yearly). The energy supply meters are not accessible as the supplier installed them in a locked room to avoid vandalism.

Consumption is only known at the reception of the invoice from the energy supplier. There is no possibility of physically checking the meter.

The finance department carries out a consistency check by calculating the ratio Wh/m3 pumped or produced to validate the billing of energy consumed.

Note that because of the financial crisis, electricity bills are not being honoured.

The NLWE representatives have expressed the wish to be able to report the kWh consumed and the cubic meters pumped to the ERP system via the SCADA system.

% of Digitalisation of the process	

Water quality Monitoring / Laboratory information management system	
Tool	Excel
Users	Laboratories (Technical Department)

Uses and Shortcomings

In NLWE, there are 9 laboratories (1 per office) including the central one in Tripoli (12 lab technicians + 6 sampling technicians). Daily tests are carried out, based on an existing sampling planning, and adjust operation parameters when necessary (e.g. chlorination). There are around 20 samples taken on the network everyday.

Monthly reports from each lab are sent to the head office(Siba Raad). Excel files is used to report the lab results and stock of reagents. The files are sent by CD or e-mail (as the internet is not always available). The written daily sheet is considered as the “original” and is archived and used in case of problem.

In case of deviation, a fax or e-mail is sent to the Head of laboratories. Branch lab technicians know which sampling technician to contact in order to sample more points (no written procedure).

Staff sometimes use Whatsapp groups for team exchanges.

The list below summarises the Functionalities for a future LIMS, identified by the staff in charge of

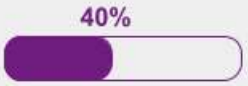
water quality:

- real time update of all labs data;
- backup of data;
- GIS link to see sampling point directly on the network;
- visualisation of results compare to thresholds;
- production of reports for an EXCOM level analysis (because daily and monthly reports are very technical).

They identified a technology for an on-pipe analyser, to get the data directly on a platform/futur SCADA (Flow cytometry).

Currently, the head of Labs only checks the ERP to attendance data (from the hand punch machines).

Procurement of lab equipment and reagent is done via procurement sheets (on paper).

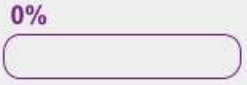
% of Digitalisation of the process	

Monitor network performance	
Tool	-
Users	-

Uses and Shortcomings

The performance of the network is in theory assessed by regularly calculating the volumes distributed and invoiced. In a more detailed approach, the volumes pumped by sector and the effect of leak repairs on the volume introduced need to be monitored and analysed.

Although the volumes produced are identified in the field and leaks are traced in the GIS, NLWE does not have a shared system for assessing the performance of its networks.

% of Digitalisation of the process	

2.2.4. Summary

The digitization assessment of sub-processes can be summarised as shown below . It is important to note that this representation does not define digital maturity, but it contributes to the overall understanding of the role of digitalization in the business.

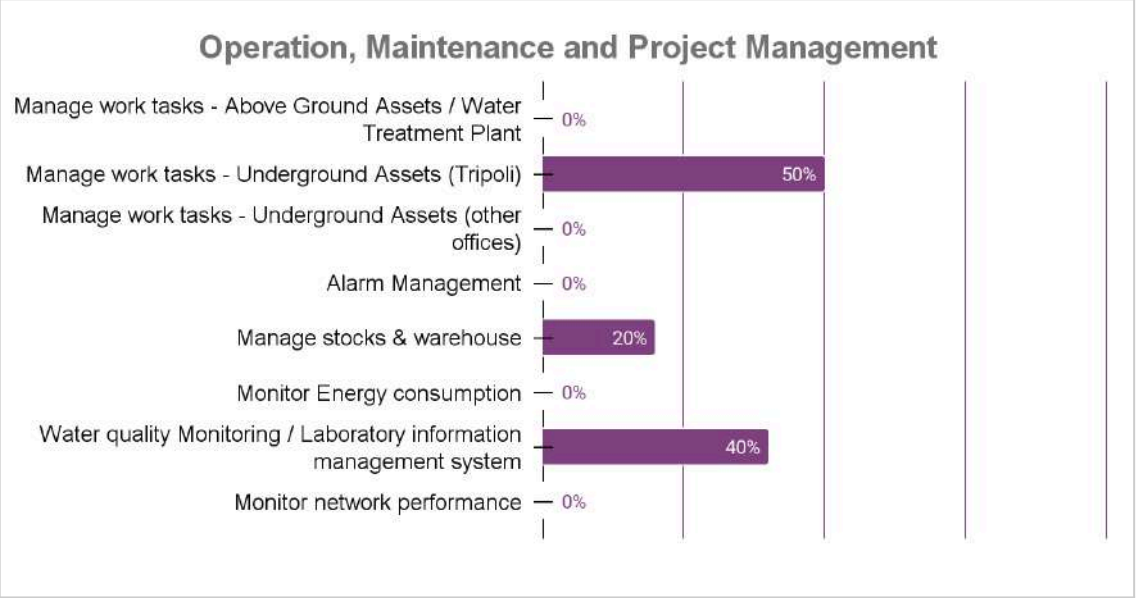


Figure 11*: Digitalisation overview of the Operation subprocesses*

2.2.5. Main shortcomings identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the diagnostic performed at a department/unit level:

Strengths	Weaknesses
• High Quality of GIS Data (Tripoli only); • Staff commitment; • Traceability culture regarding the water quality management (regular reporting).	• No preventive maintenance at all, no digitised process; • No updated inventory of AG Assets; • No asset lifecycle monitoring (even in paper form); • Lack of SOPs.
Opportunities	**Threats**
• Constant evolution and development of ERP modules with the regular support of USAID; • Strong will from the Head of Department to get a tool to track the maintenance.	• No consideration to GIS except as a database (not an operation tool); • Huge gap between Tripoli and other offices; • The mobilisation required to integrate sanitation facilities could interfere with the implementation of digitalisation measures.

2.2.6. Main recommendations

The diagnosis of the level of digitalisation of the process has led to a number of recommendations, categorised as:

- “organisation”: reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- “skills”: training to be provided;
- “tools”: need for new software or hardware, licences, software improvements, etc;
- “processes”: formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Organisation	Make organisational adjustments to limit the difference between the Tripoli and non-Tripoli processes - for example: assign all the administrative centres to the same person, while maintaining the geographical division	1
	Complete an operational and digital assessment of the future sanitation department recently integrated into the WE	1
Skills	Strengthen the digital culture (training), with priority given to district operations teams	1
Tools	Install remote reading of electricity meters for regular reading	1
	Upgrade GIS Licence	1
	Implement a CMMS module within the ERP (as it has been done in SLWE)	2
	Develop a mobile application to register the operation related to the assets.	2
Processes	Implement a reporting culture by requiring regular reports on operations: daily production, etc.	1
	Integrate the GIS in the daily activities (meter reading, maintenance, operation…)	1
	Make an inventory of mandatory procedures (e.g. parts management) and remove superfluous paper circuits	2
	Implement a minimal culture of traceability (e.g. excel form on a shared drive) for: - Asset inventory;	1

	- Asset logs; - ...	
	(common to all departments) Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule	1

Table 5: List of O&M business process recommendations

2.3. Focus on SCADA

In parallel to the digital assessment of NLWE, a focus on the SCADA has been done on the utility. This diagnosis covers the functionalities Control, Data Acquisition and Supervision of infrastructures, while taking into account the operational and IT contexts.

After an introduction on the key notions of this technical field, the current SCADA team organisation and processes are presented and reviewed.

2.3.1. Introduction and Mandate

The Supervisory control and data acquisition (SCADA) is a system of software and hardware elements that allows industrial organisations to:

- Control industrial processes locally or at remote locations;
- Monitor, gather, and process real-time data;
- Directly interact with devices such as sensors, valves, pumps, motors, and more through; human-machine interface (HMI) software;
- Record events into a log file.

The SCADA system is crucial for water utilities to improve or maintain operation efficiency by processing data for smarter decisions, and communicating system issues to help mitigate downtime.

The figure below provides an overview of the different functional and application levels of information systems dedicated to any Water utility operations as presented by the International Standard Approach ISA-95. The ISA95 is used to develop an automated interface between business and control systems. This standard was initially developed for global manufacturers and aims to provide a consistent terminology used as a foundation for supplier and manufacturer communications, while providing consistent information and operational models.There are 5 main hierarchical levels:

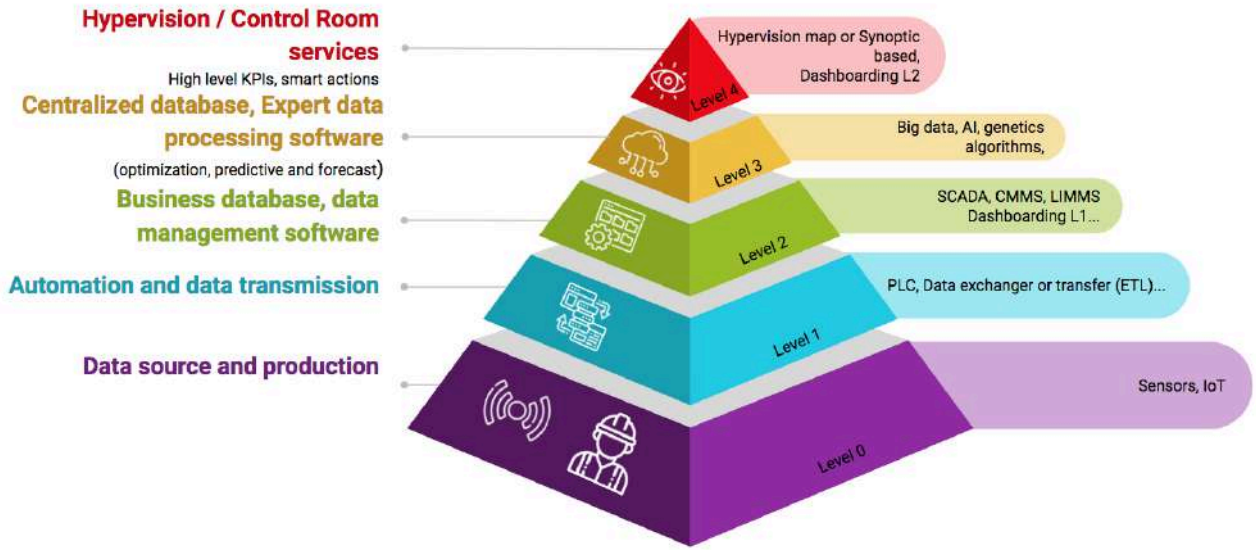


Figure 12: *Computer Integrated Manufacturing (CIM) Approach (ISA-95)*

Data is generated from level 0 (instrumentation, sensors, etc.) and processed by successive higher functional levels in order to support operational decision-making.

The levels referred to are:

- **Level 0:** Sensors and physico-chemical analysers, directly interfaced with the process which provide the exchange of information with the equipment installed on Level 1;
- **Level 1:** Programmable Logic Controllers (PLCs), Control Process Units (CPUs), Operator terminals, local supervision software, which ensure the operation of different functional process units;
- **Level 2:** SCADA System - Centralised supervision system that ensures monitoring, supervisory control and piloting of the whole installation of a production and its remote structures, through a HMI (Human Machine Interface);
- **Level 3:** It is composed of the Manufacturing Execution System (MES), archiving systems, support of resources and production optimization systems (historian, reporting tools, etc.) and links the corporate IT systems and the control systems (levels 1 & 2);
- **Level 4:** Enterprise Resource Planning (ERP) that manages the overall functions of the enterprise. This level is also named “Hypervision”.

2.3.1.1. Operation Technology (OT)

SCADA is classified as part of the Industrial Control System (ICS) in the Operational Technology domain as opposed to Information Technology (IT) domain. The Industrial internet of thing (IioT) is in between the two domains with the Industrial internet of thing is a subdivision of the IoT within the OT.

While the two domains shared common technologies and equipment, their purposes differ:

- OT has to ensure the operation continuity of the production tool. Especially in water utilities where any stoppage in production could lead to water outage. The OT must also ensure the safety of people and property during their work;
- IT, on the other hand, aims to centralise data and processes and ensure their protection.

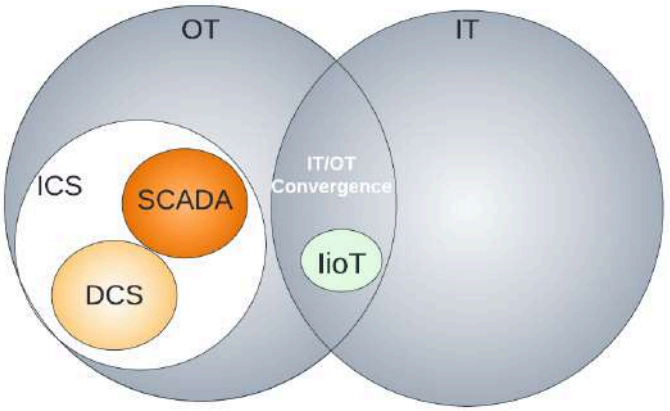


Figure 13: SCADA, ICS, OT, IT

2.3.1.2. IT/OT Convergence

Water Utilities are always looking to improve efficiency and effectiveness by converging, or at least linking, their technical and information systems. The difficulties inherent in such a strategy include governance, management of connected equipment, cyber security, data sharing, etc. In addition to these "technical" challenges, the main issue to overcome is the sharing of common objectives and the understanding of the respective constraints between OT and IT.

To achieve this convergence, companies are increasingly adopting a wide range of technologies. These include: Ethernet IP or WiFi networks, system virtualisation, client/server architectures, ETL (Extract Transform Load) type tools, and more recently the Cloud, Big Data, IoT objects, LPWAN networks, augmented reality or Machine Learning. Industrial computing technologies are also increasingly being adopted, with communication protocols promoting interoperability between IT and OT systems, such as OPC-UA based on the principles of web services.

IT/OT convergence is one of the pillars necessary for the development of Industry 4.0, also called Factory 4.0, is an industry augmented by new strategic approaches driven by new technologies.

The core of Industry 4.0 is inter-system connectivity, such as OT and IT. In this new industry, different systems and processes communicate with each other. Many technologies support the exchange of information, and one of the main ones is the Internet of Things.

A mobile approach allows you information from mobile terminals (smartphones etc.) to be used in responding to the challenges of field interventions. It also provides operatives with much better information (complete, precise and up to date) to make their work more efficient and effective.

The establishment of an integrated information system, between IT and OT, but also within IT, allows the future development of CIM level 3 and 4 expert systems (see figure 14). This requires strict compliance with cybersecurity rules right from the initial design of the systems.

2.3.1.3. Purpose of a SCADA team

A SCADA team is in charge of maintaining and improving the SCADA system, including the instrumentation. It is primarily related to Operation and Maintenance activities. Also, part of the SCADA infrastructure can be linked or even put in common with IT processes, mainly server hosting and communications networks. Therefore SCADA responsibilities can be shared between Operations and IT.

2.3.2. Organisation of NLWE regarding SCADA

2.3.2.1. Equipment Available

SCADA equipment for NLWE has been developed heterogeneously across the region. As per the ISA-95 approach detailed above, NLWE partly covers the 3 three level of CIM related to SCADA:

- **Level 0**: Actuators are available on facilities with digital sensors available on very few sites. This lack of sensors was identified as a blocking point for supervision;
- **Level 1**: Most of the facilities do not have PLCs, or are equipped with PLCs that are not fully operating due to the lack of Level 0 information. Among the few sites visited, the PLC visible were from the Modicon TSX Premium Series (Schneider Electric). Masafi WTP is the only facility equipped with a local Supervision, with no controls available from the interface.
- **Level 2**: No centralised supervision available, and it was identified as a major need for operations.

A large part of SCADA equipment available on the perimeter of NLWE, was installed by external contractors, often funded by donors and following different guidelines. Therefore the whole region lacks consistency in terms of material used. Though only Schneider Electric equipment were found during visits. NLWE Management declares that there is equipment from many different providers, and a specific inventory should be made to identify all of it.

Since there is very few control equipment installed and no inter-site communication for SCADA topics, the cybersecurity issues are limited to local on-site attacks.

2.3.2.2. Team organisation and skills

NLWE has no designated SCADA team. Process automation and supervision is dedicated to operational works, and is relying on hardware, software and communication networks. NLWE Management views the future SCADA team as part of the Operation (network) and Technical (plants and IT Unit) departments.

As the SCADA equipment was installed by external contractors, there is no engineer or technician in the NLWE capable of performing maintenance on SCADA. The topic is mainly managed by the Technical Director and Head of IT Unit.

As part of an initiative to address SCADA topics internally, three engineers of the IT unit (among which two are still working at NLWE) were trained by Schneider Electric to access and modify the PLC program of their material. They have not practised on their own system since the training.

Discussions with operators on sites have shown that they have a good understanding of electrical topics, and are used to check power cabinets in case of malfunction. However, it is not the case for the control cabinets.

2.3.2.3. Current control methods

The main issue identified by NLWE is the possibility of maintenance of PLCs.

The first major issue is that none of the contractors had given NLWE any manual, schematics, or password to access the PLC program after the integration of the control functionalities. Therefore, the maintenance has to be done by those same contractors, which is always often expensive. One short term solution adopted by NLWE is to replace the locations with dysfunctional PLCs with

autotransformators or Variable Frequency Drives, to partly cover the functionalities of the control cabinet and power cabinet. The main problem with this solution is the need of an operator on-site to change commands or read status of the facility.

Case	Context	Current solution
PLC fully operational and used	No problem with control equipments (PLC, sensors, actuators, etc).	--
PLC fully operational but not used	Case of Manar Pumping Station: Problems with all Electric Valves of the Pumping station. They have been replaced by manual valves, therefore the PLCs of the station cannot control the process. No modifications of the PLC program could be made. PLCs do not control but allow to display some values on digital displays on control cabinets.	All processes have been switched from automatic to manual. A technician is always on-site to operate the commands of pumps depending on other facilities' needs. He uses the manual commands of power cabinets, and manually operates the valves.
PLC not operational but still in place	Same case as before, but PLC is not used at all.	Manual operation of the equipment from power cabinets.
PLC not operational and replaced	PLC not functioning, and no modifications of the PLC program could be made.	A pre-actuator has been installed for easier manual control of the machine. NLWE decided to use autotransformators or Variable Frequency Drives when applicable. Not that these solutions do not replace the core functions of control of the PLCs.

Table 6*: Different cases of PLC use*

2.3.3. Details of available SCADA equipments

2.3.3.1. Local supervision of Masafi

The water treatment plant of Masafi was built in two phases. The two parts, now called old station and new station, are currently working in parallel in order to ensure 70,000 m3/day of drinking water produced. Masafi is the only location equipped with a local supervision system. A single control room is located in the old station to supervise both stations.

The old station has a classic synoptic board using LEDs and some numerical displays to show the main status. The new station uses Vijeo Citect, a supervision system from Schneider Electric. The available functionalities are the following: Synoptics, Alarms, Trends and Digital/Analog status display.

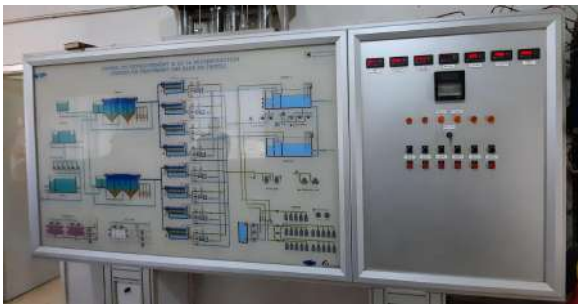


Figure 14*: Masafi old station synoptic board*

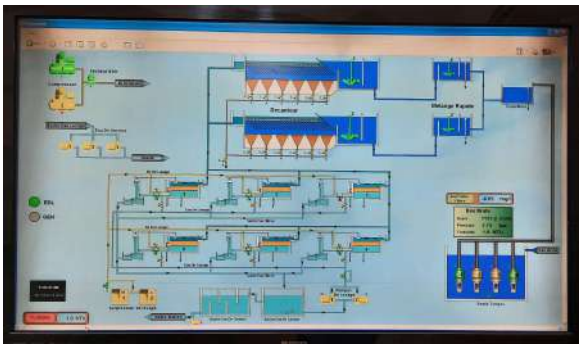


Figure 15*: Masafi new station supervision system*

Available information to display:

In both cases, the supervisions display mainly digital status for the process, and analog values for the output water quality and physicals. There are no controls available from the supervisions, the operator has to manually operate the power cabinets and other equipment in the process if needed. This possible enhancement has been pointed out as the main need of the operators.

Also, some analog values are available on the plants through mechanical or digital displays, but are not transmitted to the supervision. This enhancement could help for the daily reports as the technicians have to check all displays in the stations visually.

Alarms management:

A view in the new station's supervision is dedicated to alarm management. The view contains a table of alarms, their status (active or not) and date/time information. Alarms are sorted to see the most recent ones, and there is a functionality to filter the table as needed.

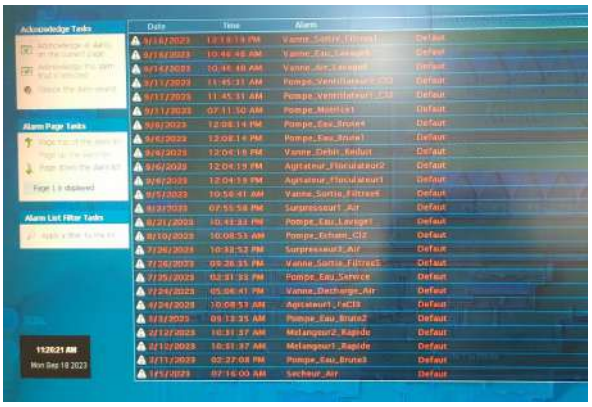


Figure 16*: Masafi new station supervision system - alarm management*

The operators explain that no sound is emitted in case of alarms as it should be. A correction should be made to enable this functionality.

Trending functionalities:

The Trends view of the supervision was not functioning during the visit (September 2023) and should be corrected as well.

2.3.3.2. Control Equipments in other distant sites

The other sites of NLWE have no supervision available. The control functions are often covered by classic logic boards, or PLCs when functioning. As explained previously, some locations are equipped with VFDs or autotransformators instead of PLCs.

The lack of instrumentation has also been identified by NLWE as a major issue for further development of the establishments SCADA infrastructure. Site visits have shown multiple digital screens on control cabinets not displaying any values, and many analog/mechanical sensors. Control equipment on sites such as sensors, or small actuators (eg: control valves) are sometimes dysfunctioning, not communicating and not replaced or repaired.

The following table shows the repartition of existing PLCs and some locations where VFDs and autotransformators were installed.

Office	Number of associated PLCs on office installations	Details on some locations
Tripoli	**2**	No problem with control equipments (PLC, sensors, actuators, etc)
Koura	**2**	14 wells with no PLCs
Batroun	**12**	Jrane, Kifafan and Houb are equipped with VFDs because of dysfunctional PLCs
Zgharta	**0**	Old wells not equipped with PLCs
Bcharreh	**0**	5 locations equipped with autotransformators

Minyeh	**0**	11 locations equipped with autotransformators; 4 of them had dysfunctional PLCs and were replaced by autotransformators
Dinniyeh	**0**	No PLCs
Halba	**2**	12 wells equipped with autotransformators
Qobayat	**0**	15 wells with no PLCs

Table 7*: PLC repartition in NLWE*

2.3.4. Main shortcomings identified

2.3.4.1. Vision of NLWE Management on SCADA

Exchanges with the Technical Director of NLWE have shown that the Establishment knows well the weaknesses of the control equipment. Also, they have plans for a future SCADA system, supervising the whole perimeter of the Establishment.

The main weaknesses identified are the lack of instrumentation, the lack of consistency between control systems funded by different donors and the absence of a dedicated SCADA team capable of doing maintenance on PLCs and control equipment.

Three main needs were highlighted by NLWE during the exchanges:

- The first need is a specific mission conducted by SCADA experts to assess all control equipment at field level (down to the content of control cabinets), in order to have a complete view of available equipment, functionalities and dysfunctions;
- The second need is to specify the future SCADA system, with functionalities and hardware details for local uses, office uses and establishment uses. The goal is to properly define all the data needed from sites by building typical schematics for each type of installation, and prevent the disparities between different contractors. As an example, a list of more than 10 measures / status was given for a typical well;
- The third need is the implementation in 5 stages of all SCADA related equipment and software. NLWE describes the 5 stages as following:
    - Implementation of SCADA for water treatment plants and Wells;
    - Implementation of SCADA for pumping stations and Stand-by Wells;
    - Implementation of SCADA for Reservoirs;
    - Implementation of Flowmeters, Pressure sensors and software for District Metering;
    - Installation of customer metres (AMI or drive-by).

An internal study of the establishment roughly estimated the project at 16 millions USD for a pilot zone (Great Tripoli). This zone was chosen because it represents 45% of NLWE customers, has a flat topology, and is a relatively small area. This estimation should be reviewed after fixing in detail the technical needs. The scope NLWE considered for this estimation is the following.

SCADA cost item
More than 66,000 individual customer metres
More than 50 District Metres
55 Flowmeters for Wells and pumping stations and 20 Flowmeters
Control room, servers and Communication network
Control cabinets and instrumentation on sites

Table 8*: SCADA estimation scope*

The estimation of 16 millions USD is difficult to review, given the few information on site conditions.
At the end, NLWE would like complete access to the Supervision for the SCADA team and Management from a laptop.

Seureca's analysis on this proposition have lead to these comments:

- The cost estimation has to be reviewed by properly defining the scope for an accurate appraisal. The Value of 16M USD is difficult to evaluate;
- The separation into the 5 stages has to be reviewed. We would rather recommend a district by district approach;
- Customer metering should not be listed among SCADA cost items. This category is related to Customer Management and Operational Efficiency. As part of the IT/OT convergence, customer data will be associated with SCADA data in higher CIM levels (Data Centralization and Hypervision);
- Given the current security challenges for water utilities, Cybersecurity has to be taken into account for the architecture and functionalities. Therefore, Seureca advises not to give access to the supervisions remotely;
- The cost of the SCADA system is strongly related to the number of measures and status to take into account (cost of instrumentation and performance of the hardware). The number of different variables described for a single well to be implemented in SCADA seems very high. The expectations of the SCADA have to be established and compared to the minimum requirements of a control system;
- The use of autotransformators removes all possibility of automated control and data acquisition for security or analysis purposes (eg. Run Feedback / Discrepancy Faults).

2.3.4.2. SWOT

Strengths	Weaknesses
• **Motivation and ambition** about SCADA development; • **Knowledge of NLWE's Management** of the weakness of the existing system.	• **No Dedicated team** for SCADA maintenance; • **Few skills** in automation available in the Establishment; • **Lack of documentation** about existing control equipment.

Opportunities	Threats
● No existing inter-site communications or centralised supervision, allowing to **build a cyber-secure infrastructure from start**, with fewer existing constraints.	● Expectations too high compared to what is required as a minimum; ● Unavailability of the needed **budget** for the desired SCADA system.

2.3.5. Main recommendations for SCADA improvement

2.3.5.1. General recommendations

The diagnosis of the SCADA has led to a number of recommendations, detailed as follows.

NLWE management has identified needs for SCADA and high expectations from it. Also, NLWE has a good appreciation of the current issues (lack of instrumentation, skills, equipment) and causes (implementation by different contractors, lack of consistency, maintenance contract too restrictive).

The implementation of the new SCADA equipment was described as a five stage deployment splitting the tasks between types of equipment and facilities. SEURECA recommends rather implementing the SCADA office by office.

Customer metering was included in the SCADA scope by NLWE management. Seureca recommends keeping it as a separate implementation work, and cost item, as it does not serve directly SCADA purposes.

So we recommend the following:

- **Establish a detailed assessment of the existing system** by contracting SCADA experts to audit all sites for their equipment. The audit should lead to these outcomes:
  - Detailed inventory of instrumentation and control equipment;
  - Availability of all documentation transmitted during the previous implementations (quotation, design, as-built, etc);
  - List of functionalities and dysfunctions seen on-site;
- **Hire or train an Instrumentation & Control referent** that will supervise the different SCADA implementation stages, with the different contractors;
- **Define an ambitious and achievable SCADA strategy** to be the guideline for future implementations. The strategy should address these topics:
  - Needs of the establishment in terms of control and data for each type of facility;
  - Typical schematics for each type of facility;
  - Responsibilities in the establishment for SCADA operations and maintenance;
  - Cybersecurity guidelines referring to a designated standard.

2.3.5.2. Recommendations priorities

The above recommendation can be categorised as:

- “organisation”: reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- “skills”: training to be provided;

- “tools”: need for new software or hardware, licences, software improvements, etc;
- “processes”: formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Organisation	Define a SCADA strategy for the establishment detailing needs for control and data analysis, schematics, and responsibilities	1
	Define and implement the necessary processes / SOPs to distinguish regular O&M from SCADA O&M	2
Skills	Hire or train an Instrumentation & Control referent that will supervise the different SCADA implementation stages, with the different contractors	1
Tools	Define SCADA architecture according to cyber security standards	1
	List and add all SCADA related assets to the inventory module. As seen on other establishments, this list is essential for future SCADA specification and implementations.	2
Processes	Retrieve all documents describing the as-built SCADA system	2
	Create a list to track the existing Instrumentation & Control equipment. Implement into the ERP inventory module when the list is complete and reliable	2
	(common to all departments) Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule.	1

Table 10: List of SCADA recommendations

2.4. Customer management business process

2.4.1. Mandate

In terms of Customer management activities, NLWE performed the following tasks:

- New contracts management;
- Customer meter reading;
- Revenue collection;
- Customer debt management;
- Customer relations & complaints management;
- Customer information management.

There is currently no formal “billing activity” as NLWE does not issue any bill to the clients; however the invoiced amount is monitored at the Finance department level, and customers debts are tracked thanks to the customer database.

In 2023, a total of 340 billion Lebanese pounds were invoiced, yet only 53.7% of this amount has been collected to date. This indicates a significant gap between the invoiced amount and its collection. Implementing effective collection strategies, streamlining billing processes, and enhancing communication with customers are some of the key steps to bridge the gap between invoiced and collected amounts.

2.4.2. Organisation

The Customer management activities are divided among two directorates:

- The O&M department:
  - In which “Admin unit”, divided in each offices, is in charge of:
    - managing new contracts;
    - updating customer database (for usual operations);
    - collecting payments at the office and with cash collectors;
    - tracking the debts;
    - receiving and managing customers' complaints.
  - In which “O&M unit” takes part in the new contracts management process (on-the-field assessment for the installation of a new connection).

- The Financial department:
  - In which “Collection unit” is in charge of:
    - cash collection monitoring and reconciliation between the customer database and the cashier office;
    - calculation of invoiced income for the financial statement;
    - customer database management.
  - In which “Collection control unit” is in charge of:
    - monitoring the income and other KPIs such as the collection rate;
    - controlling the unusual operations (debt cancellation for instance).
  - In which “Cashier control unit” is in charge of:

- Receiving of deposit proofs and verification of their integration into the ERP system;
- Reconciliations between declared deposits and bank entries.

In addition, NLWE has a calling centre, which reports to the IT unit (Technical department). The hotline office is located in the Tripoli offices. This calling centre is the entry point for customers: it concentrates complaints and requests, redirects them to the appropriate departments and monitors their progress.

The overall organisation of customer management activities is presented below:

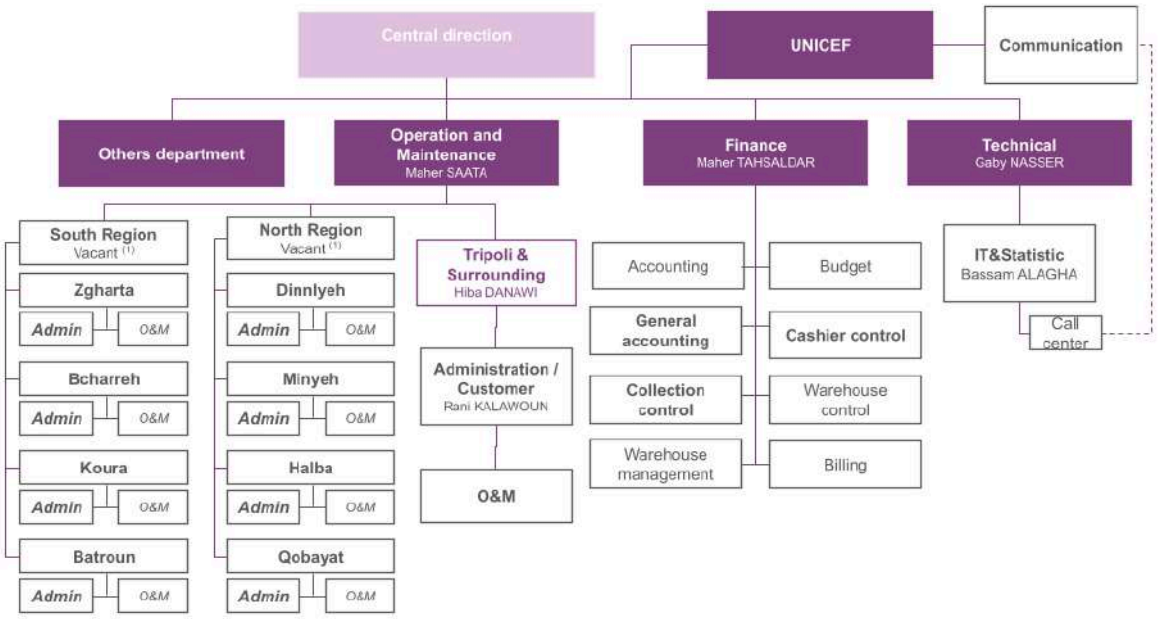


Figure 17*: Organisational chart of the departments involved in Customer Management*

(1)The positions of North and South Area Manager officially exist. They have been vacant for several years. As a result, the Operation Operation Manager is directly in charge of all the 9 offices.

This customer management organisation involving different departments complicates the application of a clear, unified strategy, in terms of both sales and digital tools management.

For the Tripoli office, the following specific features emerged:

- The staff is composed of 70 employees, permanent and contractual;
- 14 employees have access to the ERP;
- the GIS is used by 3 people, but only in reader mode.

2.4.3. Assessment of sub-processes digitalisation status

Based on the interviews and on the on-the-job observations, an assessment of the digital tools used in each sub-processes was carried-out, as presented in the tables below, in order to identified the status of digitalisation of each one and the main shortcomings in the current situation:

Manage new contracts	
Tool	ERP Microsoft Dynamics NAV 2016
Departments involved	O&M department

Uses and Shortcomings

- To subscribe a contract with NLWE, the new user has to come to the office with copies of the required documents for application → Online applications are not available, but customers can call (the call centre or directly to the branch) to obtain information about the documents that need to be brought to subscribe.
- The contract is made on a paper form template (see picture below), then the NLWE's employee fills in with the client at the office. All the application process is then followed on this paper form. This includes:
  - the validation of the application's completeness;
  - the validation of the subscription payment (related to the cost of verification by the O&M team);
  - validation of the information by the O&M inspection team (customer's connectivity and the surface area of its property) → no digital monitoring of the progress of the required controles;
  - when the customer returns (~20 days after the application), validation of payment for the year on a pro rata basis,
  - the monitoring of the installation of the new connection by the O&M team → no digital monitoring of the progress of the connections installation.
- As soon as the customer provides the completed application form and the required documents, an employee of the branch registers it in the ERP → the process is completely digitised for the customer management and finance steps, which does not stop employees from maintaining a paper workflow at certain stages.
- All contracts are archived on paper form at the office and used only in the event of a conflict, as all the information is entered into the ERP system.

The partial digitalisation of this process leads to several shortcomings:

- It prevents NLWE from quickly identifying some potential blockages of the application at any stage.
- It degrades customer experience (no vision of the progress of their application, necessity to come to the office in some cases several times, potential delays, etc.).
- The manually registering of the new client into the database can lead to data entry errors, and requires additional work by the employees.

Figure 18: *Example of contract application form*

A regression was reported following the migration from the old X7 tool to the Microsoft Dynamics NAV ERP concerning the process of adding new customers.
Indeed, when a new customer was registered in the X7 tool, the latter indicated whether there was an existing meter/connection, based on the addresses previously registered, which made it possible to prioritise/limit inspections. This functionality does not exist (or is not configured) in the current ERP.

% of Digitalisation of the process	

Consolidate customer information	
Tool	ERP Microsoft Dynamics NAV 2016
Departments involved	O&M department

Uses and Shortcomings

- Customer information is consolidated in the ERP Microsoft Dynamics NAV 2016.
- The ERP database enables the visualisation of all basic information about a customer, including paid and unpaid invoices and location of the client, however:
  - the database is not connected to GIS →it does not enable the visualisation of the customers on a map;
  - the database is not connected to the CRM (Cisco agent) → it does not enable access to the history of the customer complaints and requests.
- To update customer information, the employees at the branches can only perform basic operations (i.e. change of phone number), on a customer demand.
- Some of the paper contracts, which predate the NLWE X7 tool, are not recorded in the ERP customer database, which prevents the customers concerned from being invoiced and leads to an important commercial loss.
- Thanks to the customer meter reading department (refer to the section Domestic meters reading for more details) , 60% of the customer information is reliable enough to fully use the ERP for billing or other related processes. The remaining 40% need to be regularly manually checked, corrected...

The CRP1 (Customer Relation Portal - Phase 1) project was started in 2019 to make the database more reliable by carrying out a door-to-door exercise using a tablet to validate customer information. Due to the series of crises, although the tablets were received, the project never started.

In addition to the considerable amount of fieldwork involved to update the customer database, one of the major difficulties lies in identifying water delivery points. Lebanon does not have a reliable, recognised address database. The cadastral database is one solution, but it is not possible to differentiate between several customers on the same parcel. It is necessary to adopt a rule for designating water delivery points, in consultation with the other WEs and the relevant authorities (ministries, etc.).

% of Digitalisation of the process	70%

Manage billing	
Tool	ERP Microsoft Dynamics NAV 2016
Departments involved	O&M department

Uses and Shortcomings

- NLWE does not issue proper invoices to their customers. The yearly tariff is assigned, based on the diameter of the gauge and the tariff grid. The customer has the whole year to pay the bill. The payment receipt, printed from the ERP, is used as an invoice (separated in two parts).

Figure 19*: Example of payment receipt*

On top - blue - is the part kept by the collector, and on the bottom - green - is the receipt given to the customer.

- The ERP automatically consolidates the monthly amount invoiced, enabling rigorous monitoring.
- When X7 was migrated to ERP, only flat-rate invoicing was carried out. The following year, invoices per cubic meter resumed their normal course. However, a significant proportion of customers are still billed on a flat-rate basis (overall estimate of less than 10% in the Batroun sector, and more than 30 to 40% in the Tripoli sector).
- The finance department shared its intention to implement 2 projects impacting this process:
  - a project to update the ERP database;
  - a project for quarterly customer invoicing (instead of the current annual invoicing).

% of Digitalisation of the process	

Manage revenue collection	
Tool	ERP Microsoft Dynamics NAV 2016
Departments involved	O&M department

Uses and Shortcomings

- NLWE offers 2 channels of payment:
  - cash,
  - check.

  → OMT and online payment are not available yet in the Establishment due to legal issues (under discussion with the Ministry). Access to more payment channels would increase the collection rate.

- Regarding the payment, there are 2 possibilities:
  - for bills under 100 000 000 LBP, the client can pay through the collector who goes door-to-door to collect the annual subscription fee, or he can go directly to the branch office to pay;
  - for bills above 100 000 000 LBP, the client has to go directly to the branch office to pay.

- The collector goes to the office in the morning and collects a certain number of invoices, which must not exceed a total amount of 100 000 000 LPBP. These invoices are generated and tracked in the ERP system. Once the collector has completed his journey, whether the money has been collected or not, he must return to the office to collect a new batch of invoices → this limitation on the amount of the invoice means that the collector has to make several trips, which wastes a considerable amount of time.

BATROUN'S INGENIOUS COLLECTION METHOD

In some villages near Batroun, additional solutions have been developed to improve efficiency.
The collector has created **a WhatsApp group with all the residents to notify them of the day and place of collection**.
This innovative idea has resulted in a considerable improvement in the collection rate (the average collection rate in Batroun is 80%, while it is 45% in Tripoli).

- The collectors are over 50 years old on average → this may pose a problem for the potential digitisation of the process.

- If an invoice is not collected (due to absence or rejection by the customer), the collector may request cancellation of the invoice in order to obtain another in exchange. This request requires 3 signatures. And as long as the invoice has not been cancelled, the customer

cannot spontaneously go to the office to pay it, as the current ERP configuration does not allow the invoice to be reissued → this complex procedure can slow down the payment process for a customer.

- Thus, there is an ongoing project to deploy mobile printers for the collector →it will prevent collectors from going to the office for a batch of invoices that may not necessarily be honoured (due to absence, refusal, etc.), which will result in significant time savings.

- In the event of non-payment, no communication with the customer is made, but the water supply is cut off. Despite the numerous cases of non-payment, this action remains rare → a system to monitor unpaid bills and send out reminders could help to increase the collection rate.

Please refer to the Finance part regarding the reconciliation management process.

% of Digitalisation of the process	

Manage customers claims	
Tool	Uagent, ERP Microsoft Dynamics NAV 2016
Departments involved	Technical department (IT unit)

Uses and Shortcomings

- The Call Center can face two types of situation regarding complaints:
  - General complaint: a citizen (not necessary a customer) contacts the call centre to inform of an issue (leak in the street etc),
  - Special complaint: a customer contacts the call centre to complain against lack of water or quality issues.
- The Uagent (Call Center software) interface does not communicate directly to the ERP, however the employees of the hotline have access to the customer ERP database and can find the customer thanks to the phone number (if registered) or the name.
- Currently, the agent collects the complaint and sends an email (or phone call or Whatsapp) to the technical manager, who will dispatch the intervention to the team. There is currently no feedback regarding the completion of the intervention.

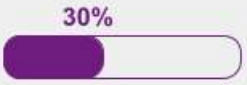
The ERP for the calling centre is still under development (95%), and faces numerous challenges (only 1 person, no 24/7 presence, and recurring power cuts).

However, the target operating mode of the service for special complaint, which should be operational by the end of the year, will be the following:

- The agent receives the call and access to the ERP to check the existence of the customer (the claim is taken into account only if the connection is existing),
- The agent registers the complaint in the ERP,
- The Technical manager in Tripoli receives the complaint and dispatch to the corresponding branch → currently it seems that the O&M team (in Tripoli or in the Branch) are not comfortable with the ERP, and the Work Order module doesn't exist.
- Once the work order is completed, the claim is updated, and an SMS is automatically sent to the customer.

→ The ERP could enable a totally digitised process, however the lack of CMMS, or equivalent, capable of issuing work orders imposes a paper-based stage that prevents the implementation of integrated claim monitoring.

- It has been observed that, in the branches, front office employees had their proper claims follow-up on a register. This suggests that there is a lack of change management regarding the use of the ERP or that the authorizations given to the branches's employees are not sufficient to enable proper request management (they cannot open or close a claim by themselves).

% of Digitalisation of the process	

Communicate with clients	
Tool	Facebook, NLWE application
Departments involved	Administrative department (Public Relation team) and O&M department (Admin teams)

Uses and Shortcomings

To communicate with its customers, NLWE uses social media (Facebook and Instagram) with its own distinctive visual identity. It enables the clients to be aware of:

- Current and upcoming projects;
- Hotline number.

Figure 20*: Facebook page of NLWE*

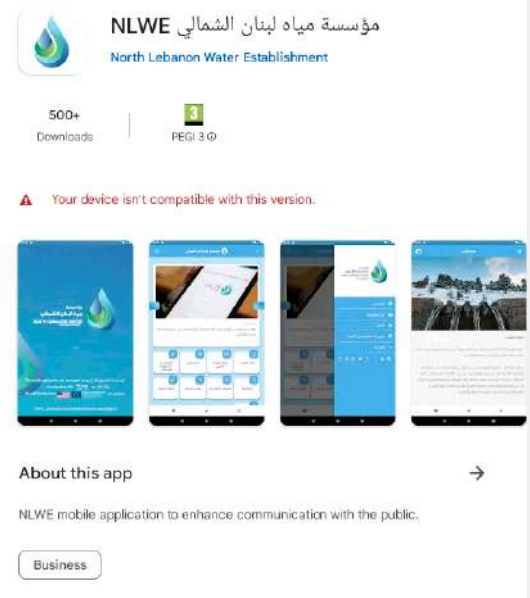
A mobile application has been developed in order to provide the customer with an interface composed of:

- current and upcoming projects.

- information on applications for various operations (new subscription request, subscription cancellation, etc),
- hotline number.

In the future, this application aims to allow the customer to have access to his personal accounts, and the possibility to pay online. However, currently the application is accessible only for Android phones (storage fees for Apple has not been paid), and is rarely used due to its lack of functionality..

Figure 21*: NLWE application on the PlayStore*



CRP2:
A website has also been developed (by the company Evergreen) through the project CRP2 (Customer Relation Portal - Phase 2), however, due to cost issues, it hasn't been published yet.

% of Digitalisation of the process	40%

Domestic meters reading	
Tool	GIS (Viewer), Excel, ERP Microsoft Dynamics NAV 2016
Departments involved	Operation and Maintenance department (Admin teams)

Uses and Shortcomings

Meters are installed in Tripoli and in the cities/villages around. However, the meter reading is based only where there is a continuous water supply.
In Tripoli, among the 70 000 connections, there are 50 000 meters.

On field meter reading:
2 employees are mandated to read the meters every 6 months in order to adjust the customer

billing.

In order to organise the round, the employee does preparatory work using the information available:

- Impression on paper of the GIS map with the house number;
- ERP checking to see if there is an existing contract, based on house number, and update of the printed map;

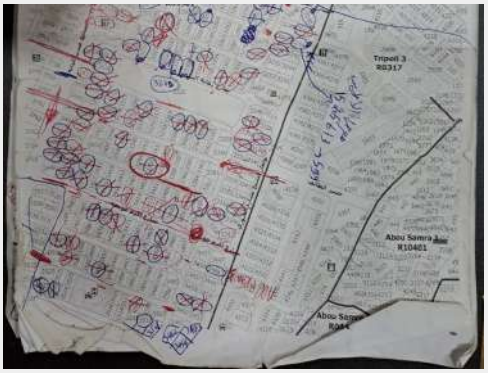


Figure 22*:* Printed map extracted from the GIS and updated

- creation and printing of a building diagram in Excel to simplify the rounds;

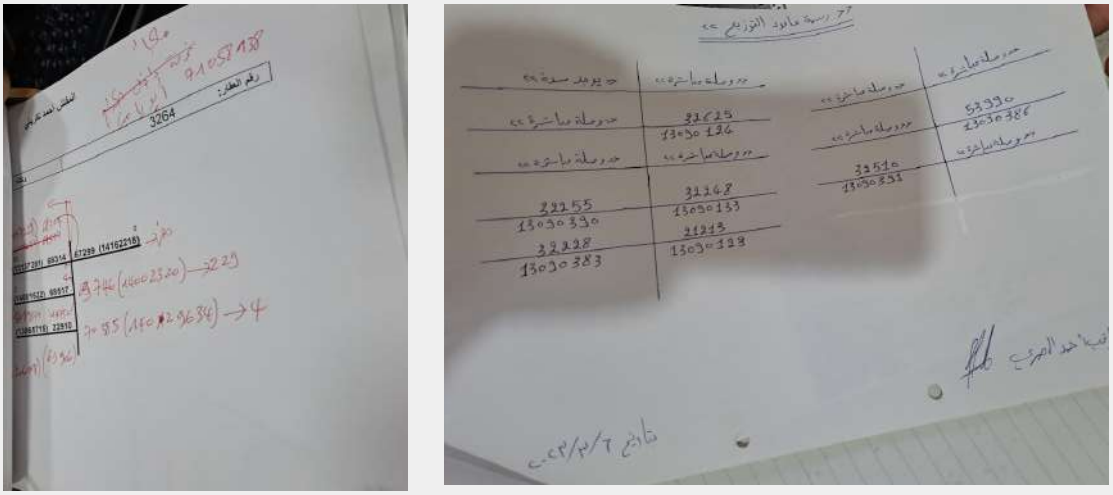


Figure 23*:* Building diagrams

(pre prepared on Excel or drawn on-site)

- Once on the field, the building diagram and map are updated based on the reality, and the meter index is written on the building diagram;
- Back in the office, an Excel is generated with the index reading and the correct number of contract/meter;
- Corrections are not reflected in the ERP as no one has been mandated to carry out this task.
  → Extending the scope of the employee to the ERP update could be interesting as it would provide a database reflecting the reality of the field. However, this would require employees

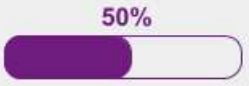
to be trained and given access to the tool.

It is important to note that the employees of this team cannot work in good conditions on a computer (no dedicated desk, the screen is on the corner of a colleague's desk, and the keypad is on the knees).
Employees do not tend to work on a tablet because of the dirtiness of the activity.

Invoice update:

- The Excel provided by the on-field employee is transferred to the IT team dedicated to the ERP.
- A program should integrate automatically the Excel file into the ERP, however, a number of anomalies are preventing the indexes from being properly integrated (20% of the information imported):
  - Different meter or contract numbers in the system and in reality,
  - Difference between the previous index and the new index is irrational.
- In the event of an anomaly, the employee is asked to read the meter again. However, this rereading process is not formalised;
- Once the ERP has been updated, the billing is automatically adjusted to include the base rate for the coming year (based on the surface area) and the actual consumption (based on the meter reading, only if the amount is higher than the estimate).

→ **In an ideal organisation, operations teams should be made responsible for the reliability of all technical data and their integration in ERP. Indexes taken in the field or read by the radio modules must be integrated into the ERP system in a reliable manner, and have undergone a consistency check by these same teams or their superiors within the operations teams. Ideally, outside of a defined "project mode", the IT or finance department should not be involved in data quality.**

% of Digitalisation of the process	

Tele-metering and point of service	
Tool	NLWE meter reading system
Departments involved	Technical department (IT team)

Smart meters have been deployed in 4 villages (Fih, Kelhat, Afsik, Batroumi) representing 1023 smart meters.

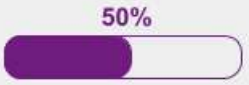
Uses and Shortcomings

Smart meter reading:

- The meter reader drives the vehicle while the reading device (application developed for EBML) automatically collects the meter readings every 3 months.
- The data collected is sent by email to a person in Beirut who imports it on the website.
- An employee in the IT team dedicated to the ERP extracts the information from the website to compile in an Excel file.

Invoice update:
The ERP integration procedure is similar to the “Domestic meters reading” process, however the number of anomalies is much lower (only 3% compared to 20% thanks to a more robust data chain).

The development of smart metering is a laudable ambition, and one that promises improvements. However, the "pilot project" mode makes implementation complex, in particular through manual integration operations in the database, which partly depend on an external organisation (Beirut platform used - EBML). Before deploying this project further, it is important to:
- Consolidate customer designation rules in the database (see update database part)
- Define a target operating scheme for index data uploads, which should be as simple/short as possible (e.g. exchange file from field terminals to ERP).

% of Digitalisation of the process	

Illegal connections management	
Tool	GIS (Viewer), ERP Microsoft Dynamics NAV 2016
Departments involved	Operation and Maintenance department (Admin team of Tripoli)

The illegal connections are managed by a team of 12 people who are also in charge of:
- installing a meter;
- modifying a connection (meter or gauge);
- disconnecting a connection (end of subscription);
- cutting an illegal connection.

Uses and Shortcomings

Figure 24: Map with Tripoli sectors displayed in the office

- The city of Tripoli has been divided manually into sector;
- Inspections are realised in the buildings to identify the illegal connexions or alteration of the connexion (gauge or meter);
- If an illegal collection is discovered, fines are made on paper, then formalised in Excel and given manually to the person responsible for the illegal connection at the time of closure;

→ Fines and penalty notices are issued independently of the ERP. The management of illegal connections and fraud remains a difficulty, is not sufficiently digitised and is not operated according to formalised processes. There is also no consolidated dashboard.

- The Excel file is then provided to the Finance department to be integrated in the ERP;
- An access to existing tablets has been requested to improve the efficiency of the work;

- The data consolidated during these inspections is not integrated in the ERP yet.

% of Digitalisation of the process	40%

2.4.4. Summary

The digitization assessment of sub-processes can be summarised as shown below . It is important to note that this representation does not define digital maturity, but it contributes to the overall understanding of the role of digitalization in the business.

Figure 25*: Digitalisation overview of the Customer subprocesses*

<u>Important to notice</u>: The apparent high level of digitalisation shows the ability of the water utility to lead customer operation in its ERP software. In reality, there still exists a lot of paperwork such as new customer management or meter reading due to change management difficulties (culture), lack of training for end users, poor database reliability or minor ERP shortcomings.

2.4.5. Main shortcomings identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the diagnostic performed at a department/unit level:

Strengths	Weaknesses
• Integrated ERP, used by the offices in the branches and consolidated in the Tripoli main office; • Presence on social networks with a distinctive visual identity .	• Poor database reliability, no update processes whereas on-field survey does exists (e.g. fraud and meter reading processes could provide reliable data); • Only one channel of payments.
Opportunities	**Threats**
• On-going projects to improve the collection by giving the collectors an equipment connected to the ERP to print the invoices; • Existing application for NLWE for subscription process, with on-going development to integrate the possibility to pay the invoice (accessible only on Google Play, as the as the cost of hosting on the Apple Store has not been covered); • Integration of the fine management in the ERP process (currently use of an Excel file); • Call centre under development to track complaints; • Data collection on the field is developed (meter reading or inspection). It is necessary to integrate it in the ERP to update the customer database.	• Willingness to keep paper (for subscription, invoice, etc). • Economic crisis in Lebanon, which limits the budget available for NLWE (esp. Fuel costs can prevent drive-by meter reading)

2.4.6. Main recommendations

The diagnosis of the level of digitalisation of the process has led to a number of recommendations, categorised as:

- “organisation”: reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- “skills”: training to be provided;
- “tools”: need for new software or hardware, licences, software improvements, etc;
- “processes”: formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Organisation	Study and set up a "customer" organisation in a specific branch of the organisation chart	1
	Appoint a team responsible for updating the customer database: provide a simple, reliable tool (field form / project CRP1), train the field teams (meter reader, fraud control, specific team if necessary) and formalise the task of updating the database	1
	Reinforce communication team (call centre)	1
Skills	Enhance training for end users in the field or their direct hierarchy: meter reading, fraud prevention, … in order to ensure a reliable database update	1
Tools	Finalise the customer portal (application or website - CRP2) for customer application and payment	3
	Integrate the customer information (from the ERP) in the GIS	2
Processes	Update of the customer database (project CRP1, 70 tablets are stored since 2019) - 6 months of work have been estimated	1
	Implement a reporting culture by requiring regular reports: new customers, % of collection, etc.	1
	(common to all departments) Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule.	1

Table 9*: List of recommendations for customer management business process*

2.5. Financial & Accounting business process

2.5.1. Mandate

NLWE Financial & Accounting has the following main scope of activity:

- General accounting;
- Budget;
- Payment / mandates (suppliers);
- Internal and legal reporting.

In collaboration with the Operations department and their "administrative" sub-departments, the Finance department is responsible for the entire geographical perimeter (9 offices):

- Supervision of the collection;
- Cash control;
- Billing.

In collaboration with the Operations Department and its sub-departments, the Finance Department is responsible for the following tasks across the entire geographical area (9 offices)

- Physical inventory control;
- Financial control of stocks.

In collaboration with the Human Resources department (under the administrative affairs department), the Finance department is responsible for:

- Editing payslips;
- Payroll.

The Head of the Finance department monitored and supported the deployment of the ERP in collaboration with USAID. The first modules were implemented in 2020 and almost all the activities carried out by the finance department are tracked in the ERP.

The Head of Finance rapidly expressed the desire to build interfaces between the technical tools and the ERP: main production meters, electricity meters, fuel meters, etc.

Focus on control department:

The Control department reports directly to the Director in a separate department.

Financial control is carried out 2 or 3 times a month. This control mission includes a technical aspect such as the control of stocks of parts and fuel.

Overall, the department lacks resources.

Financial controls are carried out on the basis of extracts that have to be requested from the Finance department. The Head of the Control department does not have access to the ERP.

2.5.2. Organisation

This department reports to the General Director, as shown below:

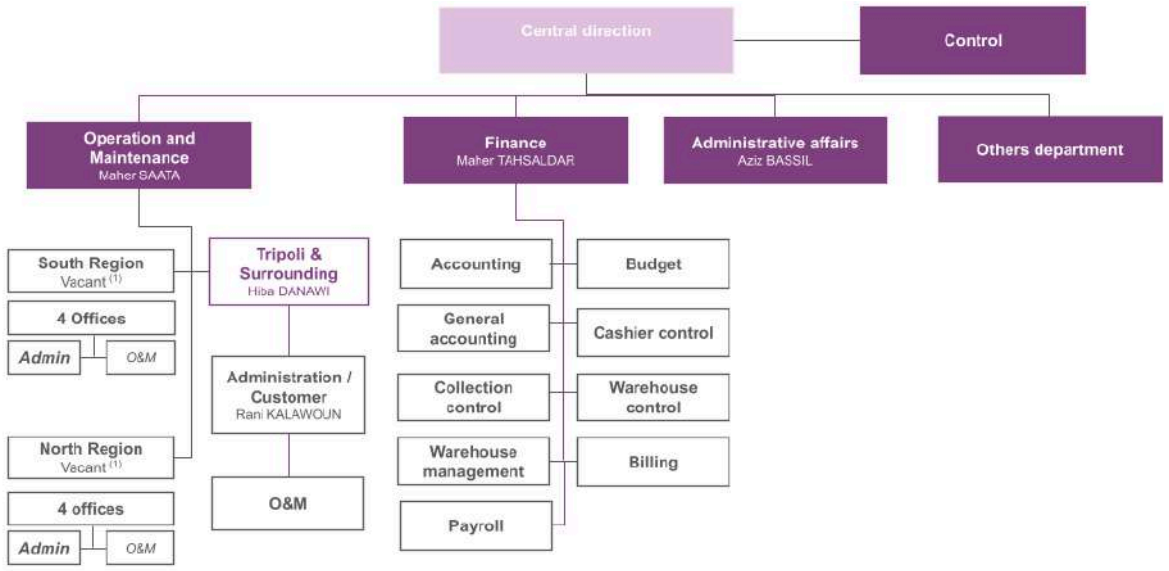


Figure 26*: Organisational chart of the departments involved in Financial and Accounting operations*

2.5.3. Assessment of sub-processes digitalisation status

Based on the interviews and on the on-the-job observations, an assessment of the digital tools used in each sub-processes was carried-out, as presented in the tables below, in order to identified the status of digitalisation of each one and the main shortcomings in the current situation:

Elaborate budget and control budget execution	
Tool	ERP Dynamics 365 Navision
Users	Finance department

Uses and Shortcomings

- Middle management produces a series of budget requests. These are integrated into the ERP system, then consolidated and arbitrated between the Finance Director and the General Director. The data is managed in the ERP.
- Budget execution reports can be issued from the ERP automatically. They are used to control the feasibility of expenditure requests.
- NLWE has a strong process of cost control: each demand of expenditure has to be approved by the Finance directorate regarding the budget available, by the relevant department, and by the General Director. Despite a high level of use of ERP, paper-based circuits are still in place for approving orders (see the Purchasing section in the Chapter 2.6. “Administrative, HR and Procurement business process”).

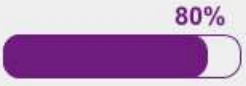
- After the expenditure control regarding the budget, the Finance department checks the cash available in the bank account for final validation of the expense and then makes the necessary provision for the future payment. The Bank Statements are not available in ERP. Bank statements are available in a separated interface.
- Expenditures are available in dedicated dashboards.
- Budget control is carried out exclusively on the ERP system to ensure that data is not altered.

% of Digitalisation of the process	

Manage accounting	
Tool	ERP Dynamics 365 Navision
Users	Finance directorate

Uses and Shortcomings

- Accounting and Financial reporting is made in the ERP.
- When they are entered and validated into the system, the ERP enables to consolidate the expenditures in the chart of accounts. Incomes are also consolidated in ERP on an ongoing basis.
- The X7 data has been migrated to the ERP (migration completed in 2021). An audit is still in progress to compare (1% error due to the rounding of the Lebanese pound).

% of Digitalisation of the process	

Ensure revenue reconciliation & monitoring	
Tool	ERP Dynamics 365 Navision
Users	Finance directorate Customer / Administrative services in the different offices

Uses and Shortcomings

Reconciliation:

- All administrative services of each branches send regularly (daily) to the Finance department:
  - a report on the cash collected during the day,
  - the payments receipts,
  - the proof of deposit into the bank account.

The Finance department checks the consistency of the information in the software and the receipts received, and consolidates a daily amount of revenue collected.

This data is updated by the cash collection service. However, paper forms remain high to ensure traceability and control: daily feedback form from cash collector, proof of deposit, etc.

The information flow is the following:

- When the accounting department collects the invoices and money from the collectors, they scan the invoices using a handheld scanner to update the ERP database and check the amount received → this digitalisation of the process ensures that the ERP is always up to date;
- The list of integrated invoices is then printed to be given to the cashier who verify the amount (thanks to a banknote counter in Tripoli, or manually count in the branches);
- At the end of the day, an excel file is printed, with the amount collected in the office and by the collectors, to track the bank deposit → an ERP configuration should enable the department to produce it directly via the ERP to avoid potential errors and gain time.
- As all the information of all branches are available in the ERP, the reports can be edited directly by the finance department's management.
- However, in the case of specific requests (monitoring collector performance), the report is produced via Excel → an ERP configuration should enable the department to produce it directly via the ERP to avoid potential errors and gain time;

Figure 27*: Example of remaining paper form for reconciliation*
List of collected bills and corresponding amount extracted from ERP and signed by the cash collector and the manager (names are masked for confidentiality reasons)

Cash collection control / monitoring:
The cash collection rate is monitored by the Finance department. Reliable and relevant dashboards are available in the ERP system:

- Revenues collected by sector;

- Revenues collected by cash collector;
- etc.

All the information is available and seems reliable. However, there are still parallel circuits:

- Occasional excel reporting;
- Existence of paper files for proof of deposit and summary lists of invoices collected.

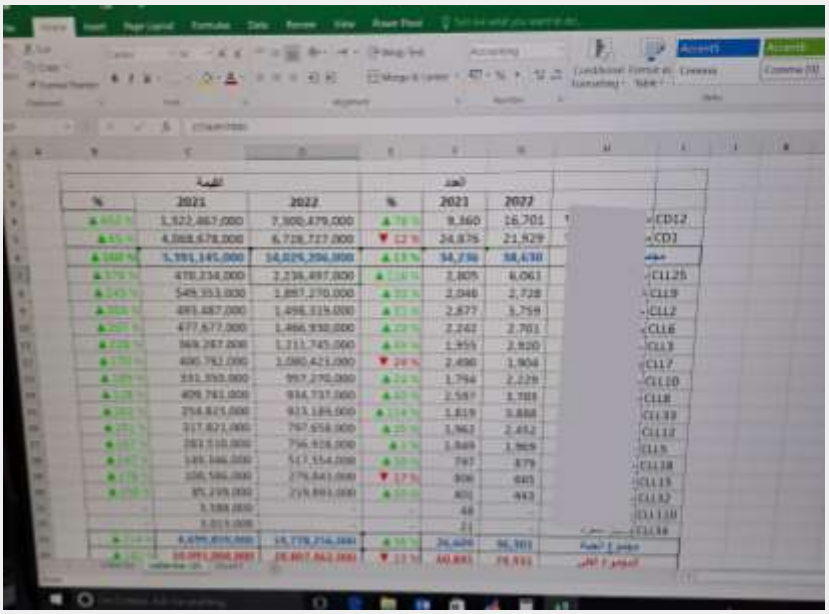


Figure 28*: Excel report of cash collector activity*

Number of bills collected and amount for years 2021 vs. 2022, for each cash collector (names are masked for confidentiality reasons)

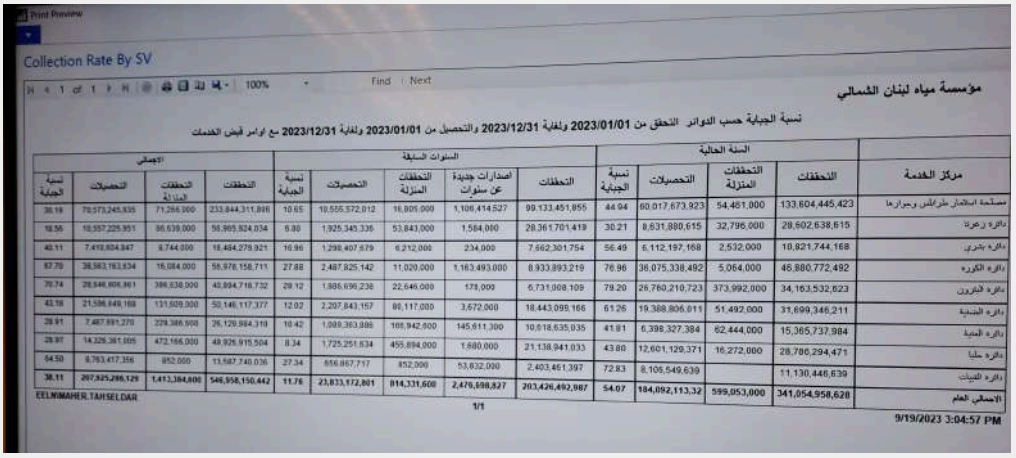


Figure 29*: Income monitoring through the ERP system*

Cash collected per office and per year, including the current year. Data are up to date (billed amount and collected amount in comparison with previous year)

The use of ERP to control and reconcile amounts collected is well advanced. Financial managers use the tool on a daily basis, KPIs and dashboard are regularly used. **However, there are 2 limitations that need to be improved:**

- The customer database is not up to date, which makes the billing rules questionable (the rules for flat-rate billing and per cubic meter are heavily dependent on the database and the ability of field staff to read meters);
- The low level of use of the ERP by office staff does not enable to consolidate proper KPIs and limits the challenge of the cash collection teams.

% of Digitalisation of the process	

Manage assets financial recognition	
Tool	ERP Microsoft Dynamics NAV 2016
Users	Finance directorate

Uses and Shortcomings

The finance department monitors the status of asset financial recognition. The last update took place in 2018 (only on operational fixed assets) and there is no update procedure, either manual (paper/Excel) or automatic (no GIS/EPR link).

With appropriate communication with other software, or even formal reporting procedures between the departments, the ERP could allow a proper fixed assets financial management.

% of Digitalisation of the process	 This assessment is made on the availability of the tool, however the database is not up to date

Human Resources: Payroll	
Tool	ERP Microsoft Dynamics NAV 2016
Users	Finance department (Payroll unit)

Uses and Shortcomings

Human resources service is dependent on the administrative affairs department. Payroll is based on data from this department. The level of use of the ERP is high despite the persistence of a large paper flow.

All payslips are produced via the ERP system.

Only a few parameters require manual intervention:

- Social security;
- Sickness;
- Transport allowances;
- Overtime working hours;
- Exceptional events.

All employees (permanent and under contract) are managed via ERP.

A project is underway to send payslips semi-automatically from the ERP to employees' personal phones (Whatsapp). This functionality is being developed by USAID.

The staff in charge of cash collection receives bonuses corresponding to:

- Contract staff: 3% of revenue collected;
- Permanent staff: bonus based on the number of invoices paid (extracted from the ERP), plus transport allowances.

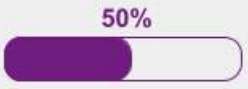
This process is managed by the ERP, but a paper circuit is maintained for the General Director validation once a month.

% of Digitalisation of the process	

Financial Reporting	
Tool	ERP Microsoft Dynamics NAV 2016, Word, Excel
Users	Finance department

Uses and Shortcomings

The consolidation of the administrative account for the Ministry was carried out for the first time in 2022 (mandatory document). This is a major step forward for the department.

% of Digitalisation of the process	

2.5.4. Summary

The digitization assessment of sub-processes can be summarised as shown below . It is important to note that this representation does not define digital maturity, but it contributes to the overall understanding of the role of digitalization in the business.

Figure 30*: Digitalisation overview of Finance and Accounting subprocesses*

2.5.5. Main shortcomings identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the diagnostic performed at a department/unit level:

Strengths	Weaknesses
• The ERP has all basic functionalities for correct accounting and financial reporting; • The ERP is used by the employees; • Relevant KPis monitored with daily update; • ERP training planned for the finance team in December.	• Head of offices do not have access to ERP; • Most of the validation workflows and communication between departments are still in paper form; • Customer database update insufficient to ensure the complete reliability of finance management; • Bank statements not available in ERP; • The fixed assets database is out of date - last full update was in 2018.
Opportunities	**Threats**
• Important digital culture of the staff; • Extend good practices within the whole	• Use of PowerBI on-premise, that will involve the payment of a high cost

establishment; • The Microsoft Navision ERP offers a lot of functionalities, some modules could be added to improve the current version.	licence every year; • Remaining mandatory paperwork despite existence of appropriate tool; • Self training remains high.

2.5.6. Main recommendations

The diagnosis of the level of digitalisation of the process has led to a number of recommendations, categorised as:

- "organisation": reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- "skills": training to be provided;
- "tools": need for new software or hardware, licences, software improvements, etc;
- "processes": formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Skills	Statute on the legal obligations regarding the ministry guidelines to keep paper versions of documents concerning expenses, contracts, purchases, etc	1
	Train the Head of branches and team leaders to the use of the ERP	2
	Train all ERP users in digital validation through the ERP	2
Tools	Digitalise the purchase request process (e.g. purchase / stock)	1
	Implement the digital validation workflows in the ERP	2
Processes	Implement reporting procedures between operations and finance for assets condition financial recognition	2
	(common to all departments) Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule	1

Table 10*: List of recommendations for Financial & Accounting business process*

2.6. Administrative, HR and Procurement business process

2.6.1. Mandate

The HR department carries out the following tasks:

- Tracking working hours;
- Leave time tracking;
- Monitoring absences (justified and unjustified).

Payroll is handled by the Finance department. This department is also responsible for Health and Safety.

The administrative department also carries out purchasing and supply procedures for the whole of NLWE, in close relation with the operational departments (operations and technical) and the finance department.
Legal processes have not been addressed.

2.6.2. Organisation

The department of administrative affairs reports to the General Director, as shown below:

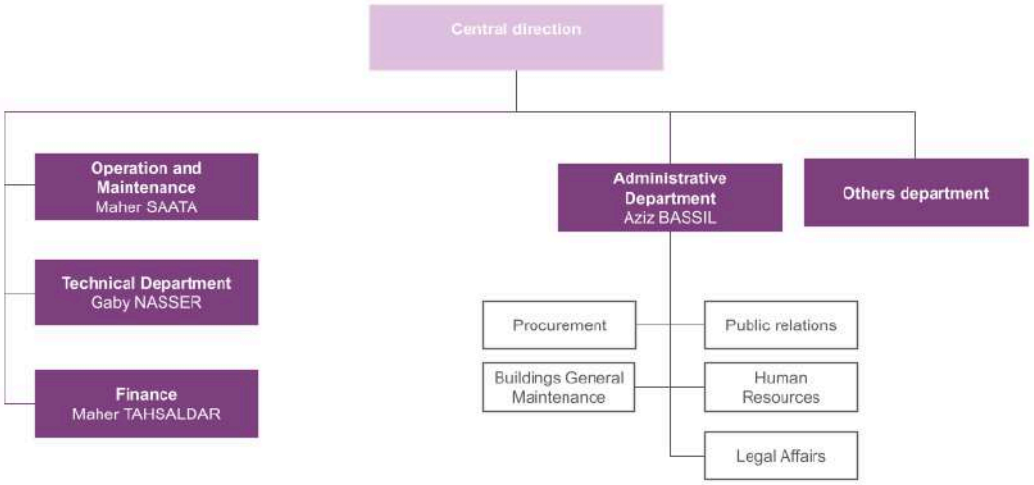


Figure 31*: Organisational chart of the departments involved in Administrative, legal, HR*

2.6.3. Assessment of sub-processes digitalisation status

Based on the interviews and on the on-the-job observations, an assessment of the digital tools used in each sub-processes was carried-out, as presented in the tables below, in order to identified the status of digitalisation of each one and the main shortcomings in the current situation:

HR Management	
Tool	ERP Microsoft Dynamics NAV 2016 + Handpunch (Time Management)
Users	HR (Administrative affairs department) Payroll (Finance department) All Staff (for Handpunch tool)

Uses and Shortcomings

Attendance monitoring:

Based on paper files coming from the 2 departments operation and technic (and validated by the Office Directors and Technical Director), the HR department uses ERP to:

- Follow up work time (based on Handpunch system - see below);
- Follow up and register annual leaves;
- Follow up and register other leaves.

This is available for permanent staff and contract staff even though different rules are available.

The finance department issues payrolls and pays employees. The paper flow remains available in order to control and ensure the traceability of actions carried out in each department (the paper culture remains important, even though ERP processes are secured).

Handpunch system is not directly linked to the ERP program. A monthly report is received, and compared with the annual and sick leaves registered.
Of the 24 existing handpunches, 6 are not connected, which means that monthly visits to the 6 sites are required to connect to the machines and retrieve data.

In case of unprogrammed leave or anomaly detected by the HR department (from daily handpunch system feedback), the HR department calls the manager of the missing worker and checks if it has to be registered as unjustified absence (unpaid) or last minute leave registration.

Figure 32*: Handpunch system*

Note that for some employees, attendance reports must be sent to the Ministry. These reports are currently prepared using Excel.

Training:

- No budget allocated for the training in the HR department, it totally depends on the donors (Unicef, USAID…);
- Lack of a formal training plan for digitization;
- No archiving of the previous existing trainings (ERP, etc).

Other processes:

- The HR department received training for the last time in 2023 (trained by the person who has retired). HR Staff have a good knowledge of ERP and use it appropriately;
- Annual appraisal interviews are carried out but not scanned or digitised. It is archived in the employee file. The training program is also not digitalised.

% of Digitalisation of the process	

Procurement / Purchase	
Tool	ERP Microsoft Dynamics NAV 2016
Users	Procurement (Administrative affairs department) Finance Department

Uses and Shortcomings

A precise and strict workflow is in place with validation processes (see Figure 32: Procurement process).

Whereas traceability of actions are well reported in the ERP by the administrative and finance teams, the ERP is not directly used by the operation / technical staff.

There is:

- No program / Long term overview of purchases;
- No database of (long-term) contract management (contract database with supplier details, bank details, contract start date, contract end date, etc.);
- No SOP or equivalent written guidelines.

The Staff reports that Service Orders are sometimes given by phone in case of emergency, actions are registered retrospectively in the system.

For the specific purchases involving tender, the use of the official platform (https://www.ppa.gov.lb/) is required. While the technical department writes the technical part of the tender, the administrative department writes the administrative part and handles the appropriate procedures.

% of Digitalisation of the process	 Traceability of purchase operations is ensured by the ERP which enables the full digitalisation of the process. However, use in the field remains very low or non-existent.

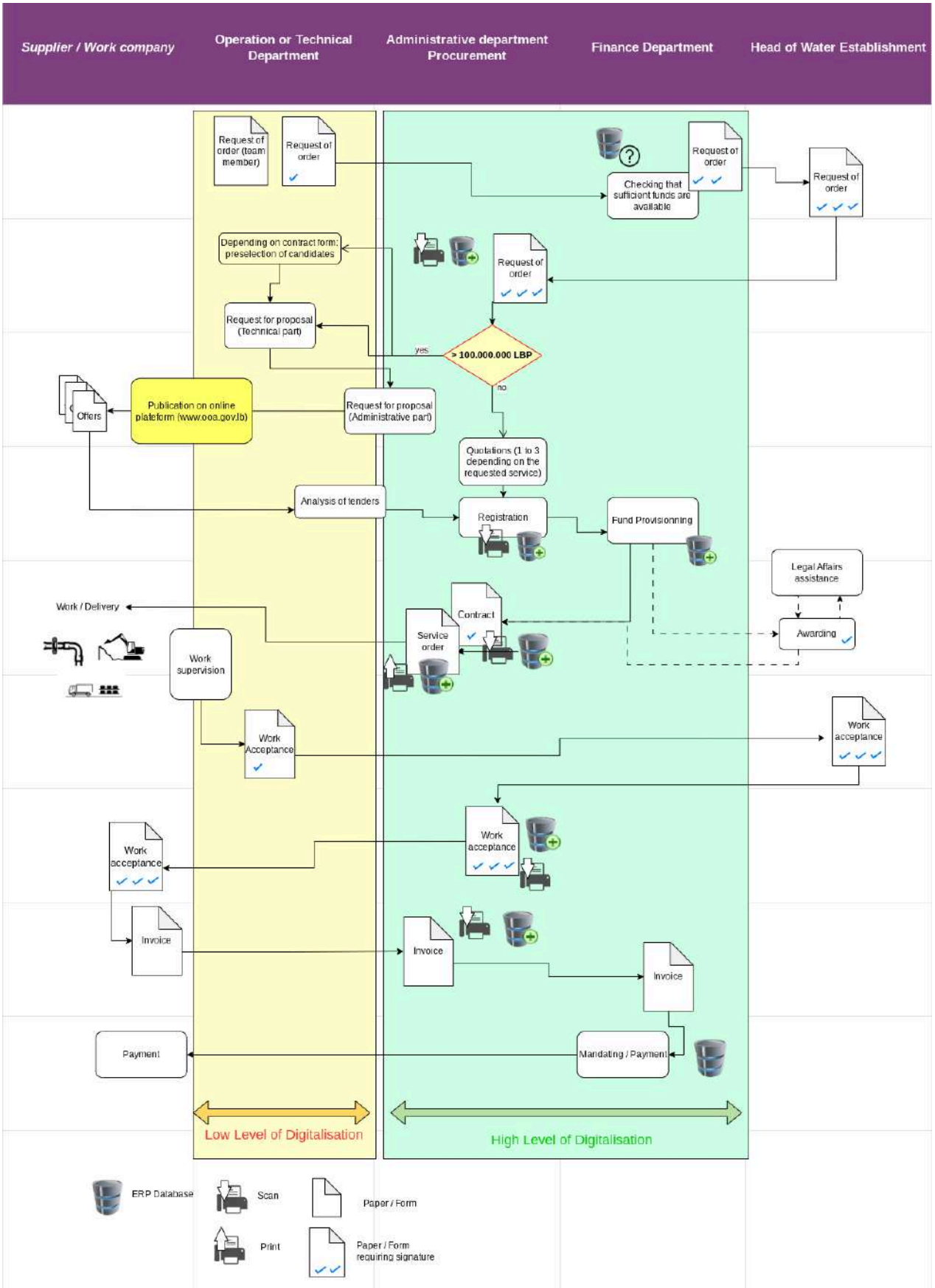


Figure 33*: Procurement process*

Vehicle float management	
Tool	None
Users	Administrative department Operation department Technical department

Uses and Shortcomings

Vehicle float management is not centralised, each department has its own vehicles.

Vehicle log books are kept up to date including:

- Name of driver;
- Period of use;
- Mileage;
- Fuel level.

Paper tickets are provided to users for refuelling → this process could appear not securised enough to prevent frauds.

% of Digitalisation of the process	

Control	
Tool	-
Users	Control Department

Uses and Shortcomings

- An administrative or technical control can be initiated by 2 processes:
  - At the DG's request (by telephone or letter), to carry out inspections with employees throughout NLWE - 2 to 3 times a month;
  - Annual programme - letter sent to DG requesting inspections (e.g. in 2024 wish to inspect warehouses every month, stations every month, financial offices every two weeks…) - currently these inspections are not being carried out as the annual program has not been approved yet.
- The control unit is also responsible for the building rental management.
- However, it is important to highlight the fact that the control unit does not have access to the ERP thus, in order to perform the controls, he relies on the session opened by the audited users. → following the DG approval of the annual program, it is mandatory to grant access to the ERP and provide training on the tool.

% of Digitalisation of the process	

Document Management System	
Tool	-
Users	-

Uses and Shortcomings

There is no proper document management system.

A number of needs were identified during site visits, showing the importance of a DMS:

- The ERP does not have a shared handbook. USAID reports a work in progress but the staff was unable to confirm the existence of this handbook;
- The company's legal articles of association shows that only the President and the Chief Executive Officer are authorised to sign any document binding the company. Some documents have been delegated to the Finance Director. An inventory of validation circuits must be drawn up in order to officially record the possibility of using validation circuits incorporating an electronic signature or validation traced in the ERP without contravening the company's statutes (refer to Appendix 2: NLWE Statutes extract);
- External (incoming and outgoing mail) and inter-departmental exchanges are recorded in a dedicated document control register (book).
- There is no e-signature tool;
- The customer department of Tripoli keeps an up-to-date register of each customer operation involving fund movement (cashier register).

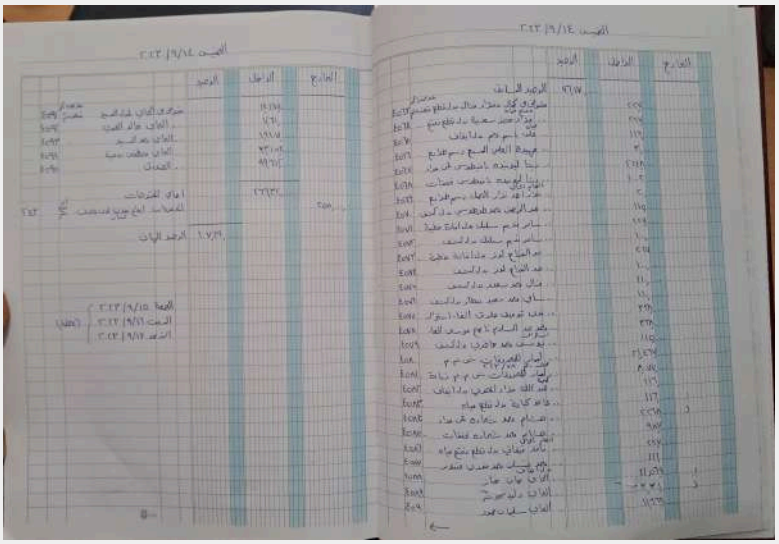


Figure 34*: Extract from customer office register*

There is no (or unknown from staff) generalised sharepoint / shared drive in place.

% of Digitalisation of the process	0%

2.6.4. Summary

The digitization assessment of sub-processes can be summarised as shown below . It is important to note that this representation does not define digital maturity, but it contributes to the overall understanding of the role of digitalization in the business.

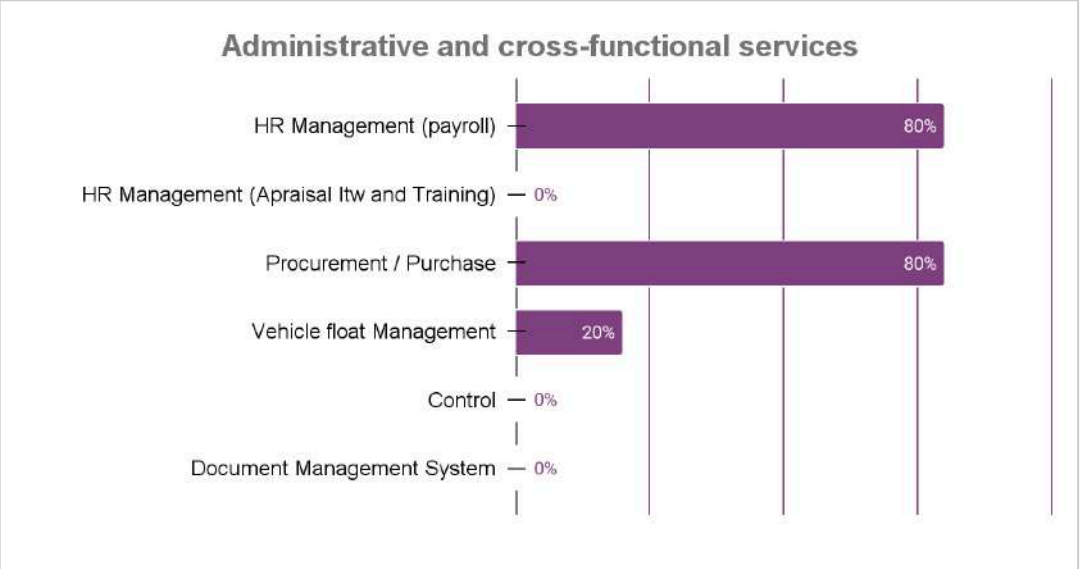


Figure 35*: Digitalisation overview of Administrative and cross-functional subprocesses*

2.6.5. Main shortcomings identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the diagnostic performed at a department/unit level:

Strengths	Weaknesses
• ERP has all basic functionalities for correct HR, purchase, and other administrative processes; • ERP is used by finance department employees; • ERP includes archiving of important papers (purchase order, work acceptance…); • Hand punch system is correctly used, digitalisation is close to 100% considering that data are almost managed “from field to payroll”.	• The validation workflows and the communication between departments are still made on paper; • No sharepoint / shared drive (or unknown from staff).
Opportunities	**Threats**
• Advanced digital culture;	

• Developing project to improve time attendance with smartphone application. (status registration with GSP and fingerprint).	

2.6.6. Main recommendations

The diagnosis of the level of digitalisation of the process has led to a number of recommendations, categorised as:

- "organisation": reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- "skills": training to be provided;
- "tools": need for new software or hardware, licences, software improvements, etc;
- "processes": formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Skills	Capitalise on positive experience on ERP by internal feedback and training	1
Tools	Identify the digitalised steps that no longer require paper duplication (example: attendance monitoring, request of order in purchase process)	1
	Finalise handpunch connection to the ERP or develop mobile application to substitute time management system	2
	Develop a digital fleet management tool	3
	Identify the reporting needs that could be covered by an automatic ERP report (dashboard)	1
	Complete presence tracking (handpunch) with mobile application with GPS and finger print for field operatives	3
	Develop the ERP contract management module (framework purchasing agreements, etc.)	2
Processes	(common to all departments) Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule	1

Table 11*: List of recommendations for administrative, HR and Procurement business process*

2.7. Technical & studies business process

2.7.1. Mandate

NLWE has one department involved in Technical & studies, even though few projects are implemented. When there are major projects, they are monitored by the donors or their contractors.

For small extension project requiring a tender, the procedure is described in the "administrative" section. The technical/projects department drafts the technical clauses, while the administrative clauses are drafted by the administrative department. The consultations are published on the dedicated platform (www.ppa.gov.lb) under the supervision of the administrative department.

2.7.2. Organisation

This department reports to the Director general, as shown below:

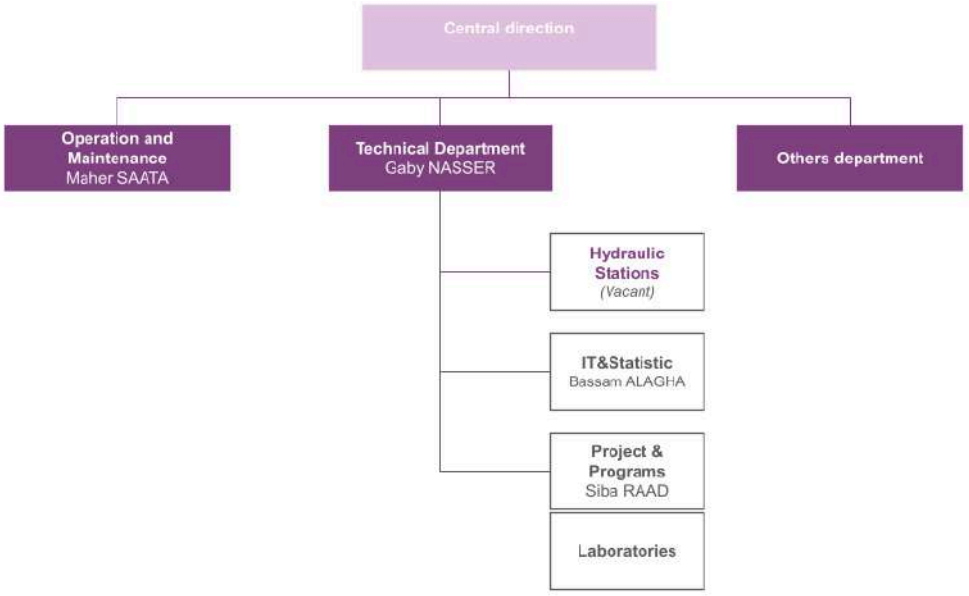


Figure 36*: Organisational chart of the departments involved in Technical & studies*

The Projects & Program Manager act as interim. Her role and responsibilities do not include IT projects. Her main function is to manage the laboratories. The head of department also leads a number of projects.

2.7.3. Assessment of sub-processes digitalisation status

Based on the interviews and on the on-the-job observations, an assessment of the digital tools used in each sub-processes was carried-out, as presented in the tables below, in order to identified the status of digitalisation of each one and the main shortcomings in the current situation:

Project Management (technical infrastructures)	
Tool	Autocad, Google Earth, Adobe.
Users	Project and Programs (Technical Department)
Uses and Shortcomings Many engineers left the WE so they do not have the skill / manpower to conduct big extension works. The scope of the WE is limited to small extensions for which no modelling is necessary. AutoCAD and Adobe (pdf editing) are used with expired licence, Google Earth is used for topographical data. The update of assets and inventories is made in GIS for UG Assets (Tripoli district only). Apart from archiving the “as built” drawings and infrastructures information, there is no database update for AG Assets. In the hypothesis of the development of major infrastructure projects, the need for digitisation will be more significant (modelling, CAD…)	
% of Digitalisation of the process	

2.7.4. Main shortcomings identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the diagnostic performed at a department/unit level:

Strengths	**Weaknesses**
• Dedicated team to lead tenders (administrative department).	• No taskforce to lead projects.
Opportunities	**Threats**
	• The lack of projects leads to a decrease in motivation and a lack of challenge for the teams in terms of methods and processes.

2.7.5. Main recommendations

The diagnosis of the level of digitalisation of the process has led to a number of recommendations, categorised as:

- “organisation”: reorganisation of teams, cross-team communication, clarification of task allocation, recruitment, etc;
- “skills”: training to be provided;
- “tools”: need for new software or hardware, licences, software improvements, etc;
- “processes”: formalisation of new processes, revision of processes with shortcomings, etc.

These recommendations are prioritised as follows:

- 1 - High priority: action to be addressed in the 1st coming year;
- 2 - Medium priority: action to be addressed in the 3 coming years;
- 3 - Low priority: action to be addressed in the 5 coming years.

Category	Recommendations	Priority
Organisation	Increase human resources in line with the investment program	3
Skills	Improve skills especially in hydraulics (incl. Use of modelling software and CAD)	3
Tools	Update licence (AutoCAD…)	3
Processes	(common to all departments) Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule	1

Table 12*: List of recommendations for Technical & studies business process*

3. Overall digital maturity diagnostic of NLWE

3.1. NLWE's digitalisation context & past initiatives

NLWE currently lacks an existing digital strategy, but is determined to embrace digitalization in order to **enhance operational efficiency** and **consolidate access to all information in one centralised location**. Additionally, there is a strong desire to **reduce paperwork** and **streamline processes**. By transitioning to digital platforms and systems, the company will be able to centralise its data, simplify workflows, and ultimately improve overall management and efficiency. Embracing digitization will also help reduce costs associated with printing and physical document storage, while **minimising human errors often associated with paper-based processes**.

With approximately 260 employees who are expected to be capable of embracing this digital transformation, the company is confident in its ability to successfully implement new digital strategies and technologies.

3.2. NLWE's digital tools overview

3.2.1. Softwares currently used in NLWE

The table below details the softwares used by each business process:

Tools managed	Version	Licence	Use	Used by
ERP Microsoft Dynamics NAV 2016	2016	85 users	Data entry, HR Management, financial management	HR, Payroll, Procurement, Document management, Inventory, Billing and collection, Accounting, Cash management, budgeting, IT
SQL Server	2016	1	Database	IT, Finance, Administration
GIS	ArcGIS Arcview 10.8.1	Arcview 10.8.1	Viewing and editing of network map of water distribution in NLWE	Programs and Projects department
TeamViewer	15.45.4 (constantly updated)	Free	Remote connection with clients for support	IT and all employees with a computer (280)
Uagent For Call Center (Altitude)	8.3.4040	1	Receives phone calls from the subscribers	CRM
Sophos Antivirus	Xgs2300	1	Its software provides critical malware, phishing website, and ransomware prevention, the sophos antivirus is funded by USAID	IT and all employees with a computer

Microsoft Office 365	- Business Standard - Business Basic - Online Kiosk	145	Work mail - Organisation mail Cloud based	Employees
Veeam Backup & Replication 10	5.0.0.4301	1	Saves a copy every day of all programs	IT
Hprocom	V1.1.1	1	It works to extract the employee's fingerprint from the HandPunch machine	HR
Time Management	- Handpunch 1000 - Handpunch 2000	1	It takes the fingerprint from the hprocom program so that we can get the employee time	HR
Firewall	19.5.1	1	Prevention of unauthorised access to the network	IT
AutoCAD	Multiple versions 2018	1	Viewing and editing of NLWE water distribution map	Programs and Projects department
WaterCAD	Connect edition 10.02.03.06	1	Water distribution simulation	Programs and Projects department

Table 13*: NLWE's software list*

3.2.2. NLWE'S SOFTWARE MAPPING

The figure below illustrates how the various software packages fit into the overall IT architecture. It details the departments in which the softwares are used, the data flows between them, and their status of use.

It was drawn up as a basis for comprehension, and to visually identify the possible interactions that might improve the overall integration.

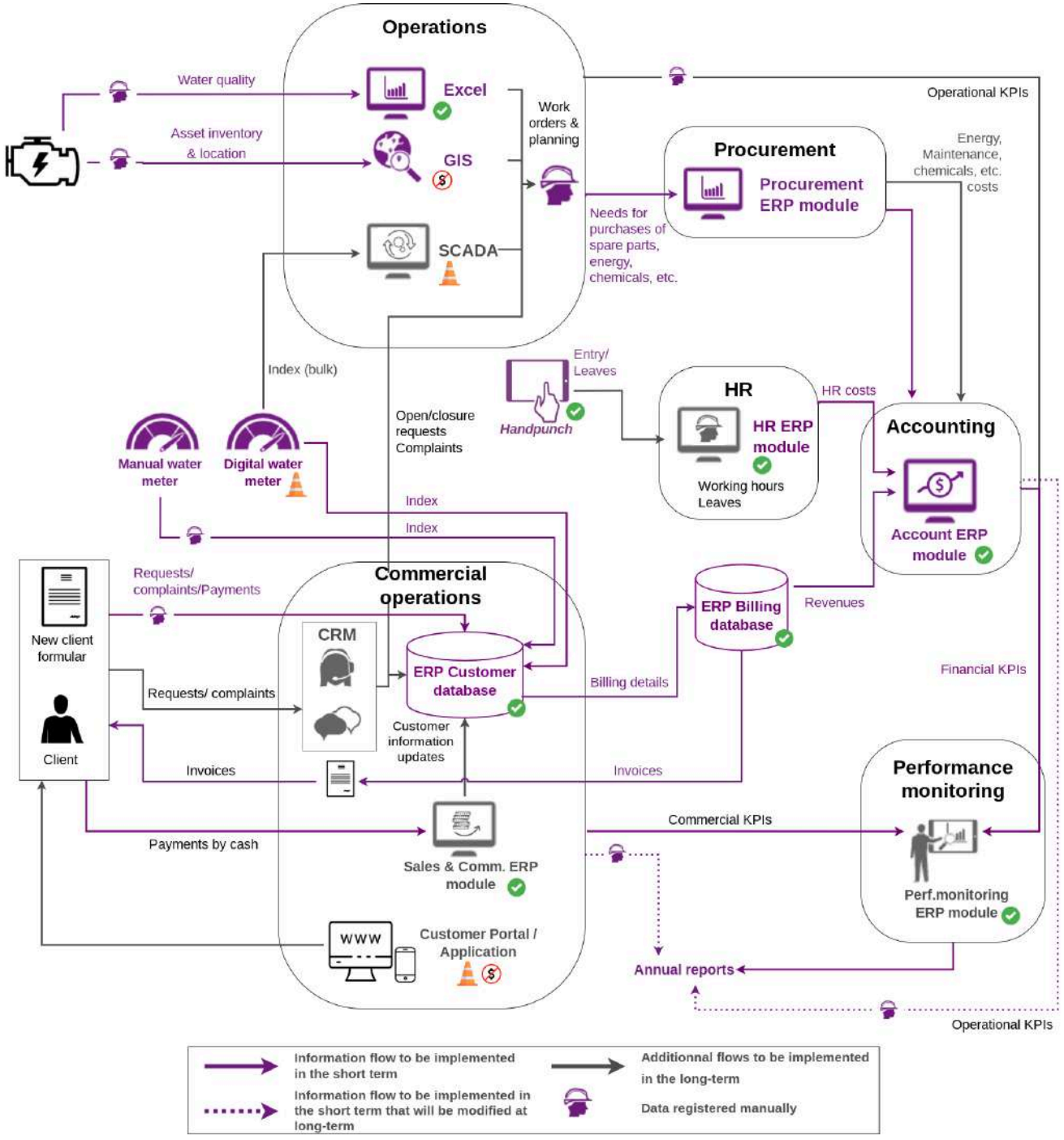


Figure 37*: NLWE's software mapping*

3.3. Main shortcoming identified

Based on the initial mission diagnostic, the SWOT matrix below displays the key elements of the individual SWOT performed at a department/unit level as well as a global analysis:

Strengths	Weaknesses
• Implemented internal reporting procedures (mensual reports); • Integrated ERP (Finance, Customer), used by the offices in the branches and consolidated in the Tripoli main office; • High implication of the staff to fulfil their essential mission despite the difficult context; • Clear appetite of the staff for digital. • Strong financial contribution of USAID, support by skilled external staff (DAI: ERP); • High Quality of GIS Data (Tripoli only).	• Limited OPEX budget impacting renewal software licence fees, correct maintenance of hardware; • No digital governance, nor digital strategy (except by finance); • No focal point within NLWE regarding IT projects and lack of project monitoring processes; • Reported existence of tool documentation (ERP) in USAID, but not available within NLWE; • Lack of SOPs; • Low digitalisation level of intervention requests (complaints, maintenance, …); • Lack of systematic database update processes → out-of-date databases, • No asset management procedures (incl.preventive maintenance).
Opportunities	**Threats**
• Development of the existing GIS best practices in Tripoli for all offices; • Continuous improvement of of ERP module, with the regular support of USAID; • Willingness to digitalise maintenance interventions monitoring process; • Ongoing creation of the call centre fully integrated in the ERP; • Implemented use of social media for external communication; • Existing mobile app that could be updated to integrate mobile/online payment; • Willingness to integrate the tools (ERP-GIS- SCADA); • On-going project to implement hand-held devices for cash collection; • On going project for a second datacenter as part of risk management plan.	• Inequality between Tripoli offices and branch offices, especially on O&M (lack of hardware for example); • Inherent resistance to the transition to a paperless system (subscription, purchase…); • Lack of instrumentation for process automation and supervision; • Lack of standardisation of the PLC (hardware and program), and necessity to own the information (documentation and access) in NLWE; • Centralization of the IT service which makes it difficult to ensure the helpdesk on field (lack of gas for the cars); • Residual duration of USAID support not contractually established; • Difficulty to cover licences, maintenance & support fees due to the economic crisis and LBP inflation; • Incoming necessity to integrate sanitation facilities which could interfere with the implementation of digitalisation measures;

	• Difficulty retaining trained staff, due to lack of financial incentives.

3.4. Digital maturity assessment

The digital maturity assessment consists in evaluating the current performance of the utility in its various business processes in relation to international best practices using SEURECA's proprietary maturity grid. The different maturity levels are described below:

Level	Scoring	Description
Innocent	0	The utility does not have any activities related to the business function
Aware	1	The utility performs basic activities related to the business function but lacks organisation, tools and processes as well as competences to be efficient
Developing	2	The utility has initiated a number of measures to improve its performance in the activities related to the business function
Competent	3	The utility performs the activities related to the business function sufficiently well to secure the sustainability of the business
Advanced	4	The utility has implemented a series of international best practices and launched a process of continuous improvement in the activities related to the business function
Expert	5	The utility is recognised as an expert in the activities related to the business function and has systematically implemented international best practices

Table 14*: Digital maturity scoring*

Based on the interviews with the different departments and the on-the-field observations, the Consultant assessed the current maturity of NLWE. Based on our perceptions, our experience of the Water Utilities worldwide and discussions with General Management, it is compared to the **targeted maturity state at mid- and long-term** in order to identify the actions required to reach those target states.

The result of the Digital Maturity assessment is summarised below.

	Current maturity rating	Target maturity state *Horizon 5 years*
Governance / Strategy / Organisation	**Level 1 - "Aware"** *Management is convinced of the impact of digital transformation on the quality of service and performance of the Establishment. It has set the course and invested in it, in the last years. However, it has not provided sufficient organisational, human and material resources, nor the necessary budget to start this transformation plan in the best conditions*	**Level 3 - "Competent"** *Management is convinced of the impact of digital transformation on the quality of service and performance of the Establishment. It is adapting the organisation and recruiting the right people. It has a clear vision of the holistic implementation of the digital transformation project and a coherent roadmap and action plan.*
Technology: Infrastructure	**Level 1 - "Aware"**	**Level 4 - "Advanced"**

	Current maturity rating	Target maturity state *Horizon 5 years*
/ Architecture / Data / Security	*The IT development plan follows the recommendations of the master plan, the IT infrastructure is well dimensioned and the outsourcing system in place satisfies users (no interruptions).* **→ Note that NLWE does not have an IT master plan or a regular security audit, but given the other assessed criteria, level 1 seems the most appropriate.**	*Security architecture and policies are documented and fully implemented. Databases are managed, including security and performance.* *Documented Business Continuity Plan for critical applications. Managed services interventions are tracked through an intervention management platform. Some preventive maintenance tasks are performed, such as firewall updates, software or operating system version management.*
Customer Relation / ERP / Services digitalisation	**Level 0 - "Innocent"** *The Customer relationship management is not integrated. The customer is obliged to visit the branch systematically for each operation.* *Each counter in the branch is responsible for one operation, and there is no multi-skilling of the customer officer. (Quotation, contract, settlement, claim). Control and management requests are not systematised. High risk of fraud.* **→ Note that the ERP interface for customer management is very good, but the lack of a digital customer interface explains this level of maturity - refer to Appendix 1: Customer Journey**	**Level 4 - "Advanced"** *The Customer relationship management is integrated with a maintenance contract and version updates. Each customer service representative in the sales office is multi-skilled and can handle any type of operation (multi-skilled) and can record complaints with an application integrated and centralised in the CRM. Complaints are traced regardless of the channel used and connected to the intervention management system. Possibility to measure intervention times. The customer can also carry out any type of operation from an online agency or mobile application. The process of handling requests is dematerialised within the Establishment. The Establishment is active on social media and communicates any operation event.*
Public service / Asset life cycle	**Level 0 - "Innocent"** *No asset database of the Establishment's assets is updated on a permanent basis. Assets monitored by acquisition contract.*	**Level 3 - "Competent"** *The equipment and network asset databases (GIS) are permanently updated on a platform linked to "fixed assets" accounting and coupled with a CMMS with exhaustive monitoring of corrective and preventive maintenance operations*
Operation Management	**Level 0 - "Innocent"** *Lack of telemetry (sectorisation), Lack of remote management.*	**Level 3 - "Competent"** *Existence of a complete telemetry system with alarm and measurement monitoring, remote control operations*

	Current maturity rating	Target maturity state *Horizon 5 years*
Works Management and Follow Up	**Level 1 - "Aware"** *Provision of sufficient human resources to monitor the work and comprehensive documentation of the monitoring of the work (recording of minutes and test reports).*	**Level 3 - "Competent"** *Existence of a permanent geospatial platform for monitoring works with start-up dates, monitoring of attachments, disbursements, recording of reports and test reports, photo reports. Systematic integration into the equipment and GIS asset database.*
Supplier Relation	**Level 2 - "Development"** *All transactions with suppliers are carried out by mail, fax and paper documents.* *Posting of tender notices on the website via the supplier platform, downloading of tender notices and communication of judgement stages.* *Internal tender management application.* **→Note that there is currently no Internal tender management application, but given the other assessed criteria, level 2 is the most appropriate.**	**Level 3 - "Competent"** *All transactions with suppliers are carried out by mail, fax and paper documents.* *Posting on the website via the supplier platform of the Tenders, downloading of the Tenders and communication of the judgement stages.* *Internal tender and contract management application.*
Supports services digitalisation / Accounting	**Level 2 - "Development"** *Integrated accounting and financial ERP with the functions of purchasing, fixed assets, general accounting, cost accounting, budgeting, works, treasury and payroll, with some links to the commercial information systems, the asset database and the purchase requests of the various departments.*	**Level 3 - "Competent"** *Integrated accounting and financial ERP with the functions of purchasing, fixed assets, general accounting, cost accounting, budgeting, works, treasury and payroll, with gateways to all commercial information systems, bank sites, the tax department, the asset database and the purchase requests of the various departments.* **→ No more paper validation workflow.**
Staff / HR digitalisation	**Level 2 - "Development"** *The dematerialisation of internal procedures enables exchanges via a digital workflow.* *Working time management: Timesheet / working time monitoring to facilitate the transmission of payroll data, absences, holidays, work accidents, with intermediate declaration and validation, linked to the payroll software for the production of pay slips.*	**Level 3 - "Competent"** *The dematerialisation of internal procedures enables exchanges via a digital workflow* *Working time management: Time sheet / working time monitoring to facilitate the feedback of data from payroll, absences, holidays, work accidents, with intermediate declaration and validation* *HR ERP platform with direct access by employees to monitor their personal file and update their personal data (personal data, career path, evaluation, pay slip, certificate management, leave management, training plan monitoring), display of procedures and safety instructions.*

Table 15*: Digital Maturity assessment*

In order to have a more synthetic view of the digital maturity results in its 9 dimensions, a radar chart is used (see Figure 37: Consolidated maturity radar). It clearly displays the gap between the current maturity and the targeted one which will be used to estimate the investments required to achieve the transformation objectives.

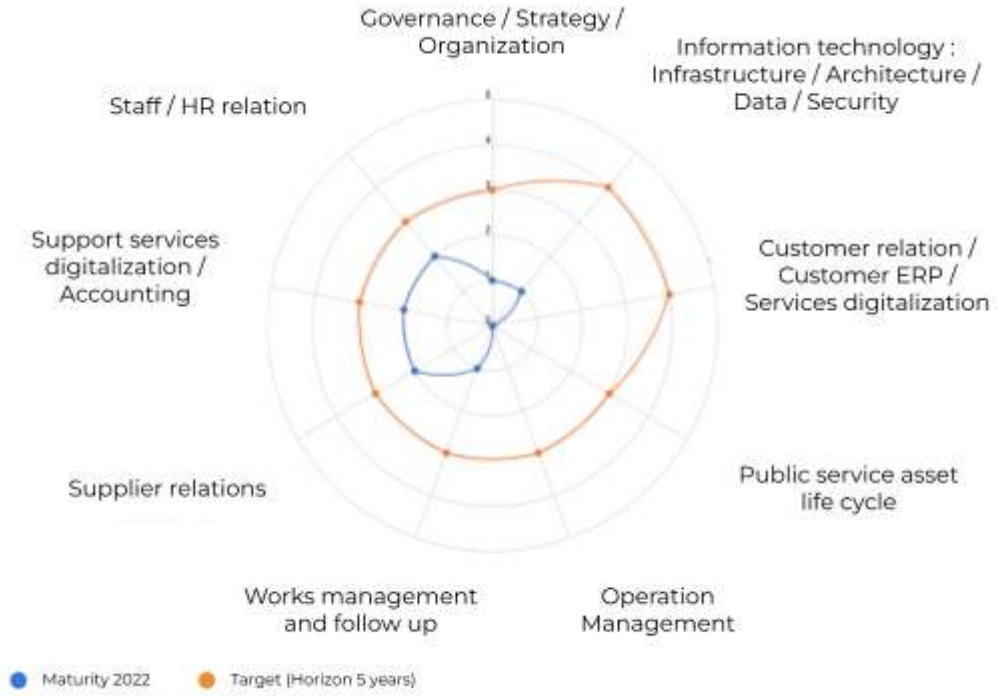


Figure 38*:* Consolidated maturity radar

The target state resulting from this targeted maturity level will have to be approved by NLWE's top-management in order to design an Action plan aligned with their vision of the utility's strategy.

4. Action plan & digital transformation roadmap

Based on the SWOT analyses and the gap analysis carried out for each of the processes, the following chapter proposes a consolidated vision of the action plan.

1.1. 4.1. Definition of the objectives for the next 5 years

The target state defined after the establishment's maturity diagnosis can be broken down into different specific objectives to be achieved by the utility. These correspond to the criteria to be met in order to achieve the target level of digital maturity. These are listed below :

Digital maturity axis	Targeted maturity level	Maturity Level definition (target objectives)	Objectives #
Governance / Strategy / Organisation	Level 3 - “Competent”	There is a coherent digitalisation roadmap, approved by the top-management	GOV1
		The staff is aware of digital transformation and involved in the implementation.	GOV2
		There is an identified team in charge of digital transformation lead, management and progress monitoring.	GOV3
		Digital information flow enables us to calculate Key Performance indicators on a regular basis.	GOV4
Technology : Infrastructure / Architecture / Data / Security	Level 4 - “Advanced”	An IT Service Management is deployed (interventions management platform, skilled team)	IT1
		IT architecture is secured and related policies are fully implemented.	IT2
		Digital tools and databases are regularly maintained, well dimensioned, and have the functionalities required for optimal utilisation and data security.	IT3
		There is a documented ITC Business Continuity Plan for critical applications.	IT4
Customer Relation / ERP / Services digitalisation	Level 4 - “Advanced”	The customer's information is digitalised and up-to-date.	CR1
		All customer management information are consolidated in the same database (customer information, invoices, payments, complaints, customer service portal information, etc)	CR2
		Customer journey is streamlined and digitalised (CRM and Customer Service Portal are fully implemented)	CR3
		Communication processes (on social media, on establishment website, etc) are fully implemented	CR4
Public service / Asset life cycle	Level 3 - “Competent”	The Network's condition is up-to-date and monitored in a GIS.	PS1
		Equipment condition is monitored in the CMMS.	PS2
		GIS and CMMS are integrated into the ERP (fixed assets financial database).	PS3

Digital maturity axis	Targeted maturity level	Maturity Level definition (target objectives)	Objectives #
Operation Management	Level 3 - "Competent"	Implement a SCADA organisation	OP1
		A complete instrumentation system is deployed in all operations sites, **with alarm and measurement monitoring.**	OP2
		A complete instrumentation system is deployed in all operations sites, **with remote control operations.**	OP3
Works Management and Follow Up	Level 3 - "Competent"	Equipment database in CMMS is fully implemented and ensures traceability of interventions.	WM1
		Network database in GIS is updated on a regular basis and ensures traceability of interventions. (reinforcement, renewal and extension requirements)	WM2
		CMMS is integrated to ERP (stock management)	WM3
		CMMS is able to issue work orders considering preventive maintenance and intervention requests.	WM4
Supplier Relation	Level 3 - "Competent"	All transactions with suppliers are done by email or paper document (if required).	SR1
		Internal tenders & contracts management module is implemented.	SR2
		The process of purchase of products and services (under tender procedures threshold) is fully managed on the ERP.	SR3
Supports services digitalisation / Accounting	Level 3 - "Competent"	The ERP is implemented in the branches and in the relevant departments.	SA1
		The ERP is permanently linked to all commercial, bank, taxes, assets information systems.	SA2
		No more paper validation workflow.	SA3
Staff / HR digitalisation	Level 3 - "Competent"	Working time monitoring is automatically integrated to the ERP.	HR1
		The dematerialisation of internal procedures enables exchanges via a digital workflow (pay slip, training, etc)	HR2

Table 16: Details of the 5-years objectives

A **gap analysis** was then conducted to identify the different actions required to reach the objectives listed above.

The different action are organised regarding 3 categories:

- "**Strategic framework**": these actions are the ones required to support the overall Digital transformation of the establishment. They are mostly focused on:
    - the strengthening of the institutional framework and the water establishment organisation;

- the setting and implementation of a structured, competent ICT department, and the tools required for its performance;
- the reinforcement of the overall ICT infrastructure and equipment, lay the foundations for a secure data management and business continuity policy;
- the creation of a digital culture within the establishment.

- "**General IT/OT improvement**": these actions correspond to improvements in business software and SCADA, which contribute to the water establishment's overall performance by supporting several business processes (customer management, finance, O&M, etc.). Those tasks are often necessary to then implement improvements focused on specific issues/shortcomings of each business process. For instance, those actions deal with:
  - general ERP improvements which enable to reduce paper use for communication between departments or validation;
  - KPIs and reporting procedures implementation;
  - SCADA improvement and implementation for better water production and energy consumption monitoring.

- "**Specific process improvements"**: these actions focus on the problems of a specific business process. They address a specific problem and they are aiming at improving service quality and continuity as well as operational performance by digitalising and optimising existing tools; they often require the implementation of actions from the previous two categories. Their implementation generally leads to concrete performance gains, or even quick wins (customer database update, NRW management, revenue collection improvement, etc.). This category is therefore presented by sub-business processes (energy management, revenue collection management, accounting, etc).

For the sake of consistency and ease of comparison, the same categories and subcategories have been applied to all three water establishments. In addition, for the reasons given above, SEURECA has chosen to keep, as far as possible, the same sub-categories (in pink) as SLWE's action plan.

These actions have been **grouped, prioritised and budgeted** and are presented in the next section.

4.2. Digital transformation action plan

The table below presents the **10-years action plan for NLWE's digital transformation.**

The prioritisation of actions and their phasing over time have been designed as follows:

- **Actions that are necessary for NLWE to reach a "competent" level of digital maturity** - i.e. to ensure a level of service that meets international standards - and those enabling rapid gains are considered to be carried out in the next few years **(2025-2029)**.
- Complementary actions, which should enable performance gains but represent a major

investment that is best spread out over time, or are less essential to the efficient day-to-day operation of the water service, are considered to be carried out as a continuation of the previous actions, during the following years (2030 - 2034).

Please note that the amounts presented in the table below are rough budget estimates. It will need to be reviewed and precised at the procurement stage.

CAPEX & OPEX

CAPEX: We considered as CAPEX the costs not recurring over the long term and not included in the WE's ordinary operations: project management, training, audit / complementary diagnosis, technical assistance, hardware and software implementation

OPEX: We considered as OPEX the costs recurring over the long-term (including after 2027) and part of the necessary expenses for daily operations of the WE: licence renewal, maintenance, etc.
Please note that costs related to HR costs of internal staff are not addressed in the estimates, as they are not considered as additional regarding the current situation.

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
STRATEGIC FRAMEWORK																$1,116,100	$240,800	
SF-1	**Strategy and general organisation**															$51,000	$0	
SF-1.1	Streamline the organisation between the branches and the headquarter to facilitate the strategy implementation	GOV1	SF-1.2	x	x									High	Medium	$45,000	-	Consultancy (diagnostic + recommendations) including on-site mission
SF-1.2	Complete an operational and digital assessment of the future sanitation department recently integrated into the WE			x										High	Medium	-	-	Included in SF 1.1
SF-1.3	Encourage NGOs to cover OPEX in their project proposals, or refuse projects that do not have the necessary OPEX funding			x										High	Low	-	-	Internal staff
SF-1.4	Set up a Customer management directorate or department, to provide the establishment with an integrated commercial strategy	GOV3	SF-1.1	x	x									Medium	Medium	-	-	Included in SF1.1
SF-1.5	Establish a "project mode" for IT projects by designating roles (empowerment of a project manager and contributors) and a schedule	GOV1 GOV3	SF-1.1	x										High	Low	$6,000	-	Training

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SF-2	**ICT department reinforcement**															$32,900	$1,600	
SF-2.1	Define CIO job description Identify the required resource within the water establishment staff	GOV3	SF-1.1	x										High	Low	-	-	Replication of SLWE Job Descriptions
SF-2.2	Define PMO job description Identify the required resource within the water establishment staff	GOV3	SF-1.1	x										High	Low	-	-	Replication of SLWE Job Descriptions
SF-2.3	Define a security officer job description Identify the required resource within the water establishment staff	GOV3 IT2	SF-1.1	x										High	Low	-	-	Replication of SLWE Job Descriptions
SF-2.4	Reinforce cyber security culture through training and regular refresh session	IT2	SF-2.3		x									Medium	Low	$10,000	-	Training + internal awareness campaign
SF-2.5	Create the missing IT policies (eg Security Awareness and Training Policy, Remote Access Policy, Data Protection and Privacy Policy, Password policy…) and plan regular training	IT2	SF-2.1 SF-2.2 SF-2.3	x										Medium	Low	$20,500	-	Consultancy (diagnostic + recommendations) including on-site mission and training
SF-2.7	Update the Business Continuity Plan (BCP)	IT4	SF-2.1 SF-2.2 SF-2.3	x										Medium	Medium	-	$1,600	Consultancy for yearly updates
SF-2.8	Initiate interoperability principles while the number of applications is limited to ensure a correct communication with the future digital tools	IT2	SF-2.1 SF-2.2		x									Low	Medium	$2,400	-	Consultancy Yearly updates performed by internal staff

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SF-3	**ICT Infrastructure reinforcement**															$530,600	$0	
SF-3.1	Audit of the facilities in the various offices to ensure that the IT installations are working properly (regular electricity supply, sufficient hardware...)	IT2 IT3 SA1	SF-1.5 SF-2.1 SF-2.2 SF-2.3	x										High	Medium	$24,000	-	Consultancy (diag. + recommendations) including on-site mission
SF-3.2	Following the audit result, provide the offices with the equipment needed to guarantee a sufficient and similar level of service everywhere (regular electricity supply, sufficient hardware...)	IT2 IT3 SA1	SF-1.5 SF-3.1	x	x									High	Medium	$25,000	-	Purchase of equipment & Works
SF-3.3	Define Cyber security audit expectation (TOR) and Perform a Cybersecurity audit including risk analysis of applications softwares to identify critical ones	IT2	SF-1.5 SF-2.3		x									Medium	Medium	$88,500	-	Consultancy for ToR drafting & Cybersecurity audit
SF-3.4	Define and implement changes based on the results of the audits and BCP strategy to secure the infrastructures	IT2 IT3	SF-1.5 SF-2.6 SF-3.3		x	x								Medium	High	$350,000	-	Estimate based on SLWE
SF-3.5	Improve the connection for the second building in Tripoli	IT2		x										High	Low	$30,000	-	Purchase of equipment & Works
SF-3.6	Create a renewal plan for hardware following the Responsible and Sustainable Digital best practices	IT3	SF-3.1 SPI-13.2		x									Medium	Low	$1,600	-	Consultancy
SF-3.7	Implement changes to the OT Network, such as the addition of a DMZ, to allow the business tools to have access to SCADA data	GOV4 IT2			x	x								Medium	Medium	$11,500	-	Purchase of hardware & software (firewall, DMZ, etc.) & implementation

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SF-4	**SCADA Activities Structuration**															$498,400	$210,000	
SF-4.1	SCADA strategy : Establish a SCADA operational strategy regarding Processes, Responsibilities, Maintenance, On-call duty, Cybersecurity, etc. In particular, define the breakdown of responsibilities between internal staff and external staff.	OP1	-	x										High	Medium	$8,000	-	Consultancy (SCADA audit + recommendations) including on-site mission
SF-4.2	SCADA strategy : Define SCADA standards (specifications, SOP, guidelines,etc) to homogenise hardware, data collection, schematics and interfaces in the establishment	OP1	SF-4.1		x									High	High	$4,000	-	Consultancy (SCADA audit + recommendations) including on-site mission
SF-4.5	Define I&C Referent job description	OP1	-	x										High	Low	-	-	Replication of SLWE Job Descriptions
SF-4.6	SCADA staff : Identify the required resource within the water establishment staff Hire or train an Instrumentation & Control referent that will supervise the different SCADA implementation stages, with the different contractors. Or contract a TA to ensure the same responsibilities	OP1	SF-4.5		x									High	Medium	$480,000	-	Consultancy (diagnostic + recommendations) including on-site mission Potential recruitment are not included
SF-4.8	SCADA external staff : mobilise two SCADA technicians to help for the implementation, operation and maintenance	OP1	SF-4.6 GII-4.4 GII-4.5		x									Medium	Medium	-	$210,000	Outsourced O&M services (2 SCADA technicians)
SF-4.10	SCADA internal staff : Train NLWE operators to have the knowledge to operate locally the SCADA equipment	OP1	SF-4.6 GII-4.9		x									Low	Medium	$6,400	-	Training by branch

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SF-5	**Continuous improvement**															$3,200	$29,200	
SF-5.1	Implement change management practices (training, awareness campaign for all staff) to (re)implement a reporting culture by imposing standard regular reports on operations: daily production, etc.	GOV2 SA1	SF-1.5	x	x	x	x	x						High	Medium	-	$29,200	Monthly support + Internal digital forum
SF-5.2	Implement change management practices (team building activities, workshops, cybersecurity awareness campaign for all staff, user feedbacks) to introduce the digital culture, with priority given to district operations teams	GOV2 SA1	SF-1.5	x	x	x	x	x						High	Medium	-	-	shared costs with SF-5.1 consultancy
SF-5.3	Share end-users manuals (ERP, GIS, etc.)	IT2 GOV3	SF-1.1 SF-2.1 SF-2.2		x	x	x	x						High	Low	$3,200	-	Mainly performed by Internal staff + external support
GENERAL IT/OT IMPROVEMENT																$7,220,800	$43,200	
GII-1	**ERP improvement**															$312,700	$37,200	
GII-1.1	Statute on the legal obligations regarding the ministry guidelines to keep paper versions of documents (concerning expenses, contracts, purchases, etc), remove superfluous paper circuits, and formalise mandatory paper-based validation workflow	SA3	-	x										High	Low	$22,500	-	Mainly performed by Internal staff + external support (including on-site mission)
GII-1.2	Complete the ERP assessment provided in the Diagnostic report (Chapter 1) to detail its limitations in order to upgrade it (missing data flow and/or modules, additional accesses to be provided, digital validation workflow)	SA3	GII-1.1	x										High	Medium	$40,000	-	Consultancy (diagnostic + recommendations) including on-site mission

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
GII-1.3	Upgrade the current ERP (Microsoft Dynamics NAV to Microsoft Business Central) as Microsoft Dynamics NAV will soon be obsolete	IT2	-	x	x									High	Medium	$231,000	$37,200	ERP development, testing, support, running External support for project management Licences renewal
GII-1.4	Based on the conclusion of the assessment, upgrade ERP to: - integrate new modules (Ex: purchase requests, tenders database, document management system, HR modules, contract management, helpdesk) - create dataflows between ERP and other software (Ex: CMMS, GIS, and Time Attendance system) - create the required digital validation workflows (for a proper data control and validation of key documents)	SA3			x	x	x	x						High	High	-	-	Included in GII-1.3 consultancy
GII-1.6	Configure user rights, linked to authorization levels previously defined	IT2	GII-1.2 to 1.4		x									High	Low	$1,600	-	Performed by internal staff
GII-1.7	Provide access to the ERP to the identified new users (branches managers)	SA1 GOV3	GII-1.2 to 1.4		x	x								High	Low	-	-	Performed by internal staff
GII-1.8	Train new ERP users - Basics All departments to benefit from the ERP experience (positive feedback, training, mentoring)	GOV2 SA1	GII-1.6 GII-1.7		x	x								High	Low	$16,000	-	Training of new users (only a sample of employees --> Train the trainer concept)

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
GII-1.9	Create procedures and/or update existing ones to adapt them to the changes to ERP (Ex: Time attendance monitoring, revenue conciliation, purchases requests, warehouse management ,etc)	IT2 SA1 SA3	GII-1.8		x	x	x	x						Medium	Medium	-	-	detailed in actions: SPI-1.6, SPI-1.9, SPI-2.5, SPI-3.1, SPI-4.8, SPI-14.4, SPI-16.3, SPI-17.2.
GII-1.10	Train ERP users to the new procedures	SA1 SA3	GII-1.9		x	x	x	x						Medium	Low	-	-	detailed in actions: SPI-1.6, SPI-1.9, SPI-2.5, SPI-3.1, SPI-4.8, SPI-14.4, SPI-16.3, SPI-17.2.
GII-1.11	Insert the existing ERP user manual in the relevant ERP module	SA1	GII-1.3 GII-1.8 GII-1.10		x	x								Medium	Low	$1,600	-	Performed by internal staff
GII-2	**Document and processus Management System**															$0	$0	
GII-2.1	Implement a Document management system (DMS) - training, procedures, organisation	SA3	GII-1.2 GII-1.5			x								Low	Low	-	-	Included in GII-1.4/1.5
GII-3	**KPI Management**															$17,500	$0	
GII-3.1	Identify the reporting needs, regarding national guidelines for WEs performance monitoring, that could be covered by an automatic ERP export	GOV4	GII-1.4 & 1.6		x									Medium	Medium	$17,500	-	Consultancy (diagnostic + recommendations) including on-site mission
GII-3.2	Identify the reporting needs that could be covered by an automatic ERP report (dashboard).	GOV4	GII-3.1 GII-1.4 & 1.6		x									Medium	Medium	-	-	Included in GII-1.2; 1.4/1.5
GII-3.3	Update the ERP to automatically generate the mandatory KPIs (dashboard)	GOV4	GII-3.1 GII-1.4 & 1.6		x									Medium	Medium	-	-	Included in GII-1.2; 1.4/1.5

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
GII-4	**SCADA infrastructure improvement**															$6,890,600	$6,000	
GII-4.1	Create and Maintain detailed asset list of SCADA equipment to be hosted in the ERP inventory module	OP1 OP2 PS2	GII-1.4	x											High	-	-	Included in SPI-10.1
GII-4.2	Centralise electronically all document related to SCADA equipment and previous implementation, to be hosted in the DMS	OP1 OP2	GII-2.1		x									Low	High	-	-	Included in SPI-10.1
GII-4.9	Carry out a Staged implementation of an NLWE overall SCADA application (including supply and installation of all the required instrumentation, control room, etc..)	OP2	GII-4.1 SF-4.2		x	x	x	x	x	x	x	x	x	High	Medium	$6,890,600	$6,000	Purchase of equipment Consultancy Software development All SCADA implementation excluding customer metering
SPECIFIC PROCESS IMPROVEMENT																$19,858,600	$1,500,540	
SPI-1	**Support for Customer management/ internal process**															$132,400	$510,000	
SPI-1.2	Implement eSignature for new contract management	CR1 CR2	GII-1.4 SF-1.4 SF-1.5		x									Medium	Medium	$40,000.00	$10,000.00	Esignature implementation (licence and external support)
SPI-1.3	Digitalise paper-based contract to the customer database (Purchase scans if necessary - not included in the budget estimate)	CR1 CR2	SF-1.4 SF-3.2			x								Low	Medium	$1,500	-	Mainly performed by Internal staff + external support

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-1.5	Set up a special team responsible for updating the customer database: provide a simple reliable tool (project CRP1), train the field teams (fraud control, specific team if necessary) and formalise the task of updating the database	CR1 CR2	SF-1.4 SF-1.5 SF-2.2	x	x									High	High	$22,500	-	SOPs development + Training
SPI-1.6	Streamline procedures for Customer information update (regularisation, payments monitoring, etc.) in line with the new tools, and update customer database	CR1 CR2			x	x								High	Medium	$22,500	$500,000	SOPs development + Training Optional: On-the-field support for regularisation campaign
SPI-1.7	Integrate the customer information (from the ERP) in the GIS Train commercial staff (specialised team) on the utilisation of GIS data for customer regularisation	CR1 CR2	SPI-1.5 SPI-10.3				x							Low	High	$21,400	-	Consultancy (Integration of the customer information in the GIS) Training
SPI-1.9	Provide access to CRM system at branches level and configure authorization levels Streamline procedures for CRM system use at branch level (offices must be able to handle basic customer complaints)	CR3	SF-1.4			x	x							Medium	Medium	$24,500	-	SOPs development + Training Configuration of authorization levels (can be performed by internal staff or external support)

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-2	**Customer journey improvement**															$84,900	$8,440	
SPI-2.1	Streamline communication channels via Customer Service Portal (website, mobile application)	CR3 CR4	GII-1.2 to 1.4		x									Medium	Low	$3,000	-	Mainly performed by Internal staff + external support
SPI-2.2	Extend the Customer Service Portal features in order to address other stages of the customer journey (subscription, termination of subscription, online payments, etc.)	CR3 CR4	GII-1.2 to 1.4		x	x								High	Medium	$54,400	$5,440	Technical assistance to develop additional modules (interactive interface, integrations, etc)
SPI-2.3	Develop the WE website, if necessary, to include access to the customer service portal functionalities; and publish it	CR3 CR4	SP-2.1 & 2.2			x	x							Medium	Medium	$5,000	$3,000	Website development, hosting cost and maintenance
SPI-2.4	Reinforce call centre team	CR3												High	Low	-	-	Recruitment of 3 employees
SPI-2.5	Create SOP to streamline Customer relation Train all commercial staff to the new tools and procedures	GOV2 CR3				x	x	x						Medium	Medium	$22,500	-	SOPs development + Training
SPI-3	**Billing management**															$22,500	$0	
SPI-3.1	Create SOP to streamline billing and train staff	GOV2 CR3	SF-1.4	x										High	Low	$22,500	-	SOPs development + Training

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-3.2	Implement a dashboard to support debt management (late payers, unpaid amount, X months overdue, etc.)	GOV4 CR2	SF-1.4 GII-1.3 GII-1.4 SPI-3.1	x										High	Low	-	-	Included in GII-3.2
SPI-4	**Collection management**															$33,500	$0	
SPI-4.1	Finalise the implementation of mobile printers for on-the-field revenue collection, communicating with the ERP SEURECA recommends assessing the status of implementation (number of mobile printers already purchased).	CR2 SA1 SA2	SF-1.3	x										Medium	Medium	-	-	Performed by internal staff
SPI-4.3	Diversify the channels of payments thanks to improved Customer Portal Service and mobile app (online payment)	CR3 SA2	GII-1.3 GII-1.4 SPI-2.3		x									High	Medium	-	-	Included in SPI-2.2 and SPI-2.3
SPI-4.5	Finalise the customer portal (application or website - CRP2) for customer application and payment	CR3 SA1 SA2		x										Medium	Medium	-	-	Included in SPI-2.3
SPI-4.6	Maximise the use of the e-payment through communication campaigns	CR3 CR4	SPI-4.5		x	x								Medium	Low	$3,000	-	Mainly performed by Internal staff + external support
SPI-4.7	Connect the ERP to bank systems and government tax department	SA2	GII-1.3 GII-1.4		x									Medium	Low	$8,000	-	Purchase of Next system (for instance)
SPI-4.8	Streamline cash collection procedures and train all commercial staff to the new tools and procedures	CR2 SA1 SA2 GOV2	SP-4.1 & 4.5		x	x	x							Medium	Low	$22,500	-	SOPs development + Training

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-5	**Metering management**															$18,611,000	$870,000	
SPI-5.1	Develop a module to integrate remote meter reading data from current pilot projects into the customer database. (SEURECA strongly advises not to extend the perimeter of pilot projects before consolidation of the current data chain)	CR2 CR3 SA2	-	x	x									Medium	High	$46,000	-	Technical assistance to write the specification redaction & develop the module
SPI-5.2	Deploy customer water metering for large consumers	CR2 CR3 SA2	SF-1.4 SPI-5.1		x	x								Low	Medium	$500,000	$10,000	Technical assistance (water metering strategy redaction & deployment) Meter installation & data management Meter maintenance & renewal
SPI-5.3	Deploy customer water metering for the entire NLWE perimeter	CR2 CR3 SA2				x	x	x	x	x	x	x	x	Low	High	$18,060,000	$860,000	Meter installation & data management Meter maintenance & renewal
SPI-5.4	Develop a meter fleet management database	SA2					x	x						Low	Low	$5,000	-	Technical assistance to development the database (basic on excel)

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-6	**Production management**															$22,500	$0	
SPI-6.1	Streamline data acquisition procedures for volume production KPIs monitoring	GOV4 OP2		x										High	Low	$22,500	-	SOPs development + Training
SPI-7	**Energy management**															$323,000	$0	
SPI-7.1	Install Energy measuring units for detailed energy monitoring linked to the SCADA	OP2	GII-4.9			x	x	x	x					High	Low	$308,000	-	Energy monitoring strategy for main consuming facilities
SPI-7.4	Develop energy consumption monitoring (energy efficiency KPIs) and management in line with the new SCADA	OP2 GOV4	SPI-7.1				x	x	x					Medium	Medium	-	-	
SPI-7.5	Train O&M staff on the use of SCADA system for energy consumption management	OP1	SPI-7.4				x	x	x					Low	Low	$15,000		Training
SPI-8	**NRW Management**															$87,000	$2,000	
SPI-8.1	Consolidate water production and consumption data to calculate NRW KPIs (physical losses)	OP2 GOV4	GII-4.9 SPI-5.3			x	x	x						High	Medium	-	-	Included in GII-3.2, GII-3.3
SPI-8.2	Develop & implement the illegal connections and consumptions management procedures, and provide the required digital tool (dedicated module in the ERP, automatic work orders, on-device tracking tools)	OP1 CR2	SF-1.4 GII-1.4 SPI-8.1		x									Low	Low	$87,000	$2,000	Consultancy (structuring of the teams, mandate needs for resources, members, activities, procedures) Purchase of on-device tracking tools (+maintenance costs) & software

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-9	**Water quality**															$38,000	$24,000	
SPI-9.1	Set up a shared water quality database with the top-management. Streamline reporting procedures.	OP2	-	x										High	Low	$10,000	-	Mainly performed by Internal staff + external support
SPI-9.2	Integrate Water Quality KPIs on the KPI monitoring platform	GOV4	SPI-9.1		x									Medium	Medium	-	-	Performed by internal staff
SPI-9.3	Implement LIMS	SA2	-						x	x				Low	High	$28,000	$24,000	Purchase of licences & development to link it to the ERP
SPI-10	**Asset management: Inventory management**															$218,500	$27,600	
SPI-10.1	Carry out an inventory of the current equipment, including SCADA related assets (cf. GII-4.1)	PS1	-	x										High	Medium	$8,000	-	Mainly performed by Internal staff + external support

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-10.2	Implement a CMMS (inventory module of equipment and Instrumentation & Control equipment) (SEURECA strongly advises to take inspiration from what has been done on SLWE to develop it.)	PS2 WM1 (WM2 only NLWE)	SPI-10.1 GII-1.3	x	x									High	Medium	$156,000	$24,000	Consultancy (technical specifications, support to deployment, development) Purchase of licences & technical support Training of the teams (Train the trainer approach)
SPI-10.3	Upgrade of GIS obsolete licence	PS1	SF-1.3	x										High	Low	-	$3,600	Purchase of licence
SPI-10.4	Update GIS database to create an exhaustive inventory of networks	PS1		x										High	Medium	-	-	Performed by internal staff
SPI-10.5	Implement SOPs to update UG assets information in the GIS and AG assets information in CMMS	PS1	SPI-10.2 SPI-10.4		x									High	Low	$22,500	-	SOPs development + Training
SPI-10.6	Make the GIS more largely available for the different departments (maintenance, operation…)	PS1	SPI-10.3			x								Medium	Low	-	-	Performed by internal staff
SPI-10.7	Create automatic dataflows (assets condition) between GIS and ERP (Fixed assets database) and CMMS and ERP (Fixed assets database)	PS3 WM3	SPI-10.2 to 10.5				x	x						Low	High	$32,000		Software development
SPI-11	**Asset management: Corrective maintenance**															$38,500	$7,800	

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-11.1	Implement a CMMS (work orders management module) (SEURECA strongly advises to take inspiration from what has been done on SLWE to develop it.)	WM1 (WM2 only NLWE)WM4	SPI-10.1 & 10.2	x	x									High	Medium	-	-	Included in SPI-10.2
SPI-11.2	Implement a mobile application for interventions reporting communicating CMMS and SIG	PS1 PS2	SPI-10.2 to 10.5 and SPI-11.1			x								Medium	Medium	$16,000	$7,800	Purchase of licence and development of software to integrate it to the ERP (ex: Kizeo)
SPI-11.3	Streamline interventions reporting procedures in line with the news digital tools and train end users in the field to ensure a reliable database update	PS1 PS2 PS3 SA3	SP-11.1 (evtl. 10.2)		x	x	x							High	Low	$22,500	-	SOPs development + Training
SPI-12	**Asset management: Preventive Maintenance**															$146,500	$0	
SPI-12.1	Configure basic preventive maintenance rules in the CMMS	WM1 (WM2 only NLWE) WM4	SPI-10.1 SPI-10.2				x	x						Medium	High	$124,000	-	Consultancy (definition of preventive maintenance rules for critical assets) including on-site mission Technical support to configure the CMMS
SPI-12.1	Streamline preventive maintenance procedures in line with the news digital tools and train users	PS1 PS2 PS3 SA3	SP-11.1 (evtl. 10.2) SPI-12.1						x					Low	Medium	$22,500	-	SOPs development + Training
SPI-13	**ICT management**															$1,800	$24,000	
SPI-13.1	Implement an incident management tool (helpdesk work orders) and write procedures	IT1	SF-2.1 SF-2.2			x								Low	Medium	-	-	Included in GII-1.2; 1.4/1.5

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-13.2	Create a list to track the existing hardware, with the date of installation, last update, and usernames	IT1 IT3	SF-2.1 SF-2.2	x										High	Low	-	-	Performed by internal staff
SPI-13.3	Complement the list of existing software, with the version, number of licence, usernames and rights	IT1	SF-2.1 SF-2.2	x										High	Low	-	-	Performed by internal staff
SPI-13.5	Create a list to track the ongoing projects, with the description of the objective, the key contacts, the CAPEX, the OPEX, the delivery date and progress	IT1	SF-1.5 SPI-13.2 & 13.3		x									High	Low	-	-	Performed by internal staff
SPI-13.7	Update TeamViewer for a more secure connection		SF-1.2	x										Medium	Low	$1,800	-	Purchase of licence
SPI-13.8	Pay the Microsoft 365 licence to restore access to employee emails		SF-1.3	x										Medium	Low	-	$24,000	Purchase of licence
SPI-14	**Knowledge and HR management**															$15,000	$0	
SPI-14.1	Finalise handpunch connection or develop mobile application to substitute time management system	HR1					x							Medium	Medium	-	-	Technical support for software development
SPI-14.3	Improve ERP HR module (attendance and leaves monitoring, automatic issuing of payslips, training monitoring, etc.)	HR1 HR2	GII-1.2 to GII-1.4		x	x								Low	Low	-	-	Included in GII-1.4/1.5
SPI-14.4	Strengthen HR procedures in line with the new ERP modules & train users	GOV3				x	x							Low	Low	$15,000	-	SOPs development + Training
SPI-15	**Fleet management**															$0	$0	
SPI-15.1	Implement fleet management in CMMS	WM1	SPI-10.1 SPI-11.1							x				Low	Low	-	-	Included in SPI-11.1
SPI-16	**Tender management and Purchase**															$38,500	$0	

Action code	Action description	Related Maturity Grid Objective	Prerequisites	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	Priority	Complexity	CAPEx	OPEx	Description
SPI-16.1	Improve the ERP supplier platform to enable to track the communications (and paper doc only if required)	SR1	GII-1.2 to 1.4						x					Low	Medium	$16,000	-	Included in GII-1.4/1.5
SPI-16.2	Digitalise the purchase request process (e.g. purchase / stock)	SR3	GII-1.1 GII-1.2 to 1.4				x							Low	Medium	-	-	Included in GII-1.4/1.5
SPI-16.3	Update procurement procedures to adapt them to new digital tools & Train staff	SR2	SPI-16.1 SPI-16.2				x	x						Low	Low	$22,500	-	SOPs development + Training
SPI-17	**Manage Accounting and Control**															$22,500	$0	
SPI-17.1	Make accessible the ERP to the Control department staff	SA1			x									Medium	Low	-	-	Performed by internal staff
SPI-17.2	Implement reporting procedures between operations and finance for assets condition financial recognition	PS3	SPI-10.7				x	x						Medium	High	$22,500	-	SOPs development + Training
SPI-18	**Technical Project Management**															$22,500	$26,700	
SPI-18.1	Update Autocad (and other design software if required) licence		SF-1.3		x									Low	Low	-	$26,700	Purchase of licence
SPI-18.2	Increase human resources in line with the investment program				x									Medium	Medium	-	-	not quantified: investment projects should be accompanied by recruitment commensurate with their number and size.
SPI-18.3	Improve skills in use of modelling software and CAD		SPI-18.1 SPI-18.2			x								Low	Low	$22,500	-	Training

4.3. Focus on the necessary investments

The implementation of this ambitious transformation roadmap will require external financial support and the resources currently generated by the utility are not sufficient to self-finance the proposed improvement. Hence, SEURECA provided a **quick estimate of the budgets related to each of the main initiatives proposed in order to assist NLWE in initiating discussions with its financial partners.**

GROUPING ACTIONS IN PACKAGES TO REDUCE COSTS

It is worth noting that, in the budget estimates presented in the table above, several actions have been presented separately (e.g. the various customer management training courses) to facilitate understanding of the approach. However, these actions must be carried out together to ensure consistency in team training, which tends to reduce their overall cost.

Example of grouped action within the establishment :
- **Customer Management processes and diverse ERP improvement**
- **Hardware updates**

Examples of joint actions by the 4 establishments: :
- **CMMS development : standards, templates, SOPs**
- **Technical trainings**
- **KPIs definition**

BUDGET ESTIMATE AND NEEDS FOR INTERNAL STAFF REINFORCEMENT

SEURECA has considered that in the mission carried out by the AFD entitled "Organigrams, Roadmap & Action Plan proposed for the Water Establishments, Organisation and Human Resources", the size of the teams would eventually enable the aim of operational quality of water services to be achieved (not only Digitalisation), in line with the ambitions of the Ministry and the establishments.

The support provided by external experts or diverse development needs (project management, training, support in drafting and implementing procedures, support to definition of needs for new tools, etc.) is included in the financial estimates and will enable staff to improve staff's skills and the level of digitalisation of the WE.

It is worth noting that, in the budget estimates, the internal staff reinforcement (salary costs) has not been included.

Therefore, certain aspects of digitisation require an assessment to evaluate the possibility of recruiting new staff in order to face the new needs (e.g. SCADA experts, call centre).

REMOTE READING: PROMISES AND PRECAUTIONS

Given the presence of water meters, a volume-based billing (mainly in the Tripoli sector) and the existence of a pilot project of remote meter reading (around 1,000 meters), it is appropriate to aim for the deployment of remote meter reading in the long term. This ambition is part of a common objective between the customer, technical and financial departments to achieve operational efficiency, an ambitious level of service and economic sustainability of the WE.

However, SEURECA considers it important to take the following aspects into account:

- It is estimated that there are 60,000 meters in the region and 130,000 customers, i.e. less than 50% of customers are equipped with meters. During the diagnostic, SEURECA identified a major problem with the **customer database update** and the **lack of a sufficiently robust updating process**. **The deployment of remote meter reading can only be successful if it is preceded by an update of the database, including field surveys.**
- The cost of deploying remote reading is estimated at $140 per customer, i.e. almost $18 million. Even if these costs can be spread over time, such a large number of meters will **require significant OPEX**. It will be important to define the economic model that will enable the meters to be properly maintained. Intermediate solutions may exist :
    - Deployment in Tripoli only (about 50% of the perimeter);
    - Deployment of radio-reading solutions (walk-by or drive-by), which are less costly but can still provide regular index readings (e.g. quarterly).
    - **The reliability of the system and data feedback is essential**. In the event of a failure, this can lead to over-activity: an increase in customer complaints, technological overload for agents exacerbated by the telecommunications infrastructure dependance, etc. It is important not to underestimate the maintenance costs and skills required to ensure that the remote meter reading system works properly.

To sum up, even if the benefits of such a system are undeniable, SEURECA insists on the need for a step-by-step deployment plan, enabling consolidation of skills and knowledge and cost/benefit analysis at each step of the deployment to ensure that financial profitability remains a key driver in this strategy. .

The necessary **CAPEX investments** for NLWE action plan implementation are up to **28,000 k$ (including 18,000 k$ for remote meter reading)**. The **yearly additional OPEX** associated with the implementation of the action suggested are up to **1,780 k$** (in 2029, considering that all actions have been implemented, this includes 860 k$ for remote meter reading).

The graph below shows the evolution of CAPEX expenditure over the next 10 years, detailing the amount for each category of action. The curve illustrates the percentage of initial budget execution year after year.

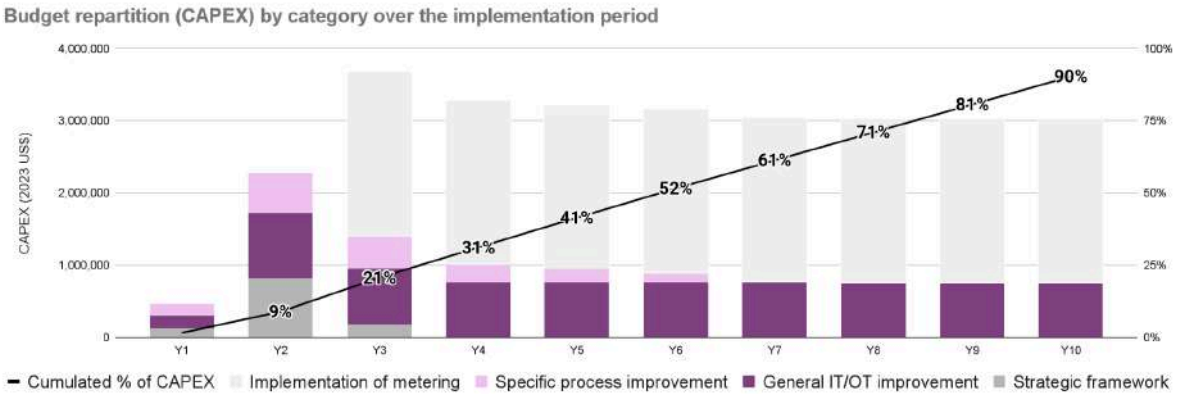


Figure 39 Investments repartition over the implementation period - including metering

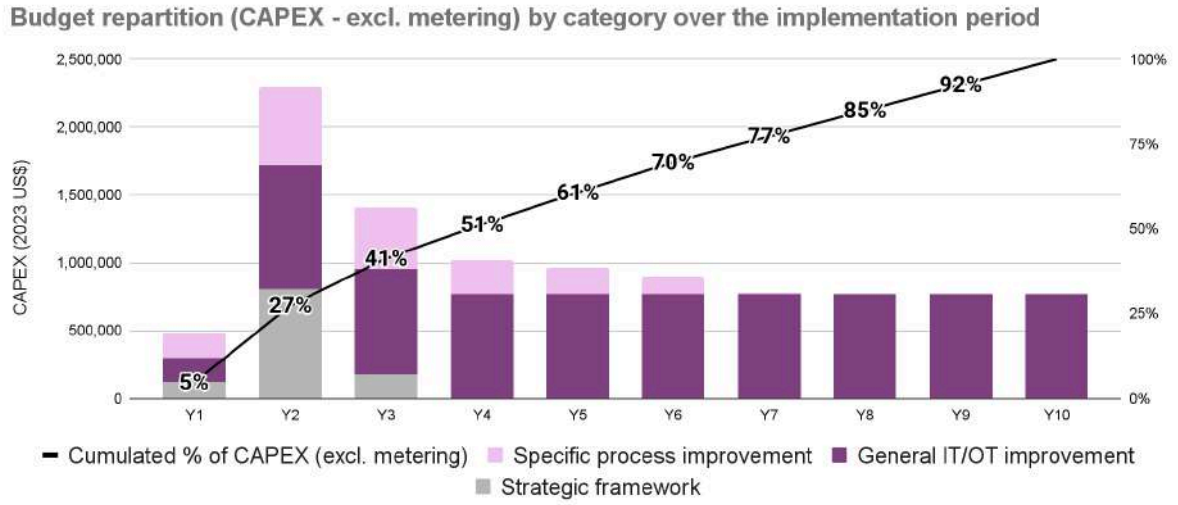


Figure 40: Investments repartition over the implementation period - without metering

The budget execution is quite regular over the 5 years. In 2025, it is expected that only 5% of the budget (excluded remote meter reading) will be used: in fact, we can anticipate a **relatively slow implementation of the action plan over the next year** (due to NLWE decision, mobilisation of donors and contractors), then an acceleration in the following years.

During the 3 first years of implementation, the financial effort is mostly focused on structuring the strategic framework in order to prepare the introduction of the new tools and procedures part of the digitalisation strategy.

The investments between 2030 and 2034, are mostly due to:

- *the implementation of the meter readings;*

- *the extension of SCADA to all sites of NLWE;*
- *the implementation of a LIMS;*
- *The implementation of additional modules to the ERP (and the related training & procedures updates): HR, tender database, procurement module.*

The main sources of expenses are used to:

- **fill the large gap identified in the operation management** thanks to:
    - The extension of the SCADA to all NLWE's installations (following the feasibility study) (General IT/OT improvement);
    - The implementation of a CMMS and the related procedures (Specific process improvement);
- **strengthen commercial management to increase revenues (quick wins)** thanks to:
    - The implementation of metering for large customers (Specific process improvement);
    - The campaigns of customer regularisation to update customer database (Specific process improvement);
- **Support all operations and overall performance by having a reliable IT architecture** thanks to:
    - The regular updates of the Business Continuity Plan (Strategic framework);
    - The update of the ERP (General IT/OT improvement).

Planned investments are mainly due to the **contracting of external experts** (technical assistance, software development, etc.) which represents **23% of the total investments** and the **purchase of hardware and software** which represents **77% of the total investments**.

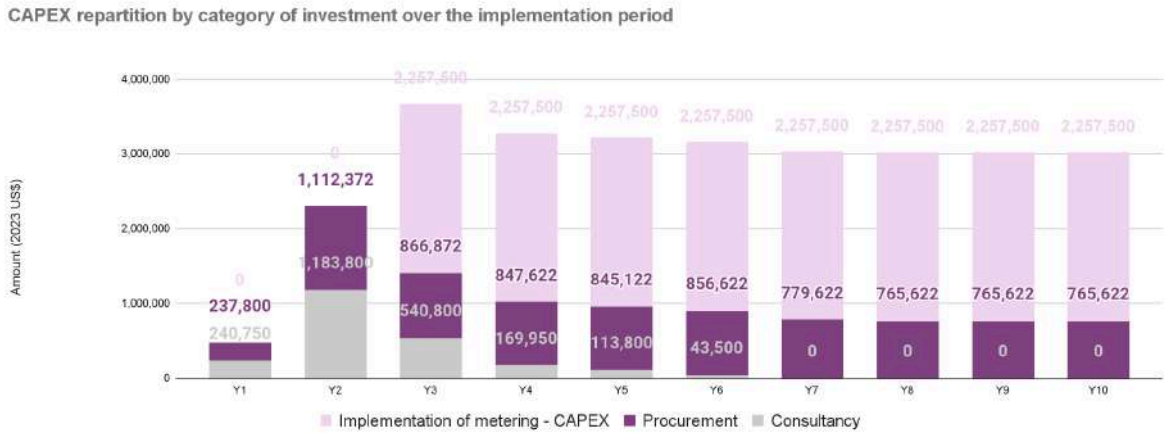


Figure 41: Investments repartition regarding the category over the implementation period - including metering

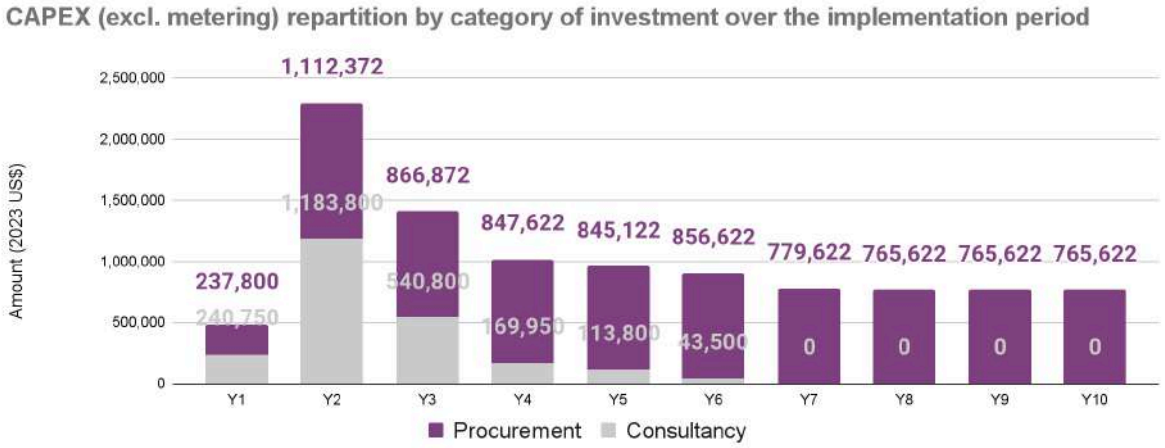


Figure 42 Investments repartition regarding the category over the implementation period - without metering

The consultancies (Technical Assistance) are mostly implemented during the first years of implementation as they enable to structure the teams, design the specification of the equipment to purchase, and prepare the handling of the new tools (by adapting the procedures and carrying out training of the teams).

1.2. 4.4. Risks and factor of success

1.2.1. 4.4.1. Risk analysis & mitigation

A risk analysis below highlights the potential threats to the success of the action plan implementation, as well as the mitigation actions to avoid or limit these risks.

Risk identified	Proba	Impact	Level of Risk	Mitigation measures
Geopolitical conflicts that can slow down / stop the implementation of certain projects			High	Breaking down the actions into smaller ones to ensure the completion. Establish partnerships with a wide range of local and international players. This will reduce dependence on a single partner or source of funding and expertise.
Lack of financial resources			High	Share the costs of certain investments (joint training between the different establishments). Rely as much as possible on modules/solutions already developed in other establishments (copy and adapt). “Train the trainer” approach to reduce the training costs In the case of IFI support, include an overall long-term budget for the actions undertaken (including OPEX over 5 years, for example), even if this means limiting lower-priority projects.
Lack of human resources			High	The use of external Technical Assistance to complement unfilled positions.
Resistance to change			Moderate	Communicate clearly and regularly with employees and stakeholders about the benefits of the digital strategy and the reasons for change. Involve employees in the decision-making process and encourage them to voice any concerns or suggestions. Provide adequate training and support to help employees adapt to new processes and technologies. Implement recognition and motivation programmes to encourage adoption of the digital strategy.
Data security			Medium	Implement robust security protocols, such as firewalls, antivirus and intrusion detection software. Regularly backup data and store it in secure locations. Train staff in good security practices, such as the use of strong passwords and awareness of phishing attacks. Establish policies for managing access to data and appropriate authorisations.

Regulatory compliance risk			Medium	Put in place monitoring and reporting processes to demonstrate compliance to the relevant regulatory authorities.

Table 17: Risk matrix and mitigation measures

4.4.2. Factor of success

Resulting from the risks analysis, some key factors of success for an efficient digital transformation of the water establishment have been identified:

A Technical Assistance to support NLWE in implementing the first steps of the strategy

Considering the ambition of the digital transformation strategy as well as the insufficient financial means to recruit/train/purchase according to the plan, it is highly recommended that Technical Assistance be put in place to support SLWE in the first 2-3 years of implementation in order to help manage the transition and in particular:

- Get guidance on initiating the various steps of the strategy;
- Benefit from the support of international digital experts from the water business while SLWE recruits its own experts;
- Implement knowledge transfer and organised capacity building;
- Obtain support on preparation of technical specification and tendering processes that may be required for the implementation of the various activities.

The technical assistance would have a real impact if it is carried out by a water expert operator as it would guarantee practical and down to earth implementation of the actions.

CHANGE MANAGEMENT

Change management plays an essential role in the successful implementation of a digital strategy. The importance of change management lies in its ability to **deal effectively with the human aspects of change** within an organisation. When new tools or methods are introduced, employees may experience resistance, fear or confusion. By integrating change management, the establishment can mitigate these difficulties and ensure a smooth transition.

Several methods exist to prepare for change:

Communication: Clear and transparent communication is essential to explain the reasons for implementing the digital strategy, the benefits it will bring, and the impact on different roles within the organisation;

Employees involvement: Involving employees in the decision-making process creates a sense of ownership and empowers them to actively participate in the change;

Training and support: Providing adequate training and support ensures that employees have the necessary skills and knowledge to adapt to the new digital strategy;

Risk management: Identifying potential obstacles and developing contingency plans helps in managing risks and minimising disruptions during the implementation process.

ENCOURAGE JOINT INITIATIVES BETWEEN WATER ESTABLISHMENTS

Where possible, SEURECA recommends to:

- **set up activities bringing together people from different water establishments to maximise impact**: for example, when training is given by international experts, include people from all 3 utilities in the audience;
- **make maximum use of what has been done in one establishment by replicating it in others:** for example, it would be worthwhile to build on Beirout's SCADA system, which is already well advanced, to set up SCADA systems in other utilities, or to replicate the performance monitoring system from one establishment to another.

This would reduce overall costs, promote knowledge sharing between utilities and standardise water management nationwide.

TRAIN THE TRAINER

In order to reduce training costs and encourage water establishments to appropriate the tools and methodologies learned during training sessions, SEURECA proposes to implement the "Train the Trainer" principle. This involves training a selected sample of employees, who will themselves be responsible for training the rest of the teams.

1.3. 4.5. Next steps

1.3.1. 4.5.1. Digital transformation roadmap

Resulting from the Action plan, a **5-years roadmap** has been designed to summarise the different actions (between 2025 and 2029) and support their implementation.


Year 1
CAPEX: 479 k$
OPEX: 120 k$
Year 2
CAPEX: 3,330 k$
OPEX: 120 k$
Year 3
CAPEX: 8,463 k$
OPEX: 890 k$
Year 4
CAPEX: 8,036 k$
OPEX: 1,760 k$
Year 5
CAPEX: 7,888 k$
OPEX: 1,785 k$
Strategic Framework implementation
Implementation of an accurate organisation for digital transformation
Strengthening of ICT department & Infrastructure
Structuration of SCADA team & strategy
Implementation of continuous improvement
General IT improvement
General improvement of the ERP
Performance monitoring system implementation
SCADA infrastructure improvement
Specific process improvement
Commercial operations improvement (customer regularisation, billing, customer journey, revenue collection)
Customer metering implementation (integration of pilot project & focus on large customers)
Implementation of volume management (production and NRW)
Implementation of energy management
Implementation of water quality management (LIMS)
Implementation of assets management & work management (CMMS, GIS, Assets database)
Strengthening of support services (HR, Accounting, Procurement)
Strengthening of ICT management (helpdesk, TeamViewer, etc.)

4.5.2. Immediate next steps

Moving forward, SEURECA strongly recommends to start with the implementation of the following actions.

In order to create the ideal environment for NLWE's digital transformation, SEURECA recommends to start by implementing the following measures:

- A technical assistance to carry out the overall re-organisation of NLWE (SF-1.1, SF-1.2, SF-1.3, SF-1.4, SF-1.5);
- The structuring of the IT department: appointment of the key positions (SF-2.1, SF-2.2, SF-2.3), implementation of policies and procedures and trainings (SF-2.5);
- The provision of additional hardware where required to ensure an accurate working framework for digital transformation (SF-3.1, SF-3.2);
- The structuring of the SCADA team by providing a strategy (SF-4.1) and appointing the relevant members (SF-4.5);
- The launch of the implementation of change management practices (SF-5.1, SF-5.2).

To provide a **framework for the contracting of external technical support and the purchase of software/hardware**, and to ensure that the **solutions are fully tailored to NMLWE's needs**, SEURECA recommends to start by implementing the following measures:

- A review of operational needs and improvement of the current ERP (GII-1.1, GII-1.2, GII-3.1) to design the technical specifications of the required improvements (new modules, digital validation workflows, etc.) and start at least of the update of the licences (GII-1.3);
- **Secure skilled internal and external human resources** to design an appropriate SCADA System. **Start SCADA development projects in stages**, by first identifying and deploying the monitoring of indicators that are essential for steering the business, such as pumped volumes and energy consumption;

SEURECA recommends to **address the critical shortcomings observed in O&M** management, by implementing the following measures:

- The structuring of the overall O&M reporting by providing digital tools & procedures: volume management, water quality, (SPI-9.1, SPI-6.1);
- An **inventory of all assets** of the WE and update or creation of the accurate databases, in order to improve overall asset management (SPI-10.1, SPI-10.4, SPI-13.2, SPI-13.4);
- The launching of the implementation of a CMMS, by developing the technical specifications in line with the assessment of the WE's needs (SPI-10.2, SPI-11.1), start by implementing traceability modules to ensure rapid analysis of activity and instil **a culture of reporting**.

Finally, SEURECA recommends to **implement the actions that could trigger quick wins for the service** *(Those additional incomes could be used for instance to finance the additional OPEX from the action plan implementation.),* as well as:

- Start work on **updating the customer database**, the quality of which is currently a source of potential financial loss and demotivation. At the same time, use the methods already in place to detect illegal connections (mainly in paper form) and meter readings to **update the database on an ongoing basis, in addition to a systematic approach field surveys**;
- Facilitate the digital customer journey and improve payment rates by diversifying payment options, offering methods such as OMT or online payments.

5. Appendix

5.1. Appendix 1: Customer Journey

	New customer with new connection						
Steps	Arrival of the customer and contact for new connection	Response from the connection department	Acceptance of the quote and return of the information	Execution of the work	Control and reception	Invoicing	Possible claim
Actor/service	*O&M department (Admin team)*	*O&M department (Admin team)*	*O&M department (Admin team)*	*O&M department (Admin team)*	*O&M department (O&M team)*	*O&M department (Admin team)*	*Technical department (IT - Calling center) or O&M department (Admin team)*
Tasks	*First contact*	*Making and sending the quotation*	*Signature and acceptance of the quote*	*Realisation of the works*	*Validation of the works*	*Invoicing*	*Complaints management*
Processes and activities	*Connections and quotations*	*Connections and quotations*	*Connections and quotations*	*Follow-up of the works*	*Connections*	*Billing*	*Customer satisfaction*
Channels - touchpoints	*Physical presence in the office (branches)*	*NA*	*Physical presence in the office (branches)*	*Works*	*NA*	*Physical presence in the office (branches)*	*Call centre* *Customer office with paper note-taking* *Social Media*
Digital bricks used (or not)	*NA*	*NA*	*NA*	*NA*	*NA*	*ERP*	*Social Media (Facebook) and Call Center*
Comments	*The client fills in a form and brings expected documentation* *The customer service team enter the information in the ERP and check if there is previous debt (if previous debt, can be registered until it is paid)* *The client pays for subscription fees*	*The customer must spontaneously return to the office 2/3 weeks after subscribing to find out if he/she is eligible for a connection*	*Signature of the quotation to be done in the office* *First payement is done when opening the connection at the office (pro rata of the year)*	*Intervention tickets are issued manually*	*When the work is finished, the control committee team visits in the following days to review the work carried out (connection + repair) 3 examples: a department manager / 2 operators / 3 controllers* *The client is not informed*	*Customer pay for the first year (pro rata)*	*The call centre is being integrated into the ERP system to track customer complaints. However, there is no ticket tracking at operations level as they have not been trained in ERP.*

	Subscriber life (recurrent)							Account closure, termination and transfer			
Steps	Reading	Invoicing	Possible claim	Contract freezing	Modification of the customer profile	Periodic communication	Incidents - interruption of the service	Departure - Arrival of the customer	Metering control	Final invoicing and account closure	Possible claim
Actor/service	O&M department (Admin team)	O&M department (Admin team)	Technical department (IT - Calling center) or O&M department (Admin team)	O&M department (Admin team)	Client	Communication department	Customer Management Department	Client	O&M department (Admin and O&M teams)	O&M department (Admin team)	Technical department (IT - Calling center) or O&M department (Admin team)
Tasks	On field metre reading to update the water consumption	Billing	Complaints management	Subcription freezing	Transmission of customer account update information (bank, telephone, etc.)	Regularly inform the customer	Alerting of an urgent or specific problem	Contact	On field metre reading to update the water consumption	Final invoicing and account closure	Complaints management
Processes and activities	On field metre reading	Billing	Customer satisfaction	Subscription	Subscription	Customer satisfaction Communication	Customer satisfaction Communication	Subscription - Billing	On field metre reading	Invoicing	Customer satisfaction
Channels - touchpoints	NA	Door to door collector or Physical presence in the office (branches)	Call centre Customer office with paper note-taking Social Media	Physical presence in the office (branches)	Physical presence in the office (branches)	Social Media (Facebook/Instagram)	NA	Physical presence in the office (branches)	NA	Physical presence in the office (branches)	Call centre Customer office with paper note-taking Social Media
Digital bricks used (or not)	GIS, Excel, ERP	ERP	Social Media (Facebook) and Call Center	ERP	ERP	Social Media (Facebook/Instagram)	NA	ERP	NA	ERP	Social Media (Facebook) and Call Center
Comments	The employee prints the GIS map of the controlled zone, checks in the ERP to see the existing contracts and creates a building diagram on Excel. Round is made with the previous printed elements. Everything is consigned on paper. These element are transparent for the customer, and if there is an consumption excess, the next bill will be updated.	Every beginning of the year, invoices are issued and need to be paid within the year. The client can pay by cash or check to the collector (door to dooe collect) or to the branch office. Invoices are edited through the ERP and payments are tracked through the ERP.	The call centre is being integrated into the ERP system to track customer complaints. However, there is no ticket tracking at operations level as they have not been trained in ERP.	Maximum 5 years The customer needs to pay a limited amount to freeze the contract. The employee updates the ERP accordingly.	The customer needs to provide all the supporting documents. The employee updates the ERP database accordingly.	The communication department communicated on the on-going projects.	NA	The customer needs to provide all the supporting documents. The employee updates the ERP database accordingly.	NA	It tooks 15 days after the office visit for the operator to come and disconnect the pipe	The call centre is being integrated into the ERP system to track customer complaints. However, there is no ticket tracking at operations level as they have not been trained in ERP.

5.2. Appendix 2: NLWE Statutes extract

Décret n° 14602
Publié le 14 juin 2005
Statuts dans
Société des Eaux du Nord Liban

Article 6

Le Conseil d'administration est chargé de veiller à la mise en œuvre de la politique de l'établissement et de diriger ses activités. Il prend généralement, dans le cadre des lois et règlements, toutes les décisions nécessaires pour atteindre son objectif et assurer le bon déroulement de ses travaux. Il précise, sans que cette énumération soit exhaustive:

-1- Règlement intérieur.
- -2Le système des salariés, déterminant leur effectif, leurs salaires, leurs conditions d'emploi et le système de procédure.
-3 -Système d'investissement.
-4- Conception du système financier et des comptes.
-5- Le budget annuel et ses comptes.
-6- Le budget annuel, la balance générale des comptes, le compte de profits et pertes et l'inventaire annuel.
-7- Prêts et emprunts.
-8- Utiliser la réserve générale et déterminer où les bénéfices seront utilisés et comment couvrir les pertes.
-9- Demandes d'avances de trésorerie.
-10- Accepter les dons et cadeaux.
-11- Programmes et plans d'affaires pour développer le travail de l'organisation et moderniser ses installations.
-12 Posséder des biens immobiliers.
-13- Transactions de fournitures, travaux et prestations conformément aux dispositions du système financier, ainsi que les rapprochements et arbitrages

Réclamations ou litiges lorsque le montant en litige dépasse vingt-cinq millions de livres libanaises.

-14- La réclamation devant le tribunal.

Article 7

Le Président du Conseil d'Administration/Directeur Général doit:

-Fixer l'ordre du jour des sessions du Conseil, les convoquer, les présider et gérer les débats.
- L'autorité exécutive de l'établissement public dépose les décisions du Conseil d'Administration pour exécution.
- Exercer les pouvoirs qui lui sont délégués par le Conseil d'Administration.
- Suivi de la mise en œuvre des décisions du Conseil d'Administration.
- Représenter l'établissement public devant la justice.

L'autorité exécutive

Article 9

Le Président du Conseil d'Administration/Directeur Général est, dans le cadre des lois et règlements, le responsable en série de toutes les unités.

Et les salariés de l'établissement, et à ce titre il exerce tous les pouvoirs qui lui sont attribués par le régime des salariés et des procédures.

Dans l'établissement.

A- Le Président/Directeur Général est notamment chargé de:

-1- Nomination des employés, des procédures et des sous-traitants.
- -2Présenter les décisions du Conseil d'Administration qui nécessitent la ratification par les autorités de tutelle et de contrôle compétentes conformément aux

Pour les actifs.

-3-Mettre en œuvre les décisions du conseil d'administration et gérer les affaires de l'établissement.
-4- Coordonner le travail entre les unités de l'organisation et suivre le bon déroulement des travaux.
-5- Veiller à la bonne utilisation et à la préservation des fonds, du matériel et des équipements de l'institution.
-6- Préparer des études, des projets et des propositions, et préparer les documents nécessaires sur des sujets liés à l'autorité

Conseil d'administration.

B- Le Président/Directeur Général soumet, chaque fois que nécessaire, un rapport annuel au Conseil d'Administration dans lequel il présente les travaux.

réalisés et les difficultés qui ont entravé le déroulement de l'investissement, ainsi que les conditions administratives, financières et techniques de l'institution et des programmes

Elaboré pour l'avenir, ce rapport est communiqué au Ministère de l'Energie et de l'Eau, au Ministère des Finances et à l'Inspection Centrale.

Le Bureau d'Audit et le Comité d'Évaluation de la Performance des Institutions Publiques de l'Eau.

C - Le Président du Conseil d'Administration/Directeur Général peut déléguer certains de ses pouvoirs aux responsables des unités qui lui sont directement liées.

A l'exception des pouvoirs qu'il exerce en sa qualité de Président du Conseil d'Administration ou de ceux qui lui sont délégués par le Conseil.

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