LEBANESE REPUBLIC
MINISTRY OF ENERGY AND WATER

NATIONAL WATER SECTOR STRATEGY UPDATE - 2020

BUREAU TECHNIQUE POUR LE DÉVELOPPEMENT Founded 1956 | DAR AL HANDASAH NAZIH TALEB & PARTNERS | ELARD | LIBANCONSULT AGM SAL Consulting Engineers | KREDO SAL | Hydroconseil

AXES OF THE STRATEGY

GOVERNANCE:

Targeting MoEW & WE thru TA, Capacity Building, Legal & Institutional reforms, etc.

CLIMATE CHANGE:

Hydrometric, meteorological, hydrogeological, Flood and drought studies thru the reactivated LCWMC

INFRASTRUCTURE:

CEDRE, Grants, Soft loans, etc. thru MoEW and WE's

STRATEGIC COMPONENTS

Seven strategic components to improve sustainable and integrated water resources management.

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AXIS I: SECTOR GOVERNANCE

AXIS I

CHALLENGES OF THE WATER SECTOR GOVERNANCE

CHALLENGE 1: STATUS OF HUMAN RESOURCES AT WE'S AND MOEW

- The sum of permanent and temporary staff combined covers only 50% of the planned positions (49% in NLWE, 51% in SLWE, and 52% in BWE).
- The number of staff does not reflect the performance of WE: need to analyze the qualification of existing staff to better understand possibilities of **improving their performance** or the necessity to **recruit more qualified personal**.
- Employees assigned **several tasks** that do not correspond to their initial training or specialization, including management functions to employees that do not have the required profiles, thus creating a poor working environment that directly affects **efficiency and performance.**
- **The current recruitment of temporary staff poses challenges around the sustainability of their position.**
- **According to law 221/2000, WE's have the mandate of managing the wastewater and irrigation systems, but their current organizational charts do not include these services**

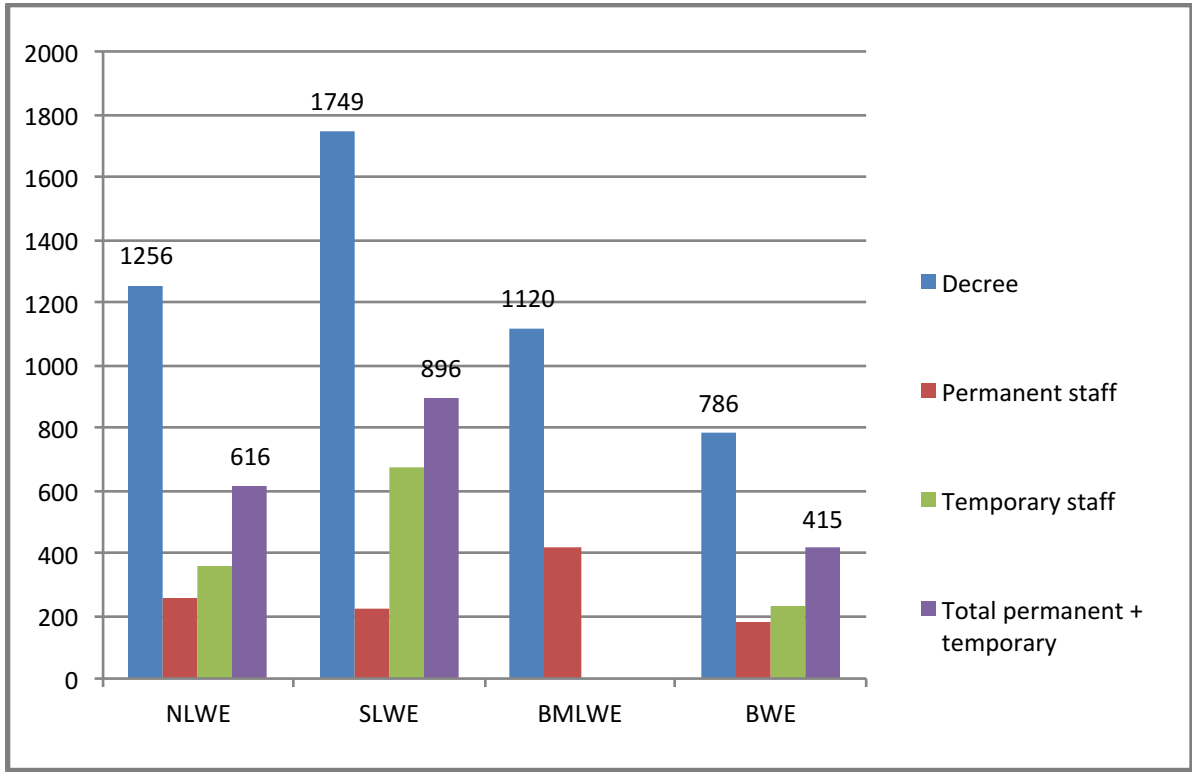
CHALLENGE 1: STATUS OF HUMAN RESOURCES AT WE'S AND MOEW

WE's:

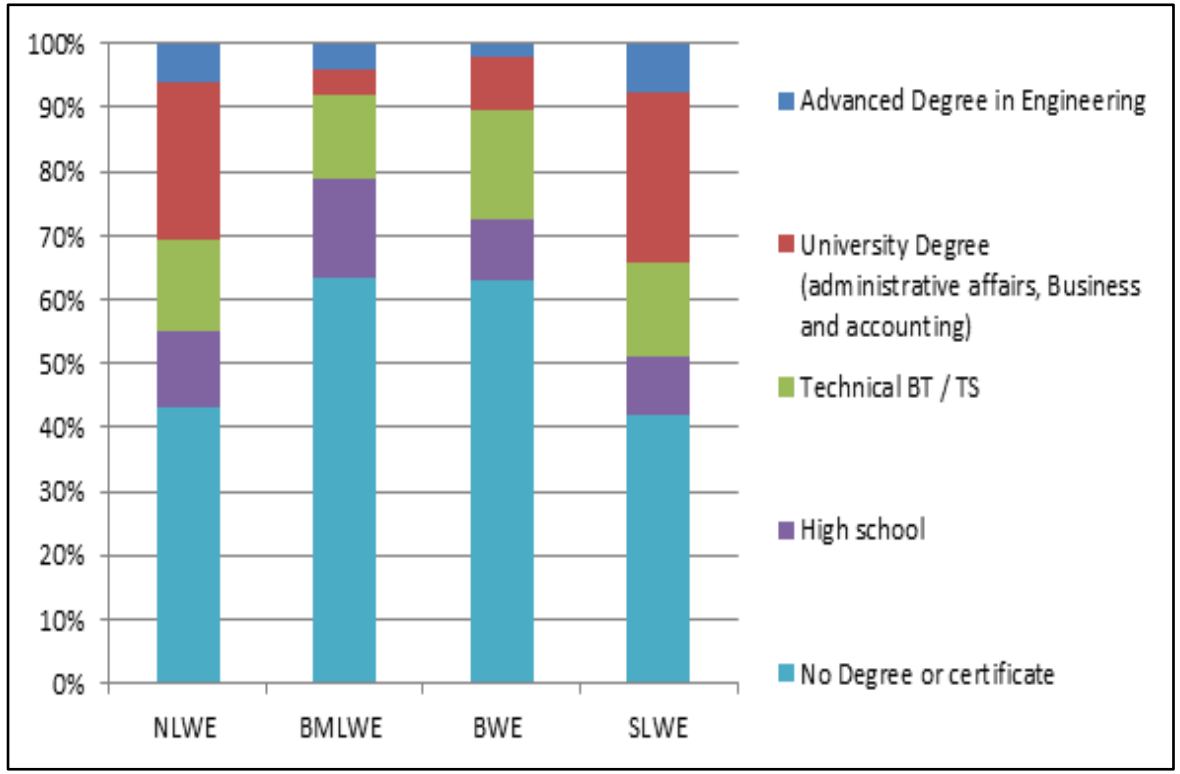
- Understaffed
- Lack of financial & technical capacities
- Organizational decrees no longer adapted for proper human resources management and development of technical expertise

MoEW:

- Understaffed
- Lack of qualified and technical staff to supervise the activity of WEs and to ensure overall sector management



Staffing Status of the 4 WEs



Overview of WE Staff Qualifications

CHALLENGE 2: THE LEGAL AND REGULATORY FRAMEWORK

- The current legal framework is composed of 4 main legal documents:
  - i) the Ottoman decision number 320/1920,
  - ii) decision number 144/S/1920,
  - iii) the sector's organizing law 221/2000 and its amendments, and
  - iv) the Water Code law 77/2018 and its amendment currently being under revision.
- On the institutional level, law 221 of 29 May 2000 and its amendments had identified and specified the **prerogatives of the MoEW and the WEs**.
- On the legal level, the legal provisions of the Arrêtés laws 144/1925 and 320/1926 and of the Water Code promulgated by law 77 dated 13 April 2018 target the **harmonization of the management** of the water sector and take into account the international principles in this field.
- The Water Code of 2018 was ratified without taking into account the revisions made by the sub-parliamentary committee. The revised version was completed in May 2020; it is therefore crucial to have the revised Code ratified soon to allow for its **executive decrees to be drafted**.

CHALLENGE 3: TUTELAGE, SUPERVISION, MONITORING & REPORTING

Poor monitoring within MoEW & WEs'

- **Limited capacities for monitoring actions across the entire sector and across the country**
- **Limited capacities for producing technical reviews**
- **No specific body or staff for this activity**

Absence of Financial Reporting

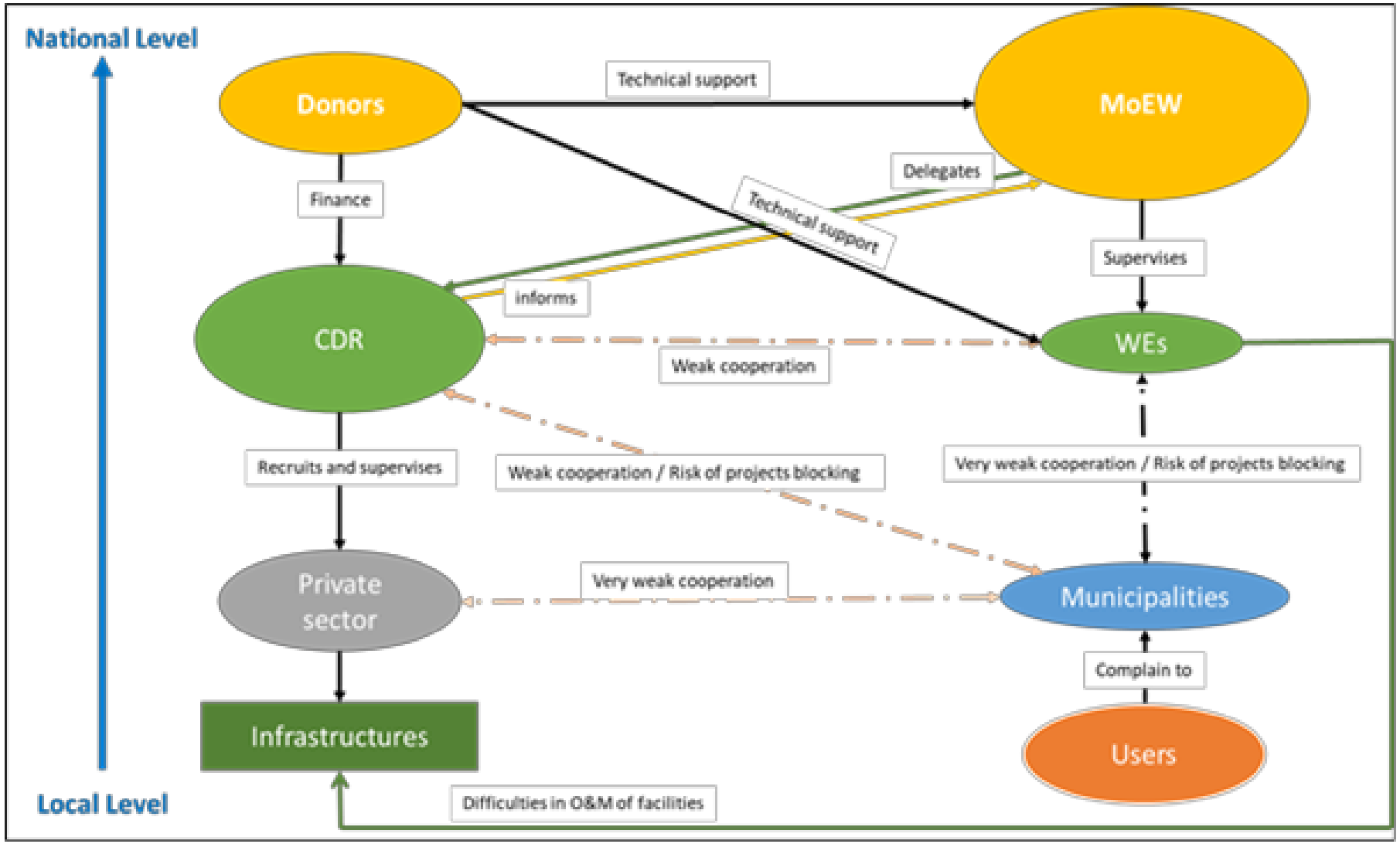
- **International financial reporting standards not applied**
- **External audits not carried out**

Weak Sector Transparency

- **Current data sector incomplete**
- **Lack of communication with the users and stakeholders**
- **Lack of coordination between institutions (CDR, WE's, Ministries)**

- Prevents the MoEW from conducting a fair assessment of the WEs performances
- Lack of trust from users in the water institutions
- Low collection rate
- Dilution of responsibilities

CHALLENGE 3: TUTELAGE, SUPERVISION, MONITORING & REPORTING



WE involvement according to current practice

Donors provide technical assistance to the WE's and the Ministry of Energy and Water, who delegate the monitoring of works to the CDR that has a very large sphere of influence. WE's have very little influence and there is poor cooperation between the WE's and the CDR.

Municipalities also appear to have an influence over project implementation, mostly because they are the main point of contact for users and are able to block projects should they wish.

There is poor cooperation between the WE's and municipalities, and between the municipalities and the CDR. There is also poor communication between the WE's and the users.

CHALLENGE 4: THE SECTOR'S FINANCIAL AND COMMERCIAL FRAMEWORK

Absence of International Financial Reporting Standards

- **Lack of annual audits of the financial statements and ledgers by an international independent audit firm**
- **No transparency of financial statements and inability of MoEW to monitor the WE's and fairly compare their performance**

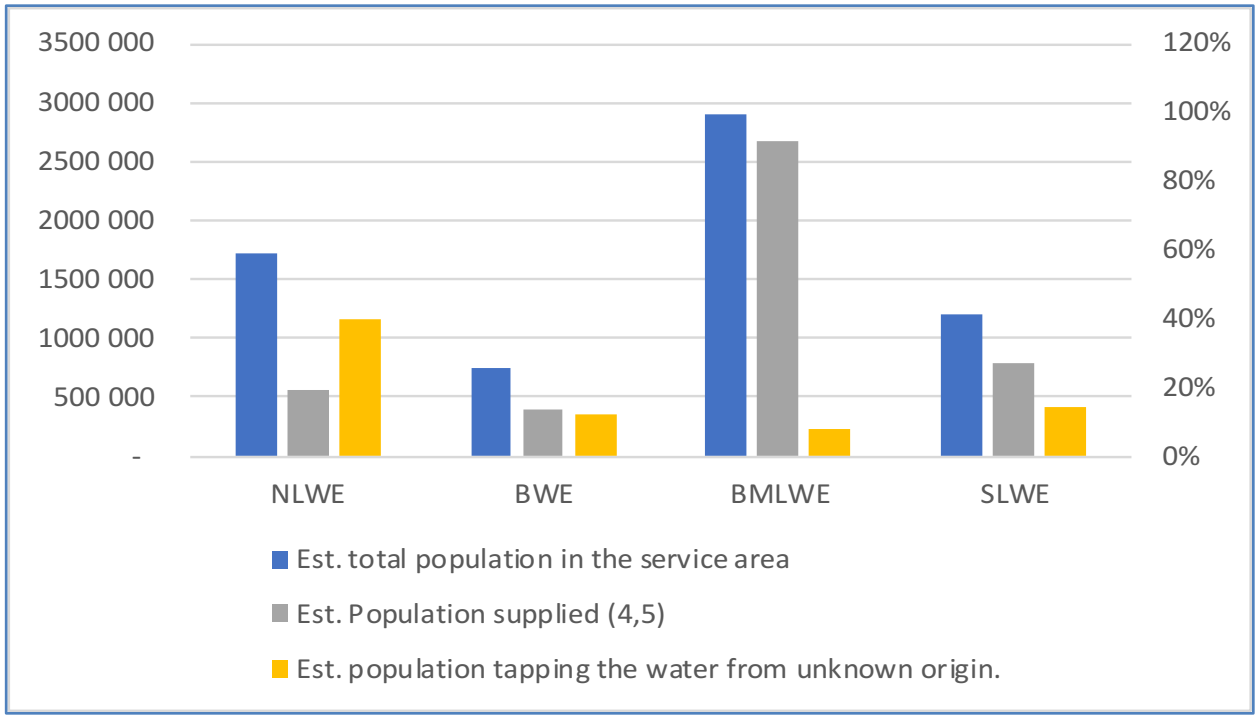
Inadequate Billing System: low Revenues vs high Losses

- **Current pricing system does not ensure a financial balance**
- **Gauge system and flat rate billing system do not allow to spot the over consumption of water and NRW**
- **Control of the facilities operating costs is insufficient and the energy bill is a heavy burden on the WEs' budget**
- **Incomplete customers databases and discrepancy between the number of official customers and the actual population tapping from the network**

- Technical and non technical water losses leading to draining of the WE's financial resources
- WE's cannot achieve basic performance in the service delivery across all sectors
- Efforts made for keeping control of NRW is not financially rewarded
- Households are supplied from unknown origins

CHALLENGE 4: SECTOR FINANCIAL BALANCE AND BILLING SYSTEM

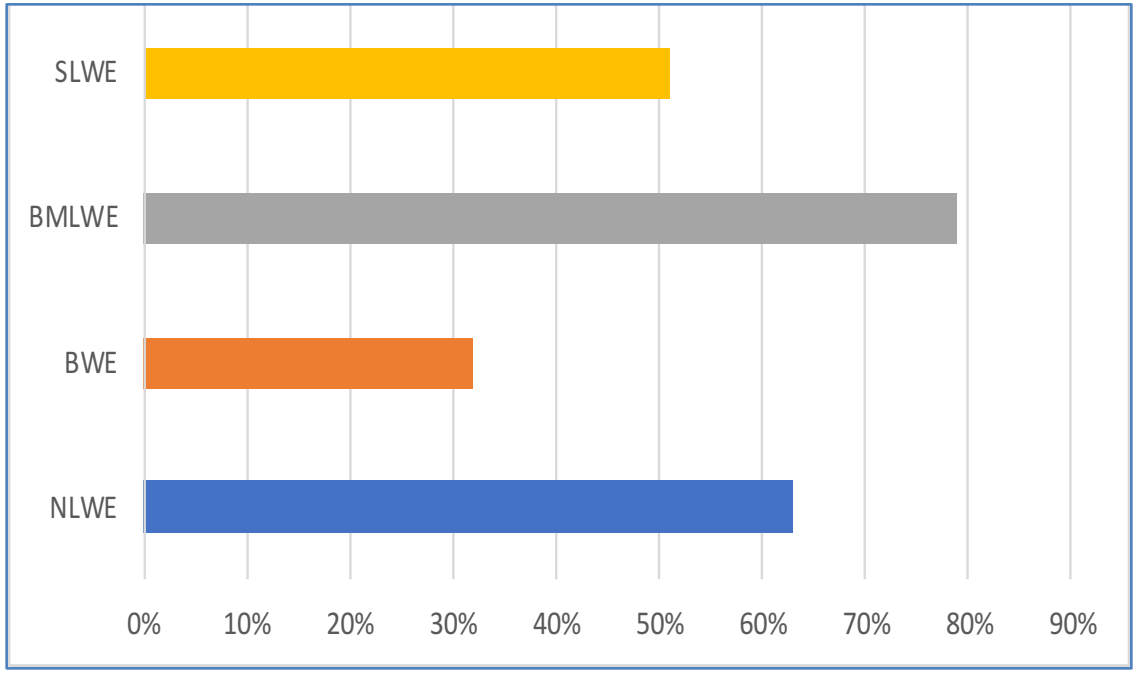
Population supplied v/s overall population



	Connected to the Waste Water system	
	Yes	No
NLWE	20 000	10 000
BWE	60 000	15 000
BMLWE	40 000	25 000
SLWE	30 000	15 000

Yearly sewage fee

Estimated collection rate (2018)



CHALLENGE 5: OPERATION AND MAINTENANCE OF FACILITIES AND SERVICES

Fragmentation of management roles

- Limited anticipation of the facilities' **operating and maintenance costs** in the design and construction
- Little consideration paid to the **technical and financial capacities** of the WE when designing the facilities
- Several actors involved in WW management (CDR, WE's, municipalities, and private operators) but **modalities of involvement and the financing method** need to be defined
- **High energy bill** due to interrupted electricity supply is the main burden on the operating cost of facilities

WEs need to outsource some of their tasks to private operators, but lack an efficient and effective contracting framework and internal technical skills to properly supervise private operators

AXIS I

OVERCOMING THE CHALLENGES OF THE WATER SECTOR GOVERNANCE

OVERCOMING CHALLENGE 1: STATUS OF HUMAN RESOURCES AT WE'S AND MOEW

- To fill the staffing gaps within the different WE's departments and within MoEW, **an authorization to recruit** is required.

- If MoEW and the WE's are given the opportunity to recruit permanent staff in the short term, they will conduct an **in-depth analysis** of the skills of their permanent staff and prioritize recruitment according to the identified crucial and **essential gaps and needs**.
- **Analysis of indicators** such as i) staff categories, ii) the main profiles, positions and tasks of permanent and temporary staff, and iii) qualifications and position of engineers, will enable a general analysis of MoEW and the WE's' situation.
- The objective is not to achieve the staff volumes set out in the organizational decrees but to **align staffing to the water institutions' mission**.

- The **recruitment of engineers** and staff with business management degrees is crucial in order to develop a customer service oriented strategy and to improve service management.

OVERCOMING CHALLENGE 1: STATUS OF HUMAN RESOURCES AT WE'S AND MOEW

- Management delegation of specific services to the private sector requires staff that specialize in managing **performance-based contracts** and that have the technical skills to supervise and monitor private operators.

- **A cell within the Ministry of Energy and Water** should be created to follow up on the implementation of all the strategy recommendations.

OVERCOMING CHALLENGE 2: THE LEGAL AND REGULATORY FRAMEWORK

Complete the **reforms** through ratification of the revised version of the Water Code:

- Preparing and adopting the decrees under the Water Code
- Specific studies will need to be conducted for some decrees (such as the tariffs and fees regime)
- Other decrees may be developed just after the final adoption of the latest version of the Water Code

The implementation of the Water Code requires several decrees to be adopted or reviewed, such as:

- Decree on vested rights over water;
- Composition and organization of the National Water Council;
- Preparation of planning in the water sector;
- **Operations subject to authorizations;**
- **Tariffs and fees regime;**
- **Public water service delegation types and arrangements**;
- Public utility services in flood-risk areas;
- Prevention of water deficits;
- Water Users' Association

OVERCOMING CHALLENGE 3: TUTELAGE, SUPERVISION, MONITORING & REPORTING

Creating a **monitoring department within the MoEW** to enhance the administrative supervision framework, and restructuring the Ministry's supervisory functions focusing on the WE's' performance monitoring

Progressively developing a framework for **performance monitoring** within each WE.

Defining basic **key performance indicators** to be monitored, and setting targets for developing improved indicators within an achievable timeframe

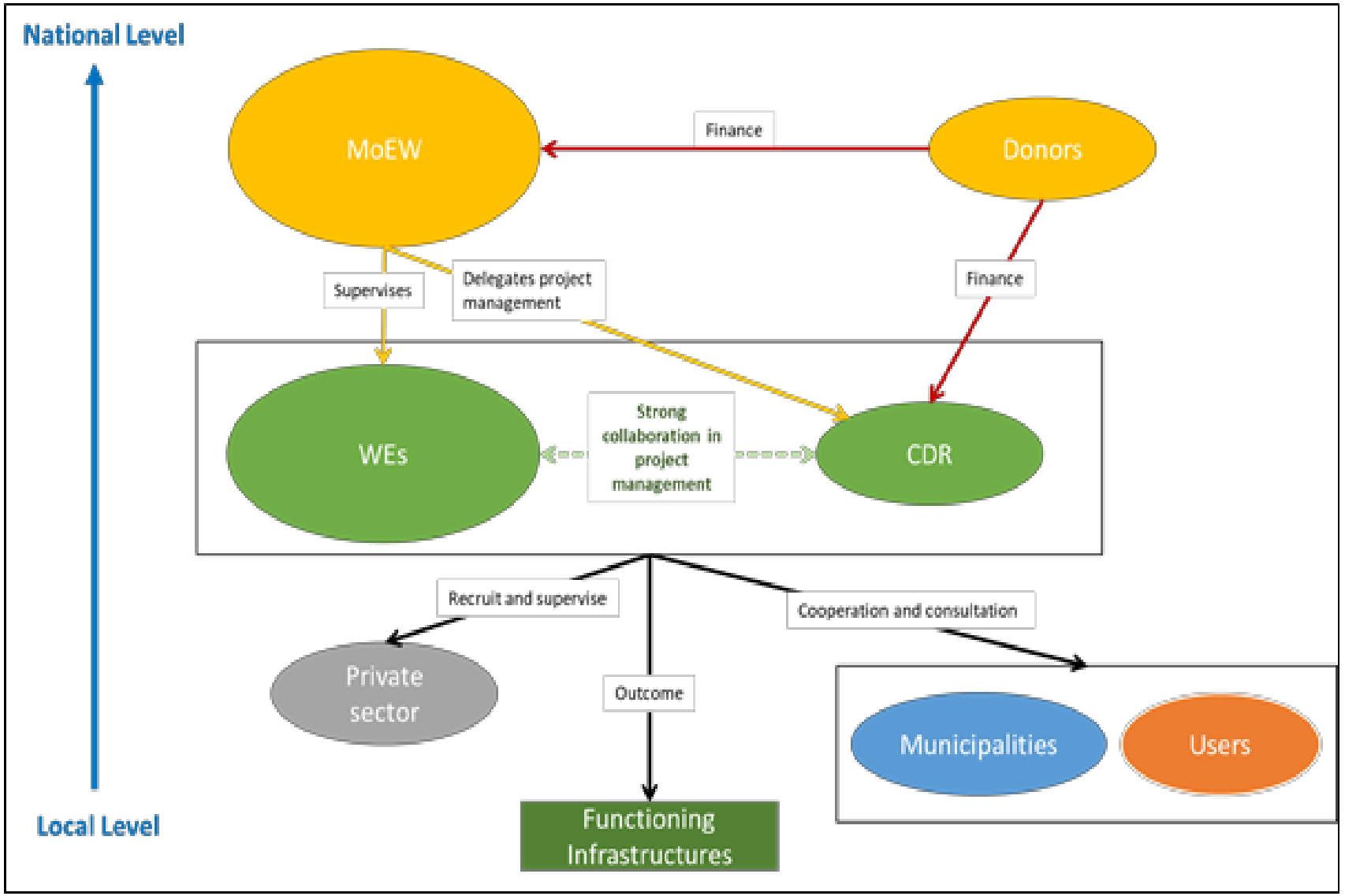
With the help of TA programs, **standardizing the structure of reports and audits** including Annual activity reports, Monthly activity reports, Annual external audit and evaluation of WE's

To enhance transparency and communication:

1- Establishing a **unified database** to include all sector monitoring data and regularly updating it

2- Setting up an **annual sector review** involving the main local and international stakeholders and partners is a key element of transparency.

OVERCOMING CHALLENGE 3: TUTELAGE, SUPERVISION, MONITORING & REPORTING

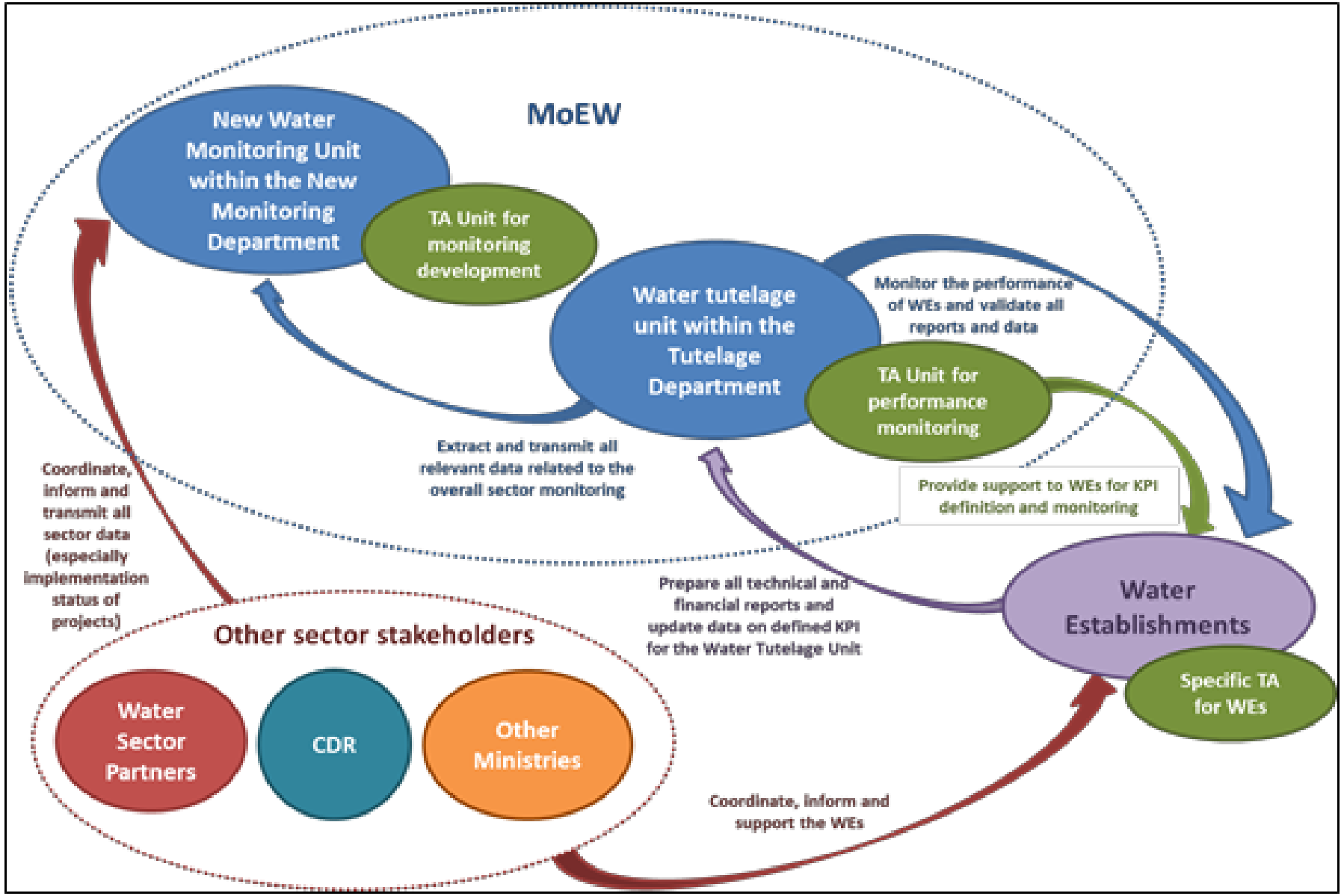


According to Law 221 and the National Water Sector Strategy, WE's should play a central role in project planning and management, alongside MoEW & CDR.

Under this arrangement, the donors finance the CDR and the Ministry, with the Ministry then providing guidance to both the WE's and the CDR.

The WE's and CDR should be responsible for ensuring the infrastructure functions correctly by monitoring the private sector and by working with municipalities and communicating with users.

OVERCOMING CHALLENGE 3: TUTELAGE, SUPERVISION, MONITORING & REPORTING



OVERCOMING CHALLENGE 4: THE SECTOR'S FINANCIAL & COMMERCIAL FRAMEWORK

FINANCIAL SIDE

Introduce International Financial Reporting Standards for all WEs with an annual audit by an international independent audit firm

Ensure the transparency of financial statements

Pave the way for **proper monitoring** of the utilities and fair comparison of performances

Restructure the **Water and Wastewater tariff** based on valid accounting books

Set **a financial plan** to have arrears, subscriptions and fees settled through periodic instalments

Introduce an **adequate Wastewater tariff**

COMMERCIAL SIDE

Bridge the gap between official customers and the actual population tapping from the network

Conduct a **customer census** campaign (each WE in its jurisdiction) to detect and attract potential new customers and include them in the customer database and billing system

Increase revenues of the WEs with **no real additional operating cost**

Introducing **district meters and water meters** targeting 100% of households by the end of 2035

For WW: **Users of the services need to be identified** and registered in specific databases.
Cross-reference the database of subscribers to the WEs with the database of users of wastewater services

OVERCOMING CHALLENGE 5: OPERATION & MAINTENANCE OF FACILITIES AND SERVICES

IMPROVEMENT OF OPERATING COST CONTROL

- Controlling the energy bill
- Defining guidelines to ensure that design of facilities is adapted to the capacity to cover operating costs

STRUCTURING AND ENHANCEMENT OF THE PRIVATE SECTOR INVOLVEMENT

- Reviewing existing contracts with private operators
- Developing a new contracting framework and performance-based contracts

ADOPTION OF A SHARED WASTEWATER MANAGEMENT FRAMEWORK

- Analyse the current WW management and financing tools
- Conduct a full cycle analysis WW systems currently operational
- Enhance joint discussions between with WE, MoEW, CDR, donors
- Propose scenarios and an overall framework for wastewater facilities management and propose financial arrangements for O&M

AXIS I

THE ACTION PLAN

PRIORITY AND IMMEDIATE ACTIONS

PRIORITY AND SHORT-TERM ACTION PLAN — Sheet 1 of 5

Total Estimated Cost of the Action Plan = 12972 500 USD

Activity	Priority	Stakeholder		Means to mobilize	Deadline	Indicators	Funding	Cost (USD)
		Lead	Involved					
A. Sector Governance								-
A.1 Implement the legal and regulatory framework reform (Water Code)								
A.1.1 Prepare, adopt and implement the Water Code bylaws as already listed	High	MoEW	WE, LRA, MoE, MoA	Recruitment of legal consultant	Phase 1 : Q1 2021 Revision : end 2025	Adopted Decrees	INT	40,000
A.1.2 Draft revised WE organization bylaws, support the approval process and follow up on their enactment	High	MoEW	WE	Recruitment of legal consultant	Phase 1 : end 2020 Revision : end 2025	Adopted Decrees	INT	35,000
							Total A.1	**75,000**
A.2 Rationalise the tutelage framework with a view for clear dispatching between operational and regulatory activities								
A.2.1 Restructure the Ministry's supervisory functions and introduce a substitute function in the event of WE failure (incl. direct procurement of external audit if not conducted by WEs and cost deduction from their budget)		MoEW		Recruitment of legal consultant	End of 2020	Revised Decree	INT	5,000
A.2.2 Review the organizational decrees by focusing them on defining guidelines for WEs organization and streamline specific procedures	High	MoEW		Recruitment of legal consultant	Phase 1 : end 2020 Revision : end 2025	Adopted Decrees	INT	
a. Define guidelines for the WEs' HR recruitment and organization structures / simplify the organization chart validation procedure			WE					
b. Streamline the HR recruitment process and make it possible to enhance recruitment outside the public service procedures			WE					*Covered under item A.1.2*
c. Raise the expenditure and procurement validation thresholds			WE, MoF					
d. Define guidelines for WE performance monitoring			WE					
e. Define guidelines for pricing services and simplify the validation procedure			WE					
f. Define guidelines for procurement management and the management of performance-based contracts			WE					
A.2.3 Conduct an assessment of the administrative follow up department roles and capacities and develop a specific staff capacity-building plan	High	MoEW		Recruitment of consultants / experts (water services management, HR, capacity-building)	Assessment : End of 2020 Implementing the capacity-building plan : End 2025	Assessment and CB plan validated by MoEW and activity reports of the supporting activities	INT	75,000 300,000
							Total A.2	**380,000**

PRIORITY AND SHORT-TERM ACTION PLAN — Sheet 1 of 5

Total Estimated Cost of the Action Plan = 12972 500 USD

Activity	Priority	Stakeholder		Means to mobilize	Deadline	Indicators	Funding	Cost (USD)
		Lead	Involved					
A.3 Develop proper mechanisms for performance monitoring							**Total A.2**	**380,000**
A.3.1 Set up a unit in charge of performance monitoring within the MoEW administrative follow up department	Short Term	MoEW		Recruitment of technical assitants (to 2 Experts in water services management and performance monitoring)	Recruitment : End 2020 TA until end 2025	*Standardized reports prepared by WEs *Conduction of external annual audits starting in 2021 *Production of KPI *Performance contracts between MoEW and WEs	INT	900,000
A.3.2 Standardise the structure of annual reports incl. financial and business reports	Mid Term	MoEW	WE					
A.3.3 Define the monthly activity report submission and validation structure and procedure	High	MoEW	WE					
A.3.4 Develop the framework for the annual external audit and evaluation of WE	High	MoEW	WE					
A.3.5 Define key performance indicators to be monitored in the short, medium and long term (in alignment with the WE monitoring capacities)	High	MoEW	WE					
A.3.6 Establish performance contracts between the MoEW and WE	High	MoEW	WE					
A.3.7 Set up the performance monitoring committee as required by law 221	High	MoEW	WE, MoF					
							Total A.3	**900,000**

Total A. Sector Governance : 1355 000 USD

PRIORITY AND SHORT-TERM ACTION PLAN

Total Estimated Cost of the Action Plan = 12972 500 USD

Activity	Priority	Stakeholder		Means to mobilize	Deadline	Indicators	Funding	Cost (USD)
		Lead	Involved					
B. Financial and commercial								
B.1 Conduct a customer and user census								
B.1.1 Identify customers connected to piped water and convert unknown customers tapping into the network into legal users	High	WE	MoEW	Recruitment of consultants (technical experts and census experts) - Census to be conducted for all customers / estimated to 1 500 000 of households (price: $3 for 1 household)	Phase 1 : End 2020 Complete census : Beginning 2021	Census reports and updated WEs' consumers database	INT	4,500,000
B.1.2 Identify users of collective wastewater services (network or network+WWTP) / identify those who are / are not WE customers (cross-reference with the water supply customer census) in order to define specific approaches for tariff-setting	High	WE	MoEW	Recruitment of consultants (technical experts and census experts)	Complete census for zone 1 by mid 2021	Census reports and updated WEs' wastewater services users database	INT	2,000,000
B.1.3 Ensure the take over of new customers/users by WEs and their inclusion in the customer/users database for the billing/collection cycle		WE	MoEW	if needed support from specific TA	Beginning 2022	Increasing subscribers base	INT	*No Cost*
							Total B.1	**6,500,000**
B.2 Implement consumption-based tariffs for water service								
B.2.1 Streamline the water meter billing procedure		MoEW		Recruitment of financial and water tariff expert(s)	Mid 2022	Harmonized guidelines and procedures for water meter billing	INT	50,000
							Total B.2	**50,000**
B.3 Revise the tariff structure for sanitation services								
B.3.1 Conduct a proper cost analysis of facilities O&M		MoEW		Recruitment of technical and financial experts on wastewater management	End 2020	Adoption and implementation of new tariff policy for wastewater management	INT	200,000
B.3.2 Base the tariff on the cost analysis and, as a minimum, cover O&M costs		WEs			Mid 2021			
							Total B.3	**200,000**

Total B. Financial and commercial : 6750 000 USD

Activity	Priority	Stakeholder Lead	Stakeholder Involved	Means to mobilize	Deadline	Indicators	Funding	Cost (USD)
C. Reporting and monitoring								
C.1 Enhance sector monitoring								
C.1.1 Create a Monitoring Department within the Ministry		MoEW		Recruitment of legal consultant	End of 2020	Revised Decree or Amendment to the Law 247	INT	7,500
C.1.2 Establish a unified database to include all sector monitoring data and ensure it is regularly updated (incl. the WE KPI)		MoEW		Recruitment of water sector monitoring (part-time assistance) and 1 IT expert (full-time assistance)	Mid 2021	*TA recruitment *TA activity reports *Establishment and regular update of the sector database	INT	750,000
					Mid 2022	Database		
C.1.3 Set up an annual sector review involving the main stakeholders and partners		MoEW		organization of annual sector workshop	Mid 2020	Workshop / annual review and annual sector review report	National	*No Cost*
C.1.4 Set up the process for monitoring the Strategy implementation status		MoEW		Analysis of sector data	Mid 2025	Strategy implementation status report	National	*No Cost*
							Total C.1	757,500
C.2 Enhance sector transparency								
C.2.1 Ensure a transparent flow of information between WEs and MoEW through regular reporting (annual report, financial report, business report)		MoEW		Reports production and publication / TA support	Continuious activity	Meeting minutes, reports	National	*No Cost*
C.2.2 Publish annual WE reports (incl. results of audits performed by independent auditors)		WEs		Recruitment of external auditors	starting from mid 2021	Annual WEs' reports publication	National	*No Cost*
C.2.3 Prepare financial reports based on IFRS book-keeping standards		WEs		Reports preparation with TA support if needed	starting from mid 2021	Financial report	National and INT TA	*No Cost*
C.2.4 Publish the main sector indicators, ensuring these are updated on a regular basis		MoEW		Update of sector indicators (with TA - see C.1.1)	starting from mid 2021	Publication of main sector indicators	National and INT	*No Cost*
C.2.5 Publish the breakdown of the water bill		WEs		Publication and communication support	starting from mid 2021	Publication by each WE of the water bill breakdown	National	*No Cost*
							Total C.2	**-**
C.3 Enhance sector coordination								
C.3.1 Improve coordination between CDR and WEs on infrastructure project planning and management		MoEW		Regular meetings, MoEW follow-up on coordination, support from donors and sector partners	Continuious activity	Participation of WEs in the projects design and implementation	National	*No Cost*
C.3.2 Organise an annual sector review involving all stakeholders and partners		MoEW		organization of annual sector workshop	Mid 2020	Workshop / annual review and annual sector review report	National	*No Cost*
							Total C.3	**-**
C.4 Enhance communication with user								
C.4.1 Develop a communication strategy for MoEW and WE		MoEW		Recruitment of communication experts	End 2020	Communication strategy, tools and supports	International	500,000
C.4.2 Design and launch a national communication campaign on the water sector		MoEW			Begin4ning 2021			
							Total C.4	500,000
							TOTAL C. REPORTING AND MONITORING: 1 257500 USD	

PRIORITY AND SHORT-TERM ACTION PLAN — Sheet 4 of 5

Total Estimated Cost of the Action Plan = 12972 500 USD

Activity	Priority	Stakeholder		Means to mobilize	Deadline	Indicators	Funding	Cost (USD)
		Lead	Involved					
D. Capacity-building								
D.1 Strengthen the MoEW monitoring capacities								
D.1.1 Appoint specific technical assistance to the MoEW to help develop monitoring		MoEW		***Covered under item C.1.1***				
D.1.2 Support the MoEW in defining sector key performance indicators		MoEW						
D.1.3 Support the MoEW and the WEs in developing a performance monitoring framework		MoEW		***Covered under item A3***				
D.1.4 Identify the MoEW staff to be trained and supported in monitoring activities		MoEW						
D.2 Streamline and structure WE internal organization and management							**Total D.1 -**	
D.2.1 Conduct an overall internal audit in each WE (organizational, HR management, financial - assets, commercial, technical), propose measures and guidelines for streamlining internal WE organization		WEs		Recruitment of the following experts: institutional, O&M of water utilities, capacity-building and HR management, water and wastewater	Beginning 2021	Audit report validated by MoEW and the four WEs	INT	450,000
D.2.2 Prepare a handbook of jobs in the WEs with minimum skills required per position and standard training / capacity-building plan to be implemented		WEs			*Beginning of 2022 for the hanbook validation *End of 2025 for implementing the capacity-building plan and TA support	*Handbook *Capacity-building plan *TA activity reports and specific studies	INT	2,500,000
							TotalD.2	**2,950,000**

Total D. Capacity-building : 2950 000 USD

PRIORITY AND SHORT-TERM ACTION PLAN — Sheet 5 of 5

Total Estimated Cost of the Action Plan = 12972 500 USD

Activity	Priority	Stakeholder		Means to mobilize	Deadline	Indicators	Funding	Cost (USD)
		Lead	Involved					
E. O&M of facilities and services								
E.1 Improve operating cost control								
E.1.1 Develop a specific strategy to control the energy costs of the facilities (based on ongoing studies)		MoEW		Recruitment of technical and financial experts	End of 2021	Validated reports and strategic guidelines	INT	150,000
E.1.2 Define guidelines to ensure that facilities design is adapted to the capacity to cover their operating costs		MoEW		Recriutment of technical and financial experts (coordinate with other financial and technical studies)	End of 2021	Publication of guidelines	INT	100,000
							Total E.1	**250,000**
E.2 Enhance private sector involvement								
E.2.1 Review existing contracts with private operators and develop a new contracting framework and performance-based contracts		WEs		Recruitment of institutional, legal and technical experts in overseeing water facilities O&M contracts	Mid 2021 for pilot contract for wastewater facilities management End of 2025 to assess the contracts and revise the framework (if needed)	Implementation of performance-based contracts Assessment report of the efficiency and ownership by WEs of this framework and propose improvements	INT	160,000
E.2.2 Identify the tasks or activities to be outsourced and the outsourcing arrangements to be adopted		WEs		Recruitment of the following experts: institutional, O&M of water utilities, capacity-building and HR management, water and wastewater	Mid 2021	Reports and validation of the proposed framework by WEs and MoEW	INT	*No Cost*
							Total E.2	**160,000**
E.3 Adopt a shared wastewater management framework								
E.3.1 Address the issue of the organization(s) responsible for managing the WW network and treatment plants (WEs, municipalities, private operators.) and determine the financing method		MoEW		Recruitment of institutional, financial and technical experts in wastewater facilities operation and management	Mid 2021	Publication of the wastewater management framework	INT	250,000
							Total E.3	**250,000**

Total E : 660 000 USD

AXIS II: FIGHTING CLIMATE CHANGE

AXIS II

SURFACE WATER MONITORING AND MANAGEMENT

INSTITUTIONS MONITORING THE MANAGEMENT AND OPERATION OF EXISTING METEOROLOGICAL STATIONS

AQMN	Air Quality Monitoring Network
AUB	American University of Beirut
CNRS	National Centre For Scientific Research
LARI	Lebanese Agricultural Research Institute
LMS	Lebanese Meteorological Service
LRA	Litani River Authority
MoE	Ministry Of Environment
USJ	Saint Joseph University
UoB	University of Balamand
LWF	Lebanese Weather Forecast
WoL	Weather of Lebanon

INTEGRATED HYDROLOGICAL INFORMATION SYSTEM

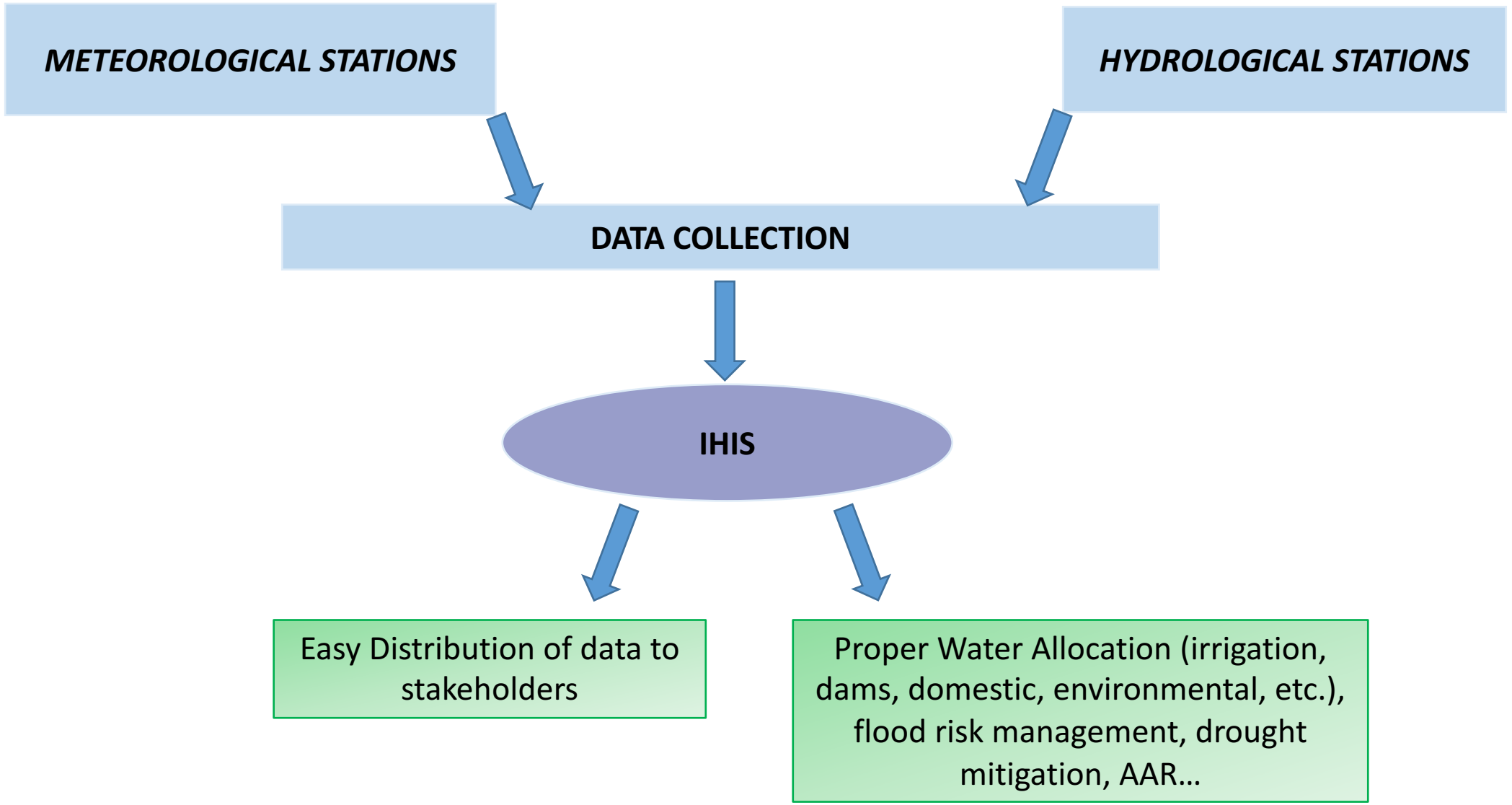
Infrastructure Upgrade is an integral part of the IHIS and should occur according to a detailed design:

- **Hydrogeological aquifers** are main contributors to river flows; they should be monitored by expanding both meteorological and hydrometric networks to detect each aquifer's contribution from and into surface flows;
- **Snow monitoring stations** should be installed to cover the mountainous regions above 1500 m and estimate precisely the snow contribution into river flows.
- **Natural reserves and forests** should be covered by expanding MoE network and including it in the integrated network;
- Expansion of networks allows also for a better **flood risk prediction** and early warning systems;

Data management and valorisation need improvements, in particular:

- Setting up a **central database** to record, check, analyse and archive all the collected measurements to improve the quality and reduce the time for water balance estimation, water allocation simulations, prediction and planning;
- **Activation** of the Geographical Information System **(GIS) platform** for an interactive and dynamic assessment and follow-up of all existing networks;
- Improving **the knowledge of global climate change** impact on Lebanese water resources for better adaptation strategies;
- Setting up a **data management protocol** which **unifies** the data sharing methodology and reliability;

OVERALL VISION: INTEGRATED HYDROLOGICAL INFORMATION SYSTEM



IHIS: TIMESCALE & REQUIRED STUDIES & IMPLEMENTATION

	Duration (months)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9
A-Recommended studies for IHIS implementation	**100**									
Assessment studies	12									
Update and Analysis of the NLUMP	12									
Lebanese Data Rescue Project	24									
Design studies for IHIS implementation	16									
Integrated water resources managemetn studies	60									
Flood Risk Management Plan	84									
B- Networks Expansion	**64**									
LMS + LRA Meteorological Network	40									
LARI Meteorological Network	12									
MoE Meteorological Network	24									
LRA Hydrometric Network	64									
C- IHIS implementation	**16**									
IHIS Implementation	12									
IHIS Operation and Supervision	24									
WEAP Implementation	6									

IHIS: TIMESCALE & REQUIRED STUDIES & IMPLEMENTATION

	Duration (months)	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
Drought Mitigation (Nation scale drought mitigation plan	**9**									
Define the conceptual and legal framework, methodology,	2									
Data collection including historical drought events	1									
Establish indicators and thresholds for drought classification	3									
Develop a program of measures, mitigations and recommendations for a nation scale strategy	6									
Establish drought early warning protocol	2									
Establish organizational framework for the production, implementation and update of the drought mitigation plan	1									
Rainwater harvesting program (Nation scale rainwater harvesting strategy and program	**3**									
Define the conceptual and legal framework, methodology	2									
Data collection	1									
Hydrological assessment of the rainwater harvesting potential	2									
Determination of the harvesting methods and potential implementation sites	3									
Development of an implementation strategy and program	6									

AXIS II

GROUNDWATER MONITORING AND MANAGEMENT

GROUNDWATER STUDY OF 2020

Study requested by MoEW as part of the strategy, financed by UNICEF, and currently under execution by BTD to assess the impact of climate change on Lebanon's GW aquifers as a continuation of previous assessments. The study should extend over a period of 4 years.

During the 1st year BTD will assess the impact of sea-water intrusion in the coastal aquifers of Lebanon. The requested study includes the following tasks:

- Collect all available data on private and public wells tapping the coastal aquifers and sort them in operational and non-operational and in licensed and not licensed.
- Collect available data on the quality of the water extracted from the public wells and the private wells
- Identify the tapped coastal areas aquifers.
- Refresh and edit the geology of the coastal area that covers the coastal aquifers, as hard and digital copies of 1/50,000 and 1/20,000 geologic maps, on the basis of geological surveys to be conducted and new mapping methods, covering the coastal parts of **3 areas** managed by the Water Establishments NLWE, BMLWE & SLWE
- Monitor the flows and the water quality of the coastal springs by collecting samples on monthly basis and analysing their physico-chemical and bacteriological characteristics.
- Assess the possibilities of recharging artificially the coastal aquifers (characterization studies)

AXIS II

MONITORING WATER QUALITY AND WATER SAFETY PLANNING

GUIDELINES FOR MONITORING WATER QUALITY

International Standards

- The EU Drinking Water Directive (Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption)
- The WHO guidelines for drinking-water quality (fourth edition incorporating the first addendum - 2017) reflect the importance of public health protection

National initiatives

1- Incentive towards publishing the 161:2016 Libnor water quality standards

A review and update of the LIBNOR standards for drinking water, initially issued in 1999, was drafted in 2016, but has not yet been published. This second edition is based on the WHO guidelines (2011) and on the water quality committee expertise.

2- Water safety plan implementation

The implementation of the water safety plan described by the World Health Organization is being carried out by the MoEW with the cooperation of the different stakeholders

GUIDELINES FOR MONITORING WATER QUALITY

Current problems	Proposed solutions
Libnor water quality standards OF 2016 have not been published	Equipping all laboratories with the necessary tools to be able to abide by the new standards
No monitoring plan	. Implementation of **Water Safety Plan** methodology including operational and compliance monitoring . The plan should be strictly implemented by all water establishments
Lack of resources, unaffordable costs	. Prioritization of parameters that should be tested regularly. Keeping the list relevant and short . Certain parameters should only be tested after an exogenous event.
Water treatment	Chlorination system should be functional for all resources, treatment plants where needed.
Unorganized or unavailable water quality data	Creation of Data Management system (Database) that is centralized in each water establishment, and is updated on a regular basis.

AXIS II

WASTEWATER REUSE AND SLUDGE MANAGEMENT

WASTEWATER REUSE AND SLUDGE MANAGEMENT

WASTEWATER REUSE

NATIONAL STANDARDS AND GUIDELINES

- **Wastewater Discharge**: Decision no.8/1, similar standards set by Decision 52/1 by MoE
- **Wastewater Reuse**: No regulations, guidelines and standards. Under development at Libnor based on FAO's guidelines developed in 2010
- **Wastewater Reuse purposes**: Irrigation, Industrial Use, Groundwater Recharge

SLUDGE REUSE

- **Master Plan for sludge recovery or disposal – CDR 2003**
- **Update of the Master Plan currently under development (MoE/CDR/Cabinet Merlin/WB)**

Sludge Reuse Alternative

- Stabilization and reuse by spreading in agricultural areas (stabilized sludge)
- Composting and reuse
- Co-composting or Anaerobic Digestion with domestic solid waste and reuse
- Drying, granulation and reuse

Sludge Non-Reuse Alternative

- Incineration
- Controlled disposal in domestic landfills

AXIS II

STRATEGIC ENVIRONMENTAL AND SOCIAL ASSESSMENT

ENVIRONMENTAL RECOMMENDATIONS

A Strategic Environmental Assessment (SEA) shall be developed for the draft National Water Sector Strategy (NWSS) update and submitted to the Ministry of Environment (MoE) for approval. The SEA report shall comply with the Decree 8213/2012

The SEA shall be used:

- As **a decision-making** tool for issuing the final NWSS update
- **Facilitate** the preparation of the Environmental Impact Assessments (**EIAs**) for specific components

SEA report shall include the following:

- **Assessment of baseline data** on the physical, hydrogeological, environmental, and socio-economic conditions of the project area
- **Identification** of environmentally significant areas in the project sites
- **Assessment** of the **best alternative(s) or option(s)** for the project in terms of socio-economic, health, financial, and environmental aspects
- **Identification of potential impacts** of the project and assessment of their significance,
- **Description of mitigation** measures to minimize impacts, and
- **Elaboration of an environmental management plan** including a monitoring program for the whole project.

AXIS III

PROPOSED INFRASTRUCTURE PROJECTS

DESIGN CRITERIA AND PRIORITIZATION

DESIGN CRITERIA FOR WATER & WASTEWATER

The NWSS 2010 has estimated the **growth factor at 1.75 %**, which, is a high figure.

For the time period **2020-2035:**
Growth Factors for all of Lebanon except SLWE :

- **In rural areas: 1.5%**
- **In urban areas: 0.75%**

For the districts under the jurisdiction of **SLWE,** ongoing studies (commissioned by SLWE), supported by field investigations and surveys, have shown a tendency for the population to "*return to their lands*", probably due to the stable socio-political conjecture.
Therefore, a flat **growth factor of 2%** was used, for a projection to 2050.

The strategic target for **2035** as follows :
Drinking water demand per capita in 2035 shall be:

• Domestic consumption:	125	l/cap/day
• Non-Domestic = 20 % of the domestic	25	l/cap/day
	150	l/cap/day
• Physical losses = 20 % of the total needs	50	l/cap/day
Total needs	**200**	**l/cap/day**

Wastewater flow per capita is calculated based on the following assumptions:

- Produced wastewater flow = 80 % of the needs (excluding physical losses) = 120 l/cap/day
- Infiltration = 10 %

NLWE

Distribution system	Water balance (m3/day) 2020	2025	2030	2035	Proposed works and Corresponding project (in Volume V A)
DISTRICT OF QOBAYATE					
Distribution system 6 and 7	-136	695	462	210	Present deficit will be covered by ongoing construction of new wells
Distribution system 8	-389	47	-60	-386	Proposed 1 new well - See Volume V-A project NL-W. H.7
Distribution system 9	-93	-194	-303	-420	Proposed 1 new well - See Volume V-A project NL-W. H.8
Distribution system 10	-2112	-2310	-2523	-2754	Proposed 3 new wells - See Volume V-A project NL-W. H.9
Distribution system 11	-843	-737	-1027	-1131	Proposed 2 new wells - See Volume V-A project NL-W. H.10
Distribution system 13	-336	-955	-1029	-1110	Proposed 1 new well - See Volume V-A project NL-W. H.11
Distribution system 17	-538	-614	-695	-783	Proposed 1 new well - See Volume V-A project NL-W. H.14
Distribution system 18	-265	-771	-831	-895	Proposed 1 new well - See Volume V-A project NL-W. H.15
Distribution system 19	41	-19	-85	-155	Proposed 1 new well - See Volume V-A project NL-W. H.16
Distribution system 20	-557	-870	-937	-1011	Proposed 1 new well - See Volume V-A project NL-W. H.17
Distribution system 21	-109	-225	-243	-262	Proposed 1 new well - See Volume V-A project NL-W. H.18
Distribution system 22	-1484	-1923	-2073	-2235	Proposed 3 new wells - See Volume V-A project NL-W. H.19
Distribution system 23, 24 and 12	-5672	-6410	-7044	-7727	Proposed 8 new wells - See Volume V-A project NL-W. H.20
DISTRICT OF HALBA					
Distribution system 1	-2840	-3263	-3719	-4210	Proposed 4 new wells - See Volume V-A project NL-W. B.1
Distribution system 2	-424	-644	-881	-1137	Proposed 1 new well - See Volume V-A project NL-W. B.2
Distribution system 3	-3555	1090	546	-40	Proposed 1 new well - See Volume V-A project NL-W. B.3
Distribution system 5 and 6A	-38	-4918	-5301	-5714	Proposed 6 new wells - See Volume V-A project NL-W. B.5
Distribution system 7A	1	-1086	-1507	-1961	Proposed 2 new wells - See Volume V-A project NL-W. B.6
Distribution system 7B	-23	-3261	-3609	-3984	Proposed 4 new wells - See Volume V-A project NL-W. B.7
Distribution system 9	-2620	-3161	-3744	-4372	Proposed 5 new wells - See Volume V-A project NL-W. B.8
Distribution system 10	-1927	-2615	-3357	-4157	Proposed 4 new wells - See Volume V-A project NL-W. B.9
Distribution system 11	0	-131	-276	-432	Proposed 1 new well - See Volume V-A project NL-W. B.10
Distribution system 12	-3	-2988	-3241	-3514	Proposed 4 new wells - See Volume V-A project NL-W. B.11
Distribution system 14A	-1053	918	787	647	Proposed 1 new well - See Volume V-A project NL-W. B.12
Distribution system 14B	-4839	-5882	-6467	-7098	Proposed 7 new wells - See Volume V-A project NL-W. B.13
Distribution system 14C	-2169	-1744	-2364	-3032	Proposed 3 new wells - See Volume V-A project NL-W. B.14
Distribution system 14D	-5581	-6169	-6802	-7485	Proposed 7 new wells - See Volume V-A project NL-W. B.15
DISTRICT OF ED DANNIYEH					
Distribution system 12	-90	-100	-111	-123	Proposed 1 new well - See Volume V-A project NL-W. E.9
Distribution system 13	-112	-123	-136	-150	Proposed 1 new well - See Volume V-A project NL-W. E.10
Distribution system 16	-1373	-1499	-1636	-1783	Proposed 2 new wells - See Volume V-A project NL-W. E.13

NLWE

Distribution system	Water balance (m3/day) 2020	2025	2030	2035	Proposed works and Corresponding project (in Volume V A)
DISTRICT OF MINIEH					
	-	-	-	-	
	1619	1787	1969	2165	
Distribution system 1a	1	9	7	8	Proposed 10 new wells - See Volume V-A project NL-W. D.1
Distribution system 2a	4	-97	-206	-324	Proposed 1 new well - See Volume V-A project NL-W. D.2
Distribution system 3a	298	-73	-473	-904	Proposed 1 new well - See Volume V-A project NL-W. D.3
Distribution system 6a	331	83	-1943	-474	Proposed 1 new well - See Volume V-A project NL-W. D.6
DISTRICT OF KOURA					
Distribution system 3	-320	-681	-1071	-1491	Proposed 2 new wells - See Volume V-A project NL-W. C.2
DISTRICT OF ZGHARTA					
Distribution system 1	-116	-142	-170	-200	Proposed 1 new well - See Volume V-A project NL-W. F.1
Distribution system 2	67	-14	-101	-195	Proposed 1 new well - See Volume V-A project NL-W. F.2
Distribution system 3	-111	-142	-175	-211	Proposed 1 new well - See Volume V-A project NL-W. F.3
Distribution system 4	-3	-11	-19	-29	
Distribution system 5	-222	-257	-295	-336	Proposed 1 new well - See Volume V-A project NL-W. F.4
Distribution system 6	-72	-106	-142	-181	Proposed 1 new well - See Volume V-A project NL-W. F.5
Distribution system 11	-961	-1194	-1446	-1718	Proposed 2 new wells - See Volume V-A project NL-W. F.10
Distribution system 12	-130	-230	-338	-455	Proposed 1 new well - See Volume V-A project NL-W. F.11
Distribution system 13	26	-136	-310	-498	Proposed 1 new well - See Volume V-A project NL-W. F.12
Distribution system 18	131	24	-91	-215	Proposed 1 new well - See Volume V-A project NL-W. F.17
Distribution system 20	97	58	15	-30	
Distribution system 21	212	141	64	-19	

CRITERIA USED FOR PRIORITIZATION OF PROPOSED PROJECTS

- The strategy reviewed all the water, wastewater and irrigation needs across Lebanon.
- It reviewed existing operational systems and identified gaps that should be filled to cover the needs of all the citizens across the territory.
- These gaps were then translated into projects in all three sectors, and these projects prioritized by order of urgency and impact.
- Three levels of priority were used over the period of the strategy extending between 2020 and 2035; priority 1 being from 2020 to 2025; priority 2 from 2026 to 2030; and priority 3 from 2031 to 2035.

PRIORITIZATION OF WATER PROJECTS

PRIORITY 1:

- Development and expansion of water resources to cover potable water needs, i.e. in **water systems having a negative water balance in 2020**
- Providing adequate water storage capacities in villages that currently have **very small reservoirs compared to the required storage** or in those that have very old reservoirs
- Providing adequate main transmission lines by **increasing the capacity of existing** ones or replacing very old ones
- Construction of distribution networks, mainly in villages that currently **don't have a distribution network** or in those that have very old one (i.e. > 30 years old)
- Monitoring main transmission and distribution lines through the installation of district water meters to better control and isolate leakages

PRIORITIES 2 and 3:

- Extension of existing distribution networks
- Expansion of existing water storage capacities
- Development and expansion of water resources to address future negative water balances, along with the construction of any related works (i.e. transmission lines, pumping stations and reservoirs)

PRIORITIZATION OF WASTEWATER PROJECTS

PRIORITY 1:

- Implementation of new WWTPs and sewer networks in **densely populated** areas
- Expansion and upgrade of major existing WWTPs if their treatment capacity isn't enough to treat the influent wastewater (in 2020)

PRIORITY 2:

- Implementation of new WWTPs and sewer networks in **less densely populated** areas
- Expansion and upgrade of existing WWTPs if their treatment capacity isn't enough to treat the influent wastewater flows in the near future

PRIORITY 3:

- Implementation of small wastewater treatment units in isolated villages/areas

PRIORITIZATION OF IRRIGATION PROJECTS

PRIORITY 1:

- Rehabilitation of **existing concrete** irrigation channels
- Construction of **new channels or pipes** for irrigation

PRIORITY 2:

- Increase the availability of water resources and construct all related works (i.e. irrigation transmission and distribution lines and small storage structures

PRIORITY 3:

- Construction of new networks and development of new resources (including dams) for potential future expansions

PRIORITIZATION OF DAMS PROJECTS

- The main objective of the proposed dams is to secure new water resources to cover future potable water and/or irrigation needs in areas requiring large amounts of water, or in areas with no other potential water resources. Priorities depend on the time identified by the water balances at which the need arises.
- It should be noted that some of the dams identified in the 2011 strategy were dropped due to the following:
  - Different criteria used to calculate water demand
  - Following feasibility or design studies conducted on some dams, it was found that they are technically or financially not feasible
  - Local municipalities expanded their construction onto the sites selected for dam construction
- Surface storage is still a strategic priority for resource exploitation within the updated National Water Sector Strategy of 2020.
- Construction of storage facilities are encouraged to be the first resort to compensate for water supply needs, as long as they are financially, technically and environmentally feasible.
- Exploiting groundwater resources is kept for areas where surface storage is not possible or insufficient to cover the growing needs; but most importantly, groundwater resources should be regarded as strategic reserve to the next generations that will witness harsher effects of climate change and reduced surface runoffs.

COST ESTIMATES

1- WATER SECTOR GOVERNANCE

2- PROPOSED INFRASTRUCTURE PROJECTS
& CLIMATE CHANGE STUDIES

1- COST ESTIMATE OF WATER GOVERNANCE PRIORITY ACTION PLAN

Priority	Project code	Description	Estimated cost (USD)
Water Governance Priority Action Plan			
1	II-E. A	Legal & Institutional	1,500,000
1	II-E. B	Financial & Commercial	6,800,000
1	II-E. C	Reporting & Monitoring	1,300,000
1	II-E. D	Capacity building	4,000,000
1	II-E. E	O&M of facilities and services	700,000
		Total	**14,300,000**

2- COST ESTIMATE OF INFRASTRUCTURE PROJECTS BY SECTOR

	Water	Wastewater	irrigation	Dams	Hill lakes	Total
Priority 1 projects						
NLWE	338.55	242.39	29.12	196.02	33.37	839.44
BWE	96.03	214.31	25.44	52.00	-	387.78
SLWE	408.02	380.50	86.55	-	-	875.07
BMLWE	420.77	569.58	1.02	65.00	-	1,056.37
Aquifer Artificial Recharge **(*)**						3.65
Meteorological and Hydrometric networks **(*)**						11.83
General Studies and Investigations **(**)**						35.78
Total	1,263.37	1,406.78	142.13	313.02	33.37	**3,209.92**
Priority 2 projects						
NLWE	-	250.03	-	50.00	110.72	410.75
BWE	50.28	268.08	-	150.00	55.20	523.55
SLWE	16.10	89.39	296.68	145.00	119.70	666.87
BMLWE	122.58	205.40	1.15	200.00	33.50	562.63
Aquifer Artificial Recharge **(*)**						11.60
Meteorological and Hydrometric networks **(*)**						-
General Studies and Investigations **(**)**						2.50
Total	188.96	812.89	297.83	545.00		**2,177.90**

2- COST ESTIMATE OF INFRASTRUCTURE PROJECTS BY SECTOR

	Water	Wastewater	irrigation	Dams	Hill lakes	Total
Priority 3 projects						
NLWE	-	-	47.27	243.00	22.90	313.17
BWE	1.55	47.50	4.52	107.06	-	160.63
SLWE	-	79.65	411.90	608.00	-	1,099.55
BMLWE	22.95	105.30	5.22	53.00	-	186.47
Aquifer Artificial Recharge **(*)**						16.50
Meteorological and Hydrometric networks **(*)**						-
General Studies and Investigations **(**)**						11.15
Total	24.49	232.45	468.91	1,011.06		**1,787.46**
Total Projects	1,476.82	2,452.12	908.87	1,869.08		7,175.28
15% Contingencies	221.52	367.82	136.33	280.36		1,076.29
Projects Grand Total	**1,698.34**	**2,819.94**	**1,045.20**	**2,149.44**		**8,251.58**

*** Including studies and implementation**

**** Including General geological studies + PMU and Governance**

DECISIONS TO BE MADE BY THE COUNCIL OF MINISTERS

- Approve that organizational charts/decrees of the Water Establishments be modified and made general to leave with some flexibility for filling their gaps in staffing the way they find appropriate
- Emphasize on the importance of and Speed up the ratification of the updated version of the Water Code by the Parliament
- Appeal for funding from the international community to the water sector, to complete ongoing projects, upgrade existing infrastructure to operate at their full capacity, and provide capacity building and technical assistance programs.
- Approve some type of recruitment within the WE's. Ideally, recruitment through the Council of Civil Service for permanent employees, or else recruitment of temporary staff through Ghob Talab projects or through individual contracts financed by the WE, with the aim of making them permanent when the situation allows or the policy of no recruitment changes.
- Nominate a committee composed of a Water Resources Expert, a Groundwater Resources Expert, Legal and Institutional Expert, Environmental Expert, Irrigation Expert and a Dam Expert, headed by the Minister of Energy and Water to follow up the implementation of the Strategy recommendations.
- Encourage people who are illegally connected, or refuse to subscribe or to pay, to become legal and allow the WE’s along with MoEW and MoIM and security forces to enforce the law as deemed appropriate.
- Approve the addition of a flat Wastewater tariff of no less than 100,000 LBP to allow WE’s to cover O&M of Wastewater systems at least partially, until the tariff restructuring study is done through the AFD Technical Assistance project.

THANK YOU