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FINAL REPORT

**LEBANON WATER AND WASTEWATER SECTOR SUPPORT PROJECT
(LWWSS)**

SEPTEMBER 30, 2009–OCTOBER 31, 2015



OCTOBER 2015

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LEBANON WATER AND WASTEWATER SECTOR SUPPORT PROJECT (LWWSS)

SEPTEMBER 30, 2009–OCTOBER 31, 2015

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FRONT COVER: Water Treatment Plant in Tripoli, North Lebanon.

INSIDE COVER: A man drinks from a public fountain in North Lebanon.

BACK COVER: The rehabilitation of pump stations in Ouadi Jilo and Batoulay in South Lebanon increases water supply to more than 71,000 residents of 49 villages in southern Lebanon.

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Executive Summary

Project Overview

The Lebanon Water and Wastewater Sector Support project (LWWSS) has continued USAID's significant commitment to improving and strengthening the water sector in Lebanon. For the past six years, the program worked directly with the four regional water establishments, providing technical assistance to strengthen their capacity to deliver high-quality and sustainable services. The project complemented this technical assistance with direct interventions such as infrastructure improvements and procurement of technical equipment, to improve the water establishments' ability to deliver consistent water to their subscribers.

Overall Goals and Objectives

The overall purpose of LWWSS was to “provide technical services and related resources (such as technical equipment) to the four Lebanon water establishments and the Lebanese Ministry of Energy and Water in order to: build the capacity of their staff; increase their managerial, administrative, technical, financial and operational efficiencies; improve the quality of water and wastewater services; expand access to water and sanitation; and improve capital investment planning and asset management. Activities pertaining to urgent and critical infrastructure needs will be also included... to significantly enhance water and wastewater service delivery or access and coverage.”

Ultimately, the LWWSS project helped the water establishments advance toward financial and operational sustainability and overcome the many challenges they faced, including staff shortages and an aging workforce, poor customer relations, low tariffs that fail to recover operating costs, lack of metering, excessive non-revenue water, and underinvestment in water and wastewater infrastructure.

The main areas of focus that LWWSS targeted in working with the water establishments included:

- Building management capacity within the water establishments
- Increasing financial management capacity and financial system integration
- Procuring equipment to complement technical assistance and capacity building
- Business planning to increase capital planning and benchmarking capacity
- Funding urgent infrastructure works to enhance delivery or access and coverage
- Developing a corporate culture, customer service orientation, and public outreach programs.

These activities corresponded to the technical components that comprised LWWSS' scope of work. We describe the work under each of these components in Chapter 1: Project Accomplishments.

Building on the Successes (and Lessons Learned) from LWPP

DAI implemented the successful Lebanon Water Policy Program from 2002-2008. Based in the Ministry of Energy and Water (MoEW), the LWPP team helped the South Lebanon Water Establishment (SLWE) forge a single entity from four water authorities, adopt an improved financial and accounting system, reduce non-revenue water, and put in place a business planning process that incorporates five-year capital planning and tariff adjustments. Through these efforts, the SLWE became a model that could be emulated by the other water establishments in Lebanon. The LWPP team also helped the Beirut-Mount Lebanon Water Establishment (BMLWE) develop a business plan and cost recovery model.

With LWWSS, USAID extended its support to help all four regional water establishments advance toward financial and operational sustainability. Using the project's work with SLWE and BMLWE as a model, the LWWSS team built on LWPP's successes and introduced new areas of assistance in staff capacity building, capital investment planning, and customer service. It also included direct investments

in infrastructure and equipment that enabled the water establishments to improve and extend services to their customers.

Expansion to Include Infrastructure

The LWWSS program was always designed to provide technical assistance and institutional development to water establishments, while supporting those investments with targeted improvements. However, in 2011 USAID determined that LWWSS could meet the increasing infrastructure needs of the water establishments by designing and implementing larger and more complex infrastructure rehabilitation and construction activities. The LWWSS project was expanded accordingly, increasing the budget by nearly \$15 million to accommodate infrastructure activities under Components 5 and 6.

The significant increase to the LWWSS budget allowed the project to work closely with the water establishments to identify more significant procurement and infrastructure activities that would support their goals of improving service delivery and network efficiency. The large projects implemented during Years 5-6 of LWWSS are a result of the prioritization, design, and procurement processes that were undertaken beginning in 2011.

Overall Approach to LWWSS Project

The interventions under LWWSS were designed to be customer-driven, results-oriented, strategic, and flexible and responsive. LWWSS worked in close partnership with the water establishments to identify priorities, design interventions, and oversee implementation to ensure that all activities supported long-term development objectives at each water establishment. The program maintained focus on development objectives and remained flexible and adaptable while focusing on sustainability, as follows:

Focus on Development Objectives. In close cooperation with USAID, the LWWSS team focused on the achievement of high-level development objectives of improving the capacity of water establishments to improve service delivery, financial management, planning, and customer outreach – all essential ingredients to long-term financial and operational sustainability – rather than choosing one-off activities that would meet an immediate need but did not support larger development goals. For example, as LWWSS worked with the water establishments to improve their long-range strategic planning through 20-year Master Plans and 5-year Business Plans, we identified infrastructure activities that supported the water establishments' long-term goals. The project emphasized infrastructure activities that could be tied to a clear improvement in water service delivery, and that the water establishment could sustain to protect the long-term investment.

Remaining Flexible and Adaptable with a Focus on Sustainability. LWWSS worked directly with the four regional water establishments to identify needs, set priorities, and design activities that meet the immediate and long-term needs of each water establishment. By working with the water establishments to set priorities, LWWSS ensured that all project activities were demand-driven, and increased the ownership of these projects by the water establishments. As projects encountered issues of staff capacity, community resistance, or engineering challenges, the water establishments played a key role in ensuring that progress continued on each work site. LWWSS coupled all infrastructure work with capacity development activities to increase the sustainability of USAID's investments in new infrastructure. Through training and institutional development opportunities, LWWSS increased the water establishments' ownership of LWWSS interventions, and increased the success and sustainability of major infrastructure investments. Our close partnerships with the water establishments also allowed the project to remain flexible and adaptable as priorities or local conditions changed. We were able to address the needs of the water establishments over time, supporting their key priorities and implementing effective, sustainable activities.

Overall High-Level Impact of Project

The six-year LWSS project made significant progress toward improving water service throughout Lebanon. In partnership with USAID and the water establishments close to 3 million citizens benefited from improved water services or 48%¹ of the population. Water revenue collection increased from 59.1% at program inception to 64.30% cumulatively or 8 per cent higher than at the beginning of the program. Infrastructure improvements were a core activity especially during Years 3-5 of the program. Between installing pump stations, water meters and building labs, the program constructed or rehabilitated 262 different water facilities. Certainly the biggest accomplishment of the program was the change in the management culture of the water establishments, as they began to make evidence-based decisions with a focus on long-term planning and sustainability, as evidenced by their continuous demand to update their business and master plans. In the words of Ahmad Nizam, Director General (DG) of the SLWE, "...for the first time we can manage it because we can measure it".

LWSS implemented the Enterprise Resource Planning system in three water establishments and trained staff to generate financial reports for use by senior management.



¹ CIA factbook lists population in Lebanon at an estimated 6,184,701 (July 2015)

Chapter 1: Project Accomplishments

The LWWSS project built from the achievements under the Lebanon Water Policy Program (LWPP) and expanded interventions to address the wider challenges faced by the water utilities throughout Lebanon. The following sections provide a summary of baseline conditions at the beginning of the LWWSS project; an overall description of activities and methods of work used; and accomplishments, deliverables, and results by technical component.

Summary of baseline conditions at beginning of the project

The Lebanese water establishments faced a number of critical challenges at the start of the LWWSS project in 2009. These challenges ranged from low institutional capacity, to poor customer relations, to low financial performance. We describe these challenges in greater detail below:

Human Resources. A government-imposed hiring freeze of more than 25 years had led to a steady loss of staff at the water establishments. As a consequence, some water establishments addressed the issue by outsourcing certain functions. While this served as a short-term solution to the staffing shortages, the long-term impact had been that water establishment staff were unable to perform all of the functions required to provide comprehensive network operations and maintenance, financial management, long-term strategic planning, and customer service.

During the start-up phase of LWWSS, the SLWE was granted approval to hire 27 staff, including accountants, data entry specialists, and engineers. The hiring was facilitated by the SLWE adopting a strong business plan, and its budget request for increased staffing was anchored in that plan. At the start of LWWSS, the team was hopeful that other water establishments would also be granted approval to hire additional staff, although that process was slow in coming.

Financial Management and Cost Recovery. In general, the lack of production, zonal, and household meters meant that the water establishments did not have accurate data on their levels of water production and non-revenue water levels, and were unable to charge customers based on their household consumption. Except for Tripoli and Saida, no cities had 24-hour pressurized supply, which further complicated the challenge of metering because the lack of pressure in the system reduces the accuracy of the existing meters.

Without accurate data on water production and usage, the water establishments were not able to justify increases to water tariffs. The SLWE successfully raised tariffs in 2003 by 35-45%, but the Government of Lebanon blocked a second increase in tariffs proposed by the SLWE in 2007. Although a customer survey conducted under the Lebanon Water Policy Program indicated that customers were willing to pay a higher rate for water if services improved, the water establishments have been unable to raise tariffs to improve their cost recovery.

Customer Relations. Customers demonstrated little confidence in the Government of Lebanon and water establishments to deliver quality services. Disruptions in service and lack of response to customer complaints had only further fed distrust and reinforced low expectations among water users. The lack of confidence and low expectations led to many water users not paying for their water at all, creating a vicious cycle where water users refuse to pay bills, water establishments lack sufficient funding to invest in operations and maintenance to improve service, service suffers and water users do not receive adequate or reliable water supply, and water users are that much more reluctant to pay for water.

To break this cycle, water establishments recognized that they needed to improve outreach and communications with customers, improve systems to properly manage and address customer complaints, and improve the customer focus among all staff.

Capital Investment Planning. The water and wastewater sector suffered from decades of insufficient capital investment. In addition, some investments had been poorly coordinated or only partly funded, so that certain parts of a system may have been in place, but not all of the elements necessary to make the

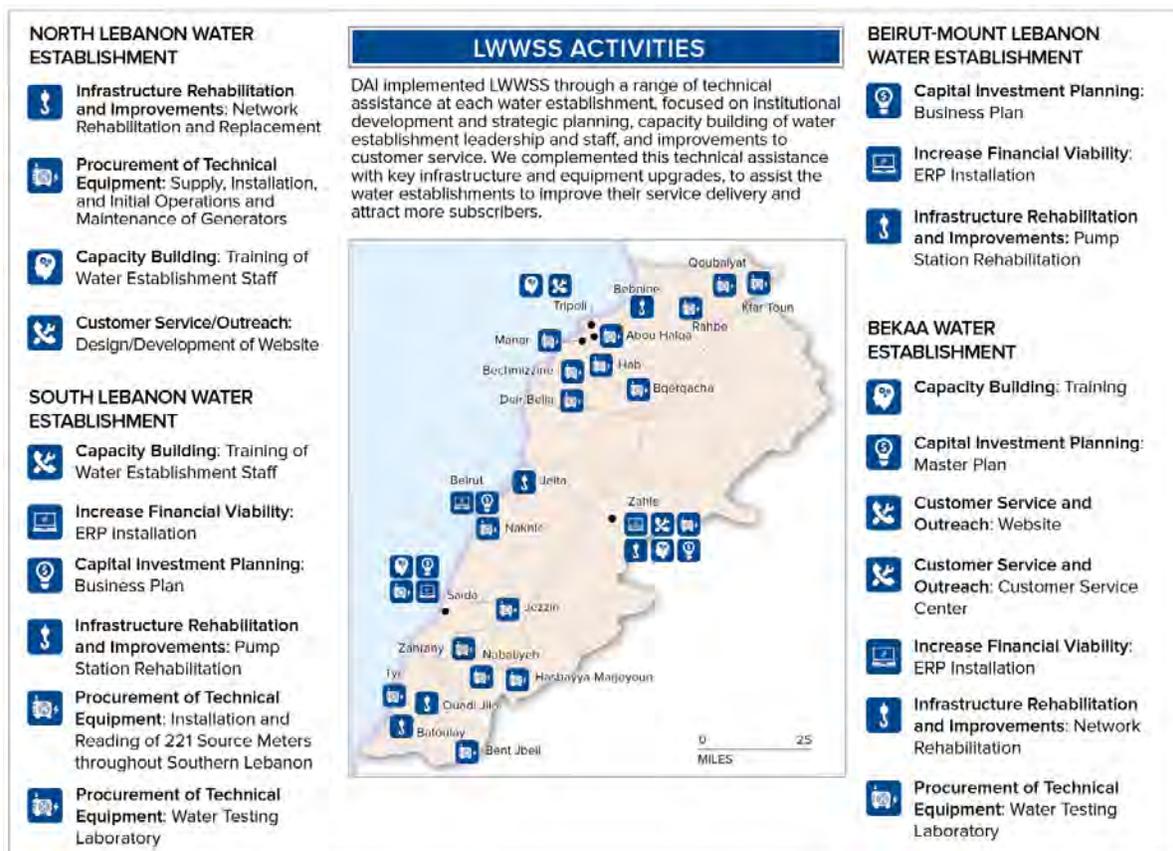
system operational. In other cases, infrastructure had been constructed or rehabilitated without a clear plan for its operations and maintenance. Without these plans in place, infrastructure investments were often not “owned” by any organization, and became unsustainable. Donors and the Government of Lebanon had taken steps with the water establishments to fill these gaps, but more needed to be done to coordinate how investments were planned and prioritized to improve physical and operational sustainability.

Overall description of activities and methods of work used

DAI implemented LWSS through a range of technical assistance, focused on institutional development, capacity building of water establishment staff, and improvements to customer service at each water establishment. We complemented all of this technical assistance with key infrastructure and equipment upgrades, to assist the water establishments to improve and extend their service.

By coupling technical assistance with more tangible upgrades to water establishment equipment and infrastructure, we helped the water establishments improve their service delivery, attract more subscribers, and enhance their ability to manage and track finances and plan for future capital investments. The combination of infrastructure improvements with institutional development also ensured that activities under LWSS were sustainable, with water establishment staff trained and capable of maintaining the significant investments in infrastructure over time.

LWSS worked throughout Lebanon to provide technical assistance, infrastructure improvements, and upgraded equipment to improve water delivery to the citizens of Lebanon. The map below presents the major activities implemented in each region under LWSS.



Accomplishments, Deliverables, and Results by Component

The LWWSS project provided a wide range of technical activities organized into seven components:

- (1) Initial Assessment
- (2) Capacity Building for Managerial, Technical, and Operational Efficiency
- (3) Increase Financial and Commercial Viability of Water Establishments
- (4) Capital Investment Planning and Program/Project Management
- (5) Procurement of Technical Equipment to Strengthen WEs
- (6) Small to Medium-Scale Rehabilitation / Upgrade / Extension of Water and Wastewater Works within WEs Areas
- (7) Corporate Culture, Customer Service Orientation, and Public Outreach

In the following section we discuss the major activities implemented under each component, including their scope, major tasks, and results and impact.

Component 1: Initial Assessment

Scope: In collaboration with each water establishment, conduct an assessment of each and use it to: 1) establish a clear plan for programming USAID resources in cooperation with GIZ and EU; 2) establish baseline information and performance targets; and 3) identify immediate and high priority investments.

Component 1 focused technical activities during the first four months of the program to conduct an Initial Assessment Report and develop a High Priority Intervention Program (HPIP). The objective was to establish baseline information for each water establishment and inform initial program design for the LWWSS project. The context and baseline data collected at the start of the program, as presented in the Initial Assessment Report, set the stage for program design in collaboration with USAID and the water establishments. The HPIP set forth initial priorities for activities under LWWSS.

Initial Assessment Report

The purpose of the Initial Assessment Report (IAR) was to examine the water and wastewater sector landscape to determine potential activities under LWWSS. Although it did not serve as a baseline study, the IAR helped to establish an initial understanding of the water and wastewater sector, what donors active in the sector were already providing, and the priority needs of each water establishment at the start of the LWWSS project.

During the first months of the project, LWWSS leadership and technical staff met with the Director General of each water establishment, Ministry of Energy and Water (MoEW) officials, other Lebanese government officials, local water sector experts, and donors active in the water and wastewater sector. Additionally, the team reviewed detailed reports from USAID's previous Lebanon Water Policy Project (LWPP), World Bank activities, and other donor activities.

In addition, LWWSS hosted a half-day working meeting on January 15, 2010 that brought together the MoEW, BMLWE, SLWE, NLWE, BWE, GTZ, EIB, and USAID to validate priority areas for LWWSS support.

Based on all of these discussions and research, LWWSS developed a list of key issues, priorities, and current activities. The list of activities presented below set forth the current situation and needs of the water establishments relative to LWWSS' scope of work, as of January 2010. Within each component sub-activity, LWWSS presented the current situation and potential activities that it could undertake with additional meetings and agreement between LWWSS, the WEs, and other donors.

POTENTIAL LWWSS PROJECT ACTIVITIES, LWWSS INITIAL ASSESSMENT REPORT

<u>Topic Areas</u>	<u>Potential LWWSS Project Activities</u>
<i>Component 2: Managerial, Technical and Operational Capacity Building</i>	
2.1 Build General Management Capacity	<p><u>2.1.a. Assist WEs as They Add Management Personnel</u></p> <p>As WEs obtain additional budget support or their own revenues permit, LWWSS in close coordination with GTZ and the EU will provide training in areas such as financial management, budgeting, procurement management (including managing the tendering process for outsourcing), capital planning that is closely related to the business plan or high priority needs of the WE. LWWSS can also assist with specific activities such as job descriptions, recruitment and performance monitoring and incentive programs. These activities would be planned and carried out with other donors, specifically the HR work that GTZ is already doing in the NLWE and SLWE.</p> <p><u>2.1.b. Develop a Common Reporting Format for all Water Establishments</u></p> <p>Each WE reports to the MOEW concerning its own performance (financial and operational) but the reports do not conform to a common format requiring the same level of information. To the extent possible, LWWSS will work with the MOEW and the WEs to harmonize the reports.</p>
2.2 Business Planning	<p><u>2.2.a. Support Business Planning Implementation</u></p> <p>LWWSS will assist WEs in implementation of adopted business plans through training, coaching specific positions that are tasked with business plan implementation and monitoring. Although LWPP produced a business plan development manual, additional technical assistance (coaching and monitoring implementation efforts) will be provided where other donors are not doing so (GTZ is currently working with NLWE in development and adoption of its business plan.)</p> <p><u>2.2.b. Assist in Updating Water Establishment Business Plans</u></p> <p>The SLWE and BMLWE have requested assistance in updating their current business plans (2006-2011).</p>
2.3 Build WWTP Management Capacity	<p><u>2.3.a. Assist WEs to Assume Operations of Wastewater Treatment Plants Post-CDR Contractor Management Period</u></p> <p>WEs do not currently have wastewater divisions within the WE structure. LWWSS will coordinate with GTZ in assisting the WEs in setting up wastewater divisions within water establishments to fully implement Law 221 and subsequent amendments. LWWSS will coordinate with GTZ in the development of organizational structures that are standardized for positions and job descriptions for all WE position titles, to include the wastewater division. GTZ is working with BMLWE to assume responsibility for a WWTP in Burj Hammoud. There are seven other plants currently managed by contractors that will eventually be turned over to a WE. LWWSS and GTZ will need to coordinate closely as each of the operations contracts ends for the WEs to take over responsibility for their operation.</p> <p>Another area of wastewater plant management for LWWSS to undertake activity in could be to assist the BKWE in assuming operational</p>

	<p>responsibility for the three plants that USAID is constructing in the Beka'a Valley. Two are complete and currently run by municipalities.</p> <p><u>2.3.b. Assist Water Establishments to Establish Twinning Relationships for Wastewater Treatment</u></p> <p>Assist WE to establish formal relationships between one or more leading wastewater treatment utilities in the region with one or more Lebanese water establishments for capacity building.</p> <p><u>2.3.c. Training with Regional Wastewater Treatment Leaders</u></p> <p>Study operations in Rabat or Tunis, or other leading wastewater utilities in the region. Strengthen the linkage with the Arab Countries Water Utility Association (ACWUA), particularly for training and information sharing, in coordination with GTZ.</p> <p><u>2.3.d. Develop Service Agreements between Water Establishments and Municipalities</u></p> <p>All WEs have municipalities where the municipalities own the sewer collection lines and may or may not operate a wastewater treatment plant. Setting aside the ownership of the plants and collector lines, the responsibility of treating wastewater is clearly that of the WEs. The problem, however, is that the WEs do not own the collector lines in many municipalities and in some cases the WWTP. On the other hand, municipalities often find it difficult to maintain the integrated storm water and sewer lines with the limited tax revenues allotted for such activities. At least until the ownership problem is completely resolved, WEs need to clarify the work responsibility and cost sharing that would enable better maintenance and operation of the sewer collection system.</p> <p>LWWSS, in coordination with GTZ, will develop and roll out a model service agreement to be used in circumstances where the full responsibility for storm water and sewerage is shared between the WE and municipality.</p> <p><u>2.3.e. Develop O&M Manuals and Training for Wastewater Treatment Plants</u></p> <p>One area that GTZ is not addressing is the preparation of operations and maintenance manuals for wastewater treatment plants. However, CDM, subcontractor to LWWSS, is developing these manuals for the plants they are constructing under a separate contract with USAID. LWWSS will explore during the work plan activities with each WE the possibility of providing a more comprehensive approach to WWTP operations and maintenance.</p>
<p>2.4 Develop Outsourcing Capacity and Help Implement as Applicable</p>	<p><u>2.4.a. Develop Outsourcing Capacity</u></p> <p>LWWSS will coordinate with the efforts already undertaken by GTZ and the EU in developing and implementing outsourcing capacity and may, through such coordinated effort provide training to WE staff for all types of outsourcing procurement. This may also include development of manuals and guidelines for specific types of outsourcing. For example, development of service agreements with municipalities.</p> <p>The development of outsourcing capacity will build on the establishment of an outsourcing department within the WE organization and will require training and technical assistance in administration of the new department. For example, BMLWE needs a better way to monitor electrical and mechanical contractors, and has asked GTZ to help on this. GTZ is also doing O&M contract design for Akkar water schemes, but this is on hold. In general this area is one that will require the joint efforts of LWWSS and GTZ and other donors as well.</p> <p>An alternative and, possibly, intermediate step to building the capacity of each WE could be to establish a unit within the MOEW to work with one or two persons in each WE to outsource service agreements. These two potential activities will be further explored during the work plan development phase.</p> <p><u>2.4.b. Assist in Development of potential PSP in Bekaa Valley</u></p> <p>The Baalbeck contract (World Bank-funded) is the only example of a major multi-year PSP currently. PSPs are politically sensitive in Lebanon, but the general feeling is that water establishments should use them when they need to, and that more PPPs are inevitable.</p>

	<p>The LWWSS could help water establishments write TORs, assist them in the procurement process, and assist them in contract monitoring. This project may need tariff reform first in some cases (such as large O&M contracts) to be able to pay the contractors. One such area of assistance is definitely needed: developing contracts between the water establishments and municipalities for the latter to keep maintaining the collector systems under contract where this is the intended mode of operation.</p> <p>BKWE is very happy with the Baalbeck contract and would like to adopt this model by dividing the Beka'a Valley into 5 sub-regions (of which one will be Baalbeck) and having them operated by O&M contractors. But BKWE does not have the money currently to hire the contractors.</p> <p><u>2.4.b. Work on MOEW/MoF Approval of Multi-year Service Contracts</u></p> <p>All the WE directors general have complained about being able to contract for services for one year. For many operations and maintenance agreements this short term does not allow for return of any investment that the potential service provider has invested in the process. LWWSS will work with AFD, GTZ and the EU to allow for multi-year outsourcing contracts addressing critical needs of the WEs.</p>
2.5 Further Develop KPIs and Monitoring Systems	<p><u>2.5.a. Set Up Data Collection and Management Systems at Each Water Establishment</u></p> <p>GTZ is developing a “starter set” of KPIs and parameters, which will over time need to be expanded, but it is felt by GTZ that such expansion should wait until the applicable data are reliable. LWWSS could provide assistance to WEs to develop ways to obtain such data.</p> <p><u>2.5.b. Conduct Study Tours in the Region to See Good Examples of Water/Wastewater Utility Operations</u></p> <p>The water establishments need training in how to utilize data to implement best practices. This may be facilitated by technical visits to cities with good management of water systems. Another approach may be for the experts of the regional facilities to tour the WEs and offer advice and suggestions on specific issues, problems and best practices.</p>
2.6 Metering Improvements	<p><u>2.6.a. Meter Management System for BMLWE and Other WEs</u></p> <p>BMLWE has requested that LWWSS provide technical assistance and training in WE-wide meter management. Further clarification is expected during the work plan development meetings with WEs. This activity touches on several other activities such as demand management, customer service, NRW reduction and asset management. With limited resources, LWWSS in coordination with other donors and agreement on priority activities with the WEs (metering production as opposed to consumption), will need to define more clearly with each WE where the priority activity will produce the most positive sustainable impact. Additionally, LWWSS could continue the zone metering project in SLWE started by the LWPP program.</p> <p><u>2.6.b. Conduct NRW Pilot at BMLWE</u></p> <p>LWWSS could assist BMLWE in a pilot that would be based on GTZ experience in other WEs. The BMLWE pilot could be spread to other areas in the WE or carried out in other WEs in coordination with GTZ and other donors.</p>
2.7 Organizational Structure	<p><u>2.7.a. Augment GTZ's Efforts in Organizational Structure Optimization</u></p> <p>GTZ is reviewing organizational structure and organizational by-laws at all water establishments. LWWSS could jointly develop a clear strategy with GTZ in this area. The process will entail review current structures, roles, responsibilities, accountabilities and development of job descriptions to match the changes in responsibilities and authority. BMLWE would like to review current structure compared to other water agencies. (Also set up wastewater departments but this is covered in 2.3.a).</p> <p><u>2.7.b. Develop Job Descriptions as Requested</u></p> <p>This would be on demand. GTZ is developing job descriptions for senior staff at BKWE. LWWSS would look to augment GTZ's efforts</p>

	when program resources permit.
2.8 HR Development	<p><u>2.8.a. HR System Development</u></p> <p>GTZ is working on parts of this, such as introducing the functions of HR and training coordination. A more comprehensive approach will be taken by LWWSS in coordination with current GTZ efforts where WEs request HR assistance.</p>
2.9 IT Systems	<p><u>2.9.a. Write Functional Specifications for Needed IT systems</u></p> <p>Based on previous donor experience in providing IT technical assistance, LWWSS could provide technical assistance in development of rational and sustainable IT programs with WEs that request such assistance. For example, the SLWE has requested a maintenance management software system. Other areas of IT assistance in general are customer information and service systems, and GIS applications especially in BKWE. This area of activity will be closely coordinated with other donors such as GTZ, EU and AFD.</p> <p><u>2.9.b. New Applications at BMLWE</u></p> <p>The BMLWE has requested an IT assessment of its systems with the goal of integrating the whole IT system, particularly the FAS and other operations systems. LWWSS may provide such assistance looking to “middleware” which is designed to work with existing software but integrate them without the disruption that installation of whole new systems brings with it. Based on the BMLWE outcome, LWWSS may be in a position to assist other WEs that want better information system integration but want to avoid the disruption that whole system replacement entails.</p> <p>Also BMLWE needs improvements to its SCADA system (covered in the HPIP).</p> <p><u>2.9.c. Support More Extensive Application of GIS</u></p> <p>A goal of all WEs is to put all maps in GIS. LWWSS, in coordination with other donors, can assist in GIS installation and collection of data where the process is sustainable by the WE. GTZ is doing GIS mapping of some water infrastructure (Akkar, BKWE, SLWE pumping stations) plus associated training and GTZ is doing GIS documentation of distribution systems (Akkar, BKWE, pumping stations SLWE) including monitoring of repair works. Also, the BKWE CDG asked for training his employees on GIS use and application.</p>
2.10 Operations and Maintenance	<p><u>2.10.a. Develop Procedures Manuals for Field Service Personnel</u></p> <p>WEs expressed a need to develop manuals first, and then use them to train staff. LWWSS could prepare procedures manuals for various assets, which form the basis of the training materials. For example, BMLWE is the product of merging 6 organizations, but procedures were never standardized. Focus on water distribution system O&M staff and supervisors, as well as water treatment. GTZ is working on standard procedures for O&M of water supply networks, and is commissioning water supply systems in Akkar (which includes O&M planning, organizational development, tools etc.).</p> <p><u>2.10.b. Assist Water Establishments in Moving from Reactive to Planned Maintenance</u></p> <p>Build on 2.10.a to create the culture and systems for increasing the ratio of planned versus reactive maintenance.</p>
2.11 Efficiency, Service and Quality Improvement	<p><u>2.11.a. Assist Water Establishments with Water Source Optimization</u></p> <p>At SLWE, LWWSS can use GTZ assessment of pumping stations as a starting point. GTZ is writing a report on a survey of 60 WPS (assessment and investment needs). One important goal will be to reduce electricity consumption by source selection to use gravity as much as possible. GTZ is assessing El Fouar Station and Kfaroueh Spring, and bulk water metering in Saida and Tripoli. While optimization studies have been completed for SLWE and NLWE, a study needs to be done for the BKWE, rather than having many small local systems, taking advantage of geography to minimize pumping needs.</p>

	<p><u>2.11.b. Electricity Consumption Reduction Strategy</u></p> <p>LWWSS can assist WEs by assisting in the development of an electricity reduction strategy where it has not been done by another donor. The MOEW has stated that the subsidization of electricity consumption will not continue and that the WEs must find ways to reduce their electrical consumption or raise sufficient revenue to meet this expense.</p> <p><u>2.11.c. Improve Pressure Control</u></p> <p>During discussions with GTZ and the WEs, LWWSS has learned that this is a big issue for Lebanon. It is felt that many areas could achieve continuous supply with better pressure management. The focus should be on old networks with high pressure. Network modeling would also be valuable to optimize distribution – this doesn't exist now.</p> <p>In BKWE, many pumps are directly connected to the network rather than gravity-fed, so there is a need to optimize pumping, storage and networks jointly. LWWSS could assist in development of a management plan to do this.</p> <p>A possible innovative approach to this problem could be to support measurement of distribution system pressure by telemetry, and implement better pressure management via these systems (link to 2.6.c and 2.9.a). GTZ is working on pressure management in Saida (pilot) – water pressure is up to 8 bars there.</p> <p><u>2.11.d. Make Improvements to Water and Wastewater Quality Labs</u></p> <p>Water and wastewater quality is a big issue receiving no donor attention currently so this may be an area for LWWSS, since it has been mentioned that the current laboratory capability is inadequate with the exception of BMLWE water testing capability.</p>
2.12 Procurement and Supply Chain	<p><u>2.12.b. Produce a Tendering Manual</u></p> <p>This is lacking now. Develop a manual and provide training.</p>
2.13 Training	<p><u>2.13.a Pumping Station Operations and Safety</u></p> <p>GTZ is working on pumping station monitoring in SLWE as a pilot. This effort can be augmented with lessons learned as well as the production of operations manuals and training.</p> <p><u>2.13.b. Water Treatment</u></p> <p>This area has been covered by many other donor efforts. LWWSS will continue to seek ways to augment their efforts where the opportunity arises and resources permit.</p> <p><u>2.13.c. Call Center, Over the Counter Services and Customer-Facing Field Staff Customer Service (linked to 7.1)</u></p> <p>There is a need to train new CSRs for the SLWE facility, eg in handling complaints, joint training with CSRs and field service people on work order processing. LWWSS will coordinate with the current efforts of GTZ to determine whether there is a need for program augmentation. LWWSS will further analyze and determine whether the processes implemented in the SLWE can be rolled out to other WEs once the GTZ pilot effort is completed.</p> <p><u>2.13.d. Train the 25 New Financial and Accounting Staff for SLWE as they are Recruited</u></p> <p>Although GTZ has been active in training in the SLWE, LWWSS may also provide some training in coordination with GTZ.</p> <p><u>2.13.e. Meter Use, Testing, Repair and Data Management</u></p> <p>This is a high priority area for all water establishments. The need is to read the meters properly and use the data to manage better. The</p>

metering program includes production, distribution zone, large user and domestic meters. GTZ is providing ongoing assistance to SLWE in meter data management. Link to use of volumetric tariffs. GTZ will, over the next few months, also be doing customer awareness campaigns related to metering.

2.13.f. WTP, WPS and Network O&M Training (in that Order) for NLWE (linked to 2.3 and 2.10)

This is a high priority for the NLWE. The Director General has stated that he wants LWWSS to work in one geographical area of the WE while other donors work in other areas of the WE.

2.13.g. Procurement (linked to 2.12)

Current processes are typically manual, and paper-based. LWWSS should investigate whether JD Edwards procurement and inventory modules are available as they may be able to be integrated with the current JD Edwards software at SLWE. GTZ is preparing an O&M contract for Akkar. Based on the results of this pilot effort, LWWSS may collaborate in the roll out of procurement of subcontracting.

These activities, and the discussions and analysis that took place as part of the generation of the Initial Assessment Report, informed LWSS' High Priority Intervention Plan and Work Plan, described below.

High Priority Intervention Plan. In conjunction with the Directors General of the four regional water establishments, LWSS developed a prioritized list of high-priority projects from which to develop recommendations to USAID for activity funding. LWSS evaluated the feasibility and cost estimates of each proposed priority project. For water establishments with an updated five-year Business Plan, LWSS also considered how proposed projects fit within the strategy set forth in the business plan.

The High Priority Intervention Plan (HPIP) included procurements to provide assistance to the WEs on high-priority investments in equipment and infrastructure. Criteria for items to be included in the HPIP included: 1) immediacy of need; 2) impact on the water establishment's operations; 3) sustainability of the equipment or infrastructure rehabilitation or new small capital construction and 4) availability of funds. Below we summarize the high priority interventions requested by each water establishment. The full HPIP is included in Annex A to this report.

Beirut-Mount Lebanon Water Establishment. The new capital investment priorities that were proposed in the 2010-2014 Business Plan were focused on the following five strategic goals embedded in the Business Plan:

- Increase number of hours of pressurized water supply service in the various water supply service areas of the water establishment.
- Increase the number of metered customers.
- Reduce the amount of lost or non-revenue water.
- Achieve full cost recovery from revenues.
- Implement asset and maintenance management.

Bekaa Water Establishment. The Director General did not provide LWSS with a detailed list of equipment and small infrastructure requests, but identified the need for water pumps of various sizes and requested a survey to determine suitable production and zone meters for the Bekaa region.

North Lebanon Water Establishment. The NLWE provided LWSS with an extensive list of needed equipment and small- and medium-size capital projects. The management of the NLWE was acutely aware of the need to be more focused in its use of capital and in its application to improve the quality of service of the establishment and its measurable performance, and to maintain its capital asset base.

To improve the quality of service and the measurable performance of the establishment, three strategic goals will require investment capital to reduce non-revenue water, increase service coverage and properly equip field service crews. To manage and maintain the NLWE's capital asset base, the management was determined to continuously improve its financial performance, such that it can generate the necessary "free cash flow" to fund the three key Capital Reserve Funds (Capital Expenditures), which are:

- Capital renewal fund (for items below the ground)
- Capital repair and replacement fund (for items above the ground)
- New capital investment fund

South Lebanon Water Establishment. The highest priorities for the SLWE were focused on improving the management and operational responsiveness and efficiency of the SLWE. The SLWE identified the following four priorities for inclusion in the HPIP:

- Reduction in non-revenue water (both administrative and technical)
- Reduction in the use of electrical energy for the pumping of water
- Overall upgrading of the networks to meet the goal of reliable, pressurized service to the customers on a 24-hours per day basis
- Improvement in the bill collection rate

In addition, the SLWE Director General requested the following high priority items for equipment and small capital construction under LWWSS:

- Replacement of all customer meters in Saida
- 60 regional flow meters
- Bulk water pumps
- New wastewater testing laboratory and equipment
- Upgrades to water pumping stations with more efficient pumps, motors, and controls

All of the equipment requested by the DG relates to increasing revenue, reducing costs, and providing more effective service. It was also in line with the SLWE Business Plan.

Component 1 Contractual Deliverables	Status
Issue Initial Assessment Report	Complete
Issue Environmental Assessment Report	Complete
Issue High Priority Intervention Plan	Complete

Component 2: Capacity Building for Managerial, Technical, and Operational Efficiency

Scope: Help each water establishment improve its management and operations and assume responsibility for wastewater treatment through the adoption of improved operating systems, reorganization of departments, outsourcing of selected services, and strengthening of staff capacity.

The purpose of Component 2 was to develop and provide capacity building for water establishment leadership and staff, to improve their ability to manage the utilities and maintain the networks. Our work under Component 2 focused on establishing a corporate culture within the establishments focused on improved performance, providing the tools and training needed to improve the physical operations and efficiency of the water establishments, undertaking procurement and investments to improve system operations, and improving the organization of each water establishment. LWWSS worked closely with each water establishment to understand its capacity challenges, develop tailored approaches to overall capacity building, and identify specific needs for training and capacity building related to individual activities being implemented at the water establishment.

This section describes key project accomplishments in this component, as well as the impact this work has had on the broader objectives of the water establishments and, of course, the water customers.

Key Accomplishments of Component Two

1	Trained Operations and Maintenance Staff of the Water Establishments
2	Established and Built Capacity of Metering Teams
3	GIS Training for the South Lebanon Water Establishment
4	Built the Water Establishments Water Quality Management Capacity
5	Built Capacity in Enhancing Administrative Performance: Public Administration and Process Management Training

Trained Operations and Maintenance Staff of the Water Establishments

Scope: The water establishments identified staff capacity building as a critical priority for long-term development and success. In order to sustain the significant investments that LWWSS made in their water networks and pumps stations, the water establishments recognized the need for increased capacity for operations and maintenance staff, who are responsible for maintaining and repairing the networks and pump stations in the long-term. LWWSS conducted two major training activities for O&M staff of the

water establishments: training on network maintenance and repair, and training on pump station operation and maintenance.

Activities: LWWSS conducted numerous trainings for water establishment leadership and staff over the course of the six year project. We provided operations and maintenance training for network maintenance personnel at the NLWE, SLWE, and BWE; and for pump station operators at the BMLWE (at the Jeita pumping station), SLWE, NLWE, and BWE.

A summary of the complete trainings provided by LWWSS is presented in the table below, and we have included a comprehensive list of these trainings in Annex A to this final report.

Water Establishment	Total No. of Participants
BMLWE	97
BWE	155
NLWE	121
SLWE	218
Cross Training	29
	620

Highlighted activities included:

BMLWE. LWWSS provided training to the nine pump station operators at the Jeita Pump Station to improve their skills and processes in operating and maintaining the pump station equipment. The equipment, which included 18 sets of pump and motor equipment, was installed by LWWSS and BMLWE in early 2013. The training course consisted of in-class and on-site training covering all the basic aspects of operating and maintaining a pump station, including operating the mechanical and electrical equipment, facility management basics, pump maintenance, motor protection, and safety procedures. LWWSS also provided a manual for operations and maintenance of the pump station, which was used in the training and will remain in use for the pump station operators. The training helps to decrease accidents on site, avoid human errors, and extend the life of BMLWE's equipment.

BWE. The Director General requested significant training in operations and maintenance as well as finance and administration. The combined training was designed to build the capacity of water establishment staff to manage its finances, accounting, procurement, and administrative processes while also building the capacity of its operations and maintenance staff to properly maintain and protect the network and pump stations in the long-term.

LWWSS carried out a series of training activities to build the capacity of the BWE, increase its commercial viability, and ensure sustainability of the different initiatives carried out by the project. Training activities covered all the basic aspects of operating and maintaining pump stations, as well as administrative and finance training to streamline and enhance business workflow and processes at the BWE.

In December 2014, USAID and LWWSS distributed training certificates to 128 staff members from the Bekaa Water Establishment in the presence of USAID/Lebanon Mission Director, Ms. Carolyn Bryan, and the BWE Director General, Mr. Maroun Moussallem (see photograph on the following page).



LWWSS and the USAID /Lebanon Mission Director, Ms. Carolyn Bryan, distributed training certificates to 128 staff members

NLWE. LWWSS trained 37 operations and maintenance staff of the North Lebanon Water Establishment in network maintenance. The 10-day training session provided knowledge and understanding on standard operating procedures as well as good guidance on how to mitigate risks associated with maintaining water distribution networks. Ensuring the proper maintenance of water networks is of utmost importance to the health and well-being of the water establishment's subscribers, since many incidents of water contamination originate in the network. Furthermore, the training was critical to sustaining the water network and pump stations in the long run, as it reduces water losses, maintenance costs, and water supply service disruptions. During a ceremony at the North Lebanon Water Establishment, LWWSS distributed certificates to these 37 operations and maintenance staff.

Results and Impact: As a result of these trainings, water establishment staff used new financial and accounting systems and processes, and improved the ongoing maintenance of water networks. The new skills developed by water establishment staff and pump station operators help to improve the service provided by the water establishment. Through their increased understanding of operations and maintenance, the pump station operators were better equipped to maintain the network, decrease accidents, and extend the life of the equipment provided by LWWSS.

Established and Built Capacity of Metering Teams

Scope: The SLWE source metering activity (described in Component 5) included training on water meter operation and maintenance so that water establishment and pump station personnel could maximize the impact of the source metering investment.

Activities: LWWSS established and trained the pump station personnel on water meter operation and maintenance. The training activity aimed to build the capacity of a metering team consisting of 82 operators from 48 pump stations in mechanical flow meter, solar ultrasonic flow meter, and pressure gauge reading and record-keeping procedures. The trainings were held in six consecutive sessions at the SLWE branches in Saida, Jezzine, Marjeyoun-Habaya, Al Nabatieh, Al Zahrani, Tyr, and Bent Jbeil.

Results and Impact: This activity advanced the SLWE capacity to monitor water production per site, and establish a culture of water demand management within the SLWE, which enabled the SLWE to better control operating costs, manage water production, decrease losses, and advance toward achieving water balance.

GIS Integration for the South Lebanon Water Establishment

Scope: In response to requests from the SLWE, LWWSS collaborated with the SLWE to implement a Geographical Information System (GIS). The activity, which began in 2012, is part of a larger initiative to analyze water production in the SLWE by providing a system to update and analyze data on the pumping stations, equipment, and their maintenance. LWWSS conducted under Component 4 a comprehensive survey of SLWE pumping stations to create an asset listing and valuation, as well as to identify the type, specifications, and status of existing equipment. Collected data were organized and integrated as an inventory into the GIS application, and various tools were provided to enable users to read and assess data without prior GIS technical knowledge.

Activities: LWWSS initially installed the software at SLWE branches and conducted basic training for data entry staff. In addition, once the SLWE had used the system for a year, SLWE requested an enhancement feature for the software. This entailed including a history log that would capture the history of every change made to the system, allowing the review of old and new values prior to accepting them into the system.

After developing the requested GIS features, LWWSS conducted training for 21 operators and supervising engineers. The two-day training combined theory and hands-on experience, specifically with the custom SLWE Pumping Station application. The training was followed up by onsite visits to ensure all end users had the modules needed and were able to update the information as needed.

Results and Impact: This activity was critical in responding to SLWE asset management needs by introducing a systematic procedure to communicate and share technical data among the various departments and branches within SLWE. Its future integration with the ERP system will contribute to increasing data accuracy and improving oversight within the SLWE, enabling it to manage its assets through a reliable, consolidated database. The enhanced GIS software will also contribute to better assessment of needs and planning of procurement activities.

Building the Water Establishments' Water Quality Management Capacity

Scope: This activity aimed to establish a sustainable plan for potable water quality management for the BWE. The plan was developed to respond to the realities of the BWE's water pollution profile, water treatment and testing infrastructure, and human capacity. LWWSS worked with the American University of Beirut to develop a comprehensive water quality monitoring and quality management program for the BWE.

Activities: AUB conducted surveys on the water quality of sources feeding distribution networks and piped water supply during both the dry and wet seasons. AUB overcame challenges such as access to sites, power cuts (preventing the water samples from being collected), and political tensions related to the

proximity with the Syrian border. Based on the survey findings, LWWSS designed the monitoring and management programs, and identified the need to establish laboratory units that would implement these objectives. As part of the activity, a laboratory location and equipment plan was developed followed by procurement and training of the 10 BWE staff. This three-day training was followed by on-the-job weekly training on water quality for nine laboratory technicians. Once the laboratory equipment was delivered, the laboratory team worked closely with AUB to design follow-up training programs as necessary.

Results and Impact: This activity enhanced the BWE's ability and capacity to monitor and analyze the quality of the water in both dry and wet seasons, and increase its transparency and accountability in water quality management. The activity also enabled BWE management and laboratory staff to understand the basics of laboratory operations and management.

Building Capacity in Enhancing Administrative Performance: Public Administration and Process Management Training

Scope: As part of staff capacity building, LWWSS provided training on public administration and process management to enhance the administrative, managerial efficiency and workflow of BWE's key personnel as well as enhance their workflow and become more acquainted with the WE's by-laws. The training also ensured that staff members within various departments of the BWE would be familiar with basic regulations associated with process management within their departments.

Activities: During the 7-day workshop, BWE staff members were trained on public administration and process management. The content of the training covered the BWE Organization Chart, Laws and Regulations. It also included process and procedure training on different modules: Procurement, Inventory and Fixed Assets, Accounting: Accrual vs Cash, Financial Reporting, Payroll and H/R, Budget Preparation and Execution, Billing and Collection vs CRM.

The training activity was highly needed in order to enhance the administrative, managerial efficiency and workflow of BWE's key personnel.

Results and Impact: The training resulted in faster processing of customer applications, work orders and requests and allowed the staff to become more acquainted with the WE's by-laws, thereby increasing their level of compliance and accuracy, as well as contributing to the BWE's better organizational and financial performance.

Increasing Knowledge through Study Tours

Scope: LWWSS planned to organize study tour and conferences throughout the course of the project to build advanced skills of senior water establishment staff in areas such as water demand management, integrated water resource management, and water quality management. The aim of these study tours was to increase the Lebanese water establishments' exposure to advanced approaches in various aspects of water utility management. However, plans were constrained by water establishment personnel's availability and the approvals necessary to allow for foreign travel. The water establishments faced considerable challenges in obtaining clearance from the MoEW and the Ministry of Foreign Affairs for attending international training and conferences, as the MoEW preferred that the water establishments receive specialized training within Lebanon rather than being sent abroad.

Activities: Although the total number of study tours was limited by the preference of the MoEW to train the water establishment Directors General and Department Heads within Lebanon, LWWSS still sent three Directors General and technical staff from all four water establishments to four study tours and conferences in the region. In December 2010, the Director General of the SLWE and Finance Directors from the SLWE and NLWE attended the Arab Countries Water Association conference in Amman, Jordan. In June 2012, the Directors General of the BMLWE, BWE, and NLWE attended the ACWUA Best Practices conference in Muscat, Oman. In November 2012, two senior engineers from the NLWE traveled to Jordan for a regional training on non-revenue water. In May 2013, 14 senior staff including

Directors General from the BWE and BMLWE and technical staff from the SLWE, NLWE, BWE, and BMLWE participated in a study tour to Morocco in partnership with Morocco's Office National de l'Electricité et de l'Eau Potable. The study tour familiarized participants with the water sector in Morocco, with particular focus on water management, water distribution, network maintenance, water quality control, metering systems, tariffs systems, and research activities.

Results and Impact: The various study tours gave Lebanese delegates the opportunity to share their experiences and gain insights on water management in the greater Middle East and North Africa region. Participants were able to share experiences and lessons learned related to technical aspects of water management, such as the application of new technologies, and approaches to reducing non-revenue water; as well as the management and administrative aspects of water management, such as overseeing procurements. Although the study tours were limited, LWWSS complemented those opportunities with substantial training conducted inside Lebanon. LWWSS provided many opportunities for customized technical training and in-country capacity building for the four water establishments, and these served as efficient and sustainable methods for capacity building.

Component 2 Contractual Deliverables	Activity	Establishment	Status
Develop an Institutional Development Workplan	Capacity building in planning and updating 5-year business plans, benchmarking and performance monitoring (please see Component 4 for this discussion)	BMLWE, SLWE	Completed for BMLWE and SLWE for the period 2010-2014 and BMLWE for 2015-2019
Implement training activities for staff and for senior and mid-level managers	a. Comprehensive training in all aspects of lab operation; b. Public administration and process management training; c. Building capacity of metering team; d. Building customer service management structure	a. BWE, SLWE b. BMLWE, BWE c. SLWE d. BWE	Complete
Conduct O&M, outsourcing, and procurement training	a. Building the capacity of pump stations operators in O&M; b. Training on network maintenance and repair	a. All four WEs b. NLWE, BWE	Complete
Conduct study tour programs on selected topics	Conduct study tours and conferences	All four WEs	Complete
Develop operation and maintenance planning procedures and systems, long-term preventive maintenance standards and guidelines	a. Building the capacity of pump stations operators in O&M; b. Training on network maintenance and repair	a. All four WEs b. NLWE, BWE	Complete
Provide recommendations for Service Standards that could be used as the basis for reviewing performance of companies	Integrating the WE's financial, accounting, customer service and business process systems: The Enterprise Resources Planning (ERP) platform (please see Component 3 for	BMLWE, BWE, SLWE	Completed as part of ERP procurement module

	discussion)		
Provide analysis and develop model service agreement for operation and maintenance of wastewater collection and treatment systems	A full report was presented early in the program; support for wastewater was discontinued	All four WEs	Complete
Provide specific recommendations to selected WEs in developing and implementing performance improvement plans (part of Business Plan)	Capacity building in planning and updating 5-year business plans, benchmarking and performance monitoring (please see Component 4 for this discussion)	BMLWE, SLWE	Completed for BMLWE and SLWE for the period 2010-2014 and BMLWE for 2015-2019

Component 3: Increase Financial and Commercial Viability of Water Establishments

Scope: Help each water establishment to adopt improved commercial practices and achieve greater cost recovery and financial autonomy.

The purpose of Component 3 was to strengthen financial systems and financial management capacity, improve business planning, implement cost recovery models, and improve the monitoring of financial performance at each water establishment. LWWSS worked closely with each water establishment to understand its current processes for financial and administrative management, and to design and implement new models to integrate these functions along with resource planning.

This section describes key project accomplishments in this component, as well as the impact this work has had on the broader objectives of the water establishments and, of course, the water customers.

Key Accomplishments of Component Three

1	Integrated the WEs' Financial, Accounting, Customer Service, and Business Process Systems
2	Developed Procedures and a Standard Manual for Yearly Budgeting
3	Developed Module and Procedures for Cost Tariff Analysis Module for Strategic Planning and Budgeting

Integrated the WE's Financial, Accounting, Customer Service, and Business Process Systems

Scope: LWWSS has worked with the Beirut-Mount Lebanon Water Establishment, South Lebanon Water Establishment, and Bekaa Water Establishment to implement the Microsoft Dynamics NAV Enterprise Resource Planning (ERP) system. The ERP is customized for each water establishment, and has been tailored to address the needs identified by LWWSS and water establishments. The ERP provides each water establishment with an integrated, flexible, and modern platform for computerized operation across all of its departments, and

“All services are integrated through the ERP. The ERP provides financial and operational information, supports performance analysis that feeds into planning, informs the decision-making process, and is used as a key tool for internal audit.”
– Ahmad Al-Azzam

enables it to achieve fast progress in terms of increased administrative efficiency, accountability, quality control, and informed decision-making. Through this integrated system, the ERP helps to assess the current management and financial situation, supports planning by helping staff to understand how a particular decision will impact the water establishment, and assists in performance evaluation.

To complement the systems being implemented, LWSS has provided training related to planning, financial management, and internal audit. The project has trained water establishment staff on how to analyze cost tariff model reports, update the system, and use it to track progress, evaluate performance, and make decisions.

Activities: ERP implementation included modules on Finance, Purchasing and Inventory, Human Resources and Payroll, Billing and Collection, Customer Relations Management, and Documentation and Registration. In addition to installing these modules, LWSS provided significant training, on-site IT support, and technical assistance to ERP users at the BMLWE, BWE, and SLWE. Below we describe the specific activities LWSS carried out at each water establishment.

BMLWE. LWSS first finished the ERP implementation at the BMLWE. The water establishment staff were well-prepared to learn the new software, and provided significant feedback to LWSS on the module operation as well as desired modifications. LWSS implemented the human resources, customer service, and payroll department modules first, followed by the billing and collection department module. The ERP was fully functional in late 2012, and LWSS provided continued technical support to the BMLWE through September 2013. At that point, the BMLWE extended a service contract for ERP technical support through its own funding, demonstrating the importance of the ERP to the BMLWE.

SLWE. The South Lebanon Water Establishment was particularly eager for the implementation of the ERP, and Director General Ahmad Nizam invested significant time and resources into the system, including IT upgrades, staff training, and leadership attention. This leadership attention to the ERP implementation ensured that staff were prepared and incentivized to learn and apply the new system, so that the ERP was successful and sustainable within the water establishment.

By early 2015, staff of the SLWE were well-trained and fully capable of performing their tasks to update the ERP data and generate reports without additional help from LWSS. The project formally handed over all ERP modules, so that the SLWE would assume full ownership of the system.

BWE. The Bekaa Water Establishment was the last of the three water establishments to begin implementation of the ERP system. Although the implementation has progressed at the BWE, challenges with staff turnover and capacity issues have slowed the implementation of the full ERP solution. While all modules have been implemented successfully, the staff are not using them to their highest potential.

LWSS worked closely with the BWE Director General to discuss technical and staff needs, and continue providing technical support to the existing and new system users on the proper functioning of all modules. Although the ERP is technically functional at the BWE, reinforcing the regular and consistent use of the ERP, including data entry and management reports, is a recommended area of emphasis for future water sector programming in Lebanon.

Results and Impact: The ERP and improved management processes have already proven to be highly successful in improving the management and financial performance of the water establishments. An example of this success is the improved accounting, reporting, and budgeting functions. The closing of books and issuance of annual financial statements previously took at least four months. Now, with the ERP, the process takes only a few days, and financial statements are issued with the click of a button.

In addition to this accounting improvement, the ERP has also assisted the water establishments to improve their customer service capabilities. Through the CRM module, a water establishment can now log all customer complaints and categorize them by branch office and level of priority. The establishment

can then monitor the time required to resolve each complaint and can follow up on outstanding complaints to assess the level of service provided to customers.

Once the ERP has been fully implemented, the water establishment will have a centralized management information system that connects to all branches and handles all financial, administrative, and customer-related processes, using a robust IT infrastructure with a well-trained team of employees. This will result in a substantial increase in the water establishment's business efficiency, in terms of financial performance and control, compliance, HR systems and processes, customer service, and organizational collaboration. Not only does the system improve the water establishment's management, it also enhances customer satisfaction through better water management, customer service, and financial performance. As Abeer Koubar, Collection and Cashiers Manager, said, "The new ERP is user-friendly and can save precious time. It provides close control over establishment cash flow and outstanding balances."

Looking forward, the sustainability of these financial management improvements in each water establishment relies on staff commitment and regular system maintenance. The agreements between LWSS and the water establishments include a commitment from the management of the water establishments to maintain the ERP system. LWSS has trained staff with financial, management, and IT responsibilities in system maintenance and customization. The demonstrated benefits of the system and the firm commitments of each water establishment to maintaining the ERP have led to successful implementation and paved the way for sustainability.

Developed Procedures and a Standard Manual for Yearly Budgeting

Scope: Budget preparation and implementation is one of the key activities performed in each water establishment on an annual basis. The annual budget is a tool for planning and control, and is closely supervised by the Ministry of Finance. This activity took full advantage of the fact that the ERP integrates all the financial data within one database. It built the capacity of the key water establishment personnel associated with annual budgeting to use the centralized and flexible database, analyze the financial information, and extract key data for more accurate and reliable budgeting. As a result, the water establishments' key staff were provided with a step by step guide on how to plan, prepare and implement the budget for a better allocation of resources, which in turn would lead to a more efficient and effective management of the water establishment. LWSS provided training to introduce water establishments to the importance of budgeting as a planning and management tool, and the stages of budget preparation and execution. We also developed a Budget Manual for use by the water establishments during ongoing budgeting processes.

Activities: LWSS developed an action plan to standardize the budget across the four water establishments, and another action plan for the implementation of the 2015 Budget Manual, and shared them with all four water establishments. LWSS also held a workshop to explain and discuss the budget manual and key issues related to its implementation, such as policies, procedures, execution, forecast, methodology, reporting, and templates. The water establishments interested in pursuing this activity were asked to officially commit, dedicating staff to work with the LWSS team in accordance to the action plan. All WEs expressed their interest, showed commitment and identified staff members to follow up on the development of the budget manual and standardization of the existing templates. These staff also received training on the importance and use of budgeting as a management tool, and the stages and requirements of budget preparation and execution.

LWSS brought together the Heads of Finance Departments from each water establishment along with the LWSS team to develop a unified standard budget template to be used by all establishments. They also considered key issues related to the implementation of the budget manual, such as policies, procedures, execution, forecast, methodology, reporting, and templates. Participants discussed budget standardization in depth and collected comments regarding the changes that needed to be made in order to reach one unified form. Attendees agreed on one template for existing budget expense categories,

formats, and definitions which was implemented according to a schedule that included steps from integration of WE's comments in the budget manual to approval of the DGs on the 2015 budget forms.

The Ministry of Energy and Water (MoEW) approved the proposed budget and budget template. Accordingly, the LWWSS team customized the ERP budget module based on the suggestions of the MOEW. The BWE and SLWE adopted the standardized budget template and LWWSS customized their ERP budget modules according to the template. The BWE and SLWE ERP budget modules are now functioning properly with the approved 2015 budget fully entered into the system. The BMLWE did not fully adopt the standard template, choosing instead to customize the format to its specific needs, using 80% of the standardized format. The BMLWE had in-house capacity to develop its 2015 budget and did not request additional help from LWWSS to support its budget development. The NLWE also did not adopt the standardized budget template because it was not compatible with the NLWE's current internal procedures or pre-printed forms; however, the DG expressed interest in implementing the standardized template in the future.

Results and Impact: Implementing this activity built the capacity of key water establishments' personnel, taking advantage of the ERP budget module, which integrates all financial data in one database. Staff are able to use this centralized and flexible database in analyzing the financial information and extracting key data for more accurate and reliable budgeting, while following standard procedures and best practices, making use of the material provided during the initial workshop and various training sessions.

The budget manual and standardized template play an important role in capacity building as they enable staff to apply the material provided during the training, and follow standard practice in terms of budgeting, to further institutionalize the practice of preparing well-documented budget forecasts on a yearly basis. This activity reinforces the use of budgeting as a planning and control tool, and provides the water establishments' key staff with a step by step guide on how to plan, prepare and implement the budget to improve planning and operations.

Developed Module and Procedures for Cost Tariff Analysis Module for Strategic Planning and Budgeting

Scope: Although the ERP platform contains accurate financial information, this information is not automatically consolidated into a single module that analyzes it within a single interface. The BMLWE and SLWE requested a module that would provide real data on the cost of water production, distribution and billing and collection.

Activities: The Cost Tariff Analysis model is composed of the following nine sections with Excel sheet templates linked to the ERP: 1) Assumptions; 2) Scenarios; 3) Consolidated Results; 4) Cost Recovery; 5) Income Statements; 6) Variable Expenses; 7) Main Fixed Expenses; 8) Project Expenses; and 9) General Expenses. Through the Cost Tariff Analysis model, LWWSS provided the BMLWE and SLWE with an analytical tool that supports financial and business planning, while strengthening the water establishments' ability capacity to improve their decision-making processes, to achieve cost recovery and better performance.

LWWSS also finalized a user guide for the Cost Tariff Model, which highlights the Model's system design, data entry and reporting procedures.

Results and Impact: By entering this data, generated from the ERP, into the Cost Tariff Model, the SLWE will have an analytical tool that supports financial and business planning and enables the decision makers to adjust their strategies for the future in accordance with the foreseen costs and revenues of the WE. This complements the budgeting efforts to strengthen the WE's capacity to improve its decision making process, and to achieve cost recovery and improve financial performance.

Component 3 Contractual Deliverables	Activity	Establishment	Status
Provide training activities for staff and for senior and mid-level managers on financial management	a. Finance Accounting Standards (business process mapping, Budget manual, Internal audit manual and Cost tariff model procedures) b. Integrating the WE's financial, accounting, customer service and business process systems: The Enterprise Resources Planning (ERP)	a. All four WEs b. BMLWE, BWE, SLWE	Complete
Provide recommendations for implementing tariff strategies for cost recovery and long-term viability	a. Finance Accounting Standards (Cost tariff model procedures) b. Integrating the WE's financial, accounting, customer service and business process systems: The Enterprise Resources Planning (ERP)	a. SLWE b. BMLWE, BWE, SLWE	Complete
Develop modern management and financial systems: Introduce at selected WEs improved financial and cost recovery systems; customer service, billing and collection, and other WEs' business procedures and intergrading them into one operating system.	a. Finance Accounting Standards (business process mapping, Budget manual, Internal audit manual and Cost tariff model procedures) b. Integrating the WE's financial, accounting, customer service and business process systems: The Enterprise Resources Planning (ERP)	a. All four WEs b. BMLWE, BWE, SLWE	Completed for the BMLWE, BWE, and SLWE
Develop Business Plans that incorporate human resource development plans, long term training needs in financial management, performance target setting, corporatization procedures, long and medium term capital investment planning and training on capital investment management and monitoring.	Capacity building in planning and updating 5-year business plans, benchmarking and performance monitoring	BMLWE, SLWE	Completed for the BMLWE and SLWE for the period 2010-2014, and the BMLWE for 2015-2019

Component 4: Capital Investment Planning and Program/Project Management

Scope: Help the WEs to develop and begin implementing long- and medium-term capital investment plans and assist the MoEW to produce and publish a master plan that identifies national priorities for meeting long-term water and waste water needs.

The purpose of Component Four is to assist the water establishments in the development and implementation of long- and medium-term capital investment plans and to assist the Ministry of Energy and Water to produce and publish a master plan that identifies national priorities for meeting long term water and wastewater needs. While experts of LWSS participated in advising and reviewing the Ministry of Energy and Water's "National Water Sector Strategy" and "National Wastewater Sector Strategy" for Lebanon, actually developing and producing the national master plans or strategies was

accomplished by the MOEW with the participation of numerous national stakeholders and international donors. With that, focus was shifted entirely on the planning and investment needs of the water establishments.

Capital Investment Planning was accomplished as part of the capacity building efforts and in the ‘hands-on’ development of business plans, master plans, and asset inventory and valuation efforts. These processes tie to the five-year budget projections as well as performance improvement planning incorporated into the business plans. LWWSS predominantly assisted the SLWE and the BMLWE in their business planning whereas, in an excellent demonstration of donor collaboration, GIZ assisted developing and updating the NLWE and the BWE in their business planning, utilizing the same LWWSS subcontractor, ValuAdd Management Services (ValuAdd), which assured consistency and continuity in the process. The importance of this was that ValuAdd was involved in the very first business planning for the water establishments in an earlier USAID program, the Lebanon Water Policy Program (LWPP), thus had a wealth of intimate knowledge of the senior management and operations within the WEs, which strengthened the acceptance of the business planning process.

This section describes key project accomplishments in this component, as well as the impact this work has had on the broader objectives of the water establishments and, of course, the water customers.

Key Accomplishments of Component Four

1	Updated BMLWE’s Five Year Business Plans, 2010-2014 and 2015-2019
2	Updated the SLWE’s Five Year Business Plan, 2012-2016
3	Implemented Asset Inventory and Valuation, SLWE
4	Developed a Water Supply and Wastewater Master Plan, BWE

Updated BMLWE’s Five Year Business Plans, 2010-2014 and 2015-2019

Scope: The purpose of having the water establishment develop a business plan was to improve cost recovery, capital investment planning, customer service, and to establish more effective overall management, over the five-year period of 2010 – 2014 and beyond. Prior to this, water establishment management was not overly concerned with longer term planning, as they were preoccupied with addressing current issues or emergencies (crisis management). This effort was part of an overall strategy to improve short, medium, and long term management of the water establishment, and to establish a “culture” of planning for the future, knowing the direction of the establishment, and being able to measure actual versus planned progress.

Activities: This work, initiated in Year 1 of the program, required interactive work with the management and staff of the BMLWE. That is because the business plan, and the capital investment element of that, must fit with the overall medium- and long-term objectives of the WE, and also address the WE’s most pressing infrastructure needs.

For the 2010-2014 Business Plan, LWWSS completed information workbooks on a) Mission, Goals, and Objectives; b) Capital Investments; c) Five-year Budget Projections, including capital outlays; d) Manpower Needs and Projections; and e) Performance Improvement Planning. The project presented a draft of the business plan for review by Director General Joseph Nseir, who then presented the business plan to the BMLWE Board of Directors. Once approved by the Board, the BMLWE made the business plan available to the MoEW.

At a later stage of the LWWSS project, specifically in Year 6, LWWSS responded positively to a request by the BMLWE for assistance in updating and preparing the new business plan for the 2015-2019 time

period. Although it was hoped that BMLWE had sufficient in-house capability to prepare the new business plan themselves, the insufficient number of permanent staff with the necessary skill sets prevented them from doing so. On the plus side, however, it demonstrates that the culture of needing, wanting, and using a business plan had indeed been firmly established. After strategy meetings and discussions of projections, the LWSS and the BMLWE presented the draft Business Plan to the Board of Directors and MoEW, which both approved the plan.

Results and Impact: The impact on the BMLWE, and the resulting improvement in services and responsiveness to customers, is significant. Business Plans tend to improve the professional nature of the management, enable better service, and the ability to better address concerns of the consumers. In addition to the two Business Plans for the BMLWE, LWSS developed the Capital Planning Guide for the next cycle. Also important, the work developed staff capacity within the BMLWE to contribute to business planning in the future, and emphasized the importance of business planning as a long-term planning tool.

From a sustainability standpoint, the BMLWE is now better able to perform most of the tasks related to business plan development. Whether or not they are able to obtain and retain sufficient qualified staff to perform this work remains a question, but certainly, as of this time, the skills and knowledge exist.

Updated the SLWE's Five Year Business Plan, 2012-2016

Scope: USAID fostered the development of business planning at SLWE during the earlier LWPP program and supported the further refinement and periodic updating of the plan for SLWE under LWSS. A recent and new feature impacting the business plan is the completion of the Ministry of Energy and Water's *National Water Sector Strategy*, which the business plan is expected to address and meet requirements of specific sections of the NWSS. The LWSS project was committed to ensuring that the business plans produced were instrumental in the SLWE adhering to requirements of the NWSS.

Activities: As in the case of the BMLWE, this work necessarily had to be interactive work with the management and staff of the SLWE. Again, the business plan, and the capital investment element of that, must fit with the overall medium and long term objectives of the WE, and also address the WE's most pressing infrastructure needs, which in 2013 included addressing a major water shortage caused by a severe drought during the warm season.

For the 2012-2016 Business Plan, LWSS completed information workbooks on a) Mission, Goals, and Objectives; b) Capital Investments; c) Five-year Budget Projections, including capital outlays; d) Manpower Needs and Projections; and e) Performance Improvement Planning. The project presented a draft of the business plan for review by Engineer Ahmad Nizam, Director General of the SLWE, who then presented the business plan to the SLWE Board of Directors. Once approved by the Board, the SLWE made the business plan available to the MoEW.

Results and Impact: As in the previous case with BMLWE, the impact on the SLWE is similar, with improvement in services and responsiveness to customers. LWSS emphasized the importance and use of having followed a Business Plan, and developed staff capacity to contribute to or lead the development of future Business Plans. The Business Plan has already improved the professional nature of management, enabled better service, and increased ability to better address concerns of the consumers.

From a sustainability standpoint, since the SLWE had previously utilized automated management and financial accounting systems, they were in a good position to understand and adhere to the practice of developing Business Plans. Retaining trained and qualified staff to perform this work will remain a question, but at the conclusion of LWSS, the skills and knowledge exist.

Implemented Asset Inventory and Valuation, SLWE

Scope: This work entailed conducting a detailed comprehensive survey of the approximately 250 various water sources (wells, springs, etc.) and pump stations around South Lebanon, to create an asset listing and valuation for the SLWE to be able to know, manage, and plan for its facilities. We have provided the list of pump stations surveyed and results as part of Annex A to this report. The inventory was undertaken in a way to be compatible with the Geographic Information System (GIS) software that SLWE already operates, and will feed into the physical assets module of the ERP. The long term intention is for SLWE to maintain their inventory, to know the condition of various equipment or facilities, and plan for repairs and/or replacements accordingly.

Activities: The following activities were undertaken to accomplish this work:

- Start-up Coordination. To include location identification, check existing information and records, schedule field visits, create appropriate templates for field data, and financial valuation.
- Site Visits and Investigations. Visits to all facilities covered spring sources, civil construction information, mechanical equipment, electrical equipment, chlorination systems, diagnosis and assessments of equipment.
- Produce Assessment and Investigation Report(AIR) to the satisfaction of SLWE and subcontract requirements.
- Training plan, training materials and report.

Results and Impact: The Asset Inventory and Valuation activity resulted in an electronic inventory of the asset database, equipment lists with maintenance history, equipment specifications and replacement schedules, sample tendering documents for procurement, completed as-built drawings, Performance Management recommendations, and assessment of operations and maintenance practices and staff training needs.

This activity allows the SLWE to oversee and manage its facilities and plan procurement in a cost-effective, organized manner based on accurate, up to date inventory information. This enables the SLWE to institute an effective preventive maintenance program using real time data, for the very first time. SLWE is now able to integrate its inventory data base into its field accounting system, which, also as a result of LWWSS, is now the Microsoft© based Electronic Resources Planning™ program. This has allowed the water establishment to raise the effectiveness and professionalism of its management to a new and unprecedented level. For example, based on its asset inventory and valuation, the SLWE can manage and plan regular maintenance based on the age of its assets, and prioritize procurement of replacement pumps and motors for pump stations.

Developed a Water Supply and Wastewater Master Plan, BWE

Scope: This activity constituted the development of a rational infrastructure development and capital investment plan for water supply, water distribution, wastewater collection and wastewater treatment systems, as well as elements of an irrigation study, for the Bekaa Water Establishment. The purpose of this initiative was to identify and set priorities for capital investments for the period 2014 – 2035 that will lead to the provision of reliable water supply and wastewater services to the residents within the service area of the BWE, and establish a framework for irrigation water management within the influence area of the BWE. In addition, this initiative will also serve to guide the capital budgeting and support of central government, as well as multi-lateral and bi-lateral donors/lenders in support of improved services by the BWE.

Activities: Numerous tasks were undertaken to accomplish this activity. First, in the Water Supply System Master Plan work, primary tasks were as follows:

- Collect all existing water supply information in close collaboration with the BWE staff.
- Collect and analyze historical and projected population data and water supply demand data for the various parts of the BWE service area.
- Recommend specific improvements to the water supply systems.
- Estimate the capital costs for each approved improvement, and the timing of need for capital for each improvement.
- Assess and estimate the needed capital investment to achieve system-wide metering across the entire service area of the BWE.

Second, with regard to the Wastewater System Master Plan, tasks included:

- Collection of all existing wastewater system information working in close collaboration with the BWE staff.
- Forecast the volume of wastewater to be generated and needing to be treated.
- Recommend specific improvements to the wastewater systems.
- Estimate the capital cost and the timing for each finally approved improvement.

Lastly, a Framework for Irrigation Services was prepared which entailed the following:

- Collect existing irrigation water system information.
- Define the current situation relative to irrigation needs and services provided in the area mandated to be served by the BWE.
- Identify major current physical deficiencies in the existing irrigation system.
- Develop a Scope of Work to tender development of an Irrigation Water Master Plan (to be implemented under a future program).

Results and Impact: The results of this work are contained in the following list of deliverables, which will be utilized by the BWE as a guideline for future development and a rationale going forward in discussion with Government of Lebanon agencies and potential donor/lending agencies:

- Inception Report
- Water Supply System Assessment Report
- Wastewater System Assessment Report
- Water Supply Capital Investment Plan and Priority Action Plan
- Wastewater Capital Investment Plan and Priority Action Plan
- Irrigation Services Assessment Report
- Terms of Reference for Irrigation Systems Master Plan
- Updated GIS Software and Current Database
- Final Master Plan with the above Deliverables as Annexes

The whole concept of a master plan development is an effort at improving management of the water establishment over the longer term. This is a major impact on the BWE, as well as the consuming public and the Ministry of Energy and Water, who oversees the performance of all the water establishments. The Water and Wastewater Master Plans are intended to be ‘living documents’ meaning that, as time goes by, the water establishment can compare annual progress toward goals, assess achievement versus the tenets of the plan, and make adjustments to the plan as needed, to keep the document relevant. All information and files have been provided to the BWE in both hard copy and electronic form, to facilitate recordkeeping and the ability to compare and update in future.

Component 4 Contractual Deliverables	Activity	Establishment	Status
Conduct detailed pump station survey in South Lebanon as a model for development of Master Plans	Pump station evaluation survey	SLWE	Complete
Train WE staff on master planning and capital investment planning and budgeting	a. Finance Accounting Standards (Budget manual) b. Business Plan and Capital investment c. Develop a water supply and wastewater masterplan	a. All four WEs b. BMLWE, SLWE c. BWE	Complete
Provide recommendations to WEs on master planning process	Develop a water supply and wastewater masterplan	BWE	Complete
Propose strengthened procurement planning procedures	a. Public administration and process management training b. Integrating the WE's financial, accounting, customer service and business process systems: The Enterprise Resources Planning (ERP)	a. BMLWE, BWE b. BMLWE, BWE, SLWE	Completed as part of ERP procurement module
Develop manual on establishing meaningful and measurable indicators to measure actual progress of construction projects	Capacity building in planning and updating 5-year business plans, benchmarking and performance monitoring	BMLWE, SLWE	Completed for BMLWE and SLWE for the period 2010-2014, BMLWE for 2015-2019
Provide management tools, such as Information Communication Technologies (ICT) and Customer Relations Management (CRM) systems, for decision-making by selected WEs' management	a. Water Quality Assessment and Management for Bekaa b. Customer service management capacity building c. Integrating the WE's financial, accounting, customer service and business process systems: The Enterprise Resources Planning (ERP) d. Geographic Information System	a. BWE b. BWE c. BMLWE, BWE, SLWE d. SLWE	Complete

Component 5: Procurement of Technical Equipment to Strengthen WEs

Scope: Identify and procure equipment that will improve the operating and/or financial performance of each establishment.

Since the Initial Assessment, and in subsequent meetings with the various water establishment Directors General, LWWSS team members reviewed the prioritized list of equipment requirements in terms of immediacy of need, anticipated impact on WEs' operations, and available budget.

Key Accomplishments of Component Five

1	Identified Water Production and Contributed to Water Demand Management
2	Upgraded Pumping and Energy Efficiency
3	Increased Supply Hours to Area Facing Supply Shortage
4	Upgraded Water Analysis Laboratories
5	Water Treatment and Operations & Maintenance (O & M) Training

Identified Water Production and Contributed to Water Demand Management

Scope: Work under this activity was performed in coordination with the South Lebanon Water Establishment (SLWE) as one of their prioritized investments. Management of the WE needed to know just how much water they were producing, in order to understand better their service coverage and how much potential revenue was being lost due to Non-Revenue Water. As Director General, Engr. Ahmad Nizam has said often, "You cannot manage what you cannot measure." It is part of better water governance that the WE understand water production, water demand, and how much and where they are distributing water. This work consisted of supplying and installing up to 218 water production meters, fittings, ancillary equipment and protection boxes or manholes at all the non-metered sources in South Lebanon.

"For the first time ever we have the opportunity to know how much we are producing and how much non-revenue water we have. For the first time, we can manage it because we can measure it."

– Ahmad Nizam, DG of the SLWE

Activities: This work goes hand-in-hand with the Component 2 activity, Establishing and Building the Capacity of Metering Teams, which was conducted for the SLWE by LWWSS. Major tasks included identifying locations and design needs and determining equipment needed at each site; supplying needed production source meters, valves, pressure gauges, and fittings; installing and testing on site; and monthly meter readings for one year after completion.

Results and Impact: LWWSS installed source meters at 218 locations throughout southern Lebanon. The impact on the SLWE is significant, as this subproject represents a major step in improving management and water service to the people of South Lebanon. SLWE was able to use the data as input to their master planning process (conducted by others), as well as have a better idea of how much water they may be losing by various means. SLWE can now know how much water they are distributing, how much of it they are collecting revenue on, and how much of their production is being lost in the system. The importance of knowing this information for the first time ever cannot be understated.

From a sustainability standpoint, the SLWE staff have been trained in taking the meter reading, reporting the results and inputting them to their computer system. Engineers can now analyze the results and make informed decisions and reports to management.

Upgraded Pumping and Energy Efficiency

Scope: This work affected two of the four water establishments, namely: BMLWE and NLWE. The work mainly involved the provision and installation of new pumps, motors, and associated electrical and mechanical works at selected locations.

Activities:

BMLWE. At the Jeita Pump Station, LWSS designed the equipment replacement as well as a solution for a sand/water separation system, procured and provided the pumps, motor control centers, and ancillary equipment. The BMLWE served as a full partner in this effort, arranging and paying for the construction and installation with their own funds. Major tasks included designing equipment replacement and a sand removal unit solution; supplying 18 US-manufactured high-performance pumps, associated valves, fittings, and electrical panel boards; and testing and commissioning the pumps and ancillary systems.

“This joint venture method to rehabilitate a station that serves 400,000 in Upper Metn areas has been the best cooperation experience with a USAID-funded project.”

- Joseph Nseir, DG of the BMLWE

NLWE. For the NLWE, LWSS replaced nine submersible pumps at various critical locations across North Lebanon, together with ancillary equipment, pumps, motors, and training of operators. The locations included Al Ouyoun(4), Abou Halqa Spring(1), Manar Tank(1), Kfarhelda-Der Bella(1), Kfarhelda-Mar Yaccoub(1), and Kfartoun(1). LWSS tested and evaluated the well holes specified by the NLWE for viability; supplied and installed 7 replacement pumps in selected locations, with 2 pumps retained for emergency spare; and trained operators in the operation and maintenance of these advanced pumps.

Results and Impact: At the BMLWE, the Jeita pump station rehabilitation extended the hours of water supply to more than 186,000 water users due to an increase of up to 30 percent in efficiency through new pumps and motors; a decrease in breakdowns and down time due to the new equipment and new electrical and hydraulic installations; and a longer lifecycle for the equipment due to a sand filter solution designed by LWSS and financed by BMLWE. Jeita is one of Lebanon’s most critical pump stations, as it serves the heavily-populated coastal Metn (Greater Beirut). With its rehabilitation, its increased efficiency has led to the pump station achieving its targeted water supply and reducing its water costs. The before and after photographs from the Jeita pumping station included in the success story and photographs on the following pages illustrate the significant upgrades and improvements made to the station under LWSS.



SUCCESS STORY

USAID Rehabilitates Major Pump Station in Mount Lebanon

Approximately 186,000 people in the Mount Lebanon region benefit from Jeita's rehabilitation



LWWSS engineers and Beirut-Mount Lebanon Water Establishment staff assess old equipment at Jeita



New pumps were delivered to Jeita in August, 2012, and the installation began in September, 2012



BMLWE's director General, USAID, and the LWWSS team during a site visit inspection of the installed pumps on August 28, 2013

U.S. Agency for International Development
www.usaid.gov

The Jeita pump station rehabilitation is a key activity for USAID's Lebanon Water and Wastewater Sector Support (LWWSS) Program with the Beirut-Mount Lebanon Water Establishment (BMLWE). Jeita is one of the country's most critical pump stations, as it serves the heavily populated coastal Metn (Greater Beirut) and some additional areas of the capital. With its rehabilitation, it can now operate more effectively, achieving its targeted water supply and reducing its running costs.

The rehabilitation was led and funded jointly by LWWSS and BMLWE, through design and supply of equipment and through installation and training of water pump operators.

The benefits of the rehabilitation include:

- Extended hours of water supply to more than 186,000 water users due to an increase of up to 30 percent in efficiency (through new pumps and motors), a decrease in break-downs and down time (due to new equipment and new electrical and hydraulic installations), and a longer lifecycle for the equipment (due to the sand filter solution designed by LWWSS and financed by BMLWE).
- Decreased operating and maintenance costs for BMLWE through the efficient design and installation of this key pump. Previously, installation was so poor that BMLWE spent one-third of its yearly Operations and Maintenance (O&M) costs on servicing Jeita.
- Enhancement of the operators' technical capabilities through training with the LWWSS-developed O&M manuals and checklists, plus specialized training by the equipment suppliers. This training will decrease accidents on site, avoid human errors, extend the life of BMLWE's equipment, and build the ability of staff to ensure sustainability.

A walk through inspection of the installed pump stations was conducted on August 28, 2013, in presence of the BMLWE Director General, USAID, and the LWWSS team.

LWWSS assists Lebanon's four regional Water Establishments in working towards financial and operational sustainability. The program began in 2009 and will continue until 2015.

Jeita Pumping Station, before renovations:



Jeita Pumping Station, after renovations:



For the NLWE, LWWSS installed seven new pumps for selected locations, and provided two additional pumps for use as spares as needed. The project also produced a well-testing report for 20 locations, which provided the NLWE with useful information on the status of its wells in key locations. This investment has resulted in increased pumping time, improved energy efficiency, and significantly reduced maintenance and repair costs for the WE. Previously, the pump motors were continuously breaking down, burning out, and needing to be rewound, at significant down time and cost. The new pumps have safeguards to prevent burnout due to power fluctuations.

Sustainability has been designed into this work by training the operators to know and understand these pumps, and how to care for them. Also, by making them more maintenance free, it reduces the amount of labor and cost in operating and maintaining these pumps, as well as reducing power requirements.

Increased Supply Hours to Area Facing Supply Shortage

Scope: In North Lebanon, there are numerous places, particularly in the more remote areas, where power is unstable and cuts in electricity are frequent and unpredictable. Despite major investments to upgrade water infrastructure in Tripoli in the 1990s, the pumps are unable to pull water out of the ground and into the system when electricity is not available. The lack of consistent electricity makes it difficult to manage water treatment and distribution, plan ahead to ensure adequate water supply, and provide enough water pressure to bring potable water to remote areas in the north.

This was considered one of the critical priority projects of the NLWE, as it can affect stability in the region and affects poor people in rural areas. The solution requested by the NLWE was for generators to be provided in key locations. The project scope included conducting the assessment, design, costing, and procurement for back-up generators in key locations identified by the NLWE; supplying and installing the generators; and establishing service agreements and conducting user training programs for the operators of each generator.

The purpose of providing generator power at these locations was to provide electric power to pumping facilities during periods of blackout, thus maintaining an adequate water supply.

Activities: With over half of the total water subscribers of the NLWE, Tripoli required two generators to meet its water treatment and distribution needs. One generator serves the Tripoli Water Treatment Plant, which treats approximately 70,000 cubic meters of water per day. “Before the generator, we relied only on electricity to treat water. With many power failures, water treatment and distribution was affected and water pressure kept decreasing. Now, with the generator, we have more control and can manage the water treatment and supply much better,” said Kamal Mawloud, Chief of Production at the Tripoli Water Treatment Plant. He estimates that 271,000 subscribers are affected by improved water treatment, thanks to the generators provided by USAID through LWWSS.

The other generator in Tripoli supports the water pumping station in Ayronieh, which pumps from a reservoir with a capacity of 30,000 cubic meters per day. Water distribution in Tripoli is powered primarily by electricity, as gravity pumping does not work because water sources are downhill from the city. Therefore, generators are indispensable to being able to continue pumping water to the residents of Tripoli when no electricity is available. The NLWE is working to produce as much water as possible without depleting the water supply too quickly.

“Having electricity at these locations is critical for consistent provision of water in Tripoli. The electricity goes out often, but the generators allow water provision to Tripoli 24 hours per day.”

- *Jamal Krayem, Director
General of the NLWE*

Outside of Tripoli, LWWSS installed six generators in the Koura and Akkar regions. The regions are not interlinked for water supply, so each town has its own supply from its wells and springs. The NLWE prioritized its top three needs for generators in Koura, and selected Beshmezzine, Nakhle, and Bqerqasha based on the size of population served by each generator. The generators installed in Koura serve 52 villages, which is nearly all the villages in the region. In Beshmezzine, the generators increased the capacity for pumping from 10 to 22 hours per day, improving water service for 11,000 people.

In the Akkar region, LWWSS installed three generators in Rahbe, Qobayat, and Kfartoun that serve several villages. The community in Rahbe was very supportive of USAID's investment and donated land to house the generator. In Qobayat, the generator has improved the consistency of access to potable water for around 6,700 inhabitants in addition to a large number of Syrian refugees.

Results and Impact: LWWSS procured and installed 11 large generators, ranging in size from 100 to 800 KVA, plus all necessary ancillary equipment in eight urban and rural locations across North Lebanon. The project also tested and commissioned the generators, and trained the operators in operations and maintenance.

This activity has positively impacted the overall performance of the NLWE by markedly improving the frequency of water supply in Tripoli as well as a number of rural communities. Despite ongoing electricity outages in the remote areas of North Lebanon, as well as Tripoli, the generators ensure that water supply will be uninterrupted. Given the sensitivity of water supply, this will aid in improving customer satisfaction as well as in revenue collection. From a sustainability standpoint, once again, the new generators will reduce down time of pumps and generators. Also, the operators of the NLWE have been given training in the operation and maintenance of these gensets. The Director General has assured that maintenance budgets will be available as needed.

Upgraded the Water Analysis Laboratories

Scope: Water quality in Lebanon – especially in the Bekaa Valley – suffers from a variety of pollutants, ranging from agricultural runoff, to inadequate handling of sewage, to degraded water infrastructure that allows metals to contaminate water during distribution. Bacteriological contamination causes a variety of ailments in those who consume the untreated water, including cases of dysentery and typhoid. Contamination from chemicals and hard metals can have negative health effects, and also causes further degradation in the water network. Conditions grow worse in the summer and during drought seasons, when less water is available to dilute contaminants. To address this public health issue, the water establishments in the Bekaa and South Lebanon rated improving their water quality testing capability as a high priority for LWWSS funding. The BWE and the SLWE requested that assessments be carried out to determine and specify required laboratory equipment or other improvements needed to complete their testing laboratories.

The purpose of upgrading these laboratories was to be better able to monitor the quality of source water coming from springs, wells or surface water, as well as the quality of water provided to households after treatment and distribution.

Activities: To support improved water testing and treatment, LWWSS provided water testing laboratories in the Bekaa and South Lebanon with laboratory equipment and training. In partnership with the American University of Beirut, laboratory staff in Zahle and Saida received training on analyzing the results of water testing, including how to determine an acceptable range of results and how to identify sources of contamination. By adding the element of analysis to the ongoing testing, LWWSS increased the laboratories' ability to report effectively on water quality and provide recommendations to the water establishment to address problems with the water quality.

The water testing laboratories in Zahle and Saida allow the Bekaa Water Establishment (BWE) and the South Lebanon Water Establishment (SLWE) to record data on the quality of their water over time, and to take efficient action to address problems. The laboratories collect water samples from throughout the network, including from water sources, tanks, and network pipes. They conduct chemical and biological testing to determine the acidity of water, test for hardness, and detect any bacteriological or chemical pollution in the water. The laboratory in Saida also has an atomic absorption spectrometer to measure the presence of heavy metals in water, which is “the most advanced in Lebanon, thanks to USAID” according to Ms. Amal Chidiak, Director of the Water Testing Laboratory at Saida.

Results and Impact: The impact on the BWE and the SLWE will be significant, as well-equipped laboratories staffed by motivated and competent technicians will boost the WEs’ ability to provide professional services, monitor water quality, and improve overall relations with its consumer base. The water testing laboratories play a critical role in the water establishment’s ability to identify and address sources of contamination in the water supply. With the new equipment provided through LWSS, the laboratories have expanded their abilities to not only test but also to analyze the data related to water quality in their water establishments. This ability has made the laboratories indispensable to the water establishments. As Khalil Azar, Head of Pumps and Laboratories at the Bekaa Water Establishment, said, “I only recognize the results of testing if they are done in the laboratory.”

“With the rehabilitated laboratory and the new equipment and materials, the BWE is able to increase water testing to cover the whole service area.”

-Maroun Moussallem, DG of the BWE

From a sustainability standpoint, LWSS has ensured that the staff know how to utilize and maintain the equipment, and the WEs are committed to budgeting for supplies and chemicals needed to operate the labs.

Water Treatment and Operations & Maintenance (O&M)

Scope: This activity relates to installation of 18 Chlorinator Units installed by LWSS for the BWE at 14 different locations. This training was necessary not only to train operators in the use of the water treatment equipment, but also to emphasize the danger in the use and handling of chlorine gas. This training resulted in fewer site accidents and equipment breakdown, as well as improved quality of water distributed. The training impacted 14 pumping stations, serving a population of over 100,000 across BWE.

Activities: This work entailed receiving 18 Chlorination Units procured and provided by UNICEF, who did not have the funds or the expertise to install them, but were deemed very important to the management of the BWE. LWSS provided gas leak detection equipment, other safety features, fittings, installation and testing of the systems. The installation subcontractor then provided training in operation, health and safety precautions in utilizing this equipment.

Results and Impact: After installing 18 chlorination units, together with all fittings and proper safety equipment, at 14 locations in the Bekaa Valley, LWSS also trained BWE staff in the use, operation, and safe handling of equipment and chlorine gas supplies. This activity aims to improve the quality of water supplied to customers who are served by the 14 pump stations. This included nearly 100,000 users.

From a sustainability standpoint, the BWE has assured USAID that they have the ability to continue to supply and maintain the chlorination units, thus establishing the practice of purifying and monitoring water quality provided to customers.

LWWSS upgraded laboratory equipment and provided training to laboratory staff in the Zahle Water Testing Laboratory of the Bekaa Water Establishment



Increase IT Infrastructure Efficiency: Supplying New Servers

Scope: Further to an IT assessment during Year 2, and to enable the implementation of an Enterprise Resource Planning (ERP) platform in BWE, the LWWSS program funded an IT infrastructure hardware and network upgrade. It established a server room at BWE headquarters, provided key IT equipment to ERP operating staff, and funded and completed the connectivity infrastructure and services across the BWE branches.

Activities: The IT assessment led to the design and specification of an IT infrastructure package to support the ERP platform. It included hardware and a robust internet connection that established permanent connectivity between the branch offices and the servers located in the main office. This IT infrastructure is required for the implementation of the ERP software.

In the BWE, procurement of the IT hardware infrastructure and Data Transmission Network Communication Link started in 2011 and installation ended in early 2012. The package includes a set of servers, stable power supply (mains power, UPS, generator back-up), cooling, cabling, computers, printers, installation and accessories, as well as connectivity infrastructure and connection. As part of the activity, LWWSS provided necessary training of BWE IT personnel in the operation and maintenance of the WE's IT infrastructure.

In the SLWE, LWWSS upgraded the server and associated equipment at the SLWE headquarters in Saida to maximize the performance of the ERP platform.

Results and Impact: The upgrades to IT infrastructure prepared the BWE and SLWE to run the ERP software platform efficiently, with strong linkages between branch offices and the headquarters office of each water establishment.

Upgraded Topographic Surveying Capacity: Supplying GNSS equipment

Scope: During year-two, the LWWSS program supplied and provided training for a Global Navigation Satellite System (GNSS) to be used by SLWE's topographic surveying team. This GNSS surveying equipment is used by the in-house surveyors of the SLWE to provide accurate geographic and topographic surveying results for source, pump station, network and connections related projects. It helps with planning, appraising and designing projects and tasks, as well as in day to day operation of the SLWE network.

Activities: LWWSS procured the GNSS for SLWE's topographic surveying team, and then provided training in equipment operation. The training also aimed to increase the sense of ownership by the SLWE, so the topographic team would maintain the equipment to maximize its longevity.

Results and Impact: The GNSS equipment allows faster and more accurate surveying, which saves time and cost for the surveying team and allows them to dedicate their time to managing the information collection. For example, instead of manually conducting surveys that require several weeks of on-site manual measurement, the SLWE can conduct these surveys in a shorter time, using electronic GIS-compatible formats, with GPS coordinates throughout longer distances. This enables faster and more effective in-house capacity to plan and monitor capital project execution and maintenance. The training provided also ensures the SLWE staff were able to operate the equipment effectively.

Rehabilitated the Customer Service Center for the Bekaa Water Establishment

Scope: LWWSS rehabilitated the Customer Service Center for the Bekaa Water Establishment in Zahle. Previously, the BWE did not have a dedicated location where customers could contact the water

establishment to report issues, pay bills, or receive service support. Complaints had been recorded manually and were frequently lost. This barrier to service effectiveness contributed to incomplete applications, illegal connections, and low bill payment and collection. It also deterred potential new customers from subscribing to the BWE. As the Director General of the BWE expressed sincere commitment to improving customer relations, the rehabilitation of the Customer Service Center was a high priority for the water establishment.

Activities: LWWSS rehabilitated an antique stone building in Zahle and transformed it into the first customer service center in the Bekaa. The center was inaugurated in June 2012 at a ceremony attended by the Minister of Energy and Water and the USAID Mission Director. LWWSS also trained 23 personnel – many of whom were hired to work in the new customer service center – on critical customer service skills (see Component 7 discussion for more detail). The BWE was also equipped with a new computerized system for finance and customer service management, which resulted in much faster processing of applications, requests, and better tracking of complaints.

Results and Impact: Thanks to the new customer service center, trained personnel, and computerized systems, customers can now pay their water bills, report service disruptions and leaks, ask questions, address complaints, and subscribe for water service, all in the same place. Already these improvements have led to increased billing collection of 38%. We expect that these changes will continue to restore customers’ trust in their public water utility and ultimately increase the number of Bekaa residents provided with drinking water.

Component 5 Contractual Deliverables	Activity	Establishment	Status
Procure selected equipment identified under HPIP plan prepared by contractor during the four month initial assessment as described under Component C.2.1., and as revised through annual work plans and associated procurement plans.	<ul style="list-style-type: none"> a. Identify water production: installing source meters b. Upgrading pumping and energy efficiency c. Increasing supply hours to areas facing supply shortage d. Upgrading the water analysis laboratories e. Installing UNICEF supplied chlorinators f. Increase IT infrastructure efficiency g. Upgrade the WE's topographic surveying capacity h. Establishing direct customer interface 	<ul style="list-style-type: none"> a. SLWE b. BMLWE, NLWE, SLWE c. NLWE d. BWE, SLWE e. BWE f. BMLWE, BWE, SLWE g. SLWE h. BWE 	Complete



USAID | LEBANON

SUCCESS STORY

USAID Upgrades Water Analysis Laboratories in South Lebanon as a Major Step in Monitoring Water Quality

Approximately 677,270 people will benefit from improved water quality testing



SLWE laboratory technician Malak Neemeh inserting water samples into the Atomic Absorption Spectrophotometer



Atomic Absorption Spectrophotometer training



SLWE Laboratory Personnel and SLWE Director General Ahmad Nizzam

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Drinking water for nearly 700,000 people in South Lebanon will be safer thanks to water quality testing equipment installed by USAID. This is critical because Lebanon's water utilities lack the proper equipment to test water quality systematically, which is one of the most critical steps to ensure that Lebanese citizens can safely consume drinking water.

With USAID assistance, the Lebanon Water and Wastewater Sector Support (LWWSS) program has built the capacity of the South Lebanon Water Establishment (SLWE) to test and monitor the water delivered to its citizens. This was accomplished by upgrading the key water quality testing equipment in all three of its laboratories and conducting extensive training for 16 personnel on equipment use. All SLWE laboratory personnel that were trained received certificates of appreciation from USAID and SLWE, at a ceremony in Saïda.

Using the new laboratory equipment, the SLWE now has more efficient and accurate data on water pollutants, including bacteriological contaminants and heavy metals. Among the new equipment installed is an Atomic Absorption Spectrophotometer. This cutting edge instrument has an advanced method for testing water quality that detects heavy metals such as mercury and arsenic in water samples.

The SLWE is now able to promptly take corrective action against pollutants by treating the water and disconnecting the service at polluted sources. This effort "ensures reliable results about the quality of water distributed to citizens," commented SLWE laboratory director Amal Chidiac, "and allows the Water Establishment to take the preventive measures and corrective action necessary to ensure the future health quality of Lebanon's drinking water."

This effort results in immediate and long term improvement of the water quality and health of the 677,270 people in South Lebanon served by the SLWE.

LWWSS assists Lebanon's four Water Establishments in working towards financial and operational sustainability. The program began in 2009 and will continue until 2015.

Component 6: Small to Medium Scale Rehabilitation/Upgrade/Extension of Water and Wastewater Works within WEs Areas

Scope: Identify and carry out small- and medium-scale construction works that improve water and wastewater system operations and service delivery.

The purpose of Component 6 is to rehabilitate, upgrade, and replace as necessary the water network infrastructure for each water establishment. DAI worked closely with each water establishment to identify its most pressing infrastructure needs and design rehabilitation projects in line with each water establishment's long-term business plans. Infrastructure rehabilitation projects were designed to be demand-driven, but also reinforce the ongoing work in institutional development and capacity building at each water establishment.

The infrastructure rehabilitation and upgrade works under Component 6 included upgrades to existing water supply networks and rehabilitation of pumping stations. The purpose of upgrading existing water supply networks was to increase the supply of water to residents of Lebanon, improve the consistency of water delivery from the network to residences and businesses, and decrease non-revenue water throughout the network. The network rehabilitation projects were an effort to support the water establishments to improve overall service, which would have the additional effect of increasing customer satisfaction and potentially even increasing revenues for the water establishments, and customers may be more willing to pay for water as their service increased.

This section describes key project accomplishments in this component, as well as the impact this work has had on the broader objectives of the water establishments and, of course, the water customers.

Key Accomplishments of Component Six

1	Rehabilitated and Constructed Water Supply Network in Beit Mellat
2	Rehabilitated Major Pump Stations in South Lebanon
3	Rehabilitated Zahle Water Network

Rehabilitated and Constructed Water Supply Network in Beit Mellat

Scope: LWSS has rehabilitated 26km of water network and constructed 21km of new water network in the town of Bebnine, in the Beit Mellat region of northern Lebanon. Bebnine suffers from a serious problem of water scarcity, where the lack of a fresh water supply poses great risks to public health and economic development. Most citizens are not connected to water sources, obtaining their supply from wells or local springs. Water scarcity was felt even more acutely in recent years due to the mass influx of Syrian refugees. In addition to the constructed and rehabilitated network in Bebnine, the project was designed to connect 4,360 households to an enhanced water supply.

Activities: LWSS officially launched the Potable Water Distribution Network project in the city of Bebnine on April 29, 2014. The inaugural ceremony was attended by more than 200 people, including the mayor of Bebnine, public officers, the LWSS team, USAID, NLWE, and Bebnine residents. LWSS introduced the project objectives and duration, and appealed to the public to be patient with the disruption that this kind of construction could cause in the community. The residents welcomed the initiative and expressed their enthusiasm for the project, stressing the importance of adhering to health and safety measures throughout the duration of the project.

Once the project was underway, the first stage was an in-depth assessment of the existing water network in Bebnine and design of network rehabilitation and replacement. The engineering works consisted of excavation and laying pipes, construction of valve chambers, installation of fittings and water meter boxes, asphaltting works, and pressure tests throughout the network.

LWWSS rehabilitated and replaced the water network in Bebnine, in a severely underserved region of Northern Lebanon.



The project faced significant delays from security issues given the proximity of the area to the Syrian border and increased tensions, local community hostility issues, and seriously inclement weather. Although citizens had welcomed the project during the inaugural ceremony, the project faced significant hostilities from residents and business owners that had experienced previous non-USAID projects that had not delivered improved water services in Bebnine. Some of these citizens demanded jobs or money from the subcontractor, and threatened the job site and employees during implementation. Coupled with the spillover of tensions from the Syrian conflict, these local hostilities created a difficult working environment for the local subcontractor and DAI management. Throughout the project, the LWWSS team proactively engaged with the subcontractor to increase the progress rate of the activity. Due to the nature of the work, the most effective way to increase the rate of progress is to add more crews to job sites. However, given the security environment and hostility on the part of local residents, the subcontractor was seriously limited in its ability to increase the number of crews with the needed specialized skill sets that were willing to work in northern Lebanon. The subcontractor increased its progress, but required a six-month extension to the overall project to finish all work in Bebnine.

Results and Impact: The network rehabilitation in Beit Mellat brought improved water supply to a significantly underserved area of northern Lebanon. The impact on the residents of Bebnine went beyond the improved water service and built their trust in the water establishment and their local government support. The residents of Beit Mellat had already experienced a previous (non-USAID) water project that failed to increase their access to water. Given the tenuous security situation in Lebanon and the region, USAID’s deep commitment to improving quality and access to water in Lebanon, and the importance of the USAID and LWWSS partnership with the North Lebanon Water Establishment, the network rehabilitation made a significant positive impact on the lives of the residents of Beit Mellat, and supported continued positive working partnerships between USAID and the NLWE.

“After many attempts from different parties, USAID has achieved this dream of Bebnine citizens by rehabilitating this old network.” – Mayor of Bebnine

Rehabilitated Major Pump Stations in South Lebanon

Scope: Many villages in South Lebanon rely on the water establishment to pump water from areas that have water resources to their villages. Residents of these villages struggle to access water due to degraded pumping stations and water infrastructure, including inefficient pumping mechanisms, which prevent water from reaching far enough.

The pump stations at Ouadi Jilo and Batoulay are major stations in South Lebanon, playing a critical role in extending water access to areas without water. Together, these stations serve over 71,000 residents in approximately 49 villages. However, degraded or out of service pumps and poor maintenance of machines have made pumping water inefficient and expensive. The inefficiency of pumps at both stations has significantly reduced the volume of water being pumped out to villages, reducing their access to potable water.

To assist the South Lebanon Water Establishment to increase water supply and distribution to villages in south Lebanon, LWWSS refurbished the Ouadi Jilo and Batoulay pumping stations, installing new pumps and replacing electrical cables and panels.

Activities: LWWSS performed thorough examinations of two major pumps stations, tested the surrounding contributing source wells and pumps, and then designed and provided solutions for upgrading these pump stations, at the existing Ouadi Jilo and Batoulay Pump Stations in the department of Tyre, South Lebanon.

“Before and After” look at pump station rehabilitation in South Lebanon



LWWSS has conducted significant work at the pumping stations, ranging from improving the buildings, refurbishing and cleaning the wells, supplying and installing new pumps and connecting pipes, and replacing electrical cables and panels. A key element of this work was rehabilitating the wells that provided water to the pumping stations. The Ouadi Jilo pumping station draws from five deep wells and the Batoulay pumping station draws from six wells. LWWSS rehabilitated the wells to remove corrosion and replace faulty seals that had previously allowed rainwater to enter the wells. LWWSS also replaced seven of the eight booster pumps in Ouadi Jilo to feed water to Chehabieh pumping station more efficiently, so that the water can then be pumped out to remote villages.

Through the support of LWWSS, the Ouadi Jilo station now pumps 12,600 cubic meters of water per day toward Chehabieh station, which then pumps the clean potable water to connected villages. The increased quantity of water pumped to Chehabieh is more than enough to meet the current and future demand for water from the pump station. The Batoulay station pumps 18,000 cubic meters of water per day toward Saddiquine pump station, located approximately three kilometers away, which in turn feeds the connected villages. This amount exceeds the estimated 16,000 cubic meters of water per day that are needed to meet the demand for water from Saddiquine.

In addition to the upgrade of the pumping stations, LWWSS installed flow meters on the lines from the wells to the large water tanks, and on the main lines out of the pumping stations. The flow meters give the pumping station management and the water establishment accurate data on how much water is being pumped out of the wells each day, and how much water is then being pumped from the pumping stations out to Chehabieh and Saddiquine. This data provides useful information about the efficiency of the pumping stations and the amount of water that is being lost during the pumping process. In the future, as the South Lebanon Water Establishment tackles the issue of reducing non-revenue water, this data will guide and support its efforts to achieve greater efficiency and reduce water losses in the network.

Results and Impact: The Batoulay and Ouadi Jilo Pump Station Rehabilitation project led to a substantial increase, up to 25%, in the efficiency of these two pump stations in terms of enhancement in the number of hours of water supply delivery for over 71,000 people in 49 villages. Efficiencies also include up to a 15 percent reduction in electricity costs for SLWE, which represent one of the highest operating costs for these stations. The reduction is a crucial contribution to SLWE’s strategic targets set in its five-year business plan of achieving full O&M cost recovery.

At Ouadi Jilo and Batoulay pump stations, “Raising efficiency means increasing quantity, which helps us meet increasing demand for water.”
– Ahmad Nizam, Director General of the South Lebanon Water Establishment

The upgrades also reduced the frequency of equipment breakdowns —minimizing repair costs from labor assigned to these works and enabling staff to focus on other tasks. Importantly, the upgrades will also stem the long hours of service disruption due to these repairs. Furthermore, the new equipment have enhanced health and safety practices in these stations because of the upgraded electrical installations, user

training, and O&M capacity building. A safer working environment will in turn lead to less service disruption due to accidents.

Rehabilitated Zahle Water Network



LWWSS rehabilitated and replaced the water network in Zahle, the Bekaa Valley's largest urban center.

Scope: In Zahle, the Bekaa's largest urban center, the water distribution network suffers from deteriorating infrastructure that causes frequent water network breaks. Water shut-downs and contamination from aging pipes reduce the population's access to water and force the residents of Zahle to buy water from water tankers at a significant expense to families. Poor water pressure in the distribution network also prevents water from reaching beyond the first floor of buildings. Further increasing demand for water and straining the limited water resources in the Bekaa, Zahle is also hosting a large influx of refugees fleeing the conflict in Syria.

To address this water shortage, LWWSS rehabilitated seven major water distribution lines from the Zahle water network. The network rehabilitation improved water services for approximately 22,000 people in the Zahle area, and reduced water leakages and water supply service disruptions.

"The replacement of the 14km of water network has significantly reduced the non-revenue water in Zahle City." – Maroun Moussallem, DG of the BWE

Activities: In close partnership with the Beka'a Water Establishment, LWWSS identified seven priority lines to rehabilitate. These lines were selected based on the amount of population served, condition of the network lines, and the potential impact on the surrounding area. LWWSS rehabilitated 15 km of water

distribution lines, covering the areas of Dhour Zahle, Haouch El Omara, Maallaka, Karakel Ferzol, Midan, Mar Elias, and RassiyeH.

LWWSS replaced aged and leaky branch network lines, added small extensions to district pipelines, and upgraded upstream connections, increasing the water supply to these districts and providing water service to a larger number of beneficiaries. By adding extensions to pipelines to enable their re-routing, LWWSS also helped the water establishments avoid having to expropriate land from citizens in densely populated districts, which would be costly and very unpopular with residents.

Results and Impact: The network rehabilitation in Zahle improved water services for approximately 22,000 people within the Zahle area, reducing water leakages and water supply service disruptions. The project also improved water pressure, allowing water to reach the upper levels of multi-apartment dwellings, therefore decreasing illegal water tapping. USAID also trained technical staff on the operation and maintenance of the network, ensuring sustainability of their intervention.

In addition, the improved water service in Zahle provides an opportunity for the BWE to improve its operations, eventually leading to enhanced revenues. Promoting customer satisfaction and improving service reliability should improve customer bill payment. In turn, increased revenue will lead to continued service improvements and continued water access to thousands of Lebanese citizens.

Component 6 Contractual Deliverables	Activities	Establishment	Status
Construct / rehabilitate small to medium size water/wastewater projects such as the North Lebanon Water Establishment, Beit Mellat Water Supply Scheme; South Lebanon Water Establishment, Pump Stations Rehabilitation; and Bekaa Water Establishment, Zahle Water Supply Scheme	<ul style="list-style-type: none"> a. Decreasing Water losses and upgrading existing network b. Expanding service provision to non-served areas (Beit Mallat) c. Pump station rehabilitation in the South 	<ul style="list-style-type: none"> a. BWE b. NLWE c. SLWE 	Complete



SUCCESS STORY

More Drinkable Water for the City of Zahle

USAID improved water services for an estimated 22,000 residents



Network Rehabilitation works at the Rassieh line in Zahle



Network Rehabilitation works at the Rassieh line in Zahle



Network rehabilitation works at the Midan line in Zahle

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At a time when water is becoming scarcer while the demand on it is escalating, the rehabilitation of water distribution lines is critical. In the city of Zahle, the Bekaa Valley's largest urban center, USAID rehabilitated seven water lines to provide access to potable water to thousands of Lebanese citizens. Zahle has the highest number of subscribers in the Bekaa region, and the highest rate of bill collection. Its water network was reported to be one of the most deteriorated in the country because of aging infrastructure and lack of capital investment.

"By rehabilitating those seven lines from the Zahle water network, USAID improved the lives of thousands of subscribers living in the area," said Mr. Maroun Moussallem, the Director General of the Bekaa Water Establishment (BWE). "Water distribution lines have been in service for 30 to 50 years and suffered from frequent breaks and water service shut-downs," he explained.

USAID's Lebanon Water and Wastewater Sector Support Program (LWWSS) rehabilitated 15 km of the Zahle water network, thus improving water services for approximately 22,000 people within the Zahle area. USAID also trained technical staff on operation and maintenance of the network, ensuring sustainability of the improvements.

"This project is so important; it's already resulted in the reduction of water leakages and water supply service disruptions," explained Mr. Moussallem. The project also improved water pressure, allowing water to reach the upper levels of multi-apartment dwellings, therefore decreasing illegal water tapping.

"In addition, the project provided BWE with an opportunity to improve operations, which is resulting in enhanced revenues," Mr. Moussallem said. These increased revenues have allowed BWE to improve customer satisfaction through better services and reliability, while the improved operations continue to reduce leakage and maintenance costs. This process should further improve customer bill payments, BWE's revenue, which will in turn lead to continued service improvements and water access to thousands of Lebanese citizens.

Component 7: Corporate Culture, Customer Service Orientation, and Public Outreach

Scope: Reinforce good corporate culture within each WE, and improve relations between the WE and its customers.

The purpose of Component 7 is to improve the customer service orientation of each water establishment, to improve relationships with subscribers and increase the interaction between subscribers and the water establishments. The improvements to customer service are important for reporting service issues, communicating about problems in the network, and even collecting payments from subscribers. However, in the long term the water establishments anticipated that improved customer service – when coupled with improved water delivery – will lead to an overall increase in paying subscribers to the water network.

This section describes key project accomplishments in this component, as well as the impact this work has had on the broader objectives of the water establishments and, of course, the water customers.

Key Accomplishments of Component Seven

1	Build Capacity and Structure for Customer Service Management
2	Develop Tools and Support WEs in Adopting Corporate Communication : Designed and Implemented Brand Identity Guidelines and Corporate Websites
3	Conduct Consumer-Targeted Awareness Programs
4	Launch Youth Water Conservation Program

Build Capacity and Structure for Customer Service Management

Scope: LWSS worked with the BMLWE, BWE, and SLWE to assess each water establishment’s customer service capacity and identify ways to improve the customer service management structure and build the capacity of its customer service staff. The project then developed tailored activities for each water establishment that addressed gaps in structure and capacity, such as establishing systems and processes for tracking and responding to customer applications or complaints, training staff in providing effective customer service, and updating customer data to ensure the water establishments had up-to-date data on subscribers.

Activities:

BWE. LWSS helped the BWE to analyze and reform its customer service department. The customer service department lacked appropriate systems and processes, staff skills, and integration – both geographically between branches and headquarters, and internally across departments. LWSS conducted a thorough analysis of the customer service department in Year 2 and determined the key areas of action. During Year 3, LWSS worked with the BWE to create a customer service cell, and the BWE hired and trained additional customer service personnel who handled the CRM module at the BWE headquarters and in the Zahle branch; ran the ERP case management modules related to claims, complaints, and customer templates; and acted as a pilot unit for instituting a customer service culture within the BWE.

BMLWE. For the BMLWE, LWSS focused on staff training and capacity building in areas of customer service management, and improving the management processes within the customer service department. LWSS also installed a customer relations management system that provides an up-to-date customer database, better tracking of customer payments, and better tracking of customer service complaints to provide a more efficient response to service disruptions and more efficient operations for the BMLWE. The project trained staff in customer complaint handling and improving overall customer relations.



SUCCESS STORY

USAID inaugurates new Customer Service Center and trains customer service staff in the Beka'a Water Establishment

Approximately 115,000 people in the Beka'a will benefit from the customer service center in Zahle



BWE personnel discuss customer service with Head of Human Resources and Head of Customer Relations Department



The Minister of Water and Energy, the Director General of the Bekaa Water Establishment, and the USAID Mission Director cutting the ribbon at the inauguration of the center



Bekaa Water Establishment employee Najwa Zarzour explains the services available during a tour of the new center

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The USAID Lebanon Water and Wastewater Sector Support (LWWSS) Program is working with the Beka'a Water Establishment (BWE) on approaches to solve the problems of low customer satisfaction and lack of bill payment by their dissatisfied customers.

While 65% of the population subscribes to BWE services, only 17% of customers actually pay their water bills. USAID surveys in 2010 indicated that 60% of people are not satisfied with the quantity and quality of water they receive from the BWE, and 80% are not satisfied with the timeliness and effectiveness of the customer service they receive when calling the BWE with questions or complaints. This lack of consumer confidence results in customers' failure to pay their bills, which perpetuates BWE's inability to cover operating and maintenance costs, and the continuation of substandard service.

To address these problems, the USAID funded Lebanon Water and Wastewater Sector Support (LWWSS) Program conducted customer service management training for 23 BWE customer service personnel from January 31 to February 2, 2013 as part of on-going capacity building with the BWE. USAID has also helped to establish a customer service center in Zahle, the largest city in the Beka'a.

The Customer Service Center is a rehabilitated antique stone building formerly used as a warehouse, and is the first of its kind in the Beka'a. Previously, the BWE was not equipped to handle the customer requests properly; complaints were recorded manually and frequently lost. This has contributed to incomplete applications, illegal connections, low bill payment and collection, and served as a deterrent for potential new customers. In addition to the new customer service center and training, USAID's LWWSS has also introduced new computerized systems which have resulted in standardized processes and faster processing of complaints, requests, and applications.

Thanks to the new customer service center, trained personnel, and computerized systems, customers can now pay their water bills, report service disruptions and leaks, ask questions, address complaints, and subscribe for water service, all in the same place. Already these improvements have led to increased billing collection of 38%, it is expected that these changes will continue restore customers trust in their public water utility and ultimately increase the number of Beka'a residents provided with drinking water.

LWWSS assists Lebanon's four regional Water Establishments in working towards financial and operational sustainability. The program began in 2009 and will continue until 2015.

SLWE. LWWSS conducted a comprehensive door-to-door customer survey in Jezzine that included subscriber addresses, contact details, connection status, and other relevant information, which fed into an up-to-date customer database.

Results and Impact: Improvements to customer service in each water establishment led to improved customer service, increased efficiency in responding to claims and complaints, shorter application processing timelines, and a more professional customer interface at the water establishments. Over time, this improved customer service led to higher rates of subscription and bill collection. Both of these factors have immediate impact on the water establishments' revenues and on service coverage for the population served by each water establishment. **Designed and Implemented Brand Identity Guidelines and Corporate Websites**

Scope: Developing corporate websites allows the water establishments to establish an online presence and extend their outreach to stakeholders including subscribers, the donor community, and government officials. Once complete, the websites play an important role in facilitating the dissemination of public awareness messages to thousands of subscribers and visitors, in addition to providing information on the services that are accessible to customers, thereby increasing customer service efficiency. Moreover, the water establishments anticipate that the corporate websites will serve as basis for deploying on-line payment systems in the future.

In addition, LWWSS supported the NLWE to develop brand identity guidelines, building its capacity to apply these guidelines across its communications materials and conducting a number of communications exercises using the new guidelines.

Activities:

BWE. LWWSS hired a local firm, Sugar Lime, to develop the BWE corporate website. After meetings with BWE leadership to determine content and the "look and feel" of the website, Sugar Lime completed a website home page mockup and preliminary structure. Sugar Lime then presented it to BWE management and staff to collect and incorporate their feedback into the design.

We held two meetings at the BWE to review and finalize the data and photos provided by BWE to the developer Sugar Lime. In the last week of August 2015, Sugar Lime did a final presentation to the Director General, who approved the final product but wanted additional content to be added before the website goes on line. The website can now be viewed publically at <http://bwe.gov.lb>. We have also provided a screen shot of the website on the following page. Sugar Lime will be hosting the website for one year, until August 2016.

NLWE. The NLWE corporate website went live in July 2013 and can be viewed publically at <http://eel.gov.lb/en/>. Hosting of the website started in June 2013 for a period of two years, until June 2015. Beginning in July 2015, the NLWE took over the financial responsibility for hosting the website.

LWWSS also prepared brand guidelines for the NLWE, using its logo, vision, and mission and provided detailed guidelines for the use of the NLWE's corporate image. LWWSS created standard typography, colors, and stationary templates; brochures for existing and new customers identifying the services provided by the NLWE and addressing frequently asked questions; and posters reflecting the NLWE's corporate identity to be hung at the customer service points at branch offices. These brand guidelines were also reflected on the NLWE corporate website.



خدمة الزبائن
مؤسسة مياه البقاع تسهر على تأمين الخدمة الأفضل للمواطن البقاعي

أهلاً بكم على الموقع الرسمي لمؤسسة مياه البقاع

Results and Impact: The corporate websites play a key role in facilitating the dissemination of public awareness messages to thousands of subscribers and visitors, providing valuable information to customers and stakeholders alike. For the BWE, the corporate website could increase the efficiency of the BWE in dealing with customer queries, concerns and complaints, thus building customers trust and improving the overall image of the establishment. In addition, the website could serve as basis for on-line payment systems in the future. Future programs could focus on demonstrating the usefulness of corporate websites for reaching subscribers, to increase ownership by the water establishments so they are sustainable past the end of donor funding.

For the NLWE, the brand identity activities help to increase the public awareness and recognition of the water establishment, communicate and reinforce the establishment's vision and values, create a positive public image for the water establishment that connects with subscribers' daily lives, and enhance customer loyalty. Internally, the level of customer loyalty to the brand correlates positively with employee loyalty and creates a cycle from which the brand benefits.

Consumer-Targeted Awareness Programs: World Water Day and Collections- and Conservation-Related Outreach

Scope: To support the water establishments' efforts to reach out to their customers, build their corporate identities, and promote water conservation, LWSS implemented an outreach campaign in partnership with the NLWE and SLWE on World Water Day in 2012. This youth activity focused on students in public schools in March 2012. LWSS also conducted a media campaign with the BWE in May-June 2011 to promote water conservation, promote new subscriptions for water service, and increase collection of bill payments in arrears.

Activities: The activity included a class-based interactive sessions on the water cycle, the water treatment process, daily water consumption, and water conservation. During the session, each student was given a comprehensive booklet that included each lesson in words and pictures, for easy understanding. LWSS also conducted interactive games and activities, such as an activity that taught students how to quantify the amount of water use in one day by a family of four by listing all of the family’s daily actions that require water, and the amount of water in liters that each action consumes. The activity concluded with a discussion regarding simple ways to reduce daily water consumption. Students were then asked to complete the same activity at home – detailing their own families’ water consumption – and pass this knowledge of water usage and conservation to their families.

For the BWE media campaign, LWSS ran several ads in newspapers, billboards, and radio strategically located throughout the BWE’s service area. These ads encouraged residents of the Bekaa Valley to conserve water and make payments on their water bills, and also encouraged those not yet subscribing to water service to formally subscribe. LWSS also trained BWE staff on conducting a media campaign, developing and understanding how to measure the impact of each media used, and improving the level of payment for services. In addition to reminding customers and potential subscribers that the MoEW decreed a discounted payment on arrears and new subscriptions, the media campaign also focused on determining which media had the “best” response to inform future media outreach from the BWE and other water establishments.

Results and Impact: LWSS held the World Water Day outreach campaign over a period of two weeks in schools in South and North Lebanon, reaching approximately 600 students. LWSS has emphasized the importance of building linkages between the water establishments and their communities, and increasing the water establishments’ capacity to engage and follow up on awareness activities in their regions. The World Water Day initiative took place as a joint effort by LWSS and the water establishments, thereby building the image of the water establishments in the public’s eyes; establishing a relationship between youth and the water utility; building the capacity of the water establishment staff, teaching personnel, and parents; and spreading the message of water conservation to the public.

The BWE media campaign was considered both a public relations and financial success. 602 new customers subscribed for service as a result of the outreach campaign, and the BWE collected more money than it spent on the campaign. The BWE spent \$39,000 on the outreach campaign, and collected more than \$100,000 in arrears. Additionally, the BWE determined that the newspaper advertisement was the most successful form of media outreach, as it reached 60% of the target audience.

Youth Water Conservation Program

Scope: LWSS conducted an awareness campaign in elementary schools to raise awareness about the water establishments’ presence and role and build the capacity of the water establishments to engage with the community and promote conservation. LWSS reached out to youth to promote conservation because children aged five to ten years old tend to be curious and eager to learn, and absorb and apply what they learn, especially when learning is done with dynamic and interactive education concepts on water conservation and pollution. Good habits can be instilled in children to shape their understanding and attitude toward water.

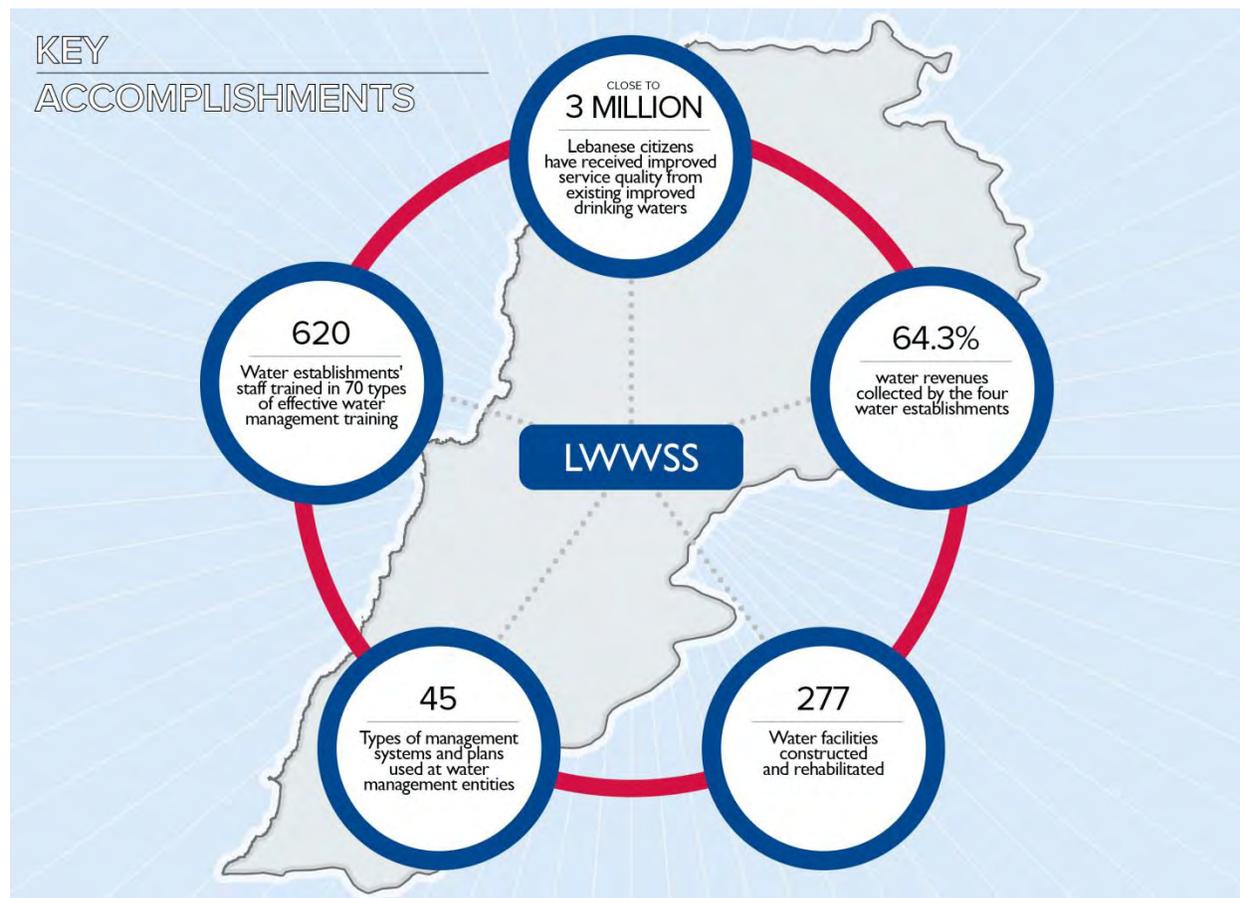
Activities: In partnership with the BWE, NLWE, and SLWE, LWSS conducted sessions in private schools and community organizations to raise awareness of the water establishments’ presence and role, promote water conservation, and build the capacity of the water establishments to engage with the community. In an effort to engage youth, LWSS held awareness sessions for two age groups – five to eight years, and eight to ten years – and included a combination of teaching and learning materials designed to help students learn about water conservation while acquiring valuable reading and scientific skills.

LWWSS has continued to promote public awareness on water conservation and water use efficiency to help decrease overuse and thereby enable more people to have access to water supply at home. LWWSS followed up the awareness activities with a yearly calendar focused on water conservation. The effort of putting together a unified calendar built the capacity of the water establishments to collaborate with each other, and ultimately helps them communicate with their customers. LWWSS printed 2,000 Arabic and 500 English calendars in February 2013 and distributed them to the four water establishments as well as to LWWSS project partners, subcontractors, and other stakeholders. The four water establishments distributed the calendars to their four head offices and 34 branches, where they could further reach their customers.

Results and Impact: The water conservation activities were very successful in reaching thousands of youth and adults. LWWSS found that the impact of youth outreach activities is higher in terms of penetration through social and age groups within the targeted regions, as compared to activities that only target adults.

Component 7 Contractual Deliverables	Activities	Establishment	Status
Development of mission statements for individual departments of selected WEs	a. Business Plan and Capital investment b. Water establishment brand identity	a. BMLWE, SLWE b. NLWE	Completed as part of business plans
Conduct public awareness plans and activities	a. Develop tools to adopt corporate communication b. Youth water conservation program c. Consumers awareness program	a. NLWE, BWE b. All four WEs c. All four WEs	Complete
Provide training on customer service relations at selected WEs	a. Customer service management capacity building b. Nationwide customer satisfaction poll	a. BWE b. All four WEs	Complete
Establishment of customer reception office and guides in selected WEs	a. Establishing direct customer interface b. Building Customer service management structure c. Customer service management capacity building	a. BWE b. BWE c. BWE	Complete

Chapter 2: Project Monitoring and Evaluation



Approach to M&E

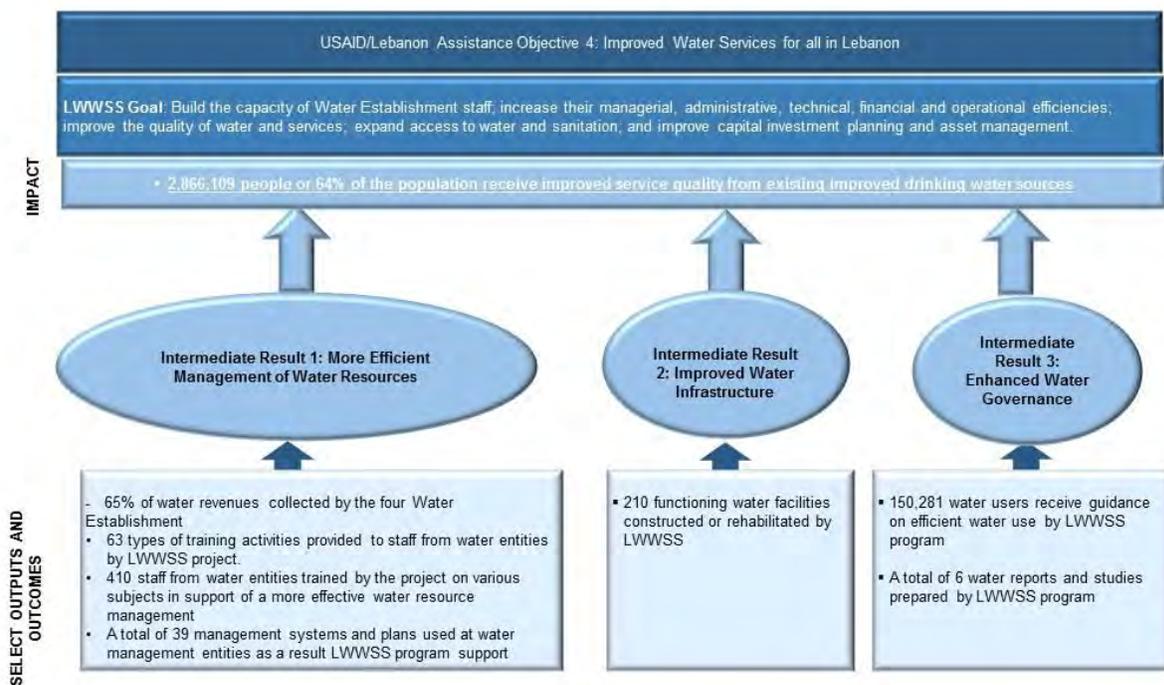
Monitoring and Evaluation were an integral part of LWSS' approach and as such contributed to the design and implementation of the program's objectives. The Monitoring and Evaluation Plan designed at program inception served two purposes: first, it was a tool for measuring progress toward meeting the expected program results; and second, it was an instrument that ensured continuous learning, adaptation and adjustment to program activities. The initial draft of the PMP was prepared after a three-day workshop facilitated by MSI, which brought together USAID/Lebanon and implementing partner (IP) staff to discuss the theories of change and results framework that would guide the programming of water support projects.

Thereafter the PMP was reviewed and updated every year, to coincide with the development of the annual work plan. An OIG evaluation conducted in 2013 on the program identified various areas of the PMP that required review and improvements. This resulted in further changes to the indicators and their definitions, ensuring that the data was accurate, valid, objective, and measuring what the program was trying to achieve. Additionally, throughout program implementation, LWSS worked closely with Social Impact, USAID's contractor that conducted regular data quality assessments and provided guidance in updating targets and calculation methods for several of the indicators.

Data collection was the responsibility of every technical team member, and overseen by an M&E manager and the COP. Results were reported regularly through the quarterly reports and shared with local partners to show progress. Each indicator was disaggregated as appropriate to account for impact on gender, region, and type of intervention.

Results Framework

LWWSS results framework provided a roadmap to what success would look like for the program, linking activities to outcomes, intermediate results and overall program objective of improving water services for all citizens of Lebanon. This framework presented below includes 8 indicators organized by 3 intermediate results: 1) more efficient water resources; 2) improved water infrastructure and 3) enhanced water governance. It also conveyed the development hypothesis implicit in the strategy and the cause-and-effect linkages between the intermediate results and the objective. One high level indicator measured the program impact, focusing on the number of people benefiting from improved quality of water as a result of LWWSS interventions.



Overall Results

LWWSS achieved and at times exceeded all its life of project targets as indicated in the table below. As a result of the 6 years of program interventions a total of 2,995,687 citizens benefited from improved water, 51 percent of which are women. Water revenue collection of the four water establishments increased from 59.1% at program inception to 64.30% cumulatively or 8 per cent higher than at the beginning of the program. The program provided a number of trainings to build the capacity of WE staff in providing more efficient management of water resources. During the 5 year program 70 different types of training were conducted with the participation of 620 employees, 21% of which were women. In addition to these training, employees benefited from the various management systems and plans implemented through a participatory process. These include water quality management plan, ERP and its various modules, business plans and internal audit manuals. Infrastructure improvements were a core activity especially during years 3-5 of the program. Between installing pump stations, water meters and building water quality labs, the program constructed or rehabilitated 277 different water facilities. Finally, the program conducted various public outreach activities to promote water governance, reaching out to 312,649 citizens, 51 % of which are women.

Indicator, disaggregation	Baseline	Life of project Target	Life of program result	Indicator achieved
1. Number of people receiving improved service quality from existing improved drinking water sources; <i>disaggregated by gender</i>	0	2,866,790 (51% women)	2,995,687 (51% women)	3.7% above target
2. Percent of water revenues collected by targeted water entities, <i>disaggregated by WE</i>	59.1%	65%	64.3%	Small difference
3. Number of training activities provided to staff from water entities as a result of USG assistance, <i>disaggregated by WE</i>	0	63	70	11% above target
4. Number Staff from Water Entities Trained as a Result of UGG Assistance, <i>disaggregated by gender</i>	0	410 (29% women)	620 (21% women)	50% above target
5. Number of management systems and plans used at water management entities as a result of USG assistance, <i>disaggregated by WE</i>	0	39	45	15% above target
6. Number of water users receiving guidance on efficient water use, <i>disaggregated by gender</i>	0	150,281 (51% women)	312, 649 (51% women)	100% above target
7. Number of functioning water facilities constructed or rehabilitated with USG assistance, <i>disaggregated by water</i>	0	210	277	31% above target
8. Number of USG Assisted Water Reports or Studies Proposing Legal, Policy, and Institutional Measures or Procedures, <i>disaggregated by WE</i>	0	5	8	60% above target

Chapter 3: Sustainability and Recommendations for Future Programming

During six years of LWWSS implementation, and another six years of LWPP implementation before that, DAI has identified two critical aspects of working with the water establishments in Lebanon: capacity building, and building ownership from the water establishments. We have worked hard to incorporate these aspects into our collaboration with each water establishment, to ensure the effectiveness and sustainability of every intervention.

Capacity Building

LWWSS incorporates capacity building into every aspect of our programming. In close collaboration with the leadership and staff of each water establishment, the project introduces new approaches and supports the water establishments to understand and apply systems and processes to improve their work. We develop training to accompany system installation, equipment upgrades, and infrastructure projects. These training programs develop relevant skills, improve the ability of water establishment staff to maintain the investments made by USAID, and increase the sustainability of LWWSS interventions.

For example, as part of the installation of the ERP system in the BMLWE, BWE, and SLWE, LWWSS worked closely with our partner Allied Business Advisors to develop training programs for water establishment leadership and staff. These programs worked directly with staff to build their capacity in data entry, analysis, and reports generation. They also worked closely with the leadership of each water establishment to support their understanding of the data generated by the ERP, and how to apply that to their decision-making processes to support effective long-term planning and management of the water establishment. The water establishment staff were encouraged to suggest modifications so the ERP was customized to their needs. By working closely with the water establishments over time to help them fully understand and apply the different elements of the ERP, LWWSS ensured that the ERP would be used effectively and sustainably by all three water establishments, even after the program ended.

Similarly, on infrastructure projects LWWSS follows the installation of equipment or rehabilitation of infrastructure with relevant training for water establishment staff. For example, as the rehabilitation of the Ouadi Jilo and Batoulay pump stations progressed in South Lebanon, LWWSS worked closely with the water establishment to identify needed training to ensure the sustainability of this large investment. LWWSS provided training in pump operations and maintenance, safety protocols, and effective management of the pumping stations to the operators at both pump stations. This training increases the sustainability of the investment by increasing efficiency of the pumps, reducing safety incidents, and improving overall maintenance of the station and the pumps themselves.

By building capacity building into all LWWSS activities, the project ensured that water establishment staff were able to work efficiently and effectively, and the interventions would be sustainable after the LWWSS program ended.

Building Ownership from the WEs

As close partners for LWWSS in all aspects of programming, the water establishments play a critical role in the success and sustainability of each activity. As a demand-driven program, LWWSS worked with each water establishment to understand its challenges, prioritize interventions, and design activities. The water establishments were fully informed of any issues encountered during activity implementation.

As the water establishments increased their ownership of activities, they often played a direct role in ensuring that subcontractors performed effectively and provided services on time. For example, when the subcontract for rehabilitation and replacement of the water network in Bebnine faced numerous delays related to security concerns, the NLWE's DG, Jamal Krayem, worked closely with DAI and our subcontractor General Company for Quarries and Contracting to resolve ongoing local hostility issues and ensure that work could continue progressing on the subcontract. Mr. Krayem also ensured that a member

of the NLWE was assigned to oversee the handover of each zone of the network to the NLWE upon completion. The NLWE representative ensured that work was completed satisfactorily, and forced the subcontractor to repair any damage or defects identified during the handover. By demonstrating ownership of the activity, the NLWE asserted its leadership in the water sector and increased the quality and sustainability of the large USAID investment.

Opportunities for Building on LWSS Achievements to Improve the Performance of the Sector

While much progress has been made under LWSS, the water sector continues to face many challenges to its ability to provide consistent water service and water quality throughout Lebanon. In the following section, we have highlighted two main areas where future programming can build on LWSS activities: increasing the financial and commercial viability of water establishments, and rehabilitating infrastructure to improve and extend the water networks.

Increasing the financial and commercial viability of water establishments. Future programming can build upon the LWSS investments to strengthen the capacity of each water establishment to develop and apply standardized information in strategic and business planning and improve their internal operations and service delivery. By focusing on helping each water establishment’s planning and management systems, capacity, and use of off-the-shelf tools that generate standardized information, we can assist in the transfer of know-how between staff of the water establishments.

The table below summarizes the current status and capacity of each water establishment with respect to key business planning and operating functions and systems. We have used a red-yellow-green color scheme to show the current state of each utility in implementing these:

- Red shows that the water establishment has not yet or has just begun an activity;
- Green indicates that it has the capacity to continue with only limited assistance from future USAID programs; and
- Yellow indicates that it is in-between in its capacity and state of implementing planning and systems.

Business Area	SLWE	BMLWE	NLWE	BWE
Master Planning – Water	Yellow	Red	Red	Yellow
Master Planning – Wastewater	Red	Red	Red	Red
Business Planning	Yellow	Yellow	Yellow	Yellow
Annual Budgeting	Yellow	Yellow	Yellow	Yellow
Improving Internal Governance	Yellow	Yellow	Yellow	Yellow
Implementation of ERP Tools – Finance	Green	Green	Red	Green
ERP – Purchasing	Green	Green	Red	Green
ERP – Budget Preparation/Execution	Yellow	Yellow	Red	Yellow
ERP – Inventory	Green	Green	Red	Green
ERP – Human Resources/Payroll	Green	Green	Red	Green
Billings/Collections	Red	Yellow	Red	Red
Asset Management	Red	Red	Red	Red
Performance and Financial Audit	Yellow	Yellow	Yellow	Yellow

Rehabilitating infrastructure to improve and extend water networks. Lebanon’s water supply infrastructure is overburdened, aging, and inadequate to meet its population’s needs. The LWSS project, along with other USAID projects such as WISE and WISE A/E, has made significant progress in upgrading key infrastructure; however, much remains to be done.

Future programs should work closely with each water establishment to identify infrastructure needs that directly affect the water establishments’ ability to deliver water services. The table on the following page highlights some of the most pressing infrastructure constraints identified by the water establishments:

Priority Infrastructure Needs	Locations
North Lebanon Water Establishment	
Potable water network rehabilitation and replacement projects, including household connections	Dannieh (Dannieh zone); Tabaneh (Tripoli zone); Kousba, Nakleh, and Afisdik (Koura zone); Bazoun (Bishari zone); Driab (Qoubayat zone)
Procurement and installation of submersible and superficial pumps for water resources	Tripoli, Koura, Batroun, Zougharta, Bishari, Dannieh, Minieh, Halba, and Quobayat
South Lebanon Water Establishment	
Water testing laboratory and equipment	Tyre
Installation of a 14 km well in East Saida to feed villages below it by gravity	Saida
Bekaa Water Establishment	
Water testing laboratories	BWE Branch Offices
Support for the Zahle wastewater treatment plant, which is already being built	Zahle
Beirut-Mount Lebanon Water Establishment	
Potable water network repair and replacement	General
Rehabilitation of pumping stations	Daichounieh, Jamhour, and Kornet El Hamra
Litani River Authority	
Assessment to inform new irrigation network downstream from the dam	Sohmour
Assess water quality testing laboratory and provide equipment to improve food testing technology and microbiological analysis	Kherbet Qanafar

Upcoming water sector programming can build from the achievements under LWWSS in each of these technical areas to continue progress toward more effective, consistent water supply throughout Lebanon. Close partnership with the water establishments and ongoing capacity building for water establishment leadership and staff – combined with targeted interventions that build from the achievements of LWWSS – will increase the sustainability of completed and future interventions.

Chapter 4: Financial Summary

Overall Budget Tables

LWWSS allocates and manages project finances according to two budgets: one organized around cost elements and one organized around technical CLINs. DAI manages the overall project budget according to these cost elements and CLINs, and works closely with USAID to discuss funding allocations and priorities over the course of the program. As necessary and with approval from USAID, LWWSS has realigned its budget to reflect the actual and projected expenses under each cost element and CLIN. The final cost element and CLIN budgets for LWWSS are presented below.

Technical CLIN Budget, approved September 24, 2015

CLIN	BUDGET
CLIN 001 – Initial Assessment	██████████
Fee	██████████
Total	\$568,408
CLIN 002 – Capacity Building for Managerial, Technical, and Operational Efficiency	██████████
Fee	██████████
Total	\$1,746,560
CLIN 003 – Increase Financial and Commercial Viability of Water Establishments	██████████
Fee	██████████
Total	\$2,850,882
CLIN 004 – Capital Investment Planning and Program/Project Management	██████████
Fee	██████████
Total	\$1,180,963
CLIN 005 – Procurement of Technical Equipment to Strengthen WEs	██████████
Fee	██████████
Total	\$11,604,448
CLIN 006 – Small to Medium Scale Rehabilitation/Upgrade/Extension of Water and Wastewater Works within WEs Areas	██████████
Fee	██████████
Total	\$15,113,364
CLIN 007 – Corporate Culture, Customer Service Orientation and Public Outreach	██████████
Fee	██████████
Total	\$1,292,461
Total Estimated Cost plus Fixed Fee	\$34,357,088

Cost Element Budget, approved September 24, 2015

Item	Budget
Salaries and Wages	██████████
Fringe Benefits	██████████
Overhead	██████████
Other Direct Costs (travel, allowances, ODCs)	██████████
Total Subcontractors	██████████
SUBTOTAL PROGRAM COSTS	██████████
General and Administrative Costs	██████████
Total Estimated Cost	██████████
Fixed Fee*	██████████
TOTAL ESTIMATED COST & FIXED FEE	\$34,357,088

Analysis of How Contract Funds Were Utilized

LWWSS used contract funds to implement a wide variety of technical assistance, equipment procurement and installation, and infrastructure rehabilitation activities throughout Lebanon. These activities were designed in partnership with the water establishments and implemented through LWWSS technical experts as well as local and international subcontractors with relevant expertise for each intervention. Despite working in highly complex, often challenging locations, LWWSS was able to implement large activities at high quality and within budget.

Throughout the program, we placed a strong emphasis on providing the best value to the U.S. Government, maximizing the amount of program funds that were spent on technical activities such as subcontracts and training. In fact, a full 54% of program funds were spent on technical subcontracts in support of LWWSS objectives.

The program fee was tied to the achievement of deliverables under each of the technical components. As a highly successful program, LWWSS achieved all deliverables set forth by the contract.

Annexes

Annex A: LWWSS Technical Reports

LWWSS developed a variety of technical reports throughout the life of the project. The reports that are provided as Annex A to this Final Technical Report include the following:

Program Reports:

- Annual Work Plans
- Quarterly Reports
- LWWSS Program Deliverable Tracker
- LWWSS Key Program Activities

Component Technical Reports:

- Initial Assessment Report (Component 1)
- High Priority Intervention Plan (Component 1)
- Environmental Assessment Report (Component 1)
- List of trainings conducted by LWWSS (Component 2)
- Budget Manual (Component 3)
- Internal Audit Manual (Component 3)
- Cost Tariff Model procedures (Component 3)
- BMLWE Business Plan, 2010-2014 (Component 4)
- BMLWE Business Plan, 2015-2019 (Component 4)
- SLWE Business Plan, 2012-2016 (Component 4)
- List of pump stations surveyed (Component 4)
- BWE Water Capital Investment Plan and Priority Action Plan (Component 4)
- BWE Wastewater Capital Investment Plan and Priority Action Plan (Component 4)
- BWE Framework for Irrigation Services (Component 4)
- SLWE Metering Strategy (Component 5)
- O&M Manual for Batoulay Pump Station (Component 6)
- O&M Manual for Ouadi Jilo Pump Station (Component 6)
- LWWSS Customer Satisfaction Survey Report, 2010 (Component 7)
- BWE Pilot Media Outreach Campaign Assessment (Component 7)
- NLWE Corporate Identity Guidelines (Component 7)
- NLWE Web Guidelines (Component 7)
- NLWE Identity Guidelines Poster (Component 7)

These are available on the LWWSS Final Technical Report Deliverables CD that accompanies this report.

Annex B: LWWSS Project PMP

The LWWSS PMP is available on the LWWSS Final Technical Report Deliverables CD that accompanies this report.

Annex C: Communications Materials

LWWSS developed a variety of communications materials throughout the life of the project. The communications materials that are provided as Annex C to this Final Technical Report include:

- Success Stories
- Public Awareness Materials

These are available on the LWWSS Final Technical Report Deliverables CD that accompanies this report.

