National Water Sector Strategy

"A right for every citizen, a resource for the whole country"

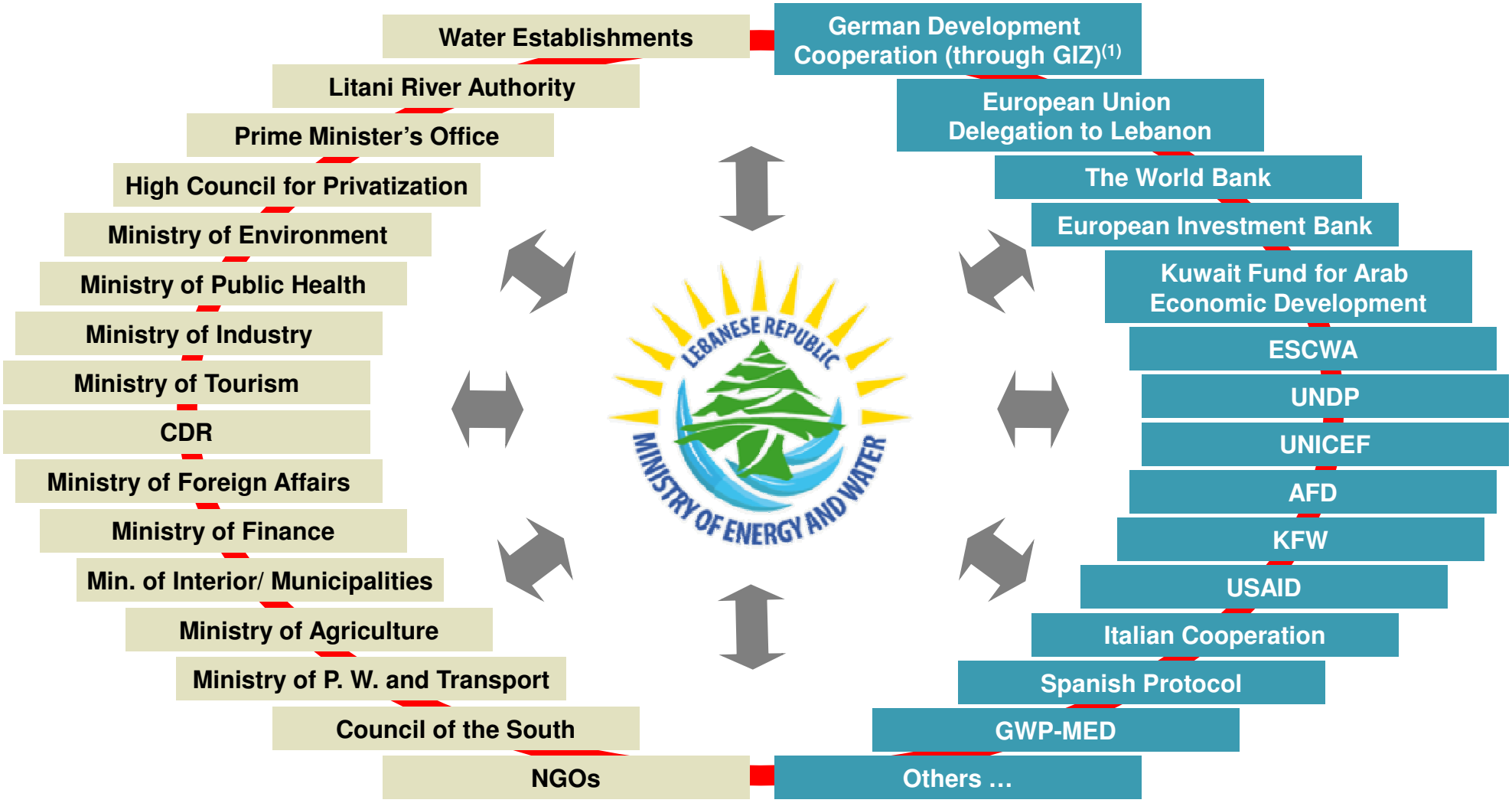




LEBANESE REPUBLIC
MINISTRY OF ENERGY AND WATER

Eng. Gebran Bassil
Ministry of Energy and Water (Date 27/12/2010)
Lebanese Government (Resolution No. 2, Date 09/03/2012)

The NWSS has been developed by the Ministry of Energy and Water, with the participation of national stakeholders and international donors



Note: (1) through giz played a key role in supporting the NWSS and its launching event.

Baseline

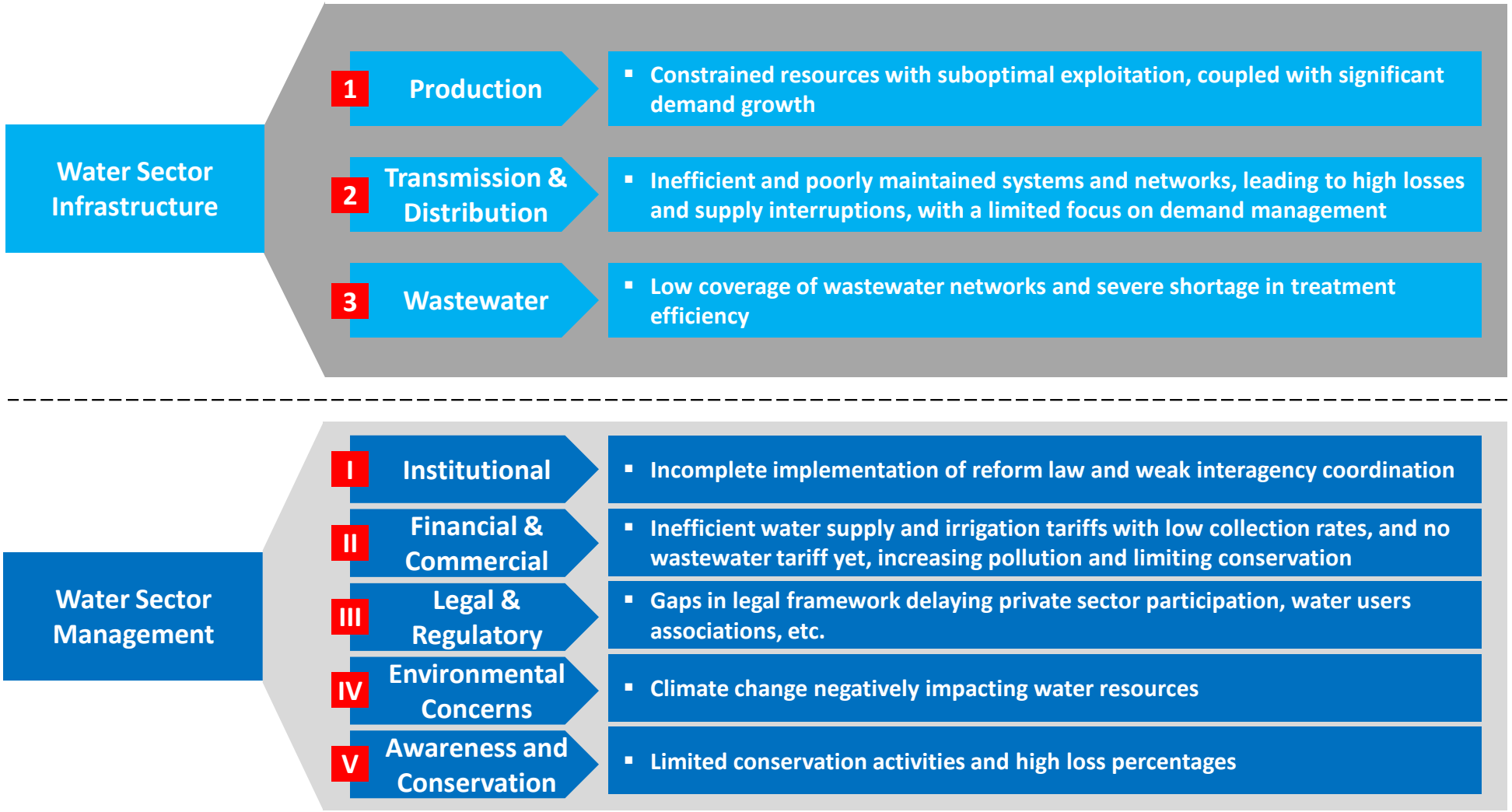
Demand/Supply Forecasts

Sector Enabling Environment

Investment Plan

Strategic Roadmap

The Lebanese water sector is facing shortcomings both on the infrastructure and management fronts



Baseline

Water Sector Infrastructure

Water Sector Management

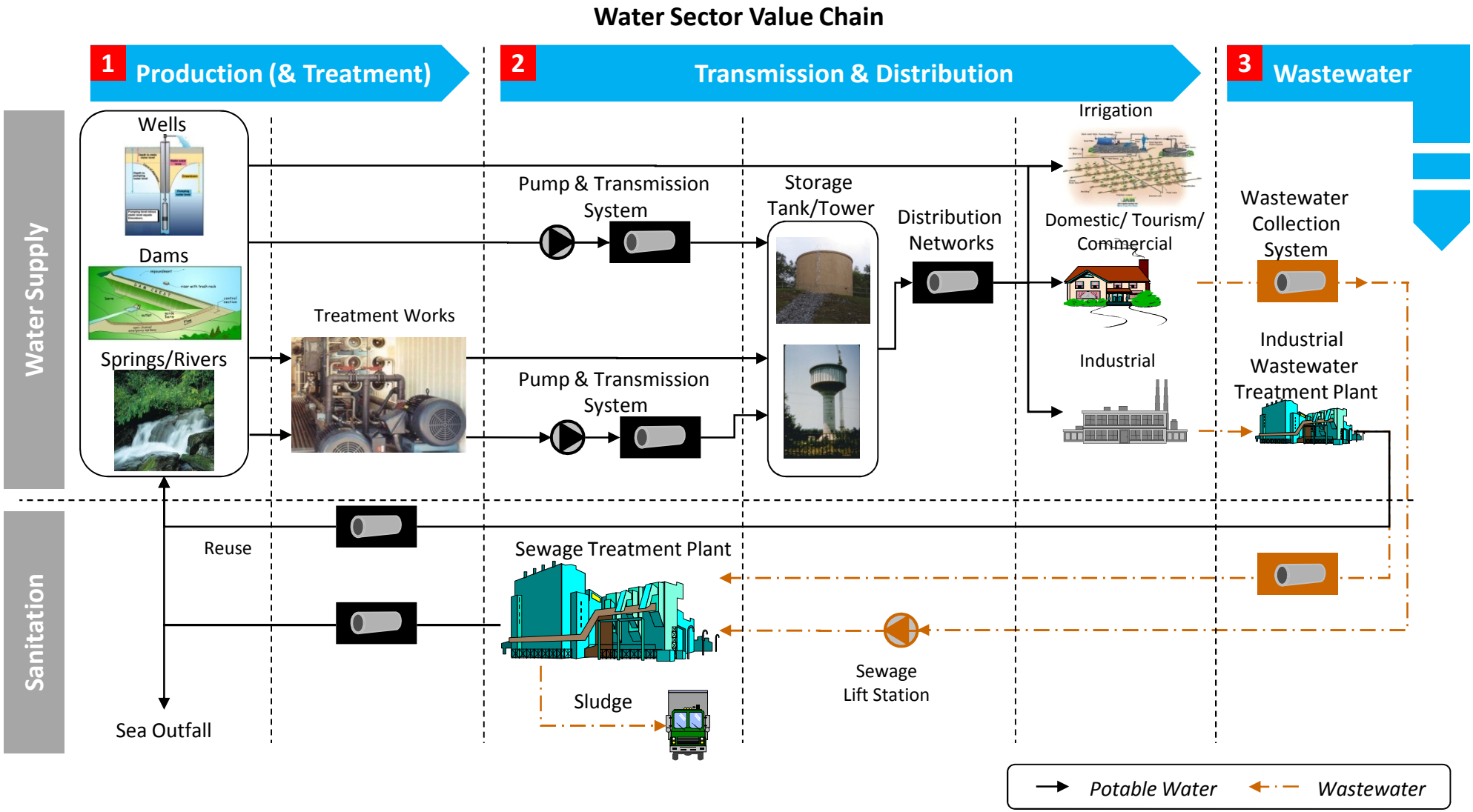
Demand/Supply Forecasts

Sector Enabling Environment

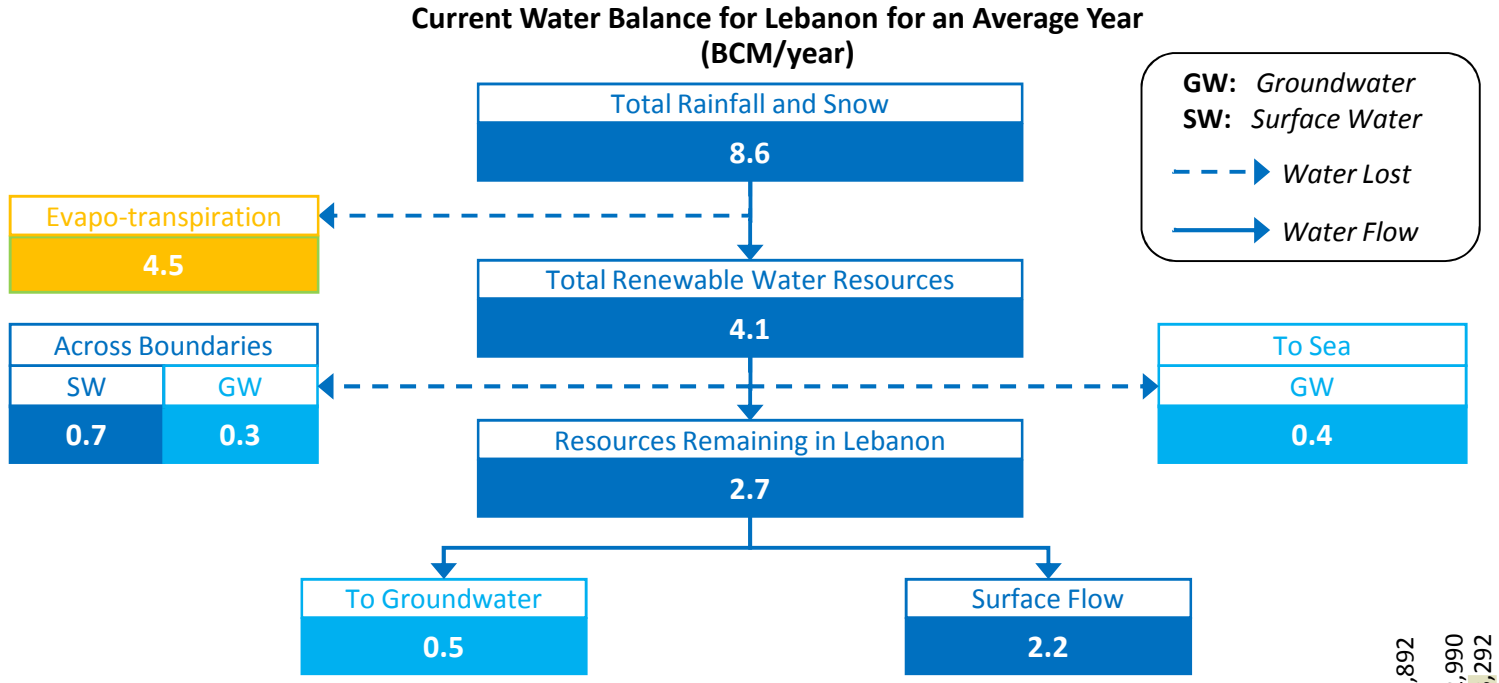
Investment Plan

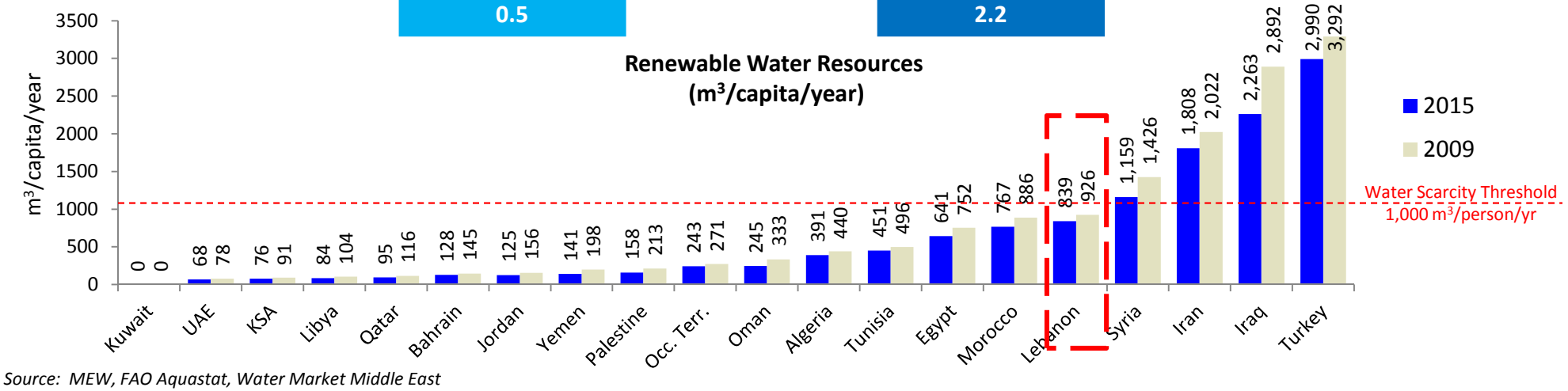
Strategic Roadmap

Several steps constitute the water sector value chain



1 Renewable water resources per capita are already slightly below scarcity threshold, with expected decrease in the coming years

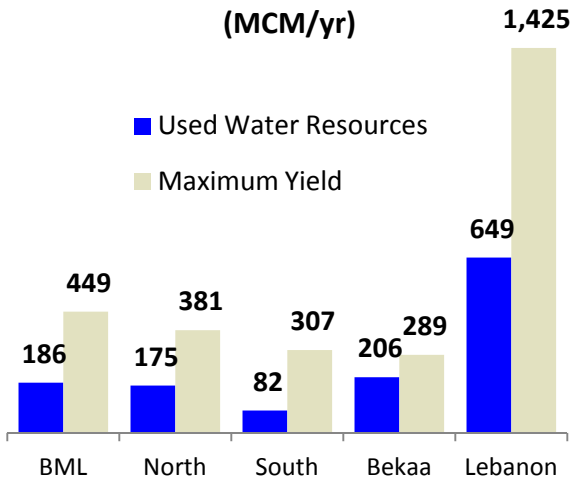




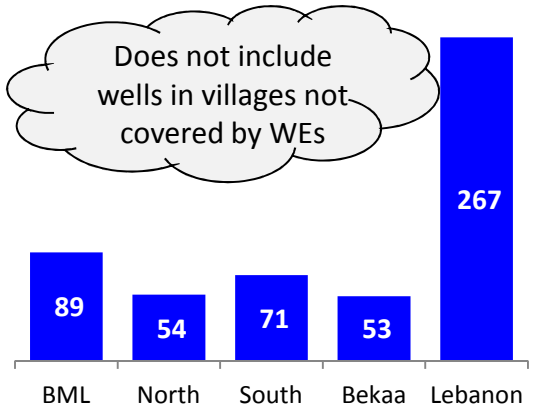
Source: MEW, FAO Aquastat, Water Market Middle East

1 Surface water resources are largely exploited but with limited storage, while significant stress is put on groundwater mainly through private wells

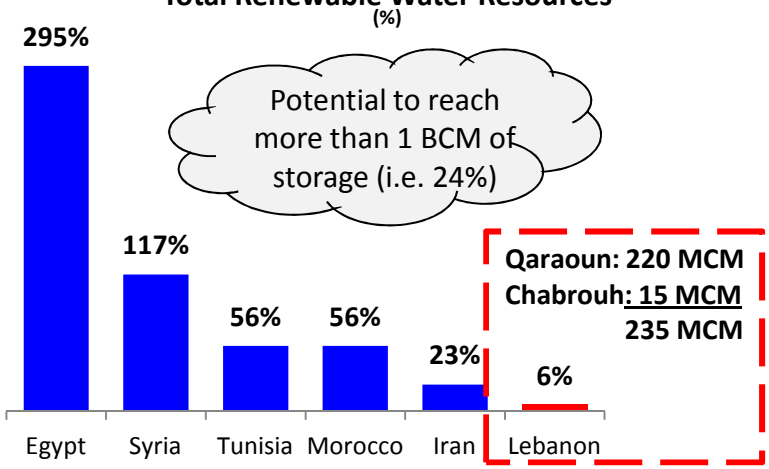
Surface Water Resources, 2010 (MCM/yr)



Groundwater Extraction Through Public Wells, 2010 (MCM/yr)

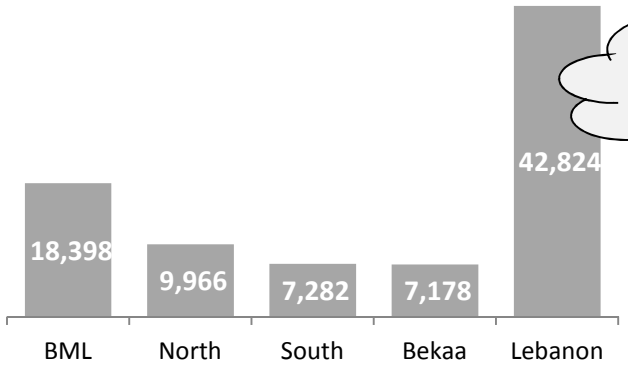


Dam Capacity as Percentage of Total Renewable Water Resources

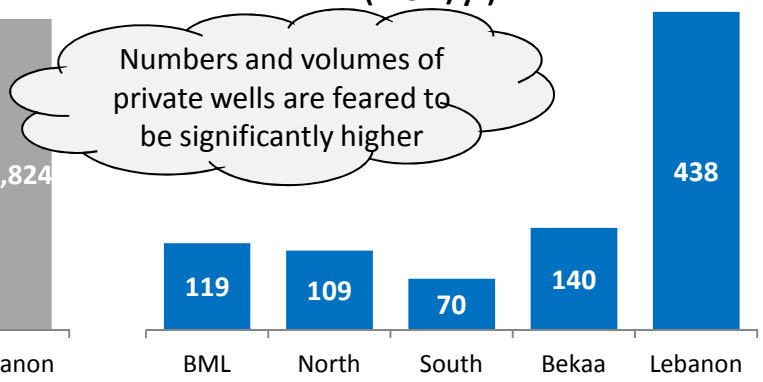


Groundwater Extraction Through Private Wells, 2010

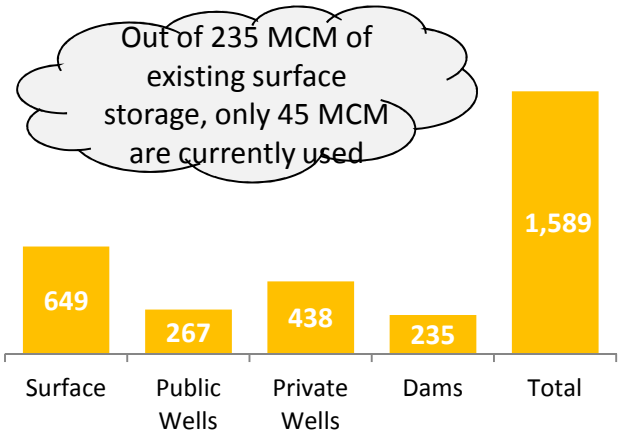
Numbers of Private Wells



Extracted Volumes from Private Wells (MCM/yr)



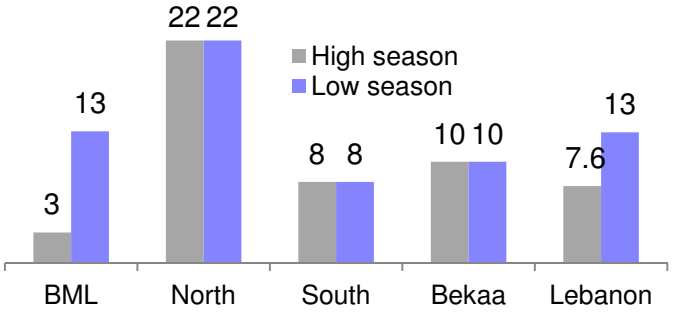
Total Water Resources Used (MCM/yr)



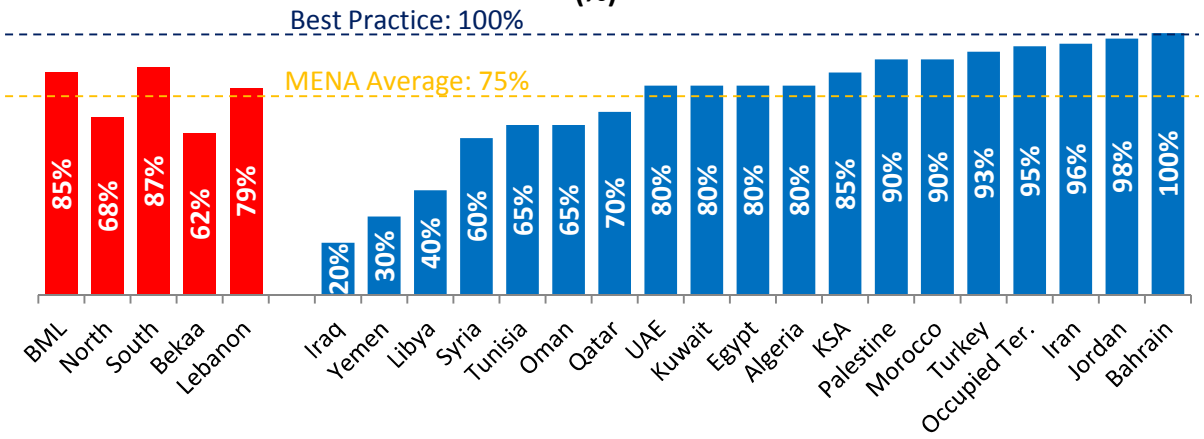
Source: MEW, WEs, FAO Aquastat

2 Although coverage is better than the regional average, more than 50% of transmission and distribution networks are past their useful life …

Continuity of Water Supply Service, 2009 (Hrs/Day)

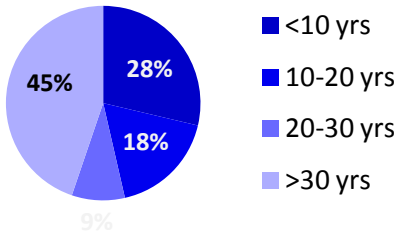


Potable Water Network Coverage (%)

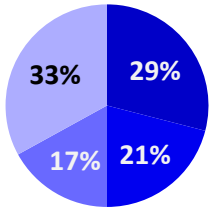


Age of Networks, 2010

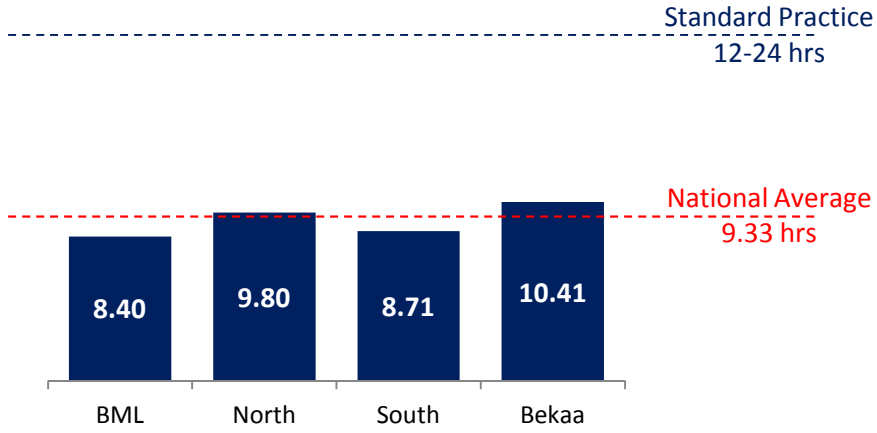
Transmission



Distribution

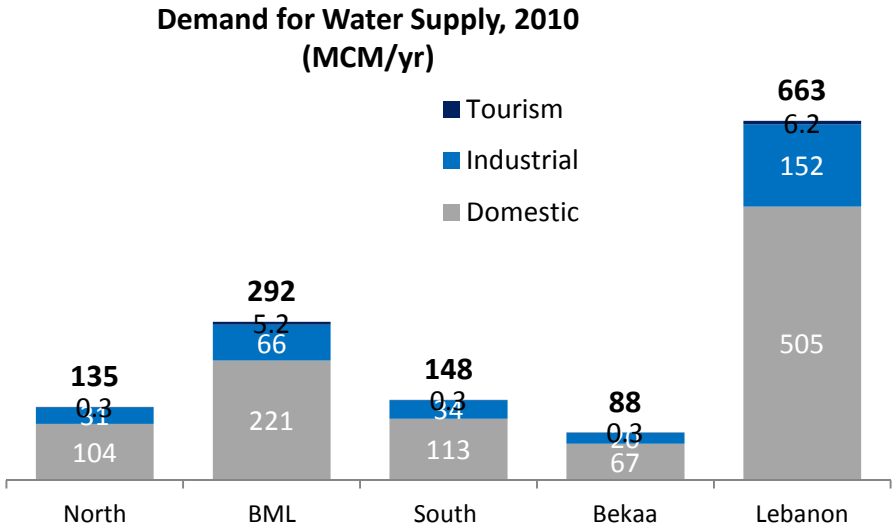


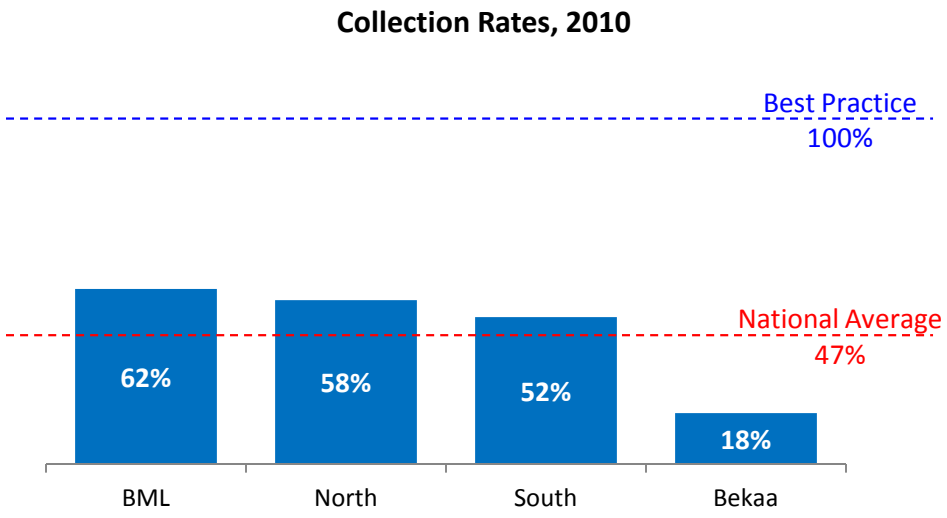
Tank Storage Times, 2010 (Hours)

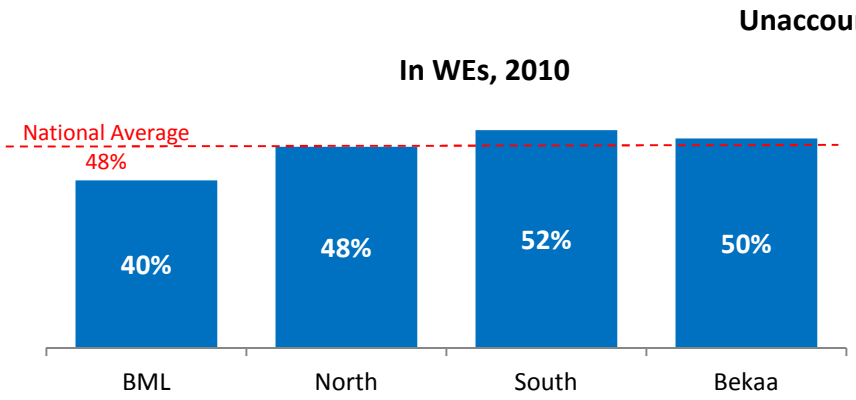


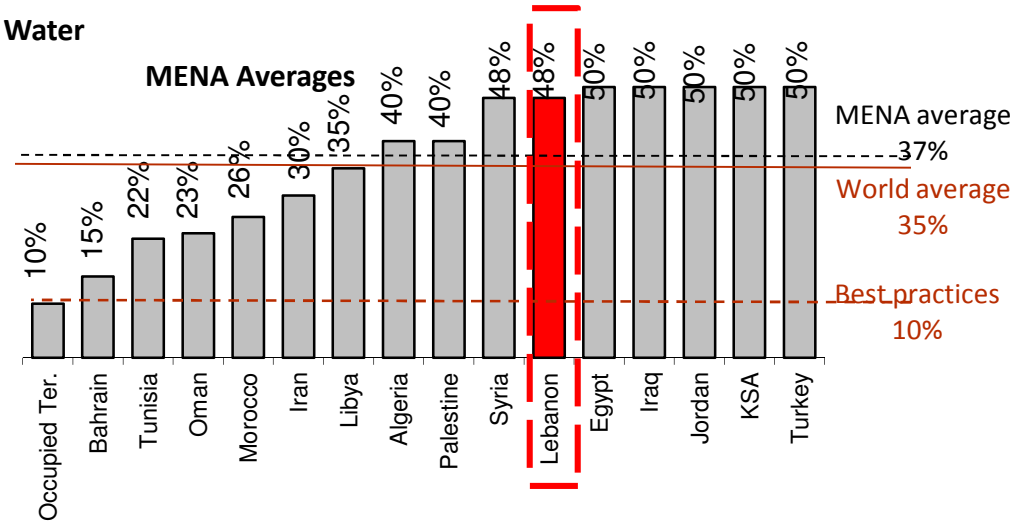
Source: MEW, WEs, WB, CAS, Water Market Middle East

2 … leading to Unaccounted for Water levels 13% higher than world average



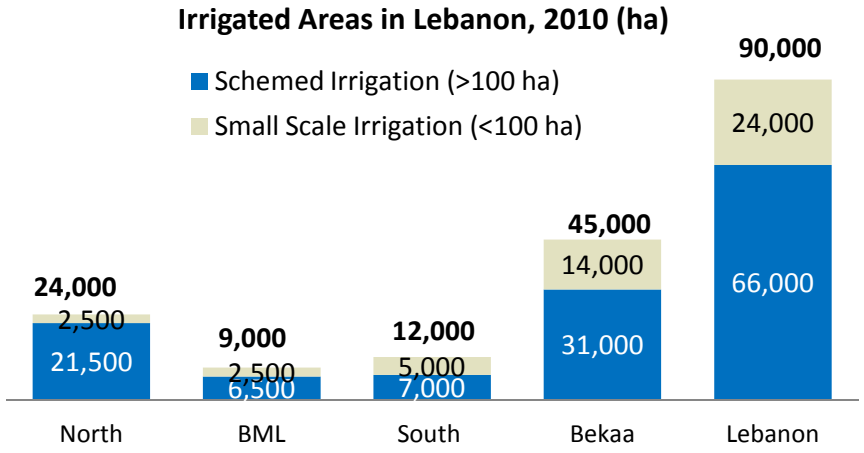


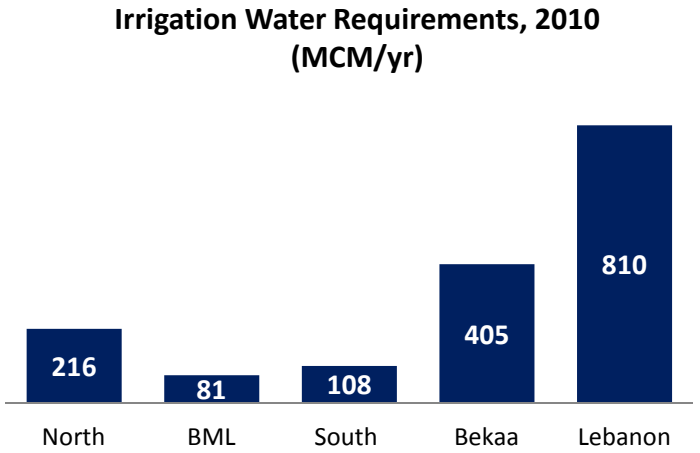


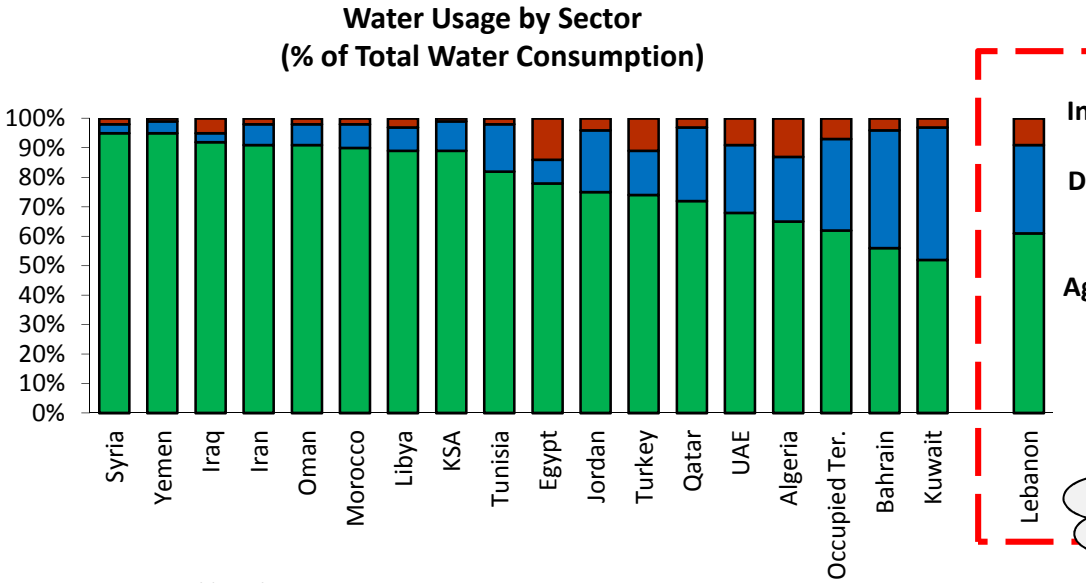


Source: MEW, WEs, Water Market Middle East

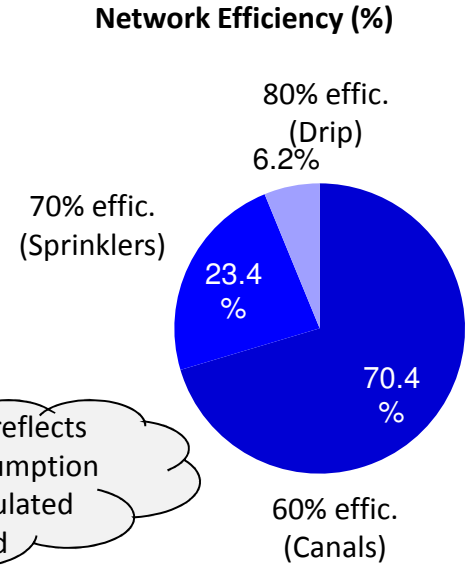
2 Irrigation is the largest water consumer with low efficiencies, as open channels still constitute the majority of the networks





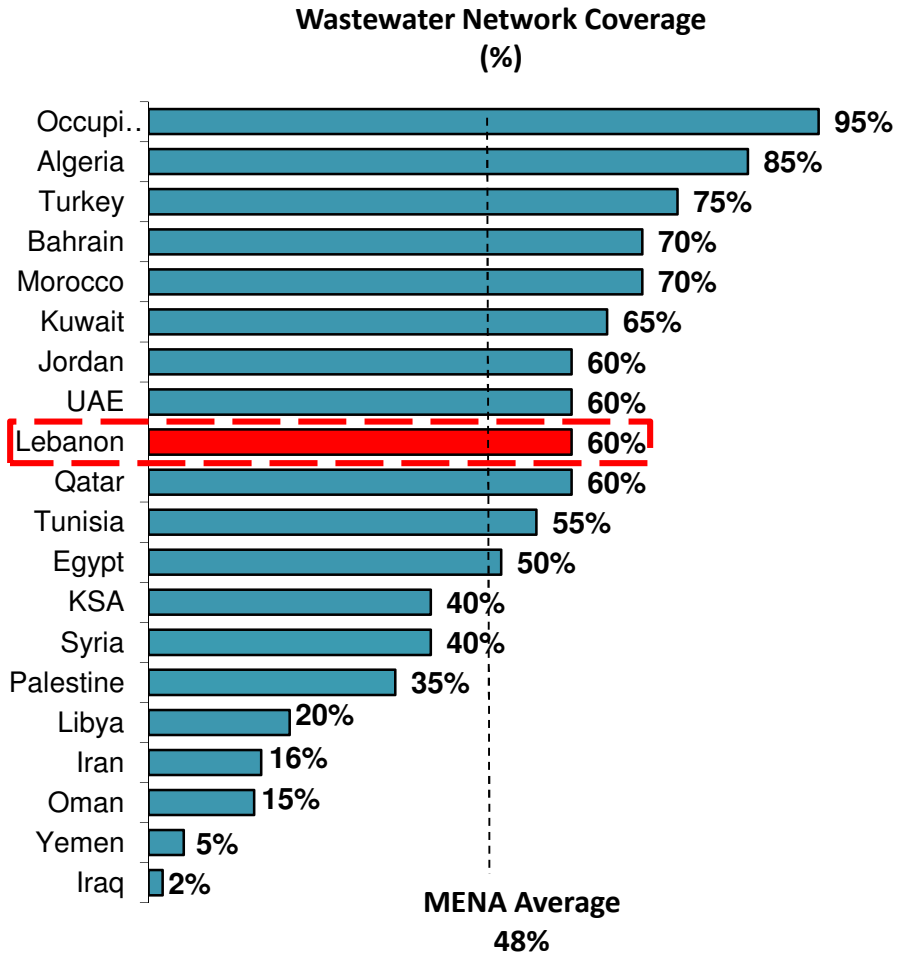


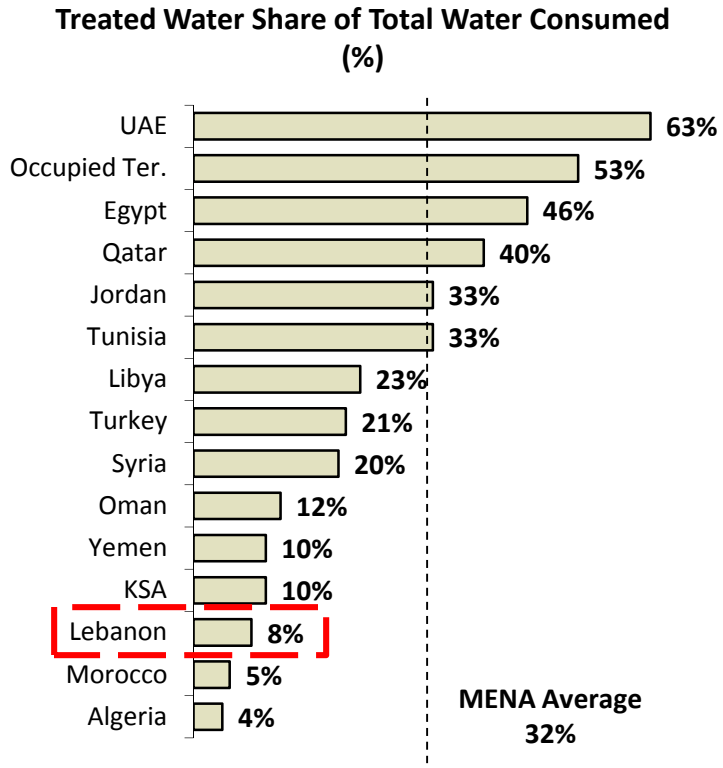
Water usage reflects effective consumption and not calculated demand



Source: MEW, WEs, World Bank

3 Wastewater network coverage of 60% is higher than regional average, coupled with significantly low treatment levels (<8%)





Note: Data not available for Bahrain, Kuwait, Iran, Iraq, Palestine

Source: Water Market Middle East, Web search

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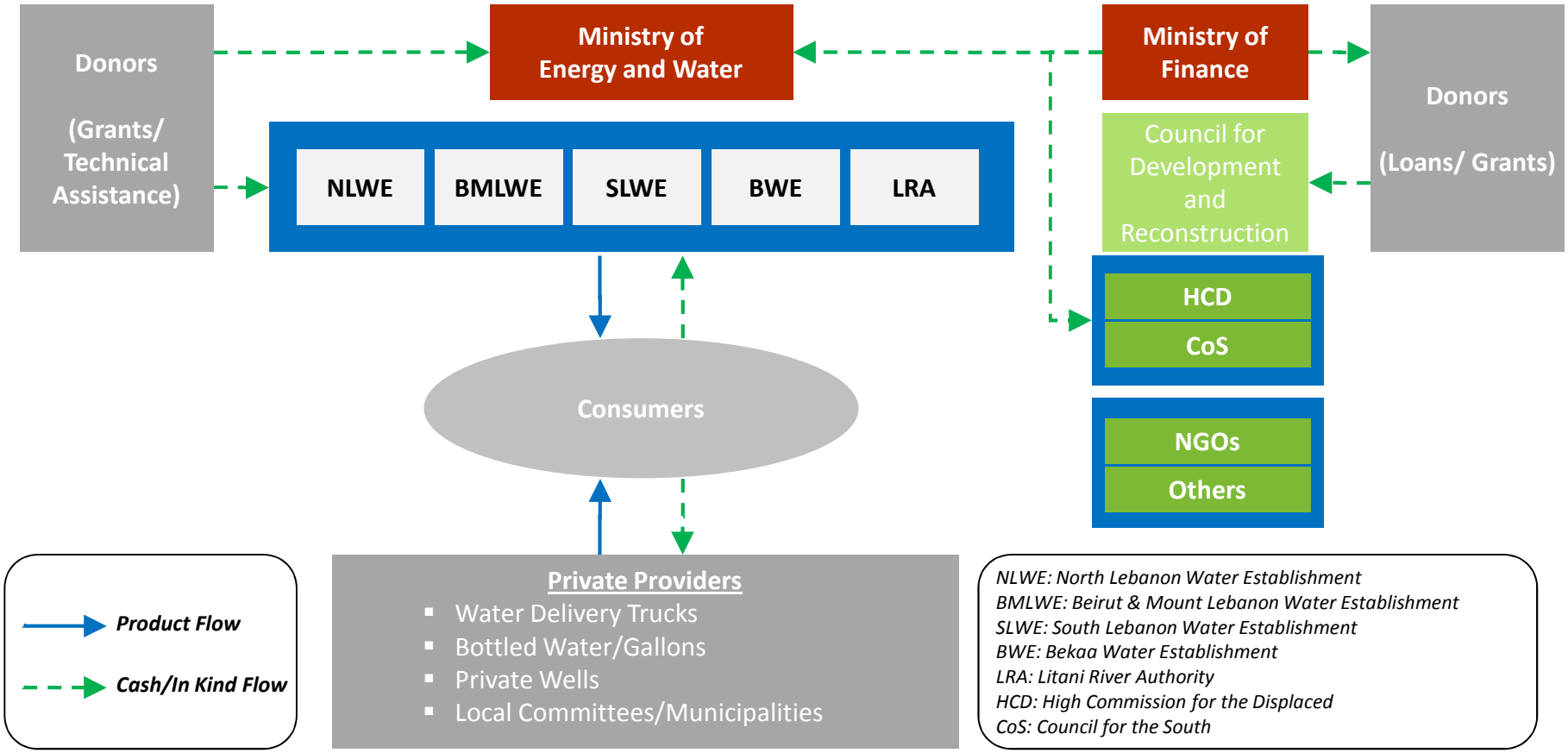
I Investment planning, capital spending and service provision responsibilities are scattered among various players with weak coordination

Current Institutional Setting and Commercial Relations in the Lebanon Water Sector



I The implementation of reform 221 is still incomplete with discrepancies between legal and *de facto* responsibilities

Assessment of the Implementation of reform Law 221

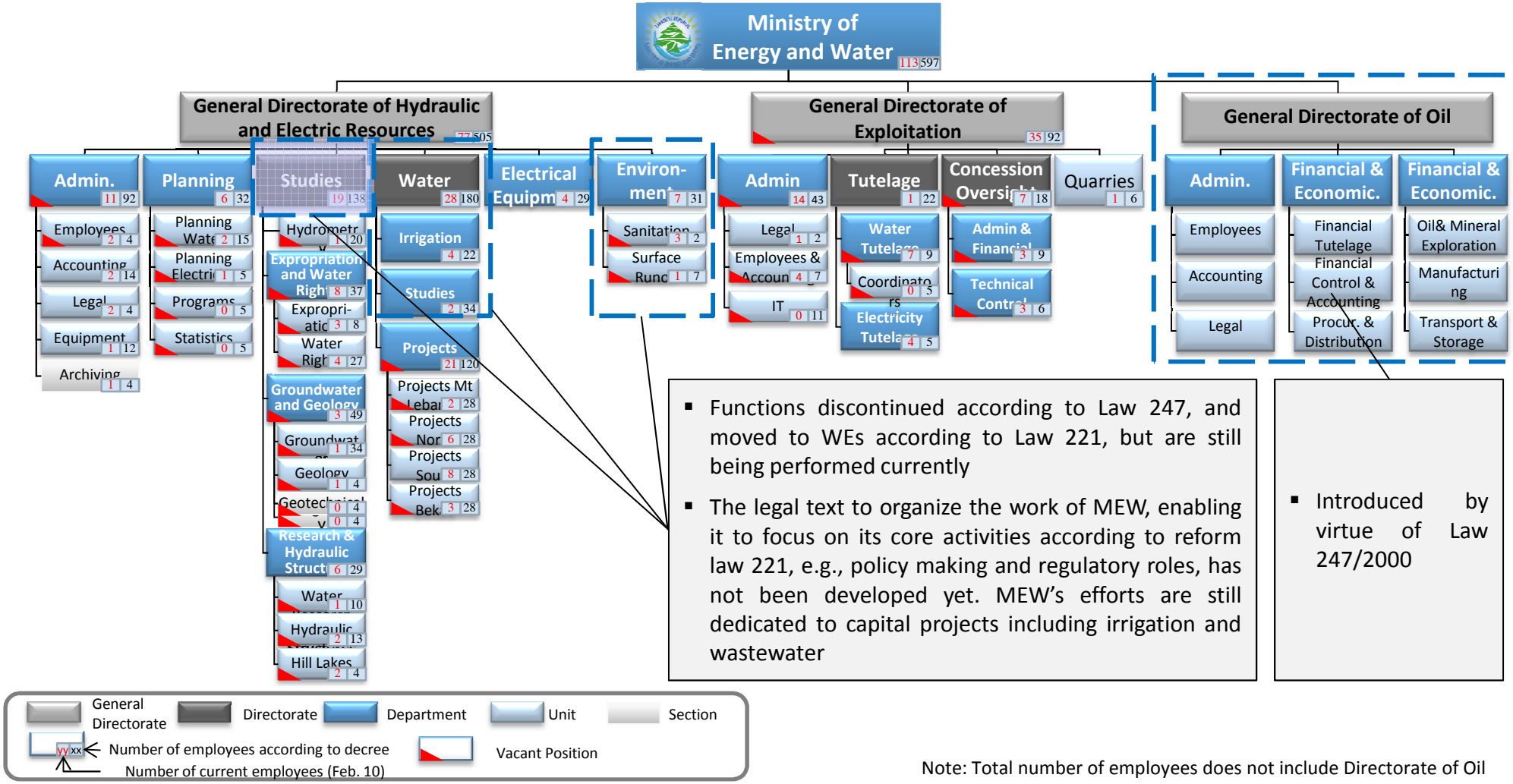
	Best-Practice Principles, 2000	Current Situation, 2010
Reform Law 221	▪ Separation between policy-making and service provision ▪ Consolidation of service provision in autonomous regional water establishments (WEs), and policy-making in MEW ▪ Financial and administrative autonomy of the new WEs	▪ The implementation of the reform law has been initiated but not fully concluded ▪ The transfer of functions to the four WEs has been subject to several delays ▪ The WEs are not yet empowered to act with full administrative and financial autonomy ▪ The legal text to organize the work of MEW, has not been developed yet. MEW's efforts are still dedicated to capital projects and O&M. ▪ WEs suffer from a shortage of funds (*) and technical staff

These discrepancies between legal and *de facto* responsibilities have created institutional uncertainty, and weakened the accountability line between the policy-maker and service providers

Note: (*) with the exception of BMLWE and LRA that do not have any shortage of funds

I MEW is not yet enabled to concentrate on policy making, and regulatory roles, as per Law 221. Efforts are still dedicated to capital projects and O&M

Organization Structure of the Ministry of Energy and Water (*de facto*)



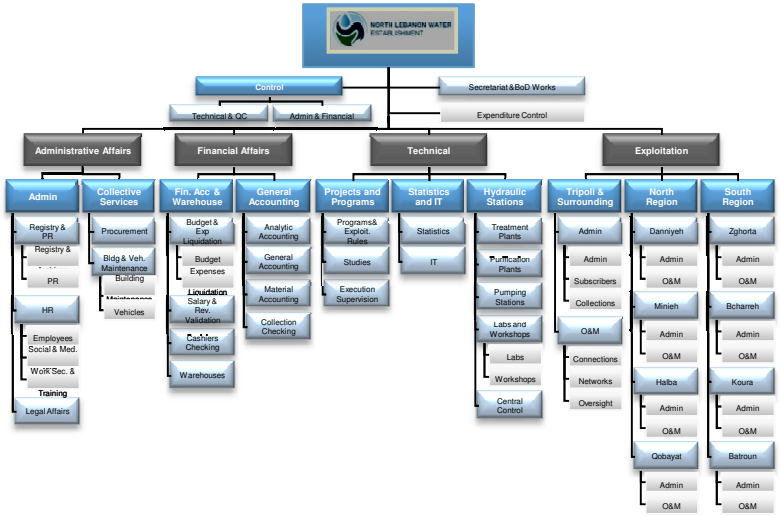
- Functions discontinued according to Law 247, and moved to WEs according to Law 221, but are still being performed currently
- The legal text to organize the work of MEW, enabling it to focus on its core activities according to reform law 221, e.g., policy making and regulatory roles, has not been developed yet. MEW's efforts are still dedicated to capital projects including irrigation and wastewater

- Introduced by virtue of Law 247/2000

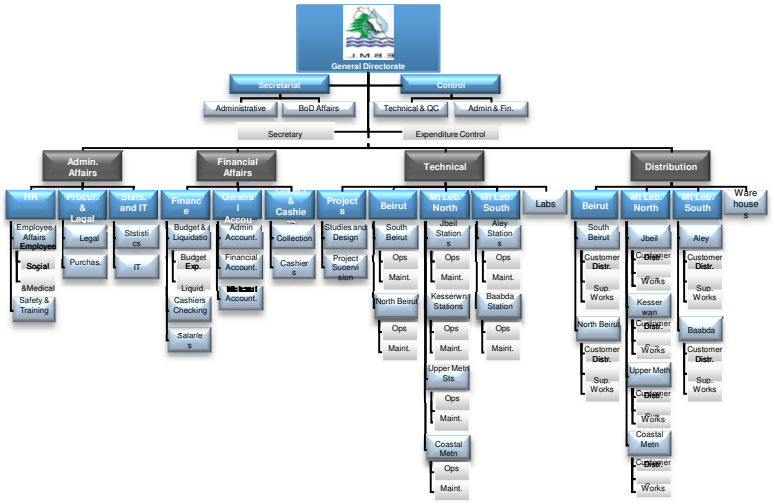
Note: Total number of employees does not include Directorate of Oil

I Focus of WEs is on water supply only with virtually no wastewater and irrigation activities performed so far

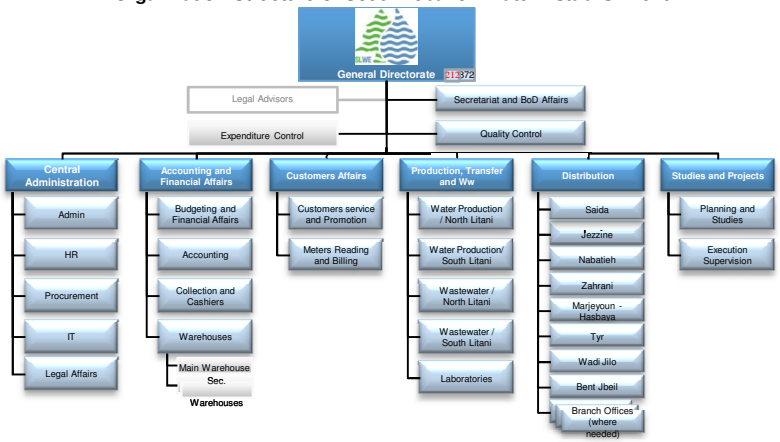
Organization Structure of North Lebanon Water Establishment



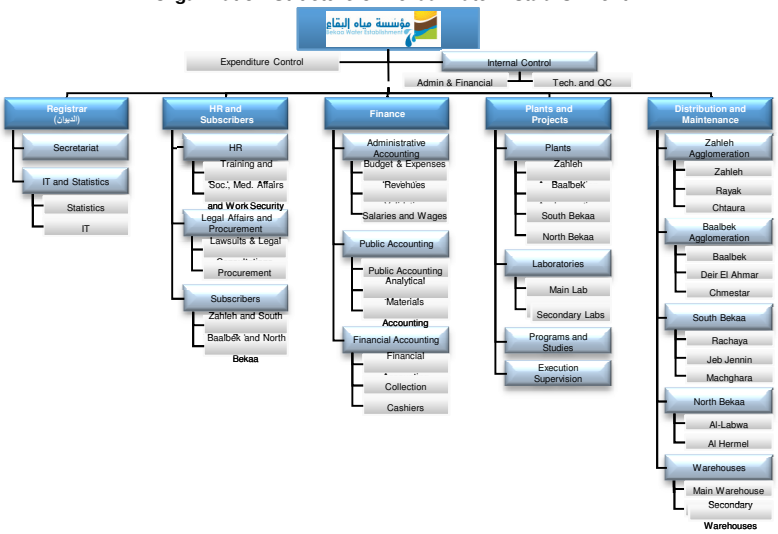
Organization Structure of Beirut & Mount Lebanon Water Establishment



Organization Structure of South Lebanon Water Establishment



Organization Structure of Bekaa Water Establishment

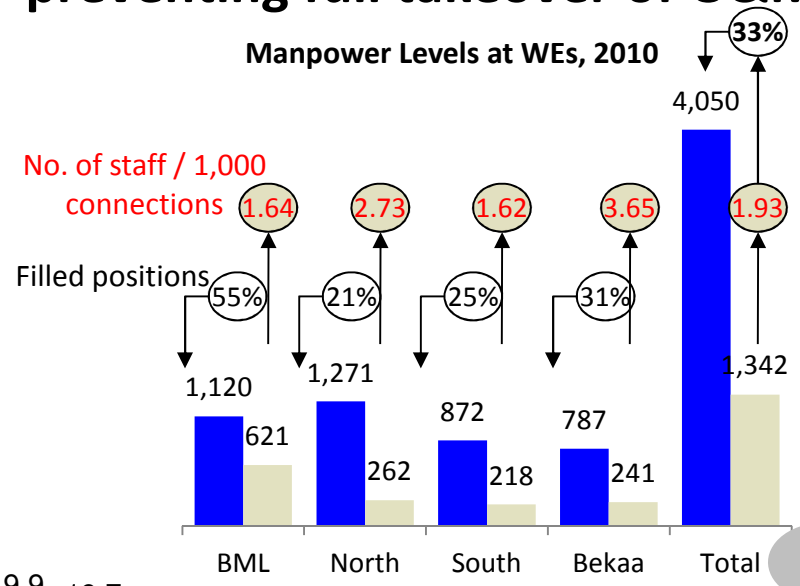


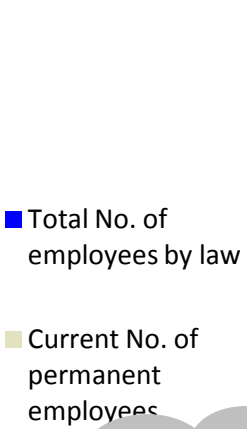
Directorate | Department | Unit | Section

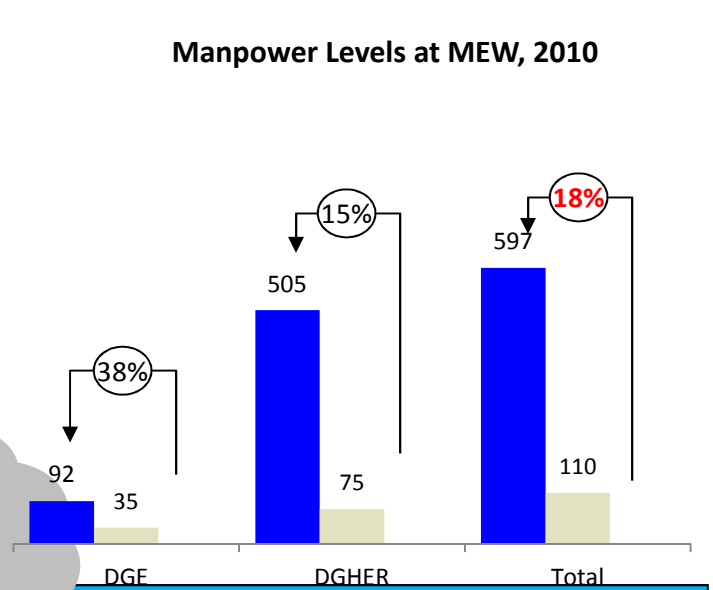
General Comments

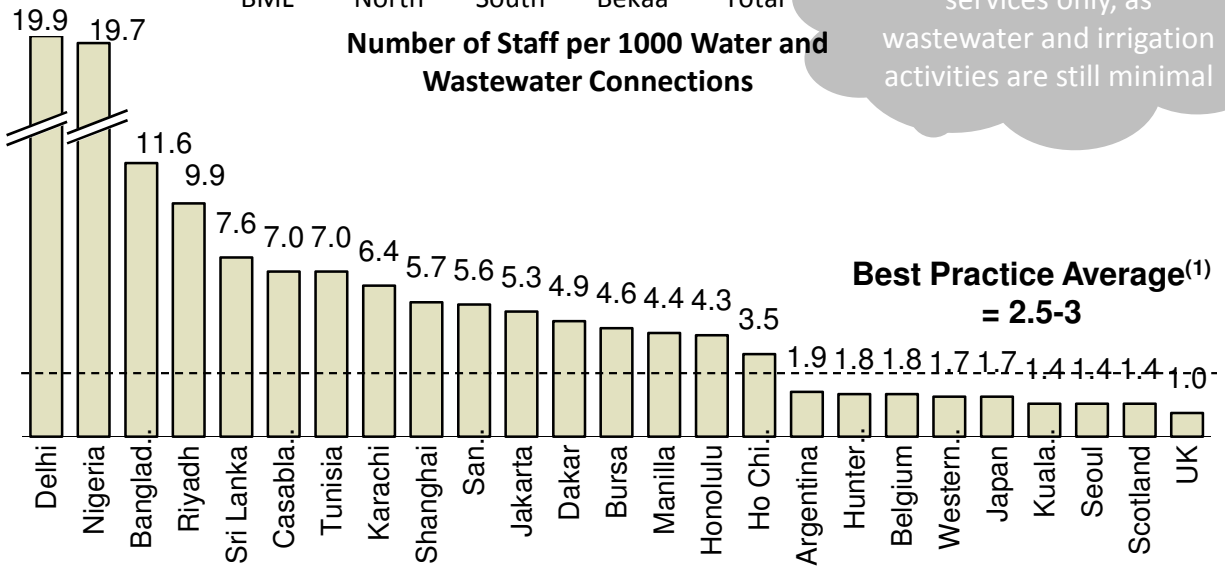
- No irrigation or wastewater responsibilities yet
- Most suitable organization for technical functions to be studied
- Limited focus on Strategic Planning and Business Planning
- No stress on water demand management
- No focus on performance management
- Limited focus on IT, placed at a low level in the org.
- Fixed Asset Management not included in the org.
- Procurement, Purchasing and Warehouses would be better grouped under Supply Chain Management
- Customer Service is decentralized and fragmented across regional units
- Control and Audit functions are grouped under one function

I The lack of technical capacity, financial autonomy and accountability are preventing full takeover of O&M responsibilities









Staff efficiency ratio of WEs calculated for water supply services only, as wastewater and irrigation activities are still minimal

Comments

- MEW and WEs are largely understaffed
- WEs rely on contractor-provided staff, mainly workers performing O&M, to partially fill the gaps. Almost 50% of total staff working in WEs are provided by contractors
- Gaps are mainly in managerial positions (Heads of Department or Unit)
- The high efficiency ratio in Bekaa reflects a low number of connections rather than a high number of employees

Note: (1) Best practice is indicative and is an average of top 15 operators. Average depends on scale, level of outsourcing as well as productivity

Source: IBNET Report and Water and wastewater utilities of the World

II Absence of volumetric charges is limiting incentives for conservation at the consumer, and production at the WE. No wastewater tariff introduced so far

	Current Tariff Structures	Comments
Water Supply	▪ Same tariff structure is applied in all four WEs, with slightly different rates; BWE: 118 $/yr (0.32 $/m3), NLWE: 140 $/yr (0.38 $/m3), SLWE: 147 $/yr (0.40 $/m3), BMLWE: 157 $/yr (0.43 $/m3) ▪ Lump-sum flat tariff based on contracted volumes of water, disconnected from real consumption ▪ Although around 10% of the connections in Lebanon are metered, volumetric tariffs based on real consumption are still not applied ▪ Customers' registers are not regularly updated ▪ Low collection rates, variable between WEs	▪ Volumetric charges prevented by the lack of meters ▪ Lebanon is one of the very few countries in the world still adopting this tariff structure ▪ Lack of volumetric charges limiting conservation incentives at the consumer level, and production incentive at the WE level ▪ Lack of incentive for WEs to reduce losses or increase availability ▪ Increased reliance on expensive private providers
Irrigation	▪ Two tariffs are generally used: • Area Charges: lump sums periodic charges based on area irrigated (from 140 to 650 $/ha/yr) • Volumetric Charges: used in case of pressurized networks, where hydrants are equipped with water meters (from 0.10 to 0.15 $/m3) ▪ Very low collection rates	▪ Irrigation is the largest water consumer, with very limited metering, preventing volumetric charges ▪ Lack of awareness on water consumption and conservation ▪ High reliance on undeclared groundwater ▪ Collection not performed effectively b WEs
Wastewater	▪ No wastewater tariff applied so far	▪ Does not provide incentive for limiting pollution

III Gaps in legal/regulatory framework are mainly leading to delays in water sector reform and Private Sector Participation in O&M and in capital projects

Gaps in the Current Legal/Regulatory Setup

- Incomplete implementation of Law 221 of 29 May 2000 and its amendments, and the lack of required bylaws to finalize the implementation of the water sector reform
- The need to develop required legislation to avoid delays in private sector participation in the water sector, mainly to allow for BOTs in large capital projects
- The need to modernize irrigation laws, thus abolishing the Ottoman law of 1913 in a view to facilitate and organize the use of irrigation water, mainly through the creation of Water Users Associations (WUAs)
- The need to develop the legal requirements to support strategic priorities in the water sector
- The need to achieve the ratification of the Water Code
- The need to undertake an in-depth gap analysis of all laws and regulations governing the water sector

IV Environmental issues are affecting water resources with a direct impact on quality

Water Quality and Pollution

State of water quality in Lebanon

- The level of bacteriological contamination differs from a public water source to another, ranging from 0% in certain rural areas to reach 90% around more populated urban areas.
- The chemical contamination varies widely among WEs:
  - Sea water intrusion being a common problem for all the coastal wells raising the issue of high salinity and conductivity problems
  - Elevated nitrate levels in Bekaa valley
  - Olive oil residue in the areas of North and South Lebanon
  - Accidental pollution due to industrial waste and oil intrusion from gasoline stations

Pollution sources

- Inadequate domestic sewage disposal, predominantly discharged in the environment without treatment; 70% of all natural sources with bacterial contamination
- Overexploitation of water resources due to excessive drilling and pumping (mainly concentrated in coastal area and Bekaa)
- Excessive use of fertilizers and unregulated application of pesticides
- Direct discharge of industrial effluent into the environment (concentrated along the coast, in Mount Lebanon, in the Bekaa valley and Litani water shed)
- Open dumping

Source: MEW, UNICEF

Strategic objectives for the Lebanese water sector

Vision — *"Water: A right for every citizen, a resource for the whole country"*

Mission — *"Ensure water supply, irrigation and sanitation services over all the Lebanese territory on continuous basis and at optimal service levels, with a commitment to environmental, economic and social sustainability"*

Objectives

Infrastructure

1 Production

- **Maximize the potential and improve the quality of surface water resources**
- **Improve management and protection of groundwater resources**, moderate extractions, promote artificial recharge, and consider this resource as a strategic reserve
- **Fulfill deficits through groundwater and/or surface storage according to potential and availability per region**; priority to be given to surface storage in case of availability of both resources

2 Transmission and Distribution

- ***Water Supply*: Ensure proper and continuous access to high-quality water supply** through increased coverage, reduced unaccounted for water and optimized network management
- ***Irrigation*: Provide adequate quantities and quality of irrigation water** and incentivize modern, water-saving irrigation techniques

3 Wastewater

- **Increase coverage of wastewater collection networks and treatment capacities**
- **Optimize current wastewater treatment processes** and sludge disposal, and ensure adequate reuse of treated effluents where applicable

Management

I Institutional and Organizational

- **Support a full implementation of the water sector reform** and improve on the management model between WEs and MEW
- **Improve on capital spending responsibilities**, inter-agency coordination and spending efficiency
- **Improve the management of the irrigation sector**

II Financial and Commercial

- **Introduce and implement new tariff strategies**
- **Promote private sector participation** in O&M and capital projects
- **Gradually achieve O&M and then full cost-recovery**

III Legal and Regulatory

- **Enhance and modernize the legal setup** to support the implementation of the NWSS and future requirements
- **Enforce a regulatory regime** which would align WEs with leading utilities in the region and worldwide

IV Environmental Concerns

- **Achieve advanced climate change knowledge**
- **Improve water quality, flood mitigation and protection of recharge zones**

V Awareness and Conservation

- **Implement awareness and conservation campaigns** consisting of gradual enforcement of consumer metering, awareness raising, and promote higher efficiency plumbing devices

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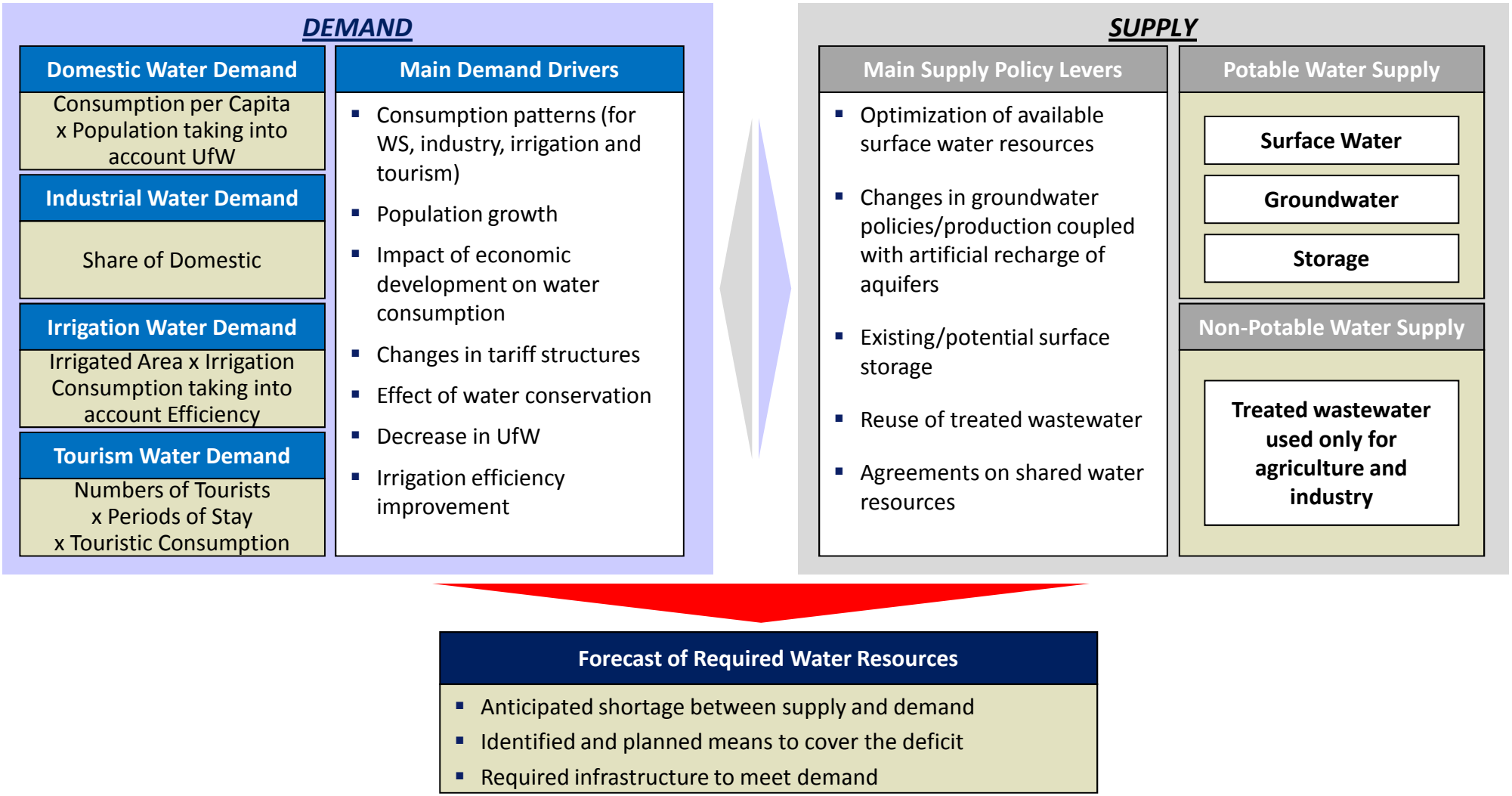
A water demand/supply model aims at forecasting required resources to cover anticipated shortages

Schematic of the Water Demand/Supply Forecasting Model



Baseline

Demand/Supply Forecasts

- **Demand**
- Supply
- Demand/Supply Balance
- Infrastructure Forecasts

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Investment Plan

Strategic Roadmap

Demand/supply forecasting methodology takes into account a number of drivers and policy levers on the demand side (1/2)

Assumptions will need to be validated/ revisited in due course during the planning phases

Drivers/Policy Levers

1.a Domestic Consumption per Capita	▪ Assumes demand per capita thresholds associated with urban development level, based on international benchmarks adapted to local conditions ▪ Domestic water includes water consumption for residential, commercial and governmental entities
1.b Industrial Consumption	▪ In the absence of recent surveys on the water consumption of the industrial sector, assumes industrial demand as a share of domestic demand
1.c Tourism Consumption	▪ Uses the latest figures of the Ministry of Tourism and the General Security, as well as international benchmarks to determine touristic water consumption ▪ Relies on Mediterranean basin benchmarks to determine daily consumption per tourist
1.d Irrigation Consumption	▪ Uses the latest figures of the Ministry of Agriculture, based on the latest census done by FAO, and World Bank studies ▪ Irrigation consumption is to be reduced, by improving irrigation efficiency of existing and planned irrigation schemes, as well as optimizing on-farm irrigation techniques
2 Population Growth	▪ Uses population figures and historical growth rates forecasts by Central Administration of Statistics to estimate projected population growth ▪ Uses numbers of Palestinian refugees based on UNRWA data

Demand/supply forecasting methodology takes into account a number of drivers and policy levers on the demand side (2/2)

Assumptions will need to be validated/ revisited in due course during the planning phases

Drivers/Policy Levers

3 **Irrigation Growth**	▪ Uses government plans for the development of the irrigation sector and achieve an integrated and sustainable rural development ▪ Irrigated areas are to be increased in line with government policies. From the current 90,000 ha of irrigated lands, targets of reaching 120,000 ha by 2020 and 150,000 ha by 2035 have been set
4 **Impact of Economic Development**	▪ Uses historical and forecasted real GDP growth to assess the impact of economic development on projected demand for water , leading to an increase of 1% per annum
5 **Tariff Change**	▪ Uses elasticity of demand to estimate the impact of water tariff changes on water consumption
6 **Water Conservation**	▪ Assumes a decrease in water consumption through anticipated water conservation initiatives and assumes its impact on domestic and non-domestic consumers. Awareness and conservation campaigns are planned through MEW's Lebanese Center for Water Management and Conservation
7 **Reduction in UfW**	▪ rates vary among the WEs from 40% to 52%. A weighted average of 48% has been adopted on country level. Targets of reducing UfW to 30% by 2020 and to 20% by 2035 have been adopted ▪ Assumes a decrease in UfW following initiatives carried out by WEs under MEW's oversight and determines its impact on distributed water

1 Water demand

Thresholds are based on international benchmarks adapted to local conditions

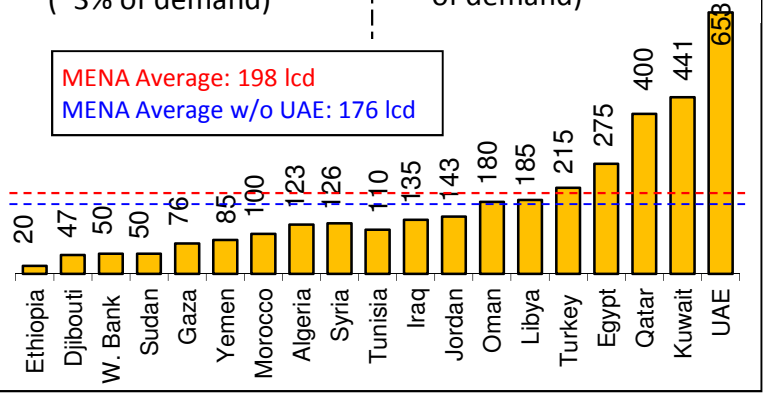
1.a Domestic

Rural Areas

- Drinking and cooking
- Personal use (bath, washing, etc)
- Laundry, dishwashing
- Cleaning
- Gardening
- Limited commercial use (~3% of demand)

Urban Areas

- Drinking and cooking
- Personal use (bath, washing, etc)
- Laundry, dishwashing (machine)
- Cleaning
- Large scale gardening
- Public Gardens
- Commercial use (5-10 % of demand)



1.b Industrial

- Mainly small scale industries: 99% of industries have less than 50 employees
- Average of 6.5 m3/day per small establishment
- Can reach up to 600 m3/day for larges establishment s
- 11% of water use goes to industry

1.c Tourism

- Consumption based on benchmarks of similar countries in the region
- Average consumption in Mediterranean countries: 440 l/tourist/day

1.d Irrigation

- Including losses in transmission and distribution networks
- 63,400 ha (70.4%) furrow irrigation
- 21,100 (23.4%) sprinkler irrigation
- 5,500 (6.2%) drip irrigation

Rural Domestic Demand 160 lcd

Urban Domestic Demand 180 lcd

Industrial Demand 30% of Domestic Demand

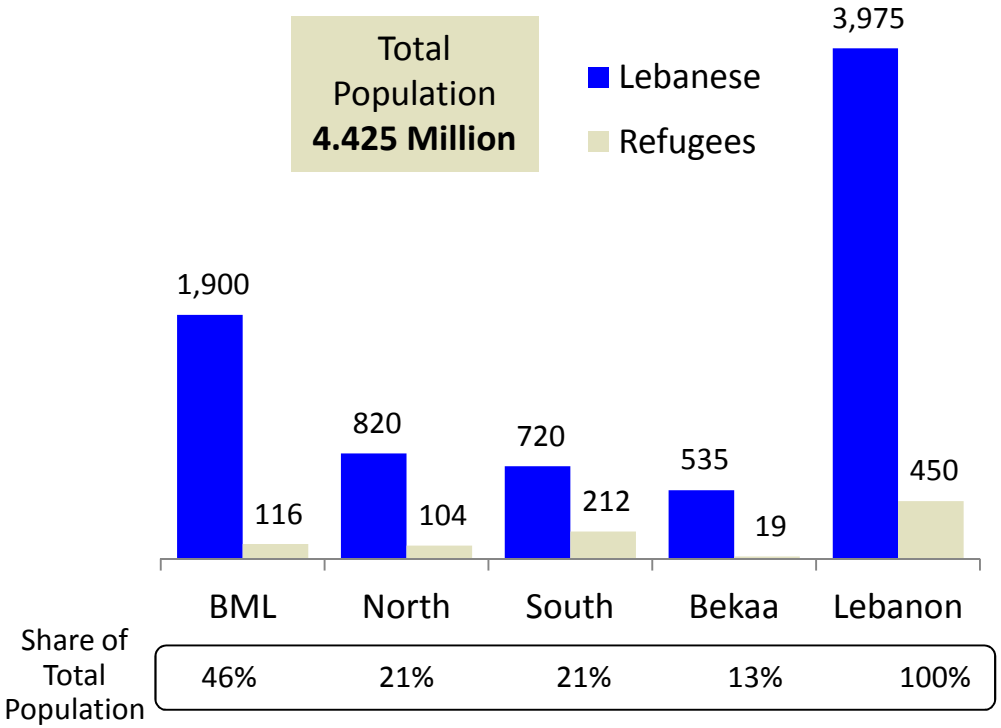
Tourism Demand 400 l/tourist/d

Agriculture Demand 9000 m3/ha/yr *In 2010*

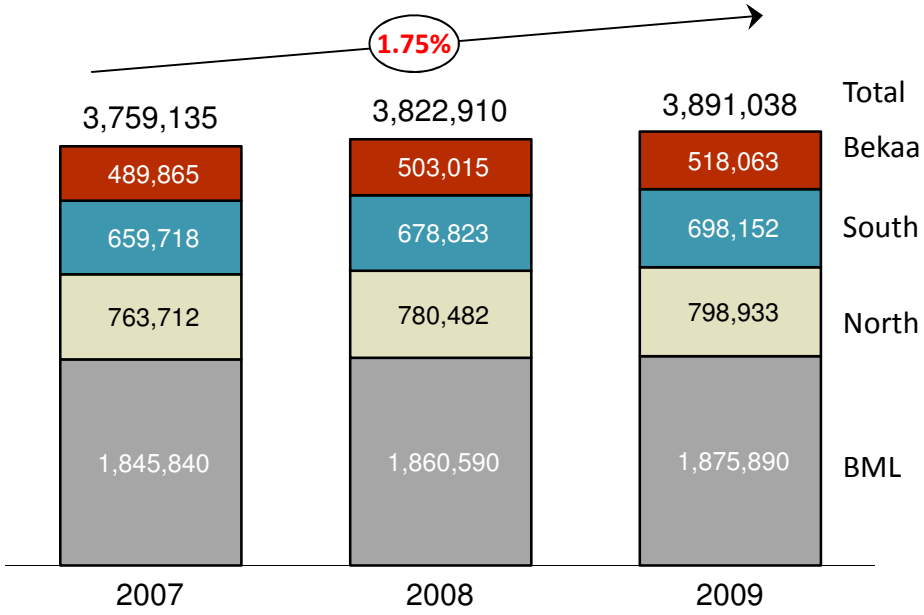
Source: MoA, FAO Aquastat, UNESCO, WB, ESCWA, MEW (1996 , 1999),

2 Population and growth

Distribution of Population by Region in, 2010 ('000)



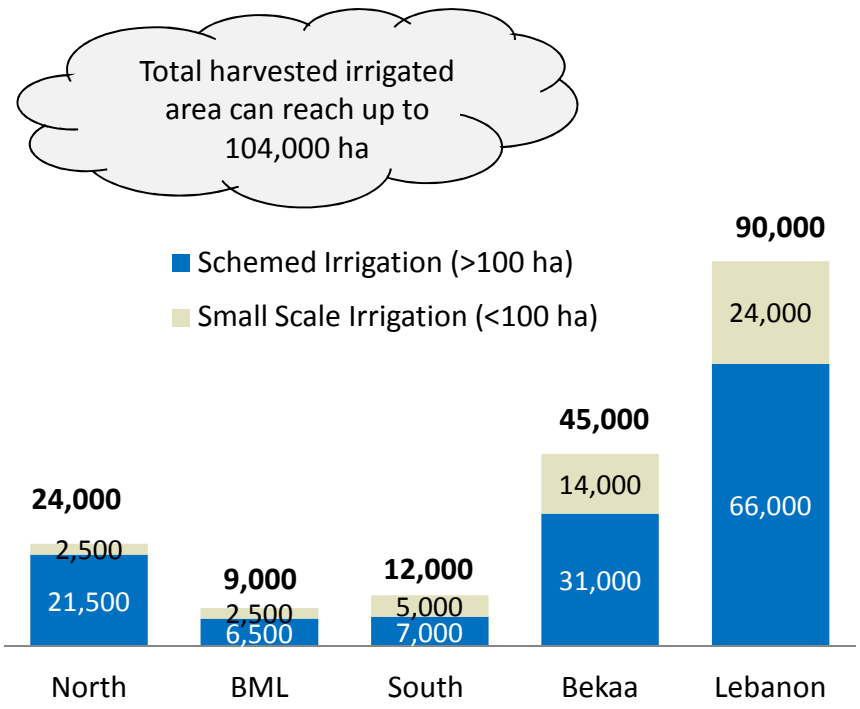
Lebanese Population Growth, 2007-2009 (%)



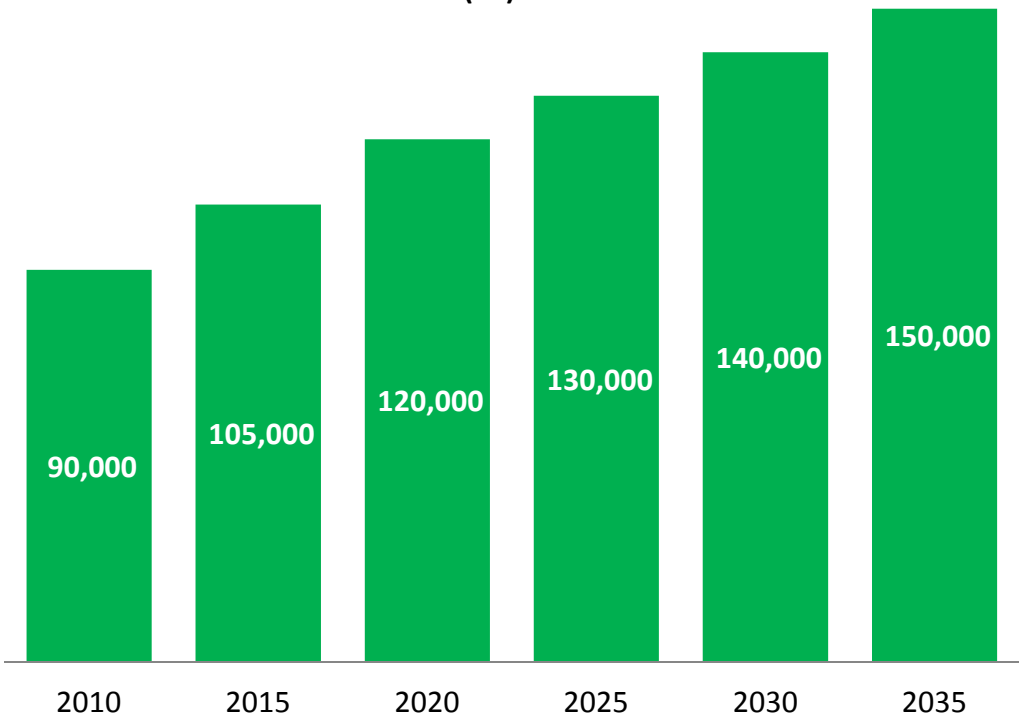
Source: CAS, UNRWA

3 Irrigated areas and growth

Irrigated Areas in WEs , 2010 (ha)

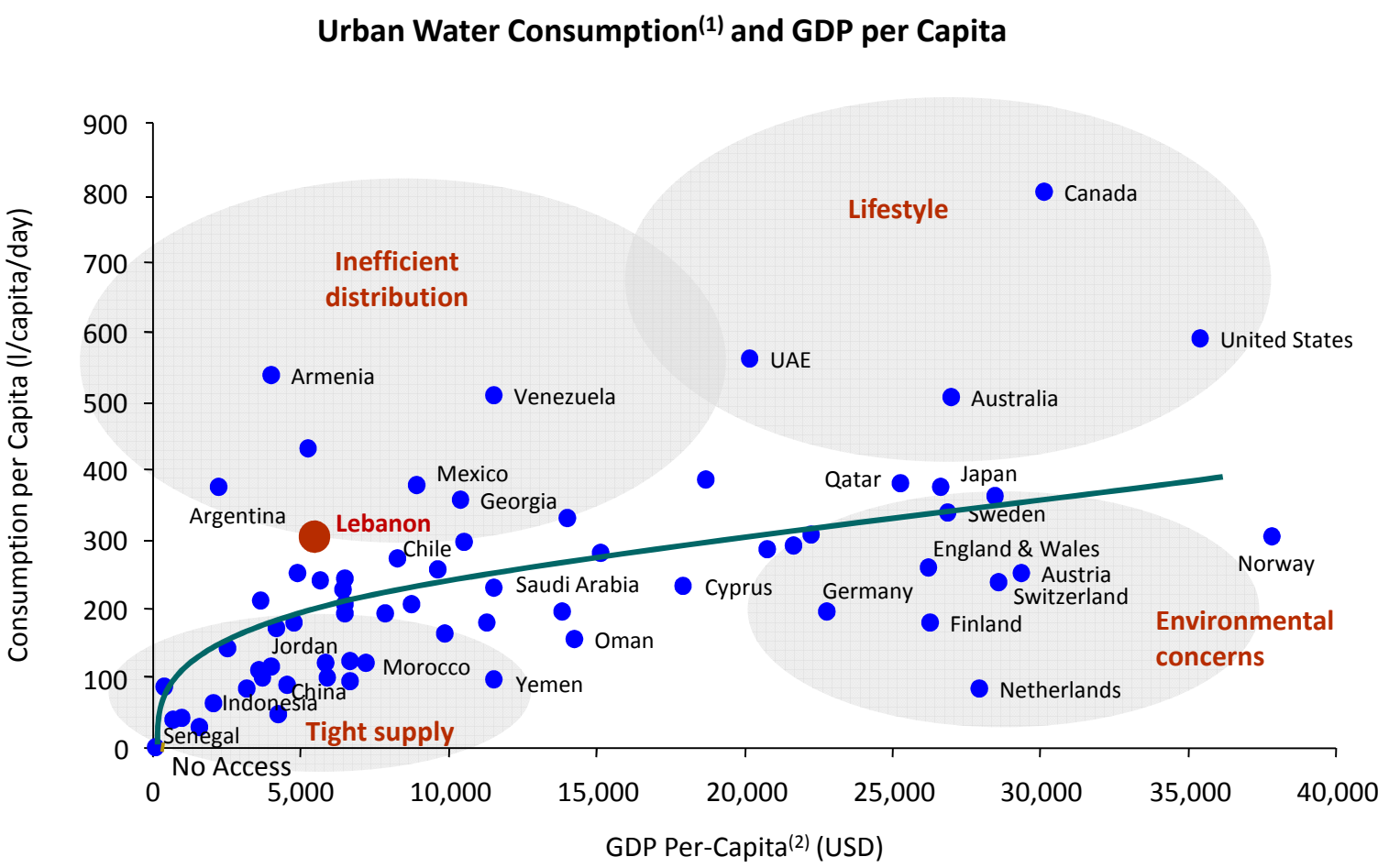


Projected Growth in Irrigated Areas in Lebanon, 2010 - 2035 (ha)



Source: MoA , FAO, WB, MEW

4 Urban water consumption and relation with economic development

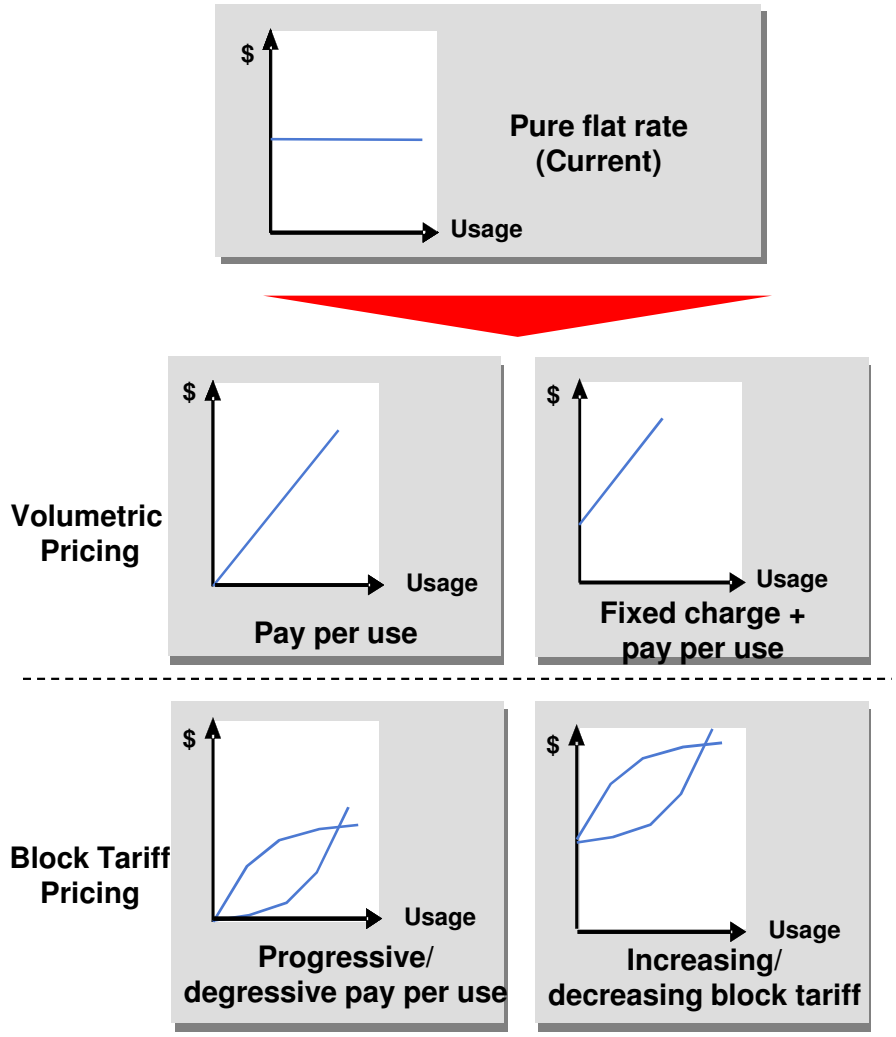


Note: (1) Includes UfW (2) Adjusted by purchasing power parity

Source: IMF, UN, MEW Analysis

5 Impact of tariff change (1/2)

Current and Proposed Tariff Systems



Source: IB-Net

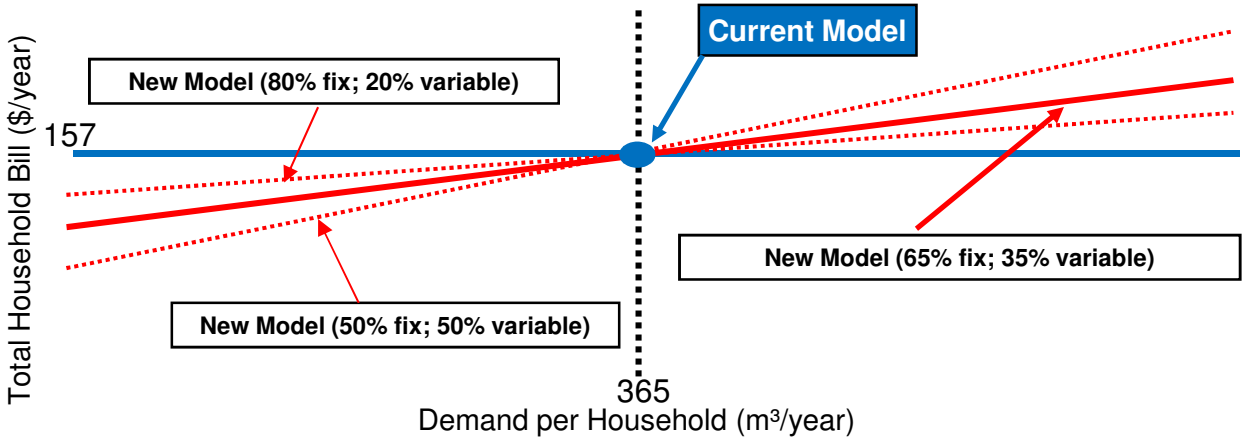
Benchmarks on Applied Tariffs in MENA region

Country	City	Structure	Block Tariff	Level of Water Tariff	Level of WW Tariff
		V, F, M	I, D, C	USD/m3	USD/m3
Turkey	Adana	V	C	1.38	0.34
	Ankara	V	C	1.31	n/a
	Izmir	V	I	1.45	1.02
	Istambul	V	I	1.96	1.29
	Konya	V	C	0.98	n/a
Syria	Damascus	V	I	0.05	0.02
Lebanon	BMLWE	F	n/a	0.43	0
Morocco	Casablanca	V	I	0.72	0.05
Oman	Muscat	n/a	n/a	0	n/a
Occupied Territories		V	I	1.23	0.32
Palestine	Ramallah	V	I	1.23	0.32
Bahrain	Manama	V	I	0.07	n/a
Qatar	Doha	V	C	1.21	n/a
KSA	Jeddah	V	C	0.05	0
	Riyad	V	I	0.03	0
UAE	Dubai	V	I	2.16	n/a

V = volumetric	I = increasing
F = fixed fee	D = decreasing
M = Mix	C = constant

5 Impact of tariff change (2/2)

	Tariffs shall be affordable	Tariffs shall cover costs	Clients able to choose consumption	Predictability for revenues
Pure flat tariff	✗	✗	✗	✓
Pure volumetric tariff	✗	✗	✓	✗
Progressive volumetric tariff	✓	✓	✓	✗
Fixed charge plus volumetric tarif	✗	✓	✓	✓
Fixed charge plus progressive volumetric tariff	✓	✓	✓	✓



Highlights

- Tariff structures will see significant modifications:
  - For water supply: the current flat tariff structure will be replaced by a volumetric tariff structure after replacement of gauges by meters
  - For irrigation: the different forms of tariffs currently applied will be replaced by volumetric tariffs
  - For wastewater: A new tariff will be introduced in proportion with the used volumes of water supply
- Tariff changes will have an impact on the different types of consumptions. This impact needs to be defined through further studies
- Once identified, the impact of these tariff changes will be reflected in demand patterns

6 Water conservation

Water Conservation Initiatives

Planned Conservation Initiatives on Domestic and Industrial Demand	Planned Conservation Initiatives on Irrigation Water
▪ Installation of conservation kits (plumbing retrofits and high-efficiency toilets and showerheads, dual flush toilets, faucet aerators, kitchen aerators) ▪ High-efficiency cloth washers ▪ Complete retrofit of large water consumers, e.g., industrial, commercial ▪ Public outreach, awareness and education programs ▪ Household and establishment audits	▪ Adoption of high efficiency on-farm irrigation techniques, e.g., drip irrigation, sprinkler irrigation, overhead irrigation where applicable ▪ Coordination with Ministry of Agriculture for the adoption towards lower consumption crops ▪ Public outreach, awareness and farmer education programs ▪ Farm audits and optimization according to local conditions

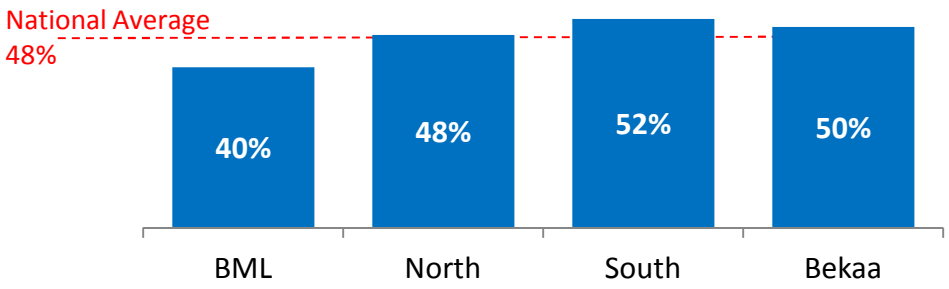
Saving per year from 2011 to 2020
3.0 lcd estimate

Awareness and conservation campaigns are planned and executed mainly through the Lebanese Center for Water Management and Conservation

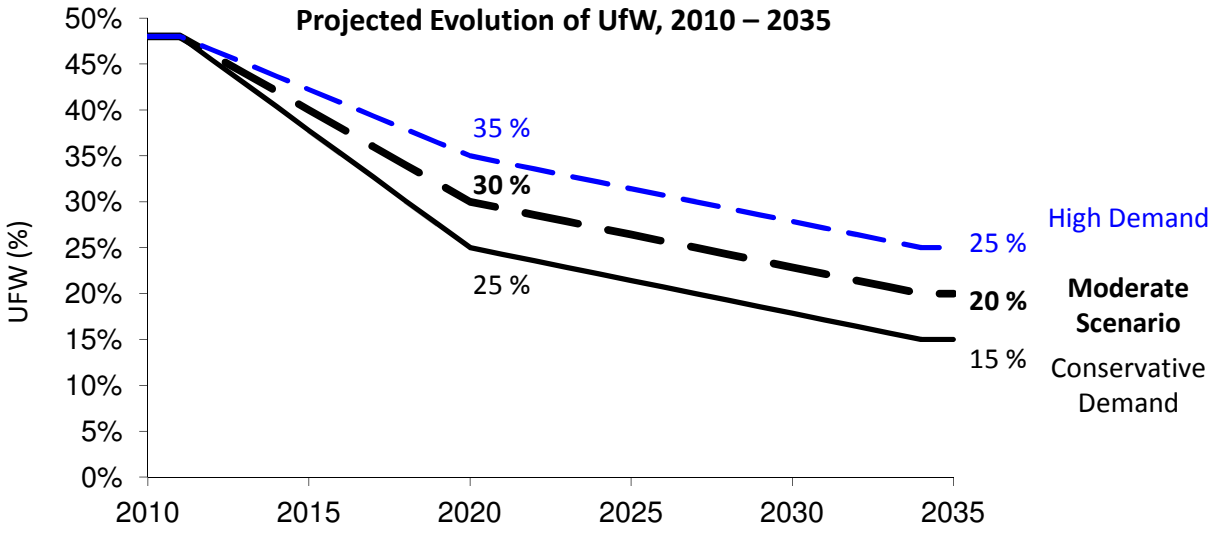
Decrease from
9,000 to 7,000 m^3/ha/yr by 2035

7 Decrease in UFW levels

Unaccounted For Water In WEs, 2010
(in % of Water Production)



Projected Evolution of UfW, 2010 – 2035



Comments and Key Assumptions

- To allow for more flexibility, three scenarios have been considered on the demand side: High Demand, Moderate Demand, Conservative Demand
- It is reasonable to assume that the UfW would reach 30% in the next 10 years and 20% in 2035 based on a scheduled decrease mainly due to fixing leakage (Moderate Scenario)
- International benchmarks and experience in MENA countries show that a level of 20% is feasible
- We assumed that significant leakage improvement projects will be carried out by WEs under MEW's oversight over the 2011–2020 period

Source: WEs, MEW analysis

To allow for more flexibility, three scenarios have been considered on the demand side: High Demand, Moderate Demand, Conservative Demand (1/2)

Drivers/Policy Levers	Scenario 1 Conservative Demand	Scenario 2 Moderate Demand	Scenario 3 High Demand
1.a Domestic Consumption per Capita	**160 lcd** - *Urban* **140 lcd** - *Rural*	**180 lcd** - *Urban* **160 lcd** - *Rural*	**200 lcd** - *Urban* **180 lcd** - *Rural*
1.b Industrial Consumption	Share of domestic **25%**	Share of domestic **30%**	Share of domestic **35%**
1.c Tourism Consumption	**350 l/tourist/d**	**400 l/tourist/d**	**450 l/tourist/d**
1.d Irrigation Consumption	Decrease from **9,000 to 7,000 m3/ha/yr by 2035**	Decrease from **9,000 to 7,000 m3/ha/yr by 2035**	Decrease from **9,000 to 8,000 m3/ha/yr by 2035**
2 Population Growth	CAGR 2010-2035 **1.5%**	CAGR 2010-2035 **1.75%**	CAGR 2010-2035 **2.0%**

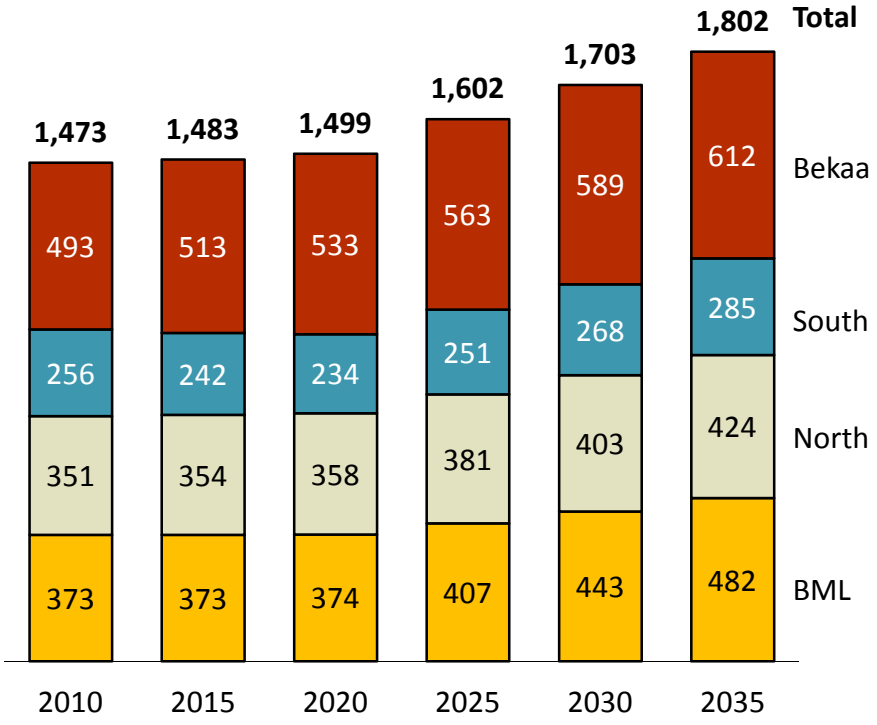
CAGR: Compound Annual Growth Rate

To allow for more flexibility, three scenarios have been considered on the demand side: High Demand, Moderate Demand, Conservative Demand (2/2)

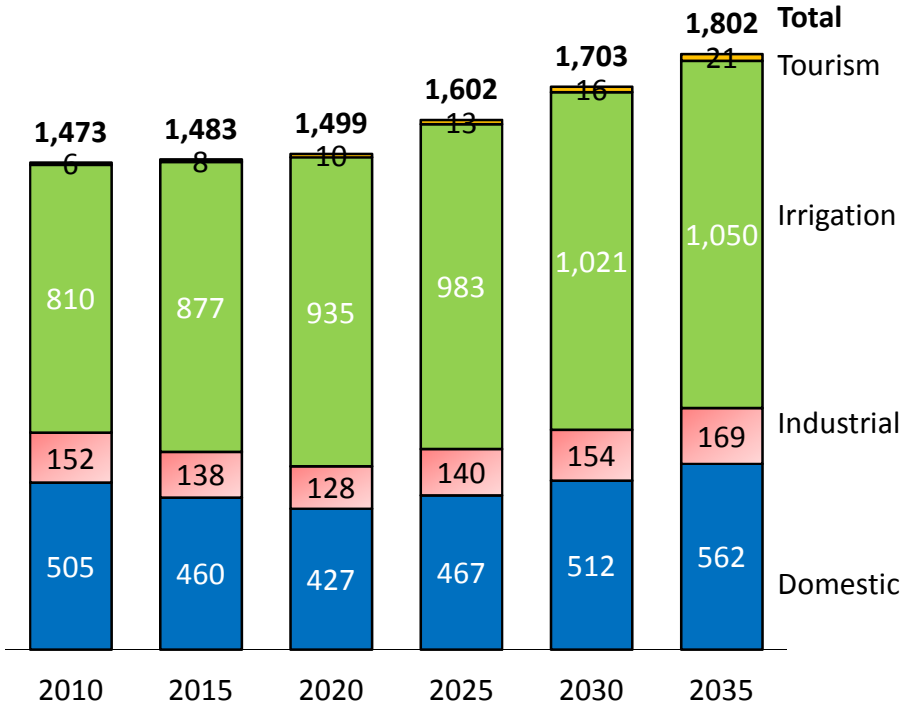
Drivers/Policy Levers	Scenario 1 Conservative Demand	Scenario 2 Moderate Demand	Scenario 3 High Demand
3 Irrigation Growth	**110,000 ha** in 2020 **130,000 ha** in 2035	**120,000 ha** in 2020 **150,000 ha** in 2035	**140,000 ha** in 2020 **180,000 ha** in 2035
4 Impact of Economic Development	Consumption Growth **0.8% per annum**	Consumption Growth **1% per annum**	Consumption Growth **1.2% per annum**
5 Tariff Change	Volumetric tariff introduction in **2012**	Volumetric tariff introduction in **2013**	Volumetric tariff introduction in **2014**
6 Water Conservation	Saving per year from 2011 to 2020 **3.5 lcd**	Saving per year from 2011 to 2020 **3.0 lcd**	Saving per year from 2011 to 2020 **2.5 lcd**
7 Reduction in UfW	Decrease from **48% to 25% by 2020 then to 15% by 2035**	Decrease from **48% to 30% by 2020 then to 20% by 2035**	Decrease from **48% to 35% by 2020 then to 25% by 2035**

Total demand under the moderate demand scenario is expected to reach 1,802 MCM/yr by 2035

Moderate Scenario for Water Demand per Region (in MCM/yr, 2010 - 2035)



Moderate Scenario for Water Demand per Usage (in MCM/yr, 2010 - 2035)

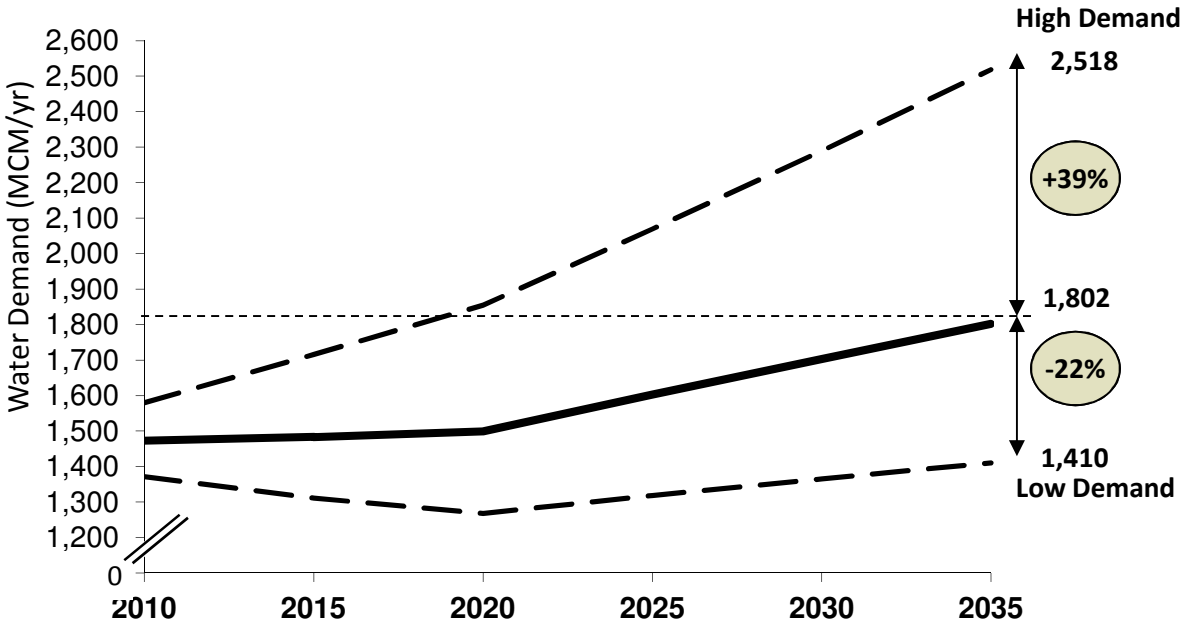


Currently the actual amount of water consumed is different form the demand due to availability and supply constraints

lcd (Urban)	180	174	167	176	185	194
Pop (M)	4.43	4.83	5.26	5.74	6.37	6.82
Irr ('000 ha)	90	105	120	130	140	150

Source: MEW, WEs,

The range between the conservative and high demand scenarios exceeds 60%



Demand Scenarios – Domestic Consumption per Capita (lcd) – Urban Area						
Low (sc. 1)	160	153	145	153	161	169
Mod (sc. 2)	180	174	167	176	185	195
High (sc. 3)	200	195	190	199	209	220

Demand Scenarios – Irrigation Consumption per Hectare (m3/ha/yr)						
Low (sc. 1)	9,000	8,600	8,200	7,800	7,400	7,000
Mod (sc. 2)	9,000	8,600	8,200	7,800	7,400	7,000
High (sc. 3)	9,000	8,800	8,600	8,400	8,200	8,000

Comments

- The range observed between the low and high demand scenarios is the result of different assumptions on the drivers in each of the scenarios
- The main drivers are consumption per capita thresholds, population growth, impact of GDP growth, industrial and irrigation consumption and growth, etc.:
  - Consumption per capita thresholds vary between 140 lcd and 200 lcd
  - Annual average population growth ranges between 1.5% and 2.0% for the low and high scenarios respectively
  - Industrial consumption varies between 25% and 35 %
  - Targets for irrigation areas in 2035 vary between 130,000 and 180,000 ha and consumption between 7000 m3/ha to 8000 m3/ha
  - Targets for UfW in 2035 vary between 15% and 25% for the low and high scenarios respectively

Baseline

Demand/Supply Forecasts

- Demand
- **Supply**
- Demand/Supply Balance
- Infrastructure Forecasts

Sector Enabling Environment

Investment Plan

Strategic Roadmap

Main sources of water in Lebanon include surface water and groundwater while surface storage and non conventional sources are limited

Surface Water

- More than 2,000 springs exist all over Lebanon with varying flows around the year
- Total yield exceeds 1200 MCM in an average year, with less than 200 MCM available during the dry summer months
- Existing surface water resources (springs) are being currently exploited to a large extent by WEs. Limited optimization could be achieved by around 1% per year for the coming 10 years

Groundwater

- Around 650 governmental wells supply WEs throughout the country with potable water. Total volume used in 2009: more than 270 MCM
- More than 43,000 private wells are used for potable water and agriculture. Total volume used in 2009 is feared to be higher than 440 MCM. **Unlike other sources, private wells serve only a portion of the population**
- Although strict policies for groundwater extractions have been initiated, no major reductions in extractions are planned before 2015, planned date for the coming on board of sustainable alternatives. Between 2015 and 2024, private groundwater extractions are to be reduced gradually at a rate of 6%per year with increasing reliance on public wells.
- Ultimately, withdrawals from aquifers should not exceed natural replenishment rate, i.e. 500 MCM/yr

Surface Storage

- Surface storage is mainly concentrated in 2 dams with a total capacity of 235 MCM:
  - Qaraoun Dam: 220 MCM static and 160 MCM (up to 180 MCM) dynamic
  - Chabrouh Dam: 8 MCM static and up to 15 MCM dynamic
- Currently, only 45 MCM are used for WS and irrigation, the rest for hydropower

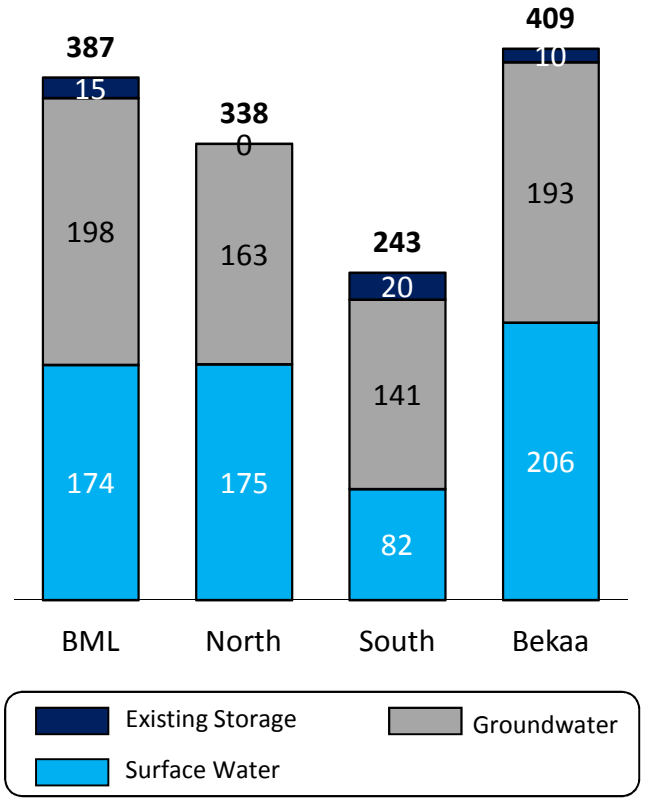
Non Conventional Water

- The average rate of wastewater treatment reached 4% in 2009 – Virtually no reuse is being currently practiced
- Limited desalination is done by private sector (4.5MCM) and EDL (5.5 MCM)
- Additional flows are expected from non conventional sources, but have not been modeled for lack of clarity on available data

Source: MEW, WEs, Ministry of Agriculture

3 scenarios for water resources are studied to balance between the use of groundwater vs. surface storage

Supply per Region, 2010 (MCM/yr)

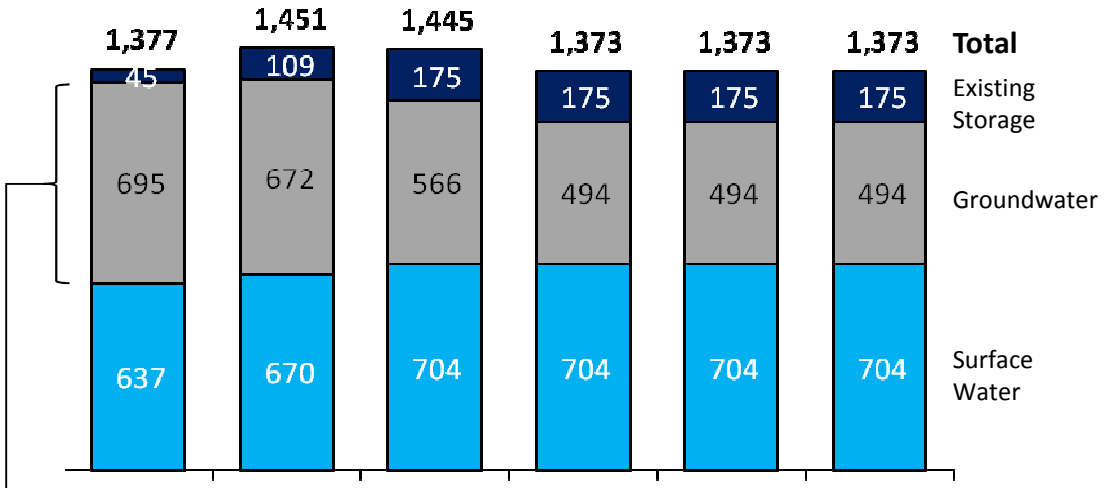


Total Supply: 1,377 MCM/yr
Surface Water: 46%
Groundwater: 51%
Used Storage: 3%

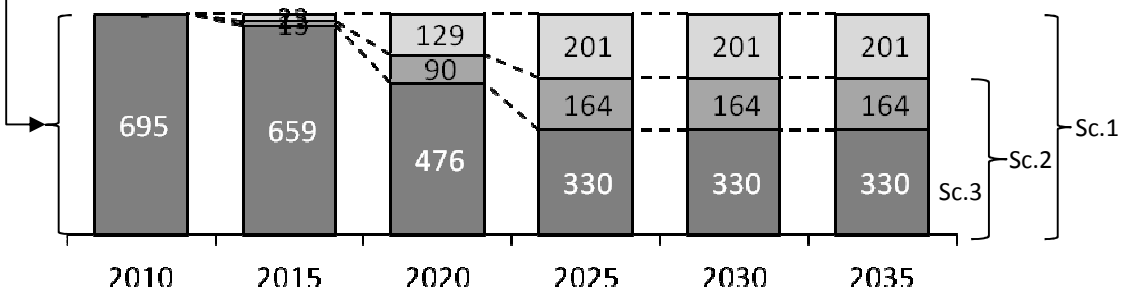
	Scenarios for water resource s
High Groundwater Supply Policy (Sc. 1)	▪ Optimize and fully utilize available renewable surface water capacities ▪ Utilize the full groundwater capacities currently used by MEW/WEs and by the private sector ▪ Provide surface storage to fill the shortage
Moderate Groundwater Supply Policy (Sc. 2)	▪ Optimize and fully utilize available renewable surface water capacities ▪ Utilize a moderate proportion of groundwater capacities currently used by MEW/WEs and by the private sector (up to 90% of the average renewable groundwater resources) ▪ Rely more on surface storage to fill the shortage
Low Groundwater Supply Policy (Sc. 3)	▪ Optimize and fully utilize available renewable surface water capacities ▪ Utilize a low proportion of groundwater capacities currently used by MEW/WEs and by the private sector (up to 60% of the average renewable groundwater resources) ▪ Rely extensively on surface storage

As surface water is limited, the tradeoff between groundwater and surface storage shall be carefully managed to ensure additional needed resources

Split between Surface Water, Groundwater and Surface Storage (in MCM/yr, 2010-2035)



Groundwater Scenarios (in MCM/yr, 2010-2035)



Key Highlights

- Currently exploited storage capacity, 45 MCM:
  - Chabrouh: 15 MCM in BML
  - Qaraoun: fro m the 220 MCM total static capacity (160 MCM dynamic capacity), only 30 MCM are currently exploited: 10 MCM for the irrigation of South Bekaa Phase I (2000 ha) and 20 MCM for Qasmieh - Ras Al Ain irrigation scheme in the South. The rest of the capacity is currently used for hydropower. 110 MCM will be used in the future (2014-2018) for irrigation of South Bekaa Ph II (additional 20 MCM) and, through canal 800, for irrigation (90 MCM) and water supply (20 MCM) in the South
- Groundwater extractions to be reduced to no more than 500 MCM by 2025
- Surface water resources to be optimized to reach around 700 MCM by 2020

Baseline

Demand/Supply Forecasts

- Demand
- Supply
- **Demand/Supply Balance**
- Infrastructure Forecasts

Sector Enabling Environment

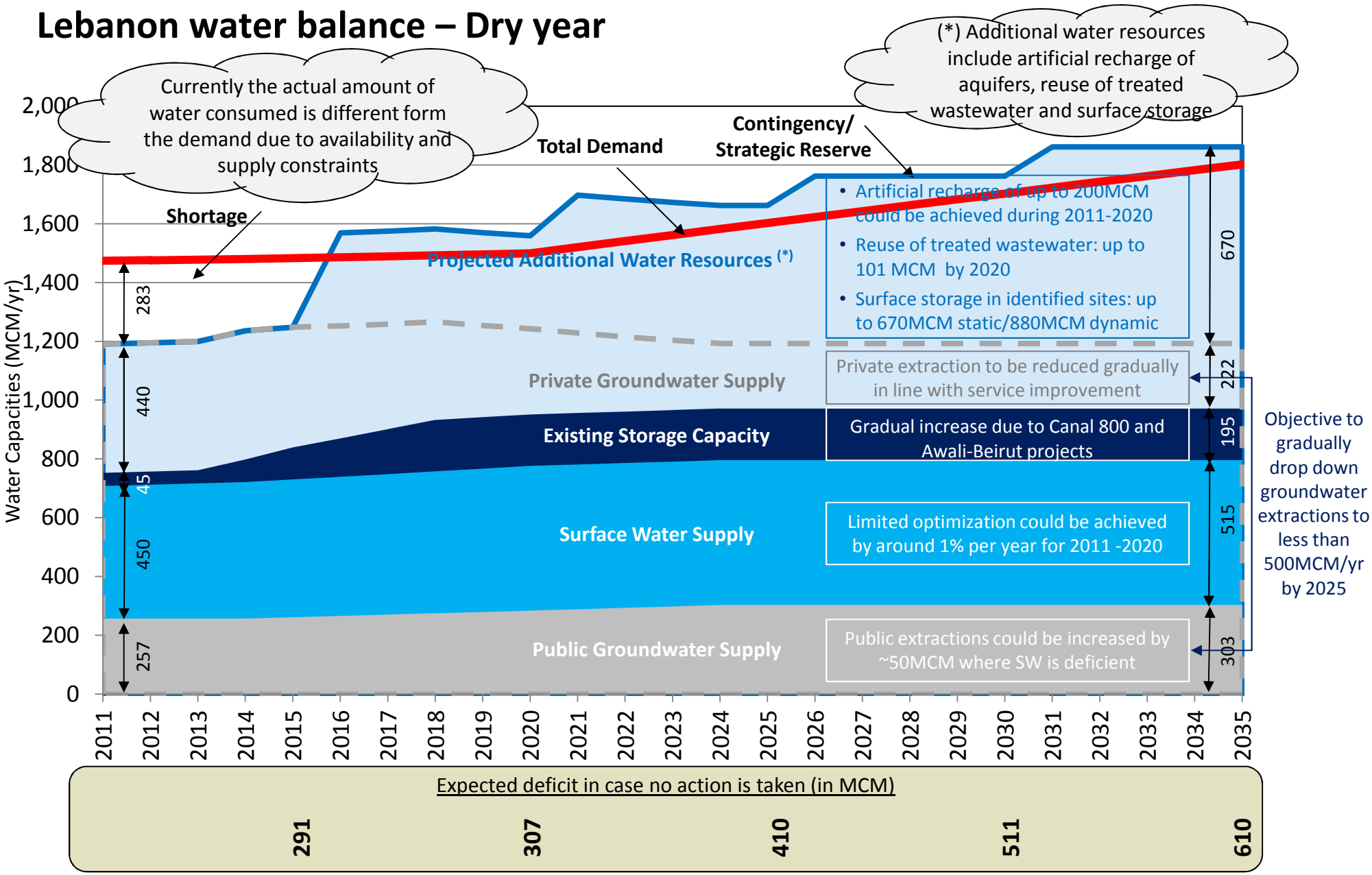
Investment Plan

Strategic Roadmap

Several considerations and assumptions on supply/demand outputs are considered based on hydrology and duration

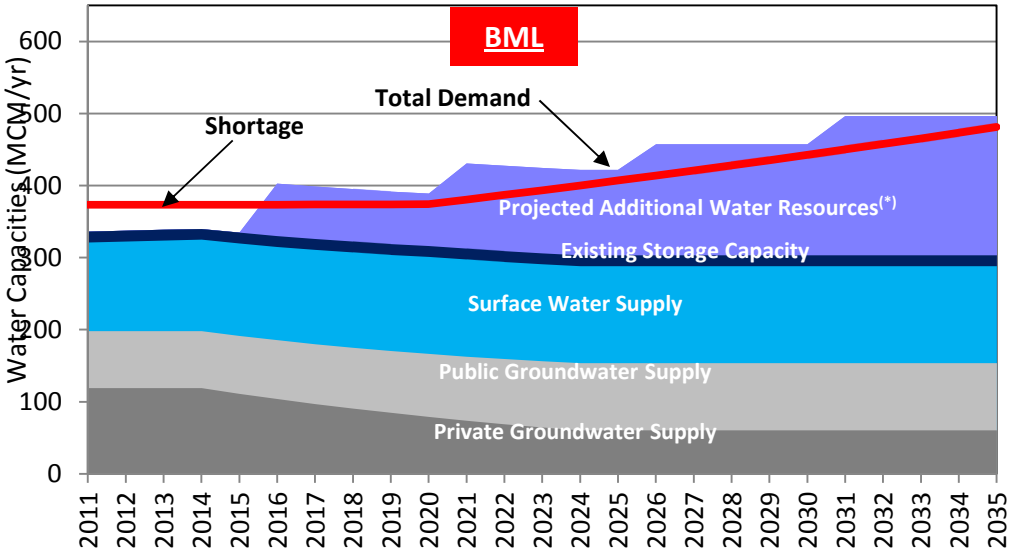
	Average Year	Dry Year
	▪ Total precipitation: 8.6 BCM/yr ▪ Total renewable water resources: 4.1 BCM/yr ▪ Groundwater resources naturally replenished up to 500 MCM/yr	▪ 10 yrs recurrence interval ▪ Precipitation and surface flows < 70% of average year ▪ Available groundwater resources: 80% of average year
Full year	▪ Surface water: 100% of available exploitable throughout the year after optimization ▪ Groundwater: 90 % of annual renewable capacity ▪ Used storage: 100% of full capacity (45 MCM in 2010)	▪ Available surface water: 70% of average year ▪ Available groundwater: 100% of average year ▪ Used storage: 100% of full capacity (45 MCM in 2010)
Summer Months (July – October)	▪ Total demand: ~60% of full year demand (irrigation demand ~70% of full year demand) ▪ Available surface water: 25% of full year ▪ Extracted private groundwater: 70% of full year ▪ Extracted public groundwater: 60% of full year ▪ Used storage: 65% of full capacity	▪ Available surface water: 25% of full dry year ▪ Extracted private groundwater: 70% of full dry year ▪ Extracted public groundwater: 60% of full dry year ▪ Used storage: 65% of full capacity

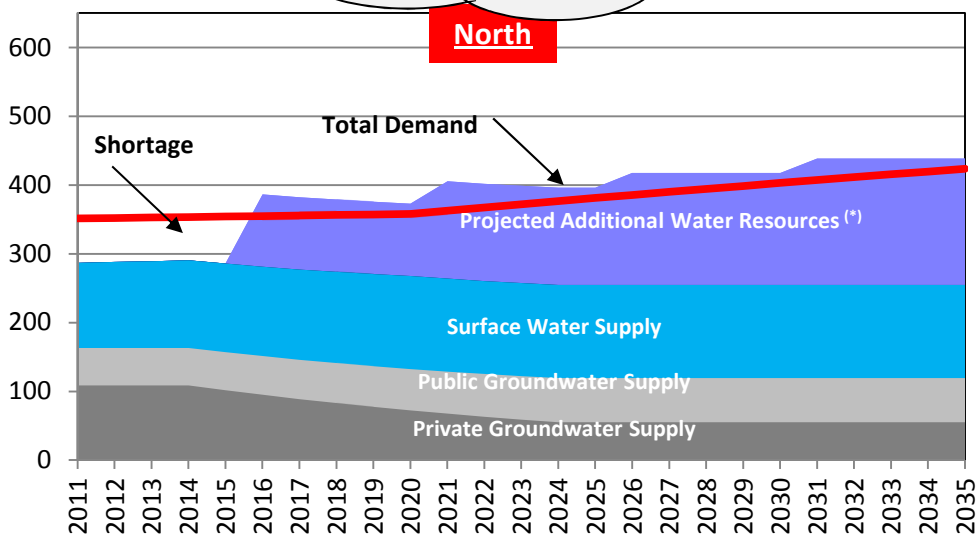
Lebanon water balance – Dry year

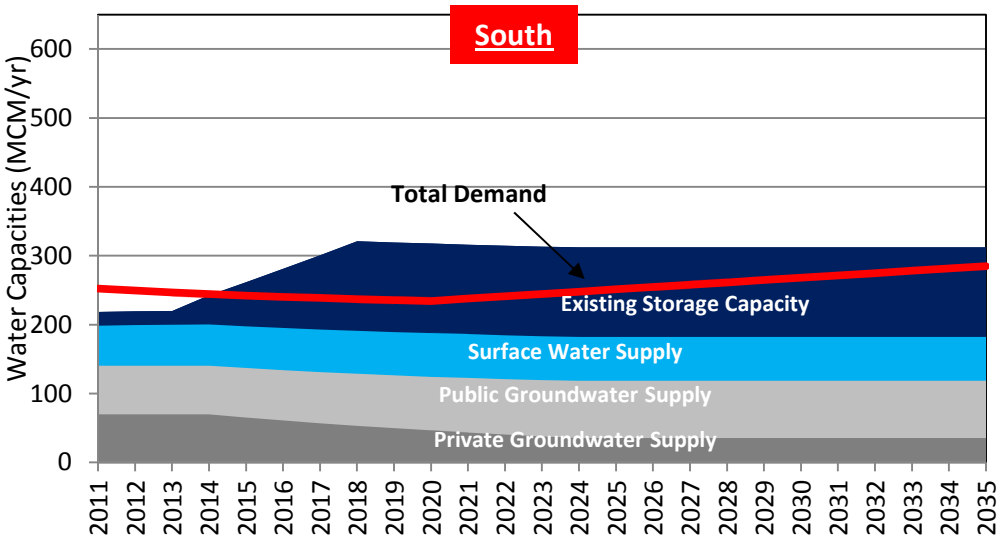


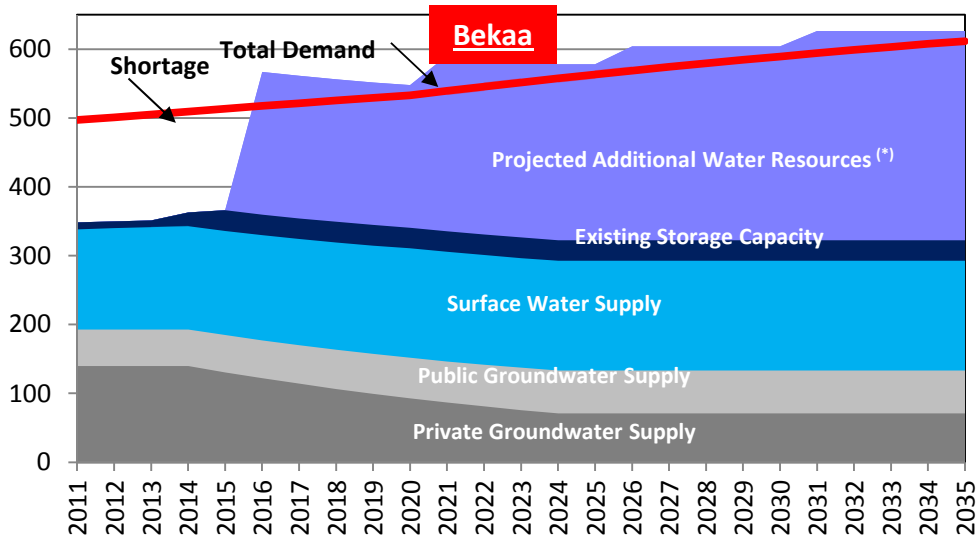
WEs – Dry Year (with projected storage)

(*) Additional water resources include artificial recharge of aquifers, reuse of treated wastewater and surface storage









Baseline

Demand/Supply Forecasts

- Demand
- Supply
- Demand/Supply Balance
- **Infrastructure Forecasts**

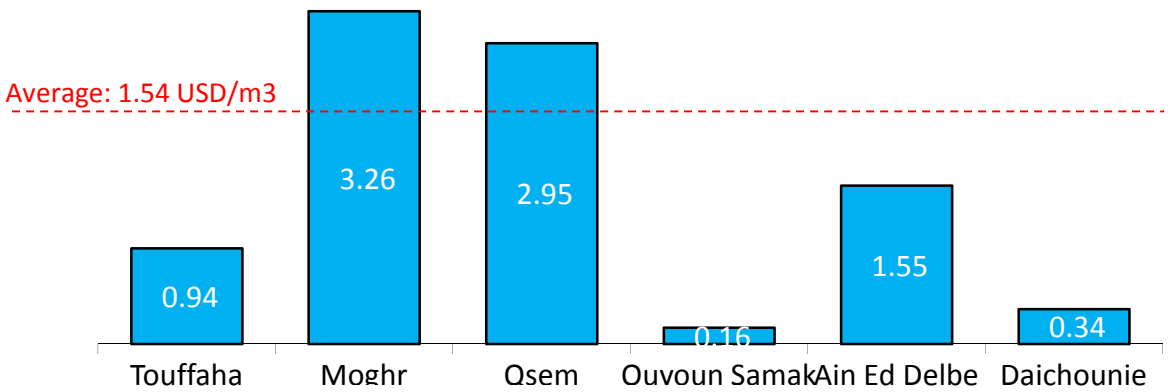
Sector Enabling Environment

Investment Plan

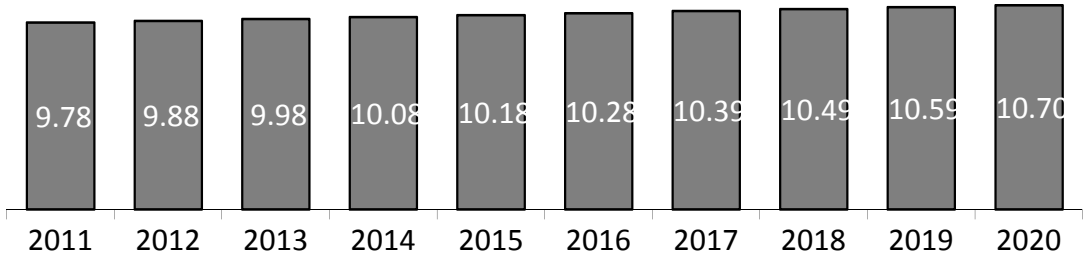
Strategic Roadmap

Outflow of existing surface water resources (springs) will be optimized by around 1% per annum for the period 2011 -2020

Unit Cost of Optimization of Surface Water Resources – Previous Experience (in USD/m3)



Cost of Optimization of Surface Water Resources (in MUSD, 2011-2020)

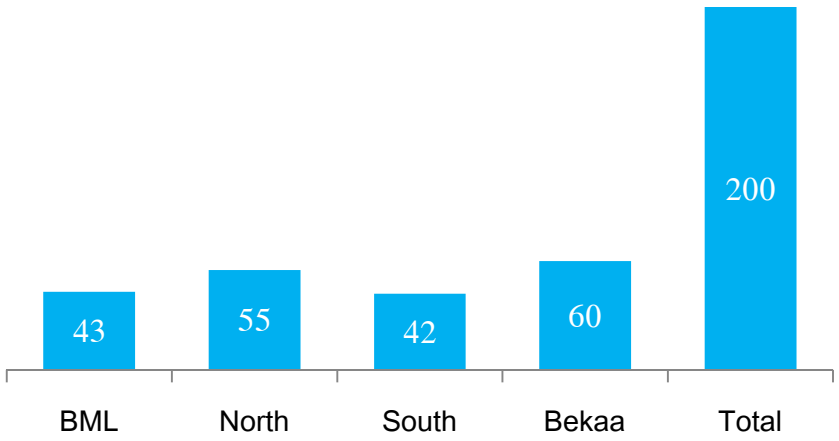


Highlights

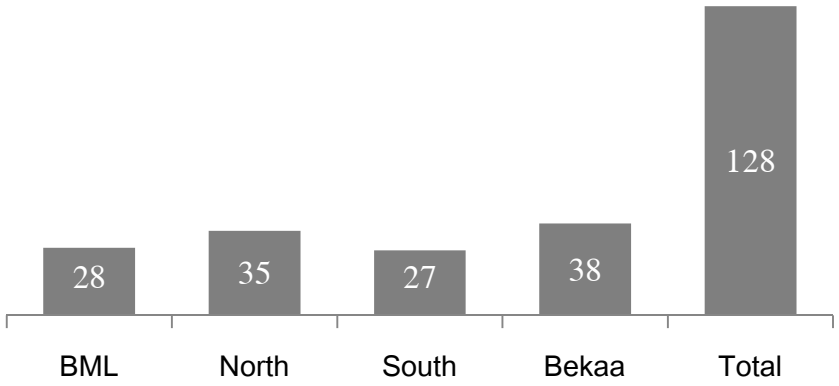
- Existing surface water resources (springs) are being currently exploited to a large extent by WEs
- Previous experience at MEW proved the efficiency of superficial improvement of the catchment of surface water springs
- An increase of 10-15% of the initial flow during the low season was achieved
- Limited optimization could be achieved by around 1% per year for the period 2011 -2020
- **Additional 65 MCM/yr are expected by 2020**

200 MCM of artificial groundwater recharge are targeted at a first stage (2011-2020)

Potential for Artificial Groundwater Recharge (MCM/yr)



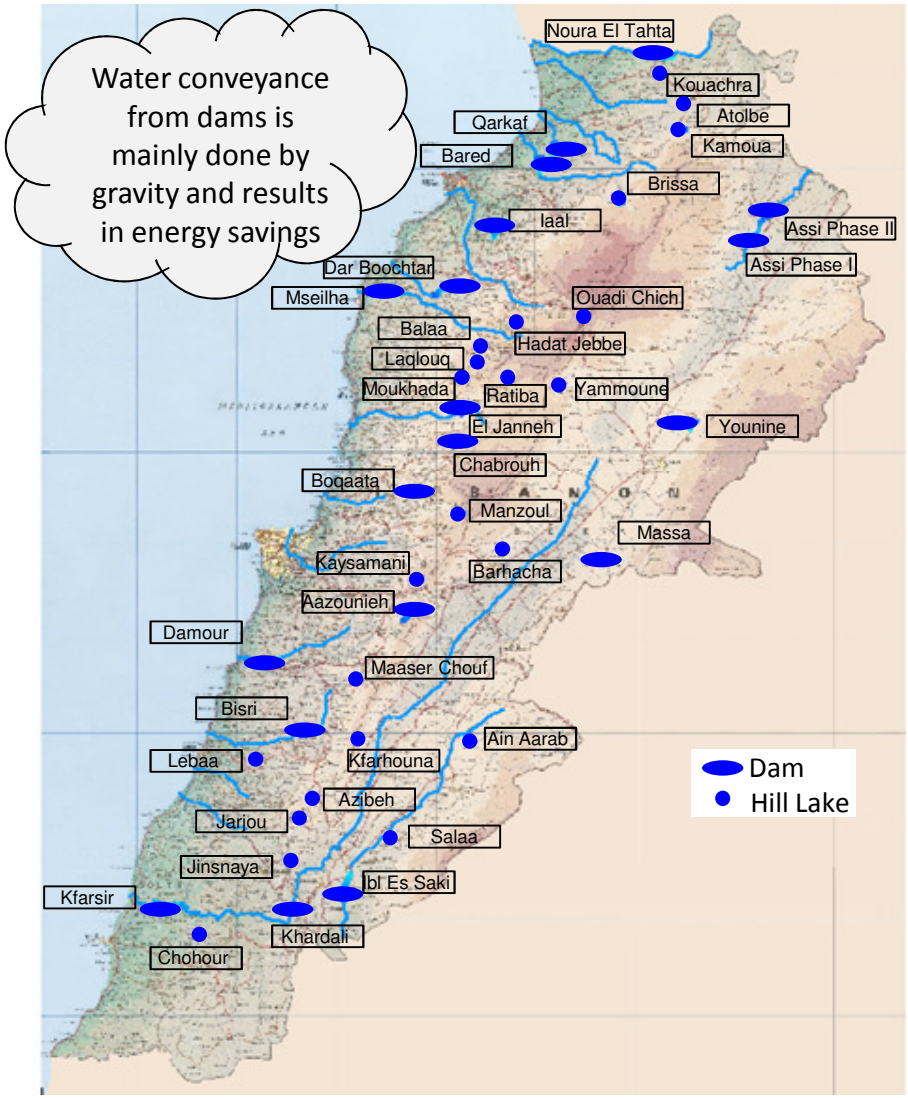
CAPEX Forecast for Artificial Groundwater Recharge (MUSD, 2011-2035)

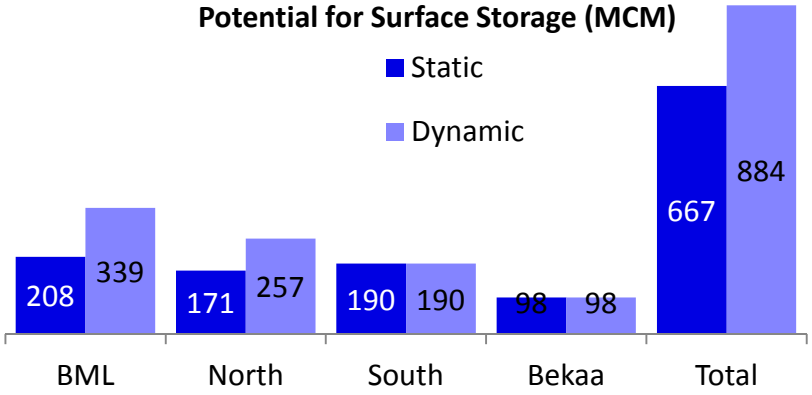


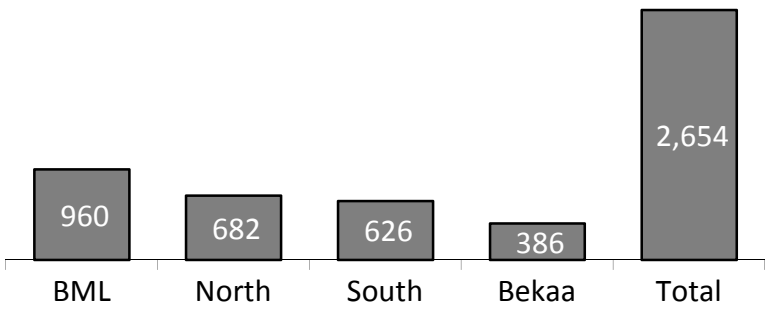
Artificial Groundwater Recharge - Rationale

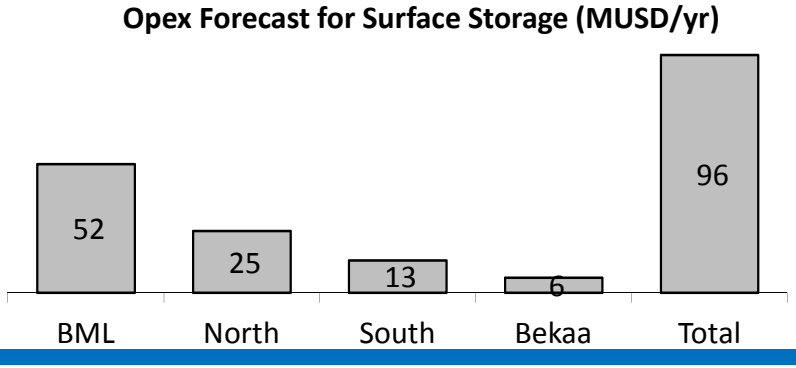
- Groundwater aquifers in Lebanon are highly exploited, mainly in Beirut, Tripoli, South Lebanon and the Bekaa.
- Around 500 MCM/yr are being naturally replenished. Current extractions amount to around 700 MCM/yr leading to a deficit of around 200 MCM/yr. As a result, the water table is depleting with saline water intrusion in coastal areas
- Karstic aquifers are well spread all over Lebanon and contain considerable volumes of water
- Groundwater is a localized resource with no surface evaporation and does not involve large transmission systems
- Artificial recharge is technically feasible in a large portion of the country
- Pilot projects can be started near Beirut, Tripoli and Baalbek. The situation in South Lebanon requires deeper consideration
- Preliminary studies show that each well could have a potential flow of 50-100 l/s during a period of at least 3 months

Up to 670 MCM of static storage (~880 MCM dynamic) can be achieved in identified sites







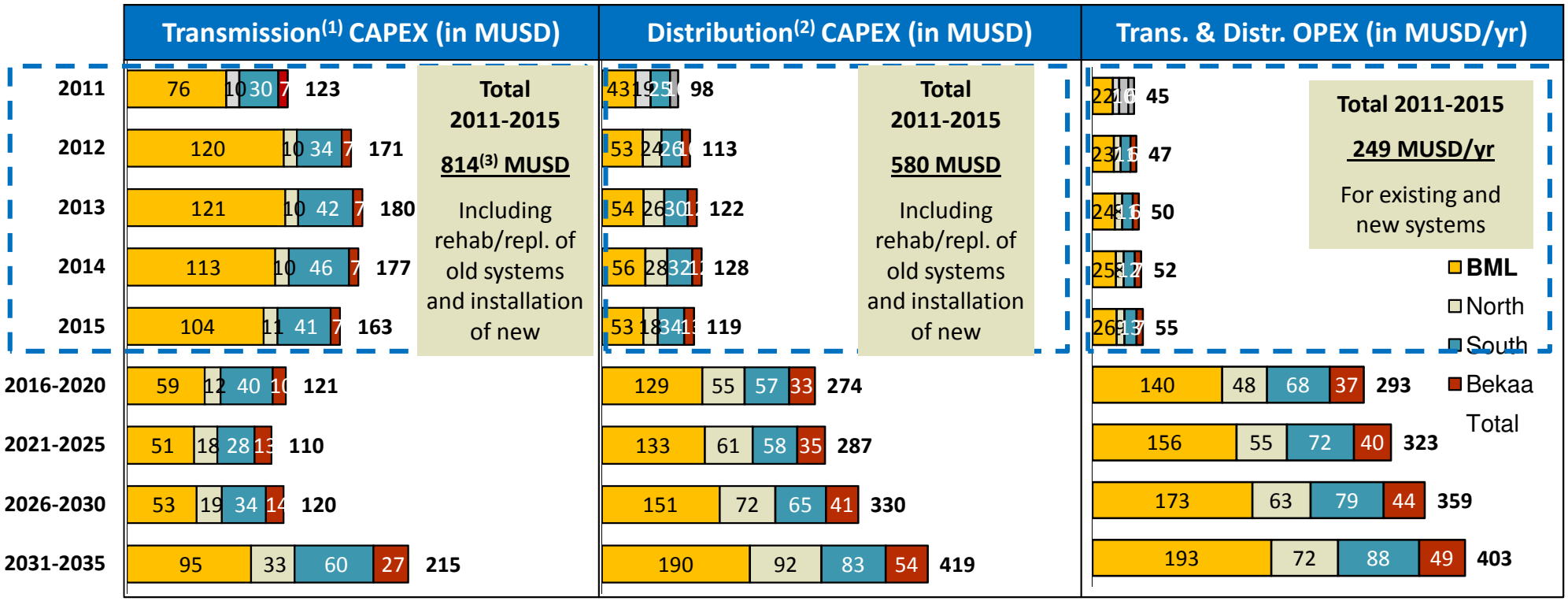


Surface storage potential per WE

Designation of Dam	Static-Dynamic Cap. (MCM)			CAPEX (MUSD)	OPEX (MUSD/yr)
	Total	WS	Irrig.		
Boqaata	6-12	6-12	0.0	69.0	2.3
El Manzoul	0.35	0.35	0.0	15.0	0.2
Bisri	120	120	0.0	265.0	26.4
Kaysamani	1.0	1.0	0.0	25.0	0.3
Aazounieh	4.1-5.0	4.1-5.0	0.0	65.0	1.1
Maaser Chouf	2.2	2.2	0.0	53.0	0.5
Damour	42-106	34-94	8-12	150.0	7.3
El Janneh	30-90	25-75	5-15	300.0	13.2
Moukhada	2.0	2.0	0.0	9.0	0.6
Ratiba	0.3	0.15	0.15	9.0	0.1
Total BML	**208-339**	**195-312**	**13-27**	**960.0**	**52.0**
Bared	37-90	37-90	0.0	144.0	14
Qarkaf	20-25	0.0	20.0-25	81.0	0.5
Kouachra	0.35	0.0	0.35	3.0	0.0
Noura El Tahta	35-50	0.0	35-50	69.0	0.9
Kamoua	1.2	0.0	1.2	25.0	0.1
Atolbe	0.70	0.70	0.0	18.0	0.3
Mseilha	6-12	5-10	1-2	55.0	2.0
Balaa	1.2-2.2	1.2-2.2	0.0	26.0	0.4
Iaal	12-18	9.5-14	2.5-4	69.0	3.2
Brissa	0.8	0.0	0.8	20.0	0.1
Dar Boochtar	55.0	20.0	35.0	150.0	3.0
Ouadi Chich	1.0	0.9	0.1	13.0	0.3
Hadat ElJebbe	0.4	0.4	0.0	9.0	0.1
Total North	**171-257**	**75-138**	**96-119**	**682.0**	**25.0**

Designation of Dam	Static-Dynamic Cap. (MCM)			CAPEX (MUSD)	OPEX (MUSD/yr)
	Total	WS	Irrig.		
Kfarhouna	1.2	0.0	1.2	17.0	0.1
Lebaa	0.8	0.0	0.8	15.0	0.1
Azibeh	0.6	0.0	0.6	13.0	0.1
Jarjou	0.5	0.5	0.0	19.0	0.3
Chohour	0.56	0.56	0.0	22.0	0.3
Jinsnaya	0.95	0.95	0.0	15.0	0.2
Ibl Es Saki	50	15.0	35.0	200.0	3.9
Khardali	120	20.0	100.0	280.0	6.4
Kfarsir	15	3.0	12.0	45.0	1.8
Total South	**189.6**	**40.0**	**149.6**	**626.0**	**13.1**
Yammouneh	1.5	0.0	1.5	Under construction	0.1
Younine	5.8	5.8	0.0	66.0	1.5
Assi Phase I	63	0.0	63.0	50.0	1.3
Assi Phase II	15	0.0	15.0	141.0	0.8
Barhacha	0.55	0.55	0.0	37.0	0.6
Ain Aarab	2.0	2.0	0.0	21.0	0.5
Salaa	2.5	2.5	0.0	36.0	0.6
Massa	8.0	1.5	6.5	35.0	0.8
Total Bekaa	**98.4**	**12.4**	**86.0**	**386.0**	**6.0**

Infrastructure forecasting – Water supply transmission & distribution

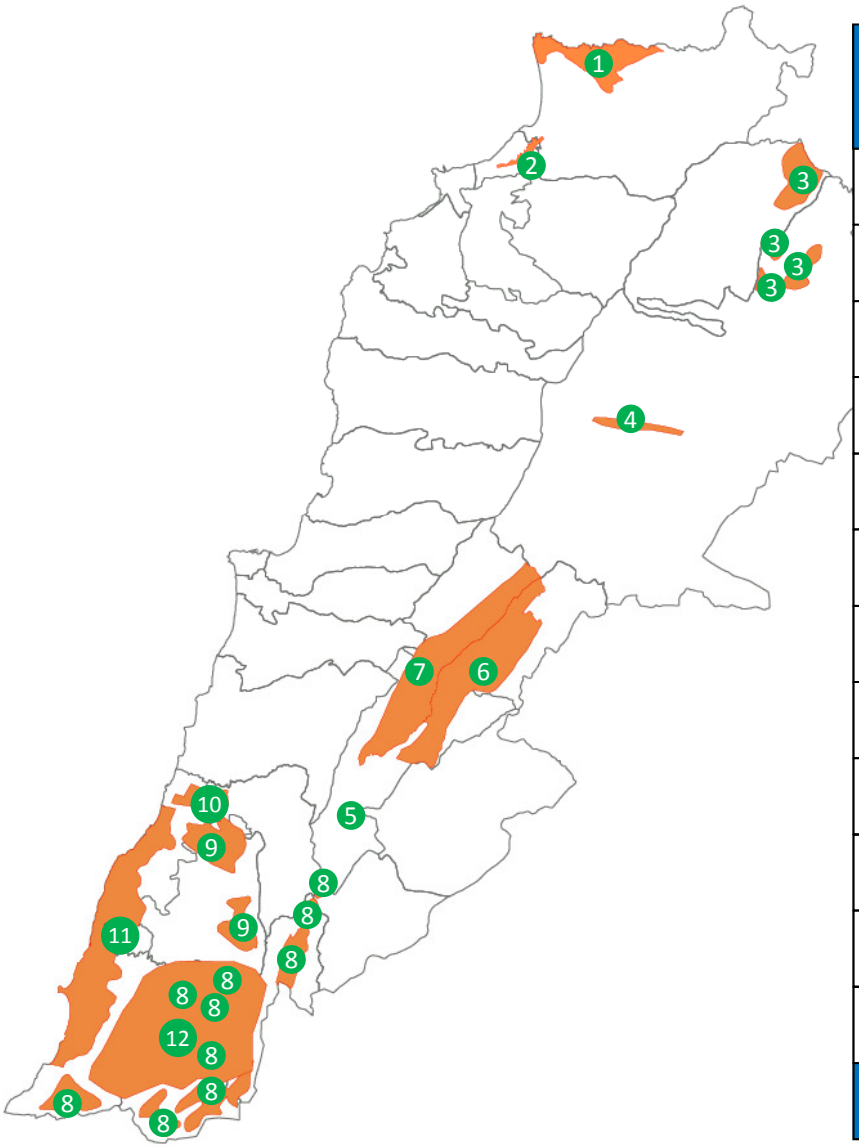


Highlights

- CAPEX in first five years are relatively high because of efforts to replace existing over-age assets. More than 50% of existing transmission and distribution assets have reached the end of their useful life
- High Transmission CAPEX for BML and South in 2011-2015 relates to the execution of Awali-Beirut and Canal 800 (WS share only)
- Storage targets to achieve 0,5 and 1 day retention time for BML and other WE's respectively
- Metering targets until 2015 in BML 95%, in North/South 85% and Bekaa 75%. Total meter installation over 1 Million in 2011-2020

Note: (1) Includes bulk meters and storage tanks, (2) includes customer meters, (3) includes CAPEX for Awali-Beirut and Canal 800 conveyors (WS share)

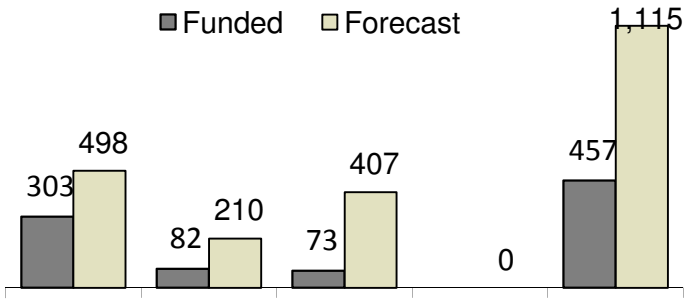
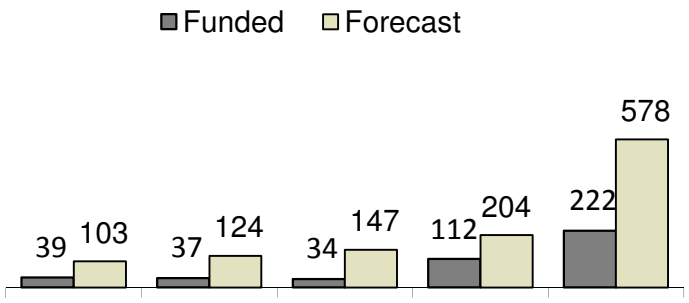
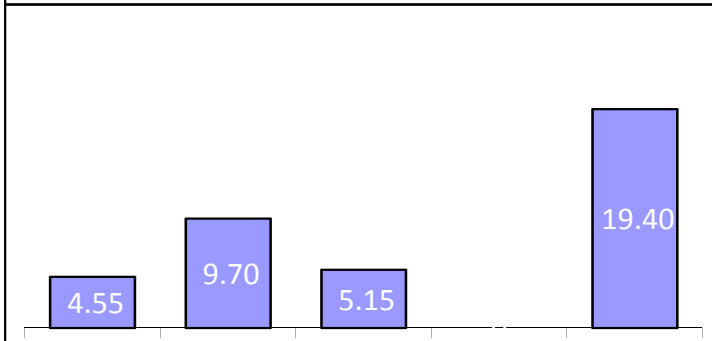
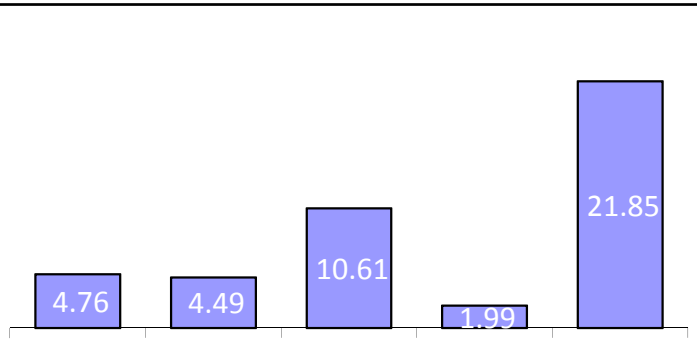
Infrastructure forecasting – Irrigation



Designation	Area (ha)	Commissioning		CAPEX (MUSD)	OPEX (MUSD/yr)
		Before 2020	After 2020		
1 Noura Et Tahta Scheme	5,000	✓		58	1.2
2 El Bared Scheme	750	✓		6	0.2
3 Assi River Basin	5,400	✓		170	2.8
4 Younine Scheme	1,550	✓		28	0.6
5 Southern Qaraoun Irrigation Project	500		✓	8	0.25
6 South Bekaa (Phase 2), Left Bank	6,700	✓		60	1.25
7 South Bekaa, Right Bank & North	12,800		✓	35	0.7
8 South Lebanon-Conveyor 800	14,700	✓	✓	255+255	5.2
9 Conveyor Anane-Nabatieh	3,500		✓	145	2.6
10 Saida-Jezzine Project	1,200		✓	8	0.25
11 Qasmieh-Ras El Ain (Phase 2)	2,100		✓	22	0.5
12 Khardale	9,000		✓	220	3.8
Total	**63,200**	**31,600**	**31,600**	**1,040**	**18.35**

Source: MEW

Infrastructure forecasting – Wastewater

	Coastal Systems	Inland Systems	Comments
CAPEX (in MUSD)			▪ Networks for coastal treatment plants and inland plants are already funded by CDR
OPEX (in MUSD)			

Assumptions

- Schemes that are currently partly funded will be funded and completed and will become operational by 2015
- Schemes that are currently unfunded will be implemented between 2013—2020
- It is estimated that remaining areas not covered by the identified schemes would require around 500 million US$ and will be implemented between 2013-2020

National Water Sector Strategy

"A right for every citizen, a resource for the whole country"





LEBANESE REPUBLIC
MINISTRY OF ENERGY AND WATER

Eng. Gebran Bassil
Ministry of Energy and Water (Date 27/12/2010)
Lebanese Government (Resolution No. 2, Date 09/03/2012)

Baseline

Demand/Supply Forecasts

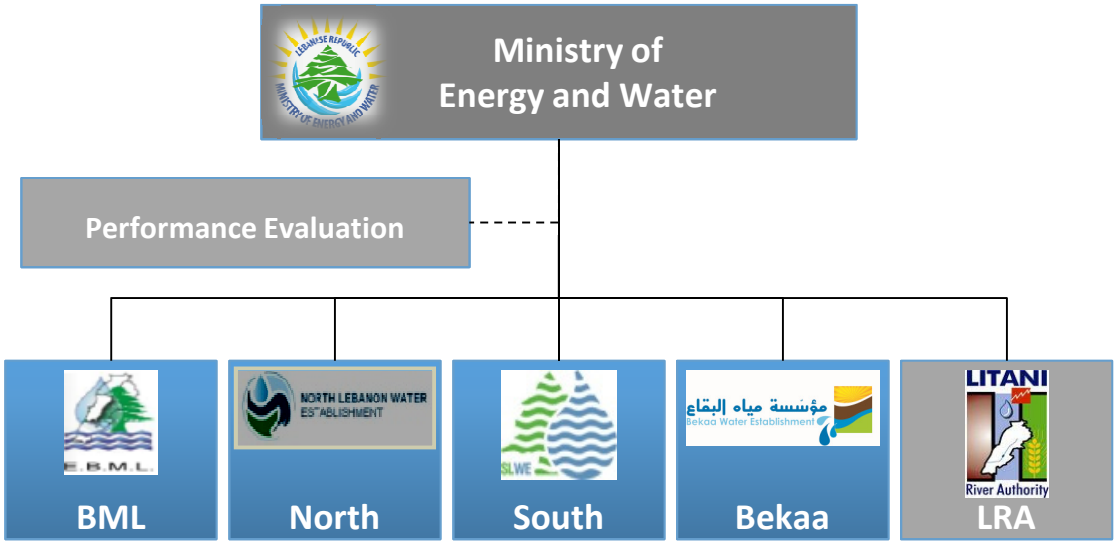
Sector Enabling Environment

- **Institutional and Organizational Initiatives**
- Financial and Commercial Initiatives
- Legal and Regulatory Initiatives
- Environmental Concerns

Investment Plan

Strategic Roadmap

Roles and responsibilities in the water sector are well defined in Law 221 …



Role of Water Establishments According to Law 221(*)

a. Design, implement, operate and maintain potable and irrigation distribution projects based on national master plan and resources allocated by MEW
b. Collect, treat and dispose of wastewater based on treatment and outfall sites approves by MEW
c. Propose water supply, irrigation and wastewater tariffs
d. Monitor water quality for distributed water supply and irrigation

Role and Modus Operandi of Performance Evaluation Committee

To be determined by joint decision of ministers of Energy & Water and Finance

Role of the Ministry of Energy and Water (Law 221)

1. Monitor, control, measure, study water resources, and estimate water needs
2. Monitor the quality of surface and groundwater and set quality standards
3. Develop and update a national masterplan for the allocation of potable and irrigation water resources, and develop a wastewater masterplan
4. Design and implement large water infrastructure projects
5. Perform artificial recharge of ground water aquifers and monitor extractions
6. Develop legal framework and procedures to protect water resources from pollution and improve water quality
7. Issue permits for water prospection and use of public water and property
8. Conduct and update hydro-geological studies and research, and collect technical water data
9. Monitor and regulate WEs and other entities working in the water sector
10. Enhance and monitor WE performance of according to indicators set in their business plans
11. Set standards and regulations for (i) studies and project execution, (ii) surface and groundwater exploitation and wastewater; and (iii) water quality monitoring
12. Perform expropriation transactions for MEW and WEs
13. Provide opinion on permits related to mines and quarries and impact on water resources
14. Ensure public relations and provide relevant information related to water conservation

Source: Law 221/2000 and its amendments
Note: (*) Applies to BML, North South and Bekaa WEs but does not fully apply to LRA

… where MEW is in charge of policy making, national planning and water resource management, while WEs will ensure service provision

	Description of Responsibilities	MEW	WEs
Policy Making	▪ Definition of sector policy, institutional roles and sector structure ▪ Enactment of legislation and regulation ▪ Development of investment and subsidy policies	✓	
Planning	▪ Establishment of long term consolidated planning for water, irrigation and wastewater ▪ Evaluation of infrastructure and investment requirements	✓	✓
Conservation/ Resource Management	▪ Allocation of resources across regions e.g., water reuse ▪ Identification and promotion of water conservation campaigns	✓	
Regulation	▪ Issuance of regulations ▪ Enforcement of regulations and standards for cost recovery, service quality, and consumer relations ▪ Review and approval of tariff adjustment in accordance with rules and regulations	✓	
Business Operation	▪ Provision of services including billing and collection ▪ Maintenance and renewal of infrastructure ▪ Funding and execution of investment programs		✓

All the deficiencies in the implementation of Law 221 will be addressed

Main Implementation Deficiencies of Law 221

▪ The implementation of the reform law	▪ Initiated but not fully concluded
▪ The transfer of functions to the four WEs	▪ Subject to several delays
▪ Administrative and financial autonomy of WEs	▪ WEs not yet fully empowered
▪ The legal text to organize the work of MEW	▪ Has not been developed yet
	▪ MEW still dedicated to projects/O&M
▪ Availability of funds and technical staff	▪ WEs still suffer from shortage
▪ Performance monitoring of WEs	▪ Not yet enforced

Initiative # II.1

1.1. Perform all priority actions required to complete the restructuring of WEs and address potential limitations, mainly:

- Development of revised and improved organization structures for WEs based on roles and responsibilities
- Drafting revised WE organization bylaws, supporting in the approval process and following up on their enactment
- Implementation of the restructuring of WEs
- Evaluate the potential for efficient outsourcing of certain non-core functions
- Providing needed support for WEs to gradually reach full administrative and financial autonomy

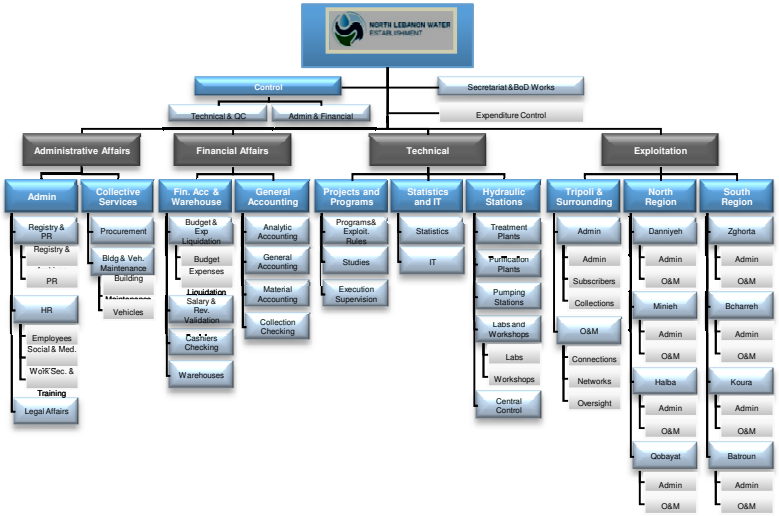
1.2. Improve on the operating model between WEs and MEW to ensure an integrated water resource management, mainly through:

- Improvement in coordination
- Ensuring an integrated management of water resources
- Providing operational and financial empowerment of WEs together with proper mechanisms for performance management
- Ensuring the involvement of WEs in project planning and implementation

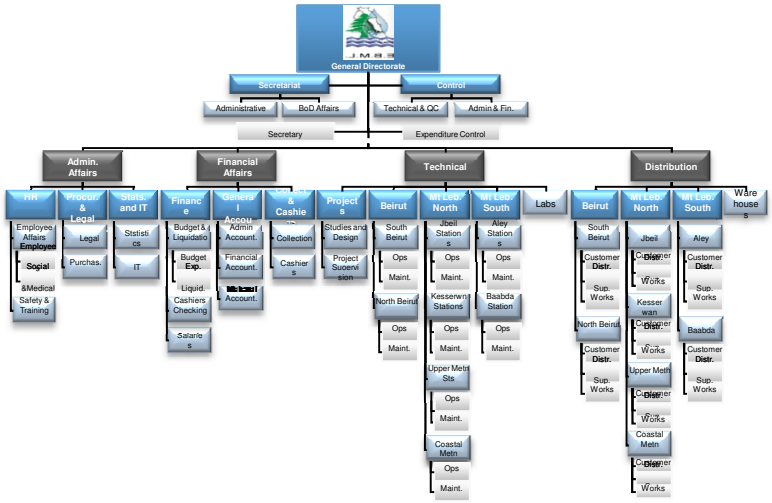
Organization structures of WEs will be reviewed for an improved performance

To date, LRA still doesn't have an organization structure

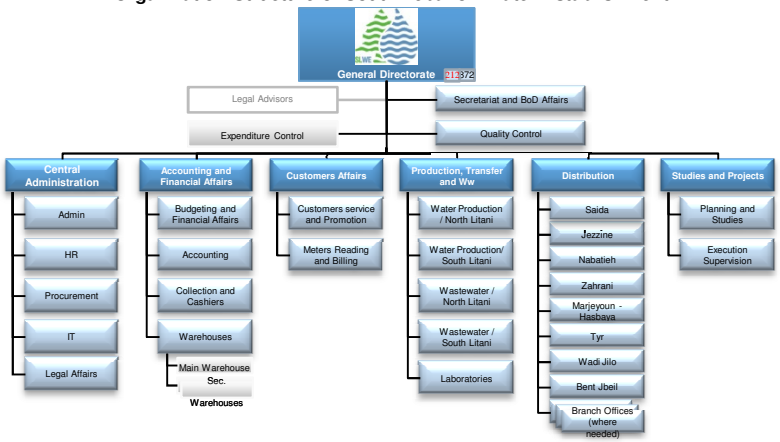
Organization Structure of North Lebanon Water Establishment



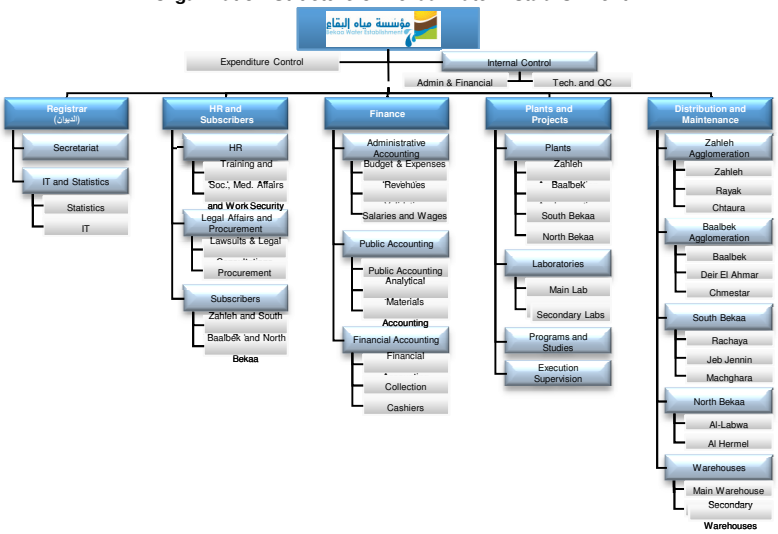
Organization Structure of Beirut & Mount Lebanon Water Establishment



Organization Structure of South Lebanon Water Establishment



Organization Structure of Bekaa Water Establishment

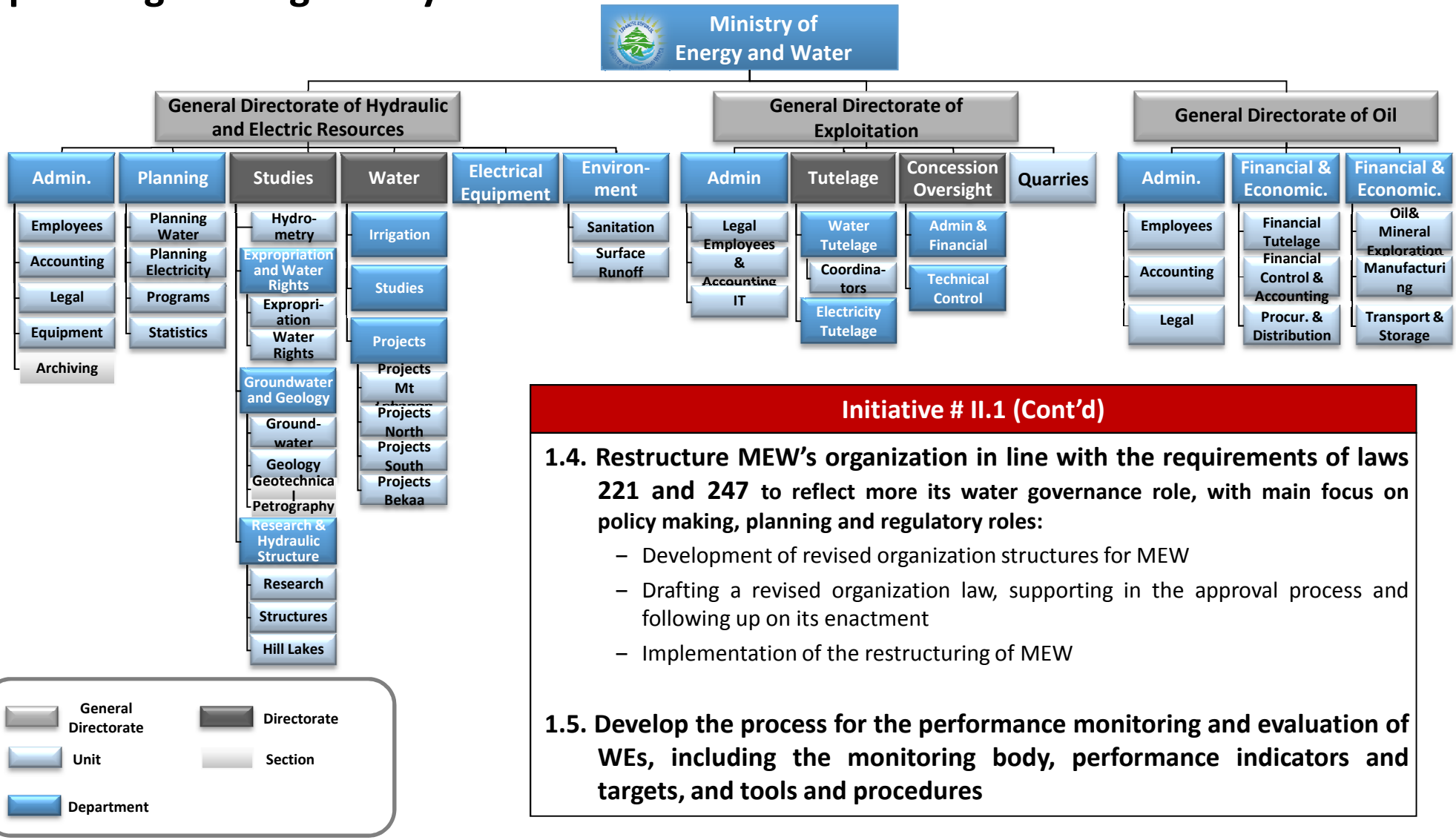


Initiative # II.1 (Cont'd)

1.3. Improve on the performance of WEs to reflect:

- More focus on irrigation and wastewater responsibilities, in addition to current water supply activities
- Most suitable organization for technical functions i.e. operation, maintenance for production, transmission and distribution
- Improvements to support functions e.g., Strategic Planning and Business Planning, Water Demand Management, performance management, more focus on IT, Fixed Asset Management, Supply Chain Management, HRM, Customer Service, Control and Audit functions

MEW's organization will be restructured with main focus on policy making, planning and regulatory roles



Initiative # II.1 (Cont'd)

1.4. Restructure MEW's organization in line with the requirements of laws 221 and 247 to reflect more its water governance role, with main focus on policy making, planning and regulatory roles:

- Development of revised organization structures for MEW
- Drafting a revised organization law, supporting in the approval process and following up on its enactment
- Implementation of the restructuring of MEW

1.5. Develop the process for the performance monitoring and evaluation of WEs, including the monitoring body, performance indicators and targets, and tools and procedures

Manpower needs and training requirements will be assessed to ensure optimal management of the sector

Initiative # II.1 (Cont'd)

1.6. Provide the required manpower levels and capabilities to ensure an appropriate operation and maintenance of assets and the delivery of water at optimal service levels, through the:

- Staffing of MEW and WEs to required manpower levels according to recommended organization structures
- Exploring outsourcing potential
- Continuous development of staff through proper training

- Perform bottom-up manpower planning based on workload drivers, requirements and current and forecasted workload volumes for each activity according to recommended organization structures
- Assess gaps given current number of employees
- Assess capabilities of MEW and WE staff and identification of training requirements

Assess the needs of MEW and WEs for additional staff and training of exiting personnel

Recruitment

- Develop a staff selection process to fill gaps where applicable for permanent and non-permanent (contract based) employees
- Develop job description for each required position
- Advertise for position
- Screen CVs, shortlist and select candidates for interview
- Conduct relevant procedures, evaluate and communicate decision

Transfers Across Entities

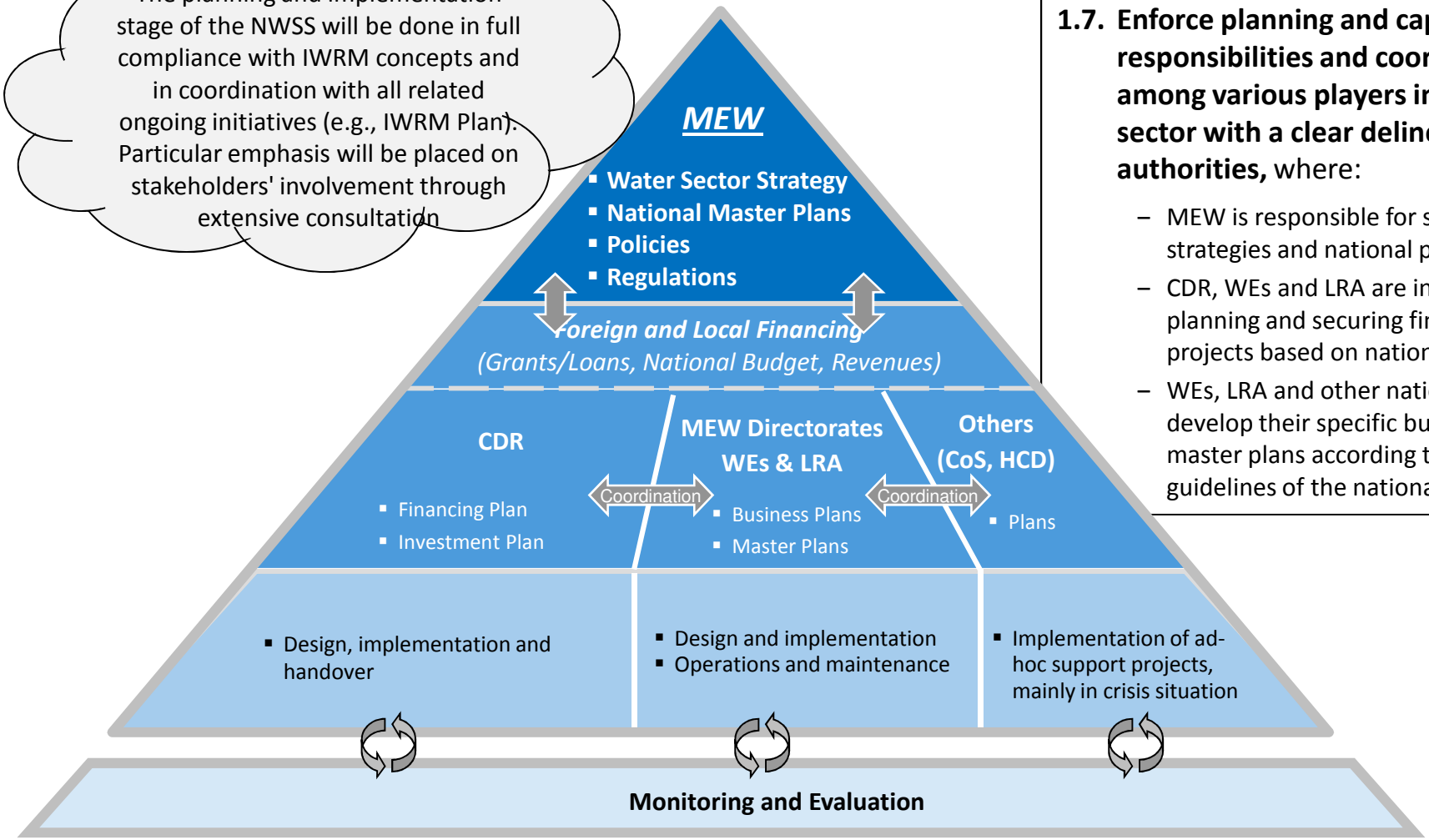
- Assess possibilities for transfer form other entities
- Screen CVs and valuate potential candidates for required position
- Conduct interview, evaluate and communicate decision

Training

- Generate an up to date training course list for use in the training needs
- Develop training budget, curricula & calendar
- Provide training courses
- Complete the course evaluation s and provide feedback

Allocation of planning and capital spending responsibilities among the various players in the sector will be clearly defined

The planning and implementation stage of the NWSS will be done in full compliance with IWRM concepts and in coordination with all related ongoing initiatives (e.g., IWRM Plan). Particular emphasis will be placed on stakeholders' involvement through extensive consultation

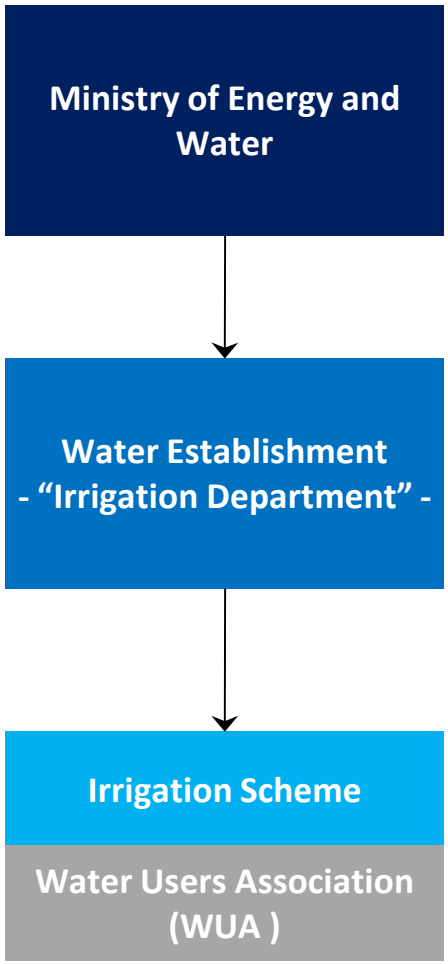


Initiative # II.1 (Cont'd)

1.7. Enforce planning and capital spending responsibilities and coordination among various players in the water sector with a clear delineation of authorities, where:

- MEW is responsible for setting policies, strategies and national planning
- CDR, WEs and LRA are in charge of planning and securing financing of capital projects based on national plans
- WEs, LRA and other national entities develop their specific business plans and master plans according to policies and guidelines of the national plan

The management of the irrigation sector will be addressed to ensure sustainability and improve cost recovery



- Water resource provision and allocation
- National irrigation master plan
- Policy making
- Large civil works

- O&M of main canals, intake structures and pumping stations often well above the farmers' capacities
- Assistance to WUAs in the O&M of irrigation schemes, especially those which are in bad state of repair

- O&M of scheme at the secondary and tertiary levels
- Collection of water fees
- Payment of fees to the WE responsible for providing the bulk water and other services
- Water quality management and pollution control

Initiative # I.1 (Cont'd)

1.8 Involve stakeholder participation in the design and management of projects to ensure sustainability according to best practices, through:

- Creation of formal Water Users Associations (WUAs) to replace the different organizations currently in charge of O&M of irrigation schemes
- Definition of roles and responsibilities with respect to water management (including water quality) of the WUAs and other partners, in close cooperation with the intended beneficiaries
- Providing well-focused training related to the establishment and management of WUAs to all involved parties

1.9 Improve irrigation water demand management and cost recovery, and sustainability of irrigation schemes, through:

- Adjustment of irrigation water tariffs to cover O&M costs at a first stage, and periodically review and adjust water tariffs to reflect actual costs (refer to Tariff Initiatives in next slides)
- Basing water charges on volume of water used rather than area. Where metering is not feasible at this time, base water charges on a combination of a fixed charge to cover the basic services, and other charges which can be used as a proxy for the volume of water used, such as crop grown and/or hourly use of water
- Carrying out periodic public awareness campaigns to inform policy makers and farmers of water shortages that could be faced, and the need for conserving irrigation water

Baseline

Demand/Supply Forecasts

Sector Enabling Environment

- Institutional and Organizational Initiatives
- **Financial and Commercial Initiatives**
- Legal and Regulatory Initiatives
- Environmental Concerns

Investment Plan

Strategic Roadmap

Tariffs structures will be reviewed to reflect value for real consumption and provide incentives for water saving

Key Highlights of Current Tariff Structures

Water Supply
- Lebanon is one of the very few countries still adopting a flat tariff structure
- Volumetric charges prevented by lack of meters
- Lack of volumetric charges limiting conservation incentives at the consumer level, and production/leakage reduction incentives at the WE level
- Increased reliance on expensive private providers

Irrigation
- The largest water consumer, with very limited metering, preventing volumetric charges
- Lack of awareness on water consumption and conservation
- High reliance on undeclared groundwater
- Collection not performed effectively by WEs

Wastewater
- Tariff not yet applied, leading to a lack of incentive for limiting pollution

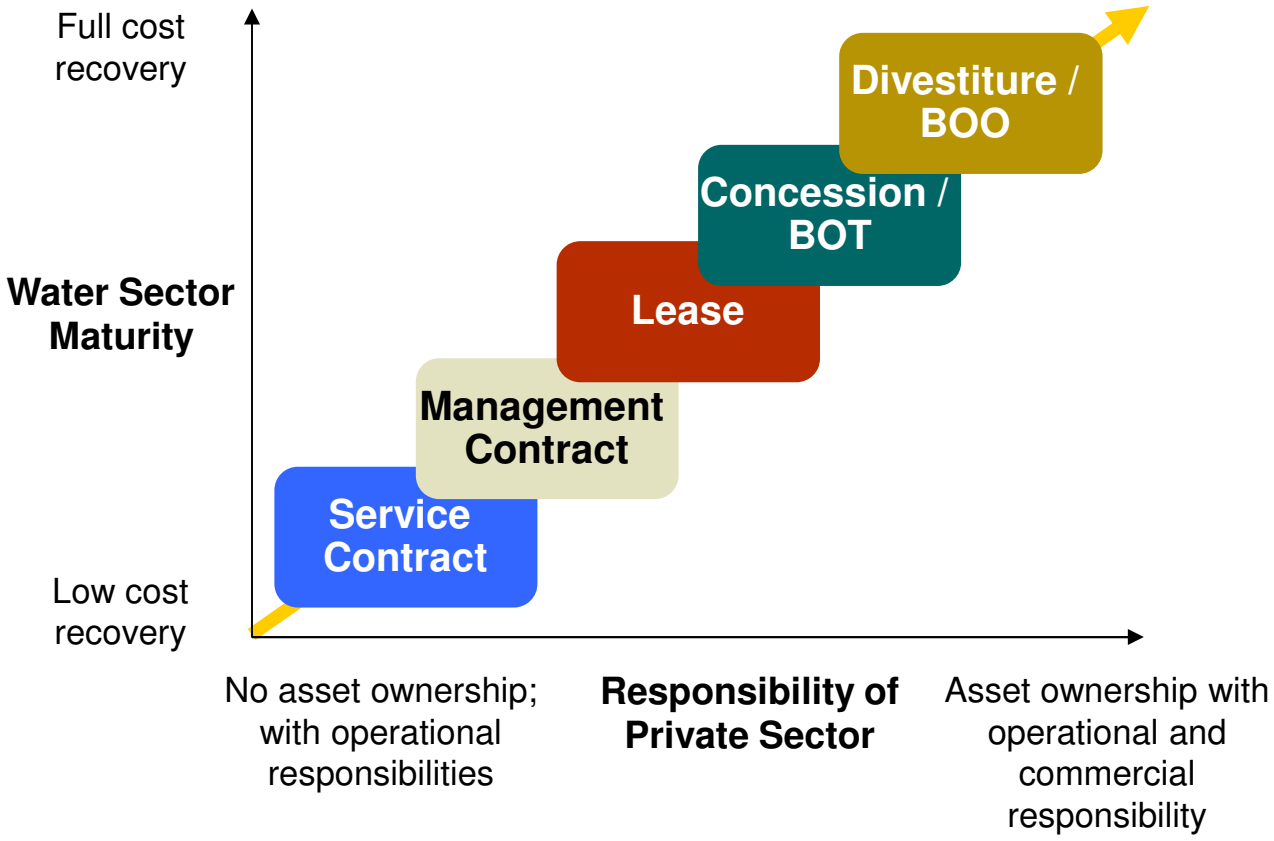
Initiative # II.2

2.1. Water Supply
- **Implement a new consumption-based tariff which includes fixed and variable (volumetric) charges for connections equipped with customer water meters**, where:
  - Current lump-sum tariff should be temporarily maintained for unmetered customers
  - No tariff increase would be introduced before concrete improvements are brought to the water sector (i.e. 2014)
  - Any future tariff increase should be based on a proper cost analysis to cover, at a minimum, O&M cost in 2014 as a first stage

2.2. Irrigation
- **Design and implement alternative irrigation tariff structures based on the specificities of existing and projected irrigation schemes**, where volumetric metering would be the preferred solution wherever possible

2.3. Wastewater
- **Apply a new wastewater tariff to customers connected to a sewer network and to a WWTP**, where:
  - New tariff should be based on a proper cost analysis and cover at a minimum O&M cost in an intermediate stage, with an introductory tariff initially in pilot areas where full service (collection and treatment) is available
  - Wastewater charges to be introduced as a percentage of water bill

Different options for Private Sector Participation (PSP) will be considered according to sector maturity



Highlights

- Given the current efficiency levels and low tariff collection, Management Contract would be a common starting point for PSP in the downstream sub-sector. It would prepare WEs for more advanced forms of PSP
- Production/ Upstream is typically a more mature sub-sector and is suitable for more advanced PPP schemes (e.g., dams, WWTPs)

While PSP is likely to be one of the main enablers of improvement, it should be supported by a holistic reform approach

1. **Select and implement suitable PSP approach**
   - Introduce private sector to increase efficiency, improve service and ensure continuous and general access to quality water
2. **Review water sector policies**
   - Review policies related to water usage and resources, tariffs, water quality and environment, and investment climate
3. **Improve Institutional Setting**
   - Review role of existing institutions
   - Design new institutions to support PSP and reform initiatives
   - Restructure and reorganize institutions

A number of shortcomings need to be addressed to ensure success of PSP initiatives

Key Lessons Learnt

- Lebanon still lags behind a number of countries in the MENA region who have already an experience in PSP
- The legal framework governing PPP activities in not yet ready
- While PSP is likely to be one of the main enablers of improvement, it should be supported by achieving a holistic reform and a sound enabling environment
- The participation of the private sector is seen as an enabler to incorporate know-how and fresh capital
- Given inefficiency and low tariff collection, Management Contracts would be a starting point for PSP in the downstream sub-sector. It would prepare the sector for more advanced forms of PSP
- Production/ Upstream is suitable for more advanced PSP schemes (e.g., BOT)

Initiative # II.2 (Cont'd)

2.4. Provide support in developing the adequate legal institutional and regulatory setting to promote PSP, in a way to ensure the interests of the Government and the Lebanese population, and provide an attractive environment to the private sector, through:

- Finalizing legal texts, existing or under development and developing any additional legislation
- Ensuring needed approvals from relevant authorities

2.5 Ensure the readiness of the water sector from all aspects (e.g., institutional, organizational, financial, legal and regulatory) to guarantee the success of future transactions *(this initiative is addressed throughout this strategy document)*

Baseline

Demand/Supply Forecasts

Sector Enabling Environment

- Institutional and Organizational Initiatives
- Financial and Commercial Initiatives
- **Legal and Regulatory Initiatives**
- Environmental Concerns

Investment Plan

Strategic Roadmap

The “Code de l’Eau” currently under development needs to be finalized and effectively implemented and enacted

Key Components of the Water Code

- Recognition of the main legal principles prevailing actually in the field of water:
  - the sustainable management
  - the right of each citizen to receive water
  - the determination of the missions of the Public Authorities to provide drinking water, the treatment of wastewater, the fight against flood, drought and pollution
- Introduction of a National Water Council including the representatives of the main authorities in charge or concerned by the water sector
- Implementation of a Water master plan to guarantee the realization of water and wastewater infrastructure
- Recognition of the administrative, environmental economic and financial requirements of water resource management
- Determination of the utilization of water including the legal possibilities to Private Sector Participation

Initiative # II.3

3.1. Produce the final version of the draft Water Code and follow up the process for its effective implementation and enactment, through:

- The approval of the Ministry of Energy and Water
- Discussion and adoption by the Council of Ministers
- Transfer by decree to the Parliament for final approval and implementation

Legal requirements stemming from the implementation of the NWSS will be identified and executed

Key Legal Highlights

- Lebanon is endowed with a tested 80 years-old body of legislation in this field of water and related issues
- In recent years, the water sector in Lebanon, albeit vital for socio-economic development, has been the object of few structural legal changes
- The modernization and updating of the legislation do not necessarily imply a complete juridical overhaul of the legal principles, but rather, a more comprehensive method of drafting based on advanced juridical, socio-economic and scientific analysis

Initiative # II.3 (Cont'd)

3.2. Strengthen the legal framework in order to improve the performance of the delivery of water and wastewater services and support the implementation of the proposed strategic initiatives, including:

- Improvements to current organizational bylaws of WEs
- Development and enactment of new organizational law for MEW's restructuring
- Reevaluation of some provisions of law 221/2000 and amendments in view to strengthen the capacities of the management and to provide better performance to the end users
- Establishment of an efficient regulatory framework
- Setting of a transparent tariff structures
- Development of a wastewater collection and disposal regulations
- Improvement of irrigation regulation bylaws
- Providing adequate legal environment to promote private sector participation
- Development of performance based incentives (e.g., procurement framework,)
- Ensuring normal access to potable water and sanitation including requirements for a proper implementation of operational and quality standards

Baseline

Demand/Supply Forecasts

Sector Enabling Environment

- Institutional and Organizational Initiatives
- Financial and Commercial Initiatives
- Legal and Regulatory Initiatives
- **Environmental Concerns**

Investment Plan

Strategic Roadmap

Knowledge on climate change and its implications on water resources and its vulnerability will be improved and refined

Indicative

		Anticipated Trends	Projected Variations
Temperature		↗	1 °C on the coast and 2 °C inland by 2040 3 °C on the coast and 5 °C inland by 2090
Evapotranspiration		↗	Beirut: 1% by 2044 & 2% from 2044 to 2098 Cedars: 5% by 2044 & 8% from 2044 to 2098 Zahleh: 26% by 2044 & 10% from 2044 to 2098
Precipitation		↘	Between 10% & 20% by 2040 Between 25% & 50 % by 2090
Snow	Snow width	↘	50% with 2 °C warming, & mean width ~20cm (i.e, Cenomanian plateau of Nahr Ibrahim 2,000m altitude)
	Snowpack altitude	↗	1,500 - 1,700 m with 2 °C warming 1,700 - 1,900 m with 4 °C warming
	Snowpack volume	↘	1,200 - 700 MCM with 2 °C warming 700 – 350 MCM with 4 °C warming
	Snowing period	↘	Begin – end of each season reduction 1 – 3 weeks
Surface Runoff		↗	
Infiltration (Recharge)		↘	
Water Resources		↘	6 to 8% with 1 °C warming 12 to 16 % with 2 °C warming

More Predictable

Predictability

Less Certain

Initiative # II.4

4.1. Improve / refine climate change knowledge, and particularly its implications on the water sector and its vulnerability (i.e. refinement of models and figures):

- Collect, analyze and develop trends for climatic data (precipitation and temperature) covering all Lebanon, to compare with historic data and detect possible deviations
- Establish a unified database to include all water monitoring data and maintain it regularly updated
- Develop and implement long-term river, spring and snow cover monitoring programs
- Update periodically water usage scenarios and thus water management options

Source: MoE, UNDP

Water, wastewater treatment and effluent quality will be improved, and flood mitigation arrangements developed and enforced

	Current situation
Water Resources Surface and Groundwater	▪ **Groundwater pollution:** – Increasing salinity – Contamination by nitrates & pesticides ▪ **Surface water pollution:** – Bacteriological contamination – Chemical contamination (excessive use of fertilizers, direct discharge of industrial effluent, olive oil residues, open dumping) ▪ **Permanent sources of pollution** (n=82) along 225 km of coast (wastewater discharge, chemicals, oil residues, turbid water, warm water and dumps/landfills) ▪ **Limited protection of water resources/ recharge zones** ▪ **Damages from flash flooding:** cost up to 2.5 million USD dollars per event (e.g. 2001 flood in Hermel region)
Usages Potable Irrigation Industrial	▪ Drinking water Standards (1999): decree # 1039 ▪ Drinking purposes, swimming purposes and aquatic life (1996): MoE decision 52/1 ▪ Water quality mostly unknown at user level (water provided from WEs or alternative water sources) ▪ Monitoring data is scarce and situation poorly monitored ▪ Monitoring of irrigation water quality quasi absent
Wastewater	▪ Standards for wastewater discharge set in 2001 (MoE decision 8/1) ▪ Coverage of wastewater network (~60 %) ▪ Wastewater treatment (~8%) ▪ Draft standards for sludge reuse set in 2010 ▪ Draft standards for wastewater reuse in agriculture set in 2010

Initiative # II.4 (Cont'd)

4.2. Improve water quality and protection of recharge zones:
- Review and upgrade water quality standards
- Take actions to protect against contaminants that may be found in drinking water
- Design and implement a comprehensive integrated surface & groundwater quality monitoring network
- Develop a implement a concept for protecting recharge zones
- Centralize data and ensure communications with the consumers
- Design and implement an integrated monitoring system for irrigation water quality

4.3. Develop flood mitigation arrangements:
- Establish a flood plain zoning
- Develop an integrated flood management plan
- Assess the potential use of flood water for groundwater recharge
- Support initiatives aiming at combating desertification

4.4. Improve wastewater treatment and effluent quality:
- Review and update wastewater treatment and effluent standards
- Review and adopt draft standards for wastewater reuse in agriculture & sludge reuse
- Implement wastewater effluent monitoring systems

Source: MoE, UNDP

A Strategic Environmental Assessment (SEA) will be conducted to ensure environmental concerns are addressed and resolved

According to the World Bank, the cost of environmental degradation: ~ 1% of GDP

SEA – Main Steps

Screening	Does the proposed strategic action affect the environment?
Scoping	What are the driving forces/issues/ components that should be addressed?
Stakeholder involvement	Were the opinions of affected groups taken into consideration?
Performing the assessment	Were the potential impacts identified & assessed?
Submission of SEA report	What documents & data need to be included & presented in an objective manner?
Peer review & integration of SEA finding	Were the original set objectives fulfilled & were the stakeholders feedback accounted for?
Decision making	To decide on the proper environmental arrangements regarding the proposed strategy
Monitoring & Quality assurance	Did SEA influence decision and result in greening public decisions?

Source: MoE, UNDP

Initiative # II.4 (Cont'd)

4.5. Evaluate environmental consequences of the proposed NWSS (Strategic Environmental Assessment) to ensure they are :

- fully included
- addressed appropriately at the earliest possible stage of decision making on par with economic and social considerations

National Water Sector Strategy

"A right for every citizen, a resource for the whole country"





LEBANESE REPUBLIC
MINISTRY OF ENERGY AND WATER

Eng. Gebran Bassil
Ministry of Energy and Water (Date 27/12/2010)
Lebanese Government (Resolution No. 2, Date 09/03/2012)

Baseline

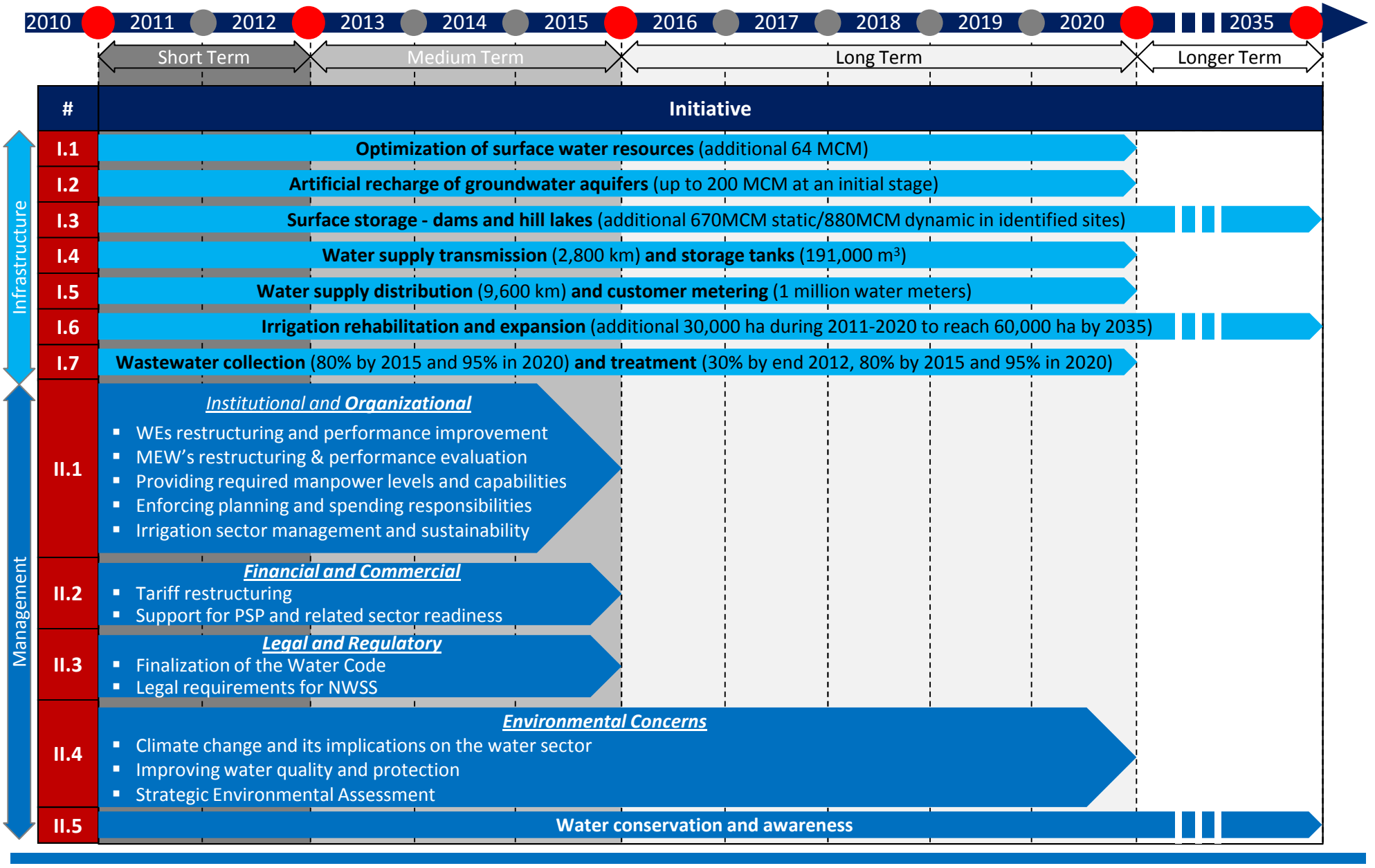
Demand/Supply Forecasts

Sector Enabling Environment

Investment Plan

Strategic Roadmap

NWSS - Strategic Roadmap



Baseline

Demand/Supply Forecasts

Sector Enabling Environment

Investment Plan

Strategic Roadmap

I. Infrastructure Initiatives

II. Sector Management Initiatives

Infrastructure – Initiative Summary (1/6)

#	Initiative		Implementation time & CAPEX						Financing
			11	12	13	14	15	16-20	
I.1	▪ **Optimization of surface water resources** – Limited optimization of around 1% per year for the period 2011 -2015, and a second stage 2016-2020 – Experience proved the efficiency of superficial improvement of the catchment of surface water springs – An increase of 10-15% of the initial flow during the low season would be achieved	2011-2015: Additional 38MCM 2016-2020: Additional 30MCM	50 M$					50 M$	GoL
I.2	▪ **Artificial groundwater recharge** – Artificial recharge is technically feasible in a large portion of the country – Pilot projects can be started near Beirut, Tripoli and Baalbek. The situation in South Lebanon requires deeper consideration – Preliminary studies show that each well could have a potential flow of 50-100 l/s during a period of at least 3 months	2011-2015: 120MCM 2016-2020: 80MCM	64 M$					64 M$	Grants GoL
I.3	▪ **Surface storage** – Around 46 sites have been identified as suitable for surface storage – Detailed designs and tender documents for a number of sites are ready. Execution could start in early 2011 including:	*As detailed below*	1,264M$					711 M$	

Infrastructure – Initiative Summary (2/6)

#	Initiative	Capacity (MCM) Static - Dynamic	Implementation time & CAPEX						Total CAPEX (MUSD)	Financing
			11	12	13	14	15	16-20		
I.3 Cont'd	▪ ***BML***	***166-233***							***859.0***	
	– Qaysamani Lake	1.0	12.5	12.5					25.0	
	– Boqaata Dam	6-12	17.3	17.3	17.3	17.3			69.0	
	– Aazounieh Dam	4.1-5.0	16.3	16.3	16.3	16.3			65.0	
	– Maaser El Chouf Dam	2.2	13.3	13.3	13.3	13.3			53.0	
	– Janneh Dam	30-90		60.0	60.0	60.0	60.0	60.0	300.0	
	– Laklouk Lake	0.5			7.0	7.0			14.0	
	– El Manzoul Dam	0.4			4.0	4.0			8.0	
	– Bisri Dam	120.0						300.0	300.0	
	– Mokhada Lake	2.0			7.5	7.5			15.0	
	– Ratiba Lake	0.3			5.0	5.0			10.0	
	▪ ***North***	***80-151***							***488.0***	
	– Brissa Dam	0.8	3.0						3.0	GOL
	– Kouachra Lake (Rehabilitation)	-	3.0						3.0	
	– El Bared Dam	37-90	28.8	28.8	28.8	28.8	28.8		144.0	
	– Qarkaf Dam	20-25		20.3	20.3	20.3	20.3		81.0	
	– Mseilha Dam	6-12	13.8	13.8	13.8	13.8			55.0	Loans
	– Balaa Dam	1.2-2.2	8.7	8.7	8.7				26.0	
	– Rahwe Lake	2.2			12.5	12.5			25.0	
	– Iaal Dam	12-18						100.0	100.0	
	– Ouadi Chich - Arz Lake	1.0						30.0	30.0	PSP
	– Atolbe Lake	0.7						12.0	12.0	
	– Hadath El Jebbeh Lake	0.4						9.0	9.0	
	▪ ***South –*** Ibl Es Saki Dam	***50***				50.0	50.0	200.0	***300.0***	
	▪ ***Bekaa***	***83***							***328.0***	
	– Assi Project Phase I	1.5	12.5	12.5	12.5	12.5			50.0	
	– Assi Project Phase II	63	28.2	28.2	28.2	28.2	28.2		141.0	
	– Younine	5.8	16.5	16.5	16.5	16.5			66.0	
	– Ouadi Sbat	0.6				7.5	7.5		15.0	
	– Barhacha Lake	2.0		5.0	5.0				10.0	
	– Massa Dam	2.5			8.3	8.3	8.3		25.0	
	– Rachaya - Ain Arab Lake	8.0				10.5	10.5		21.0	

Infrastructure – Initiative Summary (3/6)

#	Initiative		Implementation time & CAPEX						Financing
			11	12	13	14	15	16-20	
I.4	▪ **Water Supply Transmission** – Replacement of existing over-aged transmission systems and associated equipment and bulk meters – Leakage detection/rehabilitation and partial replacement of damaged middle-aged systems and associated equipment – Expansion of transmission systems to meet growing demand including district metering – Rehabilitation/replacement of existing storage tanks including hydraulic equipment and flow meters – Construction of new storage tanks to meet growing demand and achieve 0,5 and 1 day retention time for BML and other WE's respectively including hydraulic equipment and flow meters – Construction of Awali – Beirut and Canal 800 (WS share only) conveyors and related transmission systems and equipment	2011-201: Full/partial replacement of 2,550 km of pipes and additional 156,000 m3 of storage in 465 tanks 2016-2020: Replacement of 250 km of pipes and additional 35,000 m3 of storage in 96 tanks	814 M$					121M$	GoL Loans/ Grants

Infrastructure – Initiative Summary (4/6)

#	Initiative		Implementation time & CAPEX						Financing
			11	12	13	14	15	16-20	
I.5	▪ **Water Supply Distribution** – Replacement of existing over-aged distribution networks including house connections – Rehabilitation and partial replacement of damaged middle-aged networks, supported by leakage detection campaigns – Expansion of distribution networks to cover new geographic areas and meet growing demand including house connections – Installation of customer water meters. Metering targets by 2015 in BML 95%, in North/South 85% and Bekaa 75%	2011-2015: Full/partial replacement of 6,900 km of pipes with house connections and installation of 640,000 meters 2016-2020: Full/partial replacement of 2,700 km of pipes with house connections and installation of 365,000 meters	580M$					274 M$	GoL Loans/ Grants

Infrastructure – Initiative Summary (5/6)

#	Initiative	Area (ha)	Implementation time & CAPEX						Financing
			11	12	13	14	15	16-20	
I.6	▪ **Irrigation** – Rehabilitation/replacement of existing over-aged irrigation systems and networks – Implementation of additional 15,000 ha of irrigation schemes until 2015 and 15,000 ha between 2016-2020	*As detailed below*	372 M$					205 M$	GOL Loans/ Grants
	North	***5,750***							
	• Noura El Tahta Scheme	5,000	4.0	4.0	9.0	9.0	9.0	29.0	
	• El Bared Scheme	750							
	Bekaa	***13,650***							
	• Assi Scheme	5,400							
	• Younine Scheme	1,550	15	15	36	36	36	119	
	• South Bekaa Phase 2 (Left Bank)	6,700							
	South	***14,700***							
	• South Lebanon Conveyor 800	14,700	20	28	48	56	47	56	

Infrastructure – Initiative Summary (6/6)

#	Initiative	Implementation time & CAPEX						Financing
		11	12	13	14	15	16-20	
I.7	▪ **Wastewater** – Collection and treatment to at least preliminary level of 80% by 2010 and 95% by 2020 – Pre-treatment of all industrial wastewater by 2020 – Reuse of 20% of treated wastewater by 2015, and 50% by 2020 – Secondary treatment and reuse of all inland wastewater by 2020 and secondary treatment by 2020 of coastal wastewater where reuse is economically justified 1. Integrated and prioritized immediate investment: a. Funded networks for the seven completed and two operational WWTPs along the coast b. Completion of already funded projects c. Networks for already completed projects (23 inland and 11 coastal plants) 2. Preparation of regional wastewater master plans 3. Integrated national investment program 2013-2020 a. Preparation and implementation b. MEW responsibility for budget execution and project implementation with staff recruitment and capacity building 4. Economic reuse of treated wastewater and sludge (studies and investment) 5. Capacity building and pilots for wastewater sub-sector ▪ **Long term (wastewater)** – Continuation of the integrated national investment program – Updating pre-treatment plants to secondary and extension of Jbeil plant – Investments for reuse of treated wastewater for irrigation	1,895M$ 190 490 880 4 200 20 31 80					1,213M$	GoL Loans/ Grants PSP

Baseline

Demand/Supply Forecasts

Sector Enabling Environment

Investment Plan

Strategic Roadmap

I. Infrastructure Initiatives

II. Sector Management Initiatives

Management – Initiative Summary (1/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.1	**1.1. Perform all priority actions required to complete the restructuring of WEs and address potential limitations,** mainly: – Development of revised and improved organization structures for WEs based on roles and responsibilities – Drafting revised WE organization bylaws, supporting in the approval process and following up on their enactment – Implementation of the restructuring of WEs – Evaluate the potential for outsourcing of certain non-core functions – Providing needed support for WEs to gradually reach full administrative and financial autonomy **1.2. Improve on the operating model between WEs and MEW,** through: – Ensuring an integrated management of water resources – Ensuring the involvement of WEs in project planning and implementation for water supply, irrigation and wastewater – Improvement in coordination – Ensuring operational and financial empowerment of WEs together with proper mechanisms for performance management **1.3. Improve on the performance efficiency of WEs** to reflect: – More focus on irrigation and wastewater responsibilities, in addition to current water supply activities – Most suitable organization for technical functions – Improvements to support functions e.g., Strategic Planning and Business Planning, Water Demand Management, performance management, more focus on IT, Fixed Asset Management, Supply Chain Management, Customer Service, Control and Audit functions	14 M$						Technical Assistance Grants GOL

Management – Initiative Summary (2/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.1 Cont'd	**1.4. Restructure MEW's organization in line with the requirements of laws 221 and 247** to reflect more its water governance role, with main focus on policy making, planning and regulatory roles: – Development of revised organization structures for MEW – Drafting a revised organization law, supporting in the approval process and following up on its enactment – Implementation of the restructuring of MEW **1.5. Develop the process for the performance monitoring and evaluation of WEs,** including: – Monitoring body – Performance indicators – Tools and procedures	2 M$						Technical Assistance Grants GOL
	1.6. Provide the required manpower levels and capabilities to ensure an appropriate operation and maintenance of assets and the delivery of water at optimal service levels, through the: – Reduction of current vacancies (over 81% at MEW and 67% in WEs) to required manpower levels according to recommended organization structures – Continuous development of staff through proper training	4 M$						Technical Assistance Grants GOL

Management – Initiative Summary (3/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.1 Cont'd	**1.7. Enforce planning and capital spending responsibilities and coordination among various players in the water sector with a clear delineation of authorities,** where: – MEW is responsible for setting policies, strategies and national planning – CDR is in charge of planning and securing foreign financing of capital projects based on national plans – WEs, LRA and other national entities develop their specific business plans and master plans according to policies and guidelines of the national plan							-
	1.8. Involve stakeholder participation in the design and management of irrigation projects according to best practices, through: – Creation of formal Water Users Associations (WUAs) to replace the different organizations currently in charge of O&M of irrigation schemes – Definition of roles and responsibilities with respect to water management (including water quality) of the WUAs and other partners, in close cooperation with the intended beneficiaries – Providing well-focused training related to the establishment and management of WUAs to all involved parties			8 M$				Technical Assistance Grants GOL

Management – Initiative Summary (4/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.1 Cont'd	**1.9. Improve irrigation water demand management and cost recovery, and sustainability of irrigation schemes,** through: – Adjustment of irrigation water tariffs to cover O&M costs at a first stage, and periodically review and adjust water tariffs to reflect actual costs – Basing water charges on volume of water used rather than area. Where metering is not feasible at this time, base water charges on a combination of a fixed charge to cover the basic services, and other charges which can be used as a proxy for the volume of water used, such as crop grown and/or hourly use of water – Carrying out periodic public awareness campaigns to inform policy makers and farmers of water shortages that could be faced in the next thirty years, and the need for water conservation for irrigation							
II.2	**2.1. <u>Water Supply Tariff</u>** ▪ **Implement a new consumption-based tariff which includes fixed and variable (volumetric) charges for connections equipped with customer water meters**, where: – Current lump-sum tariff should be temporarily maintained for unmetered customers – New tariff should be based on a proper cost analysis to cover, at a minimum, O&M cost as a first stage – No tariff increase would be introduced before concrete improvements are brought to the water sector		3 M$					Technical Assistance Grants GOL

Management – Initiative Summary (5/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.2 Cont'd	**2.2. <u>Irrigation Tariff</u>** ▪ **Design and implement alternative irrigation tariff structures based on the specificities of existing and anticipated irrigation schemes**, where: – Volumetric metering would be the preferred solution wherever applicable **2.3. <u>Wastewater Tariff</u>** ▪ **Apply a new wastewater tariff to customers connected to a sewer network and to a WWTP**, where: – New tariff should be based on a proper cost analysis and cover at a minimum O&M cost in an intermediate stage, with an introductory tariff initially – Wastewater charges can be a percentage of the water bill		1 M$					Technical Assistance Grants GOL
				1 M$				
	2.4. Provide support in developing the adequate legal institutional and regulatory setting to promote PSP, in a way to ensure the interests of the Government and the Lebanese population, and provide an attractive environment to the private sector, through: – Finalizing legal texts, existing or under development and developing any additional legislation – Ensuring needed approvals from relevant authorities **2.5. Ensure the readiness of the water sector from all aspects (e.g., institutional, organizational, financial, legal and regulatory) to guarantee the success of future PSP transactions** *(this initiative is addressed throughout this document)*	1						Technical Assistance Grants GOL
					1 M$			

Management – Initiative Summary (6/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.3	**3.1. Produce the final version of the draft Water Code and follow up the process for its effective implementation and enactment,** through: – The approval of the Ministry of Energy and Water – Discussion and adoption by the Council of Ministers – Transfer by decree to the Parliament for final approval and implementation							GOL
	3.2. Strengthen the legal framework in order to improve the performance of the delivery of water and wastewater services and support the implementation of the proposed strategic initiatives, including all legal aspects related to: – Improvements to current organizational bylaws of WEs – Development and enactment of new organizational law for MEW's restructuring – Reevaluation of some provisions of law 221/2000 in view to strengthen the capacities of the management and to provide better performance to the end users – Establishment of an efficient regulatory framework – Setting of a transparent tariff structures – Development of a wastewater collection and disposal regulations – Improvement of irrigation regulation bylaws – Providing adequate legal environment to promote private sector participation – Development of performance based incentives (e.g., procurement framework,) – Ensuring normal access to potable water and sanitation including requirements for a proper implementation of operational and quality standards			2M$				GOL

Management – Initiative Summary (7/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.4	**4.1. Improve / refine climate change knowledge, and particularly its implications on the water sector and its vulnerability (i.e. refinement of model and figures):** – Collect, analyze and develop trends for climatic data (precipitation and temperature) covering all Lebanon, to compare with historic data and detect possible deviations – Establish a unified database to include all water monitoring data and maintain it regularly updated – Develop and implement long-term river, spring and snow cover monitoring programs – Update periodically water usage scenarios and thus water management options	5 M$						Technical Assistance Grants GOL
	4.2. Improve water quality and protection of recharge zones: – Review and upgrade water quality standards – Take actions to protect against contaminants that may be found in drinking water and its sources – Design and implement a comprehensive integrated surface & groundwater quality monitoring network – Develop a implement a concept for protecting recharge zones – Centralize data and ensure communications with the consumers – Design and implement an integrated monitoring system for irrigation water quality	4 M$						Technical Assistance Grants GOL

Management – Initiative Summary (8/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.4 Cont'd	**4.2. Develop flood mitigation arrangements:** – Establish a flood plain zoning – Develop an integrated flood management plan – Assess the potential use of flood water for groundwater recharge – Support initiatives aiming at combating desertification **4.3. Improve wastewater quality:** – Review and update water quality standards for wastewater discharge – Review and adopt draft standards for wastewater reuse in agriculture & sludge reuse – Implement pollution control programs			4 M$				Technical Assistance Grants GOL
				3 M$				
	4.5. Evaluate environmental consequences of the proposed NWSS (Strategic Environmental Assessment) to ensure they are : – fully included – addressed appropriately at the earliest possible stage of decision making on par with economic and social considerations	2						Technical Assistance Grants GOL

Management – Initiative Summary (9/9)

#	Initiative	Implementation time & Budget						Financing
		11	12	13	14	15	16-20	
II.5	**5.1. Conservation Initiatives on Domestic and Industrial Demand** – Installation of conservation kits (plumbing retrofits and high-efficiency toilets and showerheads, dual flush toilets, faucet aerators, kitchen aerators) – High-efficiency cloth washers – Complete retrofit of large water consumers, e.g., industrial, commercial – Public outreach, awareness and education programs – Household and establishment audits **5.2. Conservation Initiatives on Irrigation Water** – Adoption of high efficiency on-farm irrigation techniques, e.g., drip irrigation, sprinkler irrigation, overhead irrigation where applicable – Coordination with Ministry of Agriculture for the adoption towards lower consumption crops – Public outreach, awareness and farmer education programs – Farm audits and optimization according to local conditions	8 M$						Technical Assistance/ Grants GOL

National Water Sector Strategy

"A right for every citizen, a resource for the whole country"





LEBANESE REPUBLIC
MINISTRY OF ENERGY AND WATER

Eng. Gebran Bassil
Ministry of Energy and Water (Date 27/12/2010)
Lebanese Government (Resolution No. 2, Date 09/03/2012)

Baseline

Demand/Supply Forecasts

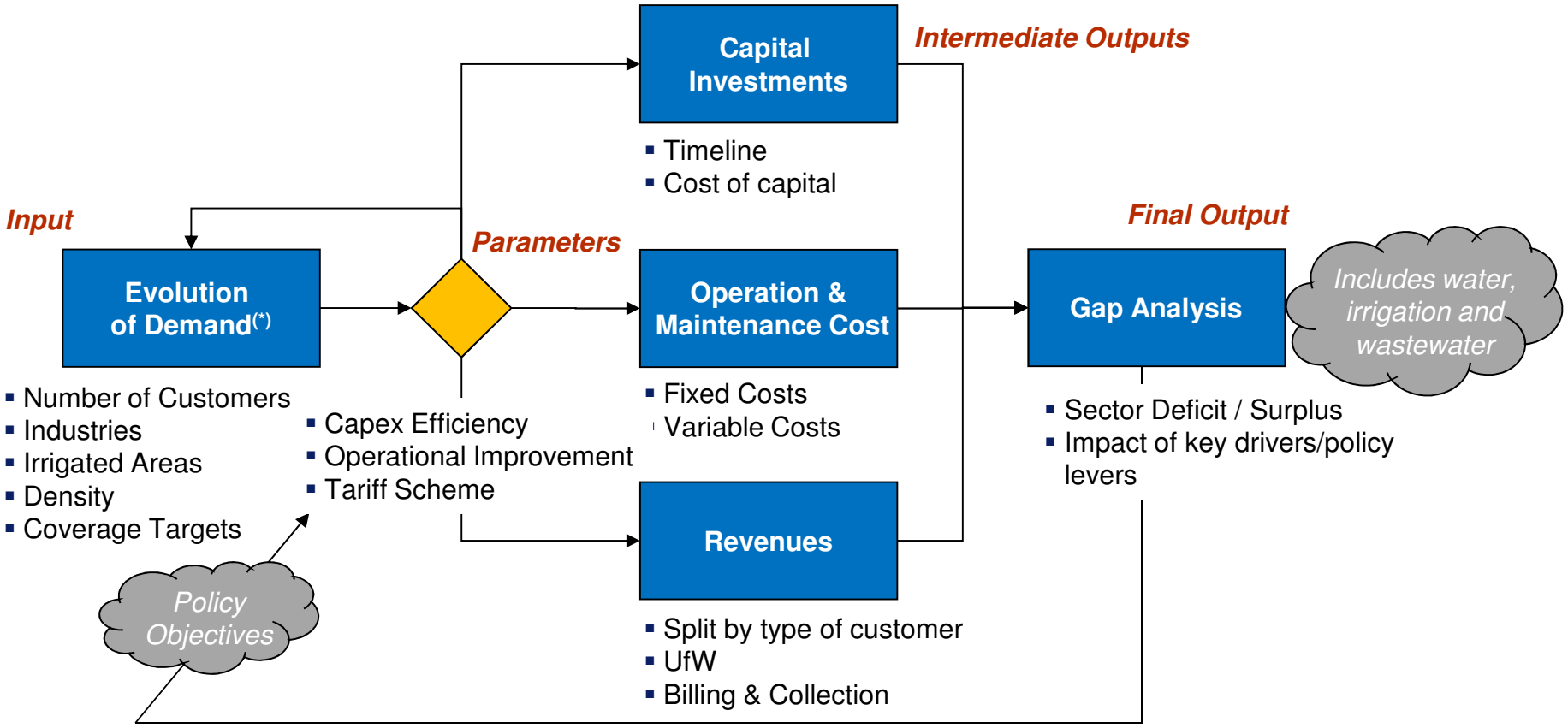
Sector Enabling Environment

Investment Plan

Strategic Roadmap

Need for Capex, Opex and revenues is driven by the evolution of demand

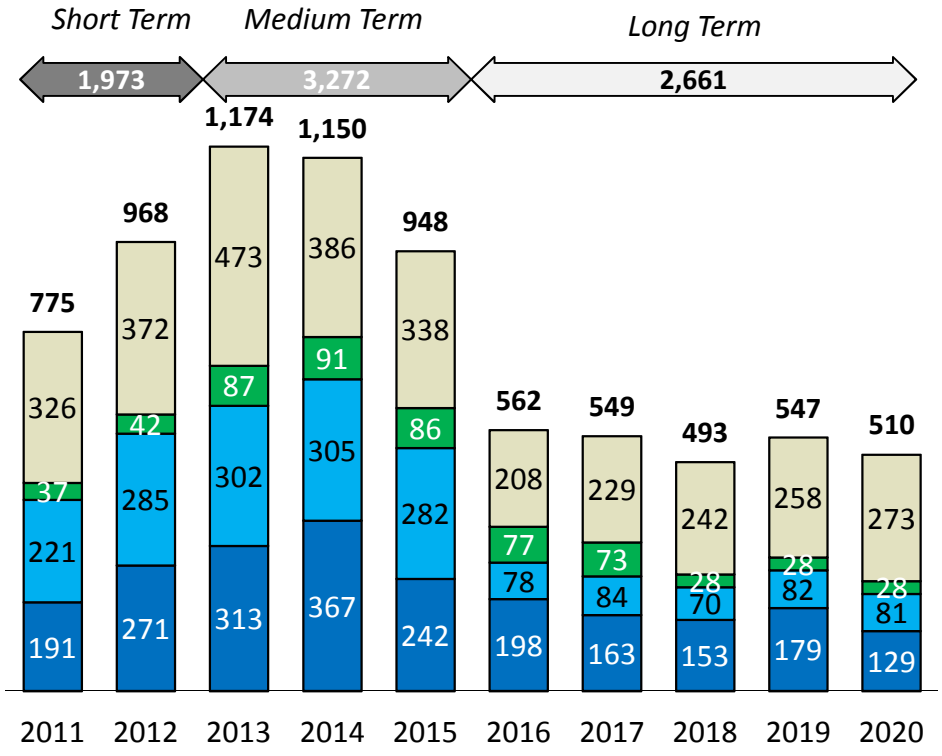
Capex and Opex and Revenue Requirements

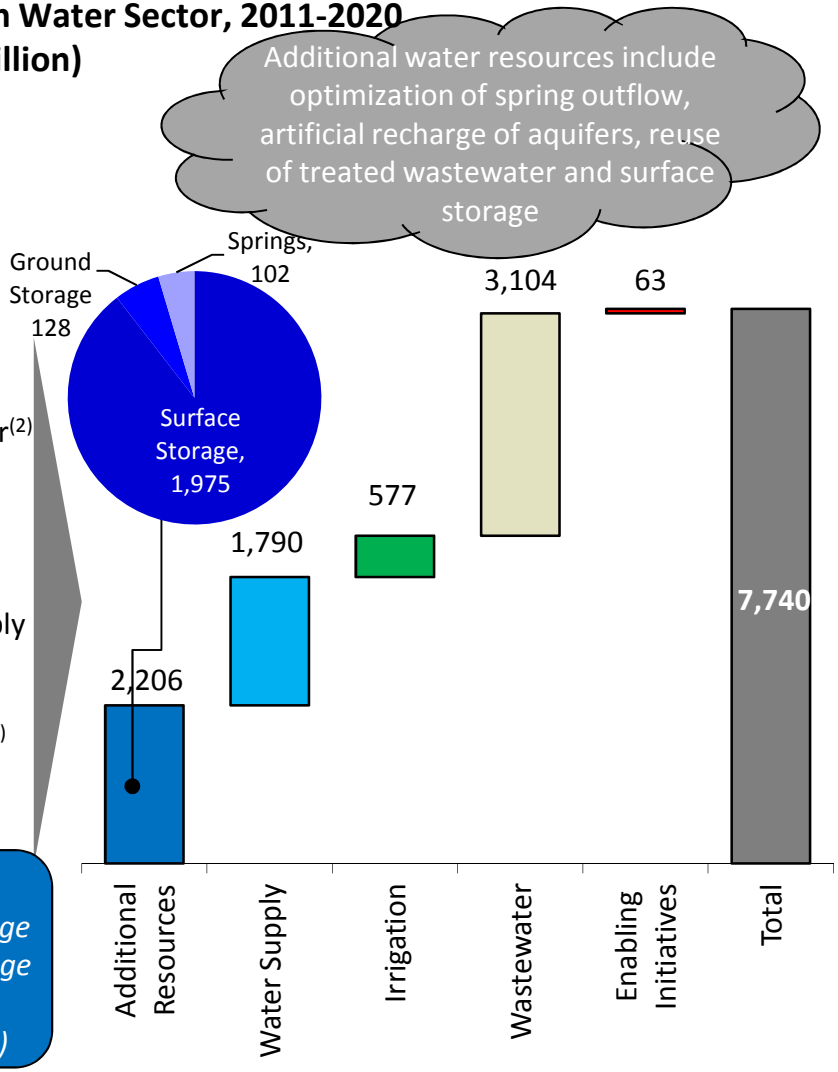


Note: (*) Includes requirements to upgrade existing infrastructure

Total capital expenditure requirements (CAPEX) for the period 2011-2020 would reach USD7.74 Billion approximately

Capital Expenditure Requirements for Lebanon Water Sector, 2011-2020 (By Sub-Sector, in USD Million)



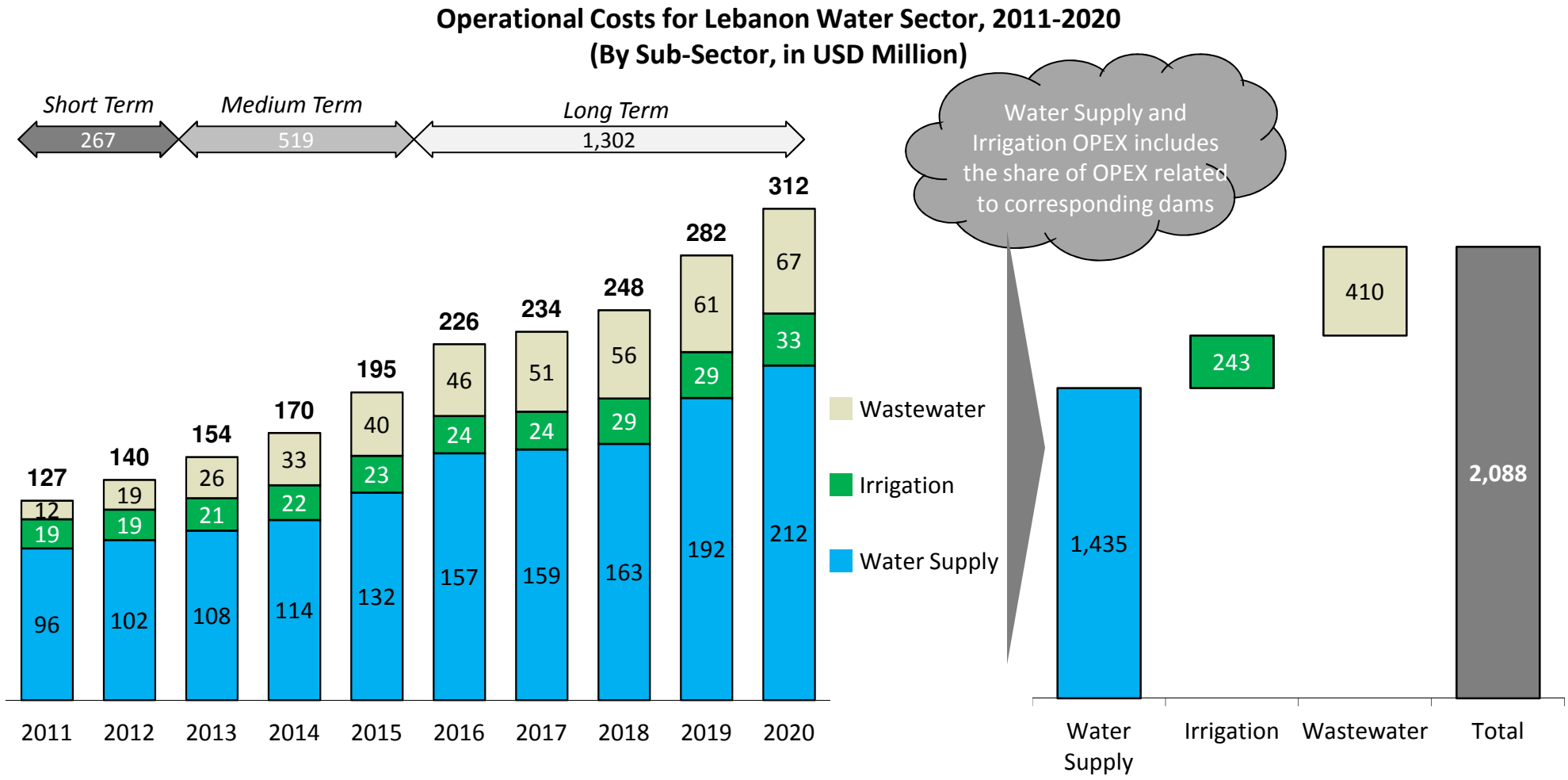


Split between types of additional water resources

174	253	285	339	214	170	135	135	161	111	*Surface Storage*
8	8	18	18	18	18	18	8	8	8	*Ground Storage*
10	10	10	10	10	10	10	10	11	11	*Springs*
CAPEX included with Wastewater										*Reuse (Trans.)*

Note: (1) Additional resources include spring optimization, artificial recharge, reuse of treated wastewater and surface storage; (2) Wastewater includes collection and treatment

Total operational expenditure requirements (OPEX) for the period 2011-2020 would reach USD2.1 Billion approximately



Policies and targets for tariffs and collection are set, together with an estimate of their implications on revenues

Water Supply

- Volumetric tariff to be introduced in pilot areas of fully metered connections (25% of customers in 2012) and gradually rolled out (75% of customers by 2015). Rate per m3 to be maintained at the current average of USD 0.39 until 2014 and then increased to reach O&M recovery by 2015 an full cost recovery by 2021
- Current lump-sum tariff to be temporarily maintained for unmetered customers
- Number of subscribers to be increased through improved coverage and customer surveys
- Collection to be improved from current national average of 47% to 60% by 2012 and 80% by 2015

Irrigation

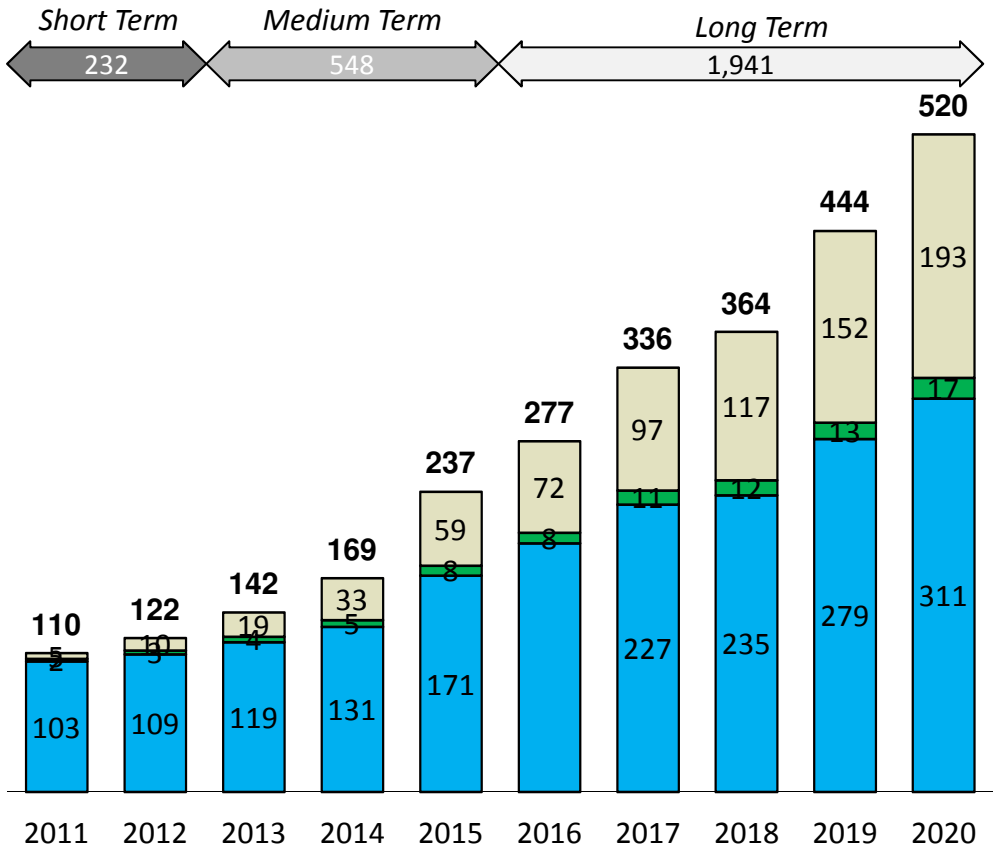
- Tariffs to be structured based on the specificities of irrigation schemes (currently assumed: <10% volumetric, 30% per hour, 60% per area). Volumetric metering would be the preferred solution wherever applicable (target by 2015: 60% volumetric, 20% per hour, 20% per area)
- Rate per m3 to be maintained at the current average of USD 0.12 until 2014. Rate per hour to be kept at an average of USD 6. Rate per ha USD 400/yr. All rates are to be increased by 20% starting 2015
- Collection to be improved from current national average of <10% to 30% by 2012 and 60% by 2015

Wastewater

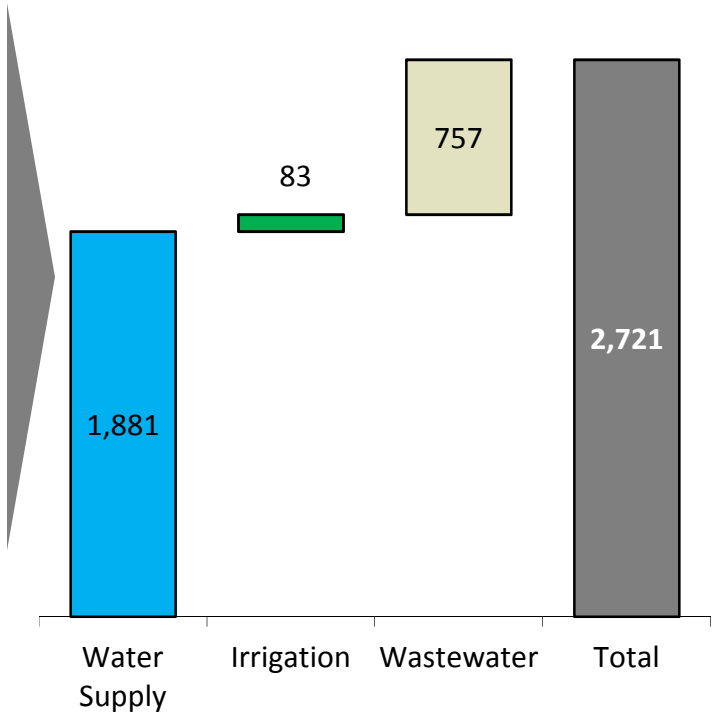
- Collection and treatment to at least preliminary level of 80% of wastewater by 2015, and of 95% by 2020. Secondary treatment and reuse for all inland and for coastal systems where reuse is applicable by 2020
- The new WW tariff (25% of the WS tariff at an initial stage) to be introduced in 2011 to pilot areas where all customers are connected to a sewer network and to a WWTP, to be then increased to gradually reach full recovery of all O&M costs by 2020
- Wastewater charges can be a percentage of the water bill

Total revenues of the water sector for the period 2011-2020 are estimated to reach USD2.72 Billion

Revenues for Lebanon Water Sector, 2011-2020
(By Sub-Sector, in USD Million)



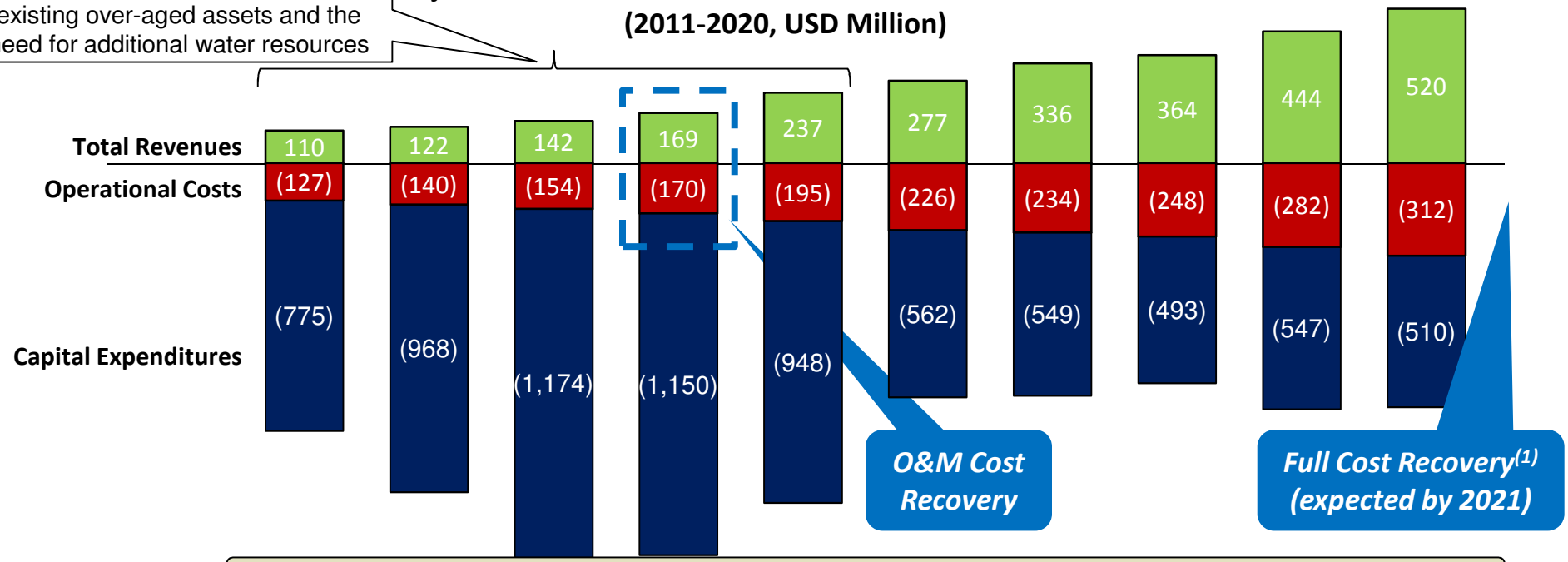
Revenues based on policies/targets for water supply, irrigation and wastewater set in previous slide



Under the set policies and targets, O&M cost recovery is expected by 2014 and full cost recovery would be reached by 2021

Higher CAPEX in 2011-2015 due to rehabilitation/replacement of existing over-aged assets and the need for additional water resources

Projected Financial Performance of the Lebanon Water Sector (2011-2020, USD Million)



Tariffs	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
WS (USD/m³):	0.39	0.39	0.39	0.39	0.45	0.45	0.50	0.50	0.55	0.55
WW (USD/m³):	0.10	0.12	0.15	0.17	0.23	0.24	0.29	0.31	0.36	0.39
Irrigation:										
Volumetric (USD/m³)	0.12	0.12	0.12	0.12	0.14	0.14	0.17	0.17	0.17	0.21
per hour (USD/hour)	6.00	6.00	6.00	6.00	7.20	7.20	8.64	8.64	8.64	10.37
per area (USD/ha)	400.00	400.00	400.00	400.00	480.00	480.00	576.00	576.00	576.00	691.20

Note: (1) Full cost recovery includes O&M, General and Administrative, depreciation and debt service. Recovery is at sector level and is not specific to a given WE or sub-sector.

Total of 321 projects, with a budget of USD 2.45 Billion are ongoing, committed or planned for the period 2001-2015 …

To be Updated and Validated

	Ongoing and Planned Projects (2001-2015) (in USD Million) [1]				Average Completion Rate of Projects Due by May 2010[2]
	Official Due Date by May 2010	Due after May 2010	Planned	Total Investments (2001-2015)	
Additional Water Resources	6%	14%	80%	379	67%
	6	5	12	*Total 23 Projects*	
Water Supply Transmission and Distribution	22%	22%	56%	812	66%
	19	43	177	*Total 239 Projects[3]*	
Wastewater Collection and Treatment	13%	27%	60%	1,011	76%
	13	18	24	*Total 55 Projects*	
Irrigation	0.1%	3.6%	96.3%	249	30%
	1	2	1	*Total 4 Projects*	

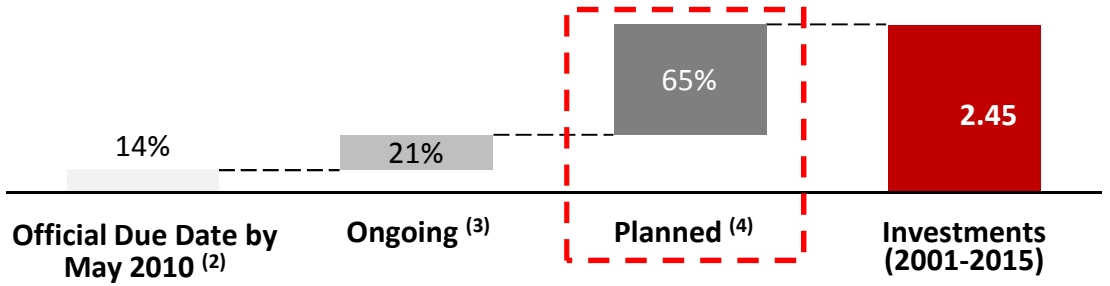
Note (1) Approximated with CDR projects, donor funded projects, MEW projects, and WE projects; (2) CDR estimations; (3) Assuming that the 5-year plans of the WEs cover 169 projects
Source: PMO – Booz & Company

… with around USD 1.6 Billion as planned to be spent on new projects

- A total of **USD 2.45 Billion**(1) channeled through various stakeholders is funding the design and implementation of current and planned projects
- Around **USD 1.6 Billion is planned to be spent on new projects**
- Investments have **a low return** with a **poor execution rate** and **low assets and investments utilization,** due to inadequate sequencing and funds' misallocation

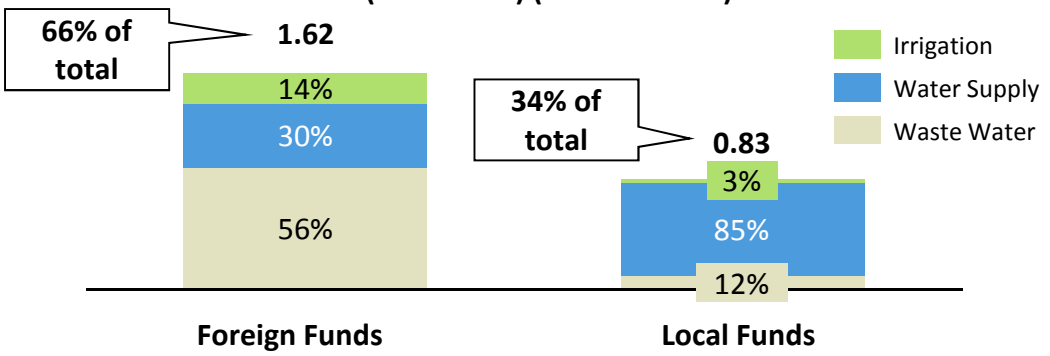
To be Updated and Validated

Ongoing and Planned Investments Timeline (2001-2015) (in USD Billion)



- **66%** of total investments are financed by **foreign funds** and **34%** by **local funds**
- 60% of local funds are financed by MEW/ WEs and 40% by CDR
- In the absence of a plan, foreign donors support **projects in line with a specific agenda** (i.e., mainly waste water in line with Barcelona convention)
- Internal investments are **not driven by a supply demand analysis**, but often influenced by political agendas

Ongoing and Planned Investments per Source of Funding and Sub Sector(1) (2001-2015) (in USD Billion)



Note: (1) Approximated with CDR projects, donor funded projects, MEW projects, and WE projects; (2) Average Completion rate 68%; (3) Started projects whose end date is later than May 2010; (4) Start date later than May 2010; (5) Disbursement over the sum of signed and planned projects

Source: PMO - Booz & Company