WATER REFORM
long term technical assistance

EU-AFD TECHNICAL ASSISTANCE PROGRAMME TO SUPPORT REFORMS IN THE WATER AND WASTEWATER SECTORS IN LEBANON

Funded by the European Union

AFD AGENCE FRANÇAISE DE DÉVELOPPEMENT
Implemented by AFD

WATER ESTABLISHMENTS PERFORMANCE FRAMEWORK

Defining and implementing KPIs

FINAL EDITION
October 2022

Hydroconseil
L'ingénierie au service du développement

HYDROPHIL VA

Report Title	:	Water Establishments Performance Framework
Edition	:	Final
Prepared by	:	Bachir AWWAD
Date submitted	:	20 Oct 2022
Revision	:	0

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

AFD	Agence Française de Développement
ALI	Apparent Loss Index
AWWA	American Water Works Association
BMLWE	Beirut and Mount Lebanon Water Establishment
BWE	Beqaa Water Establishment
Capex	Capital Expenditures
CEO	Chief Executive Officer
CMS	Client Management System
DG	Director General
DMA	District metering area
DMAs	District metering areas
EDK	Electricité De Kadisha
EDL	Electricité Du Liban
EDZ	Electricité De Zahleh
ERP	Enterprise Resource Planning
EU	European Union
GAAP	Generally Accepted Accounting Principles
GIS	Geographic Information System
HR	Human Resources
ILI	Infrastructure Leakage Index
IT	Information Technology
IWA	International Water Association
KPI	Key Performance Indicator
KPIs	Key Performance Indicators
KVA	Kilo Volt Ampere
LBP	Lebanese Pound
LWP	Lebanese Water Project
M LBP	Million Lebanese Pound
MCM	Million Cubic Meters
MoEW	Ministry of Energy and Water
NGOs	Non-Governmental Organisations
NLWE	North Lebanon Water Establishment
NRW	Non-Revenue Water
NWSS	National Water Sector Strategy 2020
O&M	Operation and Maintenance
Opex	Operation Expenditures
P&L	Profit and Loss

PI	Performance Indicator
PIs	Performance Indicators
PS	Pumping Station
RWE	Regional Water Establishment
SCADA	Supervisory Control And Data Acquisition
SLWE	South Lebanon Water Establishment
TA	Technical Assistance
UARL	Unavoidable Annual Real Loss
UNICEF	United Nations International Children Emergency Fund
USAID	United States Agency for International Development
VAT	value Added Tax
WE	Water Establishment
WEs	Water Establishments
WTP	Water Treatment Plant
WW	Waste Water
WWTP	Waste Water Treatment Plant
WWTPs	Waste Water Treatment Plants

1 INTRODUCTION

The water establishments in Lebanon are facing the need of improving continuously to offer quality services, ensure coverage and operate in an efficient and timely manner. In fact, they must have had robust business models and internal learning schemes for strengthening their essential processes to face the current challenges and develop their future-thinking capabilities to navigate a rapidly changing environment. To achieve such broad perspective, Key Performance Indicators (KPIs) provide a starting point for improving the performance in the water and wastewater sector.

Setting up KPIs for the four Wes is foreseen within the framework of the "*Technical Assistance Programme to support Reforms in the Water and Wastewater sectors in Lebanon*", funded by the European Union and implemented by AFD.

Develop the performance framework

Based on the diagnosis carried out A9 and the results of the tariff studies, a roadmap on the performance framework shall be elaborated and eventually implemented between the WEs and the MoEW.

With this perspective, the LTTA team developed a methodology adapted to the Lebanese context for performance assessment and benchmarking to support the transformation processes towards the improvement of water and sanitation services.

This document defines the roadmap for developing the performance framework between the WEs and the MoEW with a new strategic orientation that facilitates the process by which the WEs set themselves in the path to reform.

The five-step methodology presented in this document outlines the criteria for the selection of KPIs based on clear evaluation elements, considers the constraints in the data quality and processes, and formulates action-planning approach to fill the gaps to achieve the desired level of confidence and usefulness of the individual KPIs. Hence, the focus is on information systems that provide accurate, reliable and relevant data, incentivizing water establishment to contain costs, improve service quality and expand water access over the long run.

In addition, the document introduces the concept of using the overall performance index in ranking WEs and evaluating overall performance.

Collaboration as a key of success

It is important to have the full support and engagement of the WEs and MoEW in this process. Their leadership, participation, and commitment are essential to make decisions rapidly, maintain the dynamism and guarantee the implementation and continuity of the performance framework.

2 USE AND BENEFITS OF KPIS TO INITIATE THE REFORM

2.1 The performance indicator constitutes the building block of benchmarking

Performance indicators (PI) are quantitative and comparable measurements of a specific type of activity or output, often based on ratios and percentages. Key Performance Indicators (KPIs) are the subset of performance indicators most critical to the organization at the highest level, used to meet various objectives. In some countries, these are used as part of the tariff calculation process while in others KPIs are used to set targets for operators. In general, Key Performance Indicators constitute the building block of benchmarking by measuring the internal performance and identifying the strengths, weaknesses and areas of improvements.

Define a set of indicators that drive better results stated as S.M.A.R.T key performance indicators:

- **S**pecific; means the indicator clearly and directly relates to the outcome and it is described without ambiguity
- **M**easurable; means the indicator can be counted, observed, analyzed, challenged, and tested
- **A**chievable; means the indicator is attainable as a result of the program
- **R**elevant; means that the indicator holds a valid link to the result
- **T**ime-bound; means that the indicator reflects the timing of collection

General principle

One general principle is to choose indicators that do not overburden staff with data collection requirements and impede their ability to implement the reform actions down the road

2.2 Performance benchmarking can drive the sector reform

Performance benchmarking is an effective tool to reform the water and wastewater sectors. It promotes transparency and accountability across the water and wastewater sectors; public

establishments will have to disclose basic technical and financial information about their operations and abide to the rights of subscribers to see how their money is used.

A performance measurement system provides a reliable assessment of the strengths and weaknesses of the four WEs as it correlates technical with financial performance.

The main objectives of benchmarking are:

- Promote effective and efficient commercial and technical operations by using Key Performance Indicators (KPIs)
- Strengthen the processes to face the current challenges and develop the future-thinking capabilities
- Provide the water and sanitation sector with tools available to the public in line with the open knowledge philosophy

The ultimate benchmarking scheme includes mechanisms and tools for data submission, validation and monitoring aimed to have a robust measurement system (table 1).

Table 1 Proposed tools for the performance framework

1 Data Collection Tool	The "data collection tool" such as Excel spreadsheet that stores the required data submitted by the WEs. The purpose of this tool is to assure the collection of the relevant data for KPI calculation.
2 Data central repository	The "data central repository" that stores existing databases in one location. The purpose is to have records for critical data (subscribers, operation and finance).
3 National performance information system	The "National Performance Information System" is a platform that enables the participants to connect to the server, fill, import, analyze the data and have graphic representations and KPI dashboards. The purpose is to share the data, analyze and update it as required.

2.3 Performance measurement offers benefits to different users

The performance-benchmarking scheme offers different benefits to different types of users;

The WEs can use the performance measurement system as an analytical tool for self-assessment while the MoEW can track the WEs' performance over time and analyze their

strengths and weaknesses in relation to peers in the region. The results of these analyses can help policy makers at the "National Water Authority" reach informed decisions about the best direction to steer the whole sector. The authority members were not appointed yet as stated in the article 14 of the water law no. 192 due to delays in drafting the decrees.

International donors or lenders interested in making capital financing available can refine their programs and initiatives based on performance-linked funding.

Public or private service providers interested in working in the water and wastewater sector can use performance-based contracting with realistic targets (PPP agreements) while international operators interested in acquiring utilities can make a screening of potential WE target whenever privatization of publicly owned companies is on the table.

Lastly, researchers and consultants can use the data to make in-depth studies and write the terms of reference for capital investments programs and designs of projects.

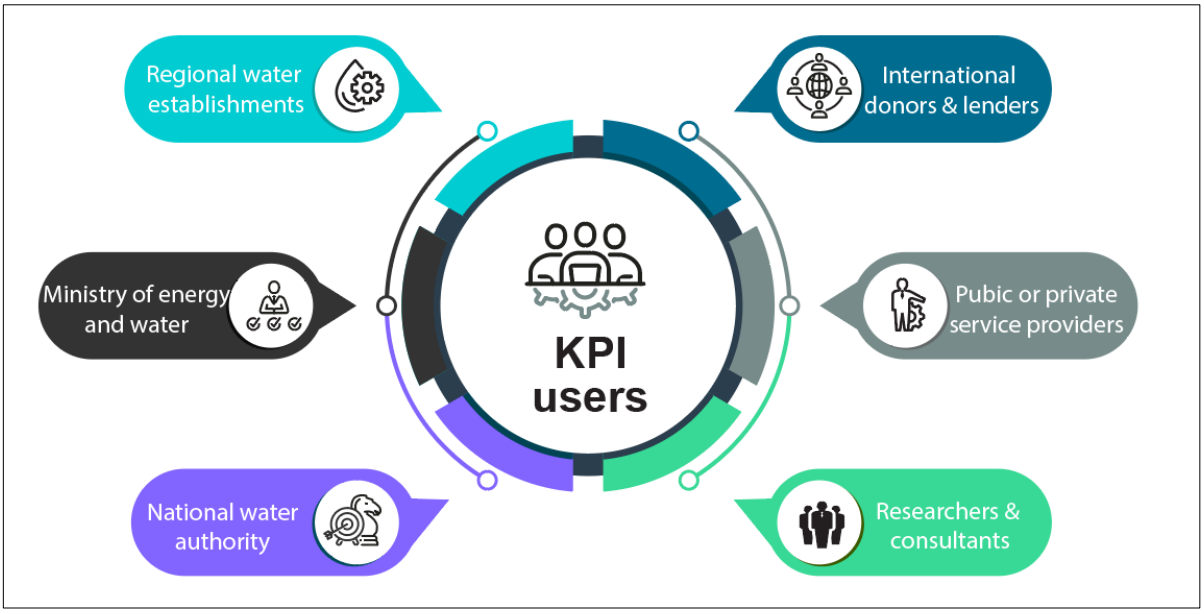

Figure 1 Type of KPI users

3 THE FIVE-STEP APPROACH

The adoption of Key Performance Indicators provides comprehensive and global view of the performance and can lead to greater efficiency in the water establishments and delivery of better services. The performance framework should be designed and implemented in a way to be as effective as possible for the reformatory efforts;

Therefore, the five-step approach proposed in this document is a practical, simple and effective methodology to implement transformation process in the WEs. The process is iterative and each step provides the information needed to move on to the next step and allows for setting new objectives successively higher.

The five steps must be done well to have a successful system and must be done one at a time and in order. To begin, the participants have to pick their objectives. The choice of objectives will determine the direction. To achieve those goals, the problems must be accurately diagnosed regardless of the means to solve them, and then an action plan should be designed and implemented to solve the problems, and it should be pushed continuously through to reach the expected results.

The 5-step approach shapes and guides the work

Blurring the steps leads to undesirable outcomes because it will hide the true problems and will lead to twisted performance system.

Figure 2 shows the 5-step approach, that will be detailed in the next section:

Figure 2 Outline of the 5-Step approach

Step 1: Have clear objectives

- Identify Key performance objectives and reach consensus about what is valued and feasible before focusing on key performance indicators. The choice of goals will determine the direction. Key performance objectives and outcomes could include sustainability of service, financial viability and resilience of WEs, customer satisfaction, quality of service, safety, innovation, transparency, etc.

Step 2: Identify and do not tolerate problems

- Identify the problems of the Key Performance Indicators in place across the four water establishments and the associated quality assurance procedures and identify whether those indicators are up to expectations and lead to the objectives.
- Identify new KPIs where needed based on the international standard for assessing performance measures in water utilities without tolerating the problems that stand in the way of the application.

Step 3: Diagnose problems to get to causal factors

- Diagnose and categorize each KPI in terms of accuracy and importance according to a comprehensive procedure for the assessment.
- Analyze accurately the causal factors affecting the problem solving in a rational and effective manner.

Step 4: Design action plans that will solve the problems

- Formulate specific actions for the gaps identified in order to achieve the desired level of confidence of the chosen KPIs.
- Categorize and prioritize all actions according to their potential level of impact, cost and difficulty.
- Sort out the actions that are low-cost, high-impact, and relatively easy to implement and include it in the short-term action plan; filter out the actions that need further efforts and budget and include it in the medium-term plan.

Step 5: Do what is necessary to push through the plans to get results

- Translate the plan into actions with monitoring mechanisms to ensure sustainable improvement of the performance framework and to increase the number of KPIs in place.
- Follow up thoroughly the implementation of the plan, remove potential bottlenecks, and work towards pushing the plans to reach the expected outcomes.

4 METHODOLOGY FOR KPI SELECTION

4.1 Have clear objectives

The water establishments' actions, activities and achievements are intended to deliver high-level objectives and outcomes. Therefore, to bring out those outcomes, outputs should be measured and monitored closely through a set of Key Performance Indicators to reach the defined goals.

In this perspective, the "Technical Assistance Programme" is foreseen to support the water establishments improving their performance and to lay the groundwork to the reform of the water and wastewater sector. The programme defined its main objective to shift the paradigm from an investment-based approach, which no longer deliver the outcomes, to a service-based approach. In addition, the implementation of sustainability and financial viability in water and sanitation services of the operators is another specific objective of the programme.

Those objectives are being prioritized in setting up the KPIs in this methodology as they are generally accepted by the WEs. However, in general during this step of the process, the water establishments must identify their areas of focus for reform by identifying imbalances within its current state and reach a consensus with the MoEW and the sector stakeholders based on a realistic approach.

Any arrangement has to consider the current environment and how far the WEs can go with any improvement plan to achieve the objectives taking into account its current capabilities, resources, constraints, and so on.

You manage what you measure

The WE has to maintain a special interest in key outcomes and decides according to its capabilities, which objectives it is willing to achieve.

This is the most important phase that generate a sense of responsibility and commitment to achieve future results

It is recommended that a workshop is convened to generate greater support, motivation and commitment.

4.2 Identify problems

In its efforts to develop the performance framework and based on the diagnosis carried out A9, the LTTA team assessed the existing KPIs in the WEs and MoEW and found that a major work has to be done to address the current situation outlined hereafter:

The WEs do have very limited number of KPIs that measure the performance of specific areas of their business such as collection rate, collectors' efficiency, growth of the number of subscribers, revenue growth, profit margin.

In 2009, Technical Assistance was provided by GTZ to support the WE's to develop a starter set of performance indicators to be calculated for the Water Establishments in Lebanon. A consensus among key stakeholders was reached on the final set of starter KPIs (See Appendix C) which covered the water supply only and didn't include any PI for wastewater. The KPIs and categorical areas suggested at the time were in fact designed with a view to scale up after the completion of the first phase, to eventually allow an in-depth view of the internal performance of the WEs. However, the appointment of new CEOs to the four WES in 2018, shortly followed by the deterioration of the country's security and economic situation, demotivated and disinterested the various actors in the project, whose implementation gradually lost momentum and eventually ended. Therefore the GTZ programme could not achieve the systemic change or implement the benchmarking framework during its time period.

In 2019, The MoEW requested data from the WEs and shared an excel file to collect basic information about the service coverage, water resources, financial status and performance. This file included 10 performance indicators as shown in the document copy (Appendix D).

Two key aspects were neglected in this process, which can lead to the distortion of the results of any analysis. First, the quality of data reported was not evaluated in accordance to strict quality assurance procedures (data submission, data validation and auditing) and second, the document itself lacks of detailed glossary and concepts of the KPIs.

The KPI has to provide oversight of the dimension of the service

For a performance indicator to be "key", it must provide oversight of the dimension of the service that the national policy makers seek to improve. Moreover, If the process lacks transparency or conceptual principles, the participants will not be convinced that the indicator is relevant for decision-making.

Therefore, the purpose of this step is to provide the foundational framework for setting up the KPIs according to the following:

- Examination of the imbalances and weaknesses across the existing KPI models
- Incorporation of critical elements of water utilities in the performance framework
- Identification of the performance indicators based on the international standard for assessing performance measures in water utilities without tolerating the problems that stand in the way of the implementation.

Therefore, the proposed KPIs are grouped into five elements and cover essential areas in the value chain. Each element is a pillar of sound management and performance for water supply and sanitation utilities.

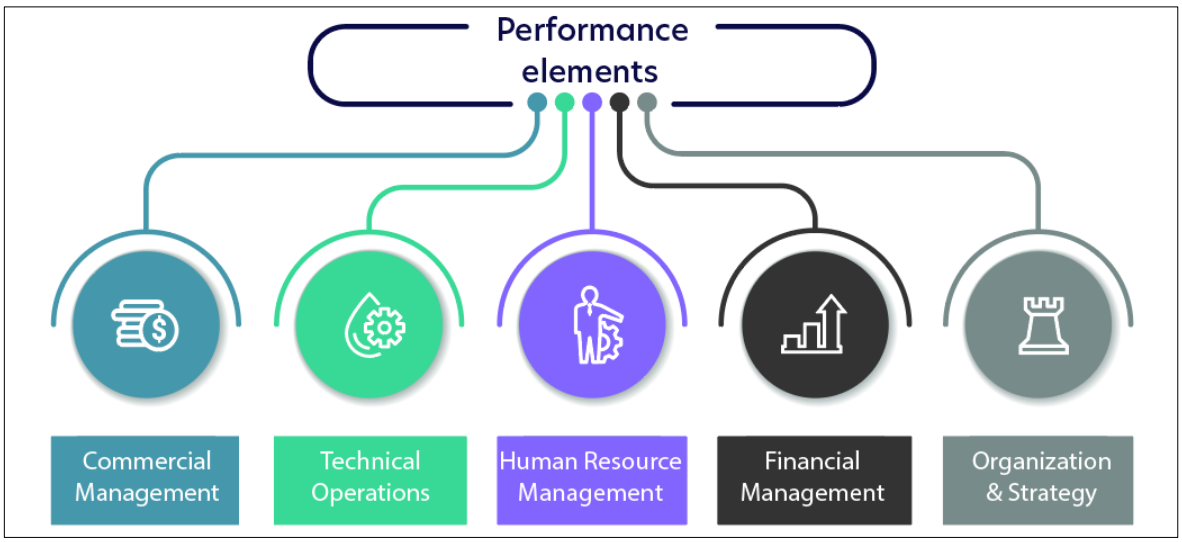

Figure 3 The 5 performance Elements

Each element is assessed through a number of performance indicators broken down in table 2. A detailed list consisting of 55 KPIs is provided along with relevant definition and concept for each proposition (Appendix A). Those KPIs are deemed to materialize the objectives set by the AFD programme as indicated in the first step of this methodology.

Table 2. Breakdown of Indicators by performance element and area

Element	Area	Count of Indicators
Technical Operations	Service Coverage	2
	Water production	2
	Water consumption	5
	Distribution and NRW	3
	Water treatment & quality	2
	Asset management	2
Commercial Management	Billings	8
	Collections	2
	Metering	2
	Quality of service	2
Financial Management	Operating costs	10
	Financial performance	6
Human Resource Management	Staff performance	5
Organization and Strategy	Valuation	2
	Growth	2
Total of Indicators		**55**

1 2 3 4 5

4.3 Diagnose causal factors

This step considers all the learnings, insights, and the outcome from the diagnosis carried out A9 to identify the gaps and risks associated to the application of KPI for each of the elements.

It is necessary to assess the integrity of each indicator in measuring the performance. If the data are accurate, the final performance assessment will reflect the reality of the utility and areas for improvements. Based on the data collection exercise carried out in the activity A9, data come from a variety of sources and departments of the WEs; some do have excellent quality assurance procedures while others follow less sound procedures. Consequently, unreliable or inaccurate data can have negative consequences on the usefulness of the KPI and lead to wrong decisions, inefficient investments and inappropriate initiatives by the WEs and sector participants.

4.3.1 Assessment matrix tool helps categorize KPI adequately

Therefore, before taking a step forward in the process, the LTTA team looked at the data confidence level and KPI importance level and defined the relationship between these two criteria.

A new KPI assessment matrix is developed and designed for this reason and ratings are assigned based on measures to reflect quality and priority of the KPI. The new tool will help in making adequate decisions on the categorization of KPIs.

Below are the definitions of the matrix headlines:

- **Confidence** refers to the reliability and accuracy of data such as how the data were collected, transmitted and stored and whether measurement values are based on sound management procedures. Confidence band ranges from Low, Medium to High.
- **Importance** refers to the necessity of measuring a certain dimension of the service that the key decision makers are prioritizing to evaluate and improve. Importance band ranges from Low, Medium to High.
- **KPI score** refers to the relationship between the confidence in data quality and importance of KPI and it is the product of two ratings: KPI score = Confidence x Importance. KPI score is grouped into three band ranges: [1-2],[3-5]&[6-9].
- **Category** refers to the group of KPIs with scores within the same band range. Grade A is for the indicators classified as not useful without any value to the objectives. Grade B is for the indicators classified for use with caution or for inclusion in the watch list for improvements. Grade C is for the indicators classified as precise, important and for inclusion in the core list for immediate use.

Table 3. KPI assessment matrix

Confidence	Importance		
	Low (1)	Medium (2)	High (3)
Low (1)	1	2	3
Medium (2)	2	4	6
High (3)	3	6	9

KPI Score	Category	Interpretation of Score
1-2	A	→ *Indicators are not useful and do not present any value to the objectives*
3-5	B	→ *Indicators can be used with caution or added to the watch list for improvement*
6-9	C	→ *The indicators have a precise calculation and high importance; Indicators should be added to core list*

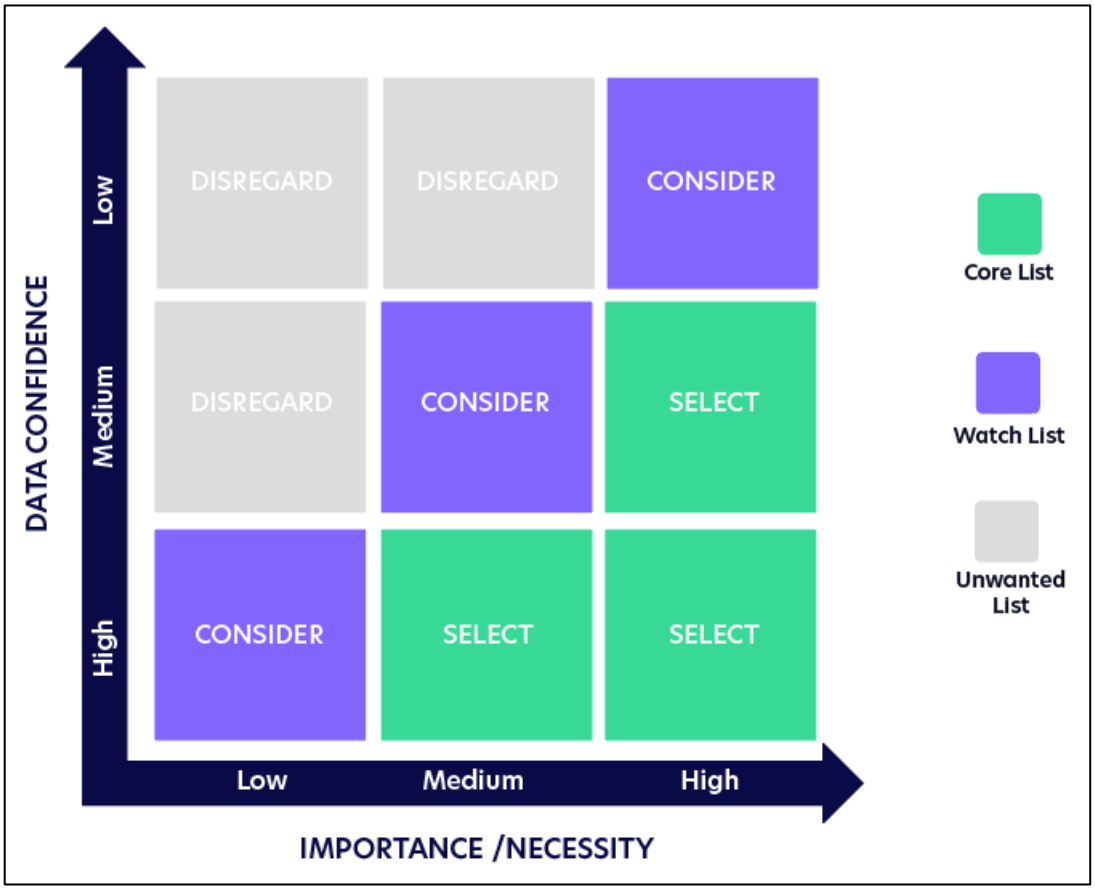

Figure 4 Nine-Box Analysis Matrix (simplified decision tool)

Table 4 Criteria definitions and ratings

Confidence Level	Rating	Explanation of value
Low	1	Based on best estimates of the WE staff members without measurement or documented evidence
Medium	2	Based on unconfirmed reports or extrapolation from limited sample which the collector is confident, some documentation may be missing, assessment may be out of date
High	3	Based on sound records, procedures, investigations

Importance Level	Value	Explanation of value
Low	1	The indicator relates to a certain dimension of service that decision makers do not want to evaluate
Medium	2	The indicator relates to a certain dimension of service that decision makers seek to evaluate
High	3	The indicator relates to a certain dimension of service that reflects the current priority of the decision makers

After analyzing the 55 KPIs by using the KPI assessment matrix, the results of the categorization exercise are listed in Table 5 au-dessous and are summarized hereafter:

- 25 KPIs can be used immediately; those indicators have a precise calculation and high importance and belong to the "**Core list**" or category C.
- 23 KPIs can be used with caution, those indicators have lower data accuracy or relatively lower importance versus objectives and belong to the "**Watch list**" or category B.
- 7 KPIs are disregarded; Those indicators are not useful and do not present any value to the objectives therefore the decision makers do not seek to measure and evaluate and must be excluded of any list.

Table 5. KPIs categorization

Key Performance Indicator		Score	Core List	Watch List
Technical Operations				
Water Coverage	%	9	X	
Sewerage Coverage	%	3		X
Water Production	litres/person/day	6	X	
Water Production	m3/conn/year	3		X
Total Water Consumption	litres/person/day	2		
Total Water Consumption	m3/conn/year	2		
Residential consumption	% of total consumption	2		
Industrial/commercial consumption	% of total consumption	2		
Consumption by governmental institutions	% of total consumption	2		
Non-Revenue Water	%	4		X
Non-Revenue Water	m3/km/day	3		X
Non-Revenue Water	m3/conn/day	3		X
Nb of tests for residual chlorine	% of nb required	3		X
Samples passing on residual chlorine	%	3		X
Pipe Breaks	breaks/km/year	3		X
Sewer Blockages	blockages/km/year	2		
Commercial Management				
Average revenue W&WW	US$/m3 water sold	9	X	
Average revenue W&WW	US$/W conn/year	3		X
Average revenue - water only	US$/m3 water sold	9	X	
Revenue split - % water	% of total for W & WW	4		X
Revenue split - % wastewater	% of total for W & WW	4		X
Water revenue - residential	% of total water revenue	4		X
Water revenue - industrial/commercial	% of total water revenue	4		X
Water revenue - governmental institutions	% of total water revenue	4		X

Table 5. KPIs categorization

Key Performance Indicator		Score	Core List	Watch List
Collection period	days	6	X	
Collection ratio	%	6	X	
Metering Level	%	6	X	
% Sold that is Metered	%	6	X	
Customers with discontinuous supply	%	3		X
Complaints of W&WW services	% of W&WW conn	3		X
Financial Management				
Unit Operational Cost W&WW	US$/m3 water sold	6	X	
Unit Operational Cost W&WW	US$/m3 water produced	6	X	
Unit Operational Cost - water only	US$/m3 sold	9	X	
Operational Cost split - % water	%	4		X
Operational Cost split - % wastewater	%	4		X
Labor costs vs operating costs	%	9	X	
Labor costs split - % permanent	%	9	X	
Labor costs split - % on demand	%	9	X	
Electrical energy costs vs operating costs	%	9	X	
Contract out serv costs vs operating costs	%	6	X	
Operating cost coverage	ratio	6	X	
Debt service ratio	%	6	X	
Gross fixed assets W&WW	US$/W+WW pop served	2		
Gross fixed assets - water	US$/W pop served	3		X
Gross fixed assets - wastewater	US$/WW pop served	2		
EBITDA	%	6	X	

Table 5. KPIs categorization

Key Performance Indicator		Score	Core List	Watch List
Human Resource Management				
Staff /'000 W subscription	nr/000 W sub	9	X	
Staff /'000 W conn	nr/000 W conn	3		X
Staff /'000 W pop Served	nr/000 W pop served	6	X	
Staff % water	%	9	X	
Staff % wastewater	%	9	X	
Organization and Strategy				
Enterprise Value/EBITDA	ratio	4		X
Enterprise Value/Revenue	ratio	4		X
Revenue growth (YoY)	%	6	X	
Subscriptions growth (YoY)	%	9	X	
Total of KPIs			**25**	**23**

4.3.2 Solving problems require confronting the causal factors

Many performance indicators have normalizing factors (in the denominator) such as population, number of connections, volume and network length. The following are key points of the diagnosis to remember and address in the step 4 of the process:

- The accuracy of service populations may need improvement due to the out-of-date census data.
- The water establishments are often more confident of the subscription figures and less certain of the exact number of connections in their system.
- The length of network in the database lacks of accuracy. Distribution network and related infrastructure are not fully surveyed or updated on the GIS.
- In general, water production is not adequately monitored due to the lack of flow measurement equipment and it is based on estimates of production and approximate working hours. Yet, water production figures may be known more reliably than those of water consumption because of the lack or absence of the household meters.

- While it is preferable to split the utility performance into water and wastewater, the information is sometimes not readily available in the data management system.

1 2 3 4 5

4.4 Design an action plan

The relative strengths and weaknesses identified for each KPI during the previous step provide one method for prioritizing actions in the action planning process. For instance, the water establishment may choose to focus first on improving KPIs with lower scores, or strengthen KPI with higher scores to continue consolidating and optimizing its processes.

Actions express priorities

The KPIs on the "watch list" under category B are those where the WEs have to focus their efforts since KPIs on the "core list" categorized as C can be immediately used with high confidence.

For each KPI on the both "core list" and "watch list", specific actions are defined to achieve the desired level of confidence. The KPI task force team should estimate the cost, level of implementation difficulty, and impact of each action. This categorization should preferably be done in coordination with all participants to take into account different points of view.
Figure 5 below illustrates a simple way for visual representation of the variety of combinations that the participants may have on the first list of actions. The top left quadrant refers to actions identified as low-cost, high-impact, and relatively easy to implement in the short-term. Whereas, the top right quadrant refers to actions identified as high-impact, high-cost and relatively difficult to implement, which will be included in the medium-term plan.

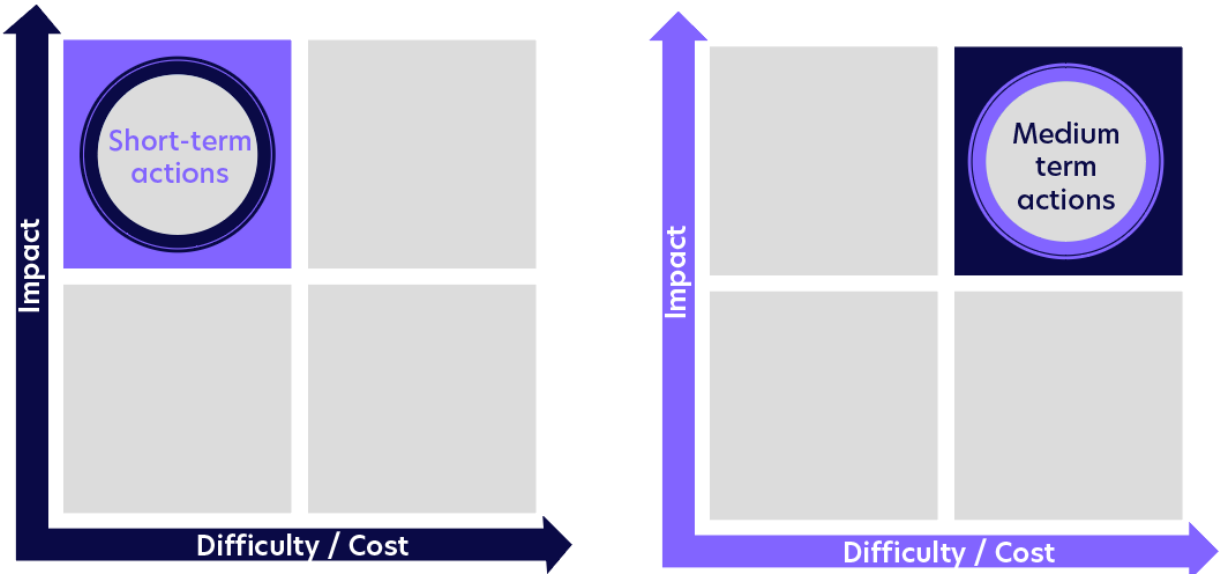

Figure 5 Visual representation of the first list of action

Table 6 is an example of various actions that the participants have to debate the costs and impacts depending on the WEs' context and availability of funds from donors.

Table 6. List of proposed actions with categorization

Action Ref.	Action to improve usefulness of KPI	Impact of action	Action cost / effort	Priority
A1	Employ a financial expert to understand the accounting needs and gaps and to split the accounts of W and WW where needed	High	Low	To be considered in the short-term action plan
A2	Develop the accounting module/practices to have individual annual accounting analyses for the O&M costs of each water system	High	High	To be considered in the medium-term action plan
A3	Hire a GIS expert to make the integration with customer database to identify inaccuracies and have the accurate number of connections	High	Low	To be considered in the short-term action plan
A4	Strengthen the GIS mapping to cover the subscribers' data and to improve the records of the customer base	High	Low	To be considered in the short-term action plan
A5	Strengthen the GIS mapping to cover the whole distribution network and have up to date network lengths	Low	High	To be dismissed
A6	Update the GIS maps to include the assets related to the water and wastewater systems	Low	High	To be dismissed
A7	Install flow/yield measurement equipment on all water sources, linked to the central production data center	High	High	to be considered in the medium-term action plan
A8	Implement different meter reading mechanisms to cover 100% of the service, with regular cycles and reliable data	High	Low	to be considered in the short-term action plan
A9	Installation of bulk flow meters and household water meters to measure the consumption	Low	High	To be dismissed
A10	Implement DMAs for demonstration and trial purposes	High	High	To be considered in the medium-term action plan
A11	Establish digital and secure back up of all records (servers)	Low	High	To be dismissed
A12	Prepare management procedures for data quality control to remove data silos and improve data reliability with periodic review of the improvement plans	High	Low	To be considered in the short-term action plan
A13	Deploy a laboratory management system for the collection, processing, analysis and presentation of data on quality of water at the level of water systems	High	Low	To be considered in the short-term action plan
A14	Put in place automated asset register with accurate asset data (asset attributes, life-cycle costing, asset failure, disposal)	High	High	To be considered in the medium-term action plan

A15	Deploy a maintenance management system to accurately monitor and control preventive and corrective maintenance costs by water system	High	High	To be considered in the medium-term action plan
A16	Develop and deploy a data collection tool in the form of standardized excel spreadsheet including macros to automatically calculate the KPIs	High	Low	To be considered in the short-term action plan
A17	Deploy a management control system across all organizational levels and units to guarantee fulfilment of objectives and goals through customizable KPI dashboards	High	Low	To be considered in the short-term action plan
A18	Establish a data repository to consolidate historical information in one place	High	High	To be considered in the medium-term action plan
A19	Establish a national information system and make it the nerve center of a performance improvement initiative	High	Low	To be considered in the short-term action plan

4.5 Push the plan through to results

The final step is to translate the plan into actions to ensure the continuity and the sustainable improvement of the performance framework in place.

A KPI task force team must be set up with a special purpose of working on the development and implementation of the performance framework. The team would be composed from representatives of the MoEW, the WEs, and any additional expert or consultant at needed.

The KPI task force team must be assembled following the workshop and consensus framework, and must periodically meet to evaluate the progress of the plan, revisit the actions that were delayed because of financial constraints, identify the bottlenecks and make the adjustments needed.

The plan is a roadmap not a static document that define a line of actions, but it is a living document that needs to be reviewed and updated.

Furthermore, the participants should monitor the usefulness of the medium-term plan in light of the rapidly changing environment and the lessons learned from the implementation of the short-term plan.

Below is the timeline for the implementation of the performance measurement framework with phased implementation of action plans and improvement activities:

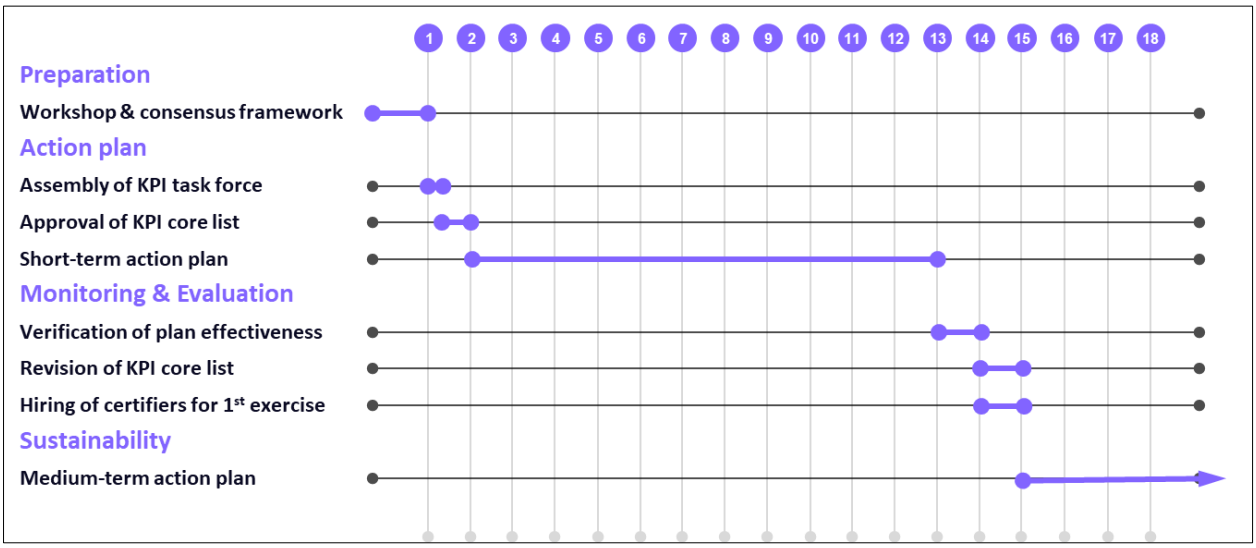

Figure 6 Performance Framework implementation (months)

5 OVERALL PERFORMANCE ASSESSEMENT

The overall performance approach evaluates a narrowed suite of metrics across the elements that directly affect the WE and the service to customers. According to the assessment carried out on 55 KPIs (section 4.3.1), 25 KPIs can be used immediately with confidence, 23 KPIs can be used with caution and 7 KPIs can be disregarded, however for the overall performance assessment, only 8 KPIs are retained (out of the 48 remaining KPIs) as shown in the below Table 7. Later on, the KPIs can be compiled in one index that will serve as benchmark to evaluate against the performance of the 4 WEs. The rationale behind this concept is that having a single indicator is more convenient than dealing with a number of KPIs. Appropriate calculation methodology should be developed to reflect the priorities of the WEs and targets of the national policy makers.

Table 7. List of KPIs for overall performance assessment

Key Performance Indicator		Observation
Technical Operations		
Non-Revenue Water	%	The KPI can be used with caution; it is included in the watch list for improvement
Nb of tests for residual chlorine	% of nb required	The KPI can be used with caution; it is included in the watch list for improvement
Commercial Management		
Collection ratio	%	The KPI has a precise calculation and high importance; it is included in the core list
Metering Level	%	The KPI has a precise calculation and high importance; it is included in the core list
Financial Management		
Operating cost coverage	ratio	The KPI has a precise calculation and high importance; it is included in the core list
EBITDA	%	The KPI has a precise calculation and high importance; it is included in the core list
Human Resource Management		
Staff /'000 W subscription	nb/000 W sub	The KPI has a precise calculation and high importance; it is included in the core list
Organization and Strategy		
Subscriptions growth (YoY)	%	The KPI has a precise calculation and high importance; it is included in the core list

5.1 Non-Revenue Water

Reference I10; Score 4; Confidence 2; Importance 2

1. Concept

   Non-revenue water is the volume of water which enters the distribution system but does not give any revenue to the utility; non-revenue water includes not only real and apparent losses, but also unbilled authorized consumption. It is the difference between water supplied and water sold expressed as a percentage of net water supplied.

2. Discussion

   The norm is to measure the nonrevenue water with the three proposed KPIs in %, in m3/km/day & in m3/conn/day to better understand and compare the performance of the WEs but the uncertainty of the connections and lack of reliability of network length make the KPI (I10) with the percentage figure our first choice for the time being. However, it should be used with caution due to the fact that a WE with compact network would appear falsely to outperform another WE operating extensive networks. Similarly, a WE with low density of connections in rural areas would appear to outperform in comparison to a WE with similar network of higher connection density.

3. Improvement actions
   - Install flow/yield measurement equipment on all water sources, linked to the central production data center.
   - Implement different meter reading mechanisms to cover 100% of the service, with regular cycles and reliable data.
   - Implement DMAs for demonstration and trial purposes.

5.2 Number of tests for residual chlorine

Reference I13; Score 3; Confidence 1; Importance 3

1. Concept

   The number of tests carried out on samples taken from the water distribution system, as a % of the number required by LIBNOR NL161.

2. Discussion

   Historically, there has been limited attention to the measures that capture the quality of water, therefore a particular focus is given to meet the ambitious goals of water quality and the rights of people to access clean and safe drinking water. The chosen KPI is one first step in the process of capturing the information about the compliance with the national norm NL161, as it gives an outlook on the progress of the routine monitoring schedules in order to reduce the risk to public health.

3. Improvement actions

   Deploy a laboratory management system for the collection, processing, analysis and presentation of data on quality of water at the level of water systems.

5.3 Collection ratio

Reference I26; Score 6; Confidence 2; Importance 3

1. Concept

   The effectiveness of the collections process is measured by the total amount collected as a percentage of the billed amount, in other terms Cash income / Billed revenue as a %.

2. Discussion

   The benefits of efficient collection practices are instant and can improve the liquidity and resilience of the WE in bad economic conditions, therefore capturing this metric is a must for the overall performance measurement. It is worth noting that the confidence is impacted somehow by the overstated revenues due to the inadequate customer records, and the absence of investigative customer surveys.

3. Improvement actions

   Strengthen the GIS mapping to cover the subscribers' data and to improve the records of the customer base.

5.4 Metering level

Reference I27; Score 6; Confidence 2; Importance 3

1. Concept

   Total number of subscriptions with operating meter/ total number of subscriptions, expressed in percentage

2. Discussion

   Metering of customers is considered a good practise to water conservation. Subscribers have the opportunity to influence their bills and the WEs have the opportunity to reduce NRW and better manage their water systems. However, based on lessons learned from past experiences in Lebanon, it appears that this was not a current priority of the WEs due to the high cost of the metering programs and difficulty of implementation in the current context, yet it remains a medium to long term objective for the policy makers therefore this KPI is selected to measure the progress of metering and to track the trends over time in the face of financial adversity.

3. Improvement actions

   Installation of bulk flow meters and household water meters to measure the consumption.

5.5 Operating cost coverage

Reference I41; Score 6; Confidence 2; Importance 3

1. Concept

   The operating cost coverage ratio (OCCR) measures the extent to which revenues cover basic operation and maintenance costs; OCCR=Total annual operational revenues/Total annual operating costs

2. Discussion

   This KPI was selected from a large range of financial indicators as it answers the question of whether the revenues exceed or not the operating costs. While the operating costs of the water service are being well accounted by the WEs, the operating costs of the wastewater service remained uncontrolled with treatment facilities and collection networks being controlled respectively by the CDR and municipalities.

3. Improvement actions

   Employ a financial expert to understand the accounting needs and gaps and to split the accounts of W and WW where needed (Impact on Revenues and Opex data).

   Develop the accounting module/practices to have individual annual accounting analyses for the O&M costs of each water system (Impact on Opex data).

   Strengthen the GIS mapping to cover the subscribers' data and to improve the records of the customer base (Impact on revenues data).

   Deploy a maintenance management system to accurately monitor and control preventive and corrective maintenance costs by water system (Impact on Opex data).

5.6 EBITDA

Reference I46; Score 6; Confidence 2; Importance 3

1. Concept

   Earnings before interest, tax, depreciation, and amortization expressed as percentage

2. Discussion

   EBITDA is a measure of a WE's financial performance and profitability, so relatively high EBITDA is clearly better than lower EBITDA. It is used as an alternative to net income to eliminate the effects of financing and capital expenditures like property, plants and equipment. The data confidence is negatively impacted by the inaccuracies of revenue figures in some WEs due to inaccurate subscribers' records, in addition to the inadequate operating costs relevant to the wastewater service with a number of facilities and networks being operated by others public institutions.

3. Improvement actions

   Employ a financial expert to understand the accounting needs and gaps and to split the accounts of W and WW where needed.

5.7 Staff /'000 W subscription

Reference I47; Score 9; Confidence 3; Importance 3

1. Concept

   Total number of staff expressed as per thousand subscriptions

2. Discussion

   Information on staff productivity is measured by the number of staff members per 1000 subscriptions instead of Staff/'000 conn because the estimated number of connections is subject to a large uncertainty, therefore using the number of subscribers is more representative of the idea behind such indicator in the case of Lebanon.

3. Improvement actions

   Hire a GIS expert to make the integration with customer database to identify inaccuracies and have the accurate number of connections.

5.8 Subscriptions growth (YoY)

Reference I55; Score 9; Confidence 3; Importance 3

1. Concept

   Total Change in total subscriptions year over year expressed in percentage

2. Discussion

   Growth of the subscriptions is a key metric for measuring the performance of the management team and organization. Adding new subscribers is essential for enhancing the revenue streams of the WE to achieve financial viability and sustainability. Expanding the customer base faster than the economic growth reflects the success of managerial actions and strategies to improve the NRW and to convert illegal users to new subscribers.

3. Improvement actions

   Strengthen the GIS mapping to cover the subscribers' data and to improve the records of the customer base, aimed to identify illegal users.

   Deploy a management control system across all organizational levels and units to guarantee fulfilment of objectives and goals through customizable KPI dashboards

APPENDICES

Appendix A. List of KPIs with concepts

Ref.	Indicator	Units	Concept
I 1	**Water Coverage**	%	Population with water services /total population under WE's responsibility, expressed in percentage
I 2	**Sewerage Coverage**	%	Population with wastewater services /total population under WE's responsibility, expressed in percentage
I 3	**Water Production**	litres/person/day	Total annual water supplied to the distribution system expressed by population served per day
I 4	**Water Production**	m3/conn/year	Total annual water supplied to the distribution system expressed by connection per year
I 5	**Total Water Consumption**	litres/person/day	Total annual water sold expressed by population served per day
I 6	**Total Water Consumption**	m3/conn/year	Total annual water sold expressed by connection per year
I 7	**Residential consumption**	% of total consumption	% split of total water consumption into 3 customer categories
I 8	**Industrial/commercial consumption**	% of total consumption	% split of total water consumption into 3 customer categories
I 9	**Consumption by governmental institutions**	% of total consumption	% split of total water consumption into 3 customer categories
I 10	**Non-Revenue Water**	%	Difference between water supplied and water sold expressed as a percentage of net water supplied
I 11	**Non-Revenue Water**	m3/km/day	Difference between water supplied and water sold expressed as volume of water lost per km of water distribution network per day
I 12	**Non-Revenue Water**	m3/conn/day	Difference between water supplied and water sold expressed as volume of water lost per water connection per day
I 13	**nb tests for residual chlorine**	% of nb required	The number of tests carried out on samples taken from the distribution system, as a % of the number required by LIBNOR 161
I 14	**samples passing on residual chlorine**	%	The % of samples tested for residual chlorine within the limit range set by LIBNOR 161
I 15	**Pipe Breaks**	breaks/km/year	Total number of pipe breaks per year expressed per km of the water distribution network
I 16	**Sewer Blockages**	blockages/km/year	Total number of blockages per year expressed per km of sewers
I 17	**Average revenue W&WW**	US$/m3 water sold	Total annual W&WW operating revenues expressed by annual amount of water sold
I 18	**Average revenue W&WW**	US$/W conn/year	Total annual W&WW operating revenues expressed by the number of water connections
I 19	**Average revenue - water only**	US$/m3 water sold	Operating revenues from water service only expressed by annual amount of water sold

Appendix A. List of KPIs with concepts

Ref.	Indicator	Units	Concept
I 20	**Revenue split - % water**	% of total for W & WW	% split of total revenue into water and wastewater services
I 21	**Revenue split - % wastewater**	% of total for W & WW	% split of total revenue into water and wastewater services
I 22	**Water revenue - residential**	% of total water revenue	% split of water revenue into 3 customer categories
I 23	**Water revenue - industrial/commercial**	% of total water revenue	% split of water revenue into 3 customer categories
I 24	**Water revenue - governmental institutions**	% of total water revenue	% split of water revenue into 3 customer categories
I 25	**Collection period**	days	(Year-end accounts receivable/Total annual billed revenues) * 365
I 26	**Collection ratio**	%	Cash income / Billed revenue as a %
I 27	**Metering Level**	%	Total number of subscriptions with operating meter/ total number of subscriptions, expressed in percentage
I 28	**% Sold that is Metered**	%	Volume of water sold that is metered/ Total volume of water sold, expressed in percentage
I 29	**Customers with discontinuous supply**	%	The % of customers with a water supply that is discontinuous during normal operation
I 30	**Complaints of W&WW services**	% of W&WW conn	Total number of W&WW complaints per year expressed as a percentage of the total number of W&WW connections
I 31	**Unit Operational Cost W&WW**	US$/m3 water sold	Total annual operational expenses/Total annual volume sold
I 32	**Unit Operational Cost W&WW**	US$/m3 water produced	Total annual operational expenses/Total annual water produced
I 33	**Unit Operational Cost - water only**	US$/m3 sold	Annual operational expenses of water service only/Total annual volume sold
I 34	**Operational Cost split - % water**	%	% split of the total cost into water and wastewater services
I 35	**Operational Cost split - % wastewater**	%	% split of the total cost into water and wastewater services
I 36	**Labor costs vs operating costs**	%	Total annual labor costs expressed as a percentage of total annual operational costs
I 37	**Labor costs split - % permanent**	%	% split of total labor costs into permanent and on-demand types
I 38	**Labor costs split - % on demand**	%	% split of total labor costs into permanent and on-demand types
I 39	**Electrical energy costs vs operating costs**	%	Annual electrical energy costs expressed as a percentage of total annual operational costs

Appendix A. List of KPIs with concepts

Ref.	Indicator	Units	Concept
I 40	**Contract out serv costs vs operating costs**	%	Total cost of services contracted-out to the private sector expressed as a percentage of total annual operational costs
I 41	**Operating cost coverage**	ratio	Total annual operational revenues/Total annual operating costs
I 42	**Debt service ratio**	%	Cash income / Debt service * 100
I 43	**Gross fixed assets W&WW**	US$/W+WW pop served	Total gross fixed W&WW assets per W&WW populations served
I 44	**Gross fixed assets - water**	US$/W pop served	Total gross fixed assets per population served, separately for water and wastewater
I 45	**Gross fixed assets - wastewater**	US$/WW pop served	Total gross fixed assets per population served, separately for water and wastewater
I 46	**EBITDA**	%	Earnings before interest, tax, depreciation, and amortization expressed as percentage
I 47	**Staff /'000 W subscription**	nr/000 W sub	Total number of staff expressed as per thousand subscriptions
I 48	**Staff /'000 W conn**	nr/000 W conn	Total number of staff expressed as per thousand connections
I 49	**Staff /'000 W pop Served**	nr/000 W pop served	Total number of staff expressed as per thousand population served
I 50	**Staff % water**	%	% split of the total staff into water and wastewater services
I 51	**Staff % wastewater**	%	% split of the total staff into water and wastewater services
I 52	**Enterprise Value/EBITDA**	ratio	Ratio of the company's Enterprise Value to its EBITDA in a year
I 53	**Enterprise Value/Revenue**	ratio	Ratio of the company's Enterprise Value to the revenue generated in a year
I 54	**Revenue growth (YoY)**	%	Change in total revenue year over year expressed in percentage
I 55	**Subscriptions growth (YoY)**	%	Change in total subscriptions year over year expressed in percentage

Appendix B. List of KPIs with score

Ref.	Indicator	Units	Data confidence rating	Importance of the KPI	KPI score
I 1	**Water Coverage**	%	3	3	9
I 2	**Sewerage Coverage**	%	1	3	3
I 3	**Water Production**	litres/person/day	2	3	6
I 4	**Water Production**	m3/conn/year	1	3	3
I 5	**Total Water Consumption**	litres/person/day	1	2	2
I 6	**Total Water Consumption**	m3/conn/year	1	2	2
I 7	**Residential consumption**	% of total consumption	1	2	2
I 8	**Industrial/commercial consumption**	% of total consumption	1	2	2
I 9	**Consumption by governmental institutions**	% of total consumption	1	2	2
I 10	**Non Revenue Water**	%	2	2	4
I 11	**Non Revenue Water**	m3/km/day	1	3	3
I 12	**Non Revenue Water**	m3/conn/day	1	3	3
I 13	**nr tests for residual chlorine**	% of nr required	1	3	3
I 14	**samples passing on residual chlorine**	%	1	3	3
I 15	**Pipe Breaks**	breaks/km/year	1	3	3
I 16	**Sewer Blockages**	blockages/km/year	1	2	2
I 17	**Average revenue W&WW**	US$/m3 water sold	3	3	9
I 18	**Average revenue W&WW**	US$/W conn/year	1	3	3
I 19	**Average revenue - water only**	US$/m3 water sold	3	3	9
I 20	**Revenue split - % water**	% of total for W & WW	2	2	4
I 21	**Revenue split - % wastewater**	% of total for W & WW	2	2	4
I 22	**Water revenue - residential**	% of total water revenue	2	2	4
I 23	**Water revenue - industrial/commercial**	% of total water revenue	2	2	4
I 24	**Water revenue - governmental institutions**	% of total water revenue	2	2	4
I 25	**Collection period**	days	2	3	6
I 26	**Collection ratio**	%	2	3	6

Appendix B. List of KPIs with score

Ref.	Indicator	Units	Data confidence rating	Importance of the KPI	KPI score
I 27	**Metering Level**	%	2	3	6
I 28	**% Sold that is Metered**	%	3	2	6
I 29	**Customers with discontinuous supply**	%	1	3	3
I 30	**Complaints of W&WW services**	% of W&WW conn	1	3	3
I 31	**Unit Operational Cost W&WW**	US$/m3 water sold	2	3	6
I 32	**Unit Operational Cost W&WW**	US$/m3 water produced	2	3	6
I 33	**Unit Operational Cost - water only**	US$/m3 sold	3	3	9
I 34	**Operational Cost split - % water**	%	2	2	4
I 35	**Operational Cost split - % wastewater**	%	2	2	4
I 36	**Labor costs vs operating costs**	%	3	3	9
I 37	**Labor costs split - % permanent**	%	3	3	9
I 38	**Labor costs split - % on demand**	%	3	3	9
I 39	**Electrical energy costs vs operating costs**	%	3	3	9
I 40	**Contract out serv costs vs operating costs**	%	2	3	6
I 41	**Operating cost coverage**	ratio	2	3	6
I 42	**Debt service ratio**	%	2	3	6
I 43	**Gross fixed assets W&WW**	US$/W+WW pop served	1	2	2
I 44	**Gross fixed assets - water**	US$/W pop served	1	3	3
I 45	**Gross fixed assets - wastewater**	US$/WW pop served	1	2	2
I 46	**EBITDA**	%	2	3	6
I 47	**Staff /'000 W subscription**	nr/000 W sub	3	3	9
I 48	**Staff /'000 W conn**	nr/000 W conn	1	3	3
I 49	**Staff /'000 W pop Served**	nr/000 W pop served	2	3	6
I 50	**Staff % water**	%	3	3	9
I 51	**Staff % wastewater**	%	3	3	9
I 52	**Enterprise Value/EBITDA**	ratio	2	2	4

Appendix B. List of KPIs with score

Ref.	Indicator	Units	Data confidence rating	Importance of the KPI	KPI score
I 53	**Enterprise Value/Revenue**	ratio	2	2	4
I 54	**Revenue growth (YoY)**	%	3	2	6
I 55	**Subscriptions growth (YoY)**	%	3	3	9

Appendix C Starter set of KPIs proposed by GTZ in 2019

	Indicator	Concept	Unit
1	**Technical**		
1.1	Water Coverage	Population with access to water services /total population under utility's nominal responsibility, expressed in percentage.	%
1.4	Water Sales	Total annual water sold expressed by connection per month.	m3/conn/m
2	**Financial**		
2.1	Unit Operating Cost	Total annual Operation and Maintenance (O&M) expenses/Total annual volume of water sold.	LL/m3 sold
2.2	Labour Costs as a Proportion of Operating Costs	Total annual labour costs (including benefits) expressed as a percentage of total annual costs.	%
2.3	Energy Costs as a Proportion of Operating Costs (Water)	Total energy costs for water operations only, expressed as a percentage of water direct operating costs.	%
2.5	Collection Rate	Amount collected for Water service, expressed as % of the total billed amount (i.e. water sales) for all customer categories.	% Overall
2.7	Operating Cost Coverage (from Collections)	Total collections/ Direct operating costs (Water).	%
3	**Management**		
3.1	Staff/'000 Water Connections	Total number of staff expressed as per thousand water connections.	#
3.2	Training Hours per Employee per Year. Also in Strategic Goals tied to SOP's.	Total of all qualified training hours for all employees as a percentage of total hours worked by total permanent full time staff.	Quantity of formal training
4	**Customer Service**		
4.2	Complaints about Water Service	Total number of Water complaints per year expressed as a percentage of the total number of water connections.	# of complaints per 1000 connections
4.3	Drinking Water Compliance Rate	Number of samples in full compliance as a percentage of the total number of samples for total coliform. Number of samples in full compliance as a percentage of the total number of samples for chlorine residual.	% samples in compliance for total coliform % samples in compliance for residual chlorine

Appendix D. Document by MoEW (2019)

	Water Establishments				
	BMLWE	**NLWE**	**SLWE**	**BWE**	**Total/Average**
Geographic and Population Coverage					
Areas served (according to water authorities prior to law 222)					
Number of cities and villages					
Estimated population					
Average number per household					
Estimated number of households					
Current number of subscribers					
Official establishments					
Subscribers equipped with water meters					
Number of households not covered by water establishment					
Percent households not covered by water establishment					
Water Resources and Available Facilities					
Available water resources (cum/day)					
Quantity of billed water (cum/day)					
Approximate quantity of produced water (cum/day)					
Ratio of produced water to billed water					
Total number of pumps					
Available storage capacity					
Available water treatment facilities					
Available electrical generators					
Consumption of fuel per one hour operation of generators (Liter/hr)					
Approximate yearly cost of fuel assuming 6 hrs daily operation (LL)					
Total length of water network (km)					
Administrative and Financial Status					

Appendix D. Document by MoEW (2019)

	Water Establishments				
	BMLWE	NLWE	SLWE	BWE	Total/Average
Total number of employees according to organization structure					
Actual number of employees					
Number of contractual employees					
Number of vacant positions					
Annual subscription fees for one cubic meter of water (LL)- excluding TVA and stamp					
Installation fees for a new water subscription (LL)					
Cost of electricity (LL/year)					
Cost of alternative electrical sources (fuel for generators)- (LL/year)					
Total cost of electricity &fuel (LL/year)					
Total cost of O&M including electricity &fuel (LL/year)					
Total expenditures (LL/year)					
Ratio of expenditures to subscriber					
Total Investments (LL/year)					
Ratio of Investments to subscriber					
percent investments of total expenditures					
Total revenues (LL/year)					
Ratio of revenues to subscriber					
Total Deficits/Benefits (LL/year)					
Performance					
Average unaccounted for water					
Percent collection					
Percentage electricity of O&M cost					
O&M cost recovery ratio (revenues/O&M cost)					
Nominal cost of O&M for one cubic meter sold water (LL)					
Nominal cost of O&M to sale price					

Appendix D. Document by MoEW (2019)

	Water Establishments				
	BMLWE	NLWE	SLWE	BWE	Total/Average
Unit o&m cost of billed water (LL/cum sold)					
Unit price of water (total subscription fees based on flat subscription, assuming 100 % collection and divided by water sold)					
Actual unit o&m cost of produced water (LL/cum produced)					
Actual unit o&m cost of produced water ($/cum produced)					