ABBREVIATIONS AND MEASURES
(Exchange Rate Effective: December 31, 2008)

Currency Unit  -  Lebanese Pound
US$ 1  =  LBP 1,508

ABBREVIATIONS AND ACRONYMS

AFD  Agence Française de Développement
BML  Beirut Mount Lebanon
BP  Business Plan
CAPEX  Capital Expenditure
CAS  Central Administration of Statistics
CDR  Council of Development and Reconstruction
CFD  Central Fund for the Displaced
CoM  Council of Ministers
CoS  Council of the South
CSB  Civil Service Board
GCC  Gulf Cooperation Council
GDP  Gross Domestic Product
HH  Household
LC  Local Committees
LBP  Lebanese Pound
LRA  Litani River Authority
MCM  Million M³
MENA  Middle East and North Africa Region
MoEW  Ministry of Electricity and Water
MoF  Ministry of Finance
NWC  National Water Council
O&M  Operation & Maintenance
PSIA  Poverty and Social Impact Assessment
RWA  Regional Water Authority
WDI  World Development Indicators
WDR04  World Development Report 2004
WRM  Water Resource Management
WSS  Water Supply and Sanitation
WW  Wastewater
WWT  Wastewater Treatment

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EXECUTIVE SUMMARY

The state of the water supply and sanitation (WSS) sector in Lebanon is not in line with the level of economic development reached by the country. Despite the relatively high coverage rate in the water sector (78 percent), continuity of supply is extremely low. The Beirut Mount Lebanon (BML) region, which accounts for 60 percent of total connected households, receives only three hours of daily water supply during the summer season. Tripoli is the only urban area which benefits from 24 hours of water supply. This is in contrast to the level of service provided in major urban centers in Morocco and Tunisia, where 24/7 is the norm. The Regional Water Authorities suffer from inadequate technical, financial and commercial performance. Only the BML Water Authority covers operation and maintenance (O&M) costs. Water losses average 40 percent, and collection efficiency is as low as 11 percent in the Beka’a Water Authority. The development of the wastewater sector is still at an embryonic stage. There are a few wastewater treatment plants in operation, all of which are small. Water storage capacity is inadequate to meet irrigation water demand, and is far below the level of other MENA countries.

The sector reform initiated in 2000 provides the basis for strengthening accountability in the water sector. Law 221/2000 initiated the reform of the water sector. The law provides for the consolidation of water service provision into four regional Water Authorities, with higher efficiency potential than the previous 22 Water Boards, and one pre-existing river basin agency. The Law 221 of 2000 also mandates a clear separation between policy-making and service provision through the establishment of financially and administratively autonomous Regional Water Authorities.

The reform agenda reached an implementation impasse soon after the enactment of the law. As a result, the reform has still to deliver benefits. Four main accountability weaknesses emerge from the institutional analysis of the water sector: (i) the institutional uncertainty stemming from the un-finished reform agenda, which has led to a growing disconnect between legal and de facto sector responsibilities; (ii) the lack of integration of policy-making with investment planning functions, accompanied by limited inter-agency coordination; (iii) the inadequacy of regulatory instruments to exercise effective central oversight over the water sector; and, (iv) the limited management and financial autonomy devoted effectively to Regional Water Authorities.

The Regional Water Authorities suffer from inadequate technical, financial and commercial performance. Despite its relative good endowment of water resources, Lebanon is poised to face chronic water shortages by 2020 unless actions are taken to reform the sector. The weak performance of the Regional Water Authorities is one of the drivers of the demand-supply imbalance, together with the lack of storage capacity and the growing demand. Continuity of supply is low, ranging from 3 to 22 hours of daily water supply during the dry season. The BML WA only provides 3 hours of daily water supply in the summer season. Tripoli is the only urban area which benefit from 24 hours of daily water supply as a result of the efficiency improvements delivered by 5-year management contract with a private operator. Water losses are above optimal level, with an average of 40 percent country wide. Only the BML Water Authority covers O&M costs. Technical constraints, in particular the lack of metering and the inefficient pricing policy, have contributed to the mis-alignment of incentives, which are at the root of poor
utility performance. The wastewater sector is still largely underdeveloped, and no effective measures have been taken to mitigate the environmental costs of delayed action. The future of the irrigation sector is heavily dependent on investments to increase water storage capacity.

**The water sector raises consumer welfare concerns.** Availability, rather than affordability, is the main constraint for consumer welfare in the water sector. The inability of the Regional Water Authorities to meet basic household water needs has led to the development of a parallel off-network private water market, which accounts for 75 percent of total household water expenditure. Water expenditure is overall within affordable limits, but the water sector raises serious equity concerns. Client power, i.e. consumers’ ability to hold service providers directly accountable for service delivery, is virtually non-existent. Because of lack of metering, households in general and low-income households in particular cannot decide their water consumption in line with demand and affordability level. In the absence of effective water service regulation, over-reliance on off-network private water provision increases the vulnerability of the population to water carried diseases.

**Lebanon’s water public expenditure has been inadequate to meet the development needs of the sector.** In Lebanon, public investment in the water and wastewater sector amounts to about 0.5 percent of GDP, below the optimal level (estimated at about 0.8 percent of GDP according to Yepes 2008). Due to limited fiscal space to increase public investment in the water sector, the development needs of the sector cannot be met within a framework of fiscal responsibility unless spending efficiency is improved. This study finds that there is significant scope for enhancing efficiency of public spending in the water sector. The execution ratio of approved Council of Development and Reconstruction (CDR) investment indicates that the sector absorptive capacity is low: 55 and 20 percent of CDR’s approved investment program was executed over the period 1992-2007 in the water and wastewater sector respectively.

**The cost of inaction in the water sector is estimated at about 1.8 percent of GDP or 2.8 percent of GDP if the cost of environmental degradation is added.** Households bear most of the costs. The opportunity costs of inadequate public water supply provision amount to 1.3 percent of GDP (World Bank 2009).1 Hidden costs to the Government (i.e. the implicit financial burden associated with water supply sector inefficiency) are conservatively estimated at about 0.5 percent of GDP, above the level of annual investment in the water sector (0.4 percent of GDP). Low collection efficiency is the main contributor to hidden costs (46 percent of total), followed by water losses (40 percent). Finally, the cost of environmental degradation caused by untreated wastewater discharges is estimated at more than 1 percent of GDP (World Bank, 2003).

**Improving continuity of water supply to achieve 24/7 provision across the country should be the top priority for the water sector, alongside increased levels of waste water collection and treatment.** Despite connection rates within the regional average, public water supply falls far below consumer needs. Continuity of supply is low, particularly in the BML region, and sensitive to seasonal fluctuations in rainfall. It is time for Lebanon to push forward its reform process and concentrate efforts towards reaching 24/7 provision standards, as comparable MENA countries have achieved in their main cities. In parallel to the water supply increases and

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1 Based on 2008 PSIA data.
volumes consumed rise, it will be crucial to increase the volume of wastewater treated to contain the cost of environmental damages.

**Improving efficiency in the water sector can generate sufficient resources to close the investment gaps in the sector, within a framework of fiscal responsibility.** Lebanon has limited fiscal space for increasing public expenditure. In this context, improving efficiency is the priority to meet the development needs of the water sector. Improving sector efficiency requires a broad range of actions to support investment prioritization, implementation of Law 221, utility management and information management. Improving the quality of services supplied to end users calls for the implementation of a “targeted investment program” with a focus on : (i) the reduction of water losses plaguing the Regional Water Authorities; (ii) the expansion of water storage facilities; and (iii) the expansion of water treatment and storage facilities to cope with the requirements for a 24 hours service. Ensuring the effective implementation of Law 221 is the entry point for improving accountability and sector performance. The short-term priorities are to gradually increase the financial and administrative autonomy of the Water Authorities so they can focus on improving the quality of services provided to end users, improve coordination across agencies and strengthen central oversight as the autonomy of the RWAs increases. In parallel, actions are needed to strengthen utility management. The gradual introduction of water metering and the transition to volumetric tariffs will providing Water Authorities with the commercial incentives for decreasing water losses and improving collection efficiency. Metering will also strengthen client power by providing end users with control over their level of public water consumption. Finally, improving the availability of accurate and consistent information on sector performance and public expenditure is recommended for effective decision-making.
CHAPTER I:  
INTRODUCTION

Country and Sector Context

1. Lebanon’s economy performed well in 2008 achieving record-high real GDP growth; however current projections suggest a slowdown following the global economic downturn. Lebanon is a middle-income country with a Gross Domestic Product (GDP) of close to USD 30 billion (2008 est). The Lebanese economy fared well in 2007 and 2008, with real GDP growth levels reaching 7-8 percent, mainly due to the good performance of the tourism and construction industries. Despite having proven good resilience to the international financial turmoil by maintaining financial stability, reducing international reserves and reducing public debt, an economic slowdown is expected as a consequence of the bleak international macroeconomic outlook. In 2009, real GDP growth is projected at 3 percent, mainly due to a decline in foreign capital flows, remittances, exports and tourism. Despite a reduction in 2008 thanks to the high economic growth, the debt to GDP ratio in Lebanon remains among the highest in the world at 162 percent, leaving limited space for increased fiscal spending and stimulus (IMF 2009).

2. The current phase of relative political stability has been crucial for the strong economic recovery, and could lead to a renewed period of reform. Lebanon’s history has been characterized by frequent international and internal tensions. Fifteen years of civil war between 1975 and 1990 and repeated conflicts with its neighbors have inevitably conditioned its development process and influenced its political economy. Both the governing parties and the opposition have support among large portions of society. In a polarized context, citizens when called to express their political choice tend to affiliate with their religious or ethnic identities, without necessarily holding representatives accountable for their behaviors (Keefer and Khemani 2005). As a consequence Parliaments have been often split and central governments generally too weak to adequately bring forward coherent policies and reform processes. Studies suggest that the new period of internal conflict following the traumatic events of 2005-2006 and the subsequent political paralysis saw the deterioration of governance indicators such as citizen’s voice and accountability relationships, rule of law and control of corruption, in comparison with other countries (Kauffmann et al. 2007). The Doha peace agreement of May 2008 put an end to the armed conflict and led to the creation of a unity government that took the country to the recent elections of June 2009, in a climate of relative stability. It remains unclear, however, whether or not the outcomes of these elections will open a phase of consolidated stability and renewed consensus for reform.

3. Lebanon is one of the most urbanized countries in the Middle East and North Africa (MENA) region. Lebanon is a relatively small country, with a total population of about 4 million people and an average population growth rate of 1.2 percent per annum. Lebanon is at very advanced stage of urbanization, with 87 percent of the total population living in urban areas, by far the highest urbanization rate in the MENA region (excluding GCC countries) – Figure 1. Half of the urban population lives in the capital city of Beirut, with a total population of 1.9
Tripoli is Lebanon’s second largest city, with approximately 500,000 inhabitants.  

Figure 1: Urbanization Rate and GDP Per Capita (USD 2000 prices): Selected MENA Countries (1988-2007)

4. The state of the water supply and sanitation (WSS) sector in Lebanon is not in line with the level of economic development reached by the country. Lebanon’s level of economic development is well above comparable MENA countries (excluding GCC countries). Lebanon per capita GNI amounted to USD 5,800 in 2007, significantly above Morocco’s and Tunisia’s levels (USD 2,290 and 3,210 respectively) – Figure 1. The outcomes in the WSS sector are however not commensurate to the level of economic development in the country. Beirut only receives three hours of water supply per day during the summer months. Tripoli is the only urban center that has recently achieved 24/7 during the dry season. This is in contrast to the level of service provided in major urban centers in Morocco and Tunisia, where 24/7 is the norm.

5. Public investment in the water sector is in line with investment in social sectors. An initial analysis of public investment by the Council of Development and Reconstruction (CDR), the main central agency responsible for foreign-financed investment in Lebanon, over the period 1992-2007 indicates that public investment in the water sector compares favorably with investments in social sectors (health and education) – Figure 2. The poor water sector performance calls therefore for an in-depth analysis of the level of efficiency of public investment, and the underlying institutional setting in which investments are undertaken.

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2 UN World Urbanization Prospects, 2007 edition. Note that no population census was conducted in Lebanon since 1932. All population figures are therefore an estimate.
Report Objectives and Structure

6. Public Expenditure Reviews (PERs) are conducted by the World Bank in all its client countries, typically every 4 to 5 years. PERs examine processes of resources allocation within and among sectors and assess the equity, efficiency and effectiveness of these allocations in the context of the macroeconomic framework and sector priorities. In Lebanon, the World Bank conducted a review of public investment expenditures in 1995 and a review of public social expenditures in 1999. A comprehensive review of public expenditure was conducted in 2005. As regards the water sector, a public expenditure review of the urban and wastewater sector was undertaken in 1998.

7. The present public expenditure aims at examining efficiency and effectiveness in the allocation of resources in the water sector. In conducting the research and analysis, the team observed a contrasted reality in which a multitude of issues afflicting the sector emerged. Alongside the public expenditure analysis, the study presents an in-depth diagnosis of the water sector in Lebanon and the issues it is facing. The analysis focuses primarily on water supply, encompassing to a lesser extent sanitation and irrigation, due to the scarcer information available on the latter two sub-sectors. Additional work will be needed to fully shed light on the specificities of each and all of the aspects identified. The key findings and recommendations of this report will serve to initiate a dialogue with government officials and civil society on the sector issues and challenges highlighted, the complexities of the budget process, the need for further reform, and other issues, including the difficulties encountered in conducting this type of analysis in terms of data availability.

8. Taking into account the complex reality of the country, the study conducts an in-depth review of the water sector in Lebanon, encompassing the institutional framework, the supply-side performance, consumer welfare and public expenditure patterns and proposes a matrix of
policy actions to improve sector performance and meet the development needs of the sector. The Public expenditure review addresses the following main questions:

- What progress has Lebanon made in reforming the water sector? What are the main weaknesses still characterizing its current institutional setting?

- Is the water sector performance in line with the level of economic development in the country?

- What are the key issues faced by consumers in the water sector?

- Has public expenditure been adequate to meet the development needs of the sector? What is the level of efficiency of public investment?

- What are the key sources of hidden costs in the water sector?

- What are the main accountability weaknesses which should be overcome to improve efficiency in the delivery of water supply and sanitation services in Lebanon? What policy actions are needed to improve sector performance and meet the development needs of the sector?

9. The public expenditure review builds on a number of previous related studies conducted by the World Bank for the Government of Lebanon: the Policy Note on Irrigation Sector Sustainability (2003), the Lebanon Public expenditure Review (2005), the Social Impact Assessment for the Water and Electricity Sectors (2009), and the recently completed Lebanon Country Governance and Anti-Corruption (CGAC) Assessment (2009), which focuses on governance-related challenges in electricity, water and social protection sectors.

10. The study had to confront severe data limitations and inconsistencies on water sector performance. Reliable data on the water sector in Lebanon is very limited. Data limitations need therefore to be taken into account in interpreting the quantitative results of the analysis. To date, there are no audited accounts and financial statements for the Regional Water Authorities. The study therefore relies on data submissions by the RWAs and Business Plans prepared by consultants to assess supply-side performance in the water sector. Secondary data sources are drawn upon to reconcile data limitations and inconsistencies. In the absence of reliable data sources, estimates are made. For example, there is consensus that the unaccounted losses in the water sector are well above optimal level; however, the exact level of water losses is currently unknown given the lack of metering in the water sector. There is also very limited reliable information that can be drawn upon to assess the private segment of the water market, despite the critical role it plays in the delivery of potable water end users. One essential recommendation stemming from this study is the urgent need for the authorities to develop capacity to collect, update data and information on the sector. Accurate and consistent information is crucial for effective decision-making. At the moment, policy formulation and implementation in the water sector in Lebanon is not supported by good sector statistics and information.
11. **The public expenditure analysis is therefore severely constrained by the limitation of publicly available budget data.** The budget in Lebanon has not been approved by the Parliament since 2004. Budget allocations to ministries since 2005 onwards are based on approved 2004 values and significantly depart from actual expenditure figures. This severely weakens the ability to monitor budgetary outcomes by comparing allocated versus actual expenditure in the sector and link spending to sector priorities. The public expenditure review is also complicated by the multiplicity of agencies involved in the water sector in Lebanon. For example, Foreign-Financed Investments under the purview of the CDR operate outside of the regular budget. Through the consolidation of various data sources and stakeholder consultations, the study has been able to gain an understanding of the level of public expenditure in the water sector, and its adequacy to meet sector development needs. However, an accurate comparison of allocated versus actual budget expenditure in the sector was not possible due to data constraints.

12. **The report is organized in seven short chapters.** Chapter I provides background information on the country and sector context. Chapter II describes the institutional setting of the WSS sector with a focus on the accountability relationship between policy-makers and service providers. The institutional review of the sector provides the broader framework for assessing the supply-side performance of the water sector (Chapter III) and consumer welfare issues (Chapter IV). The last two Chapters of the report focus on public expenditure for water services. Chapter V reviews public expenditure trends in the water sector, while Chapter VI provides an estimate of the total costs associated with inaction in the water sector. Finally, Chapter VII proposes an actionable policy agenda for strengthening accountability and aligning the water sector performance with Lebanon’s overall level of economic development.
CHAPTER II: INSTITUTIONAL FRAMEWORK

Law 221/2000 has laid the foundation for reforming the water sector based on the principle of delegated service provision and financial autonomy. However, the reform agenda reached an impasse soon after the enactment of the law. This has led to four main accountability weaknesses: high institutional uncertainty stemming from the un-finished reform agenda, inadequate level of inter-agency coordination, weak central oversight and the limited management and financial autonomy devoted effectively to Regional Water Authorities.

13. **Law 221/2000 initiated the reform of the water sector.** Prior to the enactment of Law 221/2000, service provision was fragmented into 22 Water Boards and 209 Local Committees (LCs), with significant scope for efficiency improvements. The legal reform initiated with Law 221/2000, which delegates responsibility for the delivery of potable water, wastewater and irrigation to four consolidated Regional Water Authorities (RWAs) and to one pre-existing river basin agency [Litani River Authority (LRA)]. The RWAs are given the autonomy to choose the preferred model of service delivery in line with the principles of equity, competition and transparency. More specifically, the RWAs can either opt for the direct operation of the assets (gestion directe) or further delegate service provision to public and/or private agencies. The latter option requires the approval of the parliament for its implementation as per the concession Law.

14. **Law 221 has laid the foundation for clear accountability and efficiency improvements in water service delivery.** First, the law mandates separation between policy-making and service provision, thus establishing a clear line of accountability between policy-makers and Water Authorities. Second, the law has set in motion the establishment of financially and administratively autonomous Regional Water Authorities. Third, if effectively implemented, the regional consolidation of service provision can lead to efficiency gains (economies of scale) in service provision, to be passed on to end users.

15. **However, the reform agenda reached an impasse soon after the enactment of the law.** The transfer of functions to the four RWAs has been subject to severe implementation delays: the Presidents and the six Members of the Water Authorities’ Boards were appointed in late 2002; the by-laws provided for by Law 221 were only finalized in late 2005. The Water Authorities have taken over responsibilities for operating and maintaining the public water networks, with support from the Ministry of Electricity and Water (MoEW), which still manages...

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3 The four Regional Water Authorities are: Beirut Mount Lebanon (BML), North, South and Bekaa Water Authorities. Article 4 of Law 221/2000 (as emended by Law 241/2000) defines the responsibilities of the Water Authorities as follows: (i) study, execution, operation and maintenance, renovation of potable water supply, irrigation and wastewater according to the General Master Plan or as per the instructions of the MoEW; (ii) setting of water tariffs for potable water supply and irrigation taking into account socio-economic conditions; and (iii) quality control of potable water and water for irrigation.

4 See Law 221/2000. Article 4d.
service contracts for the operation and maintenance of pumping stations. Investment planning and execution are however still centralized. Wastewater collection – legally under the jurisdiction of the RWAs – is de facto carried out by the municipalities and unregulated small-scale private operators. The operation and maintenance of large waste water treatment plants is under the responsibility of the MoEW, given that RWAs do not have yet the capacity to take them over. Operation and maintenance of irrigation works are conducted by the LCs and the old Irrigation Boards, which were pre-existing the formation of the four RWAs. The discrepancy between legal and de facto responsibilities has created institutional uncertainty, and weakened the accountability line between policy-makers and service providers. The institutional mapping of de facto responsibilities is presented in Table 1 below. See also Annex II for an overview of the key institutional stakeholders in the sector.

Table 1: Water Sector Institutional Mapping of Responsibilities

<table>
<thead>
<tr>
<th>Policy formulation</th>
<th>CAPEX planning and execution</th>
<th>Service provision (O&amp;M)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Donor financed</td>
<td>Budget financed</td>
</tr>
<tr>
<td>Water</td>
<td>MoEW</td>
<td>CDR</td>
</tr>
<tr>
<td>Wastewater</td>
<td>MoEW</td>
<td>CDR</td>
</tr>
<tr>
<td>Irrigation/WRM</td>
<td>MoEW</td>
<td>CDR</td>
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</table>


16. **Regional Water Authorities do not yet have the capacity to deliver the “delegated outcomes” set in Law 221.** The Water Authorities are not yet empowered to act as administrative and financially autonomous entities. As a result, they do not have the technical and financial capacity to perform the functions bestowed upon them by the law.5 For example, the Water Authorities suffer from a shortage of technical staff, an excess of administrative staff and very low procurement limits for contracted services. As a result, Law 221 has not yet delivered the expected efficiency gains in service delivery.

17. **The sector reform initiated with Law 221 does not address the fragmentation of responsibilities for investment planning and execution.** The Council of Development of Reconstruction (CDR) is the leading agency in charge of planning and executing donor-funded

5 As an illustration, the chairman of the Beirut and Mount Lebanon, the largest RWA, has the authority to spend only LBP 1.0 million (US$670) on procurement without bidding; beyond that, he has to follow bureaucratic procedures and red tape. See World Bank 2003.
water and wastewater investments. Several other agencies are involved in the planning and execution of investments. The MoEW takes responsibility for budget-financed investments. The RWAs may execute small capital works based on cash flow availability. The Council of the South (CoS) and the Central Fund for the Displaced (CFD) also play an important role in financing investment in water supply (see Figure 40). The CoS is responsible for the rehabilitation of the water supply network in the South region. The CFD is in charge of providing access to basic services, including water supply, to displaced households. Both the CoS and the CFD raise their finance through the issuing of government bonds. Investment responsibilities for water resource management and irrigation are also fragmented. The LRA is the leading agency in the planning and execution of irrigation investment; the CDR plays a minor role, mainly confined to the planning and executing of donor-funded irrigation investments.

18. **Policy making and investment planning and execution are not integrated.** Under the current institutional framework, there is no integration between policy-making and investment planning and execution in the WSS sector. The MoEW is responsible for setting the strategic direction of the sector; while the CDR is *de facto* leading the investment planning and execution, given that the bulk of the sector investment is financed by donors. The loose alignment of policy-making and investment planning and execution is accompanied by very weak inter-agency coordination.

19. **The current institutional setting suffers from coordination challenges.** Vertical coordination between the RWAs and CDR in the planning and execution of investment is very limited. Despite the recent efforts to strengthen coordination, the Water Authorities have still limited power to influence investment priorities within their service area. The lack of coordination is a major concern for the sustainability of the investments, given that the RWAs are responsible for the operation and maintenance of the assets. The lack of coordination has also resulted in inefficient sequencing of investments. For example, the Ba’albeck wastewater treatment plant was recently completed by the CDR with World Bank funding; however, upon completion the plant could not be operated because the sewer collection network serving the plants was not yet completed. Horizontal coordination between the MoEW and the CDR is also inadequate. The MoEW is not involved in the planning of donor-financed wastewater investment, which is undertaken by the CDR. However, upon completion, wastewater treatment (WWT) plants are handed over by the CDR to the line ministry, which is responsible for managing operation and maintenance. As a result of the lack of coordination and a lack of capacity to manage the plants, a number of WWTs have been built but are not yet operational.

20. **Central oversight over the water sector is weak.** The Ministry of Energy and Water (MoEW) is the main agency with oversight and regulatory power in the water sector, including water resource management. The MoEW exercises technical oversight ("tutelle") over the four RWAs, is responsible for pollution control, setting water standards, and enforcing legislation.

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6 The Council of Reconstruction and Development (CDR) was created in 1977 after two years of civil war in placement of the Ministry of Planning to coordinate the re-construction effort and to implement the associated investment programs in collaboration with line ministries.
Financial oversight over the four RWAs is jointly exercised by the MoEW and the MoF.\(^7\) The line ministry’s ability to perform oversight functions is however hampered by limited monitoring and enforcement capacity and the lack of appropriate legal and regulatory instruments – in particular in the area of water pollution control. In addition, the private segment of the water supply industry, in spite of its important market share, operates off the radar screen of the line ministry.

21. **The current regulatory instruments are inadequate to promote the sustainable management of water resources.** Laws and regulations governing water resource management are not up-to-date to deal with emerging issues such as acquired water rights. A pollution control strategy that provides the necessary legal and regulatory instruments to limit industrial discharges and other main sources of pollution has yet to be devised and implemented.\(^8\) There is no systematic national-level monitoring of groundwater quality, despite mounting evidence of quality deterioration due to over-abstraction.\(^9\) The regulation of groundwater abstraction, including the issuing of permits for well drilling, is currently not enforced, with 80 percent of wells reported as illegal.\(^10\)

22. **Weaknesses in the institutional framework can be explained in terms of accountability relationships between the main actors.** The report draws on the accountability framework developed for the World Development Report 04 to explain weaknesses in the institutional framework for water service delivery.\(^11\) Water services delivery in Lebanon highlights the two accountability routes discussed in WDR 04: a long and short accountability route. The long route of accountability relies on two control mechanisms, the *compact* and *voice*, to ensure efficient service delivery. Through *voice* in the political system, citizens hold government accountable for water service performance; policy-makers enter into implicit or explicit contracts (*compacts*) with service providers to define their respective obligations and rights for the delivery of water services. The short route of accountability relies on users to hold service providers accountable for service delivery (*client power*). In competitive sectors, users can exercise client power vis-à-vis service providers by “voting with their money”. This client power right is substantially reduced in situations of monopolies such as the delivery of water services (See Box 1 and Annex I).

23. **The new compact, which was set in motion by Law 221, has yet to deliver accountability for results.** Four main accountability weaknesses emerge from the institutional analysis of the WSS sector: the institutional uncertainty stemming from the un-finished reform agenda, the limited inter-agency coordination, the weak central government oversight and RWAs’ lack of management and financial autonomy. First, the institutional and legal framework that has emerged from the enactment of Law 221 has not been effectively enforced and implemented, thus leading to an unfinished reform agenda and creating institutional uncertainty over sector responsibilities. Second, the compact has also been weakened by inadequate inter-agency coordination, in particular between the line ministry and the CDR. Third, the

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\(^7\) Based on Article 4 of Law 221/2001, a Commission jointly established by the MoF and the MoEW is in charge of tariff approval and financial oversight of the RWAs.

\(^8\) World Bank 2003, p. 20.


\(^10\) Out of 50,000 wells, 40,000 are estimated to be illegal (World Bank 2003).

\(^11\) The accountability framework applied in the study is summarized in Box 1 and described in detail in Annex I.
implementation of a delegated model of service provision has not been complemented by a parallel effort to strengthen central government oversight over the water sector. Finally, and more importantly, Water Authorities cannot be held accountable for service provision as they are not yet empowered to function as autonomous entities.

Box 1: The Accountability Framework

Performance in service delivery is linked to the strength of accountability relationships among policy-makers, citizens and service providers. Based on the framework developed by the World Development Report 2004 (WDR04), performance in the delivery of basic services (water supply, education and health) is largely the product of the accountability relationships among policy-makers, citizens/users and service providers. Through voice, citizens hold government accountable for water service performance; policy-makers enter into implicit or explicit contracts (compacts) with service providers; and users can exercise client power vis-à-vis service providers by “voting with their money” (Figure 1). Weaknesses in any of the three accountability relationships are at the root of deficiencies in service delivery. In line with the WDR04, accountability is broadly defined to encompass the five elements of delegation, finance, performance, information about performance, and enforceability. The accountability framework applied to the study is described in detail in Annex I.

Water services can be delivered through two main routes of accountability. The long route of accountability relates to the vertical accountability mechanism between (i) citizens and policy-makers; and (ii) policy-makers and service providers. In the long route of accountability, the two control mechanisms of voice and compact ensure that services are delivered effectively to citizens. The short route of accountability is the direct accountability mechanism that links service providers to users. In the short route of accountability, users hold service providers directly accountable for service provision (Figure 1). The study explores two key accountability relationships in the water sector: the compact between policy-makers and service providers, and client power that hold service providers directly accountable to end users. An in-depth assessment of voice, the accountability relationship between policy-makers and citizen, although high relevant in the WSS sector, is however outside of the scope of this study.

Figure 3: WDR Accountability Framework

Source: WDR 04.
24. **Voice has not been strong enough to sustain the momentum for sector reforms**, following the enactment of Law 221/2000. The rapid loss of momentum for reforms is symptomatic of weak voice, the accountability relationship between policy-makers and citizens. Among the possible reasons of weak voice are diffuse political powers and social polarization over non-service issues. Empirical evidence finds that social polarization leads to voting based on social or ethnic identities rather than service delivery performance, and may indirectly limit political incentives to deliver public goods.12

25. **A second wave of institutional reforms is gaining momentum with the forthcoming enactment of a Water Code.** The recently drafted Water Code, prepared with assistance of the *Agence Française de Développement* (AFD), makes an attempt to address the institutional failures that have impaired progress in the sector.13 **First,** the Water Code calls for the establishment of a National Water Council (NWC), chaired by the President of the Council of Ministers (CoM) and comprising all institutional actors in the sector. The Council is expected to act merely as a consultative body on critical policy issues related to the sustainable development of the water sector.14 **Second,** the Water Code mandates the preparation of a six-year development plan for the water sector by the line ministry.15 **Third,** the Water Code re-states the need to apply the “user pays” and “polluter pays” principles consistently to the WSS sector, and restricts the use of government subsidies to the financing of capital investments with high social or environmental benefits. The Water Code allows subsidies to cover RWA’s deficits on an exceptional and transitory basis and prohibits cross-subsidies between the water and sanitation sector though this does sounds realistic.16

26. **The Water Code is un-likely to deliver the expected gains unless there is a strong political willingness to address the challenges facing the water sector.** In an institutional context characterized by weak accountability between policy-makers and service providers, the proposed NWC risks to become an additional institutional layer with limited leeway to improve sector coordination and align incentives. In addition, the preparation of sectoral development plans cannot be left to the sole responsibility of the line ministry as Lebanon shifts toward a delegated model of service provision. The Water Code does not however specify the roles that the CDR and the RWAs would play in the preparation and vetting of the six-year development plan for the sector.

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12 See, for example, Keefer and Khemani 2005.
13 Information based on the 2005 draft of the Water Code [10 December].
14 Article 2.1.1
15 Article 2.2.2
16 Article 4.1.2, 4.1.4 and 4.2.0.
CHAPTER III: WATER SECTOR PERFORMANCE

The performance of the water sector is not in line with the level of economic development in the country. Despite its relative good endowment of water resources, Lebanon is poised to face chronic water shortages year round by 2020 unless actions are taken to reform the water sector. The Regional Water Authorities suffer from inadequate technical, financial and commercial performance. Water tariffs are not linked to cost structure and demand, and do not provide incentives for demand management and increase in water production. The development of the wastewater sector is still at an embryonic stage.

27. This Chapter provides an overview of the supply-side performance of the water sector. The sub-sectors reviewed include: (i) water resource management; (ii) water supply; (iii) wastewater; and (iv) irrigation. The analysis is largely based on data provided by the four Water Authorities. Secondary data sources have been used to reconcile data inconsistencies. The results of the quantitative analysis need to be interpreted with caution given the data limitations and the inconsistencies across data sources. The main data sources and key data issues are summarized in Annex IV.

WATER RESOURCE MANAGEMENT

28. Lebanon is poised to face chronic water shortages from 2020, unless steps are taken to increase supply and manage demand. Lebanon is relatively well endowed with diversified water resources compared to its neighboring countries. Lebanon is among the countries with the highest total renewable water resources in the region, second only to Iraq and Iran (Figure 4). The country does nevertheless face water shortages during the dry season which extends over the four months of July and October. The main contributing factors of the seasonal water imbalance are the very low water storage capacity, the high amount of water lost to the sea, the growing demand for water and the deficiency of the existing water networks. If no actions are taken to improve efficiency and increase storage capacity, it is estimated that the seasonal imbalance of water resources will lead to chronic water shortages by 2020. (Figure 5)

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17 About 0.7 BCM of runoff rain water is currently lost to the sea every year.
18 See World Bank 2003. Water demand-supply balance is calculated based on the following assumptions: (i) Present Potable Water (PW) requirements per capita per day: 140 liters increasing annually by 2.5 percent; (ii) Leakage: 35 percent; (iii) Annual population growth rate: 2.5 percent; (iv) Industrial Water (IW) needs: 35 percent of PW requirements including losses; (v) Present Irrigation Water (IRRW) requirements: 9,000 m3/ha (including losses) decreasing to 8,000 m3/ha in 2030; (vi) Actual irrigation area in 2003: 90,000 ha; (vii) Planned irrigation area in 2030: 140,000 ha; (viii) Water needs during the dry season: 0.5 x PW+0.4 x IW+0.85 x IRRW; and (ix) Total available water during the four dry months: 45 percent of the total Annual Supply.
29. **Water demand over the next 20 years will be largely driven by the increase in domestic and industrial demand.** The composition of water demand is expected to change significantly over the next 20 years. Agricultural irrigation is currently the largest user of water resources, accounting for 64 percent of water demand in Lebanon. This trend is expected to be reversed over the next 20 years, as domestic and industrial water demand are anticipated to grow at about 5 percent per annum, much faster than irrigation water use, estimated to grow at about 1 percent per annum. Domestic water demand, which represents 25 percent of total demand, is expected to exceed irrigation demand by 2030, reaching 45 percent of total water use. In parallel, industrial water use is estimated to triple in volume by 2030. Domestic water demand is largely driven by increase in income and population, forecasted at 2.5 percent per annum; the surge in industrial demand is attributed to the growth in the tourism industry which has experienced a revival since the end of the hostilities (Figure 6 and Figure 7).
30. **The widespread recourse to unregulated private sources of water supply has accelerated the depletion of water resources.** The inadequacy of public water supply to meet the country’s growing water needs has led to a shift toward private solutions for water supply. In the absence of effective regulation and enforcement, reliance on private provision of water supply has accelerated the depletion of water resources, and has led to over-abstraction of groundwater. It is estimated that about 70 percent of wells are currently illegal due the lack of enforcement of licensing requirements (World Bank 2003).

**Water Supply**

31. **Public water provision accounts for only 25 percent of total sector revenues.** The largest share of sector revenues accrues to private operators. Virtually all connected households rely on a combination of public and private water supply to meet their daily water needs. Despite the critical role played by private operators, there is very limited reliable information that can be drawn upon to assess the private segment of the water market. Hence, a comprehensive assessment of the water sector, including off-network solutions, was not undertaken as part of this study. The sector performance is first benchmarked against comparators in the MENA region; the RWAs are then benchmarked against each other with respect to basic technical and financial indicators; finally, the cost structure and pricing policies of the four RWAs are discussed.

**Benchmarking of sector performance**

32. **Public network coverage is relatively high.** About 78 percent of the Lebanese population is connected to the public water network. Water service coverage in Lebanon is in line with the average in MENA countries (excluding GCC countries) (Figure 8). Connection rate ranges from 93 percent (BML) to 65 percent (North). The BML RWA is the largest public network, serving a population of 1.8 million and 60 percent of total connected households in Lebanon. (Figure 9 and Figure 10).
33. **but continuity of water supply is low.** In contrast with the relatively high connection rate, continuity of supply is low, ranging from 3 to 22 hours of daily water supply during the summer season (Figure 11). The BML RWA, which has the highest connection rate, only provides 3 hours of daily water supply in the summer season. The North RWA has the highest continuity of supply (22 hours). Tripoli, which accounts for about half of the total population in the North region, is the only urban area which benefit from 24 hours of daily water supply. The high continuity of supply in the Tripoli area is a result of the efficiency improvements delivered
by the private operator contracted by the North RWA under a 5-year management contract (see Box 2 for a review of the management contract).

![Figure 11: Continuity of Supply, by RWA Low and High Season (2008)](image)


34. **Water losses are above the optimal level.** An accurate estimate of physical water losses in Lebanon is not possible given the lack of metering. The consensus is however that water losses are well above the optimal level. The average level of losses across the four RWAs is estimated at about 40 percent, significantly above losses in Tunisia (20 percent) and Morocco (32 percent) (Figure 12). The high water losses are symptomatic of low operation efficiency and inadequate maintenance, as well as technical deficiencies due to lack of metering. Successful attempts have recently been made by the North and South Water Authorities to reduce unaccounted losses. The North RWA has managed to reduce water losses in Tripoli by contracting out O&M functions to a private operator during 2004-07. The four-year management contract with the private operator has led to sizeable efficiency improvements, and reduced water losses (see Box 2). The South RWA has taken a different approach to water loss reduction through the piloting of domestic metering in the city of Saida. The metering program is expected to be rolled out from the city of Saida to cover 75 percent of the connected population by 2013.19

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19 South Business Plan.
35. **Collection efficiency in the water sector is on average 70 percent, slightly below the MENA average of 80 percent** (Figure 13). The relatively high country average masks however significant variation across the Regional Water Authorities. Collection efficiency varies to a significant extent across the four Water Authorities, from 11 to 80 percent. On one hand, the BML is able to collect 80 percent of the billed revenues, in line with the MENA average. On the other hand, the Beka’a RWA collects only 11 percent of revenues (Figure 16 to Figure 19).
36. The Regional Water Authorities are not yet performing as financially autonomous entities, despite the progress made since their establishment. Before 2003, Water Authorities were receiving explicit government transfers to pay for their salary costs. Water Authorities were also delinquent on their electricity bills, with the exception of the BML RWA. Power charges were implicitly subsidized as no action was taken by the electricity provider to recover payment from the Water Authorities. Currently, Water Authorities are able to cover their salary costs and part of their power charges. Based on the latest information available, the Beka’a RWA is the only Authority which is still delinquent on its electricity payment. The BML RWA pays its electricity bill in full, while the other two WAs have been able to pay a part of their power charges. The MoEW is however indirectly subsidizing the O&M costs of the Water Authorities by managing service contracts for pumping stations under the jurisdiction of the RWAs. In 2009, USD 2.4 million was paid by the MoEW for service contracts in three RWA (North, South and Beka’a). The service contracts managed by the MoEW in the RWAs’ service areas are not reported in the balance sheets of the RWAs as subsidies, and are therefore not included in the financial performance analysis of the RWAs.

37. The BML Authority is the only utility that can recover its O&M costs. Financial performance varies to a significant extent across the four Water Authorities. The BML RWA is the only utility that is able to recover O&M costs from its annual revenues (Figure 14). The BML RWA’s working ratio compares favorably with other utilities in the MENA region (Figure 15). The North and South RWAs are able to recover O&M costs excluding power costs, which account for 43 and 50 percent of their total O&M costs respectively (Figure 21). Even excluding power charges, the Beka’a RWA is unable to recover its O&M costs. Including power costs, the Beka’a RWA has a working ratio of 7.5, which is the highest working ratio among the MENA utilities for which financial information is readily available.

### Figure 14: Working Ratio, by RWA (2008)

<table>
<thead>
<tr>
<th></th>
<th>With power charges</th>
<th>Without power charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>BML</td>
<td>0.4</td>
<td>2.9</td>
</tr>
<tr>
<td>North</td>
<td>1.9</td>
<td>0.6</td>
</tr>
<tr>
<td>South</td>
<td>1.4</td>
<td></td>
</tr>
<tr>
<td>Bekaa</td>
<td>0.6</td>
<td></td>
</tr>
</tbody>
</table>

Source: RWAs’ submissions. 2008 data unless otherwise stated. Note: the working ratio is provided with and without power charges for the 3 RWAs that are still not paying in full their electricity bills.

### Figure 15: Working Ratio, Selected MENA Utilities

<table>
<thead>
<tr>
<th></th>
<th>Working ratio (O&amp;M cost/revenues)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cairo</td>
<td>0.3</td>
</tr>
<tr>
<td>BML</td>
<td>0.4</td>
</tr>
<tr>
<td>Sana’a</td>
<td>0.7</td>
</tr>
<tr>
<td>Nablus</td>
<td>0.9</td>
</tr>
<tr>
<td>Casablanca</td>
<td>1.1</td>
</tr>
<tr>
<td>Damascus</td>
<td>1.1</td>
</tr>
<tr>
<td>South Lebanon</td>
<td>1.1</td>
</tr>
<tr>
<td>North Lebanon</td>
<td>1.4</td>
</tr>
<tr>
<td>Bekaa</td>
<td>7.5</td>
</tr>
</tbody>
</table>

The BML Water Authority is the most efficient of the four Authorities. In spite of the relatively high water losses (40 percent) and the low continuity of supply (3 hours/day in the summer season), the BML RWA is the best performing among the four Regional Water Authorities. The BML RWA is the only agency that can fully recover its O&M costs from collected revenues, and partially recover an allowance for capital expenditure (the O&M cost recovery ratio is 226%). Both connection rate and collection efficiency are in line with the average for MENA countries. Significant improvements are however necessary to bring the BML WA’s performance in line with MENA utilities in the area of water loss reduction and continuity of supply. The Beka’a RWA is the worst performing Authority in all performance areas. The low collection efficiency, at only 11 percent, and the high water losses (40 percent) are at the root of its very poor financial performance: only 13 percent of O&M costs are recovered through user fees (Figure 16 to Figure 19).

Note:
(1) Data sources: Connection rates are based on CDR 2002/03. The other indicators are based on RWA’s submissions and BP. All data are for 2008, with the exception of (a) the North RWA’s indicators, which are based on 2007 data, and (b) collection efficiency for the South RWA, which is calculated based on 2007 revenues.
(2) Power costs: The North RWA’s power cost is estimated based on the average power cost per connection reported by South and Beka’a RWA because of inconsistencies in the North’s data submission. See - Annex IV.
(3) Water losses: The country average level of water losses is estimated at 40 percent. No reliable water losses estimates are currently available for the individual RWAs - See Annex IV.
(4) O&M cost base: O&M costs include power charges.
Cost structure

39. **Power charges account for the largest share of O&M costs in three out of four RWAs.** Operation and maintenance costs range from 0.2-0.4 USD/m³. Operational costs (staff and other OPEX) account on average for 41 percent of O&M costs. Power charges are the biggest cost items for the South, North and Beka’a RWAs. However, until recently the three Water Authorities were not paying their electricity bills. As aforementioned, the Beka’a RWA is the only Water Authority that is still fully delinquent on its electricity bill (Figure 20 and Figure 21). Staff costs represent the biggest cost item for the BML RWA, despite a relatively low staff per 1,000 connection ratio, at 1.2 (Figure 22).

40. **In the absence of fully fledged financial statements, the study has relied on the utilities’ business plans for this part of the analysis. This is done for an illustrative purpose.** The South and BML RWAs report in their business plans an allowance for capital costs. The other two Water Authorities do not factor in capital costs in their revenue requirements. The BML RWA includes depreciation, debt service and a capital reserve fund allowance in its revenue requirement, for a total of 0.4 USD/m³. The South RWA adds a capital expenditure allowance to its cost base for a total of 0.1 USD/m³ (Figure 20). Despite the overall good financial performance, the BML cannot achieve full cost recovery when depreciation and debt service are added to the revenue requirements. Cost recovery averages about 82 percent when the capital cost allowance is included.

41. **The unit cost analysis suggests under-spending on maintenance and technical staff.** The relative low maintenance cost combined with the high water losses may indicate under-spending on critical expenditure items, in particular maintenance and technical staff. Based on best practice, maintenance costs should represent about 20-30 percent of total O&M costs. Maintenance expenditure currently represents the lowest cost item for the RWAs, accounting for...
about 14 percent of total O&M costs (Figure 21). Inadequate maintenance has an adverse impact on the sustainability of the capital program, and eventually leads to a deterioration of the asset value, and increased water losses. Second, the average number of staff per 1,000 connections is below the accepted norm of 2 staff/1,000 connections for the BML and South Water Authorities (Figure 22).\textsuperscript{20} The finding is consistent with the general consensus that shortage of technical staff is one of the main constraints to the efficient operation of the Water Authorities.

![Figure 22: Staff per 1,000 Connections, by RWA (2008)](image)

Source: Authors’ calculations based on RWAs’ submissions. 2008 data unless otherwise stated. Note: staff per 1000 connection cannot be interpreted as a measure of productivity in the context of Lebanon, given that the Water Authorities do not have yet full discretion on the hiring of technical staff.

**Tariffs and pricing policy**

42. **The unit price per m$^3$ of water sold is adequate to cover O&M costs.** The current domestic tariff structure is based on a fixed annual fee for a contractual volume of water of 1 m$^3$/day. The fixed annual fee for residential customers varies between 140,000 LBP (Beka’a RWA) to 200,000 LBP (BML RWA) – See Table 2. Based on total billed revenues, a unit price per m$^3$ of water sold is calculated taking into account the estimated level of water losses of 40 percent. The analysis shows that the unit price is sufficient to recover the unit O&M cost of service provision.\textsuperscript{21} The analysis thus suggests that low billing collection is the main contributor of the poor financial performance of the Water Authorities. A notional unit price is also calculated based on an efficient level of leakage (20 percent). The difference between the actual and notional unit price represents the premium that customers are paying for the higher than optimal level of leakage. The highest premium is paid by customers in the BML region, where the difference between notional and actual unit price is USD 0.4/m$^3$ (see Annex III for a detailed description of tariff structures for water, wastewater and irrigation).

\textsuperscript{20} Libhaber 2009.

\textsuperscript{21} Note that the unit price is calculated based on tariff and water sold to residential households, given that tariff information for industrial customers is not available for all RWAs.
Table 2: Water tariffs by RWA (annual fees, LBP)

<table>
<thead>
<tr>
<th></th>
<th>BML</th>
<th>North</th>
<th>South</th>
<th>Beka’a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual fee</td>
<td>200,000</td>
<td>180,000</td>
<td>175,000</td>
<td>140,000</td>
</tr>
<tr>
<td>(based on 1m³/day)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gauge maintenance</td>
<td>35,000</td>
<td>10,000</td>
<td>25,000</td>
<td>20,000</td>
</tr>
<tr>
<td>Total</td>
<td>235,000</td>
<td>190,000</td>
<td>200,000</td>
<td>160,000</td>
</tr>
</tbody>
</table>

Note: does not include government VAT (10 percent) and stamp fee (1,000 LBP).
Source: RWA submissions.

Figure 23: Unit Price versus O&M Costs, by RWA (2008)

Source: Authors’ calculations based on RWAs’ submissions.
Note: Unit price (USD/m³) is calculated by dividing total billed fixed fee for residential customers (i.e. fixed fee multiplied by number of connections) by the total water sold to HH (assuming 40 water losses). The notional unit price is calculated as above assuming an efficient level of leakage (20 percent).

43. **Tariffs are de-linked from both consumer demand and the economic cost of service provision.** The accountability failures that have been discussed in the previous Chapter are certainly at the root of the poor performance in the water sector. However, technical conditions, first and foremost the current pricing structure and the lack of metering, have also contributed to misalign incentives in the sector. Water tariffs are based on a flat fee (see Annex III). The current pricing structure creates a “double jeopardy” where the current tariff system does not provide incentives for demand management or irrigation efficiency improvements, nor does it provide commercial incentives for Water Authorities to reduce water losses and increase water production (as increase in water production would not be associated with increase in revenues). This mis-alignment of incentives results in rationed demand for a significant segment of the customer base, high water losses, and ultimately poor utilities’ financial performance.

**Private sector participation**

44. **Private sector participation, in the form of a management contract, has delivered significant efficiency improvements in the Tripoli urban area.** The North Water Authority has experimented with private sector participation to improve operational efficiency in the
Tripoli area. The Water Authority delegated to a French company the management of water distribution, O&M, and billings collection for the potable water system in Tripoli on a trial basis for the period 2003-2007. The most remarkable achievement of the private operator has been the significant reduction of water losses and the extension of 24 hours of daily supply to the entire urban area of Tripoli due to upgrade and rehabilitation of the network. However, the private operator was unable to increase billings collection to the cost-recovery level, despite its effort to recover fee arrears. The parties were unable to reach an agreement for the extension of the management contract, which ended in 2007. The difficulty of operating in an uncertain institutional environment was identified by the private operator as the key issue that contributed to the failure of the contract re-negotiation (see Box 2 for a comprehensive assessment of the management contract).

**Box 2: The Ondeo-Liban Contract in the Urban Community of Tripoli**

A unique example of a private company contracted by the Government for the provision of water services in Lebanon is represented by Ondeo Liban, which operated in the Urban Community of Tripoli between 2003 and 2007. The company (since renamed Suez Environment) was selected following an international bidding launched by CDR in 2002 to take over the services of the Tripoli Office of Water Services (OET). The water management contract with Ondeo Liban was signed within the framework of the Law 401 of 2000. Among the key objectives of the contract were (i) the increase in continuity of supply, (ii) the guarantee of potable water quality and (iii) operating cost coverage within the first year of the contract (and progressively of all costs). Sanitation was not included in the contract as it was not under the responsibility of the former OET.

Tripoli is the second-largest city in Lebanon and its urban area comprises 400,000 inhabitants, i.e. close to 10 percent of Lebanon’s population. Despite the complex institutional environment in which it had to operate, Ondeo-Liban achieved some significant results. The most remarkable achievement was the reduction of water losses from 65 to 45 percent in the last period of the contract, as a result of the creation of leakage detection teams and increased network rehabilitation. Another success was the elimination of the 10-year long water rationing in the areas of Qalamoun, Qobbe and Abi Samra, thus reaching a 24/hour/day potable water distribution service throughout the Tripoli urban area. Water quality was also improved. To better respond to the needs of its clients and increase confidence among subscribers, Ondeo-Liban created a 24/hour/day operative customer service line. Systems in place in the former utility were modernized and the staff qualifications were enhanced through training programs.

Despite an increase in water tariffs operating cost recovery was not achieved. The improvement in service quality and the strong effort to recover fee arrears, fine delinquent subscribers and regularize illegal connections (a census of all water subscribers was conducted throughout the duration of the contract), did not increase billing collection efficiency significantly. The metering program did not take-off in the period 2003-2007, although 40,000 meters were acquired.

Some of the obstacles faced by Ondeo-Liban can be attributed to the unstable political phase in Lebanon during the duration of the contract, which according to the company itself reduced its ability to collect customer fees. The fee recovery strategy was also somewhat weakened by the decision in 2005 of the North Lebanon WA, in agreement with MoF, to grant 70 percent discounts on customer payment arrears and fines.

Overall, the experience of Ondeo-Liban in the Urban Community of Tripoli is to be considered positive. In a difficult institutional context such as the Lebanese water sector, the quality of water services was improved in many aspects and the number of water subscribers increased. These results are encouraging and suggest that private operators have a role to play in the sector. However, an agreement with the company to extend the management contract after the expiration in 2007 was not found. The sustainability of the efficiency improvements is therefore at risk, as management of the Tripoli urban water supply network is transferred back to the North WA. The inability to renew the partnership with the private operator proves that the institutional reality of the WSS sector, characterized by government interference and lack of clear responsibilities, is a significant deterrent for sustainable partnerships with international private operators.

*Sources:* CDR 2007; North Lebanon RWA-Ondeo Liban 2006.
45. **The development of the wastewater sector is still at an embryonic stage.** Regional Water Authorities have yet to take full responsibility for wastewater collection and treatment. The un-finished reform agenda has contributed to institutional uncertainty and fragmentation of functions. Wastewater services are *de facto* provided and financed by municipalities through own-source revenues and small private sector operators. Whereas the large municipalities generally have sewerage networks, a large number of small cities lack such infrastructure. In addition, most of the networks are very old, either damaged or undersized. For these reasons, wastewater collection coverage is insufficient, averaging just 58 percent nationwide and varying widely across regions (Figure 24).

| Figure 24: Wastewater Collection Coverage, by RWA (2002) |
|------------------------|--------|--------|--------|--------|
| Country average = 58%  |
| BML                   | North  | South  | Bekaa  |
| 74                    | 45     | 35     | 41     |

Source: CDR 2002/03.

46. **Wastewater treatment facilities are in severe shortage and most of the collected raw wastewater is discharged untreated.** Despite efforts in the recent years to increase the amount of wastewater treatment facilities, there are still few treatment plants in operation, all of which are small. Several larger WWT plants have been developed (in coastal areas) by the CDR, but are not yet operational because of limited capacity and unfinished water supply network. The CDR hands over WWT plants, once they are completed, to the MoEW. The MoEW is responsible for managing the operation and maintenance of the plants, as the RWAs do not have yet the capacity to operate them. In practice, the MoEW contracts out operation and maintenance to the private sector or municipalities. Latest data from the RWAs suggests that there are currently 24 primary treatment plants in Lebanon, of which however only 12 primary are operational, 6 in Beirut-Mount Lebanon and 6 in the Beka’a. The Ba’albeck wastewater treatment plant financed by the World Bank to serve about 15,000 people was completed in 2000, but is not yet operational due to delays in the construction of the network. Secondary

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22 Previous studies reported three treatment plants in operation in the South Region. These may no longer be running due to the damages suffered in the 2006 Israeli bombings. The sources of information are the RWA submissions and the World Bank 2007b for the South WA.
treatment is inexistent for the time being, although the pre-treatment plant of Ghadir, located South of Beirut is being currently upgraded for secondary treatment.

47. **The cost to the environment of wastewater discharges is high and no mitigation measures have been taken.** Due to the lack of treatment facilities, collected wastewater and industrial wastes are currently discharged without treatments into rivers, vacant land and the Mediterranean. The cost of environmental degradation caused by untreated wastewater discharges is estimated at more than 1 percent of GDP (World Bank 2004b). So far, no major measures have been taken to mitigate the high environmental costs: monitoring of water quality is not under-taken systematically, regulatory instruments are inadequate to meet the sector challenges, and enforcement capacity is low.23

**IRRIGATION**

48. **Water storage capacity is inadequate to meet irrigation water demand.** Water storage capacity is far below the level of other MENA countries: dam capacity accounts for only 5 percent of total renewable water resources in Lebanon, against 56 percent in Morocco and almost 300 percent in Egypt (Figure 25). The lack of adequate water storage capacity is a constraint for irrigation water demand, which accounts for more than 60 percent of total water consumption. The planned investments in water resource management are expected to increase irrigation potential by 30-50 percent by 2030, and to lead in turn to a significant increase in agriculture production. The expansion in the irrigated areas is expected to prompt an increase in high-value crops for the international markets. Concerns have however been raised about the feasibility of the planned investment program given the low absorptive capacity of the sector and the fiscal pressures faced by the country. If fiscal or implementation constraints become binding, the downsizing of the investment program will require a coordinated initiative to prioritize investments, as planning and execution responsibilities are shared between the MoEW and the LRA.

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49. **About 50 percent of irrigation schemes suffer from lack of proper maintenance.** There are several organizations responsible for O&M in the irrigation sector. Given the fragmentation of the sector, pricing policies vary to a significant extent depending on the scale of the irrigation scheme and the agency involved. A systematic evaluation of the scheme performance cannot therefore be conducted given the lack of accurate data. A review of 45 schemes conducted by the World Bank in 2003 provides however valuable information on the performance of the schemes. Large irrigation schemes operated by LRA achieve full cost recovery thanks to the surplus of revenues generated by the power business. About 50 percent of small and medium irrigation schemes suffer from lack of proper maintenance. Many small schemes, which are operated by Local Water Committees, do finance part of O&M costs, and are generally well maintained, especially when farmer groups are involved (World Bank 2003). The review suggests that the formal establishment of Water User Associations as a platform to involve farmers in the maintenance of irrigation schemes could significantly improve the sustainability of irrigation investments.

50. **The financial autonomy of the LRA largely depends on a cross-subsidy between hydro-power and water supply.** Revenues generated from irrigation are inadequate to cover their O&M costs. Despite recent improvements, the working ratio is still close to 3, well above cost-recovery level. The power business is instead generating surplus revenues, with an average working ratio of 0.2. Failure to recover irrigation costs is largely due to the pricing policy, as tariffs are currently set below cost recovery level. In 2007, the unit irrigation tariff amounted to less than half of unit O&M costs. (Figure 26 and Figure 27).
Figure 26: LRA Working Ratio, Irrigation and Power, 2004-07

Figure 27: LRA Unit Cost versus Price, Irrigation, 2004-07

Source: Authors’ calculations from LRA submission.
CHAPTER IV:
THE WATER SECTOR:
SOCIAL IMPACT ANALYSIS

Availability, rather than affordability, is the main constraint for consumer welfare in the water sector. Client power is virtually non-existent given lack of metering. Households rely extensively on unregulated off-network private solutions, which account for 75 percent of total household water expenditure.

51. This Chapter largely draws on the Poverty and Social Impact Assessment (PSIA) data survey recently conducted in the water and electricity sector. The PSIA survey provides a wealth of information on household spending patterns and quality of service provision in the water and electricity sector.\(^{24}\) However, spending and consumption patterns cannot be jointly assessed at the household level given the virtual lack of metering in Lebanon. The available PSIA data nevertheless provides a useful picture of equity and affordability patterns in the water sector.

52. Reliability of water supply, rather than affordability, is the main constraint for consumer welfare. Reliability of public water supply is a widespread concern across all household expenditure groups, regardless of their level of income (Figure 28).\(^{25}\) Variations in the availability of public water supply are largely explained by regional network capacity, rather than affordability.\(^{26}\) The North Water Authority has the best performance in term of continuity of supply, with no unmet demand. The Beirut-Mt. Lebanon region, which is densely populated and has the highest level of network coverage, is severely constrained in their capacity to provide continuous water supply, as shown by the high level of un-met demand during the dry season (Figure 29).

\(^{24}\) The PSIA survey is based on a sample of 1,800 households. The sample is representative at the regional level. See World Bank 2009. “Social Impact Analysis: Electricity and Water Sector” for a detailed description of the sampling methodology.

\(^{25}\) Definition of quintiles is based on per capita expenditure. For convenience, income and expenditure are used inter-changeably in this report.

\(^{26}\) Note that low-income households are less likely to be connected to the public network than high-income households: in the lowest quintile 62 percent are connected to the network, compared with 86 percent for the highest quintile. However, the correlation is largely explained by variation in regional coverage (Figure 9).
53. **Un-met demand from public water supply varies considerably across regional networks.** Un-met demand measures the extent to which connected customers face rationing of public water supply. Un-met demand is estimated as the difference between the reported hours of daily water supply and the hours required to meet households’ basic daily water needs. Customers of the Beka’a RWA face the highest un-met demand, and would require additional 9 hours of public water supply to satisfy their daily demand during the dry season (Figure 29). Customers of the North RWA are instead satisfied with the number of hours of daily water supply provided by the utility throughout the year. The findings are consistent with the supply-side assessment of continuity of supply across the four RWAs (see Figure 11).

54. **Private water supply accounts for 75 percent of total household water expenditure.** The rationing of public water supply for domestic consumption has led to significant growth of private sources of water supply. Private water supply account for 65 percent of total water expenditure of connected households. If un-connected households are included, household spending for private supply solutions reaches 75 percent of total water expenditure. The most prominent sources of private water supply, in terms of expenditure share, are private bottled water (gallons) (35 percent), followed by delivery trucks (21 percent) and small water bottles (16 percent). (Figure 30) Bottled water (gallon) account for the highest share of water expenditure for both connected and un-connected households (33 and 40 percent respectively). (Figure 31 and Figure 32).
55. **Connected households served by the BML RWA spend a higher share of their income for water consumption (3.4 percent) than households connected to the other networks.** Budget shares for public water supply are broadly homogeneous across the 4 RWAs, ranging from 0.8 to 0.9 percent. The spending patterns for private water supply vary instead considerably across RWAs. For example, based on the PSIA results connected households served by the BML RWA spend 0.8 percent of their income for truck delivery of private water; while households served by the North RWA do not rely to a significant extent on this source of private water supply. Because of these distinct private spending patterns, there is considerable variation in the household budget shares for total water consumption (i.e. including public and private sources) across the four RWAs. Connected households served by the BML RWA have
the highest expenditure level (USD 535/year) and share (3.4 percent). The Beka’a RWA has the lowest (USD 243/year and 1.7 percent) (Figure 33).27

<table>
<thead>
<tr>
<th>Figure 33: Budget Share, by RWA and Water Source (2008), Connected HH</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BML</strong></td>
</tr>
<tr>
<td>Public network</td>
</tr>
<tr>
<td>1.1</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>0.9</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations based on PSIA survey data.

56. **Water expenditure is overall within affordable limits.** Combined water expenditures for public network and private sources of water supply ranges from 3.7 percent (bottom quintile) to 2.8 percent (top quintile). Given the current flat pricing structure, expenditure for public water supply is not related to the level of income, and range from USD 132 to USD 149/annum across the four RWAs. However, households in the top quintile spend almost three times as much for private water supply than for public water supply. Overall, the annual expenditure shares are within the 5 percent affordability limits for connected households.28 The expenditure shares for un-connected households are slightly higher, ranging from 5.6 percent (second quintile) to 2.5 percent (top quintile). Budget shares are close to affordability limits for un-connected households in the second income quintile. Note that the 5 percent affordability benchmark is generally defined to include both water and wastewater expenditure. In the case of Lebanon, no end user charges are currently levied for wastewater (Figure 34 to Figure 37).

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27 Data is available for the following number of connected households: 616 (BML), 113 (North WA), 209 (South WA), 182 (Beka’a WA). Statistics for the North RWA need to be treated with caution, given the relatively low household response rate (50 percent).

57. **but the sector raises serious consumer welfare concerns.** Despite the relatively low budget shares, the sector raises serious consumer welfare concerns given the (i) lack of consumer power; and (ii) the over-reliance on un-regulated and highly priced off-network private water providers. In particular, the over-reliance over non regulated off network providers further exposes low income households to water carried diseases or opportunistic behaviors from these private providers.

58. **Consumers have virtually no power to decide their preferred level of water consumption or control their water bill.** Consumers do not have the option to adjust their water consumption in line with their optimal demand. The lack of consumer power is a major deterrent to improvements in supply-side performance, and also raises welfare concerns. First, the inability to control consumption is particularly detrimental to low-income households. Second, the lack of alternative payment options, other than the annual payment modality based on a fixed fee, is an added burden for low-income households.
Over-reliance on off-network private provision of water services leads to negative social impacts in the absence of regulation. Private provision of water supply is currently unregulated. Price and quality are therefore entirely determined by market conditions. The capacity of private operators to engage in rent-seeking practices depends on the strength of competition, which is likely to vary by geographic area and market segment. Where competitive forces are weak because of high entry barriers, private operators have the flexibility to differentiate prices in line with fluctuations in water demand. A temporary surge in demand during the dry season, when public water supply is at the lowest, could lead to escalating prices for private water supply. While seasonal adjustment of prices to respond to demand changes is a common commercial practice, it can raise equity considerations when applied to essential services, such as water supply. Given the limited data available, the extent to which private operators are able to engage in such practices is currently unknown. However, the scope for rent-seeking behavior by private operators is likely to increase as the demand-supply balance tightens further. Low-income customers are most likely to be affected by un-regulated private provision, as they may have a more limited range of supply options and may therefore be relegated to the low-quality end of the private water market.

Consumption of gallons and bottled water remains relatively low despite the high level of expenditure. The unit price of private water solutions range from 3-6 USD/m³ (delivery truck) to USD 400-500/m³ (small water bottles), well above the average unit price for public water supply (USD 0.3-0.8/m³). Table 3 and Figure 38 below report annual household expenditure and estimated consumption by source of water supply for the average representative connected household. Consumption is estimated based on the average unit price for the different supply options. The analysis shows that consumption of bottled water and gallon water is extremely low despite the high level of expenditure. For example, average daily consumption per person of gallon water is 0.5 liters. This implies that a small increase in the level of consumption for gallon water would lead to a significant increase in expenditure. It is for example estimated that doubling the current consumption level (i.e. a half a liter increase in the consumption of gallon water) would lead to a 37 percent increase in total water expenditure for the average household.

Table 3: Estimated Consumption and Expenditure, Connected Household, by Water Source

<table>
<thead>
<tr>
<th></th>
<th>Price range (USD/m³)</th>
<th>Annual household expenditure (USD/HH/Year)</th>
<th>Estimated Consumption (l/pc/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public water supply</td>
<td>0.3-0.8</td>
<td>112</td>
<td>187</td>
</tr>
<tr>
<td>Delivery trucks</td>
<td>3-6</td>
<td>72</td>
<td>10</td>
</tr>
<tr>
<td>Gallons</td>
<td>100-220</td>
<td>143</td>
<td>0.5</td>
</tr>
<tr>
<td>Bottles</td>
<td>440-500</td>
<td>72</td>
<td>0.1</td>
</tr>
</tbody>
</table>

29 Private operators have the option to engage in such practices given the lack of price control. There is however no empirical evidence to prove that price differentiation is in fact occurring.

30 The estimated price range for private water supply options is provided in PSIA 2008.
Note: Price range for private supply sources is from World Bank 2009. Consumption level is estimated based on the average price and average household size is 4.4. Expenditure and consumption for public water supply is calculated based on RWA submissions.

Despite the high cost of alternative private solutions, consumers are unwilling to pay more for public service provision. The opportunity costs of failing public sector provision are high, amounting to about USD 307 million, equivalent to the total annual household cost for private water provision.\(^\text{31}\) Despite the potential savings associated with increase volume of public water supply, consumers reported that they are now unwilling to pay more for public service provision when presented with a scenario of better quality and sufficient supply to meet their demand (PSIA, 2008). Low willingness to pay is symptomatic of low confidence and trust in the Regional Water Authorities, and should be interpreted as an expression of dissatisfaction with the current public service. The low willingness to pay calls for a more pro-active strategy for engaging consumers in the reform process.

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\(^{31}\) Opportunity costs are the additional private costs incurred by households to cope with the inadequacy of public water supply. A proxy for opportunity costs is the annual household costs for private water provision, as most of these costs are of averting nature. However, some households, especially in the upper quintiles, may choose to drink water bottles regardless of the quality/availability of public water supply. The opportunity cost valuation is therefore likely to be an upper-bound estimate.
CHAPTER V:  
PUBLIC EXPENDITURE ANALYSIS

In Lebanon, public investment in the water sector amounts to about 0.5 percent of GDP (2008 prices), below the optimal level (estimated at about 0.8 percent of GDP). There is significant scope for improving public expenditure efficiency in the sector given the low execution ratio of CDR investment. The pipeline of CDR projects over the period 2009-2013 amounts to more than USD 1 billion. Planned capital expenditure may be too ambitious given the current implementing capacity and may need to be scaled down based on sector priorities.

Despite the recent improvements in the fiscal position of the country, the fiscal space for increasing infrastructure investment is limited. Public capital expenditure in Lebanon averages about 3 percent of GDP, far below successful comparator countries. There is widespread consensus that any further reduction in capital expenditure below the 3 percent minimum threshold will most likely reduce economic growth. On the other hand, the public sector is constrained by fiscal pressure, despite the recent decline in the debt-to-GDP ratio from 175 percent in 2006 to an estimated 150 percent in 2009. There is therefore limited fiscal space for increasing infrastructure investment over the coming years. In this context, the priority is to increase capital efficiency within the current budget envelope and correct institutional failures that greatly reduce the effectiveness of capital expenditure. These priorities also apply to the water sector, where improving efficiency of capital expenditure will be a necessary step to meet the growing investment needs.

Public investment in the water and wastewater sector has been inadequate to meet sector development needs. Based on a top-down approach (expected demand of water and sanitation infrastructure for a given level of economic growth), investment needs in the water and wastewater sector are estimated at about 0.8 percent of GDP for the average Middle Income Country in MENA region (the estimate include investment and maintenance costs for water and wastewater; irrigation investment are excluded). In Lebanon, public investment in the water and wastewater sector amounts to about 0.4-0.5 percent of GDP (2008 prices), below the optimal level of investment. Average public annual capital expenditure in the water and wastewater sector is estimated at about USD 128 million (Figure 40). Maintenance expenditure in the

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32 Tunisian and Jordanian public capital expenditures amount to about 7 percent of GDP. See World Bank 2005.
33 IMF 2009. Article IV Consultation.
35 Public capital expenditure figures for water and wastewater include: (i) CDR’s annual executed water and wastewater capital expenditure (average over the period 1994-2008); (ii) MoEW’s “annual executed water expenditure (average over the period 1992-2002); and (iii) annual water capital investment executed by the Council of the South and the Central Fund for the Displaced (average over the period 1992-2002). The CDR’s capital expenditure over the period 1992-94 is not representative of the investment trend, because in 1992-94 the CDR program was still very small, as discussed later in the Chapter. The capital expenditure for CDR is therefore calculated over the period 1994-2008. Recent investment data (for the period 2002-08) for the other agencies are not available. All figures are converted in 2008 prices for consistency.
water sector accounts for an additional USD 10 million\textsuperscript{36} Small scale private providers have played a significant role in filling the “public expenditure gap” in the WSS sector. Private provision of water has substituted public provision to the point that revenues accrued to private operators exceed revenues raised by the four RWAs.

64. **Responsibilities for public WSS expenditure are highly fragmented.** Four agencies are responsible for capital expenditure in the WSS sectors. CDR is the leading agency, which manages the bulk of the investment program through donor funding with government contributions. The MoEW manages a small investment program funded by the central budget. The CoS has responsibility for rehabilitating the water supply network in the South region. Its capital program is funded through government bonds. RWAs may occasionally fund small capital works based on cash flow availability. The CFD is entrusted with responsibility for reintegrating displaced population and providing them with access to basic services. The Fund may therefore be involved in the financing of capital investment in the water sector. O&M expenditure are even more fragmented. O&M are largely under the responsibility of the RWAs, with financial support from the MoEW (through implicit subsidies, such as non-payment of electricity bill, and direct support, through the procurement of service contracts). Figure 39 below summarizes the main flow of funds in the WSS sector, and the responsibilities of the key agencies. The rest of the Chapter presents an overview of public expenditure patterns by agency and sub-sector, with a focus on the efficiency of public spending.

36 Maintenance expenditure in the water sector is estimated at about 9 USD million for the RWA (2008) and about 1.4 USD million for the MoEW (2000-2009). Maintenance expenditure data in the wastewater sector is not available. However, expenditure is estimated to be minimal given that only a few large plants are in operation.
Public capital expenditure program

65. Since 1994, public capital expenditure has been primarily directed to water supply, which absorbed 68 percent of total investment. Wastewater and irrigation received respectively 23 percent and 9 percent of total capital expenditure (Figure 40). In water supply, CDR has executed the largest share of investment (46 percent) followed by the CoS and the CFD, which accounted for 16 and 14 percent respectively of total CAPEX. In the wastewater sector, the entire capital expenditure program the wastewater sector has been delivered by the CDR.


66. CDR accounts for the bulk of investment in the WSS sector. Over the period 1994-2008, 42 CDR projects were signed on average each year in the WSS sector for a total annual contract amount of USD 98 million. In five peak years, the annual value of signed contracts exceeded USD 150 million: 1994, 1997, 2000, 2001 and 2005. Excluding peak years, the average annual value of contract signed amounts to USD 61 million, for an average number of 30 signed projects per year. The CDR capital program in the WSS sector kicked off in 1994, when 41 projects were signed for a total contract value of USD 182 million (Figure 41 and Figure 42).
CDR is highly dependent on donor funding for the financing of its investment, and cannot therefore fully control its expenditure patterns. The lumpiness of the expenditure patterns can be partially explained by the uncertainty surrounding donor funding. Seventy three percent of total CDR investment over the period 1992-2008 has been funded by foreign sources; the share is slightly lower in the wastewater sector, with 56 percent of total investment financed by foreign funds (Figure 43 to Figure 46). A multitude of international donors have participated to the investment program in the water supply and wastewater sectors. The World Bank, European Investment Bank, Kuwait and France have been the primary international contributors to the water supply investment program, whereas Islamic Development Bank, Japan and again France and the European Investment Bank have been the major financers of wastewater investment. Few international donors have been active in funding irrigation investments in
Lebanon. The World Bank had played a major role providing over three quarters of foreign funding to the sector, followed by the Arab Fund for Economic and Social Development.

**Figure 43: CDR Investment, Source of Funding (1992-2008)**

Source: CDR submission.

**Figure 44: Water Supply, Foreign Funding by Donor (1992-2008)**

Source: CDR 2008

**Figure 45: Wastewater, Foreign Funding by Donor (1992-2008)**

Source: CDR 2008

**Figure 46: Irrigation, Foreign Funding by Donor (1992-2008)**

Source: CDR 2008

68. **The lack of a comprehensive capital expenditure plan negatively affects the ability to prioritize projects based on the sector needs.** In the aftermath of the civil war, a water sector investment plan was prepared as part of the “National Emergency Recovery Program” (NERP) approved by the Council of Ministers and delegated to the CDR for implementation. In practice, water development plans have proliferated since the 1990s – most of which have not been subject to inter-ministerial debate or government approval. Projects outside the NERP have often been prepared by the CDR based on short-term priorities and availability of donor financing. The Horizon 2000 program designed by the CDR in 1993-94 never received government approval but was nevertheless implemented piecemeal through program laws voted by the Parliament. In parallel, the MoEW drafted the 1999 Master Plan, a ten-year plan for the development of water resources. There is little coordination between the CDR and the MoEW in the planning of the investment. The lack of a consolidated WSS sectoral investment plan, and the limited coordination across agencies, greatly diminishes the ability to identify and select projects with the highest economic rates of return based on rigorous technical and economic criteria.37

69. **The sector’s investment absorptive capacity is low.** Absorptive capacity is an important measure of the efficiency of capital execution. The mismatch between capital outlays approved or in the pipeline and capital expended is indicative of low absorptive capacity. If on the one hand, CDR’s project disbursement ratio (disbursement over projects signed) has been above 70 percent in all three sectors over the period 1992-2006, the ratio of project approval (signed projects over the sum of signed and planned projects) has been low in all sectors, highlighting a backlog of projects in the pipeline. As a combination of these two ratios, the execution ratio (disbursement over the sum of signed and planned projects) shows a low absorptive capacity across all sectors. Capital expenditure has been consistently below planned and approved capital outlays. Only 55 percent of planned and approved capital expenditure has been executed over the period 1992-2006 in the water sector. The percentage of executed investments is even lower in the wastewater sector (20 percent). In the irrigation sector only 19 percent of approved capital expenditure materialized over the period 1992-2006 (Figure 47).

<table>
<thead>
<tr>
<th>Figure 47: Share of CAPEX Approved, Disbursed and Executed by sector (1992-2007)</th>
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<tbody>
<tr>
<td><strong>Water Supply</strong></td>
</tr>
<tr>
<td>Share of CAPEX approved, disbursed or executed</td>
</tr>
<tr>
<td>Project Approval Ratio</td>
</tr>
<tr>
<td>Project Disbursement Ratio</td>
</tr>
<tr>
<td>Project Execution Ratio</td>
</tr>
</tbody>
</table>

Source: CDR 2008 and CDR submission.

37 World Bank 2007b.
70. **Investment execution ratios vary significantly across regions.** A breakdown of the investment execution ratio by region shows that absorptive capacity in the Beirut-Mount Lebanon, North and South RWAs is above the country average. In the South region, 70 percent of planned and approved expenditure was disbursed. In the Beka’a region, however, the ratio of capital executed is as low as 26 percent, well under national average. The North region has the highest share of disbursed capital expenditure in the wastewater sector, at 29 percent. Wastewater investments channeled to the Beka’a region have the lowest execution ratio, with only 7 percent of planned and approved expenditure being disbursed (Figure 48). It is worth noting that the RWAs have currently limited input in the execution of project investment; the significant difference in the investment execution ratio across regions cannot therefore be attributed to differences in implementing capacity across RWAs. More research needs to be undertaken to understand fully the reasons behind the low execution ratio and the stark variations across regions.

![Figure 48: Share of CAPEX Executed by Region (1992-2006)](source: World Bank 2007b)

71. **About 70 percent of CDR investment in the water supply sector is channeled to two regions, the Beirut Mount Lebanon and the North,** based on 1992-2006 data. The Beirut Mount Lebanon region has the largest public water network in Lebanon, serving 60 percent of total connected households. During the period 1992-2006, the BML region received the largest amount of CDR’s capital expenditure for both water and wastewater (29 percent of total investment). The Beka’a region has benefited from the lowest level of CDR investment, amounting to only 6 percent of the total (Figure 49).

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38 The information on execution ratios broken down by region is for the period 1992-2006. Data for year 2007 was not available. This explains the slight differences in the national water supply and wastewater execution ratios presented in figure 47.
There is a disconnect between the planning of capital investment and maintenance expenditure. The lack of coordination in the planning of maintenance and capital expenditure negatively affects the sustainability of public investment in the water and wastewater sector. The RWAs are responsible for maintaining the capital investments executed by the CDR. In practice, they are ill-equipped to perform this function. First, the Water Authorities are not directly involved in the execution of the public investments, and may not therefore budget for the increase in maintenance costs required to match the increase in the asset base. Second, they have limited leeway to mobilize additional resources for maintenance through user fees. Maintenance expenditure accounts for only 14 percent of total O&M expenditure by the RWAs, below optimal level (20-30 percent of O&M costs) (Figure 20 and Figure 21). Given the low capacity of the RWAs, the MoEW continues to be involved in the operation and maintenance of the water sector. In the wastewater sector, institutional responsibilities for asset maintenance are even more diffuse. Completed projects are handed over by the CDR to the MoEW for O&M, as the RWAs do not have yet the capacity to take over responsibilities for managing the plants. The line ministry contracts out the O&M of the plants to either municipalities or the private sector. In the irrigation sector, it is estimated that over one-half of irrigation schemes in Lebanon do not have adequate O&M.

73. Since 2000, MoEW spends on average USD 2.5 million per annum to support the operation and maintenance of water supply networks. In 2003, O&M expenditure reached a peak of USD 4.7 million, and included the salary costs of the Water Authorities. Starting from 2004, the MoEW stopped subsidizing the salary costs of the Water Authorities, which are now fully responsible for paying salary costs. Since then, the MoEW is mainly involved in the management of service contracts for the water supply networks. The funds are not transferred to the RWAs, but managed by the Ministry, which is responsible for the procurement of the service contracts. In 2009, USD 2.5 million was disbursed to procure nine service contracts for pumping stations in three RWAs. It is difficult to assess the extent to which maintenance is adequate to whether the ex O&M budget of the MoEW is likely to be small compared to the needs of the sector, given the low maintenance expenditure incurred by the RWAs.

<table>
<thead>
<tr>
<th>Figure 50: MoEW O&amp;M Water Expenditure, by RWA, 2000-2009</th>
</tr>
</thead>
<tbody>
<tr>
<td>Million USD (Constant 2008)</td>
</tr>
<tr>
<td>Source: MoEW submission. The data only include O&amp;M costs associated with the running of the water supply networks. Recurrent costs such as salaries and power charges for the Ministry office are not included.</td>
</tr>
</tbody>
</table>

**Planned investment**

74. The pipeline of CDR projects over the period 2009-2013 amounts to more than USD 1 billion (an average of USD 255 million). Sixty-three percent of the planned capital expenditure is in the water sector in line with past expenditure trends (the water sector accounted for 54 percent of executed CDR expenditure over the period 1994-2008). The pipeline show an increase in investment channeled to water supply network in the BML region, which is expected to receive 64 percent of the planned investment (against about 36 percent of the executed investment over 1994-2008). 19 percent of the planned water investment is for the North and 16 percent for the Bek’a’a region. No investment is planned in the water sector in the South region. Planned wastewater projects are more equally distributed across regions. 38 percent of the planned expenditure will be directed to the BML region; the remaining planned investment is distributed as follows: the North 29 percent, the South 20 percent and the Bek’a’a region 13 percent. (Figure 51 and Figure 52).
75. **The pipeline of CDR projects may be too ambitious given current implementation capacity.** The feasibility of the planned capital expenditure program depends on two factors: (i) the ability of the CDR to secure donor funding and receive project approval; and (ii) the capacity of the CDR to implement approved projects. The average value of signed contracts (USD 101 million) over the period 1994-2008 and the low execution ratio of past investments suggest that the pipeline of projects may be too ambitious. The sustainability of a large wastewater investment program is also questionable given high number of completed wastewater treatment plants currently not yet operational. The program may therefore needs to be resized to account for internal constraints discussed earlier. In the wastewater sector, priority should be given to completing the current investment program by making WWT plants operational (e.g. sewer collection network).

<table>
<thead>
<tr>
<th>Figure 51: Planned CDR Water Supply Projects (2009-2013), USD million</th>
<th>Figure 52: Planned CDR Wastewater Projects, (2009-2013), USD million</th>
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</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Graph" /></td>
<td><img src="image2.png" alt="Graph" /></td>
</tr>
</tbody>
</table>

Source: CDR submission.  
Source: CDR submission.

76. **The irrigation investment program aims to increase irrigation capacity by 30-50 percent over the period 2003-2030.** The MoEW and LRA plan to implement an ambitious irrigation investment program through 2030, amounting to a total of USD 48 million per annum. The program is expected to increase the irrigation potential of Lebanon by 30-50 percent. Sixty percent of the MoEW irrigation investment program is dedicated to the construction of new dams, the remaining 40 percent to the modernization of the distribution network for the proposed dams. Concerns have however been raised regarding the feasibility of the investment program. The 2003 Irrigation Note, produced by the Bank, recommends scaling down the investment program to a more manageable level of about USD 35 million per annum, which is more in line with the implementation capacity of the country. This is confirmed by the fact that LRA’s executed capital expenditure over 2004-07 amounted to only USD 7 million, far below the planned investment amount.
CHAPTER VI:  
THE WATER SECTOR: THE COST OF INACTION

The total costs of inaction in the water sector are estimated at about 1.8 percent of GDP, or 2.8 percent of GDP if one includes the cost of environmental degradation caused by the discharge of non-treated wastewater. The private opportunity costs of inadequate public water supply provision amount to 1.3 percent of GDP. Hidden costs to the Government are conservatively estimated at about 0.5 percent of GDP, above the annual investment in the water sector (0.4 percent of GDP). Low collection efficiency is the main source of hidden costs, accounting for 46 percent of the total hidden costs.

The sector-wide costs of failing public water supply are high, and hidden costs are above the annual level of investment in the sector. The total costs of inaction in the water sector are estimated at about 1.8 percent of GDP. Households bear the largest share of the costs. The private opportunity costs of inadequate public water supply amount to 1.3 percent of GDP (USD 308 million), equivalent to the domestic expenditure for private water supply. The hidden costs for the Government (i.e. the implicit financial burden associated with water supply sector inefficiency) are conservatively estimated at 0.5 percent of GDP (USD 122 million) - this is likely to be a lower-bound estimate as it is based on a conservative estimate of water losses in the sector (40 percent) and efficient unit costs. Hidden costs in the water sector are above the annual level of investment in the sector (estimated at 0.4 percent of the GDP, maintenance included). Note that the operational transfers (service contracts managed by the line ministry) are relatively small, accounting for USD 3 million, compared to the hidden costs in the sector (Figure 53). The cost of inaction is even higher than our estimated amount if one adds the cost of environmental degradation caused by untreated wastewater discharges. Doing this increases the cost of inaction from 1.8 to 2.8 percent of the GDP.

40 The investment component of the cost-recovery tariff is estimated based on the capital expenditure per connection incurred by BML Water Authority, as reported in the Business Plan (USD 70/connection). The capital expenditure per connection is multiplied by total connections to obtain an estimate of the level of CAPEX for the other 3 RWAs. It is possible that the investment cost reported by BML under-estimate the optimal investment requirement for the network. Water losses are also conservatively estimated. The estimated hidden cost is therefore a lower bound estimate.
Low collection efficiency is the main contributor of hidden costs, followed by water losses. There are three main sources of hidden costs: low collection efficiency, below-cost recovery level and physical water losses. A description of the methodology used for the hidden cost analysis is provided in Annex V. In Lebanon, the main source of hidden costs is collection efficiency, which accounts for 46 percent of the total hidden costs. Water losses are the second contributor, accounting for 40 percent of hidden cost. Below cost-recovery tariffs accounts for the remaining 15 percent of the hidden costs. The results of the hidden cost analysis are consistent with the findings of the supply-side performance of the WSS sector, in particular the fact the poor financial performance of the RWAs is mainly due to the inability to collect revenues and the high water losses associated with lack of metering, rather than the level of the water tariffs (Figure 20). The results of the hidden cost analysis need however to be interpreted with caution given the uncertainty surrounding the level of water losses in Lebanon (Figure 54).

The BML accounts for the largest share of hidden costs. The BML RWA accounts for 42 percent of total hidden costs in the water sector. The findings are explained by the large

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**Figure 53: The Cost of Inaction (2008), Water Sector**

<table>
<thead>
<tr>
<th>Component</th>
<th>USD million</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private cost (Opportunity cost)</td>
<td>122</td>
</tr>
<tr>
<td>O&amp;M subsidies (Service contracts)</td>
<td>3</td>
</tr>
<tr>
<td>Hidden cost</td>
<td>308</td>
</tr>
</tbody>
</table>

Source: World Bank’s calculations based on RWA submissions.

**Figure 54: Hidden Cost, by Component, USD million and Share of Total**

- Poor collection efficiency, 45%
- Water losses, 40%
- Below cost recovery tariff, 15%

TOTAL Hidden Cost: $124m (0.5% of GDP)

Source: World Bank’s calculations based on RWA submissions.
customer base of the BML RWA, which is the biggest WA, serving 60 percent of total connected households. Water losses are the main estimated source of hidden cost for the BML RWA (56 percent). The South RWA accounts for 27 percent of the sector hidden costs, below its share of total domestic connection (18 percent). Poor collection efficiency is the main source of hidden cost for the South RWA (53 percent). The Bek’a RWA accounts for 13 percent of the hidden cost, above its share of domestic connections (9 percent). The LRA’s cross-subsidy between power and water supply account for 2 percent of hidden costs (Figure 55 and Figure 56).

<table>
<thead>
<tr>
<th>Figure 55: Hidden Water Cost, by RWA (2008)</th>
<th>Figure 56: Hidden Water Cost Breakdown, by RWA (2008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Image of pie chart showing distribution of hidden costs by RWA]</td>
<td>[Image of bar chart showing breakdown of hidden costs by RWA]</td>
</tr>
<tr>
<td>TOTAL Hidden Cost: $124m (0.5% of GDP)</td>
<td>Source: World Bank’s calculations based on RWA submissions.</td>
</tr>
</tbody>
</table>

CHAPTER VII: CONCLUSIONS AND POLICY RECOMMENDATIONS

Increasing continuity of water supply to achieve 24/7 provision across the country is the top priority for the water sector. Efficiency improvements in the water sector can generate sufficient resources to close the investment gaps in the WSS sector. This will require a broad range of actions to support investment prioritization, implementation of Law 221, utility management and information management.

80. **Improving continuity of water supply to achieve 24/7 provision across the country is the priority for the water sector.** Despite connection rates within the regional average, public water supply falls short of consumer needs. Continuity of supply is low and sensitive to seasonal fluctuations in rainfall. Particularly severe is the situation in the Beirut Mount Lebanon region, where in the summertime water supply averages barely three hours per day. Comparable MENA countries such as Tunisia and Morocco have achieved 24/7 water supply continuity in their main cities. It is time for Lebanon to push forward its reform process and concentrate efforts towards achieving similar standards. The total costs of inaction in the water sector are estimated at about 1.8 percent of GDP. The private opportunity costs of inadequate public water supply provision amount to 1.3 percent of GDP. The hidden costs to the Government are conservatively estimated at about 0.5 percent of GDP, above the annual investment in the water sector (0.4 percent of GDP).

**Box 3: The Costs of Reducing Water Losses**

**Investment requirements to achieve 24/7 water supply.** The solution to delivering 24/7 water supply is a mix of rehabilitation of old assets (e.g. to fix leaks in old pipes and service connections), new assets (e.g. improved network layout, creation of district meter areas for leakage management), and significantly improved distribution system management. Reducing system losses to an efficient level is a necessary condition to reach 24/7 water supply. The cost of leakage reduction can therefore be assumed as a lower-bound cost estimate of achieving 24/7. However, leakage reduction may not be sufficient to deliver uninterrupted water supply depending on the conditions and the service life of the assets. Some cities may need to replace a significant portion of their distribution network to achieve 24/7 standards. This was for example the case in the pilot towns of the Indian State of Karnataka, where delivering 24/7 entailed the replacement of the entire distribution network.

**The unit cost of physical water loss reduction.** There is very little empirical evidence available on the actual unit cost of physical leakage reduction activities - i.e. how much it costs to reduce leaks by one cubic meter of water on a daily basis. A recent study conducted in 2006 by Kindgom et al. reviews a number of leakage reduction performance-based service contracts in the State of Selangor (Malaysia), Bangkok (Thailand), Sao Paolo (Brazil) and Dublin (Ireland). The case studies provide a variety of unit costs for physical loss reduction, ranging from US$215 in Selangor (Malaysia, Phase I of the contract) to US$ 750 in Dublin for each cubic meter of water saved. Thus the study suggests that the unit cost in developing countries of saving one cubic meter per day of water would be in the range of $215 to $500 per cubic meter per day (excluding the Dublin case). Such a variation in unit costs across contracts is explained partly by different network characteristics and by differences in the cost of labor and civil works across borders, but also by how efficiently contracts were implemented.

**An estimate of the cost of reducing water losses in Lebanon.** Based on the unit costs obtained in the case studies described above it is possible to attempt an estimate of the cost of reducing water losses in Lebanon. Considering the current level of water losses of around 40 percent and assuming an increase in the amount of water imputed in the system only proportional to the population growth, the cost of reducing leakages to an efficient level of 20 percent...
of water production ranges between 50 and 117 million USD (based on a unit cost of 215 USD/m³ and 500 USD/m³ respectively).

A realistic timeframe for the implementation of such rehabilitation program could be of approximately 10 years. This is just a rough estimate, as the limited empirical available does not allow for a more accurate estimate of the cost of reducing water losses. The figures mentioned can served as a proxy, but must be used with caution. A thorough analysis will need to be undertaken to accurately estimate the cost of reducing water losses in Lebanon, prior to undertaking any rehabilitation program.

2. Note that although reducing leakages will increase water supply, this is unlikely to be sufficient to reach the 24/7. Increasing supply hours would lead to a proportional increase in physical water losses, resulting from longer leaks run time and higher pressure. Thus an investment program aiming at reducing water losses to achieve 24/7 standards in water delivery would likely need to be significantly more ambitious.

Source: authors based on Kindgom et al (2006)

81. In parallel to the increase in water supply, it is crucial to increase volumes of wastewater collected and treated. The costs of environmental degradation caused by the discharge of non treated wastewater are estimated of 1 percent of GDP. Today, many treatment plants under construction have reached, or are approaching, completion, but the capacity to operate them is so far largely lacking. As the water supply increases and volumes consumed rise, it will be of crucial importance to increase the volume of wastewater treated.

82. Improving efficiency in the water sector can generate sufficient resources to close the investment gaps in the WSS sector. Lebanon has limited fiscal space for increasing public WSS expenditure. In this context, improving efficiency is the priority to meet the development needs of the sector. Reducing hidden costs can free up sufficient resources to close the investment gap in the WSS sector (0.3-0.4 percent of GDP) within a framework of fiscal responsibility. This will require reducing water losses and increasing collection efficiency, the two main sources of inefficiency in the water sector.

83. Improving sector efficiency requires a broad range of actions to support investment prioritization, implementation of Law 221, utility management and information management. The rest of the Chapter describes the actions that can be taken in the short-term (1 year), medium-term (1-2 years) and long-term (> 2 years) to move the sector toward more
sustainable outcomes. The proposed policy interventions are summarized in the policy matrix (Table 4).

**Investment Prioritization**

84. A well targeted investment program is essential to achieve increased continuity of water supply. The priority is to ensure full alignment of the pipeline of investment projects with sector goals. Projects currently under preparation that can serve to achieve the objective of increasing water supply should be prioritized. In the short-term a “targeted investment plan” could be envisaged, focusing on: (i) the reduction of water system losses, through the rehabilitation of the water supply; networks and the installation of meters; (ii) the expansion of water storage facilities to allow the stabilization of water supply year round; and (iii) the expansion of water treatment and storage facilities to cope with the requirements for a 24 hours service.

**Implementation of Law 221**

85. Ensuring the effective implementation of Law 221 is the entry point for improving sector performance. The unfinished reform agenda is at the core of poor sector performance. Further improvements in capital and operational efficiency cannot be achieved unless the institutional reforms initiated with the enactment of the Law 221 are fully implemented. The study identifies four critical policy actions to move the institutional agenda forward:

- Provide the Regional Water Authorities with the autonomy needed to perform the functions bestowed upon them by the law. Following the enactment of Law 221, the RWAs have not been granted the administrative and financial autonomy required to effectively operate and maintain water supply networks. In the short-term, the priority is to: (i) empower the RWAs to act as autonomous entities in critical areas such the hiring of technical staff and the procurement of works; and (ii) build the technical capacity of the RWAs to operate and maintain wastewater treatment plants. In the medium-term, Water Authorities should be in a position to take on full responsibilities for operation and maintenance of the water supply networks. This will allow the phasing out of the service contracts managed by the MoEW – implicitly a subsidy to the Water Authorities. The capacity building program, associated with the increased autonomy, will enable the RWAs to take over responsibility for wastewater collection and treatment in the long-term.

- Enhance inter-agency coordination. The complete devolution of WSS services to RWAs is bound to be a lengthy process, as it entails a complete shift in the modus operandi of the Water Authorities, from arms of government to autonomous entities. Fragmentation of responsibilities is therefore likely to be the institutional reality of the WSS sector in the transition phase. The priority is to improve inter-agency coordination to enhance the efficiency of public spending. In the short-term, better horizontal coordination is needed to ensure an effective sequencing of investment (e.g. between wastewater treatment plants and sewer networks) and the alignment of O&M and capital expenditure for wastewater treatment plants (wastewater treatment plants are planned and executed by the CDR and handed over to the MoEW for O&M). In the medium-term,
strengthening vertical coordination would ensure more effective participation of the RWAs in the planning and execution of water supply investments.

- **Reinforce the MoEW’s oversight and regulatory powers.** As the autonomy of the RWAs is reinforced, the MoEW will have to strengthen its role of sector regulator. It is therefore critical that the MoEW develops the instruments and the enforcement powers required to perform its regulatory functions. In the medium-term, strengthening oversight and enforcement powers over water resource management, in particular ground-water abstraction will be a priority given the tightening of the demand-supply balance and the high share (70 percent) of illegal wells. Also, as the autonomy of the RWAs increases, the MoEW may consider taking steps to strengthen its regulatory oversight vis-à-vis RWAs, in critical areas such as financial performance, operational efficiency and water quality. In the long term, a water regulatory entity or agency could be established. This will allow introducing mechanisms for regulating some aspects of the private WSS market, with respect to quality of service, and the sustainable use of water resources.

- **Gradually transfer execution of capital works to the RWAs as they strengthen their capacity.** In the short- to medium-term, the priority is to empower the RWAs to operate as autonomous entities in critical areas, such as the hiring of staff, and complete the transfer of O&M functions for water supply to the RWAs. In the long-term, investment responsibilities need however to be rationalized. Best practice calls for gradually transferring the execution of capital works to the RWAs under the oversight of the line ministry. Central agencies would retain responsibility for planning and implementing large-scale investments spanning across regional networks. The CDR would surround responsibilities for the execution of investments, but would retain the core function of mobilizing fiscal resources as interface between donors and line agencies and overseeing project implementation.

**Utility Management**

86. **Institutional reforms need to be complemented by utility management improvements to strengthen client power.** Unless clients are empowered to hold Water Authorities accountable, institutional reforms are un-likely to deliver the expected improvements in service provision. Reinforcing client power requires complementing the reform agenda with utility management reforms, first and foremost a country-wide metering program and consumption-based tariffs. The following actions are recommended:

- **Gradually introduce metering and volumetric tariffs.** Transitioning to metered water supply and volumetric pricing policies will provide the Water Authorities with the commercial incentives for decreasing water losses and increasing water production. In parallel, the introduction of a volumetric tariff structure will provide users’ incentives for demand conservation. Metering will significantly increase the scope for system efficiency by providing valuable data to inform technical and financial decisions. As sector performance improves, Water Authorities will be able to gradually align tariffs to cost-recovery levels, and move toward financial autonomy. In the long-term, Water Authorities could also experiment with different tariff structures, such as Increasing-Block-Tariffs, to further promote demand conservation.
- **Rationalize subsidies, while addressing equity objectives.** The cost analysis suggests that physical water losses and low collection efficiency are the two major sources of inefficiency in the water supply sector. Increasing the tariff level is however not an option in the immediate future given the low willingness-to-pay for public water supply. In the short-term, operational subsidies are therefore needed as transitional measures to support Water Authorities until the efficiency gains of sector reforms materialize. Currently operational subsidies to the RWA are provided both implicitly (through lack of enforcement of payment of electricity bills) and explicitly (through the central procurement and management of service contracts for pumping stations). In this context, transitioning to smart subsidies, such as output-based subsidies, could speed up the technical and financial turnaround of the sector and the phasing out of the subsidies by providing the Water Authorities with monetary incentives for efficiency improvements.

- **Partner with small-scale private water providers.** In the *short-term*, there may be limited scope for traditional forms of private sector participation in the WSS sector. The un-finished WSS institutional agenda is a major deterrent for private participation in the sector, as proved by the failure to extend the management contract in Tripoli, despite the important efficiency improvements delivered by the private operator. Lebanon has nevertheless the opportunity to tap into a large domestic market characterized by small-scale private operators active in both water supply and wastewater collection. Private water supply accounts for 75 percent of the total market revenues, and small-scale private operators are already active in wastewater collection. While off-network private solutions currently prevail, small-scale network private operators could prove to be a viable solution in remote areas, where the cost of network connection is prohibitive. Partnerships with small-scale domestic private operators could also support the RWAs in the operation and management of parts of the water supply network.

**Information Management**

87. **Improving the availability of accurate and consistent information is crucial for effective decision-making.** This study has highlighted the severe data limitations and inconsistencies to which it was confronted. There is no systematic compilation of water sector performance and public expenditure. Available information on sector performance is often outdated (connection rates) or missing (water losses). RWAs do not prepare financial statements and their accounts are not audited. There is also very limited reliable information that can be drawn upon to assess the private segment of the water market, despite the critical role it plays in the delivery of WSS delivery. Going forward, good policy formulation and implementation will be challenging without reliable sector statistics and information. The following actions are recommended:

- **Enhance sectoral data management capacity and systems.** Readily available and accessible sectoral information will provide stakeholders with an accurate picture of the state of the water sector in Lebanon, allowing decision-makers to draw informed conclusions to appropriately orient the reform process. In the *short-term* the collection and management of data is to be strengthened at RWA level, through capacity building programs and the use of improved information systems. In the *medium-term,*
comprehensive information will need to be compiled and maintained within MoEW, as part of its regulatory functions, and made readily available to all stakeholders.

- **Rationalize public expenditure data.** The collection and maintenance of aggregate fiscal statistics in Lebanon is complicated by the existing budget system whereby the foreign financing of capital expenditure, representing close to three quarters of total investments in the water sector, is kept separate from the general budget. This makes it difficult to link current and capital expenditure and gather a comprehensive picture of public expenditure flows. This situation is further aggravated by the fact that general budgetary process is stalled in Parliament, with no general budget approved since 2005. In this context, in the short-run a clarification of roles of the various agencies involved in the collection and dissemination of water sector statistics is recommended, as it would serve to identify gaps and redefine responsibilities towards a more reliable and effective data management system. In the medium-term a dedicated unit could be created within the MoEW with adequately trained staff working in synergy with all agencies in the sector, with the objective to collect, update and maintain public expenditure data in the water sector.
### Table 4: Policy Matrix

<table>
<thead>
<tr>
<th></th>
<th>Short-term (0-1 Year)</th>
<th>Medium –term (1-2 Years)</th>
<th>Long-term (&gt; 2 Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Investment Prioritization</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Align project pipeline with sector goals</td>
<td>- Develop a “targeted investment plan” focusing on: (i) the reduction of system losses, through the rehabilitation of water supply and installation of meters, and; (ii) the increase of water storage capacity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Implementation of Law 221</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| b) Strengthen administrative and financial autonomy of RWAs | - Empower RWAs to act as autonomous entities in the hiring of technical staff and the procurement of works.  
- Gradually build technical and financial capacity of RWAs to manage wastewater sector. | - Complete the transfer of O&M responsibilities in the water sector to RWAs by phasing out service contracts managed and procured by the MoEW. | - Transfer responsibilities for WW collection and treatment to RWAs. |
<p>| c) Enhance inter-agency coordination |                                                                                                                                                        |                                                                                                                                               |                                                                                                                                               |
| (c.1) Horizontal coordination | - Ensure coordination between MoEW and CDR in the sequencing of investment (e.g. WW plants and sewer collection network) and the alignment of O&amp;M and capital expenditure for WWT plants. |                                                                                                                                               |                                                                                                                                               |
| (c.2) Vertical coordination |                                                                                                                                                        | - Strengthen involvement of RWAs in the planning and execution of investment.                                                             |                                                                                     |
| d) Reinforce central oversight |                                                                                                                                                        | - Enhance regulatory oversight                                                                                                               | - Introduce mechanism to                                                                                                                   |</p>
<table>
<thead>
<tr>
<th>Short-term (0-1 Year)</th>
<th>Medium –term (1-2 Years)</th>
<th>Long-term (&gt; 2 Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>regulate some aspects of private water markets (e.g. water quality).</td>
</tr>
<tr>
<td>e) Rationalize investment responsibilities</td>
<td></td>
<td>- Transfer investment execution to RWAs.</td>
</tr>
<tr>
<td></td>
<td>- Rationalize investment responsibilities</td>
<td>- Strengthen oversight and enforcement powers over water resource management.</td>
</tr>
<tr>
<td></td>
<td>f) Reform tariff policy based on user pay principles</td>
<td>- Work with central authorities in the implementation of the metering program.</td>
</tr>
<tr>
<td></td>
<td>- Transition from flat fee to demand-base volumetric rate both in water and irrigation.</td>
<td>- Mainstreaming of user pay and polluter pay principles in water, irrigation, wastewater sectors.</td>
</tr>
<tr>
<td></td>
<td>- Mainstreaming of user pay and polluter pay principles in water, irrigation, wastewater sectors.</td>
<td>- Introducing increasing block tariffs to promote water conservation.</td>
</tr>
<tr>
<td></td>
<td>- Transition to output-based or smart subsidies to Water Authorities.</td>
<td>- Subsidies incorporated in tariff structures (e.g. lifeline tariffs) based on equity considerations.</td>
</tr>
<tr>
<td>g) Rationalize subsidies while addressing equity considerations</td>
<td></td>
<td>- Partnerships with small-scale / domestic private providers, both off- and on-network.</td>
</tr>
<tr>
<td>h) Partner with private operators</td>
<td></td>
<td>- Introduce legislative changes making the implementation of PPP a viable policy option.</td>
</tr>
<tr>
<td></td>
<td>- Gradual transition toward traditional forms of Public-Private Partnerships (e.g.</td>
<td>- Gradual transition toward traditional forms of Public-Private Partnerships (e.g.</td>
</tr>
<tr>
<td></td>
<td>Short-term (0-1 Year)</td>
<td>Medium –term (1-2 Years)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Information management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Enhance sectoral data</td>
<td>- Strengthen sectoral data collection and management at RWA level, through capacity</td>
<td>- Build MoEW’s capacity to consolidate and disseminate regional sectoral data, as part</td>
</tr>
<tr>
<td>management systems</td>
<td>building programs and the introduction of improved information systems.</td>
<td>of its regulatory functions.</td>
</tr>
<tr>
<td>j) Rationalize public</td>
<td>- Clarify role of the various agencies involved collection and dissemination of public</td>
<td>- Create dedicated unit within the MoEW with adequately trained staff working in synergy</td>
</tr>
<tr>
<td>expenditure data</td>
<td>expenditure data in the water sector, in order to identify gaps and redefine</td>
<td>with all agencies in the sector, with the objective to collect, update and maintain</td>
</tr>
<tr>
<td></td>
<td>responsibilities towards a more reliable and effective data management system.</td>
<td>public expenditure data in the water sector.</td>
</tr>
</tbody>
</table>


ANNEX I:  
THE ACCOUNTABILITY FRAMEWORK FOR SERVICE DELIVERY

**Accountability:** The WDR 2004 adopts a broad concept of accountability. It defines accountability as a relationship among actors with five features: delegation, finance, performance, information about performance, and enforceability. Weakness in any aspect of accountability can result in service failure – for example, tightening enforceability is unlikely to have any impact on performance without proper delegation of functions.

**Accountability relationships in public service delivery:** In the chain of public service delivery, three main actors are linked in relationships of power and accountability: politician/policy-makers, service beneficiaries and service providers. The accountability relationships among the key actors can be summarized as follows: citizens exercise voice over politicians; policy-makers have compacts with service providers; and service beneficiaries exercise client power vis-à-vis service providers (see Figure below).

The “short” and “long” accountability routes: Service providers can be made directly accountable to clients by passing decisions and powers directly to citizens or communities—a “short route” of accountability based on client power. More typically, the public sector is involved, and two key relationships—voice and compacts— make up the main control mechanism of the citizen in a “long route” of accountability.

**Voice:** the term voice expresses the complex relationships of accountability between service beneficiaries as citizens and politicians. The voice relationship includes both formal political mechanisms (political parties and elections) and informal ones (advocacy groups and public information campaigns). Informed voters, credible politicians and cohesive societies are the sine qua non conditions for strong voice. When one of these conditions does not hold, politicians do not have the incentives to pursue public policies in the general public interest, and the accountability relationship breaks down. For example, social polarization can lead to voting based on social or ethnic identities rather than service delivery performance, and may indirectly limit political incentives to deliver public goods. The effect of social polarization on political incentives partially accounts
for the negative empirical relationship between social fragmentation and the delivery of public good. A number of policy interventions can be designed to strengthen voice: the most common are information strategies, which narrow the information gap between policy-makers and citizens, and political decentralization, which bring politicians closer to the citizens.

**Compact:** Policy-makers can discharge their responsibility for service delivery by engaging in a variety of institutional arrangements, such as direct production or contracting out to private agencies. Regardless of the chosen institutional arrangement, a clear separation between policy-makers and service providers is necessary to create accountability for results. The accountability relationships between policymakers and service providers can be thought of as compacts. The compact is not always as specific and legally enforceable as a contract, though a contract can be one form of a compact. The budget is the critical link on the long route of accountability connecting citizens to providers through politicians and policymakers. In a weak compact, the roles of policy-makers and service providers are blurred, and service providers’ incentives are not aligned with the outcomes that policy-makers need to deliver to citizens. There are different reform options that can strengthen the compact, such as decentralization and effective public expenditure management. If effectively implemented, decentralization of service provision can strengthen the accountability relationship between the parties by separating policy-makers from service providers. Public expenditure management is a powerful tool to strengthen the compact as it allows achieving three desirable outcomes that underpin effective services: aggregate fiscal discipline, allocative efficiency and equity, and operational impact.

**Client Power:** Improving client power can overcome weaknesses in the long route of accountability. Clients are for example often better positioned to monitor service providers than central government agencies. The greater the differences among service beneficiaries—their heterogeneity—the more that direct client power is likely to have an advantage relative to the “long route.” The more effective way to increase client power is by giving clients the choice to “vote with their feet” or “vote with their money” depending on the type of public service. In a market transaction, competition forces provide clients with the power to choose the service providers that best meet their preferences. The introduction of competition in the market may not be feasible for most public services. However, client choice can be broadened through un-conditional household transfers, such as vouchers in education, or technical solutions, such as the metering of consumption in the water sector. Devolution of service provision can also help increase client power, by bringing service providers closer to beneficiaries.
ANNEX II:
INSTITUTIONAL MAPPING OF SECTOR RESPONSIBILITIES

National

Ministry of Electricity and Water – The Ministry of Energy and Water (MoEW) has jurisdiction over the water resources in Lebanon. It is responsible for strategic planning of water resource management, including the preparation of the water master plan, conservation of surface and groundwater resources, as well as the design and implementation of large projects and dams. The MoEW has oversight of the RWAs in the areas of planning and formulation of strategies for water monitoring and distribution. It is responsible for setting specifications of water development and services, establishing regulations for supervision, evaluating the quality of water services, and approving water tariffs and pricing mechanisms (World Bank 2003). 42

Other line ministries share responsibilities in the water sector: the Ministry of Public Health (MoPH) shares responsibilities with MoEW in the area of water quality monitoring. The Ministry of Environment (MOE) is responsible to fight pollution from all sources by taking protective measures including conducting studies regarding ways and means for waste and wastewater treatment. The ministry is also responsible for setting water standards, permitting the establishment of various classified establishments and enforcing legislation (World Bank 2003).

Council for Development and Reconstruction – The CDR is the principal economic and physical planning and development agency of the central government. Established in 1977 by DL No. 5 after a period of conflict, it acts today as a sort of Ministry of planning. Among its main functions are: (i) the preparation of general plans for the country, investment and implementation programs for reconstruction and development projects; and (ii) the mobilization of external financing for priority projects within the investment plans (www.cdr.gov.lb). DL No. 5 also gave CDR the responsibility of selecting, in cooperation with line ministries, the institution or combination of institutions required for implementation of projects financed by donors.

Regional

Regional Water Authorities – Law No. 221 (29/5/2000) consolidated the previously existing 22 water authorities and 209 local water committees into four Regional Water Authorities (RWAs): (i) North Lebanon Water Establishment located in Tripoli; (ii) Beirut and Mount Lebanon Water Establishment located in Beirut; (iii) South Lebanon Water Establishment located in Saida; and (iv) the Bekaa Water Establishment located in Zahlé. The geographic areas served by the RWA largely coincide with the regional

42 Source: Water PER, Section 3; Irrigation Water Note, p.30
boundaries. The main exception is the Nabatieth region, which is part of the South RWA. The law puts the four newly created RWAs in charge of managing drinking water, wastewater and irrigation. They are responsible for the study, implementation, exploitation, maintenance and renewal of potable water, wastewater and irrigation projects. They are empowered to propose tariffs levels that can achieve cost recovery and “reasonable profits”, aiming at encouraging private sector participation in the establishments’ operations. The RWAs are also responsible for monitoring the quality of drinking water and irrigation water. Officially “public establishments”, i.e. corporate bodies with financial and administrative autonomy, the RWAs operate under the supervision of the MoEW, which is responsible inter alia for defining the composition (and remuneration amounts) of the RWAs’ board of members, to then be approved by the Council of Ministers. Financial oversight is jointly exercised by the MoEW and the MoF. The RWAs have legally the autonomy to elect the most appropriate model of service delivery, in line with the principles of equity, competition and transparency. They can either opt for the direct operation of the assets (gestion directe) or further delegate service provision to public and/or private agencies.

Litani River Authority – The Litani River Authority (LRA) was formed in 1954 to facilitate the integrated development of the Litani River Basin, including potable water, irrigation and hydropower investment. The Litani River Authority is the only water authority to retain special responsibilities and functions that extend beyond its administrative region (the natural boundaries of the Litani basin). Given this particular status, LRA was kept in existence by Law 221 which explicitly confirms its responsibility to develop and managing irrigation water and associated works in the southern Beka’a and South Lebanon. It is also in charge of measuring surface water along the Lebanese territory.

Council of the South – The Council of the South (CoS) was created in 1970 with responsibilities in the area of the infrastructure development and rehabilitation in South Lebanon region. It reports directly to the Prime Minister. Its area of operation is vast, ranging from water (including the construction of wells) electricity, roads, schools, health clinics and hospitals. It is responsible for the rehabilitation of the water supply network in the South region. It also provides financial aid for families that have been affected by conflict. The Council raises its finances through the issuance of government bonds.

Central Fund For the Displaced – The Central Fund for the Displaced (CFD) was created in 1993 to facilitate the return of displaced people to their homes and territories and support their social and economic reintegration, by reconstructing or rehabilitating homes as well as providing financial aid or/and loans. It is responsible for providing access to basic services, including water supply, to displaced households. At present, the Fund offers support to those affected by the July 2006 war with Israel as well as suffering the consequences of internal conflict. The Fund raises its finances through the issuance of government bonds.
Local

Municipalities – The municipalities are responsible for preparing general plans for works related to sanitary and water projects, as well as for the establishment of sewage disposal facilities, and for matters concerning protection of the environment and pollution control. The Ministry of Interior & Municipalities is the tutelage ministry of municipalities (World Bank 2003).

Local Committees – The Local Committees (LCs) are under the tutelage of the RWAs. They are created by a ministerial decree and their Board members, usually five, are appointed by the Minister of Energy and Water. Out of the 209 committees currently in operation, 18 percent are for potable water, 60 percent are for irrigation, 14 percent for both potable water and irrigation and eight percent have no clear mandate. In general, the role of the LCs is restricted to the operation, maintenance, rehabilitation and renovation of the networks and equipment (World Bank 2003).
Map 1: Areas Served by the Regional Water Authorities

Source: Jacobs Gibb 2002
Figure 57: Institutional Mapping, WSS Functions

Source: Authors. CSB = Civil Service Board; CoM = Council of Ministers.
ANNEX III: TARIFF STRUCTURE

Law 221 authorizes the Regional Water Authorities (RWAs) to determine tariffs levels for their water, wastewater and irrigation services to achieve cost recovery. Each RWA has therefore its own procedure and mechanisms for defining and collecting service fees. Tariffs are determined by the Board of members of each of the RWAs and are subject to the approval of the Minister of Energy and Water and the MoF (World Bank 2003).

WATER

In Lebanon households pay a fixed annual fee for the provision of public domestic water services. Water supply is based on an orifice gauge system and tariffs are usually based-on a contractual volume of water of 1m³/day. Households pay for the entire year upfront and as a lump sum. Since the four RWAs established by Law 221 became operative in 2005, tariffs have been adjusted and are now more uniform throughout the country, although differences across regions remain (RWA submissions).

<table>
<thead>
<tr>
<th>BML</th>
<th>North</th>
<th>South</th>
<th>Beka’a</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual fee (Based on 1m³/day)</td>
<td>200,000</td>
<td>180,000</td>
<td>175,000</td>
</tr>
<tr>
<td>Gauge maintenance</td>
<td>35,000</td>
<td>10,000</td>
<td>22,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>235,000</td>
<td>190,000</td>
<td>200,000</td>
</tr>
</tbody>
</table>

Note: does not include government VAT (10 percent) and stamp fee (1,000 LBP)
Source: RWA submissions.

It is important to note that, even where meters have been installed the annual flat fee system remains to date still in place, thus strongly reducing the potential benefits from the metering program.

WASTEWATER

Although formally under the jurisdiction of the RWAs established by Law 221, wastewater service in Lebanon are currently still mainly operated by the municipalities or by unregulated small private operators. There are therefore no homogeneous tariff levels or pricing mechanisms within or across regions to date. Municipalities do not charge user fees for wastewater collection services, which are financed by general taxation.

IRRIGATION

Traditionally, irrigation tariffs vary widely, ranging from very low levels to over US$450/ha serviced, depending on the area of service. RWAs have different procedures for setting tariffs. The irrigation tariffs charged by the LRA vary depending on the scheme. Despite the significant differences across agencies, irrigation tariffs generally follow two alternative systems: area charges and volumetric charges.
Area Charges. These are lump sum periodic charges based on area irrigated. The fixed charge per ha depends on the crop grown and whether pumping is used or not; it increases if the farmer wishes to receive water more frequently than his allotment (examples: Qasmiyeh Ras el Ain, Yammouneh, Akkar el Bared, Danniyeh, and Barouk/ Safa Irrigation Schemes). Area charges are indirectly related to the volume of water consumed as the charge is adjusted charges on the basis of crops grown. Most schemes operate under the “area charge” system.

Volumetric Charges. This type is used in case of pressurized networks, where the hydrants are equipped by with water counters and usually parcels have direct access to an outlet. This tariff is appropriate for schemes using sprinkling, drip or others modern methods of irrigation (example, South Beka’a Irrigation Project Phase 1 – 2000 ha). A variation of this system is based on an hourly charge for water delivery (i.e. number of hours multiplied by the discharge) (World Bank 2003).

Table 6: Irrigation Tariffs Charged by the Litani River Authority, 2008

<table>
<thead>
<tr>
<th>Area served</th>
<th>LL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qasmieh-Ras El Ain Project (LBP/Ha Serviced)</td>
<td></td>
</tr>
<tr>
<td>- Direct Pumping from Qasmieh River</td>
<td>410,000</td>
</tr>
<tr>
<td>- Pumping from the Main Irrigation Canal</td>
<td>660,000</td>
</tr>
<tr>
<td>- Gravity Supply from the Main Irrigation Canal</td>
<td>720,000</td>
</tr>
<tr>
<td>- Modern Irrigation Methods (Drip)</td>
<td>480,000</td>
</tr>
<tr>
<td>Saida - Jezzine Pilot Project</td>
<td></td>
</tr>
<tr>
<td>- Flat rate where no Volumetric Metering exists (LBP/Ha Serviced)</td>
<td>720,000</td>
</tr>
<tr>
<td>- With Volumetric Metering (LBP/m³)</td>
<td>120</td>
</tr>
<tr>
<td>South - Beka’a Project (2000Ha - Phase)</td>
<td></td>
</tr>
<tr>
<td>- Flat Rate for the Spring Season (LBP/Ha Serviced)</td>
<td>300,000</td>
</tr>
<tr>
<td>- Flat Rate for the Summer Season (LBP/Ha Serviced)</td>
<td>300,000</td>
</tr>
<tr>
<td>- With Volumetric Metering (LBP/m³)</td>
<td>80</td>
</tr>
</tbody>
</table>

Source: LRA submission.
## ANNEX IV: RWA PERFORMANCE

### Table 7: Performance Indicators, RWA

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>UNIT</th>
<th>BML</th>
<th>NORTH</th>
<th>SOUTH</th>
<th>BEKA’A</th>
<th>COUNTRY</th>
<th>SOURCE</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACKGROUND</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Population (2008)</td>
<td>000</td>
<td>1,988</td>
<td>808</td>
<td>655</td>
<td>495</td>
<td>3,946</td>
<td>CAS 04</td>
<td>2004 population is projected to 2008 based on average annual population growth rate over 2004-08 (1.2 percent).</td>
</tr>
<tr>
<td>Household size</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PSIA</td>
<td></td>
</tr>
<tr>
<td>Households (HH)</td>
<td>000</td>
<td>481</td>
<td>155</td>
<td>152</td>
<td>99</td>
<td>888</td>
<td>CAS, PSIA</td>
<td></td>
</tr>
<tr>
<td>HH Connection rate</td>
<td>Percent</td>
<td>93</td>
<td>65</td>
<td>86</td>
<td>68</td>
<td>78</td>
<td>CDR 2002</td>
<td>See Note (V) for connection rates reported by RWA submissions.</td>
</tr>
<tr>
<td><strong>TECHNICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water produced</td>
<td>MCM/year</td>
<td>210</td>
<td>74(*)</td>
<td>60</td>
<td>30</td>
<td>375</td>
<td>RWA, BP, JG</td>
<td></td>
</tr>
<tr>
<td>Water sold</td>
<td>MCM/year</td>
<td>126 EST</td>
<td>44((^*)) EST</td>
<td>36 EST</td>
<td>18 EST</td>
<td>225 EST</td>
<td>RWA, BP, Est.</td>
<td>Water sold is calculated by applying the level of water losses to water produced.</td>
</tr>
<tr>
<td>Total connections</td>
<td>000</td>
<td>746</td>
<td>119</td>
<td>145</td>
<td>75</td>
<td>1085</td>
<td>RWA, BP, Est</td>
<td>See Note (II) for assumptions.</td>
</tr>
<tr>
<td>Water losses</td>
<td>Percent</td>
<td>40% EST</td>
<td>40% EST</td>
<td>40% EST</td>
<td>40% EST</td>
<td>40% EST</td>
<td>Est.</td>
<td>Country average applied to all RWAs.</td>
</tr>
<tr>
<td>Continuity of supply (winter)</td>
<td>Hr/day</td>
<td>13</td>
<td>22</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>CDR 02/03</td>
<td></td>
</tr>
<tr>
<td>Continuity of supply (summer)</td>
<td>Hr/day</td>
<td>3</td>
<td>22</td>
<td>8</td>
<td>10</td>
<td>7.6</td>
<td>CDR 02/03</td>
<td></td>
</tr>
</tbody>
</table>

---

<table>
<thead>
<tr>
<th>INDICATOR</th>
<th>UNIT</th>
<th>BML</th>
<th>NORTH</th>
<th>SOUTH</th>
<th>BEKA’A</th>
<th>COUNTRY</th>
<th>SOURCE</th>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per capita consumption</td>
<td>L/pc/day</td>
<td>121</td>
<td>197(*)</td>
<td>158</td>
<td>134</td>
<td>149</td>
<td>IND</td>
<td>See Note (III) for assumptions.</td>
</tr>
<tr>
<td><strong>FINANCIAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Staff</td>
<td>Number</td>
<td>900</td>
<td>252(*)</td>
<td>218</td>
<td>255</td>
<td></td>
<td>BP</td>
<td></td>
</tr>
<tr>
<td>Total O&amp;M</td>
<td>million LBP</td>
<td>45,176</td>
<td>16,100(*)</td>
<td>21,884(*)</td>
<td>9,133</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Power</td>
<td>million LBP</td>
<td>17,521</td>
<td>8,120(*)</td>
<td>9,413(*)</td>
<td>5,625</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Staff cost</td>
<td>million LBP</td>
<td>18,692</td>
<td>4,947(*)</td>
<td>4,487(*)</td>
<td>2,685</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>million LBP</td>
<td>6,658</td>
<td>1,710(*)</td>
<td>4,448(*)</td>
<td>417</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Other OPEX</td>
<td>million LBP</td>
<td>2,305</td>
<td>1,323(*)</td>
<td>3,536(*)</td>
<td>406</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>CAPEX</td>
<td>million LBP</td>
<td>79,730</td>
<td>-</td>
<td>5,566(*)</td>
<td>-</td>
<td></td>
<td>RWA, South BP</td>
<td>Only cash-flow financed CAPEX included. Grants/credits are excluded.</td>
</tr>
<tr>
<td>Depreciation</td>
<td>million LBP</td>
<td>30,750</td>
<td>N/a</td>
<td></td>
<td></td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Debt service</td>
<td>million LBP</td>
<td>29,980</td>
<td>N/a</td>
<td></td>
<td></td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Capital reserve</td>
<td>million LBP</td>
<td>19,000</td>
<td>N/a</td>
<td></td>
<td></td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Total costs</td>
<td>million LBP</td>
<td>124,906</td>
<td>16,100(*)</td>
<td>27,450(*)</td>
<td>9,133</td>
<td></td>
<td>RWA, South BP</td>
<td></td>
</tr>
<tr>
<td>Collected revenues</td>
<td>million LBP</td>
<td>102,092</td>
<td>8,700(*)</td>
<td>15,100(*)</td>
<td>1,226</td>
<td></td>
<td>RWA, Est</td>
<td>For BML, revenues are estimated by applying flat fee structure to connections.</td>
</tr>
<tr>
<td>Billed revenues</td>
<td>million LBP</td>
<td>127,615</td>
<td>16,700(*)</td>
<td>24,773(*)</td>
<td>11,271</td>
<td></td>
<td>RWA, Est</td>
<td></td>
</tr>
<tr>
<td>INDICATOR</td>
<td>UNIT</td>
<td>BML</td>
<td>NORTH</td>
<td>SOUTH</td>
<td>BEKA’A</td>
<td>COUNTRY</td>
<td>SOURCE</td>
<td>NOTE</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------</td>
<td>-----------</td>
<td>--------</td>
<td>--------</td>
<td>--------</td>
<td>---------</td>
<td>--------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>Flat fee - HH</td>
<td>LBP/ Year</td>
<td>235,000</td>
<td>190,000</td>
<td>200,000</td>
<td>160,000</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Flat fee - Industries</td>
<td>LBP /Year</td>
<td>100,000</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td></td>
<td>RWA</td>
<td></td>
</tr>
<tr>
<td>Working ratio (I)</td>
<td>O&amp;M/ revenues</td>
<td>0.4</td>
<td>1.8</td>
<td>1.4</td>
<td>7.5</td>
<td>0.7</td>
<td>IND</td>
<td>Power charges included.</td>
</tr>
<tr>
<td>Working ratio (II)</td>
<td>O&amp;M/ revenues</td>
<td>0.4</td>
<td>0.9</td>
<td>0.6</td>
<td>2.9</td>
<td>0.4</td>
<td>IND</td>
<td>Power charges excluded for North, South and Beka’a RWAs.</td>
</tr>
<tr>
<td>O&amp;M Cost recovery ratio</td>
<td>Revenues/ O&amp;M costs</td>
<td>2.2</td>
<td>0.5</td>
<td>0.7</td>
<td>0.1</td>
<td>1.4</td>
<td>IND</td>
<td>Power charges included.</td>
</tr>
<tr>
<td>Staff / 1,000 connections</td>
<td></td>
<td>1.2</td>
<td>2.1</td>
<td>1.5</td>
<td>3.4</td>
<td>1.5</td>
<td>IND</td>
<td></td>
</tr>
<tr>
<td>Unit O&amp;M cost of water</td>
<td>USD/m3 sold</td>
<td>0.2&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.2&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.4&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.3&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.3&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>IND</td>
<td>Power charges included.</td>
</tr>
<tr>
<td>Unit cost of water</td>
<td>USD/m3 sold</td>
<td>0.6&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>-</td>
<td>0.5&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>-</td>
<td>-</td>
<td>IND</td>
<td>CAPEX included.</td>
</tr>
<tr>
<td>Unit price of water</td>
<td>USD/m3 sold</td>
<td>0.85&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.3&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.5&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.4&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>0.6&lt;sup&gt;EST&lt;/sup&gt;</td>
<td>IND</td>
<td>Total billed fixed fee (assuming 100% collection) divided by water sold.</td>
</tr>
<tr>
<td>COMMERCIAL</td>
<td>Percent</td>
<td>80</td>
<td>52(^)</td>
<td>61(*)</td>
<td>11</td>
<td>70</td>
<td>RWA, BML BP</td>
<td></td>
</tr>
<tr>
<td>Receivables</td>
<td>Months of sales</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>47</td>
<td></td>
<td>RWA</td>
<td>Total account receivables divided by collected revenues.</td>
</tr>
</tbody>
</table>
**Data Sources:**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP</td>
<td>Business Plans of Water Authorities (available for BML and South).</td>
</tr>
<tr>
<td>RWA</td>
<td>Water Authorities’ submissions to the World Bank.</td>
</tr>
<tr>
<td>JG</td>
<td>Jacobs Gibbs. Appendix C, p. 2/2</td>
</tr>
<tr>
<td>CDR 02/03</td>
<td>CDR 02/03 data as reported in World Bank 2007b. “Public Expenditure Review of the Water and Wastewater sector in Lebanon”. Internal Memo. September.</td>
</tr>
<tr>
<td>Est</td>
<td>World Bank’s estimate (number underlined in italics are estimates).</td>
</tr>
<tr>
<td>IND</td>
<td>Indicator that has been calculated based on data available.</td>
</tr>
</tbody>
</table>

(^	extsuperscript{)} 2007 data

(*	extit{)} Inconsistencies between data sources (see below for the list of inconsistencies)

EST Estimate
Notes:

(I) 2008 data unless otherwise specified. 2007 data are marked with (^)

(II) Total connections include connected households and industrial customers. Connected households are estimated by multiplying the total number of households (as estimated based on CAS 04 data) by the household connection rate (CDR 02/03). Information on industrial connected is estimated based on the following breakdown of connection by user group:

<table>
<thead>
<tr>
<th>Water Authority</th>
<th>Domestic</th>
<th>Industrial</th>
<th>Assumptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>BML</td>
<td>65%</td>
<td>35%</td>
<td>Source: RWA. Based on the BML submission, the share of domestic water consumption is 65 percent. It is assumed that the same share is applied to connections.</td>
</tr>
<tr>
<td>North</td>
<td>85%</td>
<td>15%</td>
<td>Estimate</td>
</tr>
<tr>
<td>South</td>
<td>90%</td>
<td>10%</td>
<td>Source: South’ Business Plan.</td>
</tr>
<tr>
<td>Beka’a</td>
<td>90%</td>
<td>10%</td>
<td>Estimate</td>
</tr>
</tbody>
</table>

(III) The breakdown of water sold to industries and households is only available for the BML Water Authority, for which 35 percent of the water is reported to be sold to industries. For the other Water Authorities, it is assumed that the share of water sold to domestic customers is equal to the share of domestic connections, as reported in above.

(IV) The following assumptions had have been made to correct for data inconsistency (the data that has been used for the report is in bold):
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Unit</th>
<th>RWA</th>
<th>Source</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collection efficiency</strong></td>
<td>Revenues collected, %</td>
<td>South</td>
<td>RWA</td>
<td>61%</td>
</tr>
<tr>
<td><strong>Power charges</strong></td>
<td>LBP million</td>
<td>North</td>
<td></td>
<td>141</td>
</tr>
<tr>
<td><strong>Water Produced</strong></td>
<td>MCM/Year</td>
<td>North</td>
<td></td>
<td>181</td>
</tr>
</tbody>
</table>
There is significant discrepancy in the household connection rate reported across sources. To ensure consistency across RWA, CDR 02/03 data have been used in the study. The various data sources are summarized in the table below.

**Table 10: Connection Rate, by Data Source**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Source</th>
<th>BML</th>
<th>North</th>
<th>South</th>
<th>Beka’a</th>
</tr>
</thead>
<tbody>
<tr>
<td>HH connection (000)</td>
<td>PSIA</td>
<td>404</td>
<td>85</td>
<td>137</td>
<td>85</td>
</tr>
<tr>
<td></td>
<td>RWA</td>
<td>477</td>
<td>103</td>
<td>115</td>
<td>66</td>
</tr>
<tr>
<td>Population (000)</td>
<td>CAS</td>
<td>481</td>
<td>155</td>
<td>152</td>
<td>99</td>
</tr>
<tr>
<td></td>
<td>RWA</td>
<td>467</td>
<td>N/a</td>
<td>146</td>
<td>122</td>
</tr>
<tr>
<td>Connection rate (%)</td>
<td>PSIA and CAS</td>
<td>84</td>
<td>55</td>
<td>90</td>
<td>86</td>
</tr>
<tr>
<td></td>
<td>RWA</td>
<td>98</td>
<td>N/a</td>
<td>79</td>
<td>54</td>
</tr>
<tr>
<td></td>
<td>CDR 02/03</td>
<td>93</td>
<td>65</td>
<td>86</td>
<td>68</td>
</tr>
</tbody>
</table>
ANNEX V:
HIDDEN COST ANALYSIS (WATER SECTOR) – METHODOLOGY

The hidden cost analysis estimates the total implicit loss in the water sector, explicit
subsidies excluded. The three drivers of sector hidden costs are: (i) tariffs below cost-
recovery level; (ii) water losses; and (iii) bill collection inefficiency. The formula for
each of the three components and the assumptions made for the calculations are reported
below:

1. TARIFFS BELOW COST RECOVERY LEVEL

   \[ QE \,(TC - \, Te) \]

2. 

   \[ QE \, TC \, (LM-LN)/(1-LM) \]

3. BILL COLLECTION INEFFICIENCY

   \[ QE \, TE \,(1- \, RCT) \]

   \[ QE \, = \, \text{WATER SOLD} \]

   \[ TC \, = \, \text{AVERAGE COST RECOVERY PRICE (ACRP)} \]

   \[ TE \, = \, \text{END USER TARIFF (REVENUES BILLED/WATER SOLD)} \]

   \[ LM \, = \, \text{LEAKAGE} \]

   \[ LN \, = \, \text{NORMATIVE LEAKAGE (20\%)} \]

   \[ RCT \, = \, \text{COLLECTION RATE} \]

   \[ ACRP \, = \, \text{CURRENT COST OF OPERATION (C) + 24 HOURS-A-DAY SUPPLY FACTOR (T) + INVESTMENT COMPONENT (I)} \]

   \[ T \, = \, 0.25 \, C \, (1- \, (t/24)) \]

   \[ t \, = \, \text{NUMBER OF HOURS SUPPLIED PER DAY (ANNUAL AVERAGE)} \]
**Assumptions**

Normative losses = 20% (Ebinger 2006)

*Investment component* = the investment component of the cost-recovery tariff is estimated based on the capital expenditure per connection incurred by BML Water Authority, as reported in the Business Plan (USD 70/connection). The capital expenditure per connection is multiplied by total connections to obtain an estimate of the level of CAPEX for the other 3 RWAs.

<table>
<thead>
<tr>
<th>USD/m3</th>
<th>ACRP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BML</td>
<td>0.69</td>
</tr>
<tr>
<td>North</td>
<td>0.47</td>
</tr>
<tr>
<td>South</td>
<td>0.75</td>
</tr>
<tr>
<td>Beka’a</td>
<td>0.68</td>
</tr>
</tbody>
</table>
REFERENCES


International Monetary Fund 2009. “Lebanon 2009 Article IV Consultation and Assessment of Performance Under the Program Supported by Emergency Post-Conflict Assistance”. Washington DC.


