

DESCRIPTION OF THE UPDATED NWSS-MOEW (2020)

The Updated National Water Sector Strategy (NWSS)-Ministry of Energy and Water (MoEW) (2020) serves as an update of Lebanon's National Water and Wastewater Sector strategies of 2012. It plans the water sector for 15 years (2020-2035). It is comprised of six volumes, as detailed below.

- Volume I: Executive Summary** – outlines the strategy objectives and projects and provides a summary of all volumes.
- Volume II: Water Sector Governance** – discusses the current legal and institutional framework, RWEs human resources, water tariff analysis, and governance recommendations.
- Volume III: Water Resources Management** – covers the available water resources, surface water and groundwater resources management, wastewater and sludge management, and the Strategic Environmental and Social Assessment (SESA) of the NWSS.
- Volume IV: Water Sector Current Situation** – provides information on water resources and wastewater facilities, water demand, and water balances.
- Volume V: Proposed Projects** – lists the cost estimates and assigns priority levels (based on deadline for implementation) of all proposed projects, studies, and investigations.
- Volume VI: Drawings** – maps the strategy's proposed projects in each district under the jurisdiction of all four water establishments, namely North Lebanon, Beirut and Mount Lebanon, South Lebanon, and Beqaa.

Vision, Objectives, and Pillars of the Updated NWSS-MoEW (2020)

The strategy aims to ensure equitable access to water and sanitation services for all. It entails a wide range of legal, institutional, technical, and financial recommendations and actions, in addition to proposed projects across the Lebanese territory, divided geographically under each Regional Water Establishment (RWE) jurisdiction (i.e., EBML, NLWE, SLWE, and BWE). Given its geographical scope, the strategy's impacts will be both national (impacts on Lebanon's various economic sectors – primarily the agricultural, industrial, and tourism sectors, the healthcare system, and social groups) and transnational (impacts on shared water bodies, marine environment, and climate change).

Figure 1 illustrates the strategy's vision, pillars, and overall objective, which are further detailed in the sub-sections that follow.



Figure 1. Updated NWSS-MoEW (2020) Vision, Pillars, and Objective

Strategy's Objectives

The Ministry aims at achieving a financially sustainable sector, that is citizen-centered and service oriented, and which would ultimately allow to reach the Integrated Water Resources Management (IWRM) approach of the sector, as per Law 192/2020.

It is built on the following three specific objectives:

1. Build an operational and sustainable legal and institutional framework.
2. Develop financing tools for the sector to set-up financial mechanisms in aims of ensuring the sustainability of services.
3. Establish sustainable and effective mechanisms for collaboration between all actors and stakeholders in the water sector to improve monitoring and transparency

The strategy is divided into six components for which specific objectives are set, as displayed in Table 1.

Table 1. Updated NWSS-MoEW (2020) Components and Related Specific Objectives

Strategy Component	Specific Objectives
Sector Governance	A.1 Implement the legal and regulatory framework reform (Water Code).
	A.2 Rationalize the tutelage framework with a view for clear dispatching between operational and regulatory activities.
	A.3 Develop proper mechanisms for performance monitoring.
Financial and Commercial	B.1 Conduct a customer and user census.
	B.2 Implement consumption-based tariffs for the water service.
	B.3 Revise the tariff structure for sanitation services.
	B.4 Revise the tariff structure for irrigation.
Reporting and Monitoring	C.1 Enhance sector monitoring.
	C.2 Enhance sector transparency.
	C.3 Enhance sector coordination.
	C.4 Enhance communication with users.
Capacity-Building	D.1 Strengthen the MoEW monitoring capacities.
	D.2 Streamline and structure RWEs internal organization and management.
O&M of Facilities and Services	E.1 Improve operating cost control.
	E.2 Enhance private sector involvement.
	E.3 Adopt a shared wastewater management framework.
Service Coverage	F.1 Enhance water service coverage.
	F.2 Enhance wastewater service coverage.
	F.3 Structure for irrigation service.

Strategy's Pillars

To achieve the aforementioned objectives, the Updated NWSS-MoEW (2020) is based on the following three pillars:

Pillar 1: Implementing Reforms and Improving Sector Governance

In this pillar, the aim is to build solid legal, institutional, financial, commercial, and monitoring frameworks to achieve sustainable water sector management. It also targets the enhancement of communication mechanisms and increased transparency with stakeholders, as well as a shift in the data sharing culture.

Pillar 2: Achieving Integrated Water Resources Management

This pillar aims to improve infrastructure planning and water allocation among economic sectors. It targets the continuous measurement and monitoring of the quantity and quality of available groundwater and surface water resources across the country and addresses environmental concerns, including wastewater reuse, sludge management and the SESA of the strategy.

Pillar 3: Improving Service Coverage

In this pillar, the strategy proposes infrastructure projects in the water, wastewater, and irrigation sectors. The proposed projects are prioritized based on criteria which considers water needs, the respective water balances of all systems, the importance of shifting from groundwater resources to surface water resources, and the urgency of storing surface water to mitigate the effects of climate change in Lebanon.

Water Sector Challenges Identified Under Each of the Strategy's Pillars

The challenges identified by the strategy under each pillar are summarized in Table 2.

Table 2. Identified Water Sector Challenges in the Strategy

Strategy Pillars	Challenges
Implementing Reforms and Improving Sector Governance	<ul style="list-style-type: none">• MoEW and RWEs lack qualified staff and are generally understaffed, not in accordance with organizational charts.• Inefficient and ineffective RWE contracting framework for private sector involvement.• Current water sector tutelage framework is highly administrative and does not focus on monitoring performance.• Current water sector data is incomplete, full of discrepancies, and does not enable systematic monitoring.• Lack of sector communication, coordination, and transparency with users and between institutions.• Lack of transparency of RWE financial statements.• Inaccurate gauge system: flat rate billing system does not identify water overconsumption.• Insufficient and ineffective water meters management.• Tariff level discrepancies among RWEs.• The RWE's customer databases for drinking water services are not comprehensive.• RWEs' user databases for wastewater management services have not been developed yet.• High operating cost control of facilities and services (mainly due to energy bill).• Fragmented wastewater management framework.

Strategy Pillars	Challenges
Managing Water Quantity and Quality	<ul style="list-style-type: none"> • Reduced volumes of water stored in aquifers due to climate change. • Damaged or insufficient meteorological and hydrometric stations. • Mismanagement and decentralization of groundwater and surface water data and studies. • Insufficient staff to cover all the duties of the geology and underground water services in the MoEW. • Absence of monitoring systems for groundwater quantity and surface water. • Uncontrolled number of private wells and extraction of groundwater. • Overexploitation of groundwater resulting in seawater intrusion in the coastal aquifers. • LIBNOR 161:2016, related to drinking water standards, has not been published yet. • No water quality monitoring plan implemented by RWEs. • Insufficient RWEs resources and equipment for water sample processing. • Unorganized/unavailable water quality data. • Lack of regulations, guidelines, and standards for the reuse of treated wastewater in Lebanon.
Improving Service Coverage	<ul style="list-style-type: none"> • Presence of negative water balances for potable water distribution schemes due to water deficits. • Water shortages of irrigation schemes. • Aged and partly damaged irrigation infrastructure. • Inadequate transmission, storage, and distribution of potable water. • Absence of/ insufficient Wastewater Treatment Plants (WWTPs) and sewer networks.

Proposed Initiatives and Recommendations of the Strategy

All strategy initiatives, recommendations, and corresponding cost estimates to address the aforementioned challenges are summarized in the sub-sections that follow. It is worth mentioning that the total cost of all strategy initiatives (with 15% contingencies) is USD 8,245.32 million. We provide a breakdown below by pillar.

The proposed initiatives are assigned a priority level based on order of urgency according to the following general criteria:

- Priority 1:** Urgent projects to be implemented as soon as possible.
- Priority 2:** Projects that are required but could be delayed if present implementation is not possible.
- Priority 3:** Projects that would be required in the future, based on the foreseen evolution of the present status of the water sector.

Implementing Reforms and Improving Sector Governance

Table 3 summarizes the initiatives and associated cost estimates pertaining to Pillar 1 of the strategy. The Updated NWSS-MoEW (2020) classifies all Pillar 1 initiatives as Priority 1 projects with a total estimated cost of USD 13,082,500.

Table 3. Updated NWSS-MoEW (2020) Pillar 1 Initiatives, including Associated Timelines and Cost Estimates

Strategy Component	Initiatives	Cost Estimate (USD)
Legal and Institutional Framework	<ul style="list-style-type: none"> • Implementation of the Water Code by preparing and issuing of the implementation decrees, including prevention of water deficit, composition, organization of the National Water Council, reuse of treated wastewater, etc. (2020 – 2025) • Review and implementation of the RWE organizational and operating decrees. (2020-2025) • Restructuring the Ministry’s supervisory functions. (2020) - <i>delayed*</i> • Set up a unit within the MoEW to coordinate and supervise the implementation of the Strategy. (2020-2025) • Set up a unit in charge of performance monitoring within the MoEW. (2020-2025) • Standardize the structure of reports and audits. (2020-2025) • Develop a framework for performance monitoring within each RWE. (2020-2025) 	1,465,000
Financial and Commercial	<ul style="list-style-type: none"> • Conduct a customer census campaign and investigation: identify users of wastewater services and identify those who are already RWE subscribers. (2020-2022) • Implement consumption-based tariffs for water services. (2020-2022) • RWEs to set financial plans for users. • Revise tariff structure for sanitation services. (2020-2021) • Introduce a wastewater fee proportional to the water consumed. • Conduct an assessment of all existing WWTPs and estimate the cost of rehabilitation/upgrading. 	6,750,000
Reporting and Monitoring	<ul style="list-style-type: none"> • Create a monitoring department within the MoEW. (2020) • Establish a unified database for sector monitoring data. (2020-2022) • Assess RWEs’ monitoring capacities. • Set up an annual sector review every mid-year. (2020)-<i>delayed*</i> • Set up a process for monitoring the strategy implementation status. (2020-2025) • Regular reporting and publishing of reports online; defining the main indicators and messages to be communicated to the public. (<i>Starting from 2021</i>) • Design and launch a national communication campaign on the water sector. (2020-2021) 	1,257,500

Strategy Component	Initiatives	Cost Estimate (USD)
Capacity Building	<ul style="list-style-type: none"> • Appoint specific Technical Assistance (TA) to the MoEW for development of monitoring mechanisms. (2020) • Hire staff specialized in managing performance-based contracts at RWEs. • Conduct an overall internal audit in each RWE. (2020-2021) • Prepare a handbook of jobs in the RWEs with minimum skills required per position (2020-2022) • Prepare and implement training/capacity building plan. (2020-2025) 	2,950,000
Operation and Maintenance of Facilities	<ul style="list-style-type: none"> • Develop a strategy to control the energy costs of the facilities. (2020-2021) • Review existing contracts with private operators and develop a new contracting framework and performance-based contracts; pilot contract for wastewater facilities management by 2021; complete adoption of contracts by 2035. • Conduct study to propose an overall framework for wastewater facilities management. (2020-2021) 	660,000
		13,082,500

**Based on personal communication with MoEW on 17/02/2022*

Achieving Integrated Water Resources Management

Table 4 summarizes all initiatives and associated cost estimates pertaining to Pillar 2 of the strategy. Pillar 2 initiatives have a total estimated cost of **USD 83,819,000**. It is worth noting that the cost of Priority 1 initiatives (i.e., urgent projects to be implemented as soon as possible) under Pillar 2 represent 50% of the total estimated cost of initiatives under this pillar.

Table 4. Updated NWSS-MoEW (2020) Pillar 2 Initiatives including Associated Timelines and Cost Estimates

Strategy Component	Initiatives	Priority Level	Cost Estimate (USD)
Integrated Hydrological Information System (IHIS) ¹	<ul style="list-style-type: none"> Studies for IHIS implementation, including: Flood-risk and drought management plans, and a rainwater harvesting plan. (2021-2029) IHIS Implementation, operation, and supervision. (2023-2029) Water Evaluation and Planning System (WEAP) operation and implementation. (2023) 	1	9,548,000
Meteorological and Hydrometric Networks	<ul style="list-style-type: none"> Network expansion: Installation of 113 additional meteorological stations and 135 additional hydrometric stations under Lebanese Meteorological System (LMS), LRA, Lebanese Agricultural Research Institute (LARI) and MoEW to reach density of 50 stations/km. (2021-2025) 	1	6,066,000
Project Management Unit (PMU)	<ul style="list-style-type: none"> Implementation of a PMU for a five-year period. (2021) Review well licensing procedures of the MoEW. (2021-2022) Staff recruitment in the MoEW, specialized in the fields of geology, hydrogeology, and water resources. (2021) Review of all existing data in the MoEW data center and data collection. (2021-2035) Monitor the flows and water quality of springs and most public operating wells with the assistance of RWEs. (2021-2035) 	1	8,505,000
General Geological and Hydrological Studies	<ul style="list-style-type: none"> Geology and hydrogeology mapping and studies. (2022-2027) 	1	21,800,000
	<ul style="list-style-type: none"> Refreshment of water budget studies of major hydrogeological basins. (2024-2035) Groundwater vulnerability mapping and delineation of protection zones for springs. (2025-2029) Modeling of major karst aquifers' hydrogeological basins, and porous, saline aquifer systems. (2027-2035) 	3	
Drilling and Testing Exploratory Wells	<ul style="list-style-type: none"> Drilling and testing 14 reconnaissance and exploratory wells at identified areas to detect the presence of new potential aquifers. (2022) 	1, 2 & 3	6,150,000

¹ A hydrological information system for all public and private water sector stakeholders to manage, publish and share their data, products, and services.

Strategy Component	Initiatives	Priority Level	Cost Estimate (USD)
	<ul style="list-style-type: none"> Drilling and testing exploratory wells in the following areas: Hadath-Hazmieh and Daichouniye (Priority 1), Akkar Plain (Priority 2), Zahrani and Damour (Priority 3) 		
Artificial Aquifer Recharge	<ul style="list-style-type: none"> Artificial Aquifer Recharge studies in the respective areas of jurisdiction of all four RWEs. Artificial recharge at six identified sites; Berdaouni site to be completed by 2025, remaining sites to be completed by 2035. 	1, 2 & 3	31,750,000
			83,819,000

Additional water resources management recommendations which address challenges pertaining to water quality management, wastewater and sludge management, and the SESA are summarized in Table 5. These recommendations have no associated cost estimates and are not assigned a priority level.

Table 5. Updated NWSS-MoEW (2020) Pillar 2 Recommendations

Strategy Component	Initiatives
Water Quality Management and Monitoring	<ul style="list-style-type: none"> Compliance monitoring; trained staff, facilities, equipment, and materials, and operating protocols at Water Establishments (WEs) for implementation. Recommended water quality sampling locations. Suggested operational monitoring parameters for both surface water and groundwater. Suggested water quality monitoring parameters for both surface water and groundwater, together with their respective sampling frequencies. Publishing of 161:2016 LIBNOR water quality standards. Implementation of Water Safety Plan by all WEs. Creation of a Water Quality Data Database.
Wastewater and Sludge Management	<ul style="list-style-type: none"> Investigate and analyze the existing potential for sludge reuse. Wastewater discharge, wastewater re-use, and sludge re-use recommendations for environmental protection. Promote regional co-operation in sludge management. Performance monitoring parameters and sampling frequency for Treated Wastewater Effluents (TWEs) discharged into the surface water in Lebanon. Performance monitoring parameters and sampling frequency for TWE reused for irrigation. Proposed minimum sludge analysis frequencies based on Lebanese guidelines on sewage sludge use in agriculture prepared by the Food and Agriculture Organization of the United Nations (FAO) in 2010.
SESA	<ul style="list-style-type: none"> Development of a SESA in compliance with Decree 8213/2012.

Improving Service Coverage

Table 6 summarizes initiatives and associated cost estimates pertaining to Pillar 3 of the strategy. Each individual project is assigned a Priority level in the strategy. Pillar 3 initiatives have a total estimated cost of **USD 7,072.865 million**; the cost of Priority 1 initiatives under Pillar 3 represent 46% of the total estimated cost of initiatives under this pillar.

The proposed initiatives under Pillar 3 were not pegged to a timeline in the Updated NWSS-MoEW (2020).

Table 6. Updated NWSS-MoEW (2020) Pillar 3 Projects including Associated Timelines and Cost Estimates

Strategy Component	Initiatives	Cost Estimate (Million USD)
Potable Water	<ul style="list-style-type: none"> • Upgrade and/or rehabilitation of water distribution systems across the respective areas of jurisdiction of all four RWEs to meet 2035 water demands: <ul style="list-style-type: none"> - Construction of 1,894 km of transmission Lines (<i>Priority 1</i>) - Construction of 559 reservoirs (<i>Priority 1</i>) - Construction of 50 pumping stations (<i>Priority 1</i>) - Drilling of 192 wells (<i>Priority 1</i>) - Construction of 6,880 km of distribution networks (<i>Priority 2</i>) • Implementation of remote control and monitoring (Supervisory Control and Data Acquisition (SCADA) and District Metered Areas (DMA)) for all systems. 	1,574.33
Wastewater	<ul style="list-style-type: none"> • Construction of 182 WWTPs with a total design capacity of 1,196,875 m³/day of wastewater across the respective areas of jurisdiction of all four RWEs. • Rehabilitation, replacement, and upgrade of sewers, including the construction of around 9,416 km of sewer lines across the respective areas of jurisdiction of all four RWEs. 	2,204.110
Irrigation	<ul style="list-style-type: none"> • Rehabilitation and/or upgrade of irrigation schemes across the respective areas of jurisdiction of all four RWEs. • Irrigation of additional ~38,000 ha at country level to reach 138,000ha irrigated areas by 2035: <ul style="list-style-type: none"> - 4,930 ha under NLWE jurisdiction - 540 ha under BMLWE jurisdiction - 8,800 under BWE jurisdiction - 23,585 under SLWE jurisdiction 	1,142.975
Dams and Hill Lakes	<ul style="list-style-type: none"> • 14 dams with around 504.1 and 683 MCM of static and dynamic water storage respectively, at identified sites with related transmission lines and reservoirs (Table 7). • Construction of hill lakes across the respective areas of jurisdiction of all four RWEs. 	2,151.450
		7,072.865

Proposed dams in the Updated NWSS-MoEW (2020) are listed in Table 7.

Table 7. List of Selected Dams in Updated NWSS-MoEW (2020)

Governorate	Dam Name	Static Capacity (MCM)	Dynamic Capacity (MCM/year)	Usage	Nature of Works	Cost Estimate (Million USD)
Priority 1						
Akkar	El Bared Dam	37	90	Water Supply	Dam, Water Treatment Plant (WTP), Transmission Lines and Reservoirs	196
Beqaa	Assi Phase I Dam*	-	63	Irrigation	-	52
Mount Lebanon	Ain Dara/ Azzounieh Dam	4.1	5	Water Supply	Dam, WTP and Transmission Lines	65
South Lebanon	Bisri Dam*	120	125	Water Supply	Dam	To be confirmed
Priority 2						
North Lebanon	Dar Baachtar Dam	7	7	Water Supply/ Irrigation	Dam and Major Transmission Lines	50
South Lebanon	Ibl El Saqi Dam	50	50	Water Supply/ Irrigation	Dam, Transmission Lines and Reservoirs	145
South Lebanon	Choumariye Dam	28	28	Water Supply/ Irrigation	Dam, Reservoirs, WTP and Transmission Lines	128
Mount Lebanon	Damour Dam	42	106	Water Supply/ Irrigation	Dam, WTP, Transmission Lines and Reservoirs	200
Beqaa	Assi Phase II Dam	37	15	Irrigation	Dam, Power Generation and Lift Lines	150
Priority 3						
Akkar	Noura El Tahta Dam	35	50	Water Supply/ Irrigation	Dam and WTP	150
Beqaa	Younine Dam	5.8	5.8	Irrigation	Dam and Major Irrigation Lines	69.96
Beqaa	Massa Dam	8	8	Irrigation	Dam and Major Irrigation Lines	37.1
South Lebanon	Khardali Dam	128	128	Water Supply/ Irrigation	Dam, Reservoirs, WTP and Transmission Lines	480
Mount Lebanon	Maaser El Chouf	2.2	2.2	Water Supply	Dam and WTP	53
TOTAL						1,776.06

*Assi Phase I and Bisri Dams are already under construction but are listed under Priority 1