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SMALL VILLAGES WASTEWATER TREATMENT SYSTEMS PROGRAM (SVWTS): Final External Evaluation

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ACRONYMS

ACDI/VOCA	Agricultural Cooperative Development International-Volunteers in Overseas Cooperative Assistance
ADS	Automated Directives System
AO	Assistance Objective
AOR	Agreement Officer's Representative
AUB	American University of Beirut
BOD	Biochemical Oxygen Demand
BOQ	Bill of Quantities
BWE	Bekaa Water Establishment
CDCS	Country Development Cooperation Strategy
CDM Smith	Camp, Dresser, McKee and Wilbur Smith
CIO	Chief Information Officer
CO	Contracting Officer
COP	Chief of Party
COR	Contracting Officer's Representative
CSO	Civil Society Organizations
DCOP	Deputy Chief of Party
DEC	Development Experience Clearinghouse
DG	Director General
DO	Development Objective
DQA	Data Quality Assessment
ED	Engineer's Decision
ED/CMC	Engineer Design/Construction Management Contract
EU	European Union
FY	Fiscal Year (USAID Oct 1 to Sept 30)
GIS	Geographic Information System
GOL	Government of Lebanon
IMF	Independent Municipal Fund
IP	Implementing Partner
IR	Intermediate Result
IRG	International Resources Group
IQC	Indefinite Quantity Contract
LMU	Lake Municipalities Union
lps	Liters per Second
LRA	Litani River Authority
LRBMS	Litani River Basin Management Support
M^3	Cubic Meters
M^3/d	Cubic Meters per Day

MAARD	Modified Acquisition & Assistance Request Document
M&E	Monitoring and Evaluation
MIS	Management Information System
MoIM	Ministry of Interior & Municipalities
MoE	Ministry of Environment
MoEW	Ministry of Energy & Water
NSWS 2012	National Strategy for the Wastewater Sector 2012, MoEW
O&M	Operations & Maintenance
PIRS	Performance Indicator Reference Sheets
PMP	Performance Management Plan
PMPL	Performance Management Program for Lebanon
PSV	Project Site Visit
SI	Social Impact
SOW	Scope of Work
SPS	Standard Program Structure (the FACTS system)
SVMTS	Small Villages Waste Water Treatment Systems
TOR	Terms of Reference
USAID	United States Agency for International Development
USG	United States Government
WTP	Water Treatment Plant
WW	Waste Water
WWTP	Waste Water Treatment Plant

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EXECUTIVE SUMMARY

Acting under Mission Assistance Objective 4: "Improved water services for all in Lebanon", and in recognition of the serious pollution problem occurring in the Litani watershed, USAID/Lebanon designed a project aimed at reducing the direct discharge of sewage into the Litani River. In coordination with other donors' wastewater treatment infrastructure programs, and with a view to using low-cost, low maintenance, natural based sewage treatment technologies, USAID/Lebanon identified locations in the Upper Litani River Basin not currently served by wastewater treatment facilities as the best target for use of development funds that would support Mission objectives.

The proposed project, called the Small Villages Wastewater Treatment Systems (SVWTS) project, identified municipalities and unions of municipalities in the West and North Bekaa regions. Municipalities, rather than the Water Establishments, were seen as the target government institutions that had the means to operate and maintain the constructed facilities to the benefit of their constituents. The Government of Lebanon and the participating municipalities were engaged in the project through Memoranda of Understanding that described the responsibilities and duties of the signatories.

Camp, Dresser and McKee (CDM)[1] was awarded the SVWTS Project under Contract #: 268-C-00-05-00066. The project was designed in two Phases. Phase I (October 2004 - November 2005) was the facility design phase where alternative infrastructure configurations that met the design criteria were compared and a final design selected. Phase II (October 2005 – August 2012) was the construction and commissioning phase and included an "Advise & Assist" stage designed to gradually transition the operation of the plants to the participating municipalities. The available budget for Phase II was $18,041,628.

The Contracting Officer's Representative (COR) for the Small Villages Wastewater Treatment Systems project requested an end of project evaluation to be limited to Phase II of the project implementation, focusing mainly on issues of sustainability, and recommendations for future projects in the sector. Subsequently, the Performance Management Program for Lebanon (PMPL) was requested to develop the scope of work (SOW) for the final evaluation of the project. The resulting Evaluation SOW is referenced in Annex B.

The proposed suggested objectives of the evaluation were:

1. Analyzing the extent of achievement of the program objectives of mitigation of pollution at the Litani River
2. Evaluating the outcomes and impact of the program.
3. Documenting successes, challenges, and lessons learned.
4. Providing recommendations for USAID on any possible enhancements of the current program, specifically enhancement of its sustainability.
5. Providing recommendations for USAID for any future programs of the same or similar nature.

[1] In 2012 CDM merged with Wilbur Smith to become CDM Smith

The final evaluation questions answered were:

Evaluation Questions		
Question Category	*Question or Issue to be Addressed*	*Findings of this evaluation*
Impact	• Explain the results and net impacts of the activities undertaken, and infrastructure built identifying any unintended impacts. • Where results were not met, identify why not and provide recommendations for strengthening the development strategy.	• Pollutants entering the Litani River have been reduced. • The number of people envisioned to be covered by the project was limited due in part to the fact that some communities were not able to extend networks as expected.
Sustainability	• What are the prospects for sustainability of the end results produced by SVWTS? • What identified results appear to be less sustainable and why? • Was the scale of the project (i.e., three WWTP, number of municipal staff trained) appropriate to ensure sustainability?	• Sustainable O&M of the WWTP by the municipalities is precarious as paying for it is not fee-based and currently relies on budget transfers. • Municipalities have not been able to provide candidate plant operators who could have been trained by CDM. This remains a challenge. • The scale of the project is appropriate for small villages not associated with larger treatment plants where sewer networks are available or can be provided along with the treatment plant.
Client Satisfaction	• Determine if the benefactor's (the municipalities served) needs were met, and if not what wasn't met and how can that be corrected?	• Municipal leaders confirmed their overall satisfaction with the project and partnership with USAID through CDM contractors.
Relevance	• How relevant is the SVWTS to the GOL short, middle and long term National Wastewater Management Strategic Plan?	• A list of all of USAID's contribution to the wastewater sector is presented in the recent National Strategy for the Wastewater Sector. How the smaller plants such as those constructed under SVWTS relate to the overall wastewater strategy going forward is not specified. The strategy stresses completion of the larger treatment plants and the networks that connect to them.
Validity of the hypothesis and assumptions	• Is the original WWTP physical plant design and the use of the MoU with the Municipalities to ensure sustained plant operation still valid?	• The physical plant design remains valid for small villages with limited means. Some modifications mentioned in this report can be made to further reduce costs. • The current legal framework for the operation and ownership of wastewater treatment plants suggests that other legally binding agreements may not be possible and that use of an MoU is the most viable option. The MoU was confirmed by the

		Council of Ministers and published in the official gazette. • The recent National Strategy for the Wastewater Sector refers to municipalities being delegated by the WE to operate facilities.

Findings:

- Phase I of the project identified locations and designs for waste water treatment plants in the Upper Litani River Basin. Sixteen municipalities comprising 101,000 people were identified as potential beneficiaries for the construction of 7 waste water treatment plants. Phase II of the project, under a separate contract, was to construct the treatment plants. The number of plants to be constructed was not specified, but was to be determined by the willingness and ability of the communities to support the construction. This resulted in the selection of 4 WWTP to be constructed. However, one of the four communities, Chmistar, was not able to secure land for the construction and was dropped. As a consequence 3 wastewater treatment plants serving 20,350 persons in 8 municipalities were constructed.

- The 3 constructed wastewater treatment plants were fully commissioned, and upon Tests on Completion for 30 consecutive days certifying that the performance of each WWTP was in compliance with design criteria and environmental standards, they were handed over to the municipalities. All 3 plants are currently in operation. However, at least one of them was shut down for an extended period of time because of electricity shortages (a recurrent phenomenon in Lebanon) and lack of funds to purchase fuel for the generator, which suggests that this might happen again.

- The project was successful in mitigating pollution reaching the Litani River. This is indicated by the volume of sludge removed from the digesters at the treatment plants, and by water quality measurements comparing influent and effluent characteristics. Specifically, Dissolved Oxygen (DO) was increased, Biochemical Oxygen Demand (BOD) reduced, and settleable solids effectively removed. Nevertheless, the impact of these three small wastewater treatment plants on the overall levels of pollution in the Litani River would be undetected by river monitoring stations. However, Government and donor agencies are committed to the waste water sector. By 2015, seven other wastewater treatment plants in the Litani Basin are said to become operational and improved water quality in the Litani River should then be detectable.

- Implementing a sewer network protection and repair program to prevent excessive inflow, such as storm water, and debris from entering the system was part of the responsibility of the Municipalities under the Memorandum of Understanding signed with USAID. Excessive infiltration of storm water into the sewer during the rainy season forces the treatment facility to treat more influent than is necessary. It results in less efficient plant operation and can overload the system. Excessive flows can lead to untreated effluent bypassing treatment and reaching the Litani River. Some municipalities have not yet implemented a sewer network protection and repair system.

- Expansion of the sewer network to Niha and repair of Nabi Alya network is a Municipal responsibility under the MoU, but this work has not yet started. Areas not yet covered by a sewer network are served by septic tanks or simple cesspits that are pumped out by septic tank pumper trucks that often dump their waste directly into the river (although they are encouraged to dump their waste at special waste receiving stations within the WWTP). Fourzol has now repaired its network and the results of this are seen in the tests taken at the plant. When networks are extended and maintained then pollutant reduction in the Litani River is further enhanced.

- The treatment plants remain vulnerable to blockages of the sewer lines. This occurred in Aitanit and in Ablah when farmers broke the line or blocked it in order to irrigate their fields with the untreated sewage water. Awareness raising and policing are needed to prevent this from re-occurring.

- Under the auspices of GIZ, a working group consisting of the 4 WE Directors General and 2 Directors from the Ministry of Water and Energy agreed that consumption-based tariffs for water supply together with newly introduced wastewater tariffs are required. All participants confirmed that existing regulations generally permit the introduction of a new tariff system. The National Strategy for the Wastewater Sector promotes full cost recovery by 2020 based on the 'polluter pays' principle.

- Water quality tests are specified in the O&M manuals for each of the 3 plants. Completing these tests is an important way to monitor plant performance. Thus far the results of measurements are kept internally and not subject to oversight and review by any external authority. Phosphates and Nitrates, pollutants associated with health hazards, are not currently monitored.

- Less sewage is reaching the plants than planned, but there is sufficient plant capacity to handle intended network expansion.

- Due to the government freeze on employment, the staff at the three facilities are hired and paid as daily workers. This staffing arrangement managed to overcome the municipalities' barrier to hiring plant operators but failed to provide the appropriate employment social security and benefits hence, could possibly affect the plants' long term management sustainability.

- Yearly service maintenance contract agreements for plants' equipment (generator, pumps, and control panels) are not yet in place for the Aitanit plant. Fourzol is already covered by a maintenance agreement and Ablah equipment is still under warranty.

- A financial analysis of the three municipalities and union of municipality showed that all were capable of covering the O&M costs and seemed to be willing to do so, but remain vulnerable to external funding source availability. Fourzol is the most vulnerable to possible short falls in the necessary budget. The establishment of user fees would do much to ensure long term sustainability.

- Unions of Municipalities currently is a 'more sustainable financial partner' for the implementation and operations of wastewater treatment plants with USAID than individual municipalities because of their higher income and financial resources.

- The MoIM committee did not *fully* deliver on their role and responsibilities as signed in the MOU with USAID to support selected municipalities "for all legal and procedural actions needed for the success of this activity." Participating municipalities are still working to secure funds for the implementation of sewer network protection and repair, construction of new sewers and connection lines and most importantly funding for O&M costs. Various initiatives in the form of draft laws are still being discussed to resolve these O&M issues.

- In spite of the financial burden of the O&M cost and challenges for operating the WWTPs, interviewed municipal leaders confirmed their municipality' and union's *ability and willingness* to operate the wastewater treatment plants.

- An interview with BWE General Director established the WE inability and unwillingness to manage the three USAID WWTPs. BWE inability is due to the Water Establishment's lack of funds and appropriately trained staff. Moreover, the financial burden of operating the WWTPs will not be offset, according to the Director, by additional income from wastewater treatment tariffs especially in the Beka'a valley where collection rates for water are comparatively low.

- The limited awareness and restricted engagement of the 'large base' of the SVWTS project's beneficiaries meant that there was limited citizen reaction to incidents that affected project's implementation such as breaking the sewer network and diverting sewage flow to irrigate farms in Mashghara; dumping solid waste in the Litani River bed at the effluent outlet of the WWTP in Fourzol; contamination of raw sewage with residues from olive presses thus hampering plants' biological treatment processes … etc. In our opinion, these constraints should have been addressed with awareness raising activities, enhanced coordination with and direct engagement of the local population to run in parallel to project infrastructure development.

- The National Strategy for the Wastewater Sector (NSWS 2012)[2] supports the polluter pays principle for full recovery of O&M costs. The strategy confirms the role of the municipalities as acceptable operators of wastewater assets, supports the economic use of effluent and sludge, encourages private sector participation in the sector, and supports legal, regulatory and policy measures that *inter alia* would establish responsibilities for monitoring and enforcement.

Recommendations:

- Reduce energy costs/consumption at the plants:
    - Reduce the number of trickle filter blowers.

[2] The Ministry of Energy and Water, National Strategy for the Wastewater Sector (2012) became available to the evaluators only in January 2013. References to the Strategy were added following submission of the first draft of the report.

- Reduce the size of the generators.

- Assist in developing municipal policy that encourages septic tank pumper trucks to deposit septic waste at the plant septage receiving stations. Impose fines for violators.

- Assist municipalities to develop a policy for use/disposal of dried sludge from the drying beds.

- Policy development for the measurement of wastewater treatment plant effluent to be discharged into the Litani River. Define different agency's responsibility. For the three plants this may best be the Litani River Authority who already see this as part of their future role and responsibility. This has been encouraged under the USAID funded Litani River Basin Management Support (LRBMS) project. The LRBMS could be requested to determine how best to implement this policy. Part of the effluent monitoring should include measurement of Total P and Total N because, according to recent research cited in this evaluation , the main concern for pollutants in the Litani River comes from Nitrates and Phosphates which have leached into underlying aquifers well beyond permissible concentrations.

- Support the wastewater tariff discussion and implementation. Introducing user-based tariffs is the best long-term solution for WWTP O&M sustainability and expansion and is now supported by the NSWS 2012.

- Support awareness raising in the Upper Litani aimed at increasing the number of water rate payers as this is linked to proposed wastewater tariff collection schemes. The Litani Water & Wastewater Sector Support (LWWSS) project has initiated awareness raising campaigns achieving positive results, and this can be encouraged.

- The municipalities and union of municipalities appear to be the best option for operation of small scale WWTP and their engagement for this task should be continued. In general, support for decentralization of wastewater treatment plant operation should be encouraged based on the experience gained from SVWTS.

- The source for training of wastewater treatment operators is not apparent. This should be supported through technical education opportunities. Many new treatment plants will come on line in the coming years that will require trained operators.

Lessons Learned:

- To assess the financial and administrative soundness of the partners before committing USAID resources. The situation of municipal, water establishment and ministerial finances and their ability to provide adequate staffing for a project or initiative is complex in the Lebanese context. Understanding this or preparing for uncertainty might avoid or mitigate the brinksmanship that caused the Fourzol plant to be inoperative for several months.

- To undertake awareness-raising campaigns in parallel with infrastructure development. Awareness raising can mitigate diversion of sewage to irrigate fields and the indiscriminate dumping of sewage into the Litani River.

- To assess the entire sewer system as a condition for investment. The sewer network serving the Aitanit plant was at one point broken by farmers to divert sewage to their fields. The Niha and Nabi Alya municipalities were to construct sewer networks to connect with the Ablah plant, but have not yet done so. The Fourzol municipality, however, did complete needed repairs.

- The USAID project design was too ambitious and initially envisioned the construction of 7 treatment plants reaching 101,000 people or 29% of the Upper Litani River basin's population. By the end of the project 20,350 persons were connected to the 3 completed treatment plants. While the reduced number of constructed WWTP can be explained, it creates the impression that targets were not achieved. Preferably, the number of WWTP to be constructed should have been specified during Phase I and the commitments from the communities obtained at that time.

- Union of Municipalities affords a financially more reliable partner for USAID investments in waste water projects than individual municipalities due to possible economies of scale in treatment processes, and second due to the larger revenues at their disposal compared to individual municipalities.

- The Memoranda of Understanding is a viable legal framework that certifies the Lebanese government's *willingness* through the MoIM, Union and Municipalities- to achieve the common purpose stated in the MoU. However, the MoU does not cover the financial ways and means –*capacity*- to deliver on these commitments. In light of the government's past and current budgetary issues, more specifics on the financial process by which this support will be realized has to be included in future agreement mechanisms. Other donors have provided project funding to cover 2-3 years of forecast O&M costs; this strategy may simply be kicking the can down the road as the resolution to covering O&M costs must come through user-based revenue.

- Wastewater projects entail costs for operation and maintenance of infrastructure and equipment that goes beyond the construction and commissioning phase. Future studies of wastewater projects would be inclusive of the long term 'sustainable sources' by which these costs should be covered. Such means can be legal such as levying wastewater treatment tariffs (draft law under process) or raising voluntary contributions from the local population as is the case in Qsarnaba for wastewater treatment or Baaloul for networks construction.

- To assess the entire sewer system and industrial pollution sources as a condition for investment. Sewer networks and wastewater treatment plants are technically considered as one unit of treatment. For the SVWTS, assessment of the network occurred after the commitment to construct the WWTP. Assessment of the network was possibly assumed not to be necessary as this was a responsibility of the municipalities under the MoU. The ability of the municipality or union to meet this responsibility was not assessed.

I. INTRODUCTION

A final external evaluation was requested for the Small Villages Wastewater Treatment Systems (SVWTS) project (October 2004 – August 2012) by the project Contracting Officer's Representative (COR). This is a project final **performance evaluation** as described in the USAID Evaluation Policy. "A **performance evaluation** focuses on descriptive and normative questions: what a particular project or program has achieved (either at an intermediate point in execution or at the conclusion of an implementation period); how it is being implemented; how it is perceived and valued; whether expected results are occurring; and to answer other questions that are pertinent to future program design, management and operational decision making."

II. SVWTS PROGRAM INFORMATION.

PROJECT CONTEXT

From the Contract 268-C-05-00-00066-00 Section C – Description/ Specifications/ Statement of Work: "The Litani River and Lake Quaraoun are among the most important freshwater resources in Lebanon. The river has a length of 170 Km and an average discharge rate of 770 Million Cubic Meters (m^3) per year. Groundwater reserves, estimated at a total of 104 m^3 per year, are relatively low and at a shallow depth. The surface and groundwater resources in the river basin provide drinking water to more than 350,000 persons in more than 161 communities and serve as a fundamental component of the Bekaa Valley's agricultural and industrial sectors. Lake Quaraoun has a storage capacity of 220 m^3 of which 160 m^3 is considered as active storage for irrigation and hydroelectricity, while the remainder is used for storage through the dry season." Flow in the river ranges between 14.2 m^3 /second during the wet season to about 4.4 m^3 /second in the dry season[3]. The river basin, covering 15% of Lebanon, lies entirely within the Lebanese territory and efficient and sustainable management of the river basin's water resources is a national priority. The principal management agencies of the Litani River Basin are the Litani River Authority (LRA) and the Ministry of Energy and Water (MoEW).

LRA is responsible for surface and groundwater resources in the Litani Basin and includes the initiation and management of irrigation, potable water, and electricity generation projects. Inter alia, the LRA monitors water quality in the Litani River Basin. The MoEW, through the Bekaa Water Establishment (BWE), is responsible for wastewater and potable water management. The National Strategy for the Wastewater Sector noted the dysfunction of the sector: "Water Establishments lack the autonomy, technical capacity and financial resources to improve service standards. Despite massive investment, very little wastewater is being treated, causing severe environmental damage. The investment program has been poorly coordinated, and reforms to transfer institutional and financial responsibility for wastewater management to the WE have been only very partially implemented."

[3] K. Khair, N. Aker, F. Haddad, M. Jurdi, and A. Hachach, Environmental Status in Lebanon, Part I: Natural Factors. National Action Program, Beirut, Lebanon, 1994

The Litani watershed suffers from a serious water pollution problem. This is mainly caused by lack of domestic wastewater treatment, agro-chemical contamination, and uncontrolled solid waste and industrial waste disposal. This situation has caused negative water-use impacts on public health, the environment, and socio-economic development. According to the project contract description, more than 92% of the summer samples from the Litani River and its tributaries show total and fecal coliform levels exceeding the Ministry of Environment (MoE) guidelines for domestic use; further, 77% and 38% of summer samples of groundwater wells exceed the MoE drinking water standards for total and fecal coliforms respectively. [4]

The Ministry of Health reports more than 1,500 cases per year of water-related illnesses in the Upper Litani watershed. The costs of these illnesses are estimated to be between $250 and $1,900 per case suggesting a total cost of more than $375,000 to $475,000 per year while the average per capita yearly income in the region is $800.

The Government of Lebanon through the National Wastewater Management Strategic Plan developed a Wastewater Master Plan in 1982 which was updated in 1994, and again in 2012.[5] The 1994 Master Plan identified 11 Wastewater Treatment Plant (WWTP) catchment areas for treating domestic wastewater in the region and which were to be owned and operated by BWE. BWE however, lacks the financial and human resources for construction and management of the WWTP facilities. By 2002, the USAID funded Lebanon Environmental Program Assessment Report noted that 25 waste water treatment plants outside the greater Beirut area were funded and were either being implemented or were in the project preparation stage (see Table 1 below), citing the CDR progress report of March, 2001.[6] Eight of the 25 were funded projects in the Upper Litani River Basin region (i.e., Baalbek, Zahle and West Bekaa area).

Table 1. Funded wastewater projects in 2001.

Caza	*Location/Name*	*Source of Funding*	*Implementation Status*		
			Under Execution	Under Preparation	No Funding Secured
Akkar	Jebrayal	None so far			X
	Abdeh	None so far			X
	Michmich	Italian Protocol		X	
Minieh-Dinnieh	Bakhoun	Italian Protocol		X	
Tripoli	Tripoli	None so far		X	
Becharre	Becharre	None so far			X
	Hasroun	None so far			X
Koura	Amioun	None so far			X
Batroun	Chikka	French Protocol	X		
	Batroun	French Protocol	X		

[4] Mark Saadeh, Lucy Semerjian, and Nabil Amacha (January 2012), "Physicochemical Evaluation of the Upper Litani River Watershed, Lebanon," The Scientific World Journal, Volume 2012, Article ID 462467, 8 pages, doi:10.1100/2012/462467. This recent study noted that "…A Water Evaluation and Planning (WEAP) simulation model shows that the current practice of discharging untreated sewage into the river system is already causing a wide-scale pollution that escalates to an alarmingly hazardous state during drier times, which last for the longer part of the year, and possibly for several years in a row during drought spells."

[5] Ministry of Energy and Water, Lebanese Government (Resolution No. 35, Date 17/10/2012), National Strategy for the Wastewater Sector.

[6] Ecodit (August 2002), Lebanon Environmental Program, Assessment Report, Final Report, prepared for USAID/Lebanon under Task Order No. LAG-I-00-99-00017-00.

Jbeil	Jbeil	French Protocol	X		
	Kartaba	Italian Protocol		X	
Kesrouane	Khanchara	None so far			X
	Harajel	Italian Protocol		X	
	Kesrouane/Tabarja	None so far			X
Metn	Dora	None so far			X
Aley	Ghadir	None so far			X
Chouf	Chouf coastal area	French Protocol	X		
	Mazraat el Chouf	French Protocol		X	
South	Saida	Japan	X		
	Sour	None so far			X
Hermel	Hermel	Italian Protocol		X	
Baalbeck	Laboue	IBRD		X	
	Yammouneh	Lebanon		X	
	Baalbeck	IBRD	X		
Zahle	Zahle	Italian Protocol		X	
	Aanjar/Marj	Italian Protocol		X	
West Bekaa	Joub Jennine/Deir Tahnich	IDB		X	
	Qaroun	Italian Protocol		X	
	Sohmor/Yohmor	IDB		X	
Hasbaya	Hasbaya	Italian Protocol		X	
Nabatiyeh	Jbaa	Italian Protocol		X	
	Nabatiyeh	French Protocol	X		
Bint Jbeil	Shakra	Italian Protocol		X	
	Bint Jbeil	Italian Protocol		X	

USAID launched the Small Village Wastewater Treatment Systems in 2 phases: Phase I (October 2004 – November 2005) to identify the most suitable design for small WWTP facilities and propose construction schedules for a number of project sites agreed with USAID/Lebanon; and Phase 2 (October 2005 – August 2012) to build a number of WWTPs in select communities in the Upper Litani River Basin based on the 100% design[7] documents prepared in Phase 1. Phase 2 had a budget of $18,041,628. At the start of Phase 2, the project identified and selected 16 candidate municipalities[8] to be served by 7 WWTPs.

The treatment facilities were prioritized in order of population served starting with the largest population to effectively utilize economies of scale. In some cases, wastewater from several villages was to be combined and treated at a single facility based on existing interconnections between the village sewer networks. The 7 selected plant sites are listed in Table 2. The 3 sites ultimately selected are highlighted.

Table 2. List of 8 out of 16 municipalities selected for the Small Village Wastewater Treatment Systems Project

Village	Proposed Plant	2006 Population*	Caza

[7] The 100% rule states that the work breakdown structure includes 100% of the work defined by the project scope and captures all deliverables – internal, external, interim – in terms of the work to be completed, including project management.

[8] The selection of municipalities was based on the following criteria:

- Population less than 15,000.
- Located within the Bekaa Valley north of Lake Qaroun and south of Baalbek.
- Currently discharge untreated wastewater that ultimately flows to the Litani River.
- Not covered in other currently funded ongoing or proposed wastewater programs.

1. Ablah 2. Nabi Ayla 3. Niha	A. Ablah	9,480	Zahle
3. Chmistar	B. Chmistar	8,030	Baalbek
4. El Marj	C. El Matj	14,500	Zahle
5. El Fourzol	D. Fourzol	5,000	Zahle
6. Qaraoun 7. Machghara 8. Baaloul 9. Aitanit	E. Machghara	22,090	West Bekaa West Bekaa West Bekaa West Bekaa
10. Rayak 11. Ali En Nahri 12. Haouch Hala 13. Haret El Fikani 14. Massa	F. Rayak	21,130	Zahle Zahle Zahle Zahle Zahle
15. Anjar 16. Majdel Anjar	G. Anjar	21,000	Zahle
Total : 16 villages	**Total: 7 Plants**	**Total: 101,230**	Zahle

The National Strategy for the Wastewater Sector - 2012[9]

The preface to the NSWS 2012 details the grim reality of the wastewater sector today, and the grave problem that is faced.

Current situation of the wastewater sector (2012)

"Along the coast, much of the planned large scale capacity has been constructed, but little of it is operational. Of the twelve large treatment plants planned on the coast to service 65% of the population, seven are completed (Tripoli, Chekka, Batroun, Jbeil, Ghadir, Nabi Younes and Saida), one is under construction (Sour), three are under preparation (Aabde, Kesrwane, and Bourj Hammoud), and one require funding (Sarafand). However, to date only two plants (Ghadir and Saida) are operational based on preliminary treatment only.and five completed plants lack collection networks (Tripoli, Chekka, Batroun, Jbeil, and Nabi Younes).

Inland, only two medium-sized collection and treatment schemes are operating - and well below capacity. Of the 42 medium sized collection and treatment schemes planned, 23 are funded. However, only two are operating, and way below design capacity (Baalbek 10%, and Yamouneh 50%). Two plants (Nabatiye and West Beqaa) are completed but not operating. Five (Kfarsir, Yahmour, Zawtar, Tibnine and Zahle) are under construction and 14 plants are under design. A further investment of $255 million is required to bring all 23 plants into operation. The remaining 19 schemes are not funded at all and would require $325 million. In addition, around 60 small treatment plants have been constructed inland by municipalities through donor funding without coordination with MoEW or CDR. Today, only a few of these plants are operational, and considerable further investment would be needed for them to operate adequately and to cover all rural areas.

As a result of these investments, about two thirds of the population are connected to wastewater collection networks but only 8% of wastewater reaches the four operational plants (Saida, Ghadir, Baalbeck and Yammouneh) and is treated. Wastewater collection networks have been conceived and executed piecemeal, leading to a major mismatch between collection and treatment capacity.

Considerable installed treatment capacity is lying idle. Seven major plants (Tripoli, Chekka, Batroun, Jbeil, Nabi Younes, West Beqaa and Nabatiye) are not working at all because of lack of networks.

[9] The national strategy breaks out coastal wastewater systems investments where a total of $648,000,000 in funding is already available, but another $1,115,000,000 is needed.

With this background the NSWS 2012 identifies 42 treatment plants in its investment program for inland wastewater treatment systems that includes systems in the Bekaa region. Twenty-three of these plants are partly funded and 19 are currently unfunded. For completion of the inland wastewater investment plan $260,610,000 is available, while $577,810,000 is needed to complete the investment plan. Table 4 below provides details of needed investments. It is noteworthy that annual O&M costs have been identified.

Table 3. Investment Program for Inland Wastewater Systems[10]

WE Zone	Number of Plants		Equivalent Population (000s)		Funds required to complete partly funded schemes (Million USD)		Requirements for unfunded schemes (Million USD)	O&M costs of treatment (Million USD)
	Partly funded	Unfunded	Partly funded	Unfunded	Already funded	Not yet funded	Not yet funded	Annual average at full operation (per scheme)
North Lebanon								
	4		141		37.00	25.38		0.24
		6		210			98.13	
Total North	**10**		**351**		**37.00**		**123.51**	
BML								
	6		116		39.40	22.88		0.28
		5		153			79.91	
Total BML	**11**		**269**		**39.40**		**102.79**	
South Lebanon								
	6		260		42.50	53.65		0.52
		6		176			93.47	
Total South Leb.	**12**		**436**		**42.50**		**147.12**	
Beqaa								
	7		803		141.71	153.39		0.13
		2		118			51.00	
Total Beqaa	**9**		**921**		**141.71**		**204.39**	
TOTAL	**23**		**1,320**		**. 260.61**	**255.30**		**02% for treatment + 02% for**
		19		**657**			**322.51**	
GRAND	**42**		**1977**		**260.61**		**577.81**	

"Note: For budget purposes, it is assumed that: (1) all schemes that are currently partly funded will be funded and completed and will become operational by 2015; (2) all schemes that are currently unfunded will be implemented 2013-2020. (3) It is estimated that remaining areas not covered by the identified schemes would require around 500 million US$ and will be implemented 2013 - 2020., (4) Out of the available 260.61 million US$ funds, 39.0 million US$ are already disbursed."

Details of existing and needed investments from the NSWS 2012 are presented in the tables of Annex C. The NSWS 2012 includes a list of all the USAID funded WWTP. However, the USAID projects, including the SVWTS plants are not well integrated into the strategy. The National Strategy says of the small treatment plants that "around 60 small treatment plants have been constructed inland by municipalities through donor funding without coordination with MoEW or CDR. Today, only a few of these plants are operational, and considerable further investment would be needed for them to operate adequately and to cover all rural areas."

New projects and donor commitment – a changing context

Since the SVWTS award the project context has evolved reflecting continuing donor interest in the wastewater sector. Table 4 shows the value of donor funded wastewater projects by region reported by the EU Water Coordination Group in February 2012. Based on the EU list (Annex D) total

[10] National Strategy for the Wastewater Sector, page 13 (table and table note).

donor commitment for wastewater infrastructure and services exceeds €500,000,000 (projects are denominated in $ or in €). It was beyond the scope of this evaluation to reconcile the donor list in Annex D of projects with those of the National Strategy in Annex C. The point to be made is that there seems to be significant funding available to address development of the wastewater sector.

Table 4. Donor funding for wastewater treatment facilities that are anticipated to come online by 2016

Region	value of commitment
South Lebanon	€ 67,648,971
Mount Lebanon	€ 196,156,007
Beirut	€ 76,200,000
Bekaa	$61,000,000
North Lebanon	€ 158,105,945
Lebanon-wide in €	€ 22,943,391
Lebanon-wide in $	$5,100,000
Total	€ 521,054,314
	$66,100,000

PROJECT IDENTIFICATION:

USAID sought the services of an engineering company to construct approved WWTPs, provide construction management services, commission these units, and provide necessary training for operation and maintenance to operators selected by the municipalities and BWE. CDM Smith was awarded the contract (#: 268-C-00-05-00066).

Scope of the Project:

The Small Village Wastewater Treatment Systems Phase II Project is fully funded by USAID and had two primary objectives:

- Assist selected Bekaa Municipalities in addressing uncontrolled discharges of untreated domestic wastewater into the Upper Litani River Basin by providing them with viable treatment systems and designs for their domestic wastewater discharges in the Litani River; and

- Assist the selected Bekaa Municipalities in establishing domestic wastewater treatment facilities based on those designs.

During Phase 1, the project completed detailed design drawings, technical specifications, bills of quantities, and proposed construction schedules for seven selected projects agreed with USAID/Lebanon. The small plants are traditional natural treatment plants, based on a standard US design that was well tested and reliable. Seven sites were selected for funding under Phase II.

Construction and commissioning

Phase 2 of the project provided for the construction of 4 WWTPs out of the 7 selected under Phase 1: at Aitanit, Fourzol, Ablah and Chmistar. However, the proposed plant at Chmistar was later dropped because the community was not able to provide the land needed to construct the facility and only the 3 remaining WWTPs were eventually constructed. Phase 2 included three stages: construction, commissioning and advise & assist training of local staff.

A Defects Liability Period of four months coincided with the Tests on Completion of the Commissioning Stage (one month) and the Advise and Assist Stage (three months). During the Commissioning Stage, CDM operated the facilities for a period of 3 months and was fully responsible for the operation and maintenance (O&M) of the plants during that period. The Commissioning Stage included two main activities: Start-Up Testing and Tests on Completion. The purpose of the Start Up Testing is to expose any flaws or defects in workmanship, equipment, or materials that were not previously discovered and correct them. At the end of the Commissioning Stage CDM conducted the Tests on Completion for 30 consecutive days certifying that the performance of each WWTP meets the design and operational requirements specified in the contract. This was completed for all three plants.

Advise and Assist

During the Advise and Assist Stage municipal operators were trained by CDM on O&M. These trainings are documented in the project's 4 "O&M Advise & Assist Progress Reports."[11] The trainees were to operate the WWTPs under the supervision of, and with the assistance of, CDM for a period of 3 months. The Advise and Assist Stage began with the completion of the Commissioning Stage. The Advise & Assist stage was extended from the original 3 months to 12 months for the Aitanit and Fourzol WWTPs, and 9 months for the Ablah WWTP under contract modification #3.

Plant design overview

The construction stage began in October 2005 and the CDM Smith technical team was fully responsible for the construction of three wastewater treatment facilities according to the approved designs. The small plants being constructed were traditional natural treatment plants, using a design mainly found in the USA. The plants include primary and secondary treatment: The plant utilizes fixed film biological treatment in a trickle down aerated tower and anaerobic digester tanks for treating the sludge. The anaerobic action kills the bacteria by reducing the amount of oxygen available.

Assessment of networks was added later

On April 28, 2010, USAID added a task to do an assessment for the sewer collection system in five villages around Aitanit WWTP, namely: Qaraoun, Mashghara, Aitanit, Baaloul, and Lala. This study was completed in August 2010, but this activity is not covered in this evaluation. [12]

[11] These reports were discontinued after Report 4 issued in June 2010 although the Advise & Assist stage continued until the end of the project.

[12] The sequence of this assessment is unusual as an assessment of this type would be of more benefit if it informed the design of the project.

On December 22, 2011, USAID amended the SVWTS phase II contract to include additional enhancement works for the three built WWTPs. The main activity of this contract modification was the construction of additional sludge drying beds (approx. 2,000 m^2) at Fourzol WWTP in order to accept some of the generated wet sludge from the Ablah WWTP.

Contracting for the construction of the plants

The first two treatment plants at Aitani and Fourzol, were constructed under the concepts of Construction at Risk and Management at Risk. The third plant at Ablah, was done directly under CDM Smith management. To do this CDM needed to change staffing. The role of the local contractors was reduced, but local contractors were still used: for example the construction of sludge drying beds in Fourzol used local contractors to build the forming that was directly supervised by a CDM on-site construction manager. In addition, the municipalities and union of municipalities had signed Memoranda of Understanding (MOUs) with USAID which stated specific tasks to be completed by the municipalities who were also involved in the periodic review of the construction progress.

All three facilities were handed over to the municipal authorities.

Responsibilities of the municipalities under Memoranda of Understanding

USAID signed separate MOUs with MoIM and the municipalities which defined the responsibilities of each party (Annexes E and F). Specifically, the municipalities were responsible for operation and maintenance of the facilities once they were handed over, and expected to make a contribution towards making the treatment plant system operational including:

- Provide suitable land for the plant
- Provide required building permits for the plant
- Perform preliminary site clearing and access for the survey crew and geological investigation
- Provide site fencing and non-process buildings such as offices, laboratory, and guard house as designed by the consultant
- Provide permanent site access as designed by the consultant
- Agreement to take on full responsibility for long-term plant (O&M)
- Implement a program to repair leaks in the existing wastewater network and pipelines to reduce inflow of surface water
- Construct wastewater interceptor pipelines designed by the consultant
- Remove industrial wastewater contribution to the municipal sewer network if the consultant advises that the industrial wastewater will harm the WWTP intended for domestic wastewater[13]

CONTRACT AND CONTRACT MODIFICATIONS:

[13] What would the municipalities do with the industrial waste? This waste should be treated separately and then redirected to the WWTP. Other possible solutions could have been investigated.

Baseline Contract Agreement:

Phase II of the Small Village Wastewater Treatment Systems (SVWTS) project provides for the construction of WWTPs based on the 100% design documents prepared through Phase I. Phase II was implemented using a single program management contract team over a period of 24 months with a six month optional period. USAID anticipated a total budget of $9.85 million which included both program management and construction costs. The construction of the WWTP facilities was to have been through the competitive procurement of local subcontractors for construction and equipment/materials procurement. Design, construction, and maintenance and operation training of the treatment plants was funded by USAID while the maintenance and operation of the facilities upon completion of the project was to be transferred to the beneficiary municipalities "until such time that the BWE has the institutional capacity to take over the operation."[14]

The goal of the USAID-funded SVWTS project was to construct the maximum amount of wastewater treatment systems serving the largest population allowable under the funding available for the project. With the 7 WWTPs initially approved, Phase II was to provide wastewater treatment service to around 101,000 people, 29% of Upper Litani River Basin population. However, since only 3 WWTPs were executed (43% of original target), the population served was estimated at 20,350[15] or 20% of the original target.

Contract Modifications:

During the life of the project there were significant modifications to the duration and scale of the project.

Contract Modification #2, date?: variation in construction of Aitanit WWTP to include sludge drying beds as requested by LRA.

Contract Modification #3, date?: considers how a 4th plant is to be constructed, extends the Advise and Assist duration from 3 months to 12 months at Aitanit and Fourzol and to 9 months at Ablah. Extends the Phase II implementation period from 24 to 69 months.

Contract Modification #5, date?: clarifies provisions for the construction of a 3rd and 4th WWTP and explains the extension of the 'advise and assist' stage of the project.

Contract Modification #6, date?: reduces from 4 to 3 the number of WWTP that are to be constructed, and adds an assessment of the sewer network in and around Aitanit to the contract.[16]

[14] However, it was not stated in the MoU with MoIM that facilities would be taken over by the BWE.
[15] SVWTS Progress Report #34, July 2012, reported under performance indicator 1 "Number of people in target areas connected to functioning wastewater treatment facilities as a result of USG assistance" that Aitanit served 11,000, Fourzol 3,000, and Ablah 6,350 people.
[16] The objective for contract modification 6 notes that "The purpose of the assessment is to collect all necessary data related to the existing sewer networks in the villages of Aitanit, Mashghara, Qaroun, Baaloul and Lala, and to develop the necessary scope of work and the anticipated cost required to have all of the above mentioned five villages connected to the Aitanit WWTP." Logically this should have been done in preparation for the project design, not after it had begun. As was seen later a breakdown of the network reduced the number of beneficiaries, and at one point (July to August 2009) there was no influent entering the plant at all.

Contract Modification #9, date?: defines SOW for expansion of sludge drying beds at Ablah. The Advise & Assist stage at Fourzol is extended until the end of the project.

INSTITUTIONAL CONTEXT

The institutional context for the implementation of the project is described in the Memoranda of Understanding (MOUs) between, on one hand, USAID/Lebanon and the Ministry of Interior and Municipalities (MoIM-USAID MOU), and on the other hand, between USAID and the individual municipalities served by the project (Annexes E and F). These MOU define the roles and responsibilities of each party. Among others, MoIM is tasked with coordinating with national stakeholders to ensure project success, such as report on progress, request assistance from the proper ministries, and provide the selected municipalities with support for legal and procedural actions needed. As to the beneficiary municipalities, their responsibilities included facilitating the construction of the WTTPs, taking on full responsibility for the WTTPs O&M once handed over, constructing and maintaining sewer networks, ensuring compliance with environmental standards and regulations, etc.

The BWE does not seem to have been involved in the discussions or signing of the MOUs. It was only mentioned in the MOU signed between USAID and the municipalities, through naming BWE as one possible specialized public establishment that could take over O&M responsibility for the WWTPs in case the municipalities were not able to do so. The MoEW was also not a party to any MoU. The project did not coordinate with the CDR, which implements virtually all of the WWTP in Lebanon.

PROJECT INTENDED RESULTS – PHASE II:

Within the $18,041,628 budget the project was expected to:

Construction

- Provide engineering to enhance the constructability of the selected WWTPs;
- Procure equipment and materials
- Construct approved wastewater treatment plants (Aitanit, Fourzol, and Ablah)[17];

Advise & Assist

- Train municipal operators to operate and maintain the constructed wastewater treatment plants, as a measure of institutional capacity building toward sustainability. The periods for the Advise& Assist Stages are as follows:
  - 12-months for Aitanit & Fourzol WWTPs; and
  - 9-months for Ablah WWTP
- Conduct a sewer collection system assessment study for five villages around Aitanit WWTP. The subject villages are: Qaraoun, Mashghara, Aitanit, Baaloul, and Lala.

DEVELOPMENT HYPOTHESIS

No development hypothesis was specifically stated in the project work plan or performance management plan (PMP). However, one of the arguments put forward in favor of the design of the

[17] A 4th plant at Chmistar was originally included.

SVWTS plants was that they use natural treatments and processes to purify sewerage bringing the final effluent into compliance with Lebanese water quality standards (and EPA standards) before discharging it into the Litani River. The design does not use expensive treatments and chemicals and hence has lower operations and maintenance costs. This aspect of the design should make it an attractive solution for other municipalities in the Litani River basin. Proxy hypotheses are that: 1) the SVWTS plants will be seen as a relatively low-cost solution to water treatment and the design will be taken up by other municipalities, and 2) that the SVWTS natural treatments and processes will bring the final effluent into compliance with Lebanese water quality standards.

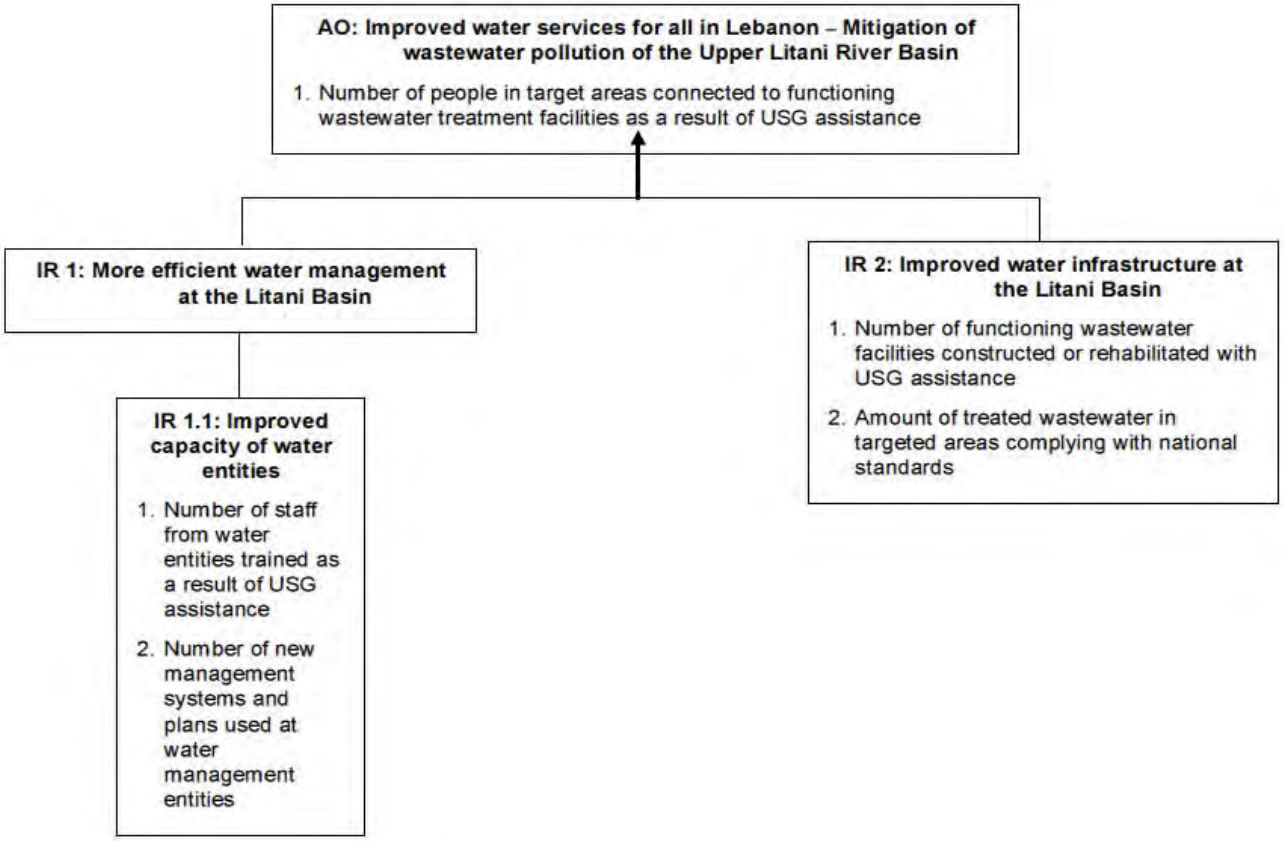
CRITICAL ASSUMPTIONS

For the project to succeed in achieving its objectives, the design of the project assumes that the Ministry of Interior & Municipalities (MoIM) and the municipal bodies of the benefitting communities will exercise active leadership and participation in the project implementation process. Another assumption adopted by the project is that sewer networks are in place and well maintained by the participating municipalities by the time the WWTPs are constructed, as declared in the MOUs signed with USAID.

RESULTS FRAMEWORK

The SVWTS project was awarded by the Mission to support IR 2 of Assistance Objective 4 (AO 4) illustrated below.

AO 4: IMPROVED WATER SERVICES FOR ALL IN LEBANON



PERFORMANCE INDICATORS

SVWTS
Performance indicators
Prepared on JULY 31, 2012

Objective	Performance Indicator	Segregation	Baseline Start of project	FY 2009			FY 2010		FY 2011		FY 12 target	FY 12 TODATE	Remarks
				FY 09 reported	FY09 verified	FY 09 Baseline	FY 10 Target	FY 10 Actual	FY 11 Target	FY 11 Actual			
AO: Improved water services for all in Lebanon – Mitigation of wastewater pollution of the Upper Litani River Basin	Number of people in target areas connected to functioning wastewater treatment facilities as a result of USG assistance	N/A											
	Aitanit		0	16000	9000	-	9000	5200	13600	10000	11000	11000	Municipality reporting corrections for Households connected to WWTP (See note 1 & 2 below).
	Forzol		0	4000	3000	-	3000	3000	3000	3000	4000	3000	Fourzol Mayor advised that the MoEW has approved to construct more sewer lines which will lead to more people connected to the plant in 2012.
	Ablah		0	0	0	-	0	0	0	0	6350	6350	Sewage entered the facility on April 20th, 2012.
	TOTAL		0	20000	12000	-	12000	8200	16600	13000	21350		
IR 1: More efficient wastewater management at the Litani Basin - IR 1.1: Improved capacity of wastewater entities	Number of staff from water entities trained as a result of USG assistance	Male / female											
	Aitanit	M	0	5	5	-	5	5	5	5	5	5	
		F											
	Forzol	M	0	3	3	-	3	5	5	5	5	5	Basic Training delivered to two newly hired plant staff members during 4th quarter 2010. Original three staff trained during 2009-2010 were dismissed by village municipality.
		F											
	Ablah	M	0	0	0	-	0	0	3	0	3	1	Training delivered to one chief plant operator that will operate both facilities Fourzol and Ablah. This person got hired by both Municipalities on July 1st, 2012.
		F											
	TOTAL	M	0	8	8	-	8	10	13	10	13	11	
		F											
	Number of Management systems and plans used at water management entities as a result of USG assistance	N/A											
	Aitanit		0	-	-	1	1	1	1	1	1	1	Facility Maintenance Mgt. Sys.
	Forzol		0	-	-	1	1	0	1	1	1	1	Facility Maintenance Mgt. Sys.
	Ablah		0	-	-		0	0	0	0	1	1	Facility Maintenance Mgt. Sys.
	TOTAL		0	-	-	2	2	1	2	2	3	3	
IR 2: Improved water infrastructure at the Litani Basin	Number of functioning water and wastewater facilities constructed or rehabilitated with USG assistance	Type / new or rehab											
	Aitanit	WWTP / new	0	1	1	-	1	1	1	1	1	1	
	Forzol	WWTP / new	0	1	1	-	1	1	1	1	1	1	
	Ablah	WWTP / new	0	0	0	-	0	0	0	0	1	1	
	TOTAL		0	2	2	-	2	2	2	2	3	3	
	Amount of treated wastewater in targeted areas complying with national standards	N/A											
	Aitanit		0	0	-	0	0	0	2200	2000	2600	2600	
	Forzol		0	0	-	600	600	600	600	600	600	600	
	Ablah		0	0	-	0	0	0	0	0	1100	1100	
	TOTAL		0	0	-	600	600	600	2800	2600	4300	4300	

Note 1: Aitanit WWTP received flow ONLY from Mashghara Village in 2009 and 2010. The reason for less number of people (from 9000 to 5200) is due to wrong reporting by the Mashghara municipality in early 2010. The number of household units that are connected to the sewer network went down from 1500 to 1300. It's worthy to note that 700 households in Mashghara discharge to a severely damaged main sewer line in the Chitta River.

Note 2: Aitanit WWTP receives sewage flow from 3 villages during this reporting period. Updated information from the Mayors of these villages regarding this indicator are as such: (1) Mashghara 1300 household x 6 people/household = 7,800, (2) Qaraoun: 300 household x 6 people/household = 1,800, and (3) Aitanit: 100 household x 4 people/household = 400; which brings the total number of people connected to the Aitanit facility during this reporting period to 9,400.

The indicators are appropriate and appear straight-forward, but their measurement was complicated by the reality on the ground. Three of the indicators had precision and reliability issues as explained below. The first indicator counts the number of people connected to the USAID-financed WWTPs waste water treatment plants in Ablah, Fourzol and Aitanit. The numbers are estimated and derived from voter registration records. The numbers reported assume that the plants are fully operational and served by a functioning network. However, at one point the Fourzol plant was not operating, and on another occasion the sewer line feeding Aitanit was blocked effectively reducing the number of households covered from 1300 to 700. In addition, the reported number may undercount the number served when consideration is taken of the trucks that deliver septic waste pumped from households in the municipalities that are not connected to the sewer network – arguably these households are also served by the WWTPs.

The second indicator captures the number of municipal staff trained to operate the waste water treatment plants but does not track staff turnover nor does it reflect the extensive coverage of the training received.

The last indicator summarizes the volume of waste water treated by the 3 WWTP. The volume reported as 4300 cubic meters per day is based on the average flows over the year. This was verified by reviewing the log maintained at the Fourzol and Aitanit sites with the daily reading for treated waste water. The measurement of the amount of water treated in this indicator is based on flow-meter readings and is accurate. Reports on water quality of the plant effluent indicate that it is in compliance with national standards (see details below).

Overall, the project performed well against its approved indicators. A qualification is that the original RFP proposed the construction of 7 WWTP, but this was later reduce to 4, and then to 3 WWTP.

III. PURPOSE OF THE EVALUATION.

This evaluation provides an external review of the Small Villages Wastewater Treatment Systems (SVWTS) Phase 2 project, with following objectives:.

- An analysis of the extent of achievement of the program objectives of mitigation of pollution at the Litani River;
- To provide documentation of successes, challenges, and lessons learned;
- To provide recommendations for USAID for any future programs of the same or similar nature;
- To evaluate the constraints of the institutional context for developing WWTP infrastructure in Lebanon;
- To confirm whether the WWTP design is appropriate for the context (it was assumed that the design solution is appropriate, i.e., rather than more expensive tertiary treatment. Is this a valid design decision?).

Specific areas for the evaluation to cover include inter alia:

- Role of USAID management and oversight of the project.
- Role of MoIM follow-up committee.

- Ability of Municipalities to operate and maintain the WWTP.
- Ability of Municipalities to honor the MoU and provide staff that will be trained to operate the plants.
- Is the MoU a valid and enforceable basis for ensuring GOL project participation? Are there other instruments more suitable?
- Operators' performance in the three plants.
- Safety, Security and Incidents.
- Functionality of the three plants.
- Sustainability (citizen awareness of the benefits, O&M technical skills, O&M budget availability).
- Comparison of the SVWTS concept with tertiary treatment plants such as the one in Joub Jennine funded by a loan from the Islamic Bank and constructed by CDR.
- Environmental impact.

AUDIENCE AND INTENDED USES

This evaluation is intended to be used by USAID/Lebanon and others at the discretion of the Mission. In the spirit of USAID Evaluation Policy this evaluation provides concise recommendations based on evidence aimed at improving future programming in this sector. It is also expected that this evaluation will be used by USAID/Lebanon during their annual Portfolio Review of the water sector.

EVALUATION QUESTIONS

Evaluation Questions	
Question Category	*Question or Issue to be Addressed*
Impact	• Explain the results and net impacts of the activities undertaken, and infrastructure built identifying any unintended impacts. • Where results were not met, identify why not and provide recommendations for strengthening the development strategy.
Sustainability	• What are the prospects for sustainability of the end results produced by SVWTS? • What identified results appear to be less sustainable and why? • Was the scale of the project (3 WWTP, number of municipal staff trained) appropriate to ensure sustainability?
Client Satisfaction	• Determine if the benefactor's (the municipalities served) needs were met, and if not what wasn't met and how can that be corrected?
Relevance	• How relevant is the SVWTS to the GOL short, middle and long term National Wastewater Management Strategic Plan?
Validity of the hypothesis and assumptions	• Is the original WWTP physical plant design and use of the MoU with the Municipalities to ensure sustained plant operation still valid?

IV. EVALUATION DESIGN AND METHOD

This evaluation relies on primary and secondary data collected from desk reviews, Key Informant Interviews with Municipal authorities (including the Mayors), the Chairman of the Municipalities Union, the Bekaa Water Establishment (BWE), WWTP project staff, plant operators provided by the municipalities, USAID staff, beneficiaries, government counterparts, other international donors in the sector, as well as field visits to the three WWTPs.

Quantitative data include estimates of sludge kept from the Litani River by the treatment plants, decreases in biological oxygen demand (BOD), increases in Dissolved Oxygen and other measures of water quality collected by the WWTP and compared with water quality standards. Financial data has been collected from participating municipalities as a basis for assessing the impact of operating the WWTP and the ability of the municipality to sustain WWTP operations.

DATA COLLECTION METHODS

Performance evaluation, data sources and collection methods

- Quantitative analyses: WWTP flow, estimates of pollutant reduction, and septage truck volumes delivered to the WWTP. Data for these analyses come from measurements taken at the WWTP by the plant operators.
- Requests for budget and expenditure data from the municipalities.
- Qualitative interviews conducted with stakeholders (municipalities, service providers; project beneficiaries, water sector donors).

DATA ANALYSIS METHODS

The evaluation will cover all three SVWTS project sites as per the "Scope of the Project" section above. These are: Aitanit, Fourzol, and Ablah WWTPs.

- Impact on pollutant reduction compares WWTP influent characteristics with effluent characteristics. This indicates the impact of the WWTP on pollutant discharge. The total amount of sludge removed by the plant is thus prevented from entering the Litani. These are measurements taken at the WWTP digesters. It is not anticipated that the effect of the WWTP will be seen through improvements in water quality measurements in the Litani itself because the volume of influent treated is a small fraction of all discharges into the Litani.
- The financial burden on the municipalities that comes from operating the WWTP will be estimated from budget figures provided by the municipalities. This will suggest whether municipalities can sustain operations or not.
- Interviews are expected to clarify the institutional framework for operation of WWTP, possible fee-based sources of revenue for WWTP operations; and the activities of the donor community related to wastewater treatment.

- Interviews with the plant operators are intended to highlight lessons learned based on their gained experience in operation the WWTP, i.e., what has worked well and what has not; what could be changed to reduce costs, etc.

METHODOLOGICAL STRENGTHS AND LIMITATIONS

Key informant interviews with operations staff and municipal authorities during site visits are the primary data source for this evaluation. Given the short timeline for this study, the evaluation team was not always able to cross-check key informant characterizations of WWTP operations and sustainability.

The level of biological and chemical pollutants in the Litani River are so high that the combined pollutant reduction in the Litani River based on the operation of the three plants is likely to be too small to measure. The impact of the WWTP is unlikely to be large when measured through river monitoring. Rather the reduction in pollutants can be measured by comparing plant influent pollutant load with effluent pollutant load to estimate the overall pollutant reduction. However, the dumping of untreated sewage into the Litani River remains a challenge for the municipal authorities (e.g., Bar Elias, Anjar…).

Further, it is unlikely that household beneficiaries whose sewage is treated by the WWTP will be aware of the benefits being provided by the plants as these benefits are long-term and indirect. For example, the municipality of Fourzol is reported to still smell like sewage in the Summer months due to sewage entering the Litani upstream. Indirect beneficiaries include those down-stream who use the Litani River water for irrigation.

V. EVALUATION FINDINGS: ANSWERING THE EVALUATION QUESTIONS

IMPACT:

Explain the results and net impacts of activities undertaken, and identify any unintended impacts

Analyzing the extent of achievement of the program objective to mitigate wastewater pollution of the Litani River [18]

Original population coverage targets not achieved

Under the RFP the SVWTS was originally intended to construct 7 WWTP to cover 16 municipalities and 29%, or 101,700 of the population of the Upper Litani River Basin. The reality was much less. Phase I of the project identified locations and designs for waste water treatment plants in the Upper Litani River Basin. Sixteen municipalities comprising 101,000 people in the Upper Litani River Basin were identified as potential sites for the construction of 7 waste water treatment plants. Phase II of the project, under a separate contract, was to

[18] Mark Saadeh, Lucy Semerjian, and Nabil Amacha (January 2012), "Physicochemical Evaluation of the Upper Litani River Watershed, Lebanon," The Scientific World Journal, Volume 2012, Article ID 462467, 8 pages, doi:10.1100/2012/462467

construct the treatment plants. The number of plants to be constructed was not specified, but was to be determined by the willingness and ability of the communities to support the construction. This resulted in the selection of 4 WWTP to be constructed. However, one of the four communities, Chmistar, was not able to secure land for the construction and was dropped. . As a consequence 3 wastewater treatment plants serving 20,350 persons in 8 municipalities were constructed. This substantially reduced the extent of achievement originally envisioned for the project. Nevertheless there was a positive affect from the 3 WWTP that were constructed.

The contribution of the 3 WWTP to an overall reduction in Litani River pollutants is negligible

Flow in the river ranges between 14.2 m^3/second during the wet season to about 4.4 m^3/second during the dry season. The combined volume of treated water from the 3 plants is 4,300 m^3/day (equivalent to 0.05 m^3/second) according to the SVWTS indicator reported above. The plants contribute no more than 1% of the total river flow. As a consequence it is unlikely that river water quality monitoring (done by Litani River Authority) would show any measured improvement in the water quality indicators based on pollutant reduction from the 3 plants (but see below).

Measuring pollutants in the final effluent

Both the biological oxygen demand (BOD) and chemical oxygen demand (COD) tests are a measure of the relative oxygen-depletion effect of a waste contaminant. Both have been widely adopted as a measure of pollution extent. The BOD test measures the oxygen demand of biodegradable pollutants whereas the COD test measures the oxygen demand of biodegradable pollutants plus the oxygen demand of non-biodegradable oxidizable pollutants. The so-called 5-day BOD (BOD_5) measures the amount of oxygen consumed by biochemical oxidation of waste contaminants in a 5-day period. Pristine rivers will have a BOD_5 below 1 mg/L. Moderately polluted rivers may have a BOD_5 value in the range of 2 to 8 mg/L. Municipal sewage that is efficiently treated by a three-stage process would have a BOD value of about 20 mg/L or less. Untreated sewage varies, but the BOD value averages around 600 mg/L in Europe and as low as 200 mg/L in the U.S., or where there is severe groundwater or surface water i infiltration/inflow that dilutes the raw sewage influent (this is the condition for the 3 WWTP).

Pollutant reduction design criteria is being met

Each of the 3 WWTP underwent a 30-day performance testing program designed to stress the WWTP systems at design conditions and measure individual unit process and treatment facility overall pollution removal efficiencies primarily for the pollutants BOD5, COD, total suspended solids (TSS), and Coliform bacteria. BOD and COD, parameters are tests done offsite since the plants do not have the equipment to do these tests. TSS, BOD and COD are done once a month at a Ministry of Agriculture lab (Tal Amara lab was mentioned) or AUB. Nitrogen (N) and Phosphorous (P) are additional parameter tests mentioned in the WWTP O&M manuals that thus far have not been measured. These are important parameters that indicate the magnitude of Nitrates and Phosphates present in the effluent. High levels of P and N predict pending eutrophication of the river.

Table 4 below shows early data from Aitanit that compares WWTP design criteria with Ministry of the Environment standards. Table 5 below is the lab results for the Ablah 30-day performance testing done at AUB (from the SVWTS final progress report.

These treatment plants use aerated trickle down fixed media filters as an efficient way to reduce BOD, while anaerobic digester tanks kill bacteria by reducing the amount of oxygen in the sludge. The sludge is what is sloughed from the trickle down filters, and what settles in the primary and secondary clarifiers. Sludge from the anaerobic digester tanks is pumped to the drying beds 40 to 60 days later. The effluent BOD design criteria is 25 mg/L or less. Recent measurements taken at the plants indicate that the design criteria have been achieved. According to one expert, the fixed media (plastic) in the trickle down filters should last about 15 years before needing to be replaced.

Table 5. CDM Design effluent criteria

Aitanit WWTP - Overall Treatment Efficiencies											
Water Quality Indicator	**Ministry of Environment Max. Limit (mg/l)**	**CDM Project Design Effluent Criteria**	Final Effluent Measured Results							
			29 April 09		**06 May 09**		**20 May 09**		**07 July 09**	
			(mg/l)	**% removed**	**(mg/l)**	**% removed**	**(mg/l)**	**% removed**	**(mg/l)**	**% removed**
pH	6-9	6-9		n/a		n/a		n/a		n/a
Maximum	30°C	30°C		n/a		n/a		n/a		n/a
BOD5 (mg/l)	25	25 max.	Not sampled for this period							
COD (mg/l)	125	125 max.	<50	n/a	<50	n/a	89	n/a	40	97%
Suspended Solids	60	30	10	82%	<10	n/a	13	92%	25	91%
Total Nitrogen	30%	20%	Not sampled for this period							
Total Phosphorus	10%	25%	Not sampled for this period							
Coliform Bacteria	2,000	2,000	Not sampled for this period							

Measuring effects of wastewater treatment

CDM provided O&M Manuals for each of the 3 WWTP that instructs operators in how to take the needed samples that measure influent and effluent characteristics at various stations in the WWTP.[19] Measurements are to be taken on a daily, weekly, monthly and bi-monthly basis depending on the parameter. According to the O&M manuals sampling is used to measure Dissolved Oxygen (DO), BOD_5, COD, TSS, % volatile suspended solids (VSS), pH, Temperature, Total Nitrogen (N), Total Phosphorous (P), Chlorine Residual, and Coliform Bacteria. Some of these measurements are done on-site while others are taken to labs for analysis.[20] These measurements can be used to verify the mitigation of pollutants entering the Litani River from each plant. River-based measurements are done by the Litani River Authority (LRA) using monitoring and lab equipment provided (in part) under the USAID funded LRBMS project.

Table 6. Ablah WWTP - Water Quality Summary Data - AUB Lab Analysis

[19] For example from Ablah see: "Ablah Village Wastewater Treatment Plant Operation and Maintenance Manual, Volume 1- Unit Process Operation; Chapter 12 – Sampling and Analysis Procedures

[20] At the time of the evaluation the lab tests for P and N had not yet been done. The ability of these types of plants to remove P and N is limited.

Water Quality Criteria	MoE Limit	09 May, 2012	29 May, 2012	07 June, 2012	13 June, 2012	20 June, 2012
Suspended Solids (ml/l)	60	7	8.5	9	19	10
BOD5 (mg/l)	25	16	11	10	10	10
COD (mg/l)	125	50	10	50	50	50

Dissolved Oxygen (DO) measures the amount of Oxygen in the water. Low levels of Oxygen in the water can lead to eutrophication of the river. DO in the Litani River Basin shows that most sources have a normal DO level.[21] However, some sites recorded dangerously low DO levels of 3 mg/L. At these low levels the river becomes unsuitable for most fresh water species. DO is a measure that is taken regularly onsite at each of the 3 WWTP.

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Table 6 shows the MOE standards (Decision 8/1/2001) and the results at the 3 WWTPs for DO, pH, and TSS. Both Ablah and Fourzol were in compliance with the MOE standards. We did not have a report from Aitanit on these parameters, but because Aitanit uses the same plant design it is expected that they are also in compliance. TSS, BOD and COD are done once a month at a Ministry of Agriculture lab (Tal Amara lab was mentioned) or AUB.

Table 7. Recent, November 2012, daily effluent readings from the 3 WWTP

WWTP	DO (Influent/ Effluent) in mg/l	pH (Influent/ Effluent)	Total Suspended Solids (Influent/ Effluent) in ml/l	Temp. (Influent/ Effluent) Degrees Centigrade
MoE Standard	No standard	6 - 9	60 ml per L	N/A
Aitanit	8.85/10.7	Not available	Not available	3.6C/4.1C
Fourzol	4.8/7.47	7.90/8.03	2ml per L/0	16.1C/15.8C
Ablah	6.6/6.75	8.15/8.17	3ml per L/0	14.3C/14.4C

Aitanit reported that the equipment for measuring the pH was being repaired. The high DO at Aitanit of 8.85 mg/l reflects the rain water that is getting into the sewer – indicating that repairs to the network are needed

The volume of sludge removed from the digester tanks and pumped to the sludge drying beds is a clear indicator of pollutants that have been prevented from reaching the Litani. About 300 m^3 of sludge is removed from Ablah during one 40-day digester cycle. In Fourzol 320 m^3 are removed during a 90-day cycle. In Aitanit 570 m^3 are removed on average each 50 days.[22]

[21] Mark Saadeh, Lucy Semerjian, and Nabil Amacha (January 2012), "Physicochemical Evaluation of the Upper Litani River Watershed, Lebanon," The Scientific World Journal, Volume 2012, Article ID 462467, 8 pages, doi:10.1100/2012/462467.

[22] The number of days vary and depends on when the digesting process has completed and the drying beds are ready to receive another load. Drying takes longer in winter than in summer.

However, according to the report cited[23], the main concern for pollutants in the Litani River comes from Nitrates and Phosphates which have leached into underlying aquifers well beyond permissible concentrations intended for human consumption. The municipalities should be encouraged to have these parameters measured.

Problems with sewer networks

At the time of the assessment, the SVWTS program had not yet achieved the projected results in terms of "Number of people in target areas connected to functioning waste water treatment facilities as a result of USG assistance". This is due to the fact that some municipalities were not able to deliver on their commitments- as per the USAID signed MoU- to construct all the communities' sewers networks and main connections lines to collect and channel raw sewage to the WWTPs. For example, part of the Ablah network coming from Nabi Alya is broken in several places and has effectively become a storm drain resulting in significant infiltration of water into the sewer. This reduces the efficiency of the WWTP making it treat much larger volumes than is necessary. This is indicated when input BOD is lower and DO levels are higher than expected. Such is the case for Ablah and Aitanit where infiltration is an issue. However, recently (December) Fourzol has repaired the network and this has reduced infiltration into the network.[24] The lack of completed networks means that not all the sewage generated by the municipalities reaches the treatment plant. Fourzol officials say that Fourzol still smells of sewage in the Summer time.

The treatment plants remain vulnerable to blockages of the sewer lines. This occurred in Aitanit and in Ablah when farmers broke the line or blocked it in order to irrigate their fields using wastewater. Awareness raising and policing are needed to prevent this from re-occurring.

More wastewater treatment capacity by 2015

Information gained during the evaluation field research and meetings with various local and central government agencies and leaders confirmed that many waste water treatment plants in the Bekaa have either began operations recently such as Aayat (Baalbeck), Soughbine and Joub Jennine (West Beka'a), or are in the tendering and construction stage such as Temnine WWTP which will cover more than 15 communities, Zahleh city treatment plant and sewers networks and El Marj treatment plant in Aanjar region. These wastewater networks and treatment projects are funded by international donors and assistance programs *inter alia* the Italian Development Assistance, the World Bank, the Kuwati Bank, the Islamic Bank, and tendered for construction by the Council of Development and Reconstruction (CDR). The combined wastewater treatment capacity of all these projects jointly with the 3 SVWTS plants is expected to reduce measureable pollutants in the Litani River. This is anticipated to

[23] Mark Saadeh, Lucy Semerjian, and Nabil Amacha (January 2012), "Physicochemical Evaluation of the Upper Litani River Watershed, Lebanon," The Scientific World Journal, Volume 2012, Article ID 462467, 8 pages, doi:10.1100/2012/462467

[24] The Fourzol municipality in conjuction with the MoEW constructed 1700 meters of new sewer line. This was paid for by the MoEW ($22,000) and citizen input ($8000). The new line is below the level of the Fourzol treatment plant and a lift station is needed to raise the raw sewage from the sewer line to the WWTP. This is because of the topography near the plant. The cost of the lift station is to be paid for by the Union of Municipalities. Currently the new line is not used pending approval of the lift station design by BWE and the construction of the lift station adjacent to the WWTP.

occur sometime in 2015 (see Annex C for a list of wastewater treatment plants expected to come online)..

Unintended consequences of an added financial burden on municipalities

The financial cost to the municipalities for operation and maintenances of the WWTPs creates additional financial burdens on the municipalities' limited financial resources. The financial implications to the individual municipality' budgets are proportional to the level of recurrent O&M costs relative to the municipalities' annual income (see below under "Evaluating the financial capacity of the managing entities" for a comprehensive view.). Service fee recovery by the municipalities seems remote as they have not imposed and do not seem inclined to impose[25] additional taxes or tariffs to cover the costs of the wastewater treatment service they provide.

In addition, agriculture is the main source of economic activity and income in the area, it is expected that the local population would not appreciate that a large proportion of the municipality' resources are committed to environmental concerns and to operate a wastewater treatment plant to mitigate the pollution levels of the Litani River rather than being spent on agriculture and local economic development projects. The need for awareness-raising that extols the opportunities for tourism and better health associated with a clean Litani River could be a catalyst for the formation of a local advocacy group.

SUSTAINABILITY:

What are the prospects for sustainability of the end results produced by SVWTS?

Plant vulnerability, weaknesses and life expectancy

The WWTP design does not include any advanced technologies that might attract increased O&M costs, for example there is no tertiary chemical treatment of the wastewater. The plant design is relatively simple with a low risk of catastrophic failure. There is no tertiary treatment or high-tech treatment. The wastewater treatment is described as "natural" rather than chemical. The mechanics of the plants are mainly pipes, valves, pumps and filters. Pumps require maintenance and occasional repair, but spare parts and repair is available locally. Submersible pumps are more vulnerable than those above ground. If the facilities are cleaned and maintained according to the O&M manuals they should last 15-20 years.

A consequence of heavy reliance on generated power means that plant generators at Ablah and Fourzol will need replacement/repair in the coming years. The current 200KVA generator is in excess of requirements as the plants currently only use 40 amps. Replacement with a smaller generator would reduce costs.

The trickle down filter media should last up to 15 years. The greatest threat comes from a possible lack of power or blocked sewer lines both of which could cause the plant to shut down. An extended shut down might damage the trickle filter media and can clog the system. This occurred at the Fourzol plant when diesel fuel was not available to run the plant. It occurred at the Aitanit plant when the sewer lines were blocked and diverted.

[25] The authority of the municipalities to impose new taxes and tariffs is vague.

However, overall there is no unusual weakness associated with the current plant design. The design uses well-proven basic technology and is not be prone to catastrophic failure.

Was the scale of the project appropriate?

The project RFP envisioned that 7 plants were to be constructed to serve 101,000 persons in 16 municipalities. This was later reduced to 4 plants and then 3. Thus overall, if the original proposal for 7 plants was valid, then the scale is not adequate. However, another interpretation of scale relates to individual plant capacity to serve known network expansion in the municipality. The individual plants each operates at less than full capacity – see Table 7 below. Hence the physical capacity of the plants to treat sewage is adequate as capacity remains to treat additional sewage that may result from added sewer lines in the municipality.

Management Sustainability

Upon completion of the Advise and Assist phase of the SVWTS project, CDM handed over the operation and management of the three WWTP facilities to the Municipalities and Union of Municipalities signatory of the MOU with USAID. The evaluation site visits confirmed that the three plants were appropriately staffed and operational with sewerage influent reaching the main inlet chambers of the three plants. However, information collected through interviews with the WWTP technical operators and concerned municipal leaders conveyed the following limitations to an effective and efficient management and technical operation of the three WWTPs:

Managing the sewer network

Managing sewage begins with the household connection where raw sewage is separated from other waste water (e.g., grey water from sinks and baths, or rain water). The WWTP are designed under the assumption that raw undiluted sewage will reach the treatment plant in sufficient volume to operate the plant efficiently. Currently, the sewage influent reaching each plant is less than the planned-for raw sewage volumes. The efficiency of WWTP performance is challenged when there is an inadequate flow of sewage into the plant, or when the sewage is infiltrated with storm water. This has mainly to do with the trickling filters.

The trickling filters remove dissolved organics and finely divided organic solids from the wastewater. The trickling filter is an aerobic treatment system that utilizes microorganisms attached to a medium (in this case plastic) to remove organic matter from wastewater. Trickling filters enable organic material in the wastewater to be adsorbed by a population of microorganisms attached to the medium as a biological film or slime layer. As the wastewater flows over the medium, microorganisms already in the water gradually attach themselves to the plastic surface and form a film. A continuous flow of sewage over the media is required to sustain growth of the film and hence the efficiency of the filtration. Low volumes of sewage, or wastewater with insufficient organic matter to feed the system, can result in degraded operation of the biological filter. It may prove to be a management challenge for the municipality to ensure that the quality and quantity of sewage reaching the plant is adequate.

Table 8. Plant capacity and 2012 influent flows

WWTP	Treatment Capacity m^3	Influent Flow per day m^3

Aitanit	5,000	2,230 highest volume[26]
Fourzol	1,000	700 average volume
Ablah	2,000	700 average in dry season[27] –

Planned sewer networks and main connection lines are yet to be constructed and linked to the treatment plants in the three projects' target areas. Though substantial pressures were exerted by municipal leaders to secure funds for these works from the relevant government bodies, these efforts were met, more often than not, with limited success. Taking matters in their own hands, Baaloul municipality (sewer network to be connected to the Aitanit WWTP) is currently constructing sections of the village network with monies collected from its local population. Other concerned municipal leaders reported during interviews that they are still following up to secure funds and thus deliver on their MoU commitments to upgrade existing networks and to construct remaining sewer and connecting lines. Upgrades to existing networks should reduce rainwater and groundwater infiltration that cause lower organic load to the filtration system possibly reducing efficiency, while increasing the flow of raw sewage to the plants. Reduced infiltration means there is more capacity to serve additional users, and a more efficient plant operation.

Informal Staffing Agreements

All three WWTPs are adequately staffed with CDM trained operators. Aitanit, the largest of the three facilities, employs 2 guards, three operators and one chief operator. The plants in Fourzol and Ablah are staffed with one guard and one operator each with a chief operator supervising both facilities. Due to the government freeze on employment, the staff at the three facilities are hired and paid as daily workers. This staffing arrangement managed to overcome the municipalities' barrier to hiring plant operators but fails to provide the appropriate employment social security and benefits hence, could possibly affect the plants' long term management sustainability if the trained staff find more secure jobs.

The Ablah and Fourzol municipalities and the BWE however did not provide enough trainees to learn how to operate the plants. No trainees were provided for the Ablah plant. Fortunately, a former CDM employee who is a certified wastewater plant operator was hired by the municipalities of Ablah and Fourzol as the chief operator. He is a key person who supervises the other operators. Should he decide to move on, plant operations could be at risk. It is uncertain where new operators would come from or how they would be trained.

Yearly service maintenance contract agreements not in place

Yearly service maintenance contract agreements for plants' equipments (generator, pumps, and control panels) are not yet in place for the Aitanit plant. Fourzol is already covered by a maintenance agreement and Ablah equipment are still under warranty.[28] Breakdowns in electro mechanical equipment might occur unexpectedly and cause lengthy periods of plant's

[26] At the time of the site visit, the influent was much less because Mashghara sewer line was diverted directly to the river to avoid intrusion of olive press residues.
[27] 1,500 m^3 in rainy season which reveals storm water intrusion with the sewer lines.
[28] The duration of the warranty varies according to the type of equipment. Pumps are under warranty until 2015

shutdown for repair works as was the case with the Aitanit pump (two months to repair the pump in Beirut). Maintenance contracts with specialized companies would insure timely repair and maintenance work.

Validation of water quality measurements needed

The regular monitoring of effluent conformity to environmental standards is part of the oversight needed to ensure proper plant operations. Plant operators are taught to carry out various tests on the characteristics of wastewater as it passes through the stages of processing and as a final effluent. The tests required are described in the O&M manual for each plant. Some tests are completed on site, while others have to be analyzed in more specialized laboratories such as the ones at the Ministry of Agriculture in Tal Amara or the American University of Beirut (AUB). Thus far municipalities have paid for these tests. What's critically missing at present is an external entity – a regulatory and monitoring organization- such as the Ministry of Environment, the Beka'a Water Establishment, or the Litani River Authority- to impose water quality tests and corroborate their conformity with environmental standards for effluent discharge to rivers. USAID's Litani River Basin Management Project has recently proposed that LRA monitor wastewater effluent entering the Litani.[29]

Financial Sustainability

To ensure sustainability of investments in the wastewater sector, the 'managing entity' needs to demonstrate appropriate management and technical capacity to operate such facilities *as well as* the financial resources to cover or recover operations and maintenance costs (O&M) and depreciation or re-investment costs for the replacement of assets at the end of their useful life.

Operational costs defined

Operation costs usually cover staff, administration, energy and other consumables whereas maintenance covers all expenditure costs for maintaining the assets operational and safe. Re-investment costs (depreciation) vary depending on the assets lifespan e.g. civil works, equipment and electro-mechanical devices, vehicles etc. To simplify our analysis of the financial sustainability of the three USAID-funded WWTPs, we will consider in this assessment only the short term operation and maintenance (O&M) costs of operating the plants.

"Managing entities" sources of revenue

The Union of the Lake and the municipalities of Fourzol and Ablah- the 'managing entities' of the three USAID-funded WWTPs- are covering the O&M costs of the plants from their own municipal resources since no fees are presently levied as service charge for wastewater treatment from the connected households. No other direct or indirect income is yet

[29] LRBMS: Restructuring the Litani River Authority, page 15, and Mark Svedsen, Senior Water Resource Specialist, IRG, "The Role of the Litani River Authority: Present and Future, page 15. Both report state that the LRA should monitor effluent discharges. This proposal was endorsed by the LRA. Further the Litani River Basin Management Plan, Vol 1. provides that LRA should annually assess the operating status of wastewater treatment plants.

generated by the plant operations either from reselling the treated water for irrigation or possible composting of the stabilized sludge as agricultural fertilizer.

Hence, to assess the financial sustainability of the three USAID WWTPs, the 'managing entities' own financial means were appraised i.e. whether their municipal income is 'large enough' to sustain the management of the plants and to cover O&M costs of operations.

In general, municipal revenues are secured from two main sources: Direct taxes levied by municipalities from building permits, property taxes, billboard advertising…etc. and allocations received from the Central Government through the Independent Municipal Fund (IMF). Individual municipality' share of the IMF is proportional to the size of its population and to the percentage of charges collected locally. Additional IMF allocations can be obtained for development projects.

Union of Municipalities revenues are mostly generated from membership fees of member municipalities and from IMF allocations. According to the Lebanese law, 25 percent of the *total IMF fund* is transferred to the Unions on the basis of their population estimates and for specific or earmarked development projects.

Evaluating the financial capacity of the managing entities

To evaluate the financial capacity (municipalities and union) to sustain operations and cover the plants O&M costs, the financial revenues of the WWTPs managing entities were analyzed and compared with the budgeting requirements for plants' operation and maintenance.

Union of the Lake - Aitanit Wastewater Treatment Plant: Based on CDM financial figures reported in the Advise and Assist Quarterly report # 4 ending June 2010[30], the O&M estimated monthly budget of Aitanit WWTP is US$ 7, 860, the yearly total equivalent of US$94,320. Actual costs incurred operating the plant, according to the same reference, have *averaged* less than the budgeted figure i.e. US$ 6,287 monthly or the yearly total equivalent of US$ 75,444 based on the following table average calculations of highest and lowest during the reported period.

Table 9. Aitanit WWTP – O&M Financial Report

Cost Items	CDM Estimated Budget Costs	Highest Incurred Costs - May 09	Lowest Incurred Costs - Oct 09	Average Monthly Cost
Electric Power	$4,250	$5,277	$1,213	$3,245[31]
Generator Diesel Fuel	$250	$520	0	$260
Staff Salaries	$2,380	$2,410	$2,450	$2,430
Insurance (Staff & Facility)	$200	--	0	0[32]
Hypochlorite Chemical Costs	$300	0	0	0
Office Supplies &	$50	$117	76	$96.5

[30] No updated figures were reported in subsequent CDM reports.
[31] The Union of the Lake is currently not settling its electricity bills to the Litani River Authority (LRA).
[32] Aitanit plant is not yet covered by a maintenance service contract for the plant' electro mechanical equipments. A work accident insurance cover is issued for two workers only.

Consumables				
Maintenance & Spare Parts Costs	$100	$30	60	$45
Water Sampling & Analysis	$300	$270	80	$175
Phone service	30	$34	37	$35.5
Monthly Total US$	**$7,860**	**$8,658**	**$3,916**	**$6,287**

To note that the Aitanit plant is connected to the electrical grid of the hydro electric power generated by Lake Quaraoun thus receiving electricity 24/24 hours. Hence, generator diesel fuel consumption is at a minimum. This is not the case for the Fourzol and Ablah WWTPs which are connected to "Electricity of Zahleh" and experiencing a total absence of electrical current for extended periods of time.

To appraise the financial capacity of the Union of the Lake to secure O&M costs for the Aitanit plant, the official financial budget of the Union was requested and quoted in Table 9 for the past three years.

Table 10. Union of the Lake: Yearly Income & Sources

	Year 2011	**Year 2010**	**Year 2009**
Contributions of member municipalities	L.L. 200,000,000 Eq US$ 133,333	L.L. 200,000,000 Eq US$ 133,333	L.L.200,000,000 Eq US$ 133,333[33]
Independent Municipal Fund	L.L. 2, 300, 000,000 Eq US$ 1,533,333	L.L. 2,000,000,000 Eq US$ 1,333,333	L.L. 1,150,000,000 Eq US$ 766,666
Various Resources	L.L. 300, 000, 000 Eq US$ 200,000	L.L. 395,000,000 Eq US$ 263, 333	L.L. 260,000,000 Eq US$ 173,333
Irregular / Exceptional Income	L.L. 1, 500, 000, 000 Eq US$ 1,000,000	L.L. 500,000,000 Eq US$ 333,333	L.L. 500,000,000 Eq US$ 333,333
Total Yearly Income	**L.L. 4,300,000, 000 Eq US$ 2, 866, 666**	**L.L. 3,095,000,000 Eq US$ 2,063,333**	**L.L. 2,110,000,000 Eq US$ 1,406,666**

The Union' financial revenues witnessed a steady increase over the past three years and averaged around US$ 2, 112,221 per year. Comparatively, the O&M yearly financial costs for the Aitanit WWTP is estimated at US$ 75,500 i.e. 3.6 percent of the Union' average revenues. Those numbers indicate that overall, the Union has the financial capacity and resources to sustain the plant's operation and cover O&M costs out of their own budget.

IMF allocations do not usually constitute a reliable revenue source specifically in terms of the exact amount of proceeds or timing of the transfers. Therefore, the extent of the Union' budget dependence on IMF proceeds can be considered as an indicator of revenue 'dependability' i.e. financial sustainability. From the Union financial excerpts above, we note that IMF proceeds constituted 53 percent, 64 percent and 54 percent of the Union yearly income respectively for the years 2011, 2010 and 2009. This percentage indicates an average reliance on the IMF and can be considered as a rather encouraging indicator of the Union, consequently of the WWTP, financial sustainability.

Municipality of Fourzol - Fourzol Wastewater Treatment Plant: CDM reported O&M monthly budget estimates of US$ 6,960[34] for Fourzol WWTP i.e. the yearly total equivalent

[33] US dollar equivalent amounts are rounded to the next whole number.

of US$ 83,520. Again, actual O&M costs incurred operating the Fourzol plant *averaged* less than the CDM budgeted figures i.e. US$ 5,329 monthly or the yearly total equivalent of US$ 63,948 based on the following table average calculations of highest and lowest during the reported period.

Table 11. Fourzol WWTP – O&M Financial Report

Cost Items	CDM Estimated Budget Costs	Highest Incurred Costs - August 09 US$	Lowest Incurred Costs - May 10 US$	Average Monthly Cost US$
Electric Power	$1,500	$1,000	$1,270	$1,135
Generator Diesel Fuel	$2,000	$4,092	$750	$2,421
Staff Salaries	$2,380	$1,600	$899	$1,250
Insurance (Staff & Facility)	$300	--	$187.5	$187.5
Hypochlorite Chemical Costs	$300	--	--	--
Office Supplies & Consumables	$50	$95	$39	$67
Maintenance & Spare Parts Costs	$100	0	0	0
Water Sampling & Analysis	$300	$231	$250	$240.5
Phone service	$30	$41	$15	$28
Monthly Total US$	**$6,960**	**$7,059**	**$3,411**	**US$ 5,329**

To note from the financial analysis above that the highest cost item is for diesel fuel to run the generator. As mentioned earlier, Fourzol plant is connected to 'Electricity of Zahleh" power grid and has been experiencing (along with the rest of the country) extensive power cuts for long periods of time. Thus, the plant' generator was running for long hours and consuming large quantities of fuel to maintain the Fourzol plant functional 24 hours a day and 7 days a week..

To appraise Fourzol municipality' financial capacity to secure the WWTP O&M costs, their latest official budget was analyzed:

Table 12. Fourzol Municipality 2012 Budget: Projected Yearly Income & Sources

	Year 2011
Direct taxes and fees collected locally by the municipality	L.L. 151,000,000 Eq US$ 100,666[35]
Municipality' share of fees collected by government and semi-independent agencies.	L.L. 155,000,000 Eq US$ 103,333
Municipality share of the Independent Municipal Fund	L.L. 324, 000,000 Eq US$ 216,000
Other various revenues	L.L. 70,000,000 Eq US$ 46,666
Total Yearly Income	L.L. 700,000,000 Eq US$ 466,666

[34] As reported in CDM Advise & Assist Quarterly report #4, June 2010. Again, no updated figures were reported in the subsequent CDM reports.
[35] US dollar equivalent amounts are rounded to the next whole number.

The projected total revenues of Fourzol municipality for 2012 are estimated at US$ 467,000. Comparatively, the O&M yearly average cost of the plant, as calculated earlier, is estimated at around US$ 64,000 or 13.7 percent of the municipality' total revenues. This percentage is relatively higher than the Union of the Lake - Aitanit plant estimated at 3.6 percent. The Fourzol 'sustainability indicator' simply means that the plant' operations and maintenance would consume close to 14 percent of the municipality's total revenues. It is our assessment that the Fourzol municipality might find it increasingly difficult over the years to secure funds for O&M from their own resources if no additional revenues are secured through other ways.

Noteworthy to mention in this context that this rather ominous financial sustainability indicator is- can be offset by the following: First, Fourzol municipality is currently covering the cost of diesel fuel consumption-which is the highest cost budget item- form the Union of Zahleh' budget thus bringing down the O&M cost paid out of their revenues. Second, the municipality would expect to receive higher revenues from the IMF either through the current law which allocates more monies to municipalities undertaking rural development projects[36] or through a draft law under discussion, planning to allocate more monies to municipalities undertaking environmental projects of solid waste *and* wastewater treatment and disposal.

At present, IMF proceeds constitute around 46 percent of the total municipal revenues and collection rate of local fees and taxes is estimated at 50 percent of total collections dues according to the Mayor of Fourzol. Both numbers are rather encouraging as the first one indicates an average dependence on the central government proceeds and the second one give us an assessment of the local population 'willingness to pay' should users fees for wastewater treatment be instituted at some future date.

Municipality of Ablah - Ablah Wastewater Treatment Plant: CDM did not report on the O&M budgeting requirements to operate the Ablah WWTP. We were also not able to secure such information from the Ablah municipality as their accounting system does not report such costs under a separate budget line item. Hence, our best estimate for Ablah O&M have been based on the Fourzol plant i.e. US$ 64,000 per year. Despite the fact that Ablah WWTP is double the treatment capacity of Fourzol – 2,000 m^3 versus 1,000 m^3 per day- other indications of costs[37] tend to confirm O&M cost estimate of Ablah as very close to Fourzol.

The Ablah municipality' financial capacity was analyzed through reviewing their latest official budget of 2011:

Table 13. Ablah Municipality 2012 Budget: Projected Yearly Income & Sources

	Year 2011
Direct taxes and fees collected locally by the municipality	L.L. 342,000,000 Eq US$ 228,000
Municipality share of fees collected by government and semi independent agencies.	L.L. 169,000,000[38] Eq US$ 112,666
Municipality share of the Independent Municipal Fund	L.L. 233, 000,000

[36] The Union of the Lake 2012 budget quoted a projected amount of L.L. 1,000,000,000 or US$ 666,667 additional funds from the IMF for development projects.
[37] Such as diesel fuel and staff salaries – the largest two items – are almost the same for both plants.
[38] US dollar equivalent amounts are rounded to the next whole number.

	Eq US$ 155,333
Other various revenues	L.L. 585,000,000 Eq US$ 390,000
Total Yearly Income	**L.L. 1,329,000,000** **Eq US$ 886,000**

The projected total revenues of Ablah municipality for 2012 are estimated at US$ 886,000. Comparatively, the O&M yearly average cost of the plant, as estimated based on Fourzol figures, is around US$ 64,000 or 7.20 percent of the municipality' total revenues. The Ablah 'sustainability indicator' simply means that the plant' operations and maintenance would consume close to 7 percent of the municipality's total revenues. Additionally, IMF proceeds constitute only 17.5 percent of the total municipal budget and indicate a relative independence on the IMF support for municipal revenues.Moreover, Ablah plant has been settling its generator fuel bill through the Union of Zahleh and can expect to receive increased IMF proceeds in support of rural development or wastewater treatment project in the future. Overall, Ablah municipality is in a better financial position to sustain O&M cost of its wastewater treatment plant compared to Fourzol municipality though it would encounter more difficulties raising the funds for O&M than the Union of the Lake which enjoys much larger financial revenues.

Concluding remarks

To conclude the financial sustainability analysis of the three WWTPs, it is imperative to point out that modern economic management principles discourage subsidizing service delivery from the national treasury. The municipalities and union of municipalities should not continue to cover the O&M costs of operating the plants out of their municipal revenues i.e. subsidizing the wastewater treatment service to the local population. *Such a strategy can be effective only for the short term pending the application of other cost coverage strategies to ensure the long term sustainability of investments in the wastewater sector.* Pilot schemes for collecting wastewater tariffs are currently being applied by the Water Establishments in certain areas of Lebanon, following the provision of sewage water treatment services, such as in Saida – South Lebanon and Baalbeck in the Beka'a. The results of these pilot initiatives are awaited.

In November 2010, GIZ convened a working group to inform a new water and wastewater tariff strategy – see Annex G. Discussions at that meeting between decision makers at MoEW and WEs in Lebanon showed that all were in agreement that consumption-based tariffs for water supply together with newly introduced wastewater tariffs were needed. Participants confirmed that existing regulations generally permit the introduction of a new tariff system.

Conclusions of the management and financial sustainability analysis

In summary, the management and financial sustainability analysis of the three WWTPs funded by USAID through the SVWTS program revealed the following:

- The three plants are currently operational and staffed with trained technical operators. The wastewater treatment plants are operating below capacity due to delays in securing funds for the construction of some communities' sewers networks and main connection lines to the waste water treatment plants. Construction of some of these sewer lines and connections is currently underway while others are in the planning stage.

- Management and monitoring of the WWTPs performance should be improved through contracting specialized companies for regular maintenance of the electro mechanical equipment and institutionalization of an external monitoring system.

- Unions of Municipalities present a 'more sustainable financial partner' for the implementation and operations of wastewater treatment plants with USAID than individual municipalities because of their higher income and financial resources.

- The MoIM committee did not *fully* deliver on their role and responsibilities as signed in the MOU with USAID to support selected municipalities "for all legal and procedural actions needed for the success of this activity". Participating municipalities are still working to secure funds for the implementation of sewers network protection and repair, construction of new sewers and connection lines and most importantly funding for O&M costs. Various initiatives in the form of draft laws are being discussed to resolve the O&M funding issue.

- In spite of the financial burden of the O&M cost and challenges for operating the WWTPs, interviewed municipal leaders verbally confirmed their municipality' and union' *ability and willingness* to operate the wastewater treatment plants.

How other donors are treating O&M costs

When consulted on the issue of O&M costs, other international donors committing resources to wastewater treatment projects, either through grants or soft loans, have taken into budgetary considerations cost coverage of O&M for two to three years before handing over the financial and management responsibility of the plants to the Lebanese government. Interestingly also to mention that the Italian Development Cooperation is actually lobbying the Lebanese government to amend the wastewater governing laws to hand over the management responsibility of the Zahleh treatment plant and networks to Zahleh municipality rather than the BWE. Their argument is based on the ownership of the treated water (for possible re-use in irrigation) by the community since the wastewater has been generated by this same community.

Social Soundness Analysis:

USAID SVWTS project started back in the year 2005. Meetings with USAID COR and the project's stakeholders confirmed that, at the onset of the project, consultations with the local population –community groups took place to inform and consult with the local people about the SVWTS project. No further coordination, engagement or awareness raising activities seem to have taken place at later stages of the project' executions except with the direct partners namely the mayors and municipal councils. Aside from Baaloul village, community funds invested in this project were drawn from municipal or government sources. This limited awareness and restricted engagement of the 'large base' of the SVWTS project beneficiaries might be the cause behind some of the incidents that affected project's implementation such as breaking the sewer network and diverting sewage flow to irrigate farms in Mashghara, dumping solid waste in the Litani River bed at the effluent outlet of the WWTP in Fourzol, contamination of raw sewage with olive press residues that hamper plants' biological treatment processes … etc. These incidents indicate that awareness raising activities, enhanced coordination with and direct engagement of the local population needs

to run concurrently with project infrastructure development. Awareness raising and engagement of the local population jointly with the municipal councils is critical in light of two facts:

- The benefits of wastewater collection and treatment will be felt only in the long-term and possibly more so for the communities downstream rather than in the project' target areas. Thus, raising awareness of the beneficiary communities and groups on the direct and indirect, short and long term, and negative impact of untreated sewage on water sources, health, the general environment, and the economic development potential of these communities will help improve the communities' acceptance of the project; hence their compliance with proper wastewater disposal practices and willingness to pay for the waste water treatment services.

- The MoEW and the WEs are planning to impose, following the provision of sewage treatment services, wastewater treatment tariffs to be collected with the water fees. Lebanon should not continue to subsidize this service for the long run and should generate income from the subscribers to this service to cover O&M costs. Again, raising awareness of the local population and community groups on the Polluter' Pay principle, the need to pay for such services in the future, as well as the negative environmental and health impacts of untreated sewage, would facilitate acceptance of the WE imposed tariffs.

Finally, it is practically difficult and rather costly to 'police' local populations into compliance with proper waste water disposal practices and appropriate environmental behavior without their tacit consent. This consent can be reached with improved awareness of the local population and enhanced engagement of all community groups and influential leaders. Long term management and financial sustainability of the waste water sector depends on good governance practices especially in such challenging geographical areas like the Beka'a valley.

Long-term Operation of WWTP:

CDM reported during the course of SVWTS program implementation numerous challenges that stemmed from the inability of the project' local partners (municipalities and union) to secure their contributions to the project as stipulated in the MoU with USAID. Moreover, the MoIM committee, whose coordination role was critical to the project success, had only limited success in supporting the local governments to deliver on their MoU commitments. To insure the long term sustainability of the three WWTPs operations, consideration has been given to handing over the management and operations of the three plants to the Beka'a Water Establishment (BWE). The ability and willingness of the BWE to provide better management and operations of the three plants compared to the Municipalities and Union is questionable.

To answer the question of who is best suited to manage and operate the WWTP, the legal institutional framework of the Waste Water Sector in Lebanon is analyzed below:

In 2000, the Lebanese Parliament approved law 221 and its amendments (law 377 and 241) to reform the water sector in Lebanon by modifying the responsibilities of the Ministry of Energy and Water (MEW) and merging the 21 former Water Authorities into four regional Water Establishments: Beirut/Mount Lebanon (BMLWE), North Lebanon (NLWE), South

Lebanon (SLWE) and Bekaa Water Establishments (BWE). In addition to providing potable water supply services, the newly formed WEs became in charge of wastewater management and irrigation (except SLWE where irrigation remains under LRA). Though formally and legally in charge of wastewater management, the Water Establishments (aside from Beirut / Mount Lebanon), are not yet institutionally, technically, or financially prepared to take over the management of the sector. The following table gives an overview of the legal framework of the water sector in Lebanon versus actual practices:

Table 14. De Jure and De Facto practices in wastewater management

De Jure – The Legal Situation	De Facto – Actual Practices
Master Planning Under the Lebanese Legal Framework, the MoEW is responsible for preparing and updating national wastewater master plans.	- Most investments in the field of wastewater are channeled through CDR, which has considerable experience. - CDR has a form of "de facto" responsibility for wastewater master planning alongside MoEW.
Legal Responsibility MoEW and WEs have overall responsibility for wastewater collection, transportation and treatment	- Existing sewer networks in Lebanon are mainly operated and maintained by municipalities. - Some municipalities have their own small treatment facilities but *most* of these are not functioning. - CDR-constructed WWTPs are operated through CDR contractual agreements with private contractors.
Effluent Monitoring - Effluent monitoring is done to measure performance and compliance. - WEs are responsible for protecting water sources from adverse effects of wastewater effluents. - Monitoring obligations are part of MoEW regulatory duties. WEs must monitor effluent at the outlets of WWTPs. - MoE has introduced national effluent standards.	- Self-monitoring is done in few facilities such as Al Ghadir and Saida pre-treatment plants and some smaller plants operated by private contractors or municipalities as is the case with the three USAID WWTPs in Aitanit, Fourzol and Ablah.
Cost Recovery Law 377/2001 has introduced the *Polluter Pays* principle into the restructured sector by amending law 221/2000. Water legislation assumes eventual cost recovery and by-laws suggest a wastewater tariff calculated as a percentage of the water tariff. Few WWTPs are operational to date and wastewater charges have not been introduced yet except in pilot schemes.	- Municipalities charge and collect an annual tax of 1.5% of the house rent for "pavements and sewers". - Municipality' construction permits include a fee of 0.5/1000 % of the selling price of the m^2 land area for the creation of sewerage and sidewalks. - The municipalities use the funds for urgent maintenance work and expansion of the sewer networks and sidewalks.
Customer Data WEs should collect comprehensive data on population densities, wastewater production, industrial pollution and sewers. Such data is important for reliable WWTPs design and future charging of wastewater treatment tariffs.	- Little customer data is available. - Cooperation between WEs & municipalities is needed to identify wastewater customers, sources of industrial pollution and to eliminate storm water intrusion.

This overview of the Lebanon waste water sector clearly indicates that although MoEW and the WEs are mandated with the overall responsibility for WW collection, transportation and treatment, they did not yet assume their full legal obligations in this sector. Various donors, including USAID, EU and GIZ, are presently providing technical and other development assistance to support MoEW and the WEs in developing their management and technical capacity to manage the water sector. This is yet a work in progress especially in wastewater treatment.

An interview with BWE General Director established BWE's inability and unwillingness to manage the three USAID WWTPs. BWE' inability is due to a lack of appropriately trained staff[39]. Moreover, the financial burden of operating the WWTPs will not be offset, according to him, by additional income from wastewater treatment tariffs especially in the Beka'a valley where BWE collection rates for water are 21% compared to the Beirut and Mount Lebanon Water Establishment (BMLWE) at 70%.[40]

Coordination with Wastewater Sector

The SVWTS did not coordinate with CDR or the MoEW. One consequence of this mentioned by CDR is that the plants may have non-standard equipment not readily available when/if the plants fall under the control of the MoEW, or under maintenance contracts funded by CDR. CDR has generally been responsible for the construction of all wastewater facilities in Lebanon.

CLIENT SATISFACTION:

The evaluation expert met and interviewed with USAID direct partners namely the president of the Lake Union and the mayors of Fourzol and Ablah as well as some of the project's beneficiary' municipalities such as the mayors of Aitanit, Mashghara, and Baaloul. The municipal leaders confirmed their overall satisfaction with the project and partnership with USAID through CDM contractors.

Additionally, the mayors of Ablah and Fourzol expressed their concerns and appealed for USAID continued support with the Lebanese Government – MoIM to come forward with the MOU commitments for O&M costs.

The meetings also discussed the potential of processing dried sludge for agriculture fertilization and investments in additional infrastructure to catch and store treated water effluent for re-use in irrigation. Treated water would be a valuable source for irrigation during the summer season when usual water sources dry up.[41] However, ownership of the treated effluent may be an issue according to the Italian Cooperation which is active in the sector. These ventures were discussed from the perspective of generating income to cover part of the plants O&M costs. Detailed plans and economic feasibility analysis are not available at present to assess the value of such ventures.

[39] BWE is currently in the process of securing the MoEW and government approval for hiring 71 new staff.
[40] USAID/LEBANON PMPL PROJECT, Project Site Visit to Lebanon Water and Waste Water Sector Support Project, 17April 2012, the purpose of the visit was to verify data for selected indicators from the Q2 FY 2012 quarterly report. One of the indicators was the "Percent of water revenues collected by targeted water entities" from which the reported results were obtained.
[41] Nitrates and phosphates in the wastewater need to be considered as these could infiltrate into ground water and become a health concern. The reuse of wastewater is not allowed in Europe or the USA.

RELEVANCE:

How relevant is the SVWTS to the GOL short, middle and long term National Wastewater Management Strategic Plan?

An interview with Dr. Yousef Karam, Director of Water and Wastewater Projects at CDR, ascertained the government of Lebanon's continued commitment to this sector, specifically for the Beka'a valley. This interest and commitment was expressed in a resolution passed by the Council of Ministers to form a parliamentary environment committee headed by the Minister of the Environment to follow up on pollution mitigation measures with special focus on the Beka'a valley. The President of the Lake Union of Municipalities mentioned meeting with this parliamentary committee and discussing/providing updates on the actual field situation in this sector.

Eng. Guido Benevento, Italian Cooperation Attache and an expert in wastewater treatment, gave an overview of Italian commitment to water and wastewater treatment in the coming years. Italian Aid works through CDR, and according to Eng. Benevento CDR is committed to constructing 35-40 wastewater treatment plants, of which 10 are "nearly ready." The Italians are financing 5 of these plants. The Eng. Stated that the "commitment of the government is significant."

The recent release of the National Strategy for the Wastewater Sector[42] confirms an aggressive strategy by the government to develop wastewater treatment plants throughout Lebanon. The details for the development of specific plants and their networks are provided in Annex C. A list of the USAID funded small treatment plants is a part of the National Strategy. Furthermore, the five initiatives of the National Strategy presented below are in general agreement with the findings and recommendations of this report.

"Strategic initiative # 1: An integrated and prioritized investment program for wastewater collection, treatment and reuse

> The strategy targets increases in wastewater collection, treatment and re-use rates. To reach these targets, MoEW will take the lead in working with CDR, WEs, the municipalities and the private sector to prepare and obtain financing for an integrated investment program. Top priority will be completing existing treatment plants and rapidly increasing the effective connection network to bring treatment rates to the level of installed treatment capacity.

Strategic initiative # 2: Legal, regulatory and policy measures

> In order to set and regulate national standards for wastewater treatment and reuse, MoEW will work with other concerned agencies to put in place the needed legal, regulatory and policy measures.

Strategic initiative # 3: Institutional measures to define responsibilities and to create capacity for service delivery

> WEs will progressively take over responsibility for service delivery. WE capacity will be developed, and the private sector will be used where appropriate. On a case by

[42] Made available to the evaluation team in January, 2013.

case basis, WEs may agree with municipalities that the municipalities operate facilities by delegation. MoEW will build its capacity for sector oversight and support.

Strategic initiative # 4: Financial measures for viability and affordable services

Following the 'polluter pays' principle, full recovery of O&M costs will be introduced progressively to generate revenues and the conditions of financial viability, and transparent operating subsidies will be paid during the transition period until WEs can cover their costs.

Strategic initiative # 5: Measures to optimize private sector participation in the wastewater sector.

The advantages of partnerships with the private sector will be explored and private enterprises will be increasingly involved through partnership approaches, including the financing and implementation of investments, and the conclusion of management contracts and possible BoT arrangements."

VALIDITY OF ASSUMPTIONS:

The MoU has been approved by the Council of Ministers and published in the official gazette. This is the highest commitment from the country' executive body (CDM report "Completed per the distribution of the approval of the MOU by the Council of Ministers as mentioned and published in the official gazette").

There has been no national budget approved for Lebanon since 2008, and reports by the Office of Technical Assistance, US Department of the Treasury advisor to the Public Accounting Directorate (PAD) of the Ministry of Finance noted that the Cabinet and Parliament have not received final national accounts since 2005. Given this, it is not surprising that the MoEW and the Bekaa Water Establishment have not been able to meet their wastewater management responsibilities; while simultaneously the Independent Municipal Fund (IMF) has not had sufficient funds to allow Municipalities to support their O&M responsibilities at the WWTP.

It was known, and well-reported by the implementing partner in bi-weekly progress reports, that some of the municipalities were unable to provide plant operators to be responsible for operation and maintenance of the WWTP. Plant operators were to receive training in the operation and maintenance of the WWTP, and each plant has a detailed O&M manual. Without trained operators overall plant operations are at risk. In some cases the municipality has insufficient resources to provide generator power to sustain plant operation when main electricity power is not available (as much as 12 hours each day). Site visits in May 2012, determined that the Ablah plant had not yet been provided with operators, and that the Fourzol plant was not operating due to lack of available funds to purchase diesel fuel to run the generator. As a result the Fourzol plant had ceased operations; this condition prevailed until early July 2012 when funds were provided. The plant was then flushed and normal operations resumed. Thus the critical assumption that the municipalities had the necessary resources to do WWTP operations & maintenance was not valid.

VI. RECOMMENDATIONS

- Reduce energy costs/consumption at the plants:
  - Reduce the number of trickle filter blowers.
  - Reduce the size of the generators.

- Assist in developing municipal policy that encourages septic tank pumper trucks to deposit septic waste at the plant septage receiving stations. Impose fines for violators.

- Assist municipalities to develop a policy for use/disposal of dried sludge from the drying beds.

- Policy development for the measurement of wastewater treatment plant effluent to be discharged into the Litani River. Define different agency's responsibility. For the three plants this may best be the Litani River Authority who already see this as part of their future role and responsibility. This has been encouraged under the USAID funded Litani River Basin Management Support (LRBMS) project. The LRBMS could be requested to determine how best to implement this policy. Part of the effluent monitoring should include measurement of Total P and Total N because, according to recent research cited in this evaluation , the main concern for pollutants in the Litani River comes from Nitrates and Phosphates which have leached into underlying aquifers well beyond permissible concentrations.

- Support the wastewater tariff discussion and implementation. Introducing user-based tariffs is the best long-term solution for WWTP O&M sustainability and expansion and is now supported by the NSWS 2012.

- Support awareness raising in the Upper Litani aimed at increasing the number of water rate payers as this is linked to proposed wastewater tariff collection schemes. The Litani Water & Wastewater Sector Support (LWWSS) project has initiated awareness raising campaigns achieving positive results, and this can be encouraged.

- The municipalities and union of municipalities appear to be the best option for operation of small scale WWTP and their engagement for this task should be continued. In general, support for decentralization of wastewater treatment plant operation should be encouraged based on the experience gained from SVWTS.

- The source for training of wastewater treatment operators is not apparent. This should be supported through technical education opportunities. Many new treatment plants will come on line in the coming years that will require trained operators.

VII. LESSONS LEARNED

- To assess the financial and administrative soundness of the partners before committing USAID resources. The situation of municipal, water establishment and

ministerial finances and their ability to provide adequate staffing for a project or initiative is complex in the Lebanese context. Understanding this or preparing for uncertainty might avoid or mitigate the brinksmanship that caused the Fourzol plant to be inoperative for several months.

- To undertake awareness-raising campaigns in parallel with infrastructure development. Awareness raising can mitigate the diversion of sewage to irrigate fields and the indiscriminate dumping of sewage into the Litani River.

- To assess the entire sewer system as a condition for investment. The sewer network serving the Aitanit plant was at one point broken by farmers to divert sewage to their fields. The Niha and Nabi Alya were to construct sewer networks to connect with the Ablah plant, but have not yet done so. The Fourzol municipality, however, did complete needed repairs.

- Phase I of the project identified locations and designs for waste water treatment plants in the Upper Litani River Basin. Sixteen municipalities containing 101,000 people were identified as potential sites for the construction of 7 waste water treatment plants. Phase II of the project, under a separate contract, was to construct the treatment plants. The number of plants to be constructed was not specified, but was to be determined by the willingness and ability of the communities to support the construction. This resulted in the selection of 4 WWTP to be constructed. However, one of the four communities, Chmistar, was not able to secure land for the construction and was dropped. As a consequence 3 wastewater treatment plants serving 20,350 persons in 8 municipalities were constructed giving the impression that targets were not met. It would have been preferable to positively identify the communities and sites securing the necessary commitments during Phase I.

- Union of Municipalities affords a financially more reliable partner for USAID investments in waste water projects than individual municipalities due to possible economies of scale in treatment processes, and second due to the larger revenues at their disposal than individual municipalities.

- The Memoranda of Understanding is a viable legal framework that certifies the Lebanese government's *willingness* through the MoIM, Union and Municipalities- to achieve the common purpose stated in the MoU. However, the MoU does not cover the financial ways and means –*capacity*- to deliver on these commitments. In light of the government's past and current budgetary issues, more specifics on the financial process by which this support will be realized has to be included in future agreement mechanisms. Other donors have provided project funding to cover 2-3 years of forecast O&M costs; this strategy may simply be kicking the can down the road as the resolution to covering O&M costs must come through user-based revenue.

- Wastewater projects entail costs for operation and maintenance of infrastructure and equipment that goes beyond the construction and commissioning phase. Future studies of wastewater projects would be inclusive of the long term 'sustainable sources' by which these costs should be covered. Such means can be legal such as levying wastewater treatment tariffs (draft law under process) or raising voluntary

contributions from the local population as is the case in Qsarnaba for wastewater treatment or Baaloul for networks construction.

- To assess the entire sewer system and industrial pollution sources as a condition for investment. Sewers networks and wastewater treatment plants are technically considered as one unit of treatment. For the SVWTS assessment of the network occurred after the commitment to construct the WWTP. Assessment of the network was possibly assumed not to be necessary as this was a responsibility of the municipalities under the MoU. The ability of the municipality or union to meet this responsibility was not assessed.

VIII. CONCLUSIONS

- The prospect of the WE taking over operation of the WWTP, once a favored idea, seems unlikely in the short run. Municipalities and the Union of Municipalities are capable of operating the small WWTP such as those built under SVWTS.

- There is a significant commitment by other donors to the wastewater sector. Should USAID wish to return to funding WWTP close coordination is imperative with other donors and the CDR.

- Third party monitoring of treatment plant effluent is desirable. The LRA would seem the likely institution to do this.

- WWTP plants should not be considered apart from the sewer network to support them and consideration for the long-term administrative support needed for O&M and 3rd party effluent monitoring.

- Maintain the management of the WWTPs with the municipalities and unions of municipalities until a determination of how a fee-based formula to fund plant O&M will unfold. The Water Establishments are currently not capable of operating the WWTP although they have a legal mandate to do so.

ANNEXES

ANNEX A. PERSONS CONTACTED

Organization	Name	Title	Telephone - Mobile
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Development Alternatives Inc. (DAI)-Lebanon Water & Wastewater Sector Support Program	Jimmy Zammar	Program Manager	04 724473 ext 114
Embassy of Italy-Italian Development Cooperation Office	Guido Benevento	Italian Cooperation Attache	05 451379/406/494
GIZ- Assistance to the Water Sector Reform	Younes Hassib	Technical Advisor	70637743 - 05 451624
Lebanese Ministry of Electricity and Water - Beka'a Water Establishment	Maroun Moussallem	General Director	03 600226
Lebanese Ministry of Interior and Municipalities	Khalil Hajal	General Director	03 342224 - 01 610120
Municipality of Ablah	Robert Semaan	Mayor	03 806147
Municipality of Aitanit	Assaad Najem	Mayor	03 612971
Municipality of Baaloul	Basim Ahamed Al Fakih	Mayor	03 854394
Municipality of Fourzol	Ibrahim Nasrallah	Mayor	03 774908
Municipality of Mashghara	Georges Debbs	Mayor	03 098532
Municipality of Qaraoun	Yahia Daher	Mayor	03 630901 (was not available)

Union of the Lake Municipalities	Khaled Shranek	President of the Union	03 424058
USAID Lebanon	Heath Cosgrove	Director- Office of Economic Growth	04 542600
USAID Lebanon	Rami Wehbeh	Program Management Specialist - COR SVWTS	04 542600 ext 4597
Wastewater Treatment Plant Fourzol & Ablah	Mohamed Bodaye	Chief Operator	71001273 - 76756101
Wastewater Treatment Plant Saida	Joseph Kassab	Director of Plant	03 714547

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ANNEX C. Wastewater Plants Investments Identified in the National Strategy 2012

Total Investment Requirements

Short and Medium Term (2011 to 2015)

Strategic Initiative	Short Term 2011 - 2012 (Million US$)	Medium Term 2013 - 2015 (MilliQn US$)	total Budget 2011 - 2015 (MillipnUSS)
Strategic initiative # 1: An integrated and prioritized investment program for wastewater collection, treatment and reuse	692	1,123	1,815
Strategic initiative # 2: Legal, regulatory and policy measures to set and regulate standards	5		5
Strategic initiative # 3: Institutional measures to define responsibilities and to create capacity for service delivery	11	17	28
Strategic initiative # 4: Financial measures for viability and affordable services	8	30	38
Strategic initiative # 5: Measures to optimize private sector participation in the wastewater sector	3	6	9
Total	- **719**	**1,176**	**1,895**
Funds already available at CDR	**380**	**300**	**680**
Funds to be made available	**339**	**876**	**1,215**

Long Term (2016-2020)

Initiative	Budget (Million US$)
Continuation of the integrated national investment program (19 unfunded inland schemes, the schemes of the inland areas not covered by the already identified 42 inland schemes, and Sarafand wastewater scheme).	835
Upgrading preliminary treatment plants (Bourj l-lammoud, Ghadir and Saida) to secondary treatment, and extension of Jbeil treatment plant	278
Investments for re-use of treated wastewater for irrigation	100
Total	**1,213**

Investment Summary

	Short – Medium Term (Million USD)	Long Term (Million USD)	Total (Million USD)
Government of Lebanon	115	113	228
Donors	250	250	500
Private Sector	200	350	550

Municipalities	650	500	1150*
Available at CDR	680	-	680
Total	**1,895**	**1,213**	**3,108**

Table A.2: Funded Inland Treatment Plants Requiring Additional Funds

tment plant	Population Equivalent	Status			Available Funds. (Million USD)	Actual Cost (Million USD)			Additional Funds Required (Million USD)
		Operational	Under construction	Under design		Treatment Plant	Networks + house connections	Total	
North Lebanon									
Bakhoun	48,000			X	19.80	8.25	14.05	22.30	2.50
Bcharre & Al Arz (2 TPs)	25,000			X	6.90	4.83	3.75	8.58	1.68
Mechmech	68,000			X	10.30	6.80	24.70	31.50	21.20
4 treatment plants in North	141,000	0	0	4	37.00	19.88	42.50	62.38	25.38
Mount Lebanon									
Barouk & Fraidis	8,000			X	6.1	1.60	2.90	4.50	9.66
Nabba Safa & Ain Zhalta	20,000			X		4.00	7.26	11.26	
Hrajel	40,000			X	9.30	6.00	14.52	20.52	11.22
Kartaba	13,000			X	5.00	3.00	4.00	7.00	2.00
Jeita and Kferzebiane (2 TPs)	35,000			X	19.00	6.30	12.70	19.00	0.00
6 treatment plants in Mt. Leb.	116,000	0	0	6	39.40	20.90	41.38	62.28	22.88
:South Lebanon									
Kfarsir, Yahmour & Zawtar	35,000		X		9.50	4.80	9.70	14.50	5.00
Nabatieh	100,000		X		13.80	8.90	9.90	18.80	5.00
Tibnine & Chakra	100,000		X		14.00	8.40	41.60	50.00	36.00
Aarkoub	25,000			X	5.20	3.75 `	9.10	12.85	7.65
6 treatment plants in South	260,000	0	5	1	42.50	25.85	70.30	96.15	53.65

Treatment plant,	Population	Status:			Available Funds (Million USD)	Actual Cost (Millions USD)			Additional Funds Required {Million USD}
		Operational	Under construction	Under design		Treatment Plant	NetWorks + house connections	Total	
Beqaa									
Baalbeck	100,000	X			17.00	6.30	19.70	2600	9.00
Yammouneh	6,000	X			2.60	1.05	2.55	3.60	1.00
Zahle	150,000		X		35.40	32.00	20.50	5250	17.10
West Beqaa (Jib Jenine + Saghbine)	100,000		X		37.00	12.00	35.00	4700	10.00
Aanjar	300,000			X	36.25	30.00	66.00	9600	59.75
Laboua	47,000			X	4.56	7.00	17.00	2400	19.44
Timnine El Tahta	100,000			X	8.90	10.00	36.00	4600	37.10
7 treatment plants in Beqaa	803,000	2	2	3	141.71	98.35	196.75	295.1	153.39
23 Plants in total	1,320,000	2	7	14	260.61	164.98	350.93	515.91	255.30

Table A.3: Inland Treatment Plants Requiring Complete Funding

Treatment Plant	Population Equivalent	Funds available (million USD)	Actual Cost of Works (million USD)		Cost to finalize all works (MUSD)
			Treatment Plant	Networks + house connections	
North Lebanon					
Al Bira and Manjaz	52,500	0.00	5.50	20.00	25.50
Beit Mellat and Akkar El Aatika	75,000	0.00	7.50	27.23	34.73
Hasroun	4,800	0.00	0.96	1.74	2.70
Kferhelda	30,000	0.00	4.50	5.50	10.00
Tannourine	10,200	0.00	2.00	3.70	5.70
Qobayet	38,000	0.00	5.70	13.80	19.50
6 treatment plants in North	**210,500**	**0.00**	**26.16**	**71.97**	**98.13**
Mount Lebanon					
Aakoura	16,250	0.Q0	3.25	5.90	9.15
Deir El Kamar	42,000	0.00	6.30	15.25	21.55
Jisr El Kadi	40,000	0.00	6.00	15.00	21.00
Khinshara	20,000	0.00	3.00	7.26	10.26
Sawfar	35,000	0.00	5.25	12.70	17.95
5 treatment plants in Mt. Leb.	**153,250**	**0.00**	**23.80**	**56.11**	**79.91**
South Lebanon					
Bent Jbeyl	25,000	0.00	3.75	9.10	12.85
Jbaa	10,500	0.00	2.10	3.80	5.90
Jezzine	30,000	0.00	4.50	11.00	15.50
Hassbaya	26,500	0.00	4.00	9.62	13.62
Nabaa El Tasseh - Nabatieh	54,000	0.00	8.10	19.60	27.70
Marjeyoun	30,000	0.00	7.00	10.90	17.90
6 treatment plants in South	**176,000**	**0.00**	**29.45**	**64.02**	**93.47**
Beqaa					
Hermel	96,000	0.00	9.60	21.00	30.60
Rachaya	22,000	0.00	8.00	12.40	20.40
2 treatment plants in Beqaa	**118,000**	**0.00**	**17.60**	**33.40**	**51.00**
19 Treatment Plants	**657,750**	**0**	**97.01**	**225.50.**	**322.51**

Table A.4: Inland Treatment Plants Funded by USAID

No.	Treatment Plant	Region	Population Served	Capacity (cum/day)	Completion Date	USAID Investment (USD)
South Lebanon						
1	Haytoura	Jezzine	1000	100	2006	64,500
2	Snayya	Jezzine	600	60	2004	62,000
3	Aychieh	Jezzine	1500	150	2005	119,000
4	Ghobbatieh	Jezzine	2800	250	2006	183,000
5	Wadi Jezzine	Jezzine	1500	150	2005	78,000
6	Barteh	Jezzine	1300	195	2002	88,000
7	El Rihane	Jezzine	4500	820	2002	NA
8	Jibaa 1&2	Nabatieh	1000	150	2002	95,000
9	Kfarkila	Hasbaya	3500	525	2002	93,000
10	Chebaa	Hasbaya	6000	900	2002	100,000
11	Hasbaya/Ain Qenya	Hasbaya	14000	2100	2002	108,000
12	Ain Qenya 2 &3	Hasbaya	7500	1125	2002	NA
13	Ain Qenya 4	Hasbaya	olive press	8	2002	NA
14	Khiam	Hasbaya	6000	600	,2002	90,000
15	Ouazzani	Hasbaya	_ 175	26	2001	45,000
16	Ain Jarfa 1 .	Hasbaya	2500	375	2002	49,000
17	Ain Jarfa 2	Hasbaya	Olive press	8	NA	NA
18	Abou Qamha	Hasbaya	600	90	2002	14,000
19	Kfeir	Hasbaya	3000	450	2002	180,000
20	Klaya 1	Marjeyoun	4000	600	2002	208,000
21	Klayaa 2	Marjeyoun	1300	200	2002	NA
22	Deir Mimes	Marjeyoun	1300	200	2002	NA
23	Marj el Zouhour	Hasbaya	1200	120	2000	133,000
23	Total. South Lebanon		65,275	9,202		1,709,500
North Lebanon						
1	Bqerzia	Akkar	1,800	NA	1998	177,000
2	Hmaira	Akkar	600	40	2002	65,000
3	Charbila	Akkar	1,152	NA	1999	80,000
4	Kaws Akkar	Akkar Atika	1,000	100	2000	120,000
5	Maakouda	Akkar Atika	1,000	100	2002	65,000
6	El Mrahet	Akkar Atika	550	60	2000	80,000
7	Andeq	Qoubayat	9,000	1350	2001	299,000
8	Markibta	Dennieh	1,300	195	1999	89,000
8	Total North Lebanon		16,402			975,000

NO.	Treatment Plant	Region	Population Served	Capacity (cum/day)	Completion Date	USAID Investment (USD))
Bekaa						
1	Bakka 1	Bekaa	1,000	160	1998	87,000
2	Bakka 2	Bekaa	6,000	160	2002	55,000
3	Rachaya	Bekaa	6,000	600	2005	240,000
4	El Housh	Bekaa	1,000	100	2005	126,000
5	Aitanit	Bekaa (Aitanit, Baaloula, Machghara & Qaroun)	35,700	5000	2009	6,000,000
6	Forzol	Bekaa	7,500	1000	2009	4,000,000
7	Ablah	Bekaa	15,000	2000	2012	4,000,000
8	Jabbouleh	Bekaa	1,000	80	2001	39,900
9	Deir El Ahmar	Bekaa	3,000	300	2002	93,000
10	Chouaia	Rachaya	700	50	2007	117,000
11	Al Fardis	Rachaya	1,200	120	2007	414,500
12	Hebbaria	Rachaya	9,200	920	2007	350,000
13	Kfar Hamam	Rachaya	1,700	115	2007	128,000
14	El Mari	Rachaya	1,300	220	2007	131,000
15	Kawkaba	Rachaya	2,000	135	2007	225,000
16	Yanta 1 & 2	Rachaya	3,000	300	2002	160,000
17	Mimes 1 & 2	Rachaya	3,000	120	2002	160,000
18	Ain Harcha	Rachaya	1,200	120	2002	145,000
18	Total Reqaa		99,500	11,500		16,471,400
Mount Lebanon						
1	Ammatour	Chouf	6000	900	2007	876,000
2	Maasser El Chouf, Ammatour, Ain Qani, Baadaran, Haret Jandal	Chouf	3000	450	2007	518,000
3	Bater	Chouf	6000	900	2007	1,228,000
4	Moukhtara	Chouf	3000	450	2007	530,000
5	Mrosti	Chouf	1500	225	2007	267,000
6	Khraibeh	Chouf	3000	450	2007	880,000
7	Jbaa	Chouf	2000	300	2007	241,000
8	Hammana	Baabda	7000	1050	2000	166,000
9	Kornayel	Baabda	6000	900	2002	183,000
9	Total Mount Lebanon		37,500	5,625		4,889,000
58	Grand Total		218,677			24,044,900

ANNEX D. List of EU & Other Donors Wastewater Projects

Project Title	Objective / Remarks	Details
Sewage Network and waste water treatment plant	The purpose of the project is the construction of three wastewater schemes in Southern Lebanon including infrastructure for wastewater collection and treatment for the villages of Yahmor, Zaoutar and Kfir Sir	start/end date: 2/8/2007-6/30/2011 status: ongoing Commitment:8,000,000 Donor Agency :European Commission/ Partner: CDR
Greater Beirut Wastewater	The construction of a wastewater treatment plant and preliminary treatment in Dora, rehabilitation or reconstruction of existing sea outfall and construction of related main collectors, waste- and storm-water networks and secondary lines.	Location: BMLWE administrative area start/end date 6/1/2010-2015 status: On hold. Donor Agency: EC subsidy Commitment: 60,000,000
South Lebanon Wastewater	Upgrading and extending the sewerage infrastructure of the coastal cities of Saïda and Sour and their surroundings in Southern Lebanon., including the construction of main collectors, treatment plants (preliminary for Saïda, secondary for Sour) and sea outfalls.	Location: SLWWE administrative area. Status: On going start/end date 10/16/2009- 2013 Donor Agency: EC subsidy Commitment: 60,000,000
Tripoli Wastewater	The construction of a wastewater treatment plant and related sea outfall, the rehabilitation and expansion of the sewerage system and the construction of a stormwater drainage network for the greater Tripoli area, which comprises the municipalities of Tripoli, El Mina and El Bedawwi.	Location: NLWWE administrative area //Greater Tripoli Status: ongoing Start/end date 1996-2012 Donor Agency: EC subsidy Commitment: 100,000,000
Kesrwan Water and Wastewater	Wastewater treatment plants with secondary treatment in Jounieh and Zouk Makhael with relevant outfalls, main wastewater collectors, inland sewer network, secondary network and house connections (100,000 inhabitants, Phase I), additional sewer networks and house connections for 200,000 inhabitants (Phase II).	Location: BMLWE administrative area start/end date: 2012-2013 Status: EIB: finance contract signed and ratified by Parliament , AFD approved Donor Agency: EC subsidy Commitment: 150,000,000
Al Ghadir Water and Wastewater	Phased construction of a waste water treatment plant with secondary treatment for the southern areas of Beirut, integrating possibly the existing pre-treatment facilities, including construction and upgrading of networks in this catchments area.	Location: BMLWE administrative area start/end date: 2012-2016 status: New FS in progress Donor Agency :TBC Commitment:NA
Water Supply and Sanitation in North Lebanon	1. Generalization of management results obtained in Tripoli to whole North Lebanon Water Establishment. 2. Building sanitation networks for 3 cities (total 100 000 equivalent habitants) and 1 wastewater treatment plant (50 000 equivalent habitants).	Location: North Lebanon start/end date 11/1/2008-12/31/2012 status: On going. Donor Agency: AFD Commitment: 30,000,000
Wastewater projects in Qadisha Valley	Implementation of an integrated waste water policy in three parts: master plan for waste water management in Qadisha valley; pilot project of semi-collective waste water management; assistance for the reinforcement of the "Etablissement des Eaux du Nord" capacities in order to develop new technologies for waste water management.	Location: North Lebanon start/end date 11/15/2007 status: Completed. Donor Agency: French Ministry of Finances Commitment: 345,380
Assistance and supervision for the 5 treatment plant financed by the Franco-lebanese protocols	Cabinet Merlin is in charge of technical assistance and supervision for the construction of the 5 wastewater treatment plants financed by french-lebanese "protocoles financiers"(Nabatiyeh, Ras Nabi Younes, Chekka, Jbeil, Batroun)	Location: Lebanon start date: 2003 status: On going Donor Agency: France/Partner: CDR Commitment: 1,104,007 €
Nabatiyeh wastewater treatment plant	Building of one wastewater treatment plant in Nabatiyeh (100 000 equivalent inhabitants)	Location: South Lebanon start date: 2003 status: On going. Donor Agency: France/Partner: CDR Commitment: 2,648,971 €
Ras Nabi Younes wastewater treatment plant	Building of one wastewater treatment plant in Ras Nabi Younes (88°000 equivalent inhabitants)	Location: Chouf start date: 2003 status: On going. Donor Agency: France/Partner: CDR Commitment: 4,437,382 €
Chekka wastewater treatment plant	Building of one wastewater treatment plant in Chekka (24 000 equivalent inhabitants)	Location: North Lebanon start date: 2003 status: On going. Donor Agency: France/Partner: CDR Commitment: 3,946,501 €
Jbeil wastewater treatment plant	Building of one wastewater treatment plant in Jbeil (48 000 equivalent inhabitants)	North Lebanon start date: 2007 status: On going. Donor Agency: France/Partner: CDR Commitment: 2,629,528 €
Batroun wastewater treatment plant	Building of one wastewater treatment plant in Batroun (30 000 equivalent inhabitants)	North Lebanon start date: 2007 status: On going. Donor Agency: France/Partner: CDR Commitment: 1,902,919 €
Al Ghadir Wastewater Project	The program's objective is to improve the environmentally sound and hygienic wastewater disposal in the catchment area of the Ghadir River and to keep the waters off the coast of Beirut clean.	Location: Ghadir river catchment area start date: 2008 status: tender document in preparation. Donor Agency: BMZ/Partner: CDR Commitment: 16,200,000
Rehabilitation of Water and Wastewater Infrastructure in Southern Lebanon	The overall objective is to reduce the health risks arising from war related damages to the water infrastructure. The program's objective is to contribute to the improvement of the continuous and hygienic supply of water and disposal of wastewater. (Emergency Program, Phase I & II)	South Lebanon, West Bekaa, and Southern Beirut status: completed. Donor Agency: BMZ/Partner: CDR SLWE, Council of the South Commitment: 12,000,000

Project Title	Objective / Remarks	Details
Rehabilitation of Sanitation System – Northern Lebanon (Emergency Program, Phase III)	Overall program goal is to improve the living conditions of the Lebanese population (6 municipalities) and the Palestinian refugees (two refugee camps) in the North of Lebanon. The program's objective is to improve the collection of the wastewater in the project area in a hygienically and environmentally sound manner. The following components will be given priority: waste water main collector between Tripoli wastewater treatment plant and the Bared River; secondary and tertiary wastewater collection systems in the "catchment area" including house-connections; and necessary accompanying consultancy services.	Coastal towns north of Tripoli: Beddawi to Bared River start date: 6/30/2007- 2012 status: ongoing. Donor Agency: BMZ Partner: CDR UNRWA, Municipalities of Tripoli, Beddawi, Deir Ammar, Minnieh, Bhannine Commitment: 16,000,000
Technical Assistance to the Water Sector Reform / Rehabilitation of Water Supply and Wastewater Systems in Lebanon	Strengthening of technical- and management capacities in all of the four WEs. the program aims to strengthen the capacity of the ministry in its regulatory and policy roles and promote benchmarking based on performance indicators, capacity building, know-how transfer, and the improvement of customer relations.	National with offices in all WEs (Beirut, Saida, Zahle, Tripoli) start date: 2/1/2008- 4/30/2014 status: on going. Donor Agency: BMZ/Partner: CDR all of the four WEs Commitment: 8,000,000
Water supply system in Koura	water supply system in Qalamoun, Majdlaya and Ras Masqa	Tripoli and Koura Caza start date: 2008- 2011 status: on going. Donor Agency: Italian government for development coop. Partner: CDR Commitment: 5,911,145
Water supply and Wastewater management in Jbeil Caza	Supply of safe drinking water and proper sewage collection and treatment to the targeted populations of Jbeil Caza, in the year 2020 (Afqa and Qatra springs Jbeil, Aabboud, Mazraat Es Siyad and Qartaba)	Jbeil Caza start date: 2008- 2012 status: on going. Donor Agency: Italian government for development coop. Partner: CDR Commitment: 39,089,097
Construction of 2 wastewater treatment plants and networks in Michmich and Hrajel	The program foresees the realization of the needed works for the collection and treatment of the waste water in the areas objects of the intervention.	Michmich (Akkar Caza), Hrajel (Kesrouan Caza) start date: 2008- 2015 status: on going. Donor Agency: Italian government for development coop. Partner: CDR Commitment: 13,839,384
Lebanon Water Policy Program	Overall objective is to help the water establishments solve their institutional and technical problems in order to become strong, viable utilities capable of attracting investment and providing responsive and high quality services to their customers.	Ministry of Energy and Water, Beirut start date: May2002-Sept. 2008 status: on going. Donor Agency: USAID Partner: MoEW, SLWE, BMLWE. Commitment: 5,100,000$
Small Village Wastewater Treatment Plants project	Construction and operation of 4 wastewater treatment plants at the upper Litani River Basin: Qaraoun/Aitanit; Fourzol; Ablah; Chmistar with the aim of reducing pollution of the Litani River and Lake Qaraoun.	Bekaa start date: 10/1/2005- 6/1/2011 status: on going. Donor Agency: USAID Partner: MoIM, MoEW. Commitment: 18,000,000
Baalbeck Water and Sanitation Project	(a) develop and strengthen the institutional capacity of the Ba'albeck Hermel Water and Irrigation Authority and the Zahle and Chamsine Water Authorities; (b) improve the access of customers to satisfactory water supply and wastewater services; (c) involve the private sector in the operation and maintenance of the water and wastewater facilities; (d) rationalize the use of water through water meters.	Baalbeck City & Neighboring Villages start date: 31/07/2003- 15/12/2012 status: on going. Donor Agency: WB Commitment: 43,000,000$

ANNEX E. MoU between USAID and MoIM

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE GOVERNMENT OF THE REPUBLIC OF LEBANON
AND
THE GOVERNMENT OF THE UNITED STATES OF AMERICA
FOR
MUTUAL COOPERATION TO ADDRESS POLLUTION OF THE LITANI RIVER AND LAKE QARAOUN
THROUGH THE
SMALL VILLAGE WASTEWATER TREATMENT SYSTEMS PROJECT

Article 1 – Purpose

1.1 The purpose of this Memorandum of Understanding (MOU) by and between the Government of the Republic of Lebanon (GOL), acting through the Ministry of Interior and Municipalities (MoIM), and the Government of the United States of America (USG), acting through the United States Agency for International Development (USAID), is to set forth the agreement of the GOL and USG (collectively, the "Parties") to cooperate on assistance provided by the Small Village Wastewater Treatment Systems Project to alleviate the pollution of the upper Litani River and Lake Qaraoun.

Article 2- The Project

2.1 The Small Village Wastewater Treatment Systems Project (the "Project):

a) Assists selected Bekaa Municipalities in addressing uncontrolled discharges of untreated domestic wastewater into the upper Litani River basin by providing them with viable treatment systems and designs for their domestic wastewater discharges in the Litani River, and

b) Assists the selected Bekaa Municipalities in establishing domestic wastewater treatment facilities based on those designs;

2.2 The Project seeks to mitigate water quality degradation of the Litani River Basin from uncontrolled discharge of untreated domestic wastewater within the upper Litani River basin. (The Project does not cover treatment of industrial and agricultural wastewater). The Project supports the preparation of designs and tender documents of multiple wastewater treatment facilities in the region, and then construction of these facilities. The final number of treatment facilities and final number of villages served will be determined before the construction funds are allocated.

2.3 USAID provides assistance to strengthen Lebanon's wastewater sector through the Project. All USAID funding for the Project is provided by USAID to a U.S. private sector contractor engaged directly by USAID to provide Project assistance, is subject to the terms and conditions of USAID's contract and nothing in this MOU amends or modifies that contract. For these purposes, USAID has entered into a contract with Camp Dresser & McKee. As used in

this MOU, "CDM" includes the organization, its affiliates, subsidiaries, sister company and branches named in the preceding sentence of this section or any successor or complementary organization(s) engaged by USAID to provide the assistance described herein. CDM may directly engage Lebanese and other subcontractors in providing the needed assistance to the Project. Such assistance is contemplated through September 2007, and is described more particularly hereinbelow.

2.4 In coordination with Bekaa Water Establishment and the selected Bekaa Municipalities, a technical team provided by CDM ("CDM Technical Team") will conduct specific assistance throughout the life of the Project. While the form of this assistance will vary during the three phases of the Project – design, construction and commissioning - as described below, the CDM Technical Team will carry out Project activities to support the development of domestic wastewater treatment facilities with the participation of stakeholders concerned, encouraging local level participation in planning, construction, and operation of wastewater treatment facilities through the Project.

2.5 During the design phase, which begun in October 2004 and has ended in November 2005, the CDM Technical Team conducted wastewater treatment initiatives through community involvement and technical cooperation, explored lessons learned from best practices for application in Lebanon, identified appropriate domestic waste treatment systems and prepared designs and tender documents for towns with populations of up to 15,000 people.

2.6 During the construction phase, which begins in October 2005 and is now expected to end in September 2007, the CDM Technical Team will oversee construction of wastewater treatment facilities as designed. Qualified Lebanese and other contractors will be used for the construction. The municipalities will have specific tasks to complete with regard to construction, and will have the opportunity to periodically review the construction progress.

2.7 During the commissioning phase, which will commence at facility start up and will continue for up to twelve months, facilities will be commissioned, municipal operators will be trained and operation of the facilities overseen by CDM.

2.8 Each Municipality selected for a wastewater treatment facility will have responsibilities as presented in a separate MOU between it and USAID. These responsibilities include providing land for the facility, initial site clearing, construction of non-process structures on site, monitoring influent and effluent quality, and identifying facility staff. The staff will receive training and will operate the facility during the commissioning period of one year, during which CDM will assist with the operations and maintenance. After the commissioning period, the Municipalities will be wholly responsible for the operations and maintenance of the facility for the remainder of its reasonable lifetime.

Article 3 – Roles and Responsibilities of the Parties

3.1 To ensure the success of the Project, USAID and MoIM will carry out specific roles and responsibilities.

3.2 USAID, acting through CDM (and its subcontractors) unless otherwise indicated, will:

a) Develop selection criteria and prepare a list of candidate villages;

b) Engage communities in the Project, addressing any comments and concerns;

c) Select Bekaa Municipalities and sign MOUs between USAID and selected Municipalities for the design and construction of municipal wastewater treatment facilities, and for operations and maintenance of the facilities;

d) Prepare design and tender documents for the facilities;

e) Select construction contractors;

f) Construct the selected facilities within the budget available; and

g) Provide operation and maintenance training to responsible Municipalities or other management bodies during the commissioning phase.

3.3 The MoIM will:

a) Designate a small group of key Ministry representatives to be involved with the Project implementation, chaired by the Minister or his designee, who will facilitate close communications with the selected Municipalities, in addition to other Ministries and governmental agencies involved in the Program scope.

b) Inform other stakeholder Lebanese government ministries of this MOU, and request their cooperation with the project to quickly reduce the domestic pollution discharged to the Litani River.

c) Provide the selected Municipalities with support for all legal and procedural actions needed for the success of the activity.

d) Ensure that the selected Municipalities take full management and financial responsibility for the operation and maintenance costs of the wastewater treatment facilities, including but not limited to the following: needed manpower for the proper operation of the facility; power requirements; sludge removal and disposal; necessary spare parts and chemicals; sampling and laboratory analysis and reporting for effluent monitoring as required by the Ministry of the Environment in the Environmental Impact

Assessment Report; monitoring the proper operation of the facility; and obtaining assistance in the event of a problem or breakage that is not reparable by the Municipality itself.

e) Facilitate the administrative procedures necessary for the selected Municipalities to comply with the Project requirements, including the provision of suitable land to host the wastewater treatment facility that meets current and future needs, and the signing by each selected Municipality of an MOU with USAID separate from this MOU.

f) Encourage and facilitate existing Municipal "public works" or "water and wastewater" (or similar) committees to oversee facility funding and operations within each contributing village or support the formation of new committee to perform this task.

g) Support and facilitate an inter-municipality Waste Water Treatment Project (WWTP) management body, in cases where the WWTP will be serving more than one Municipality, to oversee operations and maintenance of the facility and support the lead municipality (usually where the WWTP is located) in obtaining the necessary cooperation from the other participating municipalities.

h) Support the selected Municipalities as they enforce removal or pre-treatment of industrial wastewater discharges to their wastewater collection system per the Ministry of Environment requirements.

i) Arrange exemptions for all taxes, including social security taxes for salary and compensation paid for all local and foreign employees and consultants hired by CDM for the implementation of the project as well as all Value-Added Taxes (VAT) related to goods and services for Project construction and implementation.

j) Arrange exemption from any and all national and local customs duties and fees on equipment and vehicles purchased for the Project, including the minimum required taxes.

k) Arrange exemption from all municipal taxes and fees related to the offices of CDM in Lebanon including rental value fees, sewer and sidewalk maintenance fees, and applicable signage fees of those offices for the duration of the Project.

l) Maintain or cause to be maintained, as appropriate, records related to the assistance described herein in a manner adequate to show use and receipt of such assistance. Such records shall be maintained for a period of three (3) years after this assistance has been furnished. MoIM shall afford representatives of USAID, or their designees, the opportunity at all reasonable times to inspect the site(s) of such assistance and records relating to the provision of such assistance.

Article 4 – General Provisions

4.1 This MOU may be amended or modified with the written consent of both Parties.

4.2 This MOU shall enter into full force upon signature by all Parties and after approval by the GOL Council of Ministers or Parliament. This MOU may be amended or modified by the mutual written agreement by the duly authorized representatives of both Parties.

4.3 Either Party may terminate or suspend this memorandum by giving 90 (ninety) days written notice. Termination of this MOU will terminate all responsibilities of the Parties on and after the date of termination.

4.4 Neither Party obligates or commits, or promises to obligate or commit, any funding to any Party to this MOU or any other party by signing this MOU. Nevertheless, it is the intention of the Parties, subject to availability of their respective funding for this purpose, to carry out, in good faith, their roles and responsibilities as described in this MOU.

IN WITNESS WHEREOF, the Parties, acting through their duly authorized representative, have caused this MOU to be signed in their names below.

GOVERNMENT OF THE REPUBLIC OF LEBANON

X

H.E. Hasan El Sabeh
Minister, Ministry of Interior and Municipalities

Date: _____

GOVERNMENT OF THE UNITED STATES OF AMERICA

Raouf N. Youssef

Raouf Youssef
Mission Director, USAID/Lebanon

Date: 12/21/05

ANNEX F. MoU between USAID and Municipalities

MEMORANDUM OF UNDERSTANDING
AMONG
THE GOVERNMENT OF THE UNITED STATES OF AMERICA,
THE MUNICIPALITY OF ABLAH,
THE MUNICIPALITY OF NABI AYLA
AND
THE MUNICIPALITY OF NIHA
FOR
ROLES AND RESPONSIBILITIES REGARDING THE REGIONAL ABLAH WASTEWATER TREATMENT PLANT FOR ABLAH, NABI AYLA AND NIHA

Article 1 – Preamble

1.1 The Government of the Republic of Lebanon ("GOL"), acting through the Ministry of Interior and Municipalities ("MoIM"), and the Government of the United States of America ("USG"), acting through the United States Agency for International Development ("USAID"), entered into a Memorandum of Understanding, on December 21, 2005, for Mutual Cooperation to Address Pollution of the Litani River and Lake Qaraoun Through the Small Village Wastewater Treatment Systems Project (the "MoIM-USAID MOU "), a copy of which is annexed to this MOU.

1.2 The MoIM-USAID MOU describes the Small Village Wastewater Treatement Systems Project ("Project"), and sets forth the roles and responsibilities of the MoIM and USAID in carrying out the Project.

1.3 The MoIM-USAID MOU states that the Project supports the preparation of designs and tender documents of multiple wastewater treatment facilities in the region, the selection of construction contractors, the construction of selected facilities, and the provision of operation and maintenance training to responsible Municipalities. The MoIM-USAID MOU further states that each municipality selected for a wastewater treatment facility will have responsibilities as presented in a separate MOU between it and USAID. These responsibilities include providing land for the facility, initial site clearing, construction of non-process structures on site, monitoring influent and effluent quality, and identifying facility staff.

1.4 The Ablah cadastral area has been selected for a regional wastewater treatment facility or plant (hereinafter, the "WWTP") and the Municipalities of Ablah, Nabi Ayla, and Niha all have interests in the successful completion and operation of that facility.

Article 2 – Purpose

2.1 The purpose of this Memorandum of Understanding (MOU) by and among USAID, and the Municipalities of Ablah, Nabi Ayla and Niha (collectively, the "Municipalities") is to set forth the responsibilities of the Municipalities for the WWTP as called for by the MoIM-USAID MOU.

Article 3 – Responsibilities of the Parties

3.1 The responsibilities of USAID with respect to construction, start-up and commissioning of the WWTP and all other aspects of Project implementation are set forth in the MoIM-USAID MOU and are incorporated by reference into this MOU.

3.2 The land dedicated for the WWTP by the Municipality of Ablah has an area of 4,682 square meters and is identified as parcel number 698 on the official cadastral map of Ablah.

3.3 Prior to the start of construction of the WWTP, the Municipality of Ablah will obtain permission for an access road to the site as well as the authority to construct and maintain the road through a written statement from the Municipality of Ablah and/or other landowners and as may be required by law.

3.4 In addition to providing land for the site of the WWTP as described hereinabove, the Municipalities will fund, operate and maintain the WWTP on the site for a period of not less than twenty years from the date of completion, or will formally pass operations and maintenance to a specialized public establishment, such as the Bekaa Water and Wastewater Establishment. This provision, once the WWTP is completed, shall continue in force and effect until fulfillment regardless of any expiration of this MOU.

3.5 The Municipalities, as specified in this section hereinbelow, will also be responsible to:

3.5.1 Remove any unsuitable material (non-soil or vegetative) from the site, such as the planted vineyard, dumpsite refuse and cutting of trees, in preparation for site grading.

3.5.2 Provide an electric meter (kwh counter) during and after the construction phase.

3.5.3 Facilitate the electrical connection to the Electricite Du Zahle (EDZ) grid with the capacity required by the design engineer.

3.5.4 Install a public water supply connection at a point designated by the construction manager for WWTP construction and future operation.

3.5.5 Provide regular removal of construction debris and domestic-type solid waste generated by contractors during construction. The schedule will be agreed upon by the responsible Municipality and the construction manager.

3.5.6 Pay for public utilities (including water, electricity, fuel for generators,…) to the site during construction, through plant start up and during the operations and maintenance period, through plant lifetime (20 years).

3.5.7 Grade and pave the access road after construction according to the WWTP design plans and specifications by July 31, 2010.

3.5.8 Provide and install landscaping vegetation and other details for visual impact reduction and odor reduction as indicated in the WWTP design plans by August 14, 2010.

3.5.9 Implement a sewer protection and repair program to mitigate potential for excessive inflow and debris entering the system. This program will include inspection of incoming lines and removal of excess influent (patching, replacing broken pipes) by May 31, 2010.

3.5.10 Construct sewer networks from the contributing villages (Niha & Nabi Ayla Municipalities) to convey raw wastewater to the main effluent line to the WWTP by April 30, 2010. The Municipalities of Niha & Nabi Ayla will be responsible for carrying out this activity.

3.5.11 Accept ownership and responsibility to operate and maintain the WWTP from their budgets from the time of handover. The Municipalities acknowledge that operation and maintenance costs include but are not limited to the following: manpower for the proper operation of the plant, power requirements, spare parts, chemicals, depreciation cost of equipment, sampling and laboratory analysis costs for effluent quality monitoring and reporting as required by the Ministry of the Environment and to monitor operation of the WWTP, and assistance from a contractor in the event of a problem or breakage that is not reparable by the Municipalities directly.

3.5.12 Develop and implement an operations and maintenance cost sharing program with the Municipalities by April 30, 2010.

3.5.13 Assign competent Municipality personnel to ensure proper operation and maintenance of the WWTP.

3.5.14 Dispose off site the wet sludge generated by the treatment plant to the nearest solid waste facility or landfill location.

3.5.15 Furnish the plant administrative building with office desks, chairs, filing cabinets, and other furnishings and equipment (including laboratory equipment) as necessary to conduct plant business and operations by April 30, 2010.

Article 4 – Contacts and Communications

4.1 The primary point of contact for USAID with the Municipalities will be the Mayor of Ablah Municipality. USAID's contractor for construction management, CDM Constructors, Inc., will coordinate with the Ablah Municipality and with the Municipalities individually and jointly as required for the WWTP and other Project matters.

4.2 USAID will keep the Directorate General of the Ministry of Energy and Water, through the Bekaa Water and Wastewater Establishment, regularly informed of the Project and its progress.

4.3 USAID will meet on regular basis with the Municipalities on dates and places to be determined by the mutual agreement of the Parties, to ensure a solid and fruitful working relationship.

4.4 The Municipalities shall send to the USAID contractor CDM Constructors, Inc., quarterly reports on the status and operational events of the WWTP during the commissioning period (six months following construction and installation of equipment).

Article 5 – General Provisions

5.1 This MOU shall enter into full force upon signature by all Parties, shall have a duration of two years (unless extended by the mutual written agreement of all Parties), and may be amended or modified by the mutual written agreement by the duly authorized representatives of all Parties.

5.2 This MOU is entered into by USAID in accordance with the provisions of the MoIM-USAID MOU, and general provisions therein pertaining to the rights, responsibilities and liabilities of USAID shall apply to this MOU. Any modification, amendment, suspension or termination of the MoIM-USAID MOU shall be applicable to this MOU.

IN WITNESS WHEREOF, the Parties, each acting through their duly authorized representative, have caused this MOU to be signed in their names below.

Municipality of Nabi Ayla

Mohamad Amin El-Sayyed
Mayor of Nabi Ayla

Date: Mehdi El Sayed
27/4/2009

Municipality of Niha

IMAD REMAILY

Imad Remaily
Mayor of Niha

Date: 27-4-2009

US Agency for International Development

Denise A. Herbol

Denise A. Herbol
Mission Director USAID/Lebanon

Date: April 27, 2009

Municipality of Ablah

Robert Semaan
Mayor of Ablah

Date: 27/04/09

ANNEX G. New Wastewater Tariff Strategy – GTZ

TOWARDS A NEW WATER AND WASTEWATER TARIFF STRATEGY IN LEBANON: Main Principles, November 2010.

Funded and organized by GTZ (now GIZ), what follows are partial notes from that meeting.

Table 1 below includes the names of the participants in the meeting.

Table 1
List of Participants

Name	Institution
Mr. Mahmoud Baroud	Director General of Exploitation – MEW
Mr. Jamal Krayem	Director General – NLWE
Mr. Maroun Mousallem	Director General – BWE
Mr. Ahmad Nizam	Director General – SLWE
Mr. Joseph Nseir	Director General – BMLWE
Mr. Hussein Abed Al Rahman	Director of Water Oversight – MEW
Mr. Manfred Scheu	Principal Advisor – GTZ
Mr. Nabil Chemaly	Technical Advisor – GTZ
Dr. Mark Oelmann	International tariff specialist – GTZ
Ms. Maya Bou Nassar	Programme Support Officer – GTZ

6. Conclusion

Discussions between decision makers at MEW and WEs in Lebanon demonstrate a common understanding that consumption-based tariffs for water supply together with newly introduced wastewater tariffs are required.

All participants confirmed that existing regulations generally permit the introduction of a new tariff system. However, modifications may be required in the future.

Participants of the meeting agreed on the following main principles for the introduction of a new tariff strategy for water supply and wastewater disposal:

Water supply:

1. The current lump-sum tariff should be replaced by a consumption-based tariff which includes two components: fixed charges and variable (volumetric) charges.
2. The new tariff should include a relatively high fixed component to cover fixed costs and to guarantee a similar level of income to Water Establishments.

3. The new tariff for domestic customers should have a uniform variable (volumetric) component for regardless of their level of consumption (i.e. block tariffs should not be considered during the initial phase, but may be considered in the future depending on the experience gained with the new consumption-based tariff).

5. The new consumption-based tariff may vary between WEs but should be uniform within the service area of each Establishment.

6. The current lump-sum tariff should be maintained for unmetered customers (until all customers become metered). The new consumption-based tariff should be introduced for connections equipped with customer water meters.

7. The new tariff should be based on a proper cost analysis that includes minimum O&M cost coverage. Different targets for cost-coverage may be applied in different WEs considering the specificities of each Establishment.

Wastewater:

1. Current by-laws and regulations are sufficient for the introduction of wastewater tariffs according to the following principles:

    a. It is compulsory to connect all buildings to the sewage network wherever possible.
    b. Wastewater charges are a percentage of the water bill.
    c. The Establishment is responsible to provide the installations from the public sewer network until the boundary of the property.
    d. Each beneficiary pays a fee to connect to the public sewer network based on a technical inspection report prepared by the Establishment.

    However, Government policies may require amendments in the future.

2. The new wastewater tariff should be based on a proper cost analysis and cover minimum O&M cost at the beginning.

3. The new wastewater tariff (i.e. percentage rate of the water bill) may vary between WEs but should be uniform within the service area of each Establishment.

4. The new wastewater tariff should be introduced as soon as services are provided. The tariff should be applied to all customers connected to a sewer network and to a WWTP. It should be applied regardless of who is funding the operation and maintenance of the systems.

For more information, please visit
http://www.socialimpact.com

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