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Report No: PAD822

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED LOAN

IN THE AMOUNT OF
US$474 MILLION

TO THE

LEBANESE REPUBLIC

FOR A

WATER SUPPLY AUGMENTATION PROJECT

SEPTEMBER 4, 2014

Water Global Practice
Middle East and North Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective July 31, 2014)

1507.5 LBP	=	US$1

FISCAL YEAR

January 1	–	December 31

ABBREVIATIONS AND ACRONYMS

AA	Alternatives Analysis
BdL	Banque du Liban (Central Bank of Lebanon)
BML	Beirut Mount Lebanon
BMLWE	Beirut Mount Lebanon Water Establishment
CBA	Cost Benefit Analysis
CBO	Community Based Organization
CDR	Council for Development and Reconstruction
CE	Citizen Engagement
CNRS	Centre National de la Recherche Scientifique
COM	Council of Ministers
CPS	Country Partnership Strategy
CWRSAS	Country Water Resources Sector Assistance Strategy
DA	Designated Account
DSPE	Dam Safety Panel of Experts
DGA	Directorate General of Antiquities
EIRR	Economic internal rate of return
ED	Executive Director
EC	Expropriation Committee
EPP	Emergency Preparedness Plan
ERP	Emergency Response Procedures
ESIA	Environment and Social Impact Assessment
ESMP	Environmental Social Management Plan
ESPE	Environment and Social Panel of Experts
FM	Financial management
GBML	Greater Beirut Mount Lebanon
GCM	Global Circulation Model
GDP	Gross Domestic Product
GoL	Government of Lebanon
GBWSP	Greater Beirut Water Supply Project
GRM	Grievance Redress Mechanism
GWTF	Task Force of Gender and Water
HA	Hectare
IANWGE	Interagency Network on Women and Gender Equality
IFR	Interim Un-audited Financial Report
IsDB	Islamic Development Bank
IPCC	Inter-governmental Panel on Climate Change

IPSAS	International Public Sector Accounting Standards
IWA	International Water Association
IWRD	Integrated Water Resource Development
KM	Kilometer
KM^2	Square Kilometer
LBP	Lebanese Pound
LCWMC	Lebanon Center for Water Management and Conservation
LRA	Litani River Authority
M	Meter
M^3	Cubic Meter
MASL	Meter Above Sea Level
MCE	Maximum Credible Earthquake
MCM	Million Cubic Meter
MENA	Middle East and North Africa
MOEW	Ministry of Energy and Water
MOF	Ministry of Finance
MOSA	Ministry of Social Affairs
MW	Megawatts
NCLW	National Commission for Lebanese Women
NGO	Non Governmental Organization
NPV	Net Present Value
NRW	Non Revenue Water
NWSS	National Water Sector Strategy
O&M	Operation and Maintenance
ORAF	Operational Risk Assessment Framework
PAPs	Project Affected Peoples
PDO	Project Development Objective
PIC	Project Information Center
PFS	Project Financial Statements
PIM	Project Implementation Manual
PMU	Project Management Unit
POE	Panel of Experts
RAP	Resettlement Action Plan
RWE	Regional Water Establishment
SW	Staff Weeks
TOR	Terms of Reference
UNHCR	United Nations High Commission on Refugees
US$	United States Dollar
USAID	US Agency for International Development
VEC	Valued Environmental and Social Components
WA	Withdrawal Application
WSAP	Water Supply Augmentation Project
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

Regional Vice President:	Inger Andersen
Country Director:	Ferid Belhaj
Senior Practice Director:	Junaid Kamal Ahmad
Practice Director:	Jennifer Sara
Practice Manager:	Steven N. Schonberger
Task Team Leader:	Claire A. Kfouri

LEBANON
WATER SUPPLY AUGMENTATION PROJECT

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Lebanese Republic

Lebanon-Water Supply Augmentation Project (P125184)

PROJECT APPRAISAL DOCUMENT

MIDDLE EAST AND NORTH AFRICA

Water Global Practice

Report No.: PAD822

Basic Information			
Project ID P125184	EA Category A - Full Assessment	Team Leader Claire Kfouri	
Lending Instrument Investment Project Financing	Fragile and/or Capacity Constraints [ ] Financial Intermediaries [ ] Series of Projects [ ]		
Project Implementation Start Date 30-Sep-2014	Project Implementation End Date 31-Dec-2023		
Expected Effectiveness Date 30-Sep-2015	Expected Closing Date 30-Jun-2024		
Joint IFC No			
Practice Manager/Manager Steven N. Schonberger	Senior Global Practice Director Junaid Kamal Ahmad	Country Director Ferid Belhaj	Regional Vice President Inger Andersen

Borrower: Lebanese Republic			
Responsible Agency: Council for Development and Reconstruction			
Contact:	Mr. Nabil El Jisr	Title:	President
Telephone No.:	(961-1) 980-0096	Email:	njisr@cdr.gov.lb

Project Financing Data(in US$ Million)					
[X]	Loan	[ ]	IDA Grant	[ ]	Guarantee
[ ]	Credit	[ ]	Grant	[ ]	Other

Total Project Cost:	617.00	Total Bank Financing:	474.00
Financing Gap:	0.00		

Financing Source	Amount
Borrower	15.00
International Bank for Reconstruction and Development	474.00
Islamic Development Bank	128.00
Total	617.00

Expected Disbursements (in US$ Million)

Fiscal Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Annual	70	147	68	64	58	35.3	30.5	0.69	0.51	0.00
Cumulative	70	217	285	349	407	442.3	472.8	473.49	474	474

Proposed Development Objective(s)

The project development objective is to increase the volume of water available to the Greater Beirut and Mount Lebanon area.

Components

Component Name	Cost (US$ Millions)
Component 1: Construction and construction supervision of Bisri dam and associated infrastructure	391.81
Component 2: Sustainability of service delivery	46.85
Component 3: Project Management and Quality Assurance	6.74
Component 4: Land Acquisition and Resettlement Compensation	170

Institutional Data

Practice Area / Cross Cutting Solution Area

Water

Cross Cutting Areas

[ ] Climate Change
[ ] Fragile, Conflict & Violence
[ ] Gender
[ ] Jobs
[ ] Public Private Partnership

Sectors / Climate Change

Sector (Maximum 5 and total % must equal 100)

Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Water, sanitation and flood protection	General water, sanitation and flood protection	100		

	sector			
Total		100		

☑ I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.

Themes

Theme (Maximum 5 and total % must equal 100)

Major theme	Theme	%
Environment and natural resources management	Water resource management	80
Public sector governance	Other public sector governance	20
Total		100

Compliance

Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ]	No [X]
Does the project require any waivers of Bank policies?	Yes [ ]	No [X]
Have these been approved by Bank management?	Yes [ ]	No [ ]
Is approval for any policy waiver sought from the Board?	Yes [ ]	No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No [ ]

Safeguard Policies Triggered by the Project	**Yes**	**No**
Environmental Assessment OP/BP 4.01	**X**	
Natural Habitats OP/BP 4.04	**X**	
Forests OP/BP 4.36	**X**	
Pest Management OP 4.09		**X**
Physical Cultural Resources OP/BP 4.11	**X**	
Indigenous Peoples OP/BP 4.10		**X**
Involuntary Resettlement OP/BP 4.12	**X**	
Safety of Dams OP/BP 4.37	**X**	
Projects on International Waterways OP/BP 7.50		**X**
Projects in Disputed Areas OP/BP 7.60		**X**

Legal Covenants

Name: Project Agreement Section I.A.1	**Recurrent**	**Due Date**	**Frequency**

Project Management Unit		October 30, 2015	
Description of Covenant			
CDR shall establish, not later than one (1) month after the Effective Date, and thereafter maintain the Project Management Unit throughout the life of the project with staffing, resources and terms of reference satisfactory to the Bank.			
Name: Project Agreement, Section D.1	**Recurrent**	**Due Date**	**Frequency**
ESMP and RAP Implementation	**X**		
Description of Covenant			
CDR shall ensure that the Project is carried out in accordance with the ESIA, ESMP, RAP, ESIA of GBWSP and shall not amend, suspend, abrogate, repeal or waive any provision of the ESIA, ESMP, RAP and ESIA for GBSWP without prior approval of the Bank.			
Name: Project Agreement, Section D.2	**Recurrent**	**Due Date**	**Frequency**
Land expropriation and resettlement	**X**		
Description of Covenant			
CDR shall ensure that, prior to commencing any civil works under the Project, all resettlement measures set forth in the RAP in relation to the specific civil work, shall have been fully executed, including the full payment for Land Acquisition and Resettlement Compensations prior to displacement and/or the provision of relocation assistance to all Displaced Persons			
Name: Project Agreement, Section D.6(a)	**Recurrent**	**Due Date**	**Frequency**
Dam Safety Panel	**X**		
Description of Covenant			
CDR shall maintain at all times an independent Dam Safety Panel of Experts (DSPE) comprising at least four (4) experts acceptable to the Bank, under terms of reference acceptable to the Bank.			
Name: Project Agreement, Section D.6(g)(h)(i)(j)(k)	**Recurrent**	**Due Date**	**Frequency**
Construction Supervision and Quality Assurance	**X**		
Description of Covenant			
CDR shall implement the Construction Supervision and Quality Assurance Plan; Emergency Preparedness Plan; Instrumentation Plan; and Operation and Maintenance Plan (collectively "Dam Safety Plans") in a timely manner satisfactory to the Bank; not amend, revise or waive any of the Dam Safety Plans without the prior written agreement of the Bank.			

Conditions		
Source of Fund	**Name**	**Type**
IBRD	Loan Agreement, Schedule 2 Section IV.B	Disbursement
No withdrawal shall be made for payments made prior to the date of the Agreement, expect that withdrawals made up to an aggregate amount not to exceed $94,800,000 may be made for payments made prior to this date but on or after September 30, 2014 for eligible expenditures.		
Source Of Fund	**Name**	**Type**

IBRD	Loan Agreement, Article V 5.01(b) Independent Panel of Experts - Environment and Social	Effectiveness

Description of Condition

An Environmental and Social Panel of Experts has been established under terms of reference acceptable to the Bank.

Source Of Fund	Name	Type
IBRD	Loan Agreement, Article V 5.01(a) Subsidiary Agreement	Effectiveness

Description of Condition

The Subsidiary Agreement has been executed on behalf of the Borrower and the Project Implementing Entity.

Team Composition

Bank Staff

Name	Title	Specialization	Unit
Claire Kfouri	Sr. Water & Sanitation Spec.	Team Lead	GWADR
Mei Wang	Senior Counsel	Legal	LEGAM
Satoru Ueda	Lead Dam Specialist	Dam design and water resources	GWADR
Concepcion Aisa Otin	Financial Officer	Financial Officer	FABBK
Rima Abdul-Amir Koteiche	Sr. Financial Management Specialist	Financial Management	GGODR
Africa Eshogba Olojoba	Lead Environmental Specialist	Environment	GENDR
Mouna Couzi	Operations Analyst	Operations	MNCLB
Sepehr Fotovat Ahmadi	Senior Procurement Specialist	Procurement	GGODR
Rock Jabbour	Financial Management Analyst	Financial Management	GGODR
Mats Johan Rikard Liden	Senior Hydropower Specialist	Hydropower	GWADR
Sally Zgheib	Water Specialist	Water	GWADR
Andrianirina Michel Eric Ranjeva	Finance Officer	Finance	CTRLA
Hezam H. Alotaibi	Sr. Water Resources Specialist	Water	GWADR
Chaogang Wang	Sr. Social Development Specialist	Social Development	GURDR
Diego Juan Rodriguez	Senior Economist	Economics	GWADR

Jon Strand	Lead Economist	Economics	DECEE
Amal Talbi	Sr. Water Resources Specialist	Water	GWADR
Zakia B. Chummun	Language Program Assistant	Language Program Assistant	GWADR
Marcus Marinus Petrus Wijnen	Sr. Water Resources Mgmt. Spec.	Water	GWADR
Richard Abdulnour	Water & Sanitation Specialist	Water	GWADR
Nada Abou-Rizk	Program Assistant	Program Assistant	MNCLB

Non Bank Staff

Name	Title	City
Samantha Constant	Sr. Gender and Communications Specialist	Washington, DC
Mutasem El-Fadel	Professor of Environmental Engineering	Beirut, Lebanon
Eric Foster-Moore	Water Resources Specialist	Washington, DC
Ezio Todini	Professor of Hydrology	Bologna, Italy

Locations

Country	First Administrative Division	Location	Planned	Actual	Comments
Lebanon	Mont-Liban		Bisri		

I. STRATEGIC CONTEXT

A. Country Context

1. Lebanon is a small, highly urbanized, upper middle-income country with a population of approximately 4.4 million people, 88 percent of whom live in the narrow urban stretch spanning the cities of Tripoli in the north and Saida in the south. Services and industry contribute an average of 73.2 percent and 20.5 percent respectively to the Lebanese Gross Domestic Product (GDP).[1] Agriculture consumes over 60 percent of available water and employs over 20 percent of the labor force but only contributes an average of six percent per year to GDP.

2. In 2012, Lebanon's average GDP per capita was approximately US$14,000. The service-based economy remains vulnerable to internal security and political challenges as well as external shocks and regional instability. While real GDP growth was eight percent per year from 2007 to 2010, it slowed to three percent in 2011 reflecting spillover of the Arab Spring as well as the ongoing conflict in neighboring Syria.

3. Lebanon ranks 72 out of 187 countries in the 2013 Human Development Index, an improvement of three points since 2007. While Lebanon has successfully closed its health and survival gap index and claims high educational outcomes among females and males, the 2013 World Economic Forum ranks Lebanon 123 out of 136 in the Global Gender Gap Index, with a significant gender gap in access to and participation in political and economic spheres in particular.

4. Approximately 28 percent of the Lebanese population, equivalent to one million people, live under the national poverty line of US$ 4 per person per day. Half of the poor live in the Greater Beirut and Mount Lebanon area (GBML). Eight percent of the Lebanese population lives in extreme poverty and, at less than US$ 2.4 per person per day, is unable to meet basic food and non-food needs. Low-income women further carry the largest burden of poverty.[2]

5. The poor are significantly impacted by the financial burden of expensive and ineffective infrastructure services, including access to water supply.[3] Low-income households spend eight percent of total household expenditure on securing water to the home, notably higher than international benchmarks.

6. The recent influx of over one million Syrian refugees into Lebanon (equivalent to 24 percent of Lebanon's pre-crisis population) has impacted the economy and increased total poverty figures. In the water sector alone, the cost of reinstating pre-crisis levels of water supply and sanitation services to host and refugee communities is estimated at US$ 375 million.[4]

7. Lebanon's governance structure ensures that most public affairs issues are subject to consensus among the major groups of Government. This is an aspect of governance with many

1 World Bank Lebanon Country Partnership Strategy FY11- FY14, World Bank Report 54690-LB
[2] World Bank: Working Paper: 59334. Mainstreaming Gender in Water and Sanitation, November 2010.
[3] World Bank Report No.48993-LB, Lebanon Social Impact Analysis – Electricity and Water Sectors, June 2009; and World Bank Report No 52024 – LB, Water Sector: Public Expenditure Review, May 2010.
[4] World Bank Report No. 81098-LB, Lebanon: Economic and Social Impact of the Syrian Conflict, September 2013.

virtues in the Lebanese context. This arrangement has also however paralyzed structural reforms in the absence of full consensus and has challenged Government's ability to take decisive actions to address key economic and social needs, including those related to capital investments in large infrastructure. Coupled with recurring security events, the creation of an enabling environment for sustainable economic and social development has thus been impeded.

B. Sectoral and Institutional Context

8. Lebanon's climate and geography cause significant variations in water availability, with floods common in the winter, followed by droughts in the summer. Up to the early 1970's, Lebanon had ample water supply, provided continuous water services to users and was able to rely primarily on its aquifers for water supply and storage. The construction of the large Qaroun Dam and Litani Hydroelectric Project as well as promulgation of Decree 14522 on inter-basin transfers of major Lebanese rivers, are examples of milestone water management actions taken by Government in an effort to optimize water resources management during this period.

9. The sixteen-year civil war, which ended in 1991, had a devastating effect on the Lebanese water sector. In addition to the near total destruction of infrastructure, the war led to rapid urbanization of the capital Beirut and its neighboring cities. Combined, these factors led to a significant reduction in per capita water availability and pollution of groundwater aquifers.

10. Government embarked on a widespread post-war development program to rebuild the country's infrastructure including the water sector. The program was, however implemented largely in the absence of an integrated strategy for overall improved water resources management and service delivery. Longstanding political deadlocks on the prioritization of national infrastructure investments further impeded Government from making the much needed investments in surface water storage.

11. In 2000, Water Sector Law 221 was enacted with the objective of: (i) clarifying the respective obligations and rights of public agencies for the delivery of water services; (ii) empowering the newly created Regional Water Establishments (RWEs) to increase service and improve sustainability; and (iii) creating reciprocal accountability between customers and the RWEs. The full implementation of Law 221 was however impeded by fragmentation of investment, planning and execution responsibilities, poor inter-Government coordination and significant delays in infrastructure investment.

12. Groundwater is over-extracted by 200 million cubic meters (MCM) per year and water supply reaches as low as three hours per day in the summer season across many regions. Lebanon further only stores six percent of its total water resources, rendering it the country with the lowest dam capacity across the Middle East and North Africa (MENA) region.[5] Water deficits across Lebanon are currently estimated at 353 million cubic meters (MCM) and are expected to increase to 425 MCM by 2035. Despite its relatively abundant water resources, Lebanon is significantly water-stressed and does not deliver the level of service expected of similar economies.

[5] In comparison, MENA countries store on average 85% of available water resources.

Water in the Greater Beirut and Mount Lebanon region

13. As one of the most densely populated regions in Lebanon, the Greater Beirut and Mount Lebanon (GBML) region is directly and significantly impacted by existing water deficits. During the six month summer period spanning May – October, the GBML region enters into a water crisis, whereby the majority of its 2.2 million residents receive an average of three hours of water per day on average, and rely instead on over 20,000 private wells to supply their water needs. This in turn puts significant pressure on the coastal aquifer underlying Beirut, which, as a result, is exploited at unsustainable levels.

14. The Beirut Mount Lebanon Water Establishment (BMLWE) is the Regional Water Establishment (RWE) responsible for provision of water services in the GBML area. Established through Law 221, the BMLWE operates under the tutelage of the Ministry of Energy and Water (MOEW). The BMLWE's service areas are divided into three principal categories namely: (i) the northern GBML; (ii) the southern GBML; and (iii) Administrative Beirut. Southern GBML comprises four distribution zones (Zones A, B, C and D), housing an estimated 1.6 million people. Water sources to the BMLWE currently include 30 springs, 157 public wells and the Shabrouh dam.

15. During the six-month winter period spanning November - April, BMLWE's springs and wells are recharged by snowmelt, precipitation and spring river discharge. During the six month summer period, as the water levels in the springs and wells sharply decrease, the BMLWE is only able to provide an average of three hours of water per day to its users.

16. The BMLWE has implemented a pilot volumetric water tariff in some areas that receive continuous water supply. Approximately 95 percent of the BMLWE's service area however pays for water according to a flat yearly fee of approximately US$170 for one (1) m^3/day of water. Despite the low levels of service delivery, BMLWE collections averaged 80 percent in 2013.

17. Connections to the public water network and to the wastewater collection network are approximated at 90 percent[6]. Three wastewater treatment plants (WWTP) serve the GBML including: Ras Nabi Younes (operational), Ghadir (operational) and Bourj Hammoud (under design).

18. GBML water users perceive the quality of water provided to be poor. Thus, in addition to constructing and managing the wells to supplement water supply (a large majority of which are unlicensed and unregulated and produce water of irregular quality), water users must also purchase expensive bottled and tanker water for potable use, at significant additional cost to the average household. Buoyed by a vibrant Lebanese press, several non-Government organizations (NGO's) have actively articulated the general public's high levels of dissatisfaction with the level of public water service and environmental degradation.

[6] The wastewater networks are designed to the national design standard of water consumption of 180 liters/person/day suggesting that an increase in the volume of water distributed to the GBML will not impact the rate of wastewater collection as the collection networks are designed and built to handle higher volumes of water consumption. Further the net volume of water used by project beneficiaries will not drastically increase as the beneficiary population currently compensates the service deficit by over abstracting existing groundwater supplies. A sanitation tariff was introduced in 2013.

19. Recognizing the need for urgent action, Government developed and approved the 2012 National Water Sector Strategy (NWSS) with the objective of developing a comprehensive, multi-sectoral plan for improved water resources management across Lebanon. The NWSS outlines national priorities in water sector investment projects, including large dams, irrigation and inter-basin transfers. Several key components of the NWSS are under implementation including investment in transformational infrastructure[7], development of a national water and sanitation tariff, and the enactment of a water sector public private partnership law.

20. BMLWE also embarked on an extensive program of investment and demand management measures, as agreed in the NWSS, to reduce its water deficit. The BMLWE is thus in the midst of a significant investment phase to: (i) diversify its sources of water supply; (ii) reduce the estimated 40 percent non-revenue water (NRW); (iii) introduce volumetric metering; and (iv) modernize utility operations.

21. The Shabrouh Dam and the Greater Beirut Water Supply Project (GBWSP), currently under implementation, are examples of recent BMLWE initiatives to meet short term demand for water across the GBML. However significant additional water supply is needed to meet the long term needs of the GBML population and economy.

Alternatives Analysis for Water Supply Augmentation

22. The Council for Development and Reconstruction (CDR) is a Government agency responsible for the implementation of large and complex infrastructure investments. In cooperation with MOEW and BMLWE, CDR commissioned an analysis of alternatives (AA) for water supply augmentation to the GBML.

23. The AA examined the technical, economic, social and environmental tradeoffs of several dams including those at Bisri, Janna, Damour East and Damour West, to augment the volume and stability of water provided to the GBML.[8] The AA also examined five non-dam options namely desalination, groundwater recharge, rainwater harvesting, network leak reduction and wastewater reuse. A summary of the nine dam and non-dam options considered for supply augmentation to the GBML is provided in Table 1 below.

[7] These include the Canal 800 Irrigation project, which will provide irrigation water to rural farming communities in the south of Lebanon and the Bank-financed (P103063) Greater Beirut Water Supply Project which will help to meet the GBML's short term water needs.

[8] To address the water supply deficit faced by GBML, the NWSS identifies a program of three dams (Bisri, Janna and Damour dams) to secure water supply to the GBML in the long term. These three sites were selected following a comprehensive review of technical, social, economic and environmental factors.

Table 1: Summary of Potential Dam Alternative Sources[9]

Scheme	Advantages	Disadvantages	Findings
Bisri	• High storage volume that meets GBML demands to 2030 or longer; • Utilises transmission, treatment and storage facilities at limited additional cost; • Reservoir floor underlain by low permeability deposits; • Little or no pumping costs; • Lowest cost per unit volume delivered to GBML.	• Most land take is productive land; • Historic and cultural remains; • High sedimentation risks; • Seismic risk to be mitigated.	Bisri dam is the only site that will supply GBML demand over an appreciable period of time in a cost effective manner. Additional studies into reservoir geology, dam axis, water tightness, seismic and sedimentation risks have been conducted to inform the final design of the dam.
Damour West	• Land take mostly non-productive; • Favorable dam-site morphology; • Might utilize some GBWSP facilities.	• Small storage capacity; • Unlikely to sustain significant hydropower; • New treatment plant and conveyance required; • Significant pumping costs.	Water storage is substantially less than at Bisri or Damour East, and dam site geology is less favorable. Any dam here should have a reduced water level to limit lateral leakage and/or be part of a conjunctive use scheme with ground water.
Damour East	• Dam site geology better than at Damour West; • Favorable dam-site morphology; • High storage volume that meets GBML demands to 2030 or longer.	• High lateral leakage; • New treatment plant and conveyance required; • Significant costs to treat the J6 permeable strata; • Significant pumping costs; • Subject to block collapse from reservoir cliffs.	Notwithstanding the high storage volume and the relatively better site-dam geology than Damour West, this scheme raises serious concerns about the potential excessive lateral leakage.
Janna	• High flow rates, reservoir readily replenished each spring. • Favorable dam-site morphology; • High potential of hydropower generation.	• Most land take is natural landscape; • Located on highly permeable strata, hence leakage likely to be substantial; • New treatment plant and transmission line required; • Highest cost per unit volume delivered to GBML.	As a stand-alone dam Janneh will only meet GBML short term needs . Janneh dam is thus best suited to serve the northern areas of the Greater Beirut and Mount Lebanon region. Further investigations need to be carried out to address the concerns about dam and reservoir geology and water tightness.

Summary of Potential Non-Dam Alternative Sources

Source	Advantages	Disadvantages	Findings
Desalination	• Plentiful and sustainable resources; • Could supply whole GBML demand; • Technically reliable; • Independent of climate.	• Utilises an industrial process; • Only 40% of intake to supply; • High construction cost; • Substantial coastal land take; • High energy and O&M costs; • Marine environment damaged by brine;	Feasible, but very expensive. For current consideration, the 'Source of Last Resort'

[9] CDR Greater Beirut Water Supply Augmentation Project, Preliminary ESIA, Phase I, October 2013

Source	Advantages	Disadvantages	Findings
Ground Water	• Most discharge to supply; • Suitable for conjunctive-use; • Diverse source locations; • Modest carbon footprint.	• Limited future use due to over-exploitation • Resources currently ill-defined; • Insufficient to supply GBML alone; • Recharge climate-dependent; • Substantial energy costs.	Resources remain to be quantified but at minimum will significantly contribute to conjunctive use with a dam alternative but with limited volumes to be used in the future.
Rainwater Harvesting	• Basic technology; • Local sources; • Low carbon footprint.	• Short wet season; • Ill-suited to high-rise urban areas; • Climate dependent; • Poor public perception.	At best, contributes to household or compound non-potable water use.
Wastewater Reuse	• Source origin within GBML; • Source generally sustainable; • Majority of technology already required for best management practice.	• High treatment costs; • Lack of technical expertise; • Insufficient resources to meet GBML demand; • Very poor public perception and religious, cultural objection.	Strong cultural objections. At best can supply substantial quantities of non-potable water for landscape irrigation, etc.
Reduction in UfW	• Optimises existing system efficiency and cost-recovery; • Promotes Best Management Practice.	• Requires political will, legal reform and judicial support; • Requires public cooperation; • Leakage unlikely to be <25%.	Should be pursued as is economically viable. Will only reduce partial need for new development.

24. The AA was reviewed by the Bank through two independent teams and a subsequent peer review process that examined the technical, social, environmental and economic aspects of each site, and included several site visits and meetings with Government officials, technical consultants and NGOs.

25. Following a series of six public consultations on draft findings[10], the AA recommended that GBML's long-term water sustainability depends on the implementation of a program of coordinated investments and reforms involving non-dam activities, as well as development of new water sources through a phased program of dam construction.

26. Construction of a dam at Bisri was recommended as the immediate next step as part of a program for water supply augmentation to the GBML. Bisri was assessed to offer: (i) significantly larger volume of stored water; (ii) direct impact on water users in the southern regions of the GBML, where a large majority of GBML poor reside; (iii) relatively lower environmental and social impacts; and (iv) advanced level of detailed design which would enhance the rate of outcome delivery.

27. In order to carry forward the recommended next step, Government requested financing of the Bisri project from the World Bank and Islamic Development Bank (IsDB).

[10] Consultations were held with: (i) institutional stakeholders (April 3, 2012); (ii) water consumers in central Beirut (May 5, 2012); (iii) water consumers in Beirut Southern Suburbs (April 24, 2012); (iv) local authorities and residents in the vicinity of Jannah Dam (April 10, 2012); (v) local authorities and residents in the vicinity of Damour dam(April 12, 2012); and (vi) local authorities and residents in the vicinity of Bisri dam (April 21, 2012).

C. Higher Level Objectives to which the Project Contributes

28. The project will provide a step-change increase in the volume of water available to the GBML in the long term, while also complementing Government's ongoing efforts at optimizing existing water systems. The proposed water supply dam will have a transformational impact and provides a cost-effective means to make critical water services more readily available in the most densely populated region in Lebanon, where over half of the poor live.

29. As a result of the project: (i) 1.6 million residents in the project area will have access to improved water service levels and will incur a reduction in costs to supplement currently lacking public water services; (ii) BMLWE will benefit from increased flexibility and capacity in the management of its water resources and safe operations of dam infrastructure; and (iii) MOEW will implement a critical component of its national strategy for integrated water management.

30. By providing increased access to potable water in the GBML region, including to the Southern Beirut neighborhoods where over 460,000 people live on less than US$ 4/day, the project contributes to closing the high levels of disparity that exist in the project beneficiary zones, where the lowest income quintile face extreme infrastructure constraints. Combined, these factors will directly and positively strengthen Lebanon's ability to reduce poverty while also boosting shared prosperity.

31. The project is directly in line with the FY11- FY14 World Bank Group's Lebanese Republic Country Partnership Strategy[11] (CPS) and associated 2012 CPS progress report in which Government identified the water sector as a priority focus area requiring immediate investment actions and reform to "produce tangible results toward meeting the pressing needs of the population". The project is further consistent with the 2012 World Bank Country Water Resources Assistance Sector Strategy[12] (CWRSAS) which lists "investment in storage infrastructure" as one of several specific actions to reduce the development deficit in the Lebanese water sector.

32. The project is consistent with the 2003 World Bank Water Resources Sector Strategy and 2010 midterm report: "Sustaining Water for All in a Changing Climate", 2008 Sustainable Infrastructure Action Plan and Water Supply and Sanitation Sector Business Strategy in which broad-based water resources interventions, including dams and inter-basin transfers, are viewed to provide national, regional, and local benefits from which all people including the poor can gain and is thus in line with Government's CPS goals of poverty alleviation and improved service delivery described above.

33. Moreover, the 2008 Sustainable Infrastructure Action Plan includes specific reference to climate change and its implications on planning, managing and delivering infrastructure. By: (i) directly increasing regulation capacity of available water resources through storage; (ii) adding flexibility for adaptive management through more water source options; and (iii) reducing pressure on the over-exploited coastal aquifer, the project plays a critical role in climate change resilience of the water supply system.

[11] World Bank Report No. 54690 -LB, Lebanon Country Partnership Strategy and CPS Progress Report No 75814
[12] World Bank Report no 68313-LB, Lebanon Country Water Resources Sector Assistance Strategy, 2012

34. The project is in line with the Bank's MENA Scale-up Initiative in its efforts to mobilize external financing from other partners in support of the transition countries in economic crisis. By mobilizing substantial funding from the Islamic Development Bank, an Arab Coordination Group member, in a project structure jointly developed with the Bank, the project's preparation and implementation support will deepen working relationships that could be replicated elsewhere in the MENA region.

35. Finally, the project is in line with the Bank's historic involvement in the Lebanese water sector and will benefit from lessons learned in previous and ongoing engagements namely on the importance of preparing users for the implication of increased access to water services, and the cultural, social and economic adjustments that the potential behavior change entails.

II. PROJECT DEVELOPMENT OBJECTIVE

A. PDO

36. The project development objective is to increase the volume of water available to the Greater Beirut and Mount Lebanon area.

B. Project Beneficiaries

37. The project will directly benefit the BMLWE, which, upon successful project implementation, will store an additional 125 million cubic meters (MCM) of water per year. CDR, BMLWE and MOEW will also directly benefit from technical assistance on sustainable and safe dam operations and urban water service delivery.

38. The project will deliver benefits to 1.6 million residents across the GBML, located within the BMLWE areas of service provision that are geographically divided into four zones and 21 municipalities. Beneficiaries will benefit from increased volume and quality of public water provided to the household and a subsequent decrease in the cost of alternative sources of water.[13]

39. The decrease in total cost of water will directly and positively impact the poor. Of the 506,000 people across the GBML that live below US$ 4 per day, 460,000 are located in the project area, as determined by a project specific survey of 1,200 project households, Lebanon's 2005 Poverty Assessment, and available census data.

40. A household survey of 1,200 beneficiary households across the GBML was conducted as part of project preparation. Half the project survey respondents reported per capita incomes of less than LBP 600,000 LBP (US$ 400) per month, equivalent to less than the US$ 4 per day national poverty line. A map of the percent of surveyed households within each municipality whose monthly income is within the bottom third relative to the sample is presented in Figure 1:

[13] Households currently buy tanker water, bottled water and/or construct private wells to supplement the low volumes of public water. Water supplied by the Bisri dam will substitute these alternative sources of water supply.

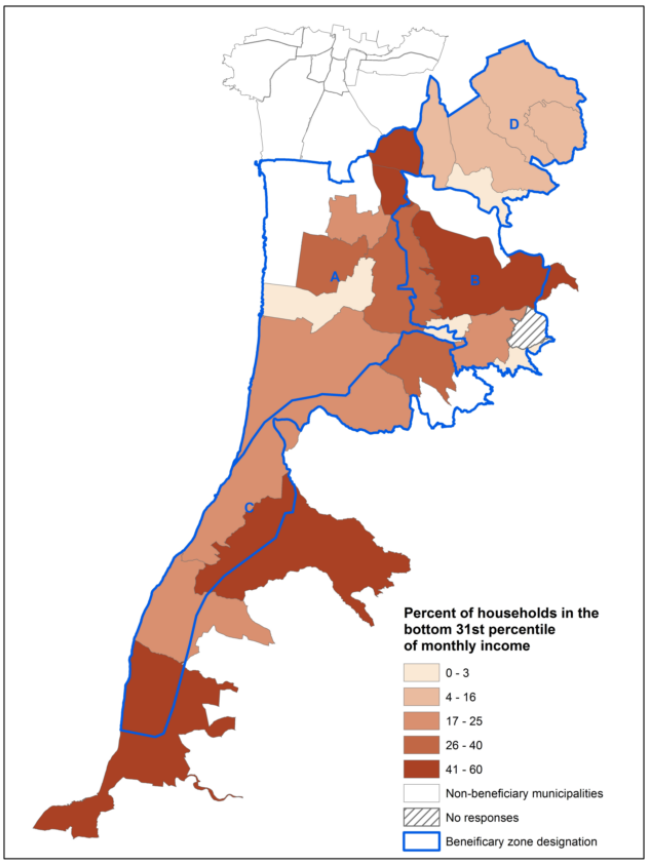


Figure 1: Low income municipalities in project area

41. A series of 12 focus groups were organized with households in the poorer municipalities to determine impediments to benefiting from the planned BMLWE water services. The main request from households was to allow monthly payments against the annual, flat tariff – something which BMLWE is pursuing through adjustment of their billing system. Additional measures to ease the financial burden on the poor, such as establishment of a graduated tariff structure, will also be developed as further reforms – including volumetric tariffs – are introduced. The geographic identification of poorer households will continue to be used in the context of the project to ensure that specific needs of the poor are identified to ensure their benefit from service expansion.

C. PDO Level Results Indicators

42. The key project result indicators include core indicators, citizenship engagement indicators and other technical indicators as follows:

- Volume of water available for BMLWE distribution from Bisri dam (m^3/sec);
- Direct Project Beneficiaries (number); of which female (percentage)
- Share of participants in consultations that are from vulnerable and marginalized groups, the percent of which are women (percentage);
- Water utilities that the project is supporting (number); and
- Dam Safety Panel recommendations implemented bi-annually (Yes/No).

III. PROJECT DESCRIPTION

A. Project Components

43. Following the completion of the NWSS, AA and associated consultation processes described above which identified Bisri dam as the next investment for long term water supply augmentation to the GBML, engineering and safeguard studies were carried out to underpin the project components described below, which will be financed in parallel by the World Bank (WB) and Islamic Development Bank (IsDB):

44. **Component 1: Construction and Construction Supervision of Bisri Dam and Associated Infrastructure (US$391.81 million of which US$305 million IBRD financing).** Component 1 will finance: (i) construction and construction supervision of the Bisri Dam and the associated access road; and (ii) construction and construction supervision of the conveyor pipelines to the existing Joun reservoir and the associated access road; two (2) hydropower plants, generating 0.2 megawatt (MW) and 12 MW respectively; and expansion of the Ouardaniyeh water treatment plant (WTP). Water stored at the Bisri dam will be conveyed, treated and distributed through the tunnel, Ouardaniyeh WTP, and distribution network currently under implementation under the partially-WB financed GBWSP.

45. **Component 2: Sustainability of Service Delivery (US$46.85 million of which US$6.6 million IBRD Financing)**. Component 2 will finance priority activities, complementary to construction of Bisri dam, to ensure the long term sustainability of water service delivery across the GBML. Component 2 will finance: (i) technical assistance to the MOEW, BMLWE and CDR on the operation and maintenance of dams; (ii) technical assistance to the MOEW and BMLWE on management of Beirut Mount Lebanon (BML) water resources; (iii) technical assistance to MOEW and BMLWE in developing and implementing awareness raising campaigns on the economic benefits of switching to the public water network and eventual volumetric metering water supply; (iv) environment and social mitigation measures including the construction of sewerage networks in the upstream catchment villages, as described in the Environmental and Social Management Plan (ESMP).

46. **Component 3: Project Management and Quality Assurance (US$6.74 million of which US$6.02 IBRD Financing)*:*** Component 3 will finance: (i) strengthening capacity of core Project Management Unit (PMU) within CDR to oversee project implementation; (ii) continued engagement of the Dam Safety Panel (DSPE) as per Bank policy requirements and of the independent environment and social Panel of Experts; and (iii) supervision of the ESMP.

47. **Component 4: Land Acquisition and Resettlement Compensation (US$170 million of which US$155 million IBRD Financing):** Component 4 will finance the costs of compensation of land acquisition of 570 hectares of land, as well as the cost of assistance for livelihood rehabilitation and monitoring of the Resettlement Action Plan (RAP) implementation. Total project resettlement costs are estimated at US$170 million and include: (i) approximately US$150 million for compensation of land acquisition and other assets related to implementation of the RAP; (ii) approximately US$5 million in assistance for livelihood rehabilitation, benefit sharing program and monitoring of implementation of the RAP; and (iii) approximately US$15 million in contingency funds.

B. Project Financing

Lending Instrument

48. Given the political and economic environment in Lebanon, an IBRD Investment Project Financing was considered the most efficient instrument for this project. Government has selected an IBRD Fixed Spread Loan with 20 years maturity including three years grace period with disbursement linked level repayment pattern.

Project Financing Table

49. The total project financing requirement is US$ 617 million. The breakdown of financing by component and financing partner (GoL, IsDB and WB) is summarized in Table 2 below.

Donor Financing Arrangements

50. The project will be financed by the World Bank and IsDB through parallel financing arrangements. Each financier will be using its own procurement and financial management guidelines for the respectively financed procurement packages. The financing partners have agreed to use World Bank safeguards and anti-corruption guidelines for project preparation and implementation.

C. Lessons Learned and Reflected in the Project Design

51. Building on experience from local project implementation in Lebanon and international experience with large water supply dams in other regions of the world, a number of lessons learned have informed the design of the proposed project:

Lebanese Context

a) ***Accelerating project readiness and allowing for retroactive financing offsets likely delays in the effectiveness of projects in Lebanon***. On average, World Bank loans in Lebanon require approximately twelve months to be declared effective. In order to minimize the impact of these delays on project implementation, CDR has advanced the prequalification of dam contractors and has prepared the relevant expropriation decrees. These actions will positively impact the rate of project implementation and disbursement following effectiveness;

b) ***Consumer behavior is a key determinant of sustainability in the Lebanese water sector given the significant erosion of public trust in government services generally.*** Drawing on lessons learned from previous World Bank water projects (see Ba'albeck Water and Sanitation Project P074042 and Bekaa Emergency Water Supply Project P103185), the project comprises specific technical assistance to MOEW and BMLWE for the design and implementation of a targeted communications and outreach strategy to households/consumers on groundwater protection, water conservation, well-capping and the benefits of eventual volumetric water metering. Project preparation was underpinned by a choice experiment survey of 1,200 households across the project area to determine

willingness to pay for improved water services, thereby refining the results of the cost/benefit analysis. Project preparation also included the development of a detailed project communications strategy informed by citizen engagement activities, which identifies project stakeholders and outlines mechanisms for the sustained flow of information during construction and operation of the dam;

Table 2: Summary of project costs and financing allocations

Component	IDB	World Bank	GOL	Total
Component-1: Construction and construction supervision of Bisri Dam and associated infrastructure				
Dam construction	-	290.00	-	290.00
Conveyance Pipelines	20.00	-	-	20.00
Hydropower Plant at Joun	15.00	-	-	15.00
Ouardaniyeh Water Treatment Plant Expansion (WTP)	43.50	-	-	43.50
Construction Supervision of Works of Dam Construction	-	15.00	-	15.00
Construction Supervision of WTP, Hydropower plant, conveyance pipelines, wastewater networks	8.31	-	-	8.31
Sub-Total Component-1	**86.81**	**305.00**	**-**	**391.81**
Component-2: Sustainability of service delivery				
Technical Assistance to MOEW, BMLWE and CDR on dam operation and maintenance	-	0.90	-	0.90
Technical Assistance to MOEW and BMLWE on management of BMLWE water resources	-	1.20	-	1.20
Awareness raising and capacity building		0.50		0.50
Environmnet Management Plan Implementation	40.25	4.00		44.25
Sub-total Component-2:	**40.25**	**6.60**	-	**46.85**
Component-3: Project Management and Quality Assurance				
Dam Safety Panel of Experts	-	2.00	-	2.00
ESMP Supervision	-	2.00	-	2.00
Environment and Social Panel of Experts	-	0.52	-	0.52
Project Management	0.72	1.50	-	2.22
Sub-total Component-3:	**0.72**	**6.02**	**-**	**6.74**
Component-4: Expropriation and Resettlement Compensation				
Sub-total Component-4:	**-**	**155.00**	**15.00**	**170.00**
World Bank Front End Fee (0.25% of total loan)	**-**	**1.185**	**-**	**1.185**
IDB Start up workshop and familiarization visit	**0.04**	**-**	**-**	**0.04**
Financial Audits	**0.18**	**0.19**	**-**	**0.37**
Grand Total	**128.00**	**474.00**	**15.00**	**617.00**

c) Citizen engagement (CE) activities must go beyond communications and stakeholder consultations, necessitating a two-way interaction process that increases greater citizen voice and participation throughout the project cycle and holds service providers and Government agencies accountable. Special attention was paid to ensure that public consultations, social and economic surveys and gender focus group discussions carried out during project preparation informed the design, implementation and monitoring and

evaluation of the project. Drawing from the recent report "*Piloting Citizen Engagement in Projects: A Guidance Note for World Bank Staff Working in the Middle East and North Africa Region*", the project incorporated CE methodologies including an overall grievance redress mechanism and a benefit sharing program for project affected people. The inclusion of intermediate and final CE outcome indicators in the results matrix measures the share of vulnerable groups reached and number of registered grievances addressed;

d) ***Women play a key role in the management and allocation of water resources within households and are thus key stakeholders in project design and operations***. Project team comprised a Gender specialist who coordinated with Government counterparts, local agencies and the World Bank Gender and Development Anchor to determine best practices into the project particularly on issues relating to water quality. This was done through the implementation of 12 gender-specific focus groups implemented across the project area to influence project design and capture anticipated project benefits through the gender lens;

Dam Infrastructure

e) ***Large scale infrastructure projects benefit from evidenced-based analysis of the combined technical, economic, social and environmental impacts of alternatives.*** Following a detailed review of nine alternatives for water supply augmentation to the GBML, Government determined that Bisri dam would be first in a prioritized program of infrastructure projects to provide water security to the GBML. The analysis of alternatives was informed by several public consultations and extensive engagement with the private sector and academia and was built on the MOEW's National Water Sector Strategy;

f) ***The design of large water supply dams must be underpinned by robust hydrological and climate variability and change modelling to ensure environmental and economic sustainability in the long term.*** Detailed hydrological and climate change modeling was incorporated into the detailed design of the dam and was reviewed by the DSPE Hydrologist. The WB provided additional technical assistance to Government in the review of these analyses and connected project partners to national stakeholders including the Lebanese *Centre National de la Recherche Scientifique* (CNRS), a renowned institution for independent academic scientific research in Lebanon and the MENA region.[14] The findings of the hydrological analysis were reflected in various aspects of the dam design and climate change sensitivity analysis;

g) ***Targeted and early-stage focus on an integrated monitoring and evaluation framework promotes the safety and sustainability of water services and associated environmental and social management plans***. Notably, (i) the project comprises a detailed grievance

[14] Separately, the World Bank has provided a GEF Grant to the CNRS under the Improved Water Resources Management and Capacity Building Project (P117170 – currently under implementation) which provides technical assistance on the use of remote sensing and earth observation for improved water resources and agriculture management, and this in collaboration with the US National Aeronautics and Space Administration (NASA).

redress mechanism and alternative dispute resolution system on land acquisition; and (ii) an independent Environment and Social Panel of Experts will also be recruited by Government to monitor the implementation of the ESMP; and

Multidonor Partnerships

h) Early agreement among the partners on the lead partner for the supervision of the environment and social aspects of the project is important to ensure that the schedule of safeguards and construction works are implemented in tandem. The WB and IsDB have agreed to jointly supervise the implementation of the Bisri Project as per the recommendations of the OP 4.37 mandated Safety of Dams, Environmental and Social Panel of Experts, ESMP, RAP and institutional arrangements for operation and maintenance of the dam post construction. This reconfirms the strong commitment of IsDB to the WB environmental and social safeguards policies.

IV. IMPLEMENTATION

A. Institutional and Implementation Arrangements

52. The Lebanese Republic, represented by the Ministry of Energy and Water (MOEW) is the owner of the project which will be implemented by CDR and will be operated and maintained by the BMLWE. CDR has extensive experience with the World Bank's financial, procurement and safeguards requirements for infrastructure-related projects.

53. A Project Management Unit (PMU) will be established at CDR to manage project implementation and will comprise a Project Director, Project Engineer, Financial Officer, Environment Specialist, Social Specialist, Communications Officer, MOEW Coordinator, BMLWE Coordinator and Project Assistant. An electro-mechanical engineer and civil engineer may also be recruited to the PMU by IsDB during implementation. The Project Director and Social Specialist will be recruited as soon as possible, and can be financed through retroactive financing arrangements, to ensure swift and effective start to project implementation including the expropriations of land.

54. The BMLWE will operate and maintain Bisri dam post-construction. Working directly with MOEW, BMLWE will be closely involved in managing the implementation of the dam, to ensure timely handover upon the finalization of construction. BMLWE will assess options for the operation and maintenance of the dam[15] to ensure a balance between: (i) water security and access to water supply for distribution to the GBML and (ii) the technical complexity of operating large dams and hydropower schemes and ensuring the safety of their operations.

[15] Government will finalize its strategy for O&M arrangements of the Bisri dam prior to June 30, 2018, as per the Loan Agreement.

B. Results Monitoring and Evaluation

55. The results framework outlines key performance indicators, data collection methods, a timetable for collection, and responsible agencies (Annex I). This framework will be used by the WB and IsDB Task Teams to jointly supervise and monitor project implementation.

56. The PMU will be responsible for the overall management and implementation of the project monitoring mechanisms and reporting under Components 1, 2, 3 and 4. Monitoring tools to be used for the project will include progress reports compiled by the works construction supervision (Component 1), and the PMU (Component 3).

57. The Dam Safety Panel of Experts (DSPE) will carry out periodic supervision of hydrology, seismic assessments, and geotechnical isues related to dam construction and safety. These reports will be used for periodic technical audits of environmental and social safeguard measures. The DSPE will remain on contract with GoL until one year after completion of the first filling of the reservoir, as per OP 4.37 requirements.

58. Monitoring and evaluation of outcomes and results during implementation will be undertaken through systematic interim supervision missions coinciding with key project milestones and through PMU quarterly progress reports. Discussions during supervision missions related to institutional capacity building, financial viability, technical reviews and site visits will also provide effective means of monitoring progress.

C. Sustainability

59. The project's direct beneficiary is the BMLWE - the water utility responsible for water services in the GBML - which will store additional volumes of water for distribution across the project area. The project will further increase the climate resilience and adaptive capacity of water supply systems across the GBML for BMLWE to optimally manage water supply and provide more sustainable long-term water resources.

60. Several key sustainability factors have been incorporated into the project design:

- *Dam construction is implemented on schedule and in coordination with other infrastructure:* Water stored at the Bisri dam will be conveyed, treated and distributed through the GBWSP infrastructure currently under implementation by CDR with partial WB financing (P103063). It is thus essential for the WB to closely monitor implementation of both projects in tandem to ensure that the downstream conveyance infrastructure is complete by the end of dam construction. The full implementation of the RAP, ESMP and communications strategy will also contribute to clarifying project objectives, status and mitigation measures to project affected people, environmental groups and/or the general public.

- *Safe and sustainable operation of the dam:* Once commissioned, the dam will need to be operated in a safe and efficient manner, such that water service delivery to the project area is balanced with anticipated revenue-generating hydropower production. The institutional arrangements for dam operation and maintenance have been closely

considered as part of project preparation and will be formalized as the operation strategy by 2018, in close consultation with Government counterparts.

- *Users substitute groundwater pumping and private wells by BMLWE network water:* The economic sustainability of the project is directly impacted by users abandoning the use of groundwater wells and other freshwater alternatives, in favor of the dam-supplied water. To ensure that this critical transition is made, the project will provide technical assistance to MOEW and BMLWE in raising public awareness on the environmental and public health risks of continued reliance on groundwater, and in monitoring and communicating the quality of water from the improved network, and strategically communicating results to increase customer confidence in Government water services. The project also draws from international experience in well-capping, and will develop a strategy for MOEW and BMLWE to implement the legal and institutional prerequisites of a succesful well-capping program.

61. Implemented together, these critical factors are expected to significantly increase the sustainability of the project and water sector as a whole.

V. KEY RISKS AND MITIGATION MEASURES

62. The project has been designed to mitigate the various inherent risks which include: (i) Lebanese context risks; (ii) technical and cost risks; (iii) environment and social risks; and (iv) operational risks. These are summarized below and described in detail in the attached ORAF:

a) **Lebanese context risks**: Country specific risks to the project include (i) delay in project effectiveness, resulting in a delayed start to project implementation; (ii) delay in implementation of expropriation decree and disbursement of associated funds prior to the start of construction and (iii) political and security instability which could deter international contractors from bidding and/or increase the overall cost of construction. The WB has engaged with Government counterparts to raise awareness of the importance of timely project implementation and seek political commitment to enact swift Loan ratification and approval of the expropriation decree, required for the commencement of expropriation and resettlement activities;

b) **Financing risks:** The World Bank Standard Bidding Documents and Procurement Guidelines will be used for the procurement of the part of the Project financed by the World Bank, including construction of the Bisri dam works, and the IsDB will use its own guidelines and standards for items financed by IsDB. However, in the unlikely event that IsDB withdraws its financing of the Project, a financing gap would be incurred. GoL has confirmed its commitment to seek to close the financing gap should this situation arise;

c) **Technical and cost risks**: Bisri dam will be constructed on a site that is known to be seismically active and karstic in nature. The detailed design of the dam has thus incorporated the results of additional geotechnical investigations, a seismic hazard

assessment study as well as other technical recommendations by the Dam Safety Panel of Experts. The four dam safety plans (i.e. Construction Supervision & Quality Assurance Plan, draft Instrumentation Plan, draft Emergency Preparedness Plan and draft Operation & Maintenance Plan) have also been reviewed by the Dam Safety Panel of Experts and Bank team. A 30 percent physical and financial contingency is included in the project budget to finance possible cost over-runs considering complicated geological conditions;

d) **Environment and social risks:** Concerns around a potential increased influx of refugees to the project area has been mitigated by the establishment of the RAP cut-off date coupled with continued dialogue with Government on means in which to address the humanitarian crisis facing refugees in Lebanon. The WB has agreed with the Lebanese office of the United National High Commission on Refugees (UNHCR) on actions to ensure that Syrian refugees present on the Bisri site are provided with appropriate assistance. Delays in or unsatisfactory implementation of the mitigation measures described in the safeguards documents poses a further risk. Implementation of the ESMP and RAP will be supervised by independent project-financed environment and social panel of experts. An independent Panel of Environmental and Social experts will monitor implementation of the ESMP and RAP including land acquisition on behalf of Government; and

e) **Operational risks**: Water stored at Bisri will be conveyed, treated and distributed through infrastructure that is currently under implementation in the GBWSP. Delays in implementation of the GBWSP will thus directly impact the dam's ability to increase the volume of water delivered to the GBML. The World Bank, as financier of GBWSP is working with Government to coordinate timely implementation.

63. In November 2010, a complaint was registered with the Inspection Panel against the GBWSP. Among other issues, the complaint alleged that the GBWSP depended on the construction of Bisri dam to be economically feasible. The Inspection Panel found the complaint to be not eligible for inspection (reference Report No 63546-LB). The Bank team maintains its existing dialogue with the lead complainant and Government representatives on this issue and has agreed to a comprehensive communications strategy with Government to ensure wide dissemination of relevant project information.

A. Risk Ratings Summary Table

Risk Category	**Rating**
Stakeholder Risk	**High**
Implementing Agency Risk	
- Capacity	**Moderate**
- Governance	**Substantial**
Project Risk	
- Design/Technical	**High**
- Social and Environmental	**High**

- Program and Donor	**Substantial**
- Delivery Monitoring and Sustainability	**High**
Overall Implementation Risk	**High**

B. Overall Risk Rating Explanation

64. The overall risk rating is High and reflects the technical, environmental and social complexity of the various components of the project and the operating environment in Lebanon generally. The project is nonetheless considered to be feasible technically (as confirmed by the DSPE) and environmentally and socially sound. The project is economically viable and will lead to improved services provided to households in the project area.

VI. APPRAISAL SUMMARY

A. Economic and Financial Analysis

Economic Analysis

65. A detailed Cost Benefit economic analysis (CBA) was undertaken for the project. The Economic Internal Rate of Return (EIRR) of the invested capital was calculated to be at least 14 percent per annum. The net present value (NPV) was also calculated to be at least US$113 million, over the period up to 2047, at a discount rate of 12 percent. Alternatively, the NPV at a discount rate of eight percent is at least US$540 million, over the same period.

66. Sensitivity analyses were conducted to reflect several various forms of project uncertainties. These include sensitivity analyses to reflect investment cost overruns and delays in project implementation. The analyses demonstrated a margin for increased discounted investment costs of approximately US$113 million, for a worst-case scenario with respect to project benefits. This is considered to provide a sufficient buffer capacity for cost overruns during implementation. The analyses further demonstrated that a two year delay in implementation of the Bisri dam (without delay of investments) would lead to a reduction of US$40 million in benefits, as a discounted value. This will reduce the net benefits from US$113 million to US$73 million and the EIRR to an estimated 13.5 percent, implying that the project would still be viable even under the most conservative assumptions about project benefits. Details are provided in Annex 6 with further information available in project files.

67. Public financing rationale includes the significant public interest and concerns associated with such a significant water resource initiative, and the current Lebanese context which impedes private sector willingness to assume the risk of a project of the scale and duration of the proposed Project. In this context, Government has requested financing from the World Bank given Government's limited ability to raise required capital affordably from private markets, and the Bank's historical engagement in the Lebanese water sector and ability to support Government with the high technical requirements and thorough safeguards involved in large dams.

Financial Analysis

68. Upon completion of Bisri dam, BMLWE will operate and maintain the dam. A financial analysis was therefore undertaken to assess the BMLWE's capacity to operate and maintain Bisri dam, at an estimated cost of US$3 million per year, as part of a comprehensive system of water distribution to the GBML. The financial analysis is based on a cash flow simulation of BMLWE's revenues and expenses.

69. The financial analysis found that despite a period of heavy capital investments spanning 2014 – 2018, BMLWE will continue to be viable and would generate surpluses to cover the O&M of its entire distribution system, including the O&M costs of Bisri dam, upon its commissioning in 2022. In line with the NWSS and BMLWE Business Plan however, it is critical to ensure that volumetric metering is implemented in tandem with the infrastructure investments described above, and this to ensure sustainability and efficiency of supply operations. Details of the financial analysis are provided in Annex 7.

70. Accordingly, Component 2 of the Project will provide technical assistance to BMLWE and MOEW in the improvement of the overall efficiency of its operations, including the implementation of volumetric metering, as well as to ensure safe and sustainable implementation of Lebanon's national program of water supply dams.

B. Technical

71. The project was selected based on the conclusions of the AA commissioned by CDR and reviewed by the Bank for water augmentation to the GBML. The AA undertook an evidenced-based review of the technical, economic, environmental and social aspects of four dam options (Bisri, Janneh, and two sites at Damour) as well as several non-dam options, including improved groundwater management, desalination, demand management and treated wastewater reuse.

72. The Bisri Dam emerged as the best option for having the potential for highest storage volume capacity while leveraging costs significantly through the utilization of the anticipated GBWSP transmission, treatment and storage facilities resulting in lowest cost per unit volume delivered to GBML. BMLWE has launched the implementation of Janneh dam. A combination of burdensome costs, geological risks and technical limitations however currently prevent the Damour dams from being feasible options for domestic water supply at this time, until further studies are initiated.

73. Component 1 of the project will finance construction and construction supervision of the Bisri water supply dam and associated facilities. The Bisri dam will be located approximately 17 kilometers inland from the coast of the Mediterranean Sea and north east of the southern city of Saida. The Bisri dam will be a zone embankment dam with clay core, 70 meters high and 116 million cubic meter live storage capacity. A small hydropower plant of 0.2 MW capacity will be installed at the dam site. A 3.7 kilometer twin pipeline will convey stored water to connect to the tunnel currently under construction under the GBWSP. A second larger hydropower plant (12 MW) will be installed at the existing Awali hydropower plant.

74. The detailed design, including an early warning system, and dam safety studies have been developed under supervision of a GoL-appointed DSPE as per World Bank OP 4.37, which included experts in dam construction, seismology of dams, hydrology and geology. Technical details are provided in Annex 2. The panel of experts will remain appointed until the end of the first year after completion of the first filling of the dam and initial operation period.

75. The Bank undertook a review of the hydrological model of Bisri River and associated climate impacts[16] to independently confirm the results of the detailed design in this regard. The study found that the hydrological characteristics (inflow, design floods, safe yield, etc.) have been computed through standard methods at level of international good practice. Uncertainties in historical records, as well as future effects of climate change, have been assessed and transparently presented. The hydrological assessment shows that the Bisri Dam, with a proposed storage of 116 million cubic meter (m^3) will produce a yield of 5.1 m^3/s (80 million m^3) during six summer months, at 93 percent assurance for the Iklim El Kharoub and Beirut Water supply. The rare deficits are possible to address through other available sources - mainly water transfer from Litani River. Uncertainties due to future climate change have been incorporated in the analysis and have shown that the scheme is climate resilient.

76. Operation and maintenance of the dam will be the responsibility of BMLWE. Following an institutional assessment of options for sustainable and cost effective operation and maintenance of the dam, MOEW will further cooperate with the Litani River Authority (LRA) and other stakeholders as appropriate on modalities of jointly operating the hydropower plants at the dam site.

77. Building on the Bank's previous engagements in the water sector in Lebanon and global practices in the implementation of dams and groundwater management, Component 2 has been designed to finance priority activities, complementary to construction of Bisri dam, to ensure safety and the long-term sustainability of water service delivery across GBML.

C. Financial Management

78. The project will be financed by Government, World Bank and Islamic Development Bank. The Project financial management arrangements, including accounting, reporting, and auditing functions will be centralized at the PMU within CDR.

79. Two Designated accounts (DA) for the project's loan funds will be opened at the Banque du Liban (BDL) in US$. Funds will be transferred to the two DAs. CDR will use one DA to pay for eligible expenditures related to all components activities that the World Bank is financing except for resettlement which will be done from the second DA in order to account for and monitor the status of beneficiaries.

80. A Project Implementation Manual (PIM) including an FM chapter for the Project FM implementation has been prepared and includes detailed internal control procedures and

[16] The Bank engaged with the Conseil National de la Recherche Scientifique (CNRS) which is the recipient of another World Bank financed GEF Grant: Improved Water Resources Management and Capacity Building in partnership with NASA (P117170).

guidelines related to the expropriation of Land and properties. The project financial reports will be prepared by the PMU and submitted to the World Bank and Islamic Development Bank along with the Project Progress Reports.

81. The Project's Interim Un-audited Financial Reports (IFRs) will be prepared in accordance with International Public Sector Accounting Standards (IPSAS) – Cash Basis and generated through the Accounting System. The IFRs will be sent to the World Bank by no later than 45 days after the end of each quarter.

82. The Project Financial Statements (PFS) will be prepared in accordance with IPSAS – Cash Basis - and should contain the same information as the quarterly IFRs but cover an annual period. The PFS will be audited by an independent private external auditor acceptable to the World Bank. The audit will cover all activities of the project financed by the loan, including compliance with the PIM, review of effectiveness of the internal controls system, and compliance with the Financing Agreement. The audit TORs will be prepared by CDR and reviewed by the World Bank. The audit will be carried out in accordance with International Standards on Auditing. The audit report and PFSs, along with management letter, will be submitted to the Bank no later than six months after the end of each fiscal year.

D. Procurement

83. The World Bank Procurement Guidelines (Guidelines: Procurement of Goods, Works and Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers dated January 2011 and revised July 2014) and the World Bank Guidelines on Preventing and Combating Fraud and Corruption in Projects financed by IBRD Loans and IDA Credits and Grants, dated October 15, 2006 and revised in January 2011 and July 2014 will apply to the procurement and implementation of the project procurement packages financed by the World Bank, including the dam works and dam construction supervision contracts. IsDB Procurement Guidelines will be used for packages financed by IsDB under parallel financing. Packages identified to be financed by each financier are included in the Project Procurement Plan.

84. The World Bank and IsDB will co-supervise the Project to facilitate the review of Project documents and ensure the timely procurement & implementation of the activities.

85. An assessment of CDR's procurement capacity was undertaken as part of preparation. The Public Accounting Law of 1963, supplemented by several decrees, constitutes the legal foundation of Lebanon's organizational and institutional framework for procurement. The current system has remained entirely centralized, with the Department of Tenders (DOT) being in charge of public procurement. CDR is however exempt from the Public Accounting Law of 1963. Since its establishment in 1977 as a legally and financially autonomous state agency, CDR has operated under special procurement regulations. This was formalized in 1980 through a decree covering CDR's financial and accounting transactions assigned to CDR by the Minister of Finance. As a result, CDR, under monitoring of its Board, can adhere to the procurement requirements of donors, including the World Bank.

86. CDR has shown capability to handle large and complex projects by using a combination of its own staff and outsourced staff and consultants to address capacity needs of each specific project. In a reorganization of its functions in 2003, CDR created a bureau for monitoring and evaluation as well as for appointing bid evaluation committees. CDR at times, and when a project team is not adequately staffed, still faces difficulties in managing procurement issues due to the number of projects being implemented. To ensure satisfactory performance under this project, CDR has been using qualified, outsourced procurement and technical consultants during preparation and will continue using the services of qualified outsourced consultants, in addition to its own staff, and will ensure that the PMU is adequately backed by additional support in order to prevent overloading of current staff. Contract management capacity will be improved by hiring qualified consultants to ensure timely decision-making and amendments to contracts as needed. Bank Standard Bidding Documents and Request for Proposals (RFPs) will be used for the Project.

87. A Procurement Plan dated August 11, 2014 for project implementation has been developed. Currently, there are no post-review packages planned, hence procurement supervisions will take place along with regular supervision missions planned for the project (twice a year) and as part of interim reviews. In the event of the need for post review packages, these will be reviewed during Bank supervision missions.

E. Social

88. The project will generate broad social benefits. GBML residents currently suffer from the shortage of water supply with rationing common during the six month dry summer season. Through the implementation of the Bisri dam, residents in the project area will have access to significantly improved volume and quality of water supply. The Project targets the poor within the GBML who will also benefit from a decrease in the overall cost to households for water provision. A detailed description of the social safeguards is presented in Annex 9.

89. The key adverse social impacts of the project are largely related to land acquisition and demolition of structures. The total permanent land acquisition is about 570 hectares, which includes the lands needed for dam site, reservoir, buffer zone, power plant, transmission line, water conveyor, and the access road. It includes 966 separate cadastral land plots owned by 861 landowners. Among them, 765 landowners do not live in the project area or the neighboring communities and do not rely on the land for their income and livelihood. These landowners are identified as absentee landowners. 135 structures will need to be demolished for the project construction and the total area of these structures is 10,128 square meters.

90. Land acquisition will affect 49 residential households, of which six households are landowners, eight households are Lebanese tenants, and 35 households are tenants from other countries. The total residential population affected is 238 persons, of which 64 are Lebanese and 174 are foreigners. Among 174 foreigners, 72 persons are non-refugees and 102 persons are refugees.

Table 3: Summary of Project Affected Persons

District	Residents within the expropriation limits			TOTAL	Landowners (households)			TOTAL
	Lebanese		Non Lebanese					
	Landowners	Non-Owners	Residents		Resident Landowners	Non-Absentees	Absentees	
Chouf	**15**	**17**	**123**	**155**	**5**	**68**	**509**	**582**
Jezzine	**2**	**30**	**51**	**83**	**1**	**22**	**256**	**279**
TOTAL	**17**	**47**	**174**	**238**	**6**	**90**	**765**	**861**

91. **Resettlement Action Plan:** To mitigate the impacts, a Resettlement Action Plan (RAP) has been prepared following the World Bank policy on Involuntary Resettlement OP 4.12 and relevant local laws and regulations. The RAP is prepared based on detailed census of the affected people, inventory of affected assets, socioeconomic surveys and extensive consultations with the project-affected people highlighted in Annexes 9 and 11. The RAP was publically disclosed in Lebanon and at the Infoshop on June 2, 2014. Project consultations were held to inform the RAP and project design.

92. **Project Cutoff date:** The cut-off date has been established and publically announced to be March 20, 2014. In the absence of the expropriation decree, the March 20, 2014 cut-off date places the project lands "under study", as allowed by Government's Higher Council for Urban Planning.

93. Lebanese expropriation guidelines consider the date of the actual expropriation decree to be the cut-off date. The expropriation decree date will fall after the cut-off date included in the RAP, and CDR will provide compensation/resettlement to those who move onto the site after the RAP cut-off date. This approach goes beyond the World Bank's policy requirements and is deemed acceptable to both CDR and the World Bank.

94. The WB commissioned an independent review of the application of OP 4.12 Involuntary Resettlement to Syrian refugees in Lebanon and absentee land owners, the findings of which are summarized below:

- **Assistance to family members with Syrian refugees**: In the years before the project eligibility cut-off date was established, a small number of Syrian nationals moved into the project area as contract laborers, leaseholders or encroachers on unoccupied land, thereby obtaining eligibility as displaced persons under OP 4.12. Some have been joined by family members who have left Syria because of the ongoing civil strife. Under OP 4.12, refugees, as well as persons arriving after the cut-off date, are not eligible for assistance as displaced persons. To prevent impoverishment or hardship, the project will provide assistance as required to all persons occupying the project area prior to the cut-off date, and arrangements will be agreed with GoL to provide the families involved with limited

and temporary transitional support. The details are included in the RAP. The WB also met with UNHCR representatives in Lebanon several times during project preparation and agreed on mechanisms to facilitate the provision of assistance to Syrian refugees present within the project area.

- **Absentee Landowners**: Approximately 90 percent of project affected landowners are considered absentee i.e. not residing in the expropriated area or in the villages surrounding the valley and/ do not rely on the land. Compensation to absentee landowners may result in delays or unexpected challenges. In most project situations, compensation is paid before land and fixed assets are taken for project purposes. In Lebanon projects, payment of all compensation in advance of land taking has been a challenge in certain cases because owners of significant numbers of affected land plots cannot be found or because persons eligible for compensation do not make claim for payment. As similar circumstances may occur in the project, Government has agreed to: (i) place unclaimed compensation prior to taking; (ii) undertake additional efforts to notify owners; (iii) establish a basis for determining abandonment of property; (iv) simplify compensation claims procedures to encourage claimants; and (v) periodically report to the World Bank regarding status of outstanding cases. The WB Supervision team will incorporate a legal specialist in these issues to advise as required.

95. Other potential negative social impacts and risks include changes of water access to local communities through the construction of the dam; and large number of construction workers and possible subsequent conflict between construction camps and local communities. These are addressed as part of the Environment and Social Impact Assessment (ESIA) prepared under the project and described below.

96. **Benefit Sharing Program:** The project will primarily benefit the residents of the GBML through increased water supply. Landowners in the valley whose land will be inundated and the villages in the surrounding hills may on the other hand suffer from adverse impacts of induced development including soil erosion and reduced water sources for irrigation. To ensure that local people in the surrounding communities receive adequate benefits from the project construction and operation, a benefit sharing program will be established. The objective of the program is to share the benefits of Bisri Reservoir beyond water supply consumers in the GBML. More specifically, the program will help: (i) improve community services and social welfare throughout the areas impacted by construction and inundation; (ii) ensure the surrounding communities share the benefits from subsequent development of the reservoir shoreline and adjacent areas; and (iii) promote employment opportunities. The program will initially be funded through an injection of US$1.5 million from the project budget for land expropriation and resettlement. Future sources of funding may include contributions from: (i) small levy on GBML consumers relative to the volumetric consumption; and (ii) small percentage of revenue of the reservoir operation. The institutional arrangements of the program implementation and activities to be financed will be designed based on the consultations with local people.

97. **Citizen Engagement (CE):** Public consultations and focus group discussions were conducted as part of project preparation, and sought feedback on Components 1 and 4 in particular. Additional citizenship engagement activities including a household survey and focus

group discussions were also designed and carried out during project preparation to ensure that citizen feedback informs the design, implementation and monitoring and evaluation of the project. A detailed communications plan identifies specific activities to facilitate citizen engagement and two-way communication (Annex 11).

98. The project has been designated an "entry point" pilot project for citizen engagement in MENA. Specific CE indicators have been included in the results framework (Annex 1) to ensure monitoring of CE implementation over the project period**.**

99. **Grievance Redress Mechanism:** Based on feedback received from consultations, the project includes a grievance redress mechanism (GRM) to provide clear and accountable means for affected persons to raise complaints and seek remedies when they believe they have been harmed by the project. An effective and responsive GRM also facilitates project progress, by reducing the risks that unaddressed complaints eventually lead to construction delays, lengthy court procedures, or adverse public attention. The project includes multi-level arrangements for registering and addressing grievances and complaints from project-affected people. The process and procedures of grievance redress are as follows:

- Level 1: For any complaints, concerns or suggestions with the project design and implementation, land expropriation, valuation and compensation, an individual can lodge an oral or written grievance through mail, email, or phone text message to the mayor's office of the municipality and/or the Project Information Center (PIC). In case an oral complaint is made, it will be written on paper by the receiving unit. The above issue will be resolved within 14 days.
- Level 2: If the individual is not satisfied with the decision of the Mayor's Office or the PIC, he or she can bring the complaint to the attention to the Social Specialist of the PMU within one month from the date of the receipt of the decision. The issue shall be resolved within 14 days.
- Level 3: If the individual is not satisfied with the decision of the Social Specialist of PMU, he or she can bring the complaint to the attention of the PMU Director within one month from the date of the receipt of the decision. Once the PMU Director receives the complaints, it must be resolved within one month in coordination with relevant departments of CDR and local municipalities.

100. A designated person at each level will be assigned responsibility for receiving and recording receipt of each complaint, whether received orally or in writing. The contact information of the person will be made publicly available prior to commencement of project implementation. At the end of each month during implementation, the designated person reports to the PMU on the number and subject of new complaints received, and the status of complaints, if any, remaining under resolution. The report also informs the PMU of complaints that could not be resolved and are being elevated to the PMU Director's attention. Each quarter, the PMU aggregates information received into a status report, indicating the number and subject of complaints. The quarterly status report also provides up-to-date information on the number and subject of complaints that have been resolved, and the manner in which they have been resolved. The quarterly status reports are made available for external monitoring and to the World Bank for project supervision and project evaluation purposes.

101. **Public Information Center (PIC):** A PIC will be created at the PMU in Beirut with a branch in an easily accessible location in works area. The PIC will comprise of a Social Specialist responsible for coordinating and responding to citizen queries. Feedback can be submitted via multiple tools and in person. Once hired, the Social Specialist will be trained in Citizen Engagement methodologies to carry out activities prior to and during the expropriation process and to liaise with civil society organizations, community cooperatives, religious institutions, local municipality officials in their role as social intermediaries and project stakeholders. Such activities will contribute to the development of a benefit-sharing program that responds to citizen feedback and promotes new sources of income for people impacted by the project. Special attention will be paid to the inclusion of women, youth and the elderly in order to ensure adequate voice and representation. Additionally, a satisfaction survey will be carried out during project reviews to assess effectiveness of the PIC and GRM, and a final survey will be carried out among beneficiaries upon operation of the dam.

102. **Gender:** Shared, gender-based differences exist in the water sector. Globally, women are primarily responsible for managing water and hygiene at the household and community levels. Furthermore, women and girls are most impacted by limited access to infrastructure services. They spend a disproportionate amount of time carrying out time-intensive domestic tasks, a burden which is only compounded in situations where chronic deficiencies exist in water provision**.**[17]

103. Eight percent of women in the GBML service area are reported as the main breadwinners.[18] The project mainstreams gender by: (i) quantifying the differentiated impact of the burdens and benefits of improved water supply among male and female residents in the project affected areas and GBML service zones, and (ii) identifying areas of engagement by men and women during the operationalization of Component 1 and through the support of Component 2 in terms of citizen feedback and awareness. A qualitative study in the form of twelve semi-structured focus groups was carried out over the period of project preparation to provide deeper understanding of the gendered dimension and inform the design of gender-responsive indicators for measuring how the project is performing in this particular area.[19] Details of the analysis are provided in Annex 10. The Project Implementation Manual (PIM) contains gender-sensitive language that monitors and guarantees inclusiveness during such activities including citizen outreach, communications and recruitment to project positions. This requirement will help ensure equal representation of all diverse population groups in the GBML.

[17] Literature review includes: World Bank Social Development Department. Making Water Supply and Sanitation Work for Women and Men, December 2010. A policy brief on Gender, Water and Sanitation developed by the Inter-agency Task Force on Gender and Water (GWTF) under the UN-Water and the Interagency Network on Women and Gender Equality (IANWGE) in support of Water for Life 2005-2015. June 2006.

[18] World Bank Water Supply Augmentation Project (P125184) Household Survey, March – April 2014.

[19] Gender-responsive indicators can encapsulate gender-specific or gender-inclusive performance outcomes. The former measures specific needs of men and women whereas the latter focuses on relative benefits and provides comparable information.

Table 4: ESIA and RAP Consultations

Time	Place	Audience
04/2012	CDR	Institutional Stakeholders
10/04/2012	Mazraat El Daher	Project Affected People
24/04/2012	Hadath	GBML Beneficiaries
05/10/2012	Beirut	GBML Beneficiaries
30/12/2013	CDR	Institutional Stakeholders
02/02/2013	Midane	Project Affected People
02/02/2013	Mazraat El Daher	Project Affected People
06/02/2013	Hadath	GBML Beneficiaries
09/02/2013	Ammatour	Project Affected People
09/02/2013	Mazraat El Chouf	Project Affected People
25/04/2014	Aamatour	Project Affected People
	Mazraat El Chouf	Project Affected People
26/04/2014	Bisri	Project Affected People
	Mazraat El Dahr	Project Affected People

F. Environment

104. The project is designated Category A per the Bank's policy on Environmental Assessment (OP/BP 4.01) due to the potential adverse environmental and social impacts that could be sensitive, diverse or unprecedented. The following safeguards policies are triggered by the project: Environmental Assessment (OP.BP 4.01); Natural Habitat (OP/BP 4.04); Physical Cultural Resources (OP/BP 4.11); Forests (OP/BP 4.36); Involuntary Resettlement (OP/BP 4.12), and Safety of Dams (OP/BP 4.37). A comprehensive Environmental and Social Impact Assessment (ESIA) including Cultural Resources Management Plan, an Environmental and Social Management Plan (ESMP), the Resettlement Action Plan (RAP), and Dam Safety Plans have been prepared, consulted upon, approved and are in compliance with World Bank safeguard policies. The ESIA/ESMP and RAP were disclosed in-country and at the InfoShop on June 2, 2014. All safeguards instruments are also accessible on the CDR's website**.**

105. The ESIA revealed a number of environmental impacts including impoundment and inundation, erosion and sedimentation, impacts on ground water resources, biodiversity and habitats. Operational environmental issues include water and power supply, irrigation needs, downstream flood control, dam safety, greenhouse gas emissions, and local climate change. Social impacts largely include land take, involuntary resettlement, public health and well-being, workers' health and safety, and induced development.

106. **Public Consultations:** During the ESIA process, a series of consultation and scoping process/meetings including an institutional stakeholders session were held with key stakeholders in different venues. The consultation process will continue during reservoir filling and project implementation.

107. **Ministry of Environment Review:** As per MOE 2012 Decree on EIA, an ESIA is required for all Category A projects. The Ministry of Environment cleared the project ESIA and

will remain involved in the implementation and monitoring of the ESMP, as described in the ESIA.

108. **Associated Infrastructure:** In addition to the dam works, the project ESIA covers the associated infrastructure as follows: (i) reservoir and buffer zone; (ii) access road; (iii) conveyor line; (iv) hydropower plant; (v) expansion of the water treatment plant at Ouardaniyeh and (vi) upstream catchment sewerage networks. The water treatment plant at Ouardaniyeh is currently under implementation under the Bank-financed GBWSP. The water treatment plant was addressed under the GBWSP ESIA. The hydropower plant, conveyor line, water treatment plant expansion and sewerage networks will be financed in parallel by IsDB and will be subject to the World Bank Safeguards Policies.

109. **Independent Panel on Dam Safety and Environment/Social:** In addition to the Dam Safety Panel of Experts, CDR will appoint an Environmental/Social Panel of Experts that will assist in monitoring the implementation of the ESMP and RAP in line with best practice international standards and Bank safeguards policies. The independent panel of experts on environmental and social aspects comprises: (i) an environment expert; (ii) a social expert; and (iii) a cultural anthropologist. The World Bank and CDR discussed provisions for the ESMP implementation and supervision arrangements.

110. **Wastewater impacts:** The proposed project will replace water currently distributed in households from tankers, wells and bottled water from the Bisri dam. Thus, the impact on sanitation within the GBML area is not expected to be significant. Project preparation confirmed that collection networks are designed as per the national design criteria for sewer design. The Bank also confirmed the status of implementation of the three wastewater treatment plants (WWTPs) in the project area, in line with the MOEW National Wastewater Strategy, namely: (i) Ras el Nabi Younes wastewater collection networks; (ii) Ghadir WWTP and wastewater networks; and (iii) Burj Hammoud WWTP). The ESMP includes regular monitoring and supervision of these wastewater projects. Bank supervision missions will also monitor progress on implementation of these wastewater collection and treatment projects.

111. A number of villages in the upper catchment of the reservoir do not currently have sewerage infrastructure, which poses a risk of water pollution from wastewater discharge into the reservoir. The ESMP addresses this issue through the construction of sewerage networks in the upstream catchment. These works will be financed in parallel by the ISDB and will be supervised by the WB team to ensure compliance with World Bank Safeguards Policies.

112. **Quarries:** Bisri Dam will consume about six million tons of building materials, of which some 80 percent is expected to be from existing workings and borrow areas within the reservoir area. The remaining 20percent will therefore be derived from quarries outside the project area. The contractor will be expected to procure these materials from existing commercial quarries rather than to create new excavations. Lebanon has a large number of quarries with many in the vicinity of Bisri. Bisri is well located to take advantage of quarries in the foothills south of Damour and within the Nahr Awali Valley downstream of the dam site. Details on the environmental impact of quarries and associated environmental management plans are described in the ESIA. A detailed description of the environmental safeguards is presented in Annex 8.

G. Other Safeguards Policies Triggered

Physical Cultural Heritage

113. A field-based survey of archaeological and historical sites in and around the dam and impoundment area, and sites of all associated facilities (e.g. quarries, work yards, construction camp, access roads, diversion channels, etc.) was carried out during the preparation stage. CDR has agreed with cultural heritage and religious authorities on the mechanisms, costs and responsibilities for any necessary relocation of artifacts and structures - namely the Mar Moussa Church and remains of the St. Sophia Monastery. The survey confirmed the absence of graves or graveyards. The survey and the cultural resources management plan approved by relevant Lebanese authorities, forms part of the ESIA.

Safety of Dams

114. The Dam Safety Panel has been established and provided review and recommendations on the draft design report, and confirmed overall technical feasibility and safety of the dam. The detailed design and bidding documents are being completed incorporating their recommendations. Four dam safety studies have been satisfactorily prepared, namely: (i) Construction Supervision and Quality Assurance Plan; (ii) draft Instrumentation Plan; (iii) the Preliminary Operation and Maintenance (O&M) Plan; and (iv) the Framework Emergency Preparedness Plan (EPP). The final O&M Plan and EPP will be finalized six and twelve months prior to the first impoundment.

Natural Habitats

115. The Project has no major conversion of critical natural habitats. The ESIA includes details of the ecological and habitat survey and associated biodiversity management plan and action framework developed as part of the Project, in compliance with the Bank's safeguards policies on Natural Habitats.

Forests

116. Forest issues include measures for the recovery of the wood from the dam reservoir, as well as control of induced impacts at the periphery of the reservoir. The impacts and mitigation measures are explained in the ESIA.

H. Communication

117. Government deploys a combination of broadcast and written communiqués, social media and mobile applications to raise public awareness on issues related to water consumption, management and distribution of resources. In an effort to leverage these efforts and build on the experience of past projects, the World Bank has carried out a series of studies to better understand the current communication landscape in the context of water supply and sanitation. Drawing from the inputs of the studies, the project developed a communication strategy to be carried out throughout the project implementation cycle. The strategy provides an operational framework with tactical steps that will contribute to overall improved development

communication and a positive environment for successful completion of the project. The strategy is available in project files and summarized in Annex 11.

118. The communication plan has three main areas of focus: (i) supporting the PMU in carrying out overall activities in a timely and effective manner; (ii) managing risks and fostering good practices in accountability through active stakeholder engagement; and (iii) raising awareness and promoting behavior change in the GBML region.

119. Supporting the PMU in completing the overall project tasks in a timely and effective manner is the primary objective of the communication strategy. A mapping of stakeholders to understand the landscape as well as the key players involved in the water sector was carried out through a combination of literature review and qualitative interviews. A Communication Associate will be included as part of the PMU to ensure systematic documentation and knowledge sharing of key milestones and updates and to provide support to the environmental, social, and engineer specialists based at the PMU. The communication associate will report directly to the PMU Director.

120. Risk management will be founded on the principals of good governance and managed through internal and external communication efforts. The specific goals concern both internal and external communication. The internal communication mechanisms will focus on safeguarding the timeliness and efficacy of each of the project components, in particular contracts and procurement processes, dam safety measures, as well as enforcement of the ESMP and GRM during expropriation and overall project cycle. The external communication will be designed to communicate the project outcomes and benefits through multi-media and public relations activities joined by relationship building with various interest groups, including those from civic organizations and the private sector.

121. Finally, the operational communication support will contribute directly to Component 2, including a long-term plan for raising awareness among citizens in the GBML region. The objectives of these activities will be to evaluate water user management, conservation attitudes, and willingness to pay. Activities will build off the results of the household survey and gender focus group discussions carried out during preparation stage and to promote the necessary behavior change to ensure gradual switch over to the public network and eventual volumetric metering of water supply. Messages will focus on positive impact of switching over to the public network, including cost savings to beneficiary households that no longer need to pay for construction, operation, and maintenance of private wells or bottled and tanker water. A media campaign coupled with beneficiary feedback mechanisms is integrated into the overall communications plan proposed in the Communication Strategy Matrix (Annex 11).

122. Activities that will be used for meeting the aforementioned communication objectives include: (i) Weekly Communications Brief; (ii) Periodic press releases; (iii) Website & Internal Listserv; (iv) Coordination of key Staff – Management, Technical, Emergency Response; (v) Raising Awareness Campaigns and (vi) Consultations and Feedback Mechanisms (Surveys, Community Score Cards, Citizen Report Cards).

Annex 1: Results Framework and Monitoring

Country: Lebanon

Project Name: Lebanon-Water Supply Augmentation Project (P125184)

Project Development Objectives											
PDO Statement The project development objective is to increase the volume of water available to the Greater Beirut and Mount Lebanon area.											
These results are at | Project Level											
Project Development Objective Indicators											
		Cumulative Target Values									
Indicator Name	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Direct project beneficiaries (Number) - (Core)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1600000	1600000	1600000
Female beneficiaries (Percentage - Sub-Type: Supplemental) - (Core)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	49.00	49.00	49.00
Volume of water available for BMLWE distribution from Bisri dam (Cubic Meter(m3/sec)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.80	5.80	5.80
Share of participants in consultations that are	0.00	0.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00	48.00

vulnerable and marginalized groups, the percent of which are women (Percentage)											
Dam Safety Panel recommendations implemented in a timely manner twice each year (Yes/No)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intermediate Results Indicators											
		Cumulative Target Values									
Indicator Name	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**
Number of water utilities that the project is supporting (Number) - (Core)	0.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Independent supervision of ESMP issues satisfactory performance reviews (Yes/No)	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Independent monitoring of RAP implementation (Number)	0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00	7.00	7.00	7.00
Award of dam	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

works contract (Yes/No)											
Generation Capacity of Hydropower constructed or rehabilitated under the project (Megawatt) - (Core)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	12.00
Generation Capacity of Hydropower constructed under the project (Megawatt - Sub-Type: Breakdown) - (Core)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12.00	12.00	12.00
Financing of dam O&M strategy approved by BMLWE (Yes/No)	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Satisfactory dam O&M capacity and equipment in place within BMLWE (Yes/No)	No	No	No	No	No	No	No	Yes	Yes	Yes	Yes
BMLWE Water Resources Management	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Study Completed (Yes/No)											
Surveys to measure results of awareness raising campaigns (Number)	0.00	0.00	0.00	0.00	1.00	2.00	3.00	4.00	5.00	6.00	6.00
Quarterly progress reports submitted in a timely manner (Number)	0.00	2.00	6.00	10.00	14.00	18.00	22.00	26.00	30.00	34.00	34.00
Completion of dam wall and associated works (Percentage)	0.00	0.00	0.00	0.00	10.00	30.00	50.00	80.00	100.00	100.00	100.00

Annex 2 : Detailed Project Description

1. **Lebanon Water Resources:** The water resources of Lebanon are seasonal, with the majority of flows occurring during winter (mid-October to mid-April). This results in water supply deficits during summer, which is further augmented by increased irrigation water requirements. Factors exacerbating this seasonal water imbalance are the very low water storage capacity (6 percent of total resources, compared to the MENA average of 85 percent), deficiency of water supply networks and, on the demand side, rising demand from the municipal and industrial sectors. Groundwater has historically played the role of seasonal buffer but is being exploited at unsustainable levels. In the absence of additional water sources, the coastal aquifer in the GBML region will be permanently destroyed, thus depriving the region from a vital buffer against climate variability.

2. As part of the development of the National Water Sector Strategy, Government developed a list of critical infrastructure to improve the management of Lebanon's water resources in general. This plan included, among other national priorities, a focus on simultaneously: (i) improving water supply in the GBML region (where over half of the Lebanese population lives); and (ii) improving irrigation in the South of Lebanon and Western Bekaa foothills, which have long been underdeveloped. Both initiatives comprised storage and inter-basin transfer of the Litani river and are largely based on Presidential decree 14522 dated May 1970 which allocated specific volumes of water from the Litani to the GBML region. The Litani river is the longest river in Lebanon and is dammed at Qaroun.

3. During dry years, the Litani river flows and other associated water sources cannot support the required water supply in Greater Beirut and Western Bekaa valley with potable water. The 1996 Master Plan for Preparation and Investment in Litani River Basin, therefore states the development of the Bisri dam as a requirement, among other storage infrastructure, to provide sufficient long term water supply to the GBML while also meeting irrigation and water supply needs in other areas of Lebanon. The need for additional storage infrastructure was reconfirmed by the Ministry of Energy and Water's (MOEW) National Water Sector Strategy and associated Surface Water Storage Strategy in 2006.

4. For the GBML area, MOEW developed a plan to provide water supply to the GBML area from a combined system that captures water on both the Litani and Awali/Bisri rivers and includes: (i) the Greater Beirut Water Supply Project in the short term, and (ii) Bisri dam, Janna dam and Damour dam in the long term. Under this plan, Bisri dam and GBWSP would service the southern portions of the GBML while the Janna Dam and existing wells would service the northern portions of the GBML.

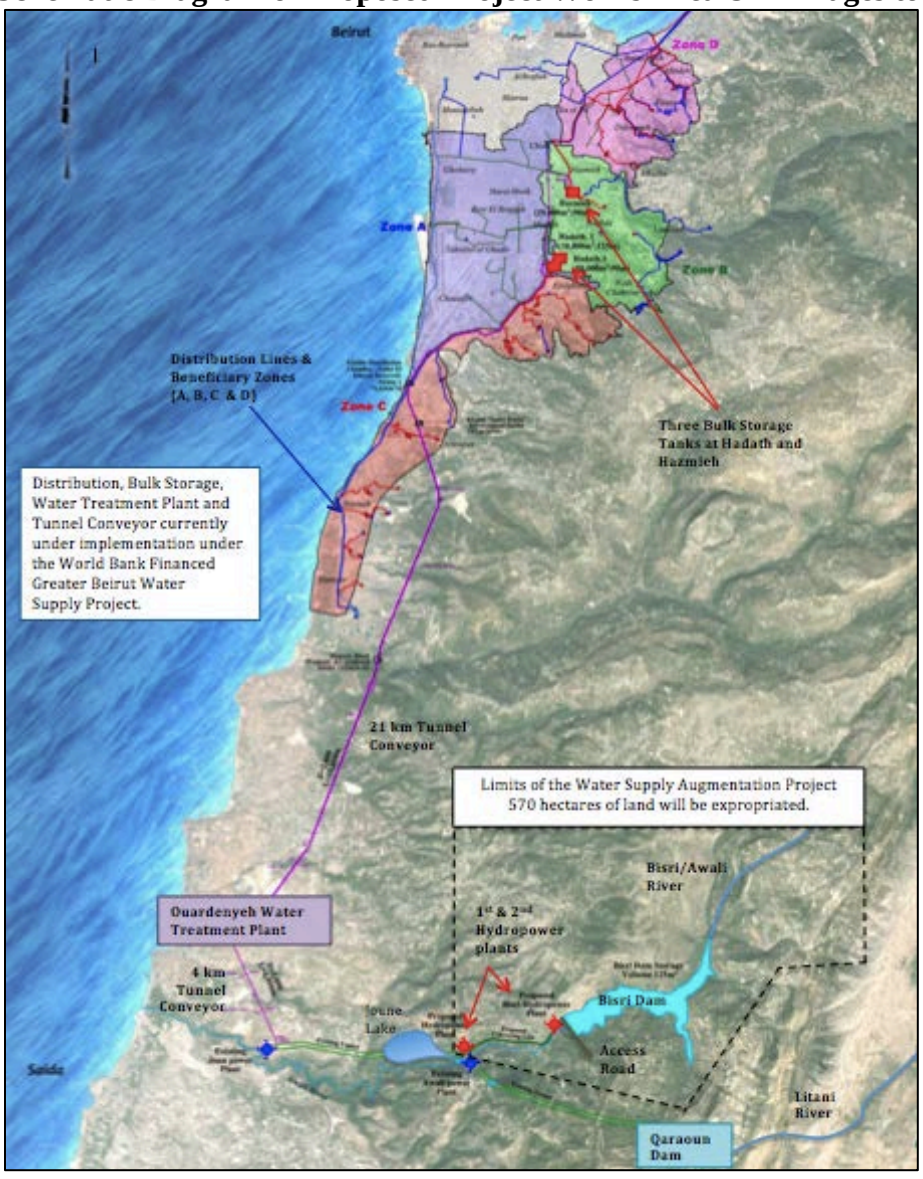
5. **Project Components:** The project will comprise four components described below. A project implementation schedule has been developed and includes one year of dam operation and maintenance post the finalization of construction.

Component 1: Construction and Construction supervision of Bisri dam and Associated Infrastructure (US$391.81 million of which US$305 million IBRD financing).

6. Component 1 will finance: (i) the construction and construction supervision of a water supply dam on the Bisri river and twin conveyor pipelines to the existing Joun reservoir; (ii) construction and construction supervision of two hydropower plants, generating 0.2 MW and 12 MW respectively and (iii) expansion of the Ouardaniyeh water treatment plant.

7. Water stored at Bisri will be conveyed to the GBML region through the underground tunnel, water treatment plant, storage and distribution infrastructure currently under implementation under the GBWSP, which are also partially financed by the World Bank (P103063), BMLWE and Government. A schematic diagram of linkages between GBWSP and the project is provided in the figure below.

Figure 1: Schematic Diagram of Proposed Project Works Area & Linkages to GBWSP



Bisri Dam and Associated Infrastructure

8. A joint venture of an international firm and national consulting firm prepared the detailed design based on the review of 1997 design study along with additional geotechnical investigations, seismic hazard assessment, dynamic analysis of the embankment – foundation system under seismic loading, hydrological assessment and hydraulic model test of spillway.

9. The overall construction period for the dam will be five years. The construction schedule includes temporary river diversion, taking advantage of the relatively long dry season at the site. The bottom outlet will be used as an important element in the diversion arrangement.

10. Bisri Dam will be located approximately 17km inland from the coast of the Mediterranean Sea at an elevation of 395 meters above mean sea level. The dam will create a reservoir with 4.34 km^2 surface area at full supply level. Bisri dam will be a zoned earth embankment dam with a clay core, 70 meters high with a dam crest of 740 meters long. Two meters of camber are required along the crest of the dam, and this to offset the anticipated settlement of the embankment following the completion of construction, most of which will occur in the clay deposits in the foundation. The earth embankment is comprised of six zones. Shell and transition zones are provided on the upstream side of the dam followed by a vertical clay core. Immediately downstream of the core are a filter and a drain and shell zones.

11. The design is overall solid with the following key features:

- Whilst the crest width is 12m, the top of the core is 4m wide and the bottom width is about 44m or 2/3 of the maximum head. The upstream and downstream slope gradient is 2.5H: 1V. These are based on seismic design as per Maximum Credible Earthquake (MCE).
- The freeboard from dam crest (and also from top of core) to full supply level in the reservoir is as much as 8m to allow for post-construction settlements due to earthquake shaking and extreme flood levels.
- The wide fine and coarse filter zones on the downstream side of the core, ensuring they will arrest any internal erosion even if large shear distortions take place due to earthquake shaking and/or fault movements.
- In order to limit the seepage/leakage and control the seepage gradients under the dam and through the abutments, the design includes extensive grouting in the bedrock along the dam axis along with lateral extension to both abutments. Special grouting galleries have been considered, two at different levels in the right abutment and one in the left, to achieve the grouting required and allow for post-construction grouting if necessary. In addition, cut-off walls by plastic concrete are proposed through the deep lacustrine deposits down to a maximum depth of about 120m plus about 5-10m into the bedrock in the river valley section.

Additional technical information and design considerations are provided below:

Geological Conditions

12. The geological conditions are complicated and were studied in detail. The right abutment consists of a series of Cretaceous limestone layers dipping to the northwest, while in the left abutment Jurassic limestone layers dipping predominantly to the east. They outcrop at the lower part of the abutment and are overlaid by Cretaceous sandstones. The bottom of the river-bed is composed of lacustrine deposits, the result of sedimentation in the river after a landslide that occurred in Annan, downstream of the dam site during the Quaternary period.

Seismic Hazard and Design

13. A seismic hazard assessment has been undertaken to define the characteristics of the earthquakes that may be encountered at the site, which is used as input in the dynamic analyses to document adequate dam and foundation resistance. Whilst the Yammouneh fault of more than 200 km length is located 10 km to the east of the dam site, the seismic condition of the dam site is more influenced by the Roum fault of more than 35 km located 2 km south of the site. A neo-tectonic seismic hazard assessment has been undertaken, including the characteristic a fault or structural flexure at the dam site, in order to define the seismic design criteria of the dam. The report has been reviewed and confirmed by the panel.

14. The consultant has conducted a numerical dynamic analysis of the dam-foundation system in order to estimate the magnitude of crest settlement, permanent displacements and shear distortions, and any cracking caused by the earthquake shaking. The consultant has also examined the effects of fault movements in the dam foundation on shear distortions and displacements in the dam core and filters. The consultant is finalizing the analysis based on the result of aforementioned seismic assessment. The densification of surface granular alluvial deposits is also considered in order to increase its density high enough to resist possible liquefaction during earthquakes by vibro-compaction, etc. if required, but a recent boreholes investigation has indicated that liquefaction potential is low due to higher composition of clay materials within top 30 m deposits.

Seepage Control

15. In order to control seepages, the design provides a diaphragm cut-off wall with plastic concrete down the whole depth that reaches at around 120 m depth. The wall is anchored in the limestone bedrock and is extended by grouting into this bedrock. Given karstic nature of limestone zones, seepage possibility around the reservoir rim has also been carefully checked. The risk is considered as manageable based on geological and topographical conditions, which has been confirmed by the panel geologist. A detailed design of treatment works, including extended gallery and curtain grouting on the right abutment and extension to the upstream right bank, is being completed based on additional geotechnical investigation result.

Embankment Settlements

16. The magnitude of crest settlements that may occur due to foundation consolidation, earthquake shaking and post-construction creep is estimated. The design includes large berms on both upstream and downstream embankment in order to provide surcharge weight to accelerate consolidation and enhance shear strength for stability. The berm zones will be free draining and consist predominantly of quarried rock-fill. Wick drains will also be installed spaced on around three meter intervals to the maximum depth of around 70m in order to facilitate foundation drainage and consolidation so that the embankment settlement will occur rapidly, much of it during construction. Nonetheless, 2m of camber are designed, raising the crest elevation to El. 471 for construction. This camber would offset the anticipated settlement of the embankment following the completion of construction, most of which will occur in the clay deposits in the foundation.

Spillway Design

17. The un-gated spillway is located on the left abutment. This is a much better design than that proposed in the original design, which consisted of a concrete spillway block located inside the embankment. The interface between the concrete spillway and the embankment on the right side of the spillway could become a location of cracking and leakage due to differential settlements and dynamic response of the concrete block versus adjacent embankment. The interface design has been reviewed and confirmed by the panel. The design consultant has also adjusted the location and orientation of the spillway on the left bank based on additional geotechnical investigation and optimized the design the spillway entrance, crest, chute, flip bucket and downstream areas based on a hydraulic model test. The consultant has also updated hydrological assessment based on additional hydro-meteorological data and analyses. The spillway discharge capacity is based on Probable Maximum Flood.

Bottom Outlet

18. During operation, the bottom outlet can be used to lower the reservoir in case of emergency, for example, after an earthquake causing significant damage to the dam. This is a very important aspect in the design as it significantly reduces risks involved. The bottom outlet can also be used for sediment flushing and sluicing. A pipe for releasing the environmental in-stream flow and micro power generation will also be installed within the bottom outlet.

Dam Safety Panel Review

19. The Panel consists of four experts covering four aspects: (i) embankment /foundation design; (ii) geology; (iii) seismology and (iv) hydrology. The Panel met and reviewed the consultant's proposed design in November 2013, March and June 2014. The panel has overall confirmed the technical feasibility and safety of the design, as well as cost estimates and dam safety plans. It also provided recommendations for further design optimization which could result in cost savings in some areas, such as depth/scope of cut-off wall in the foundation and abutment, seismic spectrum and potential rupture used for dynamic analysis, etc.

Dam Safety Plans

20. CDR has prepared dam safety plans including: (i) Construction Supervision and Quality Control Plan which was reviewed by the Bank; (ii) Instrumentation Plan currently being finalized as part of detailed design and bidding document; (iii) Preliminary Operation and Maintenance Plan; and (iv) Framework of Emergency Preparedness Plan (EPP) including a dam break and downstream flooding simulation. The panel and Bank have reviewed the plans and considered them as overall satisfactory. The required preparation costs are included in the budget. The O&M Plan and EPP will be finalized during implementation six months and twelve months prior to the first impoundment of the reservoir.

21. The instrumentation plan and O&M plan will provide close attention to the monitoring activities during construction and operation periods with due attention to the following:

- Monitoring during construction
- Foundation settlement
- Pore pressure buildup (foundation and core)
- Hydrostatic pressure in the bedrock
- Monitoring during operation
- Seepage (vibration wire piezometer connected by optical fiber, weirs…)
- Settlement and inclination
- Pore pressure and hydrostatic pressure
- Surface displacements (geodesy, extensometer)
- Ground acceleration and embankment response
- Permanent visual inspection

22. Construction materials for the dam are derived primarily from the valley floor within the reservoir area. These materials include the sound and durable sand and gravel river channel deposits and the alluvial clay deposits. Some shell and riprap material will come from quarry sites in the nearby limestone deposits.

23. A 3.7 km twin pipeline water conveying system will convey water from the dam reservoir to the new hydropower station (12MW) to be constructed near the existing Awali power house. An access road above the conveying lines is also proposed and is reflected in the ESIA as associated infrastructure.

Hydrology

24. The Bisri dam receives water from a catchment area of 215 km^2. Climate is distinctly seasonal with a rainy season of approximately seven months that begins in November of each year and lasts into April. Rainfall during the months of June through August is extremely rare. Average annual precipitation is 1,250 mm/year. Hydrological design characteristics for the dam were computed utilizing historical record at the nearby Marj Bisri runoff gauging stations, as well as rainfall records from the adjacent areas of the dam. The average annual inflow to the dam site based on the years 1952-2012 is 130 million m^3 (4.1 m^3/s), with annual values ranging from

a high of 434 million m^3 to a low of 55 million m^3. The probable maximum flood estimate is 2,300 m^3/s.

25. The Bank assessed the hydrology relating to Bisri and the associated detailed design. This assessment reviewed in detail the quality of the runoff records at the Marj Bisri gauging station, and the methodologies used for computation of average inflow and extreme floods. The assessment indicated that while low flows may be correctly estimated, high flows estimates are highly uncertain. The assessment therefore triggered additional parallel hydrological modeling exercises, leading to new more robust hydrological characteristics that have been incorporated into the final detailed design.

26. The water demand to be supplied by the Bisri dam and the Awali conveyor in the normal case is 5.1 m^3/s serving 1.6 million people in 2035. The water demand has been estimated based on guidance from the National Water Sector Strategy. For security and operational flexibility, the planned infrastructure has been designed to accommodate 5.8 m^3/s to cover jointly connected areas with the northern water supply sources, The total deficit to supply 5.1 m^3/s continuously (24 hours) during summer months is 8 percent (or 6.4 million m^3 per year in average). This shows that on average the deficit can be solved by utilizing the other sources of water supply to Beirut, which do not rely on the same hydrological regime as Bisri Dam. Even in the worst dry year the deficit can be supplied by the possible water transfer from the Litani river in accordance with the Decree 14522 (1970) that allows water to be taken from the Qaraoun reservoir for potable water supply.

Climate Change Analysis

27. Climate Change may impact water availability for the Bisri Dam reservoir and change the reliability to deliver the required drinking water demand to southern Beirut during the summer season.

28. Precipitation records in the latest 30 years show a generalized reduction in precipitation over Lebanon in the order of 8%, while General Circulation Models (GCMs) predictions anticipate an additional small reduction in the order of 5 percent in the next 50 years. Similarly, in the last 30 years temperature records show an increase in the order of 2°C, with an anticipated additional increase in the order of 1 °C.

29. Given the small size of the Awali catchment upstream Bisri Dam (215 km^2), the idea of downscaling the GCMs outputs used in the IPCC projections (generally available at scales of the order of ~180 km or coarser) was not considered appropriate. The probable climate change was instead estimated, and agreed with the Panel of Experts for Dam Safety, based on general GCM model results for Lebanon and the recent historic trend. A conservative (pessimistic) estimate over the economic life time of the project was agreed to be a further 5 percent decrease in rainfall and temperatures additionally increased by 0.7 °C from November to March and by 1.2 °C from April to October.

30. A hydrological model (TOPKAPI), sensitive to the climatic changes was set up in order to convert the anticipated temperature increase and precipitation reduction into changes of Bisri

Dam inflows. Because long precipitation and temperature records are scarcely available in and around the catchment, the used precipitation and temperature records for the period 1979-2009 were extracted from the Climate Forecast System Reanalysis (CFSR) dataset, a reanalysis product developed at the National Centre for Environmental Prediction (NCEP). CFSR data have an hourly temporal resolution and a spatial resolution of approximately 38 km.

31. The detailed hydrological catchment model was adapted to the upstream catchment on the basis of the CFSR data and cartographic maps information on topography, soil, land use, catchment boundaries and river network which were made available by the Lebanese CNRS. Following calibration, the full CFSR record was used to simulate 30 years of monthly flows in a Control Run, to be used as the reference for comparing the scenarios accounting for climatic changes. Two modified precipitation and temperature series, which represent the agreed climate change scenario, were then prepared by gradually reducing the annual amount of precipitation and increasing the temperature over a 30 year period.

32. The results of the simulations show that the combined effect of reduced precipitation and increased temperature leads to a reduction of 4 percent in Bisri Dam average annual inflow volume over its economic life time compared to the historical inflows of the last three decades.

33. The climate changed-affected inflow series were then routed through the reservoir model already applied to the Bisri Dam to estimate the effect on safe yield. The results show that the average annual water deficit from Bisri Dam to supply 5.1 m^3/s for six summer months will in a pessimistic climate change scenario increase to 13 percent (or 10.5 million m^3 per year on average compared to 6.4 million m^3 in case the historic climate persists).

34. Since the Greater Beirut and Mount Lebanon area has additional sources of water from the Litani river in accordance with the Decree 14522 (1970), which well exceeds the 13% deficit, the Bisri Dam is resilient to a possible climate change occurring over its economic life.

Hydropower

35. Two hydropower plants will be constructed as part of the project. The first will be at the foot of the dam, the second will be downstream of the conveyor lines from the dam. The total production capacity will be 40 GWH/year. This generated capacity will serve to replace the capacity lost to the Litani River Authority at the downstream Charles Helo hydropower plant.

36. The larger hydropower plant (12 MWH) will be procured and financed by the IsDB.

Water Treatment Plant Expansion at Ouardaniyeh

37. A water treatment plant (WTP) at Ouardaniyeh is currently under implementation as part of Component 2 of the Greater Beirut Water Supply Project (GBWSP – P103063). Water stored at the Bisri dam will be conveyed through the underground tunnel (also under implementation through the GBWSP) and treated at the Ouardaniyeh WTP. To accommodate the additional flow of water stored at Bisri, the WTP will be expanded. The water treatment plant and plans for expansion are addressed under the GBWSP ESIA.

38. The estimated cost of WTP expansion is US$43.5 million and will be financed by IsDB.

Component 2: Sustainability of service delivery (US$46.85 million of which US$6.6 million IBRD Financing)

39. The number of small scale private wells in the GBML has increased dramatically during the past few years due to population growth, economic development, urban expansion, supply shortages and the inability of public water entities to deliver required volumes. Additional wells are being drilled continuously, which makes it difficult to assess their number and discharge. It is estimated that, to date, the total number of private wells is about 20,000 individual private wells in GBML area. The total number of private wells is feared to be significantly higher, with a total yield estimated at about 119 MCM/yr.

40. Ministerial Decision 118 published on September 13, 2010 defines the procedures to be followed to acquire a permit for private well drilling, pumping, renewal, etc. This Decision for water management features more stringent conditions for well drilling and exploitation, whereby a license to drill is given, mainly if the proposed well: (i) does not fall within a restricted excavation area; (ii) does not fall within a distance of less than 350 m from public wells or springs; (iii) would not have any effect on public water resources (wells and springs) located within a radius between 350 and 2,000 m; and (iv) the public water utility is not capable of providing the amount of water required. The result was a decrease in the number of permit acquired since 2010.

41. Under these conditions, the BMLWE will be able to provide water supply from the Bisri dam which will help to decrease the number of private wells permits in the GBML area delivered by the MOEW. The project will coordinate with the MOEW to follow on the licensed permits delivered each year in this area in order to ensure that the number of permits for licensing private wells will decrease after the water supply of BMLWE is increased. The project will thus draw from international experience in well-capping, and will develop a strategy for MOEW and BMLWE to implement the legal and institutional prerequisites of a succesful well-capping program

42. The project will assist MOEW and BMLWE with targeted outreach to project beneficiaries on the improved quality and quantity of water available through the public supply from surface water instead of using licensed private wells. A detailed communications strategy has been developed and will support BMLWE in implementing awareness raising campaigns on the economic benefits of switching to public water supply as well as volumetric metering and to support the MOEW in the management of groundwater wells across the GBML. The communications strategy is informed by international experience in the challenges of well-capping.

43. Component 2 will finance priority activities, complementary to construction of Bisri dam, to ensure the long-term sustainability of water service delivery across the GBML.[20] Component 2 will finance: (i) technical assistance to the MOEW, BMLWE and CDR on the operation and

[20] To date, there is no legal framework in Lebanon on dam safety providing the context and need for activities proposed under Component 2.

maintenance of dams; (ii) technical assistance to MOEW and BMLWE on management of BMLWE water resources; (iii) development and implementation of awareness raising program and (iv) environment and social mitigation measures including the construction of sewerage networks in the upper catchment villages of the reservoir:

44. **Technical Assistance to MOEW, BMLWE and CDR on O&M of dams:** This activity will provide targeted capacity building technical assistance to management and staff of the MOEW, BMLWE and CDR and will focus on: (i) requirements for the establishment of a dam O&M department; (ii) technical training on the O&M of large dams; (iii) water quality monitoring; and (iv) facilitation of coordination with other stakeholders particularly on hydropower generation.

45. **Technical Assistance to MOEW and BMLWE on management of BMLWE water resources:** The BMLWE manages several sources of public water supply, including several large public wells, the Jeita spring, the GBWSP infrastructure (currently under implementation), in addition to the anticipated Bisri dam. BMLWE further has the legal space to coordinate with the LRA on the use of the Litani river for potable water during dry years as per Decree 14572. Thus, this activity will finance an optimization study/water balance model of BMLWE's various water resources in order to increase efficiency and sustainability, as per international best practice methods. The activity will finance expert consultants to provide technical assistance to staff and management of BMLWE in this regard, as well as any associated hardware or data that may be required for the complete analysis and optimization exercise. Additionally, the BMLWE intends to establish a dedicated dam safety and operations unit of which activities could be outsourced to the private sector hence providing staffing support for long-term water resource management.

46. **Awareness raising and well-capping:** This activity will finance a series of awareness raising campaigns on water demand management and conservation as well as well-capping, in line with earlier efforts by the MOEW and its partners. The activity will also support raising awareness on the benefits of water metering and well-capping and will assist Government on communicating effectively on the impending implementation of volumetric meters and subsequent switch from the current flat fee gauge fee.

47. **Environment and Social Management Plan:** The ESMP details a number of activities to mitigate the environment and social impacts of the project. These include a number of measures including water quality monitoring, biodiversity management and protection and the construction of a sewerage network in the upper catchment villages to divert sewage away from the reservoir and into the wastewater treatment plants currently under construction in the upper Bisri area. Details are provided in the ESIA.

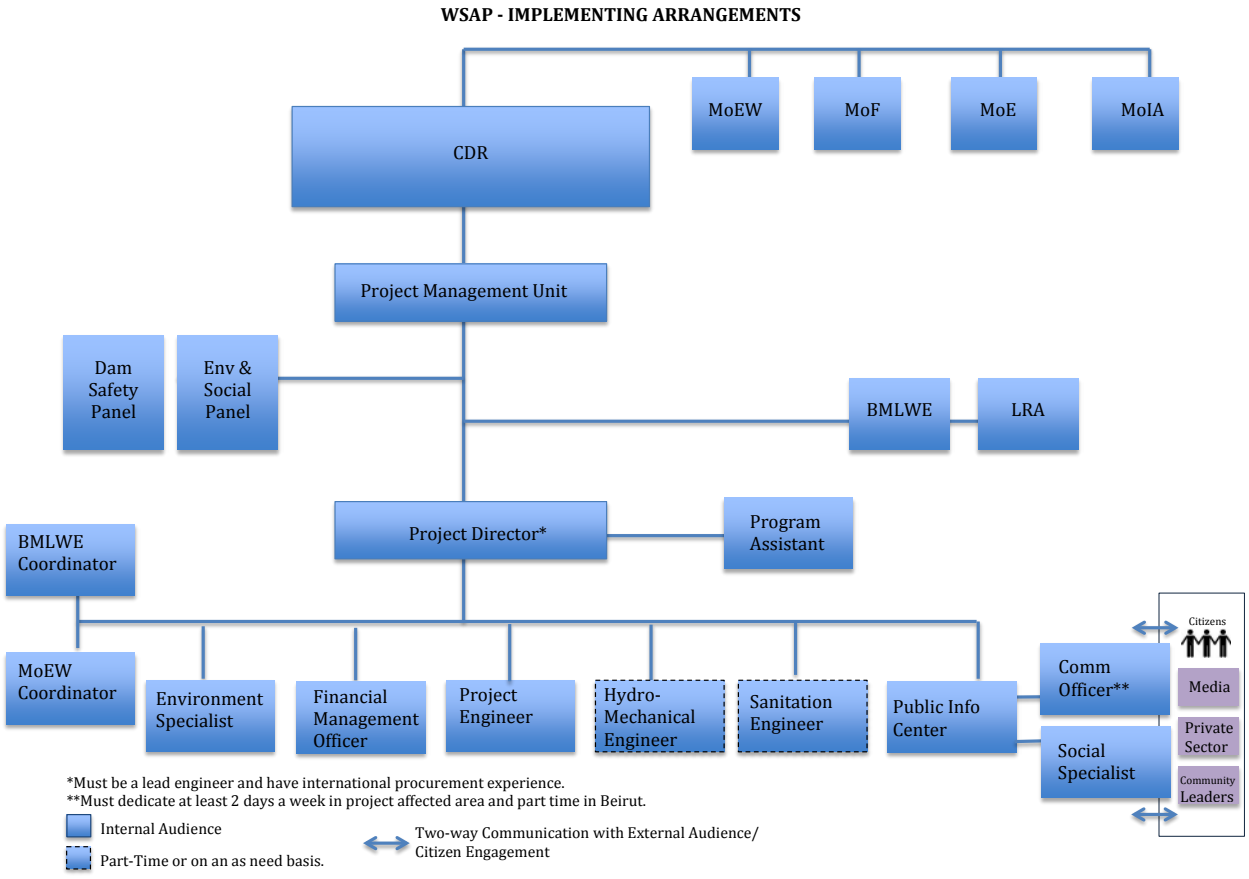
48. Component 2 is designed to accelerate institutional reforms within BMLWE and the MOEW in order to ensure safe and sustainable implementation of Lebanon's national program of water supply dams, including Bisri. Additionally, activities build on the Bank's historic engagements with Government on the development of the NWSS and Country Water Sector Assistance Strategy.

Component 3: Project Management and Quality Assurance (US$6.74 million of which US$6.02 IBRD Financing)

49. Component 3 will finance: (i) core Project Management Unit (PMU) within CDR to oversee project implementation; (ii) continued engagement of the DSP as per Bank policy requirements; (iii) independent environment and social Panel of Experts and (iv) ESMP Implementation Supervision.

50. The PMU structure is provided below:

Figure 2: Project Institutional and implementation arrangements within CDR



Component 4: Land Acquisition and Resettlement Compensation (US$170 million of which US$155 million IBRD Financing)

51. Total project resettlement costs are estimated at 170 MUS$ and include: (i) approximately US$150 million for compensation of land acquisition and other assets related to implementation of the Resettlement Action Plan (RAP); (ii) approximately US$5 million in assistance for livelihood rehabilitation and monitoring of implementation of the RAP and (iii) approximately US$15 million in contingency funds. Component 4 will finance the costs of compensation of land acquisition as well as the cost of assistance for livelihood rehabilitation and monitoring of the RAP implementation.

Annex 3 : Implementation Arrangements

Project Institutional and Implementation Arrangements

1. CDR will implement the project and will coordinate with representatives from key stakeholders including the MOEW, Ministry of Finance, BMLWE, Ministry of Environment and Ministry of Culture. A Project Management Unit (PMU) will be established at CDR.

2. The PMU, headed by a Project Director, will be responsible for the day to day management, monitoring and reporting on the project including the implementation of the RAP and the ESMP. The PMU will consist of: (i) Project Director; (ii) a Project Engineer; (iii) Financial officer; (iv) Environment Specialist; (v) Social Specialist (PIC); (vi) Communications Officer, (vii) a Project Assistant; (viii) MOEW Coordinator and (ix) BMLWE Coordinator.

3. The MOEW will own the dam post construction and will delegate the operation and maintenance to the BMLWE, which operates under the tutelage of the MOEW. BMLWE will be closely involved in managing the implementation of the dam, to ensure timely handover upon the finalization of construction. BMLWE is financing and leading the implementation of the water treatment plant and distribution networks across the project beneficiary zones. This arrangement will ensure that concurrent focus is provided on the need to balance (i) water security and guaranteed access to water supply for distribution to the GBML and (ii) the technical complexity of operating large dams and hydropower schemes and ensuring the safety of their operations.

4. A Project Implementation Manual (PIM) covers project implementation arrangements, including the roles and responsibilities, procurement, disbursement and financial management procedures.

5. Building on global experience in the implementation and supervision of water supply dam projects, a series of interim project reviews will replace the single “midterm review” implemented on other WB-financed projects. Given the complexity of the project from a technical, fiduciary and safeguards aspects and the relatively long implementation period (9 years), an interim project review will be undertaken every three years and will coincide with major project milestones including: the finalization of expropriation and tendering of the dam works contract, construction of the dam, and handover/O&M to BMLWE.

Financial Management, Disbursements and Procurement

6. Project financial management arrangements, including accounting, reporting, and auditing functions will be centralized at the PMU within CDR. The flow of funds process will be undertaken through two Designated Accounts to be opened for the project. The project financial reports will be done by the PMU and submitted to the Bank along with the project progress reports.

7. CDR has significant experience in implementing construction components for Bank supported projects and its financial management (FM) performance on past and current projects

is considered satisfactory. It has a functional unit undertaking FM responsibilities, including funds flow management, accounting, reporting, and facilitating an acceptable external audit. CDR's external auditor will conduct the audit of the World Bank-financed projects. The key FM issue for CDR is the lack of proper maintenance of asset lists and the delay in submission of timely audit reports. In addition, as this project introduces a new component on Land/ property expropriation, there is a need to ensure that the resettlement for beneficiaries is adequately implemented with proper controls.

8. Thus, in order to mitigate FM-related risks CDR will operationalize the assets module of its accounting software to ensure proper management of assets purchased under its component, will recruit an acceptable external auditor in the early stages of the project to enable constant audit compliance. A Project Implementation Manual (PIM) was prepared including a FM chapter that details the financial management arrangements to be established for carrying out the project FM implementation and defining the roles and responsibilities. The FM Chapter includes a detailed description of the process for expropriation and resettlement.

9. **Staffing**: The existing CDR Financial Officer (FO) has adequate experience in managing World Bank financed projects and will thus manage the project. As this project involves a component on Land and property expropriation, additional load will be envisaged associated with the close coordination with the legal team and others within CDR for payment to beneficiaries. Accordingly, an assistant Finance Officer will be hired to support the project's financial management implementation. This finance team will be supervised by the Head of Funding Division at CDR.

10. **Project Accounting Software:** CDR has in place customized accounting software that has been used for the FM implementation of the World Bank financed projects and can be used to record project's accounting transactions and generate the project's Interim un-audited Financial Reports (IFRs). The Financial management team within the CDR PMU headed by the CDR Head of Funding Division will be responsible for accurate and complete recording of the daily transactions in the accounting system and ensuring that the required project Interim Un-audited Financial Reports (IFRs) are generated automatically from the system.

11. **Budgeting:** The Borrower, after being notified by CDR of the receipt of the loan proceeds, shall through the Ministry of Finance (MoF) open additional budget lines within the national budget to record the receipts of the funds. The total amount allocated to such budget lines during the life of the project up until the Disbursement Deadline Date shall not exceed the total amount of the Loan. A set of FM arrangements will be undertaken to ensure proper project accounting, reporting, controls and audits. As to the project budget, the project's allocation and categories of expenditures will be disclosed in the financing agreement to be approved by the Council of Ministers and ratified by the Parliament. A project quarterly and annual budget and disbursement plan will be maintained by CDR based on the project procurement plan and implementation schedule to ensure timely availability of funds. It will be used as an effective tool for comparing planned expenditures with actual ones and monitoring the existing variances.

12. **Internal Controls:** CDR has adequate internal controls in place for preparation and approval of transactions and segregation of duties related to Bank-supported projects. CDR has

significant experience in implementing construction components for Bank supported projects and its financial management (FM) performance on past and current projects is considered satisfactory. Nevertheless, as this project includes Land and Property expropriation, additional mitigating measures need to be taken to ensure that settlement is conducted properly and transparently. Therefore, for that specific component on expropriation, the process will be as follows:

a. Decree issuance of expropriation needs to be issued and ratified by Cabinet (Prime Minister and all cabinet ministers/exceptional case as President of Republic is not yet elected). The Decree will include lists of properties along with the name of beneficiaries;
b. A commission will be created composed of a nominated Judge, evaluation expert, and engineer. This commission will call for hearings in the presence of CDR, and beneficiaries related to the land and properties for expropriation. It will be responsible for the evaluation of Land and property settlement values;
c. Decision settlement will be issued by the commission;
d. Based on the Decision settlement, the CDR board issues a decision of reserve of funds for the respective beneficiaries for immediate settlement. In case the beneficiary is absent, communication of settlement will be done through publication in newspapers and is considered official; Accordingly, once CDR board decision of reserve of funds is issued, the funds will be transferred from the DA-B to the Operational Account.
e. A "main-mise" decision is issued accordingly by CDR to reflect the expropriation of land/property;
f. Upon formal communication of the "main mise" decision as indicated above, the land and property need to be evacuated within 15 days and 30 days respectively; and
g. The beneficiary is paid upon showing the required identification documents to CDR. To note that beneficiaries can object to the decision settlement by raising an appeal, and in all cases, the beneficiary will be paid what has been decided in the decision settlement until the outcome of the appeal is issued, the difference of which, if any, will be paid additionally.

13. The affected people using the Land or property of a beneficiary can claim settlement through obtaining an attestation from the municipality, and by submitting it to the commission for ruling. Any proceeds decided by the commission to those affected people will be deducted from the beneficiary settlement amount.

14. For the purpose of the project's component on expropriation, the above process will be applied for the beneficiaries' settlement and needs to be documented in detail in the project PIM.

15. Flow of Funds: The project will have a parallel financing with the Islamic Development Bank (ISDB). Thus, for the loan financed by the World Bank, the World Bank financial management, procurement and anti-corruption guidelines will be used.

16. Two Designated accounts (DA-A & DA-B) for the project's loan funds will be opened at Banque du Liban (BDL) in US$. The funds will be transferred to the DAs of the loan. CDR will use the DA-A to pay for eligible expenditures related to category (1) activities financed by the World Bank and DA-B for category (2) related to the payments for affected people from land

and properties expropriation. This will ensure an improved monitoring over resettlement and better traceability and follow up on payment status for beneficiaries.

17. In requesting disbursements into the DA's for expenditures incurred, CDR will make use of a Statement of Expenditure (SOE) record. For payments against contracts subject to the Bank's prior review, records evidencing eligible expenditures should be attached to the Withdrawal Application. Any payments against Category 2 submitted to the Bank should be cleared by the Task Team Leader (TTL) as per Disbursement Condition set forth in the Disbursement Letter.

18. As explained above, payments to beneficiaries under category 2 "Land Acquisition and Resettlement Compensations" will be done through transfer from the project DA-B to a separate Operational Account opened for that purpose as a means to reserve the amounts for beneficiary settlements based on the issuance of the CDR decision of reserve of funds. Payment from the operational bank account is done upon beneficiaries demonstrating official identification documents (Refer to the internal controls paragraph). CDR will prepare quarterly statement to list the beneficiaries paid, and those that are still pending as part of the Project Interim Un-audited financial reports (IFRs). In the case of absentee landowners or outstanding claims during project implementation, CDR will need to maintain these funds in this account and to keep updating the list on quarterly basis until final settlement of all beneficiaries before project closure. In case of amounts exceeding the threshold as set per the project disbursement letter, a direct payment can be made to the respective beneficiary. Any funds remaining in the CDR's Operational Account at the project closing date will be reimbursed to the Bank. To ensure that affected people, who have not come forward to claim their compensation, CDR will use their own resources to provide compensation to such affected people. If CDR wishes to keep the remaining IBRD funds in the Operational Account, CDR should submit a request to the Bank for consideration.

19. **Interim Un-audited Financial Reports (IFRs):** The Project's IFRs, prepared in accordance with International Public Sector Accounting Standards (IPSAS) – Cash Basis and generated through the Accounting System, will be sent to the Bank by no later than 45 days after the end of each quarter. The format and content of IFRs was agreed with CDR and was be included in the PIM. The IFRs are composed of: (i) Statement of Cash Receipts and Payments by category for the year then ending and cumulatively from inception date up till the year ending including funds received from third parties; (ii) Accounting policies and explanatory notes including a footnote disclosure on schedules; (iii) Statement of Designated Account reconciling period-opening and end balances; (iv) Statement of project commitments, showing contract amounts committed, paid commitments, and unpaid commitments under each project's signed contract; (v) Statement of expenditures by category for the quarter and cumulative, (vi) a comprehensive list of fixed assets, and vii) list of beneficiaries resettlement.

20. **Project Financial Statements (PFS):** The PFSs, prepared in accordance with IPSAS – Cash Basis - will contain the same information as the quarterly IFRs but cover an annual period. The audited PFS will be submitted to the Bank no later than six months after the end of each fiscal year[21] (see External Audit Arrangements below).

[21] Project fiscal year ends December 31.

21. **External audit:** The PFS will be audited by an independent private external auditor acceptable to the World Bank. The audit will cover all projects' activities financed by the loan, including compliance with the PIM, review of effectiveness of the internal controls systems, the reconciliation statement of the two project DAs and the operational bank account and compliance with the Loan Agreement. The audit will be carried out in accordance with International Standards on Auditing. The audit report and PFSs, along with management letter, will be submitted to the Bank no later than six months after the end of each fiscal year. In addition, the project management letter will contain the external auditor assessment of the internal controls, accounting system, and compliance with financial covenants in the Loan Agreement. The audit TORs are included as part of the PIM. The external auditor will be engaged within six months of project effectiveness.

22. Moreover, according to Bank Disclosure Policy effective July 1, 2010, the Bank as well as the Borrower make publicly available the Borrowers' audited annual financial statements for all investment lending operations. Accordingly, this Project's audited annual financial statements once issued and deemed acceptable to the Bank, will be made available to the Public on the CDR website.

Disbursement Arrangements

23. The proceeds of the Loan will be disbursed in accordance with the Bank's disbursements guidelines for projects and as outlined in the Disbursement letter. Transaction based disbursement will be used under this project. Accordingly, requests for payments from the Loan will be initiated through the use of Withdrawal Applications (WAs) either for Advances, Reimbursements, and Replenishments to the Designated Accounts. All WAs will include appropriate supporting documentation including detailed Statement of Expenses for reimbursements and replenishments to the DA.

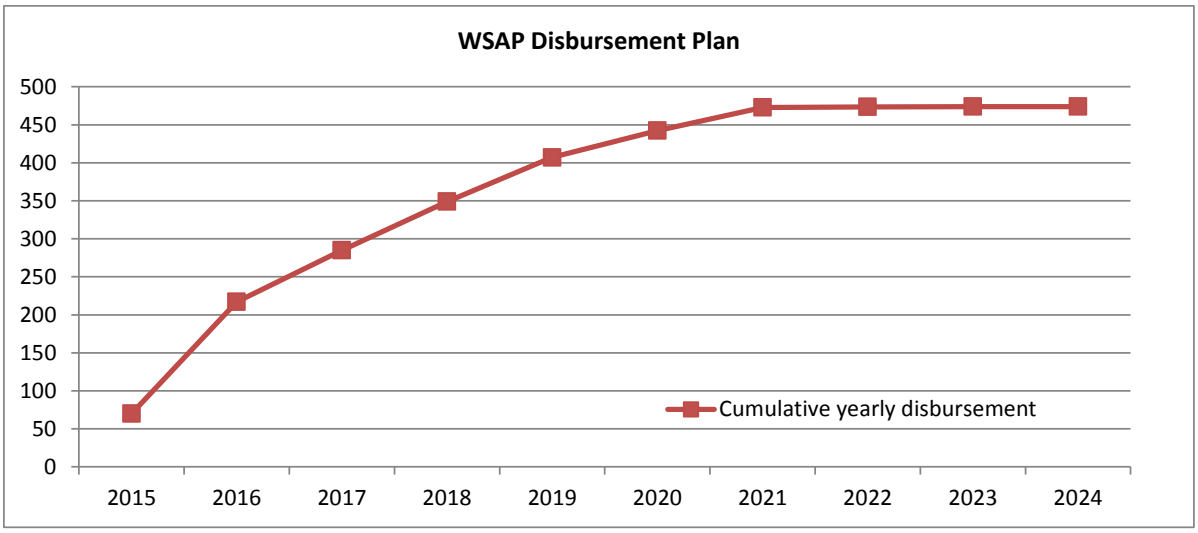
24. The following table indicates the loan allocation and disbursement by Category:

Category	Amount of the Project Allocated (in US$)
Category 1: Works, Goods and non-consulting services, Consultants' services and Training and Incremental Operating Costs (excluding Parts 1(b) and 2(d)(i) of the Project)	317,815,000
Category 2: Land Acquisition and Resettlement Compensations	155,000,000
Category 3: Front-end Fee	1,185,000
Category 4: Interest rate Cap or Interest Rate Collar premium	0
Total	474,000,000

25. The distribution of the financing will be as follows:

Financier	Amount Allocated (US$m)
World Bank (WB)	474
Islamic Development Bank (IsDB)	128
Government of Lebanon (GoL)	15
Total	**617**

26. The disbursement plan is depicted below



27. **E-Disbursement.** The World Bank has introduced the e-disbursement for all Lebanon supported projects. Under e-disbursement, Project's required transactions will be reported and associated supporting documents scanned and transmitted on line through the Bank's Client Connection system. E-disbursement will considerably speed up disbursements and facilitate project implementation

28. The disbursement methods will be: advance, direct payments, reimbursement, and special commitments. The minimum amount per withdrawal application will be 20 per cent of the value of the Designated Account. Project disbursement guidelines are documented in the disbursement letter. All documentation showing expenditures shall be retained by CDR and shall be made available to the Bank and its representatives for audit, if requested.

29. The Bank will honor eligible expenditures completed, services rendered and goods delivered by the project closing date. A four months' grace period will be granted to allow for the payment of any eligible expenditure incurred (i.e. services, goods or works, received and accepted) before the Loan Closing Date.

30. Retroactive financing of up to US$94,800,000 will be allowed for eligible expenditures under categories goods, consultant's services and training, and operating costs made on or after September 30, 2014 and up to the date of Loan Agreement signing. Payments for items procured must be in accordance with applicable Bank Procurement procedures.

31. **Authorized Signatories:** Authorized signatories will be nominated by CDR to sign the Withdrawal Applications. Names and corresponding specimen of their signatures will be submitted to the Bank prior to the receipt of the first WA (advance to DA). Each WA will be approved and signed by the authorized signatories.

32. **Supervision Plan**: A supervision mission will be conducted at least twice a year based on the risk assessment of the Project. Interim reviews will also be implemented every three years, and this to coincide with major project milestones. The supervision mission objective is to ensure that strong financial management systems are maintained throughout the life of the Project. The IFRs will be reviewed on a regular basis by World Bank staff and the results and issues will be followed up during supervision missions. Financial audit reports will be reviewed and issues will be identified and followed up by the Project Finance Officer. Additionally, during supervision missions, the Project's financial management and disbursement arrangements (including a review of sample payments and financial movements the DAs and operational account) will be reviewed to ensure compliance with the Bank's minimum requirements.

Procurement

33. Procurement under the project will be carried out in accordance with the "Guidelines On Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants" dated October 15, 2006 and updated January 2011, World Bank "Guidelines: Procurement of Goods, Works and Non-consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" dated January 2011 and revised July 2014 and World Bank "Guidelines: Selection and Employment of Consultants under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" dated January 2011; and the provisions stipulated in the Legal Agreement.

34. **Procurement of works, goods and non-consulting service:** The project includes one large contract for construction of Bisri dam, using the Bank's Standard Bidding Documents (SBD), and possibility of several contracts for ESMP goods. For National Competitive Bidding (NCB) contracts, if any, a translated version or the version in English of the Bank International Competitive Bidding document, acceptable to the Bank as mentioned in clauses 3.3 and 3.4 of the procurement guidelines will be used. Other possible procurement methods for Works, Goods and non-consulting services are: (i) shopping and (ii) direct contracting.

35. **Selection of Consultants:** The project is expected to conduct: (i) construction supervision; (ii) supervision of ESMP; (iii) panel of experts for dam safety and for environmental and social aspects; (iv) monitoring and evaluation of project implementation (including the environment and social aspects); and (v) technical assistance under Components 2 and 3. Procurement methods followed for these includes: (i) Quality and Cost Based Selections (QCBS); (ii) Selection under a Fixed Budget (FBS); (iii) Least-Cost Selection (LCS); (iv) Selection Based on the Consultants' Qualifications (CQS), (v) Single Source Selection (SSS), and (vi) Selection of Individual Consultants including sole sourcing procedures.

36. **Staff:** CDR will use the services of qualified outsourced individual procurement and technical consultants in addition to its own staff. Contract management capacity needs to be

improved by hiring qualified consultants to ensure timely decision making and amendments to contracts as needed.

37. **Procurement plan:** A project procurement plan dated August 11, 2014 agreed upon as summarized below. The detailed Procurement Plan will be updated as needed or on an annual basis as a minimum.

World Bank Financing

Table A: Procurement Packages with Methods and Time Schedule (Works & Goods)

Ref. No.	Contract (Description)	Estimated Cost (US$m)	Procurement Method	Prequalification (yes/no)	Review by Bank (Prior / Post)	Expected Bid-Opening Date
WSAP-W1	Dam construction	290	ICB	Yes	Prior	Q4 2015
WSAP-G1	ESMP Equipment (Several contracts)	4	ICB/NCB	No	Prior	Starting Q1 2015

Table A1: Consultancy Assignments with Selection Methods and Time Schedule

Ref. No.	Description of Assignment	Estimated Cost (US$m)	Selection Method	Review by Bank (Prior / Post)	Expected Proposals Submission Date
WSAP-C1	Construction Supervision of Dam	15	QCBS	Prior	Q3 2015
WSAP-C2	ESMP consultant	2	QCBS	Prior	Q2 2015
WSAP-C3	TA to BMLWE on dam O&M	0.9	Individuals or CQS	Prior / Post	Q1 2020
WSAP-C4	TA on management of BMLWE water resources	1.2	Individuals or CQS	Prior / Post	Q1 2018
WSAP-C5	Awareness Raising	0.5	Individuals or CQS	Prior / Post	Q3 2015
WSAP-C6	Dam Safety Panel	2	Individuals	Prior / Post	Several contracts starting 2015
WSAP-C7	Environmental and Social Panel of Experts	0.52	Individuals	Prior / Post	Q2 2015
WSAP-C8	Project Management	1.2	Individuals	Prior / Post	Several contracts starting in 2015
WSAP-C9	Audit	0.5	LCS	Prior	Q3 2015

Islamic Development Bank Financing

Procurement Packages with Methods and Time Schedule (Works & Goods)

Ref. No.	Contract (Description)	Estimated Cost (US$m)	Procurement Method	Prequalification (yes/no)	Review by Bank (Prior / Post)	Expected Bid-Opening Date
IsDB-W1	10 MW Hydropower Plant & conveyance Pipeline	35	ICB	Yes	Prior	Q1 2018
IsDB-W2	Ouardaniyeh WTP (2nd Phase)	30	ICB	Yes	Prior	Q2 2018
IsDB-W3	Wastewater Network system	23	ICB/MC	Yes	Prior	Q1 2017

Consultancy Assignments with Selection Methods and Time Schedule

Ref. No.	Description of Assignment	Estimated Cost (US$m)	Selection Method	Review by Bank (Prior / Post)	Expected Proposals Submission Date
IsDB-C1	Design & Supervision Engineer	6.45	QCBS	Prior	Q1 2016
IsDB-C2	Financial Audit	0.2	LCS	Prior	Q3 2017

38. **Prior-Review Thresholds**. Initial prior-review and procurement method thresholds for the project are indicated in Table B. These may change with experience gained during project implementation through clearance of updated procurement plans. Prior review thresholds are to be US$500,000 for Goods, US$5,000,000 for works, US$200,000 for consulting firms and US$100,000 for individual consultants. The first package using each method will be prior review irrespective of cost estimate.

Table B: Procurement Thresholds

	Prior Review Thresholds (US$)m	Procurement Method Thresholds Proposed (US$ million)							
		ICB	NCB	Shopping	QCBS	QBS	CQS	Least Cost	SSS
Goods	0.5	>0.5	≤0.5	≤0.25					
Works	5	>5	≤5	≤0.25					
Consulting Services	0,2 for firm 0.1 for individuals, SSS: all				Default	TBD	TBD	TBD	TBD

39. **Risk Rating & Mitigation measures:** The Procurement Risk Rating is considered as Moderate as CDR has a defined system of accountability and the responsibilities including procurement decision making. The agency in addition to its experienced procurement staff has the capacity to outsource and benefit from both Individual Consultants and Consulting Firms to enhance its capacity whenever needed. CDR has proved that it is capable of handling large and complex projects. Nevertheless, contract management is one of the shortcomings of CDR, resulting in delayed decision makings and eventual payments, contract amendments and extensions.

40. To mitigate the risk, CDR should continue using the services of qualified outsourced individual technical consultants, and make sure they are adequately supported by additional experienced procurement staff. Contract management capacity needs to be improved by hiring qualified consultants to ensure timely decision making and contract amendments. Procurement Plans will be prepared and published based on Bank Guidelines. Bank Standard Bidding Documents and RFPs are to be used for the Project. Publication of contract award will be done as required by the Bank Guidelines.

Environmental and Social

Resettlement Impacts

41. The key adverse social impacts of the project are largely related to land acquisition and demolition of structures. The inundated area of the reservoir is about 570 hectares, which include 953 separate cadastral land plots and 166 building structures. In total, it will affect about 861 landowners. The project will also affect some non-Lebanese workers in the project area.

Resettlement Policies and Legal Framework

42. To mitigate the impacts, a RAP has been prepared following the World Bank policy on Involuntary Resettlement OP 4.12 and relevant local laws and regulations of Government of Lebanon. The RAP is prepared based on detailed census of the affected people, inventory of affected assets, socioeconomic surveys and extensive consultations with the project affected people. The basic principles to be followed for the land acquisition and resettlement planning and implementation are listed below:

- All affected persons are entitled to compensation for lost assets, or to alternative but equivalent forms of assistance in lieu of compensation; lack of legal rights to the assets lost will not bar affected persons from entitlement to such compensation or alternative forms of assistance.
- Compensation rates as established in the RAP refer to amounts to be paid in full to the individual or collective owner of the lost asset, without depreciation or deduction for any purpose.
- When cultivated land is acquired, it often is preferable to arrange for land-for-land replacement. Where suitable alternative land is not available, or at the preference of the affected person, compensation in cash at full replacement cost is appropriate.

- Replacement house plots, sites for relocating businesses, or agricultural land should be of equivalent use value to the land that was acquired by the project.
- Compensation for land and other assets should be paid prior to the time of impact, so that new houses can be constructed, fixed assets can be removed or replaced, and other necessary mitigation measures can be undertaken prior to actual displacement. Adequate transitional support should be provided to affected persons or businesses required to relocate because of the project.

Compensation

43. A historical assessment of land prices in the Bisri area was undertaken as part of project preparation and informed the RAP. The RAP contains compensation rates for various impacts which are determined based on the replacement cost through consultations with various stakeholders, including local Government officials and people affected. The compensation arrangements vary between owners of private land, tenants, users of Government land and communal land.

Institutional Arrangements

44. The PMU will take the responsibility for resettlement Planning and implementation. Within the Legal Affairs Division of CDR, the Expropriation Department (ED) Manager reports directly to the Legal Affairs Divisional Director. The ED works closely with the Projects Implementation Unit from the initiation of the Expropriation Decree until the settlement of payments.

Public consultation and participation

45. Public consultation and participation played a key role in formulating the RAPs, including affected residents (both men and women), business people and district Governments participated in the census, inventory and formulation of the livelihood rehabilitation strategy, measures and relocation sites. Their feedback has been incorporated in the RAP. The RAP contains the methodologies of consultation, the key topics covered, the main concerns of affected persons, and the measures how people's concerns are addressed.

46. Public consultation and participation will continue during RAP implementation. Information will be provided to the affected people as outlined in the Communications Strategy. The RAP will further be summarized into a resettlement information booklet and distributed to every affected household.

Grievance Redress Mechanism

47. Grievances may be filed either in writing or orally. The redress channel lies within the project management and Government systems. Recording requirements and timeframe have been established for grievance resolution. This mechanism has been disclosed as part of the RAP. Special attention will be paid to ensuring that the GRMs meet the specific needs of women and

men, equitably. Where necessary, separate mechanisms may be developed in order to fulfill such gender-specific needs.

Resettlement Implementation Monitoring

48. Internal and external monitoring has been designed as part of project resettlement management. The PMU will carry out internal monitoring of the resettlement implementation. The monitoring procedures, content, staffing, responsibility, timeframe and reporting have been detailed in the RAP. An external monitor will be selected for independent monitoring of RAP implementation. Independent monitoring will cover physical progress of RAP implementation, including compensation payment, allocation of residential sites, farm-land allocation, and restoration of infrastructure. The independent monitor will also review the public consultation process, grievance redressal mechanisms, and restoration of livelihood of the affected farmers. Independent monitoring will be conducted twice a year during the first two years of implementation, and once a year thereafter.

49. The RAP contains a detailed resettlement budget that covers all basic resettlement costs, management costs, contingencies, and monitoring cost. The basic resettlement cost includes compensation for land, house, other structures, standing crops and trees, business profit loss, reconstruction of affected infrastructure, and relocation subsidies. The total resettlement and compensation budget is estimated at US$170 million.

Environment Safeguards

50. A detailed description of environmental safeguards is provided in Annex 8.

Annex 4: Operational Risk Assessment Framework (ORAF)

Lebanon: Lebanon-Water Supply Augmentation Project (P125184)

Project Stakeholder Risks						
Stakeholder Risk	**Rating**	**High**				
Risk Description: Implementing agencies may not communicate clearly or sufficiently on the various alternatives reviewed for long term supply augmentation to GBML. A complaint could be lodged with the Inspection Panel regarding this project (see Inspection Panel April 2013 Report No 76416-LB regarding the Greater Beirut Water Supply Project – P103063).	**Risk Management:** The Bank team has worked closely with GoL officials to develop a communications plan to be implemented prior to and during project implementation with the objective of ensuring that all project details are clearly and widely distributed to project stakeholders. A detailed grievance redressal mechanism has also been developed as part of the Resettlement Action Plan. Adequate resources have also been provided for supervision of the project's social safeguards.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Both	Not Yet Due	Both	☑		Quarterly
Implementing Agency (IA) Risks (including Fiduciary Risks)						
Capacity	**Rating**	**Moderate**				
Risk Description: CDR may experience delays in preparing for the procurement of the large works contract for the dam and may delay in reflecting comments to ensure that all technical issues have been addressed to the satisfaction of the Dam Safety Panel of Experts. FM requirements according to World Bank guidelines may not be carried out according to plan and could result in poor project performance, effectiveness and reporting.	**Risk Management:** The Bank has worked closely with CDR on advancing in the prequalification of dam contractors so as to accelerate project readiness. CDR has done so very readily and has actively sought technical feedback and guidance from its independent Dam Safety Panel of Experts. CDR will implement the project in accordance with World Bank reporting requirements and training will be provided to build the project team responsible for complying with World Bank guidelines and the delivery of World Bank financial reports.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	Not Yet Due	Implementation	☑		Quarterly

<table>
<tr><td>Governance</td><td>Rating</td><td colspan="6">Substantial</td></tr>
<tr><td>Risk Description:

Conflict between various water sector stakeholders may arise on the institutional arrangements for operation and maintenance of the dam.

CDR may not communicate regularly enough with civil society on the progress of project preparation and implementation.</td><td colspan="7">Risk Management:

As part of project preparation, the Bank has worked closely with GoL counterparts to provide international best practice examples of the operation, regulation and maintenance of dams. The Bank has also worked closely with CDR to ensure the involvement of all stakeholders in the design of hydropower and associated infrastructure, thus increasing ownership and cooperation on the project. An operation and maintenance strategy is included as a dated covenant and will detail final arrangements for O&M of the dam.

A detailed communications plan has been developed in close coordination with CDR and other GoL counterparts to ensure that project information is communicated in an effective and transparent manner.

<table><tr><td>Resp:</td><td>Status:</td><td>Stage:</td><td>Recurrent:</td><td>Due Date:</td><td>Frequency:</td></tr><tr><td>Both</td><td>Not Yet Due</td><td>Both</td><td>☑</td><td></td><td>Quarterly</td></tr></table>
Risk Management:

CDR is currently implementing several large World Bank projects and has a good performance track record as documented in the 2010 Independent Procurement Review (available in project files). The fiduciary assessments which were conducted as part of project preparation include a review of fraud and corruption issues and any necessary mitigation measures that may need to be included in project design. An independent Technical Audit will also be incorporated into project supervision as required.

<table><tr><td>Resp:</td><td>Status:</td><td>Stage:</td><td>Recurrent:</td><td>Due Date:</td><td>Frequency:</td></tr><tr><td>Both</td><td>Not Yet Due</td><td>Both</td><td>☑</td><td></td><td>Quarterly</td></tr></table></td></tr>
</table>

Project Risks						
Design	**Rating**	**High**				
Risk Description: Complex geotechnical, hydrological and structural design issues (including the seismic and leakage site risks) may delay the finalization of the detailed design to a standard acceptable to the Dam Safety Panel of Experts.	**Risk Management:** CDR has recruited an Independent Dam Safety Panel of Experts which will advise GoL and remain in place until the dam is fully operational after the first reservoir impoundment thereby ensuring that technical complexities are handled in a timely manner by CDR and in a manner that is acceptable to the Bank and Panel. The design engineer has further partnered with an international dam design firm which further strengthens the design of the dam. The Bank mobilized a hydrologist through the World Bank Water Expert Team (WET) program, to review the dam hydrological reports and ensure that climate change sensitivity analyses are undertaken to international best practices. These reviews have been finalized and the results communicated to GoL for further refinement of the detailed design.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	In Progress	Both	☑		Quarterly
Social and Environmental	**Rating**	**High**				
Risk Description: Environmental and social mitigation measures may not be properly implemented and take second stage to construction and operation of the dam. A large number of absentee land owners may not claim their compensation.	**Risk Management:** The ESIA comprises a detailed Environmental and Social Management Plan (ESMP) for which a detailed Bill of Quantities will be included in the contractors program for works. An independent ESMP supervision consultant will also be financed by the project to oversee the implementation of both works and implementation of the ESMP. A senior environmental specialist and senior social specialist will also be recruited to the Project Management Unit (PMU). Finally, an independent Panel of Environmental and Social Experts will also be recruited by GoL to independently oversee the implementation of the ESMP. The issue of absentee land owners has been extensively considered as part of project preparation and several mitigation measures are in place including fiduciary controls on the disbursement of the Designated Account for Category 2 (Expropriation and Resettlement) as well as plans for an intense communications outreach to target those					

	absentee landowners and encourage them to claim compensation.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Client	In Progress	Both	☑		Quarterly
Program and Donor	**Rating**	**Substantial**				
Risk Description: A project financing gap could arise, should IsDB withdraw its financing.	**Risk Management:** IsDB has confirmed submission of its project package to the IsDB Board in October 2014, shortly after World Bank Board on September 30, 2014. GoL has also confirmed that it will seek to close the financing gap, in the highly unlikely event that IsDB financing is not available.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Both	Not Yet Due	Implementation	☑		
Delivery Monitoring and Sustainability	**Rating**	**High**				
Risk Description: CDR may not have the requisite capacity to effectively monitor delivery and sustainability. Mechanisms for operation and maintenance of the dam and financial sustainability thereafter may not be finalized by the time of dam construction.	**Risk Management:** Monitoring and evaluation form an integral part of the project implementation manual. The financial sustainability of operations of the dam have been assessed in detail through project preparation and build on the WB's longstanding relationship and technical knowledge of the BMLWE. The project also includes specific technical assistance to both the MOEW and BMLWE, as well as a dated covenant, for the development of a detailed strategy, budget, staffing plan and capacity building program to be finalized within the first 2 years of project implementation, thereby allowing adequate time for the strengthening of capacities and establishment of required mechanisms to take over the operation of the dam. The project also is financing one additional year of operation and maintenance (in addition to the defect liability period associated with the construction contract) and this to also ensure a					

	smooth transition from CDR to MOEW and subsequently BMLWE.					
	Resp:	**Status:**	**Stage:**	**Recurrent:**	**Due Date:**	**Frequency:**
	Both	Not Yet Due	Implementation	☐		

Overall Risk		
Overall Implementation Risk:	**Rating**	**High**

Risk Description:

The implementation risk rating is High to reflect (i) the complexities of procurement and construction of works involved in a large and technically complex dam; (ii) the importance of strict compliance with all environmental and social safeguard instruments; (iii) the potential additional management required to manage a project that involves several co-financiers and (iv) the overall country context of operations in Lebanon.

Annex 5: Implementation Support Plan

Strategy and Approach for Implementation Support

1. The strategy for Implementation Support (IS) was developed based on the nature of the project and its risk profile. It will aim at making implementation support to the client more flexible and efficient, and will focus on implementation of the risk mitigation measures defined in the ORAF, namely the delivery quality and design risk which are rated as high, safeguards risks and fiduciary aspects. The parallel financing arrangements on the project, between the World Bank and Islamic Development Bank also necessitate further additional planning for effective supervision and implementation support.

2. Building on global experience in the implementation and supervision of water supply dam projects, a series of interim project reviews will replace the single "midterm review" implemented on other WB-financed projects. Given the complexity of the project from a technical, fiduciary and safeguards aspects and the relatively long implementation period (9 years), an interim project review will be undertaken every three years and will coincide with major project milestones including: the finalization of expropriation and tendering of the dam works contract, construction of the dam, and handover/O&M to BMLWE.

3. In addition to interim reviews, formal supervision and field visits will be carried out semi-annually and will focus on:

a) **Technical inputs.** Engineering inputs are required to review bid documents to ensure fair competition through proper technical specifications and fair assessment of the technical aspects of bids. During construction and commissioning, a once yearly technical audit will be undertaken to ensure technical quality of construction and to ensure that technical contractual obligations are met. The team's dam safety specialist and hydrologist will conduct site visits on a semi-annual basis throughout project implementation. The task team will also ensure that it participates in the site visits of the GoL-appointed Dam Safety Panel of Experts which will remain under contract to GoL until the first filling of the reservoir;

b) **Fiduciary requirements and inputs**. Training will be provided by the Bank's financial management specialist and the procurement specialist before the commencement of project implementation. The financial management specialist and the procurement specialist will both be based in the Country Office to provide timely support and to coordinate closely with colleagues at the IsDB. Supervision of financial management arrangements will be carried out semi-annually as part of the project supervision plan and support will be provided on a timely basis to respond to client needs. Procurement supervision will be carried out on a timely basis as required by the client;

c) **Safeguards:** The environment specialist will ensure that training is provided to relevant counterpart staff with a particular focus on implementation of the ESMP and dam safety issues. On the social side, supervision will focus on the implementation of the agreed RAP and social aspects of the ESMP. Field visits will be made on a semi-annual basis and as required to respond to social and/or environmental issues that may arise. The

social and environmental specialists will liaise closely with the Independent Panel of Experts on Environment and Social, to be appointed by GoL to supervise the implementation of the ESMP;

d) **Client Relations**: The TTL will coordinate the Bank team to ensure project implementation is consistent with Bank requirements, as specified in the legal documents. S/he will meet with senior officials on a regular basis to keep them informed of project progress and issues requiring resolution at their level. The TTL will ensure that the communications plan, as agreed with counterparts during project design, is implemented accordingly; and

e) **Financing partner relations:** Given the parallel financing arrangements of the project, the TTL will coordinate closely with counterpart teams from IsDB to ensure effective project implementation. A Donor Coordination Meeting will be held once-yearly to coordinate project implementation efforts.

Implementation Support Plan for Supervision Missions and Interim Reviews

Time	Focus	Skills Needed	Resource Estimate	Partner Role
First twelve months	Launch of project and establishment of PMU	Procurement, financial management and safeguards	4 staff weeks	Implementation support
	Launch and evaluation of construction tender	Technical and procurement skills	12 staff weeks	Implementation support
12-48 months	Supervision of technical and safeguards project aspects	Technical, fiduciary and safeguards	12 staff weeks	Implementation support
48 months – project close	General project supervision	Technical, fiduciary and safeguards	20 staff weeks per year	Implementation support

Skills Needed	Number of Staff Weeks (SW)	Number of Trips
Dam Safety and Engineering	4 SW's annually	2 per year
Water Engineering	4 SW's annually	2 per year
Procurement	8 SW's annually	As required
Financial Management	4 SW's annually	As required
Environment	6 SW's annually	2 per year
Social	6 SW's annually	2 per year
Gender and Communications	3 SW's annually	1 per year
Task Team Leader	6 SW's annually	2 per year

Name	Institution/Country	Role
World Bank	World Bank Group	Financing partner
Islamic Development Bank	Islamic Development Bank	Financing partner

Annex 6: Economic Analysis

Economic Analysis Assumptions

1. A detailed Cost Benefit economic analysis (CBA) was undertaken for the project with the following assumptions:

   - **Source of data:** CBA data was derived from (i) a 1,200 household survey of project beneficiaries undertaken as part of project preparation (available in project files) and (ii) existing cost data from projects currently under implementation.

   - **Infrastructure included in the analysis:** The economic analysis included the costs of the Bisri dam and associated infrastructure, as well as infrastructure currently under implementation under the Greater Beirut Water Supply Project (GBWSP) namely the conveyance tunnels, water treatment plant, storage tanks and distribution networks.[22] The analysis assumes current-valued operation and maintenance costs of US$5 million/year.

   - **Dam Construction Period:** The dam construction period is assumed to span from March 2017 to March 2021. Impoundment begins during the 2022 rainy season and the power stations and water distribution are on line by 2023. The analysis also assumed that GBWSP infrastructure would come online by 2018.

   - **Analysis period:** The analysis period is 30 years from the start-up of expanded water service, assuming six years for construction of dam and first fill. This assumes that benefits will be provided over a 30 year period.

   - **Discount rate*:*** The net present value (NPV) was calculated using a discount rate of 12 percent. The analysis also considered an alternative 8 percent discount rate for NPV calculations, to reflect the relatively long implementation period for the dam construction and recent developments in international economic practice which lower discount rates for projects with long implementation periods.[23]

   - **Hydropower benefits:** Benefits from hydropower generation at the two hydropower plants are not included in the analysis to reflect the fact that there will be no net increase in hydropower generation capacity as a result of the project.[24]

Economic Internal Rate of Return (EIRR)

2. Without including the impacts from upstream developments, the EIRR at 12 percent discount rate is at least 14.5 percent, as calculated by the methodology described below.

[22] The "GBWSP Independent Study of Project Cost Estimates, Financial and Economic Analyses" (Travers, 2012) confirmed that the GBWSP is an independent project that does not require the Bisri dam to be economically viable.
[23] See Weitzman (1998; 2012); Hepburn et al (2009); Norwegian Ministry of Finance (2013); HM Treasury (2003); Swedish Transport Administration (2012).
[24] The Bisri hydropower plants will offset losses in hydropower at downstream stations. Thus there is no net increase in hydropower generation as a result of the project.

Net Present Value (NPV)

3. The NPV at a discount rate of 12 percent is calculated at least US$165 million, over a period of 30 years. Alternatively, the NPV at a discount rate of 8% is US$600 million, over the same period.

Methodology and Sensitivity Analyses

4. **Estimation of costs:**

- Two sets of costs were included in the analysis: (i) the cost of GBWSP infrastructure (US$370 million) currently under implementation with partial Bank-financing (US$200 million – P103063[25]) and (ii) the cost of the Water Supply Augmentation Project (US$617 million), including the cost of land expropriation and resettlement (US$170 million). Costs of GBWSP infrastructure were derived from ongoing tendered infrastructure bid packages. Costs of the proposed project were taken from cost estimates provided by the dam design engineer.

- Estimates of discounted investment costs are approximately US$720 million (assuming 12 percent discounting), and US$800 million (assuming 8 percent discounting).

5. Estimation of benefits:

- The assessment of project benefits undertakes a commonly used "revealed preference" (RP) valuation approach[26], which builds on the capacity for the project to phase out coping costs that households would otherwise need to sustain over the period for benefits.

- The assessment also considered Willingness to Pay (WTP) for the improved water service, which also takes into account the motivations that drive consumer decisions for payment of service. After careful assessment, the RP approach was selected as the best approach for analysis of benefits with the aim to prove that discounted benefits exceed discounted costs (at a chosen discount rate).

- Four types of benefits were considered in the analysis:

    - *Water service improvements for households connected to the public network* including: (i) extended hours of service; (ii) improved water quality; (iii) improved water pressure; and (iv) reduction in current expenditures related to "coping" costs[27])

[25] World Bank Report No 76416-LB – April 8, 2013

[26] Revealed preference theory, is a method of analyzing choices made by individuals, mostly used for comparing the influence of policies on consumer behavior. These models assume that consumer preferences can be revealed by their purchasing habits;

[27] Coping costs refer to the purchase of tanker and bottled water, as well as the construction of private wells to augment water available to individual households. The average coping costs of connected households were found to be approximately three times the expenditure on regular connection costs. Water-related costs were also found to be a very high fraction of low-income household expenditures.

- *Water service improvements for households without current access to public sources of water supply*. In addition to gaining access to the public network, these households would access the benefits described above.;
- *Reduction of coping costs as a result of improved service.* Consumers pay significant coping costs to purchase additional water and compensate for BMLWE water deficit. A large fraction of these coping costs will be eliminated once water is available through improved service.
- *Other benefits resulting from the project for "public at large"*, resulting from the improved water service in the GBML region including: (i) direct public health effects, improved labor productivity and higher labor market participation; (ii) reduction in salt water intrusion to coastal aquifers; (iii) improvements in service for other water consumers; (iv) Reduced groundwater pumping costs; and (v) increased agricultural yields from Litani water converted to agricultural use[28]. These benefits are not quantified as part of the economic analysis but are assumed to contribute to an overall strengthening of the project value.

- Only reduction in coping costs is used for the explicit benefit calculation. This by itself likely leads to a downward bias for benefits (thus, a conservative calculation). Several other benefit types from the project are listed in the underlying project report, but not quantified for this analysis.

- The analysis further considers three alternatives for calculating benefits, for each of the chosen discount rates, 12 percent and 8 percent. In the case of "non-conservative" calculations, all coping costs are assumed to be phased out as result of the combined two projects (BMLWE, and Bisri). Under a "conservative" calculation, only half of current coping costs, expended on water purchased in stores (bottled water, and gallon containers), is assumed to be eliminated as result of the project. Under the case of "further reduced benefits", also half of other coping costs (mainly from tank trucks and wells) are assumed to still remain over the period from implementation of the BMLWE (2018) and up until completion of Bisri (2023). The ranges for benefits represent alternative assumptions regarding the GBML population that will benefit from the project.

- The annual and aggregate present nominal value of benefits are presented below:

Type of calculation	Annual nominal benefits	Aggregate present value of project benefits
Non-conservative, 12% discounting	193.5-220.7	1421 – 1618
Conservative, 12% discounting	128.7-145.0	938 – 1068
Further reduced summer benefits, 12% discounting	96.8-110.4	832 - 947
Non-conservative, 8% discounting	193.5-220.7	2291 – 2608
Conservative, 8% discounting	128.7-145.0	1442 – 1641
Further reduced summer benefits, 8% discounting	193.5-220.7	1344 - 1529

[28] Post construction of Bisri dam, GoL plans to divert Litani and other water sources previously conveyed to GBML through the conveyance tunnels to agricultural uses.

- Considering the most conservative of these estimates (12% discounting and most conservative benefit count), the aggregate discounted benefits are US$832 million which significantly exceeds the total discounted costs of US$719 million.

Summary of Sensitivity Analyses

6. Sensitivity analyses were conducted to reflect several various forms of project uncertainties:

- **Investment cost overruns**. The sensitivity analyses demonstrated a margin for increased discounted investment costs equal to at least US$113 million. This provides sufficient buffer capacity for cost overruns during implementation, as in particular, benefits are likely to be under-valued in this alternative.
- **Delays in project implementation**. The sensitivity analysis demonstrated that a two year delay in implementation of the Bisri dam (without delay of investments) would lead to a reduction of US$40 million in benefits, as a discounted value. This will reduce the net benefits from a minimum of US$113 million to a minimum of US$73 million which will reduce the EIRR to an estimated 13.5% and is therefore still viable.
- **Impacts of climate change on average inflows to the dam reservoir:** A parallel assessment of the impacts of climate change on the inflow to the dam reservoir was conducted as part of project preparation. This study found that the combined effect of reduced precipitation and increased temperature may lead to a reduction of 4 percent in the average inflow of Bisri Dam. This however will not impact the economic analysis of the project since: (i) metering will be installed across the GBML relatively shortly after the Bisri project is commissioned; and (ii) GoL has access to supplemental sources of water in the event of shortfalls from the dam (Ref Presidential Decree 14522).

Annex 7: Financial Analysis

Beirut Mount Lebanon Water Establishment (BMLWE) Financial Analysis

1. The yearly cost of operation and maintenance of Bisri dam, post construction, is estimated at 3 million USD. A financial analysis was carried out in order to confirm the capacity of BMLWE to finance the operations and maintenance costs of the Bisri dam, as part of a comprehensive system of water distribution to the Greater Beirut and Mount Lebanon (GBML) area. The financial analysis is based on a cash flow simulation of BMLWE's revenues and expenses. The capital expenditure costs associated with dam construction are financed entirely by the Ministry of Finance.

BMLWE Financial Reporting Status and Limitations of Financial Analysis

2. BMLWE was established in 2000, following the enactment of water sector Law 221/2000. Prior to the enactment of Law 221, service provision across Lebanon was fragmented into 22 Water Boards and 209 Local Committees, with significant scope for efficiency improvements. The legal reform initiated with Law 221/2000, delegated responsibility for the delivery of potable water, wastewater and irrigation to four consolidated Regional Water Establishments (RWE's) and to one pre-existing river basin agency (Litani River Authority (LRA). The RWEs were given the autonomy to choose the preferred model of service delivery in line with the principles of equity, competition and transparency. While Law 221 was considered to have laid the foundation for clear accountability and efficiency improvements in water service delivery[29], the implementation of the reform agenda has however been significantly delayed.

3. Nonetheless, the BMLWE remains the strongest performer of the RWEs as measured by numbers of billings, collections, debts and cash availability. BMLWE provides water services for the GBML that includes the city of Beirut and its five neighboring districts: Jbail, Barouk, Metn, Ein el Delbe and Keserwan. The total service area covers a population of about 2.5 million, of which BMLWE serves about 2.12 million.

4. Water sales are the only source of revenue to the BMLWE which is responsible for service provision to the exterior wall or meters of service units. The BMLWE charges users for water per a flat yearly fee of approximately US$170 /year for 1 m^3/day of water. Despite the low levels of service delivery, BMLWE collections averaged 80 percent in 2013.

[29] Law 221 mandates separation between policymaking and service provision, thus establishing a clear line of accountability between policymakers and RWEs. The law also set in motion the establishment of financially and administrative autonomous RWEs. Finally, if effectively implemented, the regional consolidation of service provision can lead to efficiency gains in service provision, to be passed on to end users.

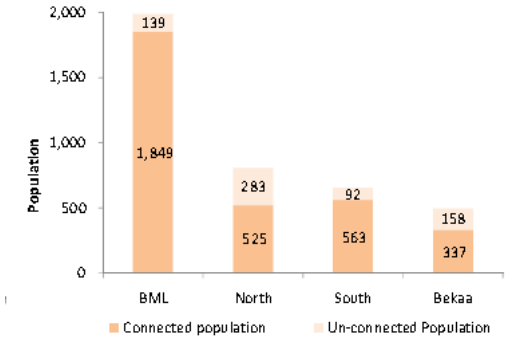


Figure 1: Connected population by RWE

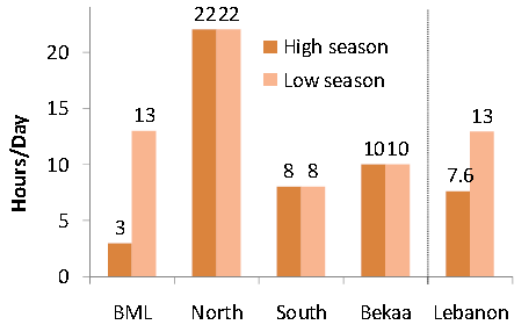


Figure 2: Continuity of supply by RWE

5. BMLWE has been profitable since its establishment, except in 2007 as a result of the financial cost of rebuilding damaged infrastructure due to the 2006 conflict. In 2010, and following the approval of the 2010- 2014 BMLWE Business Plan (developed with technical assistance from USAID), and the subsequent approval of the National Water Sector Strategy (NWSS), BMLWE embarked on an extensive program of investment to (i) expand its water storage capacity; (ii) reduce non-revenue water (NRW) by rehabilitating/replacing distribution networks and (iii) modernizing the utilities' operations.

6. Major investments have included Shabrouh Dam, Janna Dam and the Greater Beirut Water Supply Project, to which the BMLWE is contributing US$140 million in parallel funds (in addition to those of the Bank loan and GoL contributions). BMLWE is thus currently in the midst of a significant investment phase which has reduced its cash reserves, investing in sustainable improvement in service delivery in the long term.

7. BMLWE has also implemented a Geographic Information System (GIS) and Customer Information System and continues to move to enterprise accounting, as required by Law 221. The move to enterprise accounting has been slowed, in part, by the difficulty of valuing assets. The asset valuation process is expected to be completed by the end of 2014 and will result in the development of a balance sheet to accompany the statement of cash flows and the income statement. USAID has provided technical assistance in this area.

Methodology

8. To assess the capacity of the BMLWE to generate enough revenues to cover the O&M cost of Bisri dam and the overall O&M of the BMLWE, a revenue expenditure model was conducted and projections applied until year 2024. The model consisted of estimated revenues, expenses, number of households connected, the O&M and the ongoing BMLWE costs.

9. The data used in the analysis includes annual BMLWE financial statements and reports. The financial analysis and financial forecast are conducted on the basis of these reports and are further informed by the operational and service targets discussed with the BMLWE, consultants and other sector professionals.

Assumptions

10. ***Investment expenditures***: The capital expenditures associated with Bisri dam will be financed entirely by the Government with MOF repaying the IBRD loan in its entirety. BMLWE will be responsible for the operation and maintenance costs associated with the dam, estimated at approximately 3 million USD/year. BMLWE is in the midst of a significant scale up in investments to augment the volume of water available to users thereby improving service delivery. Investments were estimated to continue to increase, for a total of US$200 million, up to 2018. Capital investment expenses for 2013-2014 are based on the average of 2009-2012, equivalent to approximately 30 billion LBP/year.

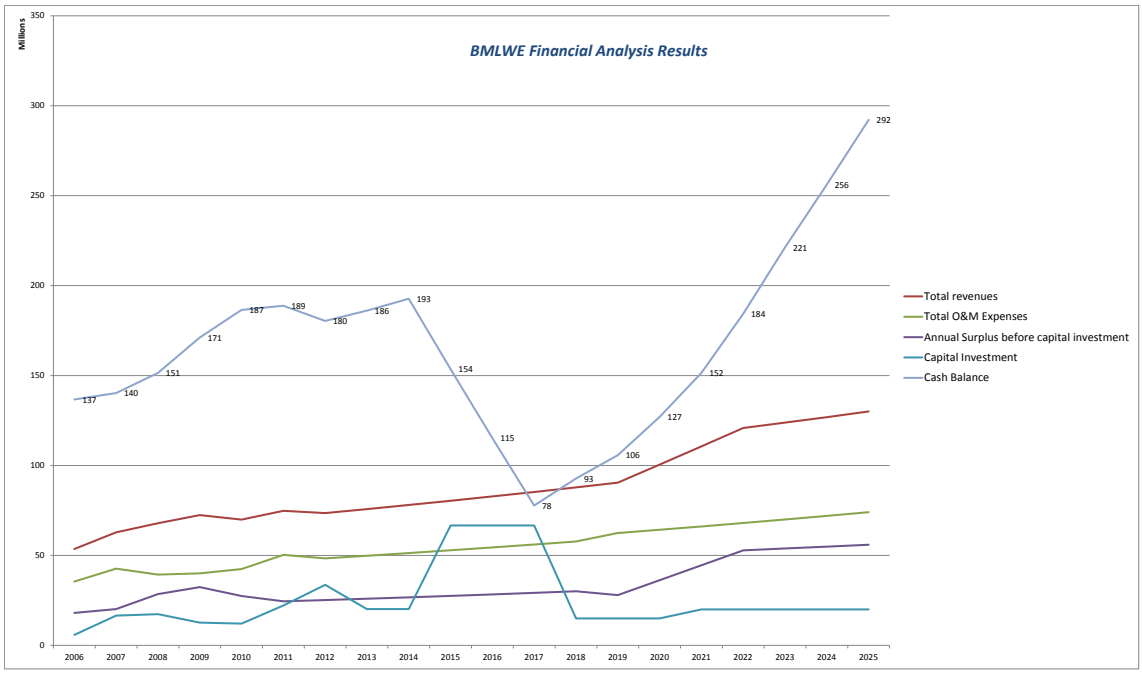
11. ***O&M Expenses:*** The analysis assumed 3% growth in O&M expenses per annum post 2012 based on average growth pattern for 2008-2012. An additional US$3 million /year was included from 2018 onwards to reflect the increase scale of operation, increased cost of electricity and additional costs of O&M associated with the GBWSP and other infrastructure such as wastewater treatment plants that are currently under implementation within the GBML. O&M costs associated with Bisri dam (US$3 million /year) will come online after completion of construction works, estimated in 2022.

12. ***Revenue:*** Collection rate was maintained at 90 percent, as per average data from 2007-2009. Revenues from 2013 onwards were further assumed to increase at 3 percent per year based on the average for 2008-2012.

13. ***Number of household connections:*** The analysis assumes that the currently unconnected 110,000 households within the GBML, will gradually connect to the public network (at an average yearly connection rate of 33 percent), as of 2018.

Results of the Financial Analysis

14. The results of the financial analysis are depicted in the graph below.



15. The financial analysis demonstrates that despite a period of heavy capital investments spanning 2014 – 2018, the BMLWE will continue to be viable and would generate surpluses to cover, the O&M of its entire distribution system, including the O&M costs of Bisri dam, upon its commissioning in 2022. In line with the NWSS and BMLWE Business Plan however, it is critical to ensure that volumetric metering is implemented in tandem with the infrastructure investments described above, and this to ensure sustainability and efficiency of supply operations.

16. Accordingly, Component 2 of the Water Supply Augmentation Project will provide the technical assistance to the BMLWE in the improvement of the overall efficiency of its operations, including the implementation of volumetric metering.

Annex 8: Environment Safeguards

Introduction

1. Appropriate environmental and social management of the project is critical to long-term sustainability. Integrating environmental and social issues upstream also increases the project's benefits by anticipating potential problems and avoiding ex-post mitigating measures, always costlier than prevention. Further, the impacts of the project on the economic and social development in Lebanon are enhanced by proper management of social and environmental issues and challenges. Beyond the obvious need for complying with national rules and regulations on environmental assessment, the above explains why Lebanon has decided to exert due environmental and social diligence on project according to international good practices, notably the Bank's safeguards policies and Ministry of Environment requirements.

2. The safeguard annex is structured in the following parts: (i) Part I: Regulatory Context, Applicable safeguards Policies, and Public Consultations; (ii) Part II: Analysis of Alternatives; (iii) Part III: Impact Assessment; (iv) Part IV: The Environmental and Social Management Plan (ESMP) and (v) Part V: The Social Safeguard Mitigation Instruments.

Part I: Regulatory Context, Applicable Safeguard Policies, and Public Consultations

3. The project's major risks include: (i) the loss of terrestrial natural habitat due to flooding. The area expected to be inundated is 570 ha; (ii) the risk that construction activities will not be conducted in an environmentally or socially sound manner; (iii) induced environmental, human and health risks associated with the construction and operation of a large dam; and (iv) historical and cultural heritage to be affected by the Bisri Dam and reservoir, including a Roman-Persian era temple, a single-arched stone bridge, a small vaulted Maronite church, and St. Sophia Monastery. Extensive public consultations for this long-awaited project has also yielded expectations from local populations, which will be partly fulfilled by increased water supply as the capital's population expands to 3 million and beyond and a set of environmental and social mitigating measures for this project, including local development activities.

Regulatory Context

4. Lebanon has an established institutional and regulatory framework for the management of environmental assessments (EAs). All large projects, such as the proposed project, are subjected to EAs that must be reviewed by the Ministry of Environment. The EA process is governed by Decree No 8633 (Fundamentals of EIA) that was passed by the Council of Ministers (COM) in August 2012. Although the draft Decree No.444 of 2002 had existed earlier 10 years ago, even though it was not passed, the Ministry of Environment influenced project proponents to abide by its requirements, in particular Article 23 that stipulates that all development projects undertake an environmental assessment. Besides the EA Decree, the design, construction and operation of the project will comply with all applicable Lebanese Standards and guidelines, including but not necessary limited to:

- Water Supply for Public and Commercial Facilities;
- Drinking Water Quantity Standards 1999;

- Wastewater Discharged into the Sea 2001;
- Stack Emission Standards 2001;
- Recommended Noise Emission Limits for Outdoor Areas;
- Draft Ordinance on the Use and Disposal of Sewage Sludge;
- National Environmental Action Plan; and,
- National Biodiversity Strategy and Action Plan.

I-B. Applicable Safeguard Policies

5. Given its complexity, the project will have significant technical, environmental, social, and reputational risks and impacts requiring various mitigation measures and offsets. The project is Category A per the Bank's policy on Environmental Assessment (OP/BP 4.01). Table 1 below clarifies the rationale of the safeguards policies triggered by the proposed project.

Table 1: World Bank Safeguards Policies Triggered by the Project

Safeguards Policies Triggered	**Yes**	**No**
Environmental Assessment (OP/BP 4.01) The project will have significant and irreversible environmental impacts, including: (i) the loss of terrestrial natural habitat due to flooding; (ii) the risk that construction activities will not be conducted in an environmentally or socially sound manner; and (iii) induced environmental, human and health risks associated with the construction and operation of a large dam and associated facilities (i.e. the two hydropower plants, access road, conveyor pipeline). The expansion of the water treatment plant is addressed in the GBWSP ESIA which has been reviewed and disclosed by the Bank and in accordance with Bank policies and procedures. An Environmental and Social Impact Assessment (ESIA) with a detailed Environmental and Social Management Plan (ESMP) for the project site has been approved and is in compliance with the World Bank safeguard policies. The ESIA was disclosed in country and at the Infoshop on June 2, 2014.	**X**	
Natural Habitats (OP/BP 4.04) The project will have impacts on natural habitats, both during construction and operation of the dam. The main impact will be the flooding of about 430ha. An annex to the ESIA addresses the biodiversity survey and ecological inventory and includes a biodiversity management plan. The survey indicates that the project will have impacts on natural habitats, in particular during filling of the reservoir and operation of the dam. The main impact will be inundation of terrestrial natural habitat used by aquatic mammals and birds. Mitigation measures are elaborated in the survey.	**X**	
Forests (OP/BP 4.36) Forest issues include measures for the recovery of the wood from the future reservoir, as well as control of induced impacts at the periphery of the reservoir. The impacts and mitigation measures are explained in the ESIA.	**X**	

Pest Management (OP 4.09) This policy is not triggered as there are no pest management issues		**X**
Physical Cultural Resources (OP/BP 4.11) Physical Cultural Resources were covered in the ESIA. During the ESIA process, reconnaissance sites visits to the Dam site have identified various cultural resources within the reservoir limits including archaeological remains at Marj Bisri, historic remnants of St. Sophia Monastery and the Mar Moussa Church. Discussions and agreements were reached with the Directorate General for Antiquities regarding management of chance finds and the necessary measures to be undertaken to preserve these cultural artifacts.	**X**	
Indigenous Peoples (OP/BP 4.10) No indigenous people have been identified in the wider project area. Measures to assist vulnerable project-affected persons (PAPs) are included in the RAP.		**X**
Involuntary Resettlement (OP/BP 4.12) The project is expected to have direct and indirect social impacts in its area of influence and beyond. A Resettlement Action Plan (RAP) has been prepared in close consultation with project affected people (PAP). The RAP was disclosed in country and at the Infoshop on June 2, 2014.	**X**	
Safety of Dams (OP/BP 4.37) The project includes the construction of a new, large 73 m high dam and an associated reservoir. The CDR has appointed an independent dam safety panel. The panel will be used during construction, reservoir filling and the initial stages of operation to advise on associated dam safety risks.	**X**	
Project on International Waterways (OP/BP 7.50) There are no international waterways in the project area.		**X**
Projects in Disputed Areas (OP/BP 7.60) The project is not situated in a disputed area.		**X**

6. CDR has prepared a comprehensive Environmental and Social Impact Assessment (ESIA) including the Cultural Resources Management Plan, an Environmental and Social Management Plan (ESMP), the Resettlement Action Plan (RAP), and the Dam Safety Plan including preliminary Operational and Maintenance Plan. The ESIA has been prepared, consulted upon, approved and in compliance with World Bank safeguard policies. The ESIA/ESMP and RAP have been disclosed in-country and at the InfoShop on June 2, 2014. All safeguards instruments are also accessible on the CDR's website**.**

7. The Dam Safety Panel of independent and internationally recognized experts has been appointed by the CDR. The Environment and Social Panel will also be appointed as a condition of effectiveness. These panels will accompany and supervise project preparation in line with best practice international standards and Bank safeguards policies. The environmental and social panel comprises an environment specialist and a social expert. The dam safety panel comprises a geologist, a dam safety specialist, a hydrologist and a seismologist. Once project implementation begins, both panels will be financed by the project.

8. The environmental safeguards documentation consists of an ESIA and ESMP. The ESMP is an "umbrella plan" that comprises several components which are to be integrated and implemented by CDR, its contractors and supervising consultants; and includes the following elements: (i) the objectives of the ESMP; (ii) the ESMP components and descriptions of their future implementation; (iii) institutional framework, including agencies responsible for implementing the ESMP; and (iv) the ESMP costs and budget. The ESMP is an 8-year program. The total ESMP implementation costs are estimated at US$ 37 million.

9. A RAP has been prepared following the World Bank policy on Involuntary Resettlement OP 4.12 and relevant local laws and regulations of Government of Lebanon. The RAP is prepared based on detailed census of the affected people, inventory of affected assets, socioeconomic surveys and extensive consultations with the project affected people. The prepared ESIA and RAP, were consulted upon, approved and disclosed in-country and in the Bank's Infoshop.

I-C Public Consultations:

10. Extensive public consultations were held on the ESIA, and will continue throughout project preparation and implementation. Civil society, Project-Affected People (PAP), vulnerable groups and various stakeholders were consulted on all safeguards documents, including the ESMP and the RAP. The following methods were used for targeted communication:

- Dissemination of information in the affected villages/communities and continuous discussions with villagers in the project area by CDR staff.
- Disclosure of safeguards documents at the various project sites. Information was also disseminated through the CDR website as well as the World Bank Infoshop.
- At the national level, information is disseminated via the press and during information meeting; and through the local press and targeted local authorities, opinion leaders, elites, NGOs and other interested parties; and at the local level, meetings in all villages were set up during preparation of the ESIA and during public hearings organized by CDR.

11. The following is a summary of the main consultation activities:

- In 2012, a series of scoping sessions and consultation meetings, followed by collaborative and information meetings during April and May 2012, commencing with an institutional stakeholders session at the CDR offices in Beirut to which stakeholder ministries, Government agencies and NGOs were invited. This was followed by separate meetings held at Mazraat El Dahr Municipality in the vicinity of Bisri dam. Finally, two separate sessions were held for Beirut residents, the prime project beneficiaries.
- The safeguards consultant presented the results and recommendations of the ESIA study in different venues for institutional stakeholders, for local PAPs in the villages in the vicinity of the proposed Bisri dam, and for Greater Beirut residents. The date and timing of all meetings were agreed with individual municipalities. The village sessions were scheduled at weekends and early evening's week-day for Beirut residents to allow the maximum number of concerned people to attend.

- Following revisions to the ESIA and RAP consequential upon changes to Dam design, land expropriations requirements, completion of the household survey and the establishment of indicative costs, further sessions of public consultation were held on Friday April 25, 2014 at Dar Ammatour and Saturday April 26, 2014 at Mazraat El Dahr

12. Key issues raised in the consultations included: (i) need to gain access to drinking water; (ii) ensuring access to jobs and other opportunities for tourism; (iii) the need to preserve archaeological, historic and cultural heritage; (iv) need to access productive land upstream and downstream of the dam and need for people living in the vicinity of the dam to benefit from water supply; (v) means of compensation for land take and fairness of compensations for expropriated lands; (vi) the returns for such project on local residents in economic and employment terms; (vii) issues of sewage, sanitation and wastewater before and after dam construction; and (viii) protection of nature and environment from pollution. These issues have been addressed in project design through detailed planning in the compensation/resettlement process, and environmental management aimed at sustainable use of resources.

Part II: Analysis of Alternatives:

13. The project has been subject to a series of detailed analysis of alternatives in line with OP/BP 4.01 Environment Assessment. The range of alternatives includes; non-dam alternatives, dam alternatives, in addition to "Do Nothing" or "Without Project" alternatives.

14. Non-dam alternatives considered were desalination, ground water, rainwater harvesting, wastewater reuse and reduction in "Unaccounted for Water". With all inherent limitations and constraints unrealistically overcome, the non-dam alternatives, would conditionally contribute in reducing GBML imbalance over the next 30 years. While the unconventional water sources will go mainly for non-potable water use, the augmented supplies will not eliminate the persisting water deficit that will keep on showing an annual water deficit varying between 30 and 100 MCM over the next 20 years.

15. With the GBML edging towards a projected population of 3.5 million people by 2035, the present shortages of water, particularly severe during the hot and dry summer months will only be exacerbated by continued population growth, increased living standards, and changing climatic conditions due to global warming. Thus, the consequences of the "Without Project" alternative are expected to include amongst others the following: (i) Further reduction in water availability to less than 3 hours/day; (ii) Increased pumping from illegal, unlicensed wells; (iii) Increase in both salinity concentrations and the area suffering saline intrusion; (iv) Increased used of tankered supplies, often from non-potable sources; and (v) Increased household expenditure on water.

16. On Dam alternatives, earlier studies and work identified potential dam sites, and over the last three decades Government of Lebanon has commissioned feasibility studies at three sites in addition to Bisri namely (i) On the Damour River (two sites: Damour East and Damour West) and (ii) On Nahr Ibrahim upstream of the Janneh Plain (one site: Janneh site).

17. In assessing each of the options for augmenting Greater Beirut water supply, the Analysis of Alternatives conducted an options-prioritization-exercise, looking at both the fundamental considerations and detailed impacts. The analysis revealed that the Bisri Dam site was the first in a priority program of investments to increase water access to the GBML and is the alternative site which can: (i) meet the high storage volume that meets GBML demands to 2030 or longer; (ii) reservoir floor underlain by low permeability deposits; (iii) little or no pumping costs; (iv) lowest cost per unit volume delivered to GBML; and (vi) detailed design in advanced stage of readiness.

18. Given its size and cost effectiveness, Bisri Dam is considered the priority option, and the site is acceptable from an environmental, social, technical, economic and financial perspective. Since water storage, supply and mobilization are main objectives of the project, no alternatives have been considered which are not related to water storage and supply.

Part III: Impact Assessment:

19. A comprehensive ESIA was prepared by CDR. The ESIA describes project impacts according to two complementary analytical frameworks; first, according to project activities, and then according to environmental and social components.

Environmental Impacts

20. **Construction Phase Impacts.** Impacts during the construction phase are caused directly or indirectly by activities at the main work sites, including: the dam site (as defined in the bidding documents, including camps and quarries); the power plant; the conveyor line; access roads; the relocation of the cultural and historic relics; and the recovery of wood from the reservoir.

21. **Construction activities will have indirect impacts on neighboring settlements and regional semi-urban centers where the workers will seek services.** These impacts are both direct and cumulative and are focused on specific areas in the wider project area of influence, as well as Nahr Bisri valley. The impacts arise either from these areas hosting workers, creating additional stress on already insufficient services e.g. health, education and public security, which can in turn cause population influx into the project's area of influence, increasing pressure on land resources and possibly leading to an expansion of areas under agriculture.

22. While the scope of the impacts at each of the construction sites will vary, the impacts of construction activities on the physical environment are concentrated at these sites, and depend on contractors practice. The indirect impacts of construction at the different sites are cumulative since they all occur in the same project area. Accordingly, the impacts of construction activities have been grouped into five categories: (i) general environmental, social and safety impacts of construction activities; (ii) direct impacts on populations; (iii) indirect and induced impacts on populations; (iv) direct impacts on natural habitats; and (v) indirect and induced impacts on natural habitats.

23. Mitigation measures with regard to the construction ESMP, as described in the ESMP and RAPs, are similar for the same type of impacts at all sites (including social impacts). These measures have been integrated into bidding documents and contracts by specifying environmental and social management clauses. The dam contractor will prepare his own Construction ESMP, which will be approved by the Bank.

24. **Impacts on Natural Habitats**. The project will not cause any conversion of critical natural habitats. The project will impact natural habitats during construction (in particular at the time of reservoir filling) and operation of the dam. The expected land take extends to some 570 ha, of which 434 ha the inundated area including reservoir and dam footprint. Land to be expropriated and inundated on the completion of Bisri Dam is primarily agricultural estimated at 150 ha in addition to pine woodland (82 ha) and natural vegetation (131 ha). Indirect impacts on natural habitats could in the long term be more significant than direct impacts. The creation of the reservoir will cause both loss and alteration of natural habitats, with resulting impacts on ecology and biodiversity. Direct loss of habitat will occur as a result of dam construction, inundation, installation of pipelines, and the upgrading of access roads. The presence of the reservoir will transform riparian riverine habitats into lacustrine habitats with both adverse and beneficial effects. The reservoir will reduce habitats for wildlife species that require flowing water but attract those adapted to still or slower-moving waters such as waterfowl.

25. **Impacts on Fauna, Flora, Mammals, Birds and Amphibians.** Five fish species and one crab were identified in Nahr Bisri. Three of the above fish species deserve special mention. These are the Freshwater blenny, the European eel, and the Middle Eastern Green carp. No exotic fish or macro invertebrates were captured. Impacts on aquatic fauna are considered to be moderate to minor at Bisri dam site, but some mitigation measures should be taken to maintain fish populations downstream of the dam and to allow the passage for migratory fish so to protect spawning grounds. The construction of the dam will significantly reduce water flow downstream, which will affect the freshwater blenny population surviving in the lower course of the river. Approximately 50 plants were identified in Bisri, of which 11 are of conservation value. Eight reptiles/amphibians of conservation value, including the *Bufo c. Bufo*, (Common European Toad), were also identified. Thirty two bird species were observed during the surveys. Of the observed birds, four are threatened (White storks, Lesser Spotted Eagle, White Pelicans that are of passage only, and Short-toed Eagle that is of wide range of action. Hence their conservation depends on areas other than Bisri Site. Finally, 17 species of mammals were identified including hedgehog, bat and badgers of conservation value.

26. A detailed biodiversity management plan which includes the results of a detailed ecological survey is included in the ESIA. The summary of actions is included below:

Table 1: Summary of action plan objectives

During Construction	
1	Inform construction staff on the habitats of conservation value and notable plant species
2	Plan starting time for major construction works and activities to avoid disturbance of critical species
3	Clearly mark areas to be cleared during construction and fencing of critical flora
4	Translocation of flora in area to be cleared
5	Establish corridors for crossing to avoid fragmentation of habitats
6	Methodical clearance of forested areas to allow natural dispersal of wildlife into adjacent habitat
7	Reduce hunting and logging in areas opened up through the creation of new or improved access roads
8	Reduce and prevent mortality of wildlife from collision from vehicles
9	Prevent pollution from construction waste to reach habitats
10	Light control within Project Area to minimize disturbance to critical species
12	Avoid noise pollution (blasting) at times critical for bird nesting
During Operation	
13	Maintain connectivity and habitats downstream of dam through minimum flow releases
14	Operation of reservoir to avoid water level fluctuation in spring to preserve critical habitats

27. **Deforestation and Release of Greenhouse Gases.** Forestry issues include recovery of pine woods from the future reservoir, as well as control of induced impacts at the periphery of the reservoir. Greenhouse gas emissions (GHG) from the construction of the dam occur primarily during construction, from exhaust gas emissions, from construction machinery, and during early operation as a result of decomposition of organic material inundated in the reservoir. The Bisri dam project will avoid the potential local health risks of particulate matter, nitrous oxides and sulphur dioxide emissions from construction machinery. Most of the biomass will be removed from the reservoir to reduce greenhouse gases, particularly methane emissions after flooding.

28. The biochemical degradation of vegetation and organic material in the area inundated by the Bisri dam will cause GHG, mainly carbon dioxide (CO_2) and methane (CH_4), to be emitted to the atmosphere. Using the recent World Bank guidelines from 2013 for GHG accounting for reservoirs and energy projects, the estimated GHG emissions from the reservoir and construction area is in the order of 2,150 tons CO_2-equivalents per year, or in the order of 0.01 percent of Lebanon's annual emissions. As further comparison, the associated hydropower plants to the Bisri dam, which will produce in average 40 GWh/year of clean and renewable power, will offset about 29,000 tons CO_2-equivalents/year from current fossil based power production.

Social Impacts.

29. In the absence of a reliable national census, the populations in the area of influence of the project have been studied using a combination of socio-economic surveys, desk study, informal meetings and direct analysis. The total population living in the area of influence is estimated at 36,000 in summer months and about 21,000 in winter months. Notwithstanding this, only a small

percentage of this population will in any way be impacted by the dam. Even those with only a distant view of the reservoir will be few. Most landowners within the proposed area of inundation are 'absentee landlords'. Major economic activities in the area are agriculture, sedentary and itinerant livestock rearing and fishing.

30. Expected social impacts are analyzed in detail in the project's ESIA. The major socio-economic impacts are summarized in Table 2. The reservoir will displace economic activities currently practiced, including agriculture, livestock rearing, and fishing. The reservoir will also entail land take for other project activities and associated infrastructure like the access road leading to the dam. One cultural heritage site, a small church, and adjacent monastic remains will also be relocated.

31. The involuntary resettlement of the populations directly affected by the dam and the reservoir is described in the RAP along with its mitigating measures. Some additional mitigation measures are included in the ESIA (in particular the ESMP).

32. The dam construction contractor has the contractual obligation for traffic, waste, labor force, environmental monitoring, health and safety, and hazardous materials management. This includes mitigation and management measures to deal with social and health consequences of migrant workers coming into communities, e.g. risks of development of STI (Sexually Transmissible Infections) and of AIDS, and safety issues from construction related activities.

Table 2: Major Socio-Economic Impacts Identified in the ESIA

Impact Characterization	**Phase of Works**
- Increased STD/AIDs Transmission risks	Construction
- Increased STD/AIDs Transmission risks - Job opportunities/creation - Forced population moves - Impacts on cultural heritage, historic ruins and archeological artifacts	Dam and power plant construction
- Population influx - Job opportunities/creation - Criminal risks from uncontrolled origin - Impacts on public safety at village crossings	Dam, transmission line and power plant construction
- Impacts on cultural heritage, historic ruins and archeological artifacts - Improved living conditions	Dam and power plant construction; reservoir filling; and access road construction.
- Increased waterborne diseases risks - Development of tourism - Accident risks - Drowning risks possibly as a result of unexpected operational water releases - Dam failure risks - Possible development of irrigated agriculture	Dam and reservoir operation

33. **Positive Impacts.** Expected positive impacts include job creation through the hiring of local labor for construction works, improved water supply in the GBML and living conditions through the benefits of rural electrification, and the establishment of a benefit sharing program as detailed in the RAP. CDR is committed to undertaking ongoing consultation activities with the local communities to help prioritize community development needs aside from the required livelihood restoration measures.

34. **Land Acquisition and Resettlement.** Land take will be extensive within the proposed area to be expropriated, estimated at 570 ha. Residential properties are few and there are no commercial or industrial premises and no significant public infrastructure or community facilities within the impoundment area. In total, there are some 966 separate cadastral plots, within these 570 ha, that will be expropriated from 861 landowners, including around 135 building structures that could be residential, water tanks, storage rooms, generator rooms, religious places, or animal refugees. The occupied residential accommodations house seasonal farm workers, mostly non-Lebanese, that will need to be relocated. Twenty six designated archaeological sites and one heritage site, are within the area to be expropriated. Land take and resettlement will also occur for other project activities and associated infrastructure such as the distribution lines and access road in the lower catchment along the conveyor line. There will be a need to expropriate a total of 7.5 ha of lands that are included already into the 570 ha, for the purpose of the conveyor line downstream of the dam.

35. In addition to the 861 landowners, the land acquisition will also affected 49 residential households, of which six households are landowners, eight households are Lebanese tenants, and 35 households are tenants from other countries. The total residential population affected is 238 persons, of which, 64 are Lebanese and 174 are foreigners. Among 174 foreigners, 72 persons are non-refugees and 102 persons are refugees.

36. The RAP addresses issues related to Expropriation, Resettlement and Compensation covering the Bisri Scheme which consists of: (i) The upper catchment containing the inundation area (434 ha), and a reservoir that extends for about 4 km upstream of the dam axis on Nahr Bisri; (ii) The lower catchment downstream incorporating the associated infrastructure, access roads and pipelines leading to the Awali Conveyor; and (iii) A 15m horizontal buffer zone around the periphery of the reservoir to allow for a shoreline access road and about 700m downstream of the dam, to allow for the construction of appurtenances and appropriate security.

37. In the context of the RAP, Project Affected Person (PAP) is defined as any person, residing or not residing in the project area, that will be impacted negatively and lose their land, livelihood, or asset. Almost all of the 861 owners are absentee landowners and employ seasonal workers to carry out agricultural activities. The total resident people are 238 of which 64 are Lebanese and the remaining 174 are foreigners. Government has committed itself to implement the RAPs according to the requirements of OP 4.12 for resettlement and compensation. These requirements are considerably more stringent than the applicable national laws and Government has agreed to compensate PAPs according to Bank standards. IsDB has also agreed to adhere to the standards of OP 4.12 and to the RAP.

38. **Impacts on Vulnerable People.** In the project area there are no Indigenous Peoples, as defined in OP 4.10. However, women, elderly, children, sick, and disabled people can be considered as particularly vulnerable on account of their limited adaptation capacities, their mutual need for dependency, and/or their fragility or specific needs. Foreign and Lebanese farm labourers with no formal employment title or no legal tenancy entitlement can also be considered as vulnerable. The needs of the vulnerable groups are given specific attention and support as part of the RAP.

39. **Dam Safety Concerns.** Dam safety concerns, in particular, potential dam break flooding, are an integral part of the World Bank Group's review of any dam development. The safety issues posed by Bisri dam and its impact on the proposed project, as well as an extensive review of all technical matters, have been addressed by the DSP. This panel will continue to provide guidance through construction, initial filling, and start-up of the dam, including any design or operational precautions to ensure that the project is consistent with Bank safeguards policies. CDR has appointed an independent DSP with terms of reference and staffing acceptable to the World Bank. The dam design, including the selection of the project site, seismic design requirements, the general arrangement of the site, the location of the main structures, and the scheme for diversion of the river during construction, has been reviewed by the panel and is considered appropriate for the site and its construction feasible without undue difficulties. This review has also included the evaluation of flood risks and their incorporation in the design of the Bisri dam and is considered to be consistent with industry design practice. Dam safety plans (draft instrumentation plan, operation and maintenance plan and emergency preparedness plan) and a construction supervision and quality assurance plan have been elaborated as part of the revised engineering design and have been reviewed by the Bank and DSP. An Emergency Preparedness Plan will be drafted and will be available at least one year before reservoir filling and will include a discussion of procedures for timely and reliable identification, evaluation, and classification of existing or potential emergency conditions.

40. **Impacts on Physical Cultural Resources.** Physical Cultural Resources were addressed in the draft ESIA. Further work was conducted to meet Bank requirements, and agreement was reached with the Department of Antiquities and Culture (DGA) concerning the management of chance finds. From extensive field visits, a total of 78 archaeological sites were identified, of which 27 fall within the area of expropriation for the Bisri dam project and a further 10 sites are within 100 m of the expropriation boundary. Of particular significance as witnesses to the relatively recent cultural heritage of the area are the sites of Mar Moussa El Habchi Church and the remains of St. Sophia's Monastery, located very close to each other a short distance upstream of the proposed dam axis.

Cumulative Impacts

41. The project's immediate area of influence includes: (i) area inside which the project's direct, indirect, and induced impacts are felt, an area that can be represented as the area around the main infrastructure elements required by the Bisri Dam, as well as; (ii) a much larger area inside which the cumulative impacts are felt.

42. The cumulative impacts assessment reported in this section of the ESIA Report focuses on the interaction of the Project and developments that are realistically defined at the time the environmental assessment is undertaken, where such projects and developments could directly impact on the project area of influence. A set of Valued Environmental and Social Components (VECs) has been selected as shown in the table 3 below:

Table 3: Most Significant VECs for the Bisri Dam

Environmental and Social Component	Subcomponent	Parameter	Examples of VECs
Water	-Water Abstraction -Water Quality -Hydrological Flow -Domestic Water Supply	-MoE Water Quality Standards - Flow rate	-Water Resources -GBML water Consumption -Downstream Flow
Air	-Ambient Air Quality	-Greenhouse Gases	-Sensitive Receptors -Terrestrial Environment
Power	-	- Power Supply	-Power Supply
Land Use	-Natural Use -Human Use	-Land Cover -Reservoir Sedimentation	-Agriculture and Reforestation
Habitats and Wildlife	- Terrestrial Habitats - Riverine Habitats	- Species Diversity - Species Population - Wetland Development	-Flora species -Fish Species -Amphibians -Reptiles -Birds -Mammals
Public Health	-	-Health Costs Incurred (diarrhea, chronic illnesses)	-Sensitive Receptors -GBML water users

43. The cumulative socio-economic impacts resulting from the project and other development projects such as GBWSP will, if well managed, afford an overall increase in domestic water supply to GBML consumers, providing them with better water quality treated in the proposed Ouardaniyeh WTP as well as diversion of sewage in the upper catchment through the sewerage network to be constructed as part of the project. Hence, the combined effect will be positive. The main benefits will be decreased cost of water provision to the household as a result of curtailing the costs burden of securing water from private tankers. Improved water infrastructure, treatment, and metering will definitely lead to a better water management system, decreased water losses and a more sustainable water supply.

44. In addition, cumulative impacts of potential upstream reforestation programs will have the propensity to offset carbon dioxide emissions by increasing storage of carbon in terrestrial pools or carbon sequestration. In addition, these forests will contribute to reduced evaporation in the upper catchment leading to increased runoff down the valley into the reservoir. Forests also provide alternative habitats and migration routes for some bird and mammal species, otherwise impacted by Bisri dam.

45. Mitigating measures have been included in the ESMP to mitigate these cumulative impacts. Most particularly, the ESMP includes a detailed plan to monitor environmental impacts

in the GBML following commissioning, as well as a provision to fund measures if mitigation is required. The project's technical assistance will support the implementation of the ESMP, and the environmental and social monitoring program.

Overview of Project Impacts that Require Mitigation

46. The table below indicates which project impacts require mitigation. The water treatment plant is not included in the table as it is currently under implementation and covered under the GBWSP ESIA that was reviewed and disclosed by the Bank. The construction of Bisri dam will require an expansion to the water treatment plant's capacity and this was anticipated during the GBWSP ESIA. It will be financed by ISDB.

Table 4: Project impacts that require mitigation (Construction Phase)

	Construction Activities	**Direct impacts on natural habitats (footprints)**	**Direct impacts on populations (resettlement)**	**Indirect impacts on natural habitats**	**Indirect impacts on populations**	**Forest impacts**
Dam (construction site as defined in the bidding documents, including the camps and quarries)	Addressed in the ESMP and through the environmental and social clauses for contractors	Loss of 570 ha	Covered in the Dam RAP: 860 PAPs will be affected	Increase in illegal logging of pine woods	Management of workers away from construction sites.	Management of pine wood salvage at construction site
Power Plant	Addressed through the environmental and social clauses for contractors		No resettlement			Management of pine wood salvage at construction site
Conveyor line	Addressed through the environmental and social clauses for contractors	Loss of 363 ha of natural habitat	No resettlement			Management of pine wood salvage at construction site
Access roads	Addressed through the environmental and social clauses for contractors		Covered in the Dam RAP		Population influx along access road	
Cumulative impacts of construction	Addressed through the environmental and social clauses for contractors	Loss of terrestrial habitat in the areas of agriculture (150 ha);		Possible increased expansion of grazing and agriculture into natural	Influx of population in the overall area; and management of workers	

		pine wood (82 ha); and natural vegetation (131 ha)		habitats	away from construction sites	
Operation Phase Impacts						
	Water Quantity/Quality and Sedimentation	**Green House Gases**	**Fisheries**	**Indirect impacts on natural habitats**	**Direct impacts on populations**	
Dam	Release of water from anoxic layer. Management of reservoir drawdown in dry years		Reduced fish abundance in the river stretch downstream of the dam			
Power plant	Turbined water is oxygen deficient		Impacts on fisheries and fish reproduction downstream			
Reservoir	Stratification and eutrophication of water in the reservoir	Decomposition of vegetation produces methane	Possible development of commercial fishery in the reservoir	Possible replacement of river fish species by lake species	Fisheries and other activities near the reservoir induce population influx	
Downstream from dam	Lack of oxygen		Impacts on the downstream stretch of the river	Impacts on fish spawning	Decrease of revenue generated by downstream fisheries	
Conveyor line					Villages along the power line do not have access to electricity	
Access Roads						Increased logging at the periphery of the reservoir
Resettlement of impounded				Increased pressure on	Increased demand for	

villages				neighboring habitats	services	
Salvage of pine wood in the reservoir				Facilitate colonization of reservoir periphery		
Cumulative Impacts				Natural habitats reduced through reservoir and encroachment of agriculture and vegetation clearance Degradation of natural habitat and loss of biodiversity.	Improve living conditions and economic opportunities	

Part IV: The Environmental and Social Management Plan (ESMP)

47. The Environment and Social Management Plan (ESMP) is made up of mitigation measures that are proportional and sufficient to mitigate the impacts identified in the ESIA. The mitigation measures are organized in these areas: (i) Management of the construction sites; (ii) Management of reservoir and downstream areas; and (iii) Social Measures.

Management of the Construction Sites

48. Management of construction sites aims to minimize impacts on the environment, workers, and on neighboring populations. Construction activities will take place over a period of approximately five years. Construction sites include the main dam construction site, the power plant, as well as several other sites, including maintenance workshop, worker camp, bridge, quarries, transmission lines, access roads. Each of those sites could potentially generate negative impacts in terms of environment, health and safety of the workers.

49. Rules on the management of the construction activities are spelled out in the Construction ESMP that was disclosed on June 2, 2014 as part of the updated ESMP. The mitigation measures are included as environmental and social clauses in the contract for dam construction. Similar clauses will be incorporated in all other works contracts. Each contract legally requires the contractor to prepare a contractor ESMP prior to commencement of civil works. The clauses cover construction sites activities that might trigger OP 4.01 (Environment Assessment), OP 4.04 (Natural Habitats), or OP4.11 (Physical Cultural Property). The dam construction contract pays special attention to quality assurance and to the installation of required instrumentation, to ensure the security of the permanent structure as required by OP 4.37 (Safety of Dams).

50. The implementation of the contractor ESMPs will be monitored and enforced through a permanent control by the CDR with the support of the construction supervision engineers. Also, various Government departments regulate the works as part of their inspection and monitoring mandates. Contracts include a system of warnings and penalties in case of non-compliance. Regular Ministry of Environment patrols will inspect construction sites if construction activities are in compliance with the approved ESMP.

51. CDR is responsible for the overall supervision of the construction sites. CDR will also retain the area required for the dam's management and will remain responsible for the management of the reservoir and protect the watershed around the reservoir. This requires strengthening of CDR's technical capacity to manage environmental and social issues, the satisfactory performance on the part of the engineers that are entrusted by CDR with the supervision of the construction sites, and close coordination with relevant ministries and agencies, most particularly the ministry of environment.

52. The following measures will be taken to limit the influx of populations in the Bisri dam area:

- Recruitment in villages close to the construction sites will cause an influx of people seeking employment and most likely lead to a long-term population increase in these villages. However, the project will preferentially recruit unqualified manpower that originates from localities close to the construction sites;
- The purchase of produce preferentially from areas next to the sites will facilitate agriculture expansion. Contractors are expected to buy their supplies from the wider Bisri dam area, especially from Beirut and Saida;
- Workers will be transported from the dam's construction site to the worker's camp, to avoid the development of services targeting them in villages close to the construction site; and
- Possible investment in a Visitors' Centre on the hillside a short distance downstream from where views over the works can be enjoyed in safety.

Management of the Reservoir and Downstream Area

53. Management of the reservoir, its periphery and downstream impacts will be the main environmental challenge of the project during the dam's operation phase. It will seek to avoid or mitigate its direct, indirect, induced and cumulative impacts. It will take into account the strong seasonal variation of the water level, given that drawdown during the dry season will create opportunities for recession agriculture, seasonal pastures, and other land uses. The ESMP also requires that CDR give particular attention during the operation phase to the risks that water releases or a dam breach would pose to persons and their assets downstream. The following measures in the ESMP are directly related to the management of the reservoir:

- **Monitoring of Water Quality**: It is expected that a major part of the shrub biomass from the future reservoir can be removed before it is flooded. Decomposition of the remaining vegetation and delays in the renewal of the water in the reservoir will lead to a stratification of the water layers, with the deepest layers being anoxic. The ESMP

proposes management rules for these impacts and require that CDR monitor water quality in the reservoir as well as the quality of water released by the dam.

- **Monitoring of Greenhouse Gases:** The decomposition of vegetation in the reservoir will release greenhouse gases. Under the ESMP, CDR will implement a program to monitor greenhouse gas releases after impoundment.
- **Management of Watershed Surrounding the Reservoir:** CDR will need to take responsibility for the management to the watersheds surrounding the reservoir to ensure that sediment loading of the reservoir is being managed adequately.
- **Fisheries Management:** Mitigation measures for impacts on fish species and fisheries: The dam designer will incorporate sensitive design such as allow shallow areas for spawning. The current artisanal fishery along the Bisri River might develop into a more important fishery in the reservoir after its impoundment. However, annual variation of water levels will reduce fish stocks. CDR will need to prepare a MOU with the Ministry of Agriculture to implement measures that seek to monitor fish stocks and manage fisheries through access rights and controls. CDR will also undertake a study to assess the long-term viability and growth of the fisheries.
- **Environmental Flows**: The environmental flow will be released from the Bisri Dam, and be utilized by the small hydropower plant at the dam. The environmental flow release is incorporated in the reservoir operation simulation as standard. The environmental flow set by the ESIA consultant is 0.3 m^3/s for winter and 0.45 m^3/s for summer.

54. Regulation of the Bisri River by the dam will have impacts downstream that are cumulative to the modification of the hydrological regime of the Bisri River. The ESMP includes measures that address the cumulative impact assessment. The program will include monitoring of downstream aquatic ecosystems to determine magnitude of changes (e.g. water quality, biodiversity, natural aquatic habitats). Water releases from the anoxic water layer in the reservoir will have a negative impact on aquatic biodiversity immediately downstream from the reservoir. The releases could also have an impact on the geomorphology (e.g. river bank erosion) and downstream salinity. The ESMP includes a program to monitor this situation during construction and after impoundment.

IV-B. ESMP Management and Capacity Building

55. The implementation arrangements for the ESMP are fully integrated with the overall implementation arrangements of the project. CDR will have the day-to-day responsibility for the project's compliance with the Lebanese legislation and bank safeguards policies. CDR coordinates closely with the Ministries and other actors involved in the project, as has been outlined in the ESMP. A competent environmental and social consulting firm will oversee the overall implementation of the ESMP and the RAP.

56. The independent panel of experts for environment and social issues and the independent panel of experts for Dam safety are independent entities set up by CDR in agreement with Government and donors to provide advice and recommendations on all environmental, social, and dam safety aspects of the project. CDR will extend the mandate of the panels throughout the duration of the implementation and initial year (s) of operation of the ESMP.

57. Various reputable consulting firms will be contracted to ensure controls and supervision of construction works, including safeguards aspects. On environmental and social aspects, supervisory engineers will monitor compliance of contractors with the Construction ESMPs and provide CDR with the technical assistance.

58. CDR will implement a monitoring and evaluation program, including monitoring of ESMP indicators, monitoring impacts and their mitigation, as part of the regular donor reporting. These reports will also be available in the CDR local office in Bisri.

59. The ESMP includes a periodic environmental and social audit, which will enable the project team to identify any adverse impacts and, if mitigation measures are ineffective, will enable CDR to effect corrective action.

60. The ESMP includes continued capacity building measures to strengthen CDR's capacity for technical assistance and to handle safeguards issues according to international standards, particularly in the context of large water supply infrastructure projects like the Bisri dam project. The capacity building measures in the ESMP build on the technical assistance for environment and social studies. Government and the CDR teams will also continue to receive guidance and support as needed from World Bank safeguards specialists. Complementing this ongoing support, the proposed project will include further measures to ensure satisfactory handling of safeguards during the construction and operation of the Bisri dam; in particular, the project will include a training program, supported by a technical assistance package as needed.

Annex 9: Social Safeguards

1. The project has the advantage that no significant settlements lie within the area to be inundated or within at least 500m of the expected reservoir shoreline. While land take will be extensive within the proposed area to be expropriated, some 570 ha, residential properties are few and there are no commercial or industrial premises and no significant public infrastructure or community facilities within the impoundment area. In total, there are some 966 separate cadastral plots, within these 570 ha, that will be expropriated from 861 landowners, including around 135 building structures that could be residential, water tanks, storage rooms, generator rooms, religious places, or animal refuge. The occupied residential accommodations house seasonal farm workers, mostly non-Lebanese, that will need to be relocated. Twenty six designated archaeological sites and one heritage site, within the area to be expropriated were identified.

2. Land take and resettlement will also occur for other project activities and associated infrastructure such as the distribution lines and access road in the lower catchment along the conveyor line. There will be a need to expropriate a total of 7.5 ha of lands that are included already into the 570 ha, for the purpose of the conveyor line downstream.

3. Coverage of inundation and the expropriation limit, will affect lands from nine municipalities together with six other cadastral regions as shown in the Table below.

Table 1: Administrative Divisions within the Project Area

Caza	Municipality	Cadastral Region
Chouf	Mazraat El Dahr	Mazraat El Dahr
	Bsaba	Bsaba
	Mazraat El Chouf	Mazraat El Chouf
	Aamatour	Aamatour
	Bater	Bater
	Administered by the Ka'emMaqam	Khirbet Bisri and Deir-el-Mkhaless
Jezzine	Midane	Midane
	Benouati	Benouati
	Aariye	Aariye
	Bkassine	Bkassine
	Administered by the Ka'emMaqam	Bisri, Harf, Ghbatiyeh, and Bhannine

4. The current lands distribution, that is broken down into lands use categories, is below:

Table 2: Estimated Distribution of Land Use within Expropriated Area

Land Use	Approximate Area - ha	% of Total expropriation
Irrigated Agricultural Fields at minimum distance of 100m of river	148	26%
Natural bush vegetation sloped	131	23%
Natural bush vegetation flat	105	18%
Other open rocky and steep slopes lands	99	17%
Accessible Natural Pine Woodlands	82	14%
Poly-tunnels	4	0.7%
Built-up Areas	1	0.2%
Total	**570**	**100%**

Social Baseline Conditions

5. The Households and Landowners Surveys were carried out between February and April 2014 based on the finalized project design, expropriation limits and identified plots and ownership titles. In the context of the RAP, Project Affected Person (PAP) is defined as any person, residing or not residing in the project area, that will be impacted negatively and lose their land, livelihood, or asset. The affected communities are divided into Residential PAPs, Non-Residential PAPs, and Vulnerable Groups.

6. The surveys disclosed the following results:

   - There are total of 238 residents that were identified by the Household Survey. Of these 238, there are 17 Lebanese landowner Residents, 47 Lebanese tenant residents who are Non-owners and the other 174 are all non-Lebanese residents with or without a rental contract;
   - As identified by the Landowners Survey, there are estimated 861 Lebanese landowners that will be affected by the Project, six of whom reside in the Valley with their family members (totaling 17 residents as mentioned above), 90 are considered Non-absentee Landowners30 and the remaining 765 are considered as Absentee Landowners, according to the below mentioned definition;
   - Number, category and distribution of Project Affected Persons are given in Table below.

[30]Non-Absentee Landowners are those, not living in the expropriated area, and where at least one of the following criteria applies i) do rely on the land for their income or livelihood or ii) do live in the villages surrounding the valley i.e the Project Catchment Area..

Table 3: Project Affected Persons

District	Residents within the expropriation limits			TOTAL	Landowners (households)			TOTAL
	Lebanese		Non Lebanese					
	Landowners	Non-Owners	Residents		Resident Landowners	Non-Absentees	Absentees	
Chouf	**15**	**17**	**123**	**155**	**5**	**68**	**509**	**582**
Jezzine	**2**	**30**	**51**	**83**	**1**	**22**	**256**	**279**
TOTAL	**17**	**47**	**174**	**238**	**6**	**90**	**765**	**861**

- The majority of resident and Non-absentee Landowners employ seasonal workers to carry out agricultural activities that is the main occupational sector for residents;
- There is a 50 percent gender split between female and male and 55 percent of the age group are adults[31];
- Not all workers receive health insurance[32] and since there is no unemployment welfare, the labor force depends on employment for health benefit;
- The whole of the project area is given over to agricultural activity which includes open fields variously tilled, cropped, laid fallow or under poly-tunnels. The majority of the trees are Oak, Citrus, Pine, and Olives; while flowers and strawberries are grown in poly-tunnels;
- There are no industrial or non-agricultural commercial enterprises within the area to be expropriated;
- The 90 percent of active resident population works in agriculture with the 60 percent of workers earning less than US$500 per month;
- There is very little access to public utility services within the reservoir area such as domestic water source, public sewerage connection, electricity supply and solid waste disposal;
- The Social Survey has identified un-contractual workers and property tenants with no legal right as the most vulnerable group. The distribution of persons into each group and their level of vulnerability are given in details in Social Baseline Conditions Section of the present report.

Project Impacts

7. The development of dams always involves the permanent occupation of land, not only for dam construction and reservoir impoundment, but also for new access roads. Land acquisition will result in resettlement of displaced PAPs, relocation of their businesses and rehabilitation of their livelihoods. Road construction will open up poorly accessible remote areas, affording them

[31]Adults range between 18 and 65
[32]NSSF (National Social Security Fund) is a health insurance and end-of service pension

better access to regional centers, Government facilities and public services. However, this might have a downside such as abuse of existing communities, landscape and ecology.

8. The Expropriation File along with the 2014 Socio-economic and Landowners Surveys have allowed to identify and quantify the impacts generated on people and their properties as a result of land and asset acquisition and that need to be mitigated, as presented here after.

9. ***Magnitude of Land Take:*** While 69 percent of lands to be expropriated will be taken from the ChoufCaza, only 31 percent will be taken from Jezzine Caza. Among the cadastral regions, Aamatour and Mazraat El-Chouf will be heavily affected by the land takes with 54 percent of Project total lands to be expropriated. The split of land take between cadastral regions is shown in the table below.

Table 4: Extent of Land Take within the Reservoir Area

Casa	Cadastral Region	No. Plots	No. of plots totally expropriated	No. of plots partially expropriated	Expropriated Area (ha)	% Area Expropriated
Chouf	Aamatour	310	279	31	160	31%
	Mazraat El Chouf	277	225	52	120	23%
	Mazraat El Dahr	55	36	19	42	8%
	All others	39	15	24	36	7%
ChoufSub-Total		681	555	126	358	69%
JEZZINE	Midane	80	70	10	48	9%
	Harf	69	64	5	46	9%
	Bisri	74	62	12	44	9%
	All others	62	35	27	21	4%
JezzineSub-Total		285	231	54	159	31%
Expropriation Grand Total		966	786	180	517	100%
"DomainePublique" (river + roads)					53	
Total Land take					**570**	

10. ***Current Land Use:*** The lands to be taken vary in type, ownerships and use. While the "Domaine Public" Lands total an area of 53 ha, 517 ha of lands will be taken from their private owners. The Table below summarizes the type, use and areas of lands that will be affected.

Table 5: Type and Use of Lands to be expropriated

Land use and cover	TOTAL M^2	Ownership	
		PUBLIC M^2	PRIVATE M^2
Irrigated Agricultural Fields at distance of >100m from river	1,480,000	51,874	1,428,126
Other open and rocky with steep slopes lands	990,000	31,515	958,485
Natural bush vegetation flat	1,050,000	322,610	727,390
Accessible Natural Pine Woodlands	820,000	42,015	777,985
Natural bush vegetation sloped	1,310,000	82,089	1,227,911
TOTAL*	**5,650,000**	**530,102**	**5,119,898**

** the total area does not include the 1 and 4ha of Built-up area and Poly-Tunnels that are included under the structures and other attachments categories respectively shown here after.*

11. ***Structures:*** There are a total of 134 structures to be demolished and one church to be relocated as a result of the Project. While 49 residential dwellings are inhabited, the remaining are either empty or non-residential structures, such as animal shelters, agricultural warehouses, etc. Table below summarizes the number, type of use and areas of the structures that will be affected.

Table 6: Structural Assets Affected

Structural Asset	Nr	M^2
Residential Structures inhabited	49	3,349
Empty Structures	26	2,902
Non-residential structures including one church	60	3,877
TOTAL	**135**	**10,128**

12. ***Field Crops:*** Seasonal field crops could be either found covered under poly-tunnels mainly strawberry and flowers plantations, or un-covered vegetables which accounts for the largest field crops area as shown in Table below.

Table 7: Field Crops

Field Crops	M^2
Strawberry under Poly-tunnels metal – plastics	40,000
Rose and other Flowers under Poly-tunnels metal – plastics	27,000
Open Field crops (Tomato, Lettuce , fava bean, cabbages and others)	200,000
Total	**267,000**

13. ***Trees:*** There are a total of 110,814 trees that will be cut from the Valley. These include 28,737 young trees and 82,077 mature trees.

14. ***Land attachments:*** There are also other assets that could be attached to the lands and that will be affected by the Land Take. These include all equipment and assets that are primarily

related to servicing the major occupation sectors in the Valley (plant and animal production sectors). The Table below provides the land area and attached assets.

Table 8: Other Land attachments

Other Land attachments	Unit	Quantity
Water ground tank, concrete	cubic meter	985
Water tank, elevated, plastic on metal frame	cubic meter	910
Poly-tunnels, metal and plastic	meter square	40,000
Agricultural and irrigation Equipment *	meter square	227,000
Animal shed, concrete walls and floor	meter square	2,220
Metal overhead Pergola	square meter	115
Metal pipes	linear meter	65
Metal wired fence	linear meter	1,680
Water channel, open, concrete	linear meter	990

** for total area cover refer to field crops area.*

15. ***Property tenancy:*** The 2014 Social Survey has revealed that 35 households are non-Lebanese (totaling 174 persons) of which 34 households (housing 165 persons) have no legal Tenancy Right. Similarly; the eight counted Lebanese non-owner-households (totaling 47 persons) have no Tenancy rights to the property they occupy, and are not protected under the Lebanese law. The Table below summarizes the Impact over Properties Tenancy in the valley.

Table 9: Impact over Tenancy Rights

TENANCY RIGHT	Nr Households				Nr of Persons		
	Lebanese	Other-Arabs	Total		Lebanese	Other-Arabs	Total
Resident-Owner	6	0	6		17	0	17
Resident-Renter	0	1	1		0	9	9
Resident Upon Mutual Agreement	8	34	42		47	165	212
TOTAL	***14***	***35***	***49***		***64***	***174***	***238***

16. ***Employment:*** Of the total 238 Valley residents, there are 103 who compose the working force, of which 39 are Lebanese and the remaining 64 are non-Lebanese. 87 percent of the working force is employed as skilled agricultural and fishery workers as shown below.

Table 10: Impact over Employment

EMPLOYMENT (Number of individuals affected)	Lebanese	Other-Arabs	GRAND TOTAL
Skilled agricultural and fishery workers	30	60	90
other Working force	9	4	13
TOTAL	***39***	***64***	***103***

17. ***Foreigners***: 174 foreigners reside in the project area. Among these, 64 are part of the working force in the valley. Some of them are refugees and some are not. The details are shown in Table below.

Table 11: Impact over Resident Foreign Population

Number of people	Total foreigners	Of them total Working Foreigners
Non-Refugees	72	36
Refugees Registered with UNCHR	79	25
Refugees Not Registered with UNHCR	23	3
GRAND TOTAL	**174**	**64**

18. ***Summary of all impacts:*** The Table below summarizes the magnitude of impacts as presented above, due to the Lands take over people, their rights, assets, lands, employment and other attachments.

Table 12: Summary of Resettlement Impacts

Summary of Resettlement Impact	Land ha	Structures Nr	Trees Nr	FIELD CROPS M^2	Owners Nr	Tenants Nr	Workers Nr
Reservoir area including all buffer zone around	485	119	107,426	186,000	789	187	89
Dam foot print	29	12	1192	67,000	23	34	14
Associated facilities: transmission line, access road*	56	4	2196	14,000	49	0	0
TOTAL	**570**	**135**	**110,814**	**267,000**	**861**	**221**	**103**

Existing Legal and Policy Framework

19. The prime legislative instrument for expropriation is the 1991 Expropriation Law 58, which authorizes expropriation of private property in the public interest where deemed to be for the public utility, but only in exchange for fair and adequate compensation. It provides for the determination of compensation and appeals procedure for dispute resolution. The Lebanese Government may pay an interim amount before the appeal process has been completed while leaving the payment of the balance amount until the Appeal Committee decision.

20. In accordance with CDR policy, and while simultaneously complying with GoL procedures, the assessment needs to follow the requirements of World Bank Policy on Involuntary Resettlement OP 4.12 to render it acceptable for any future funding.

Table 13: Discrepancies and Gap-Filling Measures

Discrepancy	Gap-Filling Measures for Bisri
Stakeholder Consultations	• Stakeholder consultations have been held in project affected villages and in Beirut.
	• A Project Information Centre (PIC) will be established.
PAP Participation	• Public consultations have been held to elicit PAP participation.
	• A dedicated phone line for consultation sessions has been announced in the Press.
Compensation Terms	• All compensation value will be determined based on full replacement cost of affected assets.
Grievance Redress	• To make an Appeal more accessible to poor PAPs, for those whose total landholding is less than 1,000 m^2 or their total asset value less than LL 10 million, the project will pay the Appeal fee and the cost of legal representation.
PAPs without Title	• PAPs without title have been identified by a 100% household survey and appropriate payments will be made via the title-holder, with PAPs asked to sign to confirm receipt.

Compensation Entitlements

21. Compensation is paid in cash, provided it is adequate, and paid in time and in full. Bank funded projects are expected to compensate all persons affected by the project and for all losses of assets and investments (e.g. lands, structures, trees, fixtures, lands attachments, etc.). In accordance with Lebanese expropriation procedures, rates of compensation shall be determined by the Expropriation Commission (EC) upon the receipt of the approved-on Expropriation Decree.

22. A cut-off date of Eligibility to compensation has been set as of March 20, 2014. Local people in the project areas have been informed about the cut-off date through public announcement in local newspapers. Eligibility for compensation for the losses occurring and status of persons affected, with the compensation basis are presented in the Table below.

Table 14: Entitlement Matrix

Eligible Persons		Nr of households/persons	Loss of:	Compensation Payable
Lebanese Nationals	**Resident Landowners** **Living in the *area to be expropriated* and do rely on owned land for their livelihood**	**6/17**	Land House Structure Trees Crops other assets livelihood	*PAPs shall be compensated at the replacement cost as estimated by the EC for:* - land loss and disturbance of livelihood; - Transitional allowance for moving of household and belongings; - income and loss of earnings; - costs incurred for improving the property assets and land productivity; - rehabilitation that is sufficient to enable PAP to re-establish in similar condition; - allowances for continued post project use of any lands at existing levels of productivity; - assistance of replacing and transition costs to new location for PAP's movable goods and assets.
	Non-absentee Landowners **where at least one of these two criteria applies:** **- Living in the *Project catchment area*** **- do rely on owned land for their livelihood**	**90/-**	Land Structure Trees Crops other assets livelihood	*PAPs shall be compensated at the replacement cost as estimated by the EC for:* - land loss and disturbance of livelihood; - income and loss of earnings; - costs incurred for improving the property assets and land productivity; - rehabilitation that is sufficient to enable PAP to re-establish in similar condition; - allowances for continued post project use of any lands at existing levels of productivity; - assistance of replacing and transition costs to new location for PAP's movable goods and assets.
	Absentee Landowners	**765/-**	Land other assets	*PAPs shall be compensated at the replacement cost as estimated by the EC for:* - land loss ; - consequential loss of any land's asset.
	Total of Landowners	**861/17**		
	Non-Owner residents	**8/47**	House Structure Trees Crops other assets livelihood	*PAPs shall be compensated at the replacement cost as estimated by the EC for the housing tenancy:* - those with Tenancy post-1991 contract at a rate of 3 months payment and landlord is instructed to return all in-advance money received to tenant; - those with no Formal Tenancy Contract for the incurred costs for improvement brought to the land and property as valued by the EC as a case-by-case basis; *'PAPs shall be compensated at the replacement cost as estimated by the EC for other than housing:* - any consequential loss of trees and crops and other land attachments; - assistance to recover livelihood and rehabilitation. - assistance of replacing and transition costs to new location for PAP's movable goods and

Eligible Persons			Nr of households/persons	Loss of:	Compensation Payable
					assets.
Foreigners	**Labor residents**	**Non refugees**	**7/36**	Job Full timer / Part timer and Shelter	<u>*PAPs shall be compensated for Jobs loss as it follows:*</u> - loss of income of full timer at a rate of 10$ daily for total of 156 days. - loss of income of part timer for 3-month-payment based on their currently received monthly wage. <u>*PAPs shall be compensated for shelter loss as it follows:*</u> - those with Tenancy post-1991 contract at a rate of 3 months payment and landlord is instructed to return all in-advance money received to tenant; - those with no Formal Tenancy Contract for the incurred costs for improvement brought to the land and property as valued by the EC as a case-by-case basis.
		Refugees	**4/28**	Shelter	Project will Provide assistance to get PAPs connected to the UNHCR.
	Non Labor residents	**Non refugees**	**7/36**	Shelter	<u>*PAPs shall be compensated for shelter loss as it follows:*</u> - those with Tenancy post-1991 contract at a rate of 3 months payment and landlord is instructed to return all in-advance money received to tenant; - those with no Formal Tenancy Contract for the incurred costs for improvement brought to the land and property as valued by the EC as a case-by-case basis.
		Refugees	**17/74**		Project will Provide assistance to get PAPs connected to the UNHCR.
	Total of residents in the Valley*		**49/238**		

**the 49/238 Households/personsinclude the 6/17Resident Landowners, as above. All resident Lebanese Nationals are from 14 Owner and Non-owner households while all foreigners are from 35 households totaling the 49 households.*

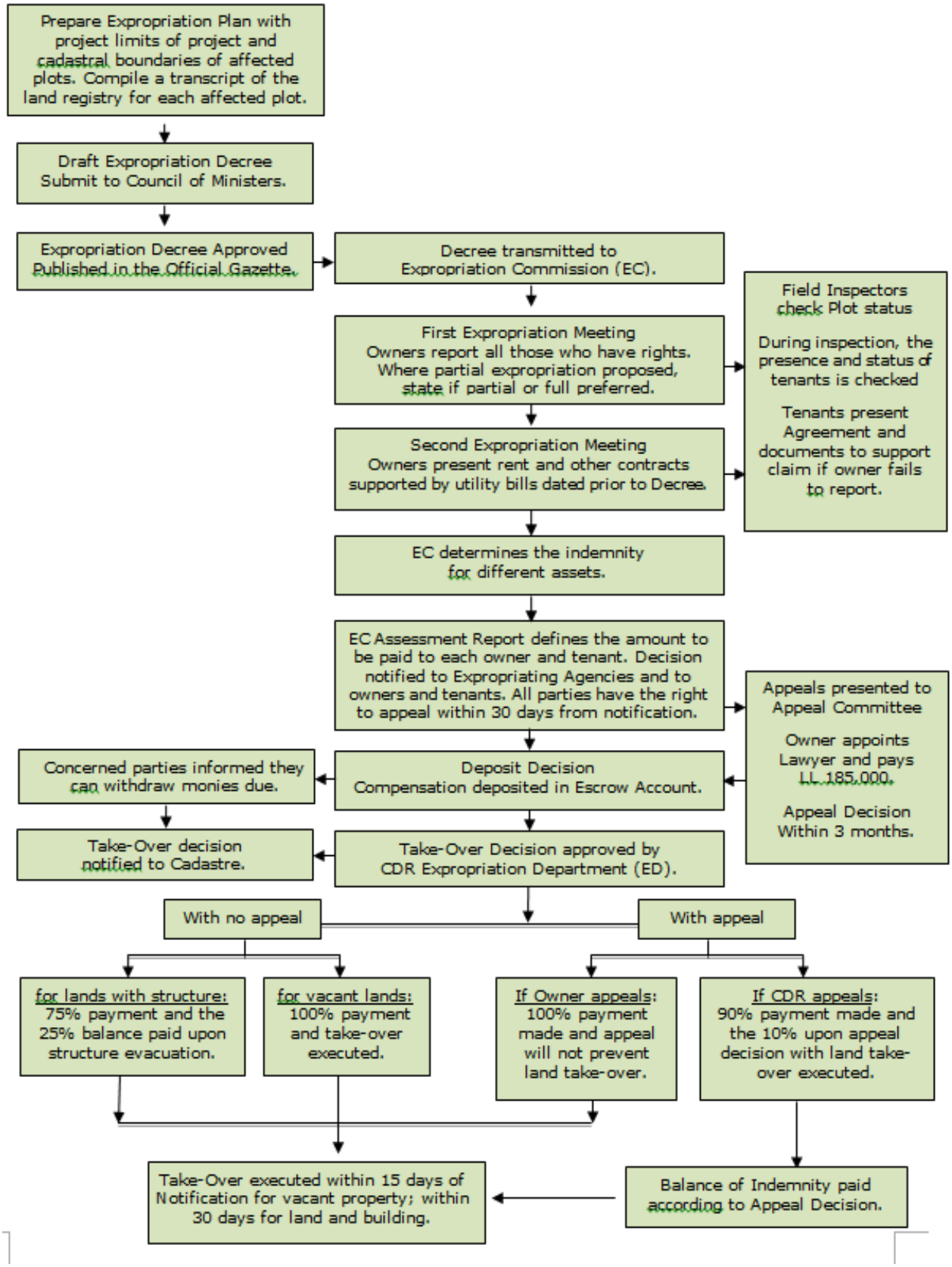
Implementation Structure

23. A summary of agency roles and responsibilities for RAP execution is given in the table below.

Table 15: Role and Responsibilities for RAP Implementation

Stage	Agency	Responsibility
Final Design/ Design Review	CDR	• Approve final design; • Define land to be acquired; • Prepare Resettlement Plan; • Budget for rescue archaeology and building relocation.
Negotiation	PIC of PIU	• Undertake Community liaison and support to PAPs.
	ED within CDR	• Initiate the Expropriation Decree; • Ensure expropriation tasks accord with the Lebanese Law and the World Bank Policy on Involuntary Resettlement OP 4.12; • Liaise with project engineers drafting the Decree and the consultant preparing the expropriation files; • Verify expropriation files.
Implementation	CoM	• Approve the Expropriation Decree.
	EC	• Determine all compensations;
	Municipal Councils	• Assist PAPs with grievance redress.
	ED of CDR	• Deposit determined indemnity values; • Takes possession of the property.
	ED	• Inform beneficiaries of deposition.
	CDR or PAP	• If required, appeal EC decision to Appeals committee.
	DLRC	• Implementation of RAP, Monitoring and Evaluation activities
	ED	
	CDR/SC	
	Appeals Committee	• Ultimate determination of disputes.

24. The Expropriation Procedure for Lebanon is illustrated in the figure below.



Resettlement Cost and Budget

25. The provided indicative rates, along with various item-quantities that compose the overall operation of Resettlement, are used to estimate the total costs for implementing the whole Resettlement operation of Bisri Project. As such; the total cost of resettlement is estimated at US$170 million including the costs for acquiring the lands, compensation for all lost assets, restoring the livelihood of affected PAPs, etc.

26. The table below summarizes the detailed costs making up the Total Project Resettlement Cost.

Table 16: Resettlement Total Cost

Compensation Costs	**Total US$**
Compensation for Lands to be taken	120,751,312
Compensation for Structures to be demolished	1,054,590
Compensation for Field crops losses*	0
Compensation for Trees losses	24,659,727
Compensation for other Lands attachment losses	3,763,058
Total for all Compensations	**150,228,686**

** Construction works shall not be started until field crops season is over.*

Other Costs	**Total US$**
Assistance with resettlement and livelihood re-establishment	1,500,000
Benefit Sharing	1,500,000
Compensatory planting of natural tree cover	1,500,000
RAP Monitoring and Evaluation	500,000
Total for all Other costs	**5,000,000**

Miscellaneous	**14,771,314**
GRAND TOTAL (US$)	**170,000,000**

Annex 10: Gender Analysis

1. Government has made significant strides in promoting gender equality throughout the last two decades. A Women's Affairs Division at the Ministry of Social Affairs (MoSA) was established in 1994 (Decree n^{o} 5734) to "formulate and institute programmes which respond to the needs of women and improve and strengthen capacities.[33]" Further in 1996, the National Commission for Lebanese Women (NCLW) became the official national mechanism to advance the status of women and ensure gender equality as per the Beijing Declaration and Platform for Action. The importance of gender mainstreaming is prominently featured in the MoSA Social Development Strategy 2011 with a strong focus on strengthening the NCLW, and fostering partnerships with Lebanon's vibrant civil society in the area of women's rights and equal access.

2. Additionally, MoSA with support from the Italian Government recruited an expert in gender and local governance for a two year duration and has carried out a series of activities, including the funding of 18 projects proposed by female council members and officials, a gender training program for staff in Government offices, and a gender audit of the MoSA in order to identify challenges in integrating gender in policy, planning and operations. To date however, the application of gender and development in infrastructure projects has been very limited in Lebanon.

3. Through in-depth analysis of the gender and poverty profiles of the targeted population groups in the GBML, the Project integrates specific measures that respond to the needs of both women and men, especially among the poor, in an equitable and inclusive manner. Data gathered was used to integrate gender sensitive features for the anticipated public outreach and awareness campaigns on metering, water quality and demand management. As such, activities will be tailored based on the socio-economic profiles of the various population groups in the GBML identified as part of project's analysis.

Objectives

4. Mainstreaming gender in the Water Supply Augmentation Project will focus on the following objectives: (i) inform the differentiated impact of the burdens and benefits of improved water supply; and (ii) identify areas of engagement by men and women during the operationalization of the project.

5. In order to achieve these objectives, a qualitative study in the form of semi-structured focus groups was carried out in the GBML area to provide richer analysis of the gendered dimension and inform the design of gender-responsive indicators for measuring how the project is performing in this particular area.[34]

6. In the Bisri region, women comprise a sizeable percentage of the population living in project-affected areas: approximately 50 percent of the residents are women whose livelihoods

[33] Republic of Lebanon MoSA Social Development Strategy, 2011.

[34] Gender-responsive indicators can encapsulate gender-specific or gender-inclusive performance outcomes. The former measures specific needs of men and women whereas the latter focuses on relative benefits and provides comparable information.

depend on farmland production and who actively contribute to the local economy.[35] Consultations were held to determine the differentiated needs of women and men throughout the process of resettlement and construction. Coordination with women's associations, community leaders and local authorities was key to the consultation process and a poster campaign to increase awareness of women's property rights is planned as a follow up activity. The campaign will be organized by the expropriation consultant and carried out at public information and municipal centers of the project affected areas. The issues have been addressed in the Resettlement Action Plan (RAP).[36]

Methodology

7. The Water Supply Augmentation Project takes into account gender considerations in and around the upper and lower catchment areas where construction of the reservoir and associated infrastructure (including access roads and pipelines) will take place, and in the GBML region where residents will benefit directly from the improved water supply at project completion. A combination of quantitative and qualitative methods were carried out, including the implementation of a sex-disaggregated economic survey of 1200 households, gender and poverty focus groups, stakeholder interviews with officials from the MOEW, CDR, BMLWE and LRA, along with citizen consultations coupled with literature review.

8. The gender and poverty focus group discussions were launched on March 18, 2014 and completed on June 23, 2014. Twelve groups comprising each of seven-eight residents, disaggregated by gender, socio-economic status and beneficiary zone or caza,[37] were organized through a combination of random and convenience sampling. A large portion of the residents selected came from some of the poorest neighborhoods in Southern Beirut, known for its heavy reliance on private networks and artesian wells due to limited or lack of public water supply in these areas. Based on the project household economic survey conducted in April 2014, approximately 48 percent of household heads in the project beneficiary areas had not completed primary school and 50 percent reported incomes of less than US$392 per month.

9. The development of the focus group instruments and sample frame benefited from in-depth interviews with the MOEW and official documentation provided on residents listed as direct project beneficiaries in Zones A, B, C and D. A recent census of the beneficiary zones also contributed to the development of the sample frame. Neighborhoods that were covered in the focus group discussions included Burj Barajneh, Bir al-Abad, Kokodi, Tahweeta al-Ghadeer, Hay al-Salam, Al Laylaki, el-Jnah, al-Ruwais, Ain al-Delbeh, al Shiyah, Hadath, Sahra al-Choueifat, Baabda, Louaizeh, Haret el Sett, Wadi Chahrour al Oulya, Boutchay, Merdash, Wadi Chahrour al Soufia, Aaramoun, Naameh, Damour, Kfarshima Baouchriyeh, Jdeideh, Sin el Fil, Mkalles, Dekwaneh, Fanar Choueifat, Bchamoun Aramoun, Amroussiyeh.

10. The major themes selected for the focus group discussions revolved around the following areas: demand user management, communications and community participation, conservation, metering and willingness to pay. A local, independent researcher and

[35] See Resettlement Action Plan for Water Supply Augmentation Project, Republic of Lebanon. March 2014.

[37] Project beneficiary areas at the village level (referred to as Circonscription Fonciere) may be placed in multiple zones depending on their geographic boundaries.

development consultant with extensive consultation experience facilitated the discussions organized by the local survey firm.

11. The majority of connected focus group respondents reported to receive water twice or three times a week for several hours, with summer being the most challenging. As a result all rely on alternative water sources, primarily on artesian wells with reportedly poor quality and of salty nature. Respondents highlighted psychological stress, health issues, pressure on community and household relations, and depreciation of home appliances as key challenges that emerge from limited or lack of a reliable source of water supply. Many of the women emphasized the importance of family health, especially among children. The male focus groups highlighted how water difficulties often led to disagreements in their households or at times caused an argument or fight in the neighborhood.

12. Key findings include the following:

a) ***Regardless of gender, participants reported that they rely on coping sources due to limited or lack of public water supply and in turn suffer from poor health and hygiene outcomes.*** A large percentage of focus group participants in Southern Beirut reported they were not connected to the public network, and those who were still relied heavily on artesian wells or private network sourced by a well due to irregularities in the water supply. Over 90 percent of participants resort to mineral water for drinking, with a small number of exceptions. The poor water quality and overutilization of well water is widely recognized and participants complained of the water's increasing levels of saltiness. As a result, the majority emphasized the challenge of maintaining good health and hygiene, referring to outbreaks in skin conditions, hair loss, and a compromise in general wellbeing. Female participants focused a great deal on their children with one participant claiming to use mineral water to bathe her toddler. Postponing chores such as washing of clothes and bathing were typical depending on water availability that day/week;

b) ***Associated costs, such as those related to health, hygiene and home repairs were reported as an additional financial burden to household expenditures and result in chronic psychological distress.*** Participants reported that the salty water contributes directly to damage of electrical appliances such as dishwashers, washing machines, and bathroom and kitchen faucets, which frequently need replacement, as well as damage to clothing. Additionally, several participants particularly among the male participants attributed additional indirect costs to time spent away from work as a result of psychological distress;

c) ***In urban settings, men are responsible for delivering alternative water sources to the household while women are in charge of water allocation for domestic use.*** Service water is either delivered via tankers or in most instances pumped from private wells, usually requiring men of the household to physically monitor the pumping process of water to individual household tank. Among participants in the focus group discussions, the responsibility of delivering mineral water (in gallons) falls mostly on the male household members. Women reported to spend time at home waiting for delivery and are generally in charge of how service and mineral water is allocated for domestic chores. A number of female participants reported to resort to various purification methods of service water to

utilize for either bathing or washing vegetables. However, participants from Aley reported that, increasingly, the spouse (female) is designated in charge of purchasing water from the store since the male spouse is typically at work during the day;

d) ***Electricity shortages were reported by a majority of the male participants as a major obstacle in household ability to retrieve water in a timely fashion.*** Since the majority of households rely on electric pumping of water from wells to fill the tanks, electricity plays a large factor in terms of when and how households receive water. For example, male participants in Southern Beirut and Baabda claimed that filling the tank revolved around when there was electricity, even if it was in the middle of the night. Others claimed that they would have to wait in line if other neighbors were also getting water. Participants acknowledged that such tasks were time spent away from productive activity**;**

e) ***The majority of participants associated improvements in public water supply with reduction of coping costs.*** When asked about willingness to pay for improved service, the majority of participants responded positively reporting that they would draw funds from savings accrued in not having to pay for coping costs. At first, many of the women were reluctant to pay additional fees to an improved network, arguing that they should receive a better service at the price they are already paying. However, the same women changed their minds once they were prompted to calculate how much they currently spend on alternative water resources. In some areas such as Aley and Metn, the women responded with a higher willingness to pay on average than their male counterparts from that same region. The average household spends approximately between US$400-600 a year on coping costs in addition to the costs associated with the public network;

f) ***Regardless of gender, caza, and connection status, over 90 percent of participants in the focus group discussions supported a metering system over the current fixed gauge.*** A metering system was viewed as a just and transparent way for Government to deliver water service, providing families with the option to pay for what they spend. The majority of participants reported to be conscious of the need to conserve with a select number stating that metering would incentivize them to conserve as they do not feel obliged to do so at this time. Results from the survey reveal that perception of the metering is actually split with approximately half in favor. Therefore, a further assessment of perceptions is required to better understand behavior at the time of potential reform and incentives;

g) ***Participants reported that public outreach by the BMLWE is limited yet all participants welcomed better communication with water utility.*** The majority of participants reported to not receive any information from the water utility, leaving them with little trust of Government efficiency and delivery of service. For example, some complained that one of the biggest issues they face to date is the lack of knowledge of when water will become available since it varies from week to week. Participants welcomed better communication with the BMLWE and reported to want to see information disseminated on quality monitoring and schedule of water availability. Both female and male participants reported that short message service (SMS) via mobile technology is the preferred way to receive updates and information, including using the Internet, which is usually accessible and popular among younger members of the household. Print media and television was also noted as possible mediums of knowledge exchange; and

h) ***Incentives are required for greater citizen engagement, with particular attention to improving perceptions of women's role and participation in decision-making.*** While a select number of participants were open to joining citizen committees should they arise, there was a general lack of interest reported by men to engage in activities and lack of confidence among women to participate in similar activities related to water supply. Only two women indicated they held decision-making roles in committees while the majority (of women and men) expressed concern of women's ability to tackle technical subjects (such as maintenance) that required dealing with repairmen or to make decisions affecting people outside her household. Among the male participants, the majority reported to be disenchanted by committees in their neighborhoods, and a lack of trust in the public water utility. The majority of male participants reported that committee gatherings in their neighborhoods tend to result in complications and disagreements between members where violent breakouts are not uncommon.

17. Overall, the focus group discussions shed light on the differentiated impact of water service provision in the GBML. Outcomes of the focus group discussions reveal that while men and women are impacted equally by poor service delivery, the women have fewer opportunities to give voice and to participate in decision-making activities about water related issues outside of their own household. This may present challenges in terms of mobilizing women in project related activities and in reflecting their needs through raising awareness campaigns. At the same time, the outcomes present an opportunity to collaborate with environmental associations and carry out gender-responsive educational programs about water demand management early on to help meet project goals and intermediate objectives.

Annex 11: Communications Strategy

RESEARCH-BASED SCHEME TO HELP INFORM THE COMMUNICATIONS PLAN[38]

Research Foundation	
Method	Results
Project Affected Area: Public Consultation in the field with citizens and with institutional stakeholders Social Survey Interviews with various stakeholders, including meetings with religious leaders, community based organizations / non-Governmental organizations, municipal officials *Greater Beirut Mount Lebanon Region*: Household Survey (with key socio-economic, poverty, gender and willingness to pay variables) Focus Group Discussions Rapid Assessment of Communications Environment at the MOEW Institutional meetings with CDR, MOEW, BMLWE	*Project Affected Area* Equal demographic split 50 / 50; Among agricultural families working in the reservoir area, many women play equal part in farming activities in addition to their other gender-related duties; Although land ownership and related legal entitlement in Lebanon is gender-neutral, there are still families where male members usurp their rights; Illiteracy high among women; Need for awareness on issues relate to public health, impact of dam projects, negative impact of leakages and water wastage such as over irrigation, surrounding ecology; Interest in how investments will benefit local residents. *Greater Beirut Mount Lebanon* Female breadwinners comprise <10 percent of project beneficiary area; Women are more often designated as the family member to wait for delivery of water to the home and purchasing of the water at the store; Men responsible for handling rooftop *cisterns* and dealing with tankers/maintenance issues. Equal percentage of men and women favor metering; Preference for monthly payments rather than annual subscriptions.
Overall Objectives of the Communications Strategy	
Supporting the Project Management Unit in carrying out overall project activities in ta timely and effective manner. Managing risks and fostering good practices in accountability through active stakeholder engagement. Raising awareness and promoting behavior change in the GBML.	
Target Groups (See Stakeholder Matrix – Table 2)	
External: Project affected people GBML beneficiaries External: Opinion Leaders consisting of religious leaders and CSOs identified in Bisri and GBML, Private Sector, Concerned Citizens Internal Stakeholders: CDR, PMU, BMLWE, Donors	
Required Attitudinal and Behavioral Changes	
Project affected areas: Utilization of grievance redress mechanisms GBML: Metering and Switch to Monthly payments	
Messages, Information, Topics for Debates	
Direct Beneficiaries of the GBML: Increased public water service will be available with high quality; deduction of coping costs; decreased health risks including less stress; Projected Affected People: – Availability of economic opportunities during project works; availability of grievance redress mechanism; Opinion Leaders: Receipt of updates during key milestones for any necessary intervention, exposure to activities for engagement	
Communication Activities and Vehicles (See Table 1 Communications Matrix)	
In person and through religious/community leaders, CSOs as the most effective, GBML – SMS updates and website portal as key channels for communication, along with TV and print media.	
Monitoring and Evaluation	
Establishment of a website and number of visits; number of registered grievances addressed, number of awareness raising campaigns conducted and number of people reached..	

[38] Adapted from the publication: "*The Role of Communication in the Development of Sustainable Communities*" Dan Petrescu, 2014, University of Oradea, Oradea, Romania

WSAP Communications Strategy Matrix

Specific Communication Objectives	Risks	Key Audience	Communications Activities	Expected Results	Monitoring and Evaluation Mechanisms
Objective 1: Supporting the Project Management Unit in carrying out overall project activities in a timely and effective manner.					
Internal: Support the PMU Project Director in internal reporting and updating staff of important milestones and events. Responsible Authority is PMU	Internal reporting arrangements and responsibilities are unclear.	BMWLE, CDR, Donors and Project Director/PMU Staff.	Communication briefs to the Project Director; Distribution email list as required; Minute taking and keeping an official log of meeting outcomes.	All recipients are up-to-date on informed of status of implementation, challenges and action plan for mitigation.	Progress recorded by Bank Supervision Team; Simple perception survey conducted over email to internal staff upon approval of CDR.
External: Promote transparency and achieve a positive project environment through active and two-way communication. Responsible Authority is PMU	Citizens and stakeholders feel excluded; are not aware of major changes	Media, Community Leaders Academia; NGOs, CBOs, General Public. Outspoken individuals/ initiatives.	Establishment of an online presence; Periodic press releases; Communications Specialist fields phone calls, checks emails.	Increase in Citizen-Government Trust	Consumer Perception Survey, Monitoring of Press and Media; Progress recorded by PMU; Number of website visits. Number of phone calls fielded and emails responded;
Objective 2: Managing risks and fostering good practices in accountability through active stakeholder engagement					
Dam Safety: Convert the reporting of dam safety measures into user-friendly internal briefs for donor reporting as necessary. Responsible Authority is PMU	Messages of periodic reports are not communicated to stakeholders in a streamlined fashion	*Internal Audience and external as appropriate:* Independent Panel of Dam Experts, CDR, BMLWE Partner, PMU, Media.	Internal communications brief as required; Key messaging/media release to media as appropriate; Update PMU's online content as needed.	Strengthened awareness of dam safety measures among key stakeholders. Safety assurance and timeliness in response to urgent matters	Progress recorded by PMU.
Environment: Support the Environmental Specialist to identify good practices, lessons learned during the ESMP Implementation (Specific of arrangements are included in the EMSP) Responsible Authority is PMU	Messages of periodic reports are not communicated to stakeholders in a streamlined fashion	*Internal and External Audience:* Partner IFIs, Panel of ESMP Experts; Community Leaders and Cultural Heritage Experts, Private Contractors, CDR, BMLWE; General Public.	Documenting stories and good practices of projects; Presentations and seminars upon request.	Strengthened awareness of good environmental practices. Mitigate risks, Timeliness in response of urgent matters; Participatory form of monitoring and evaluation.	Progress recorded by PMU.

Social: Support the Social Specialist in ensuring the use and effectiveness of the Grievance Redress Mechanism (GRM) and resettlement action plan is implemented accordingly with particular attention paid during expropriation. Responsible Authority is PMU and Municipalities	Lack of a responsive and transparent mechanism for allowing citizens and project associates to submit feedback and complaints; Lack of mechanism to flag emergency issues; Difficulty of GRM access and use; Construction site poses unknown safety risks to nearby communities resulting in avoidable accidents;	*Internal and External Audience:* Project affected peoples (PAPs), Project Beneficiaries/GBML Water Consumers, Concerned Citizens, PMU; UNHCR Universities/NGOs (i.e. involving students and NGOs to distribute forms).	Communications Associate to field hotline and direct to the Social Specialist; support in the development and dissemination of resettlement information manual; Engage with NGOs/CBOs and conduct CE activities to help inform benefit-sharing program in project-affected area; Coordinate with UNHCR on relocation options. For residents of GBML, assess possibility of having water consumer feedback forms available at the BMLWE, local NGOs or community centers or at the PIC.	Informed PAPs, Preempting and responding in a timely manner to feedback/ complaints, Improved trust among citizens of project; Citizen sense of security, putting citizens first.	Visits to local authorities by PMU/Bank supervision team; Periodic visits by social science students to NGOs/CBOs to distribute and/or collect rapid feedback forms/conduct interviews; Benefit Sharing program established.
Technical**:** Support the Engineer Specialist in documenting and communicating the water quality maintenance and linkages with other infrastructure as requested. Responsible Authority is PMU.	The focus on infrastructure results in a neglect of focus on water quality assurance and linkages with other ongoing projects.	*Internal Audience Only:* Independent Panel of Dam Experts, CDR, BMLWE Partner, PMU	Meeting with the Engineer on a regular basis and includes results as required in communication brief.	Quality assurance is maintained and multiple project cycles are synced and on schedule.	Visits to the water quality labs and documenting results / flagging concerns.
Procurement**:** Support Project Director (and Procurement Specialist) in responding to inspection on governance and accountability of large contracts. Responsible Authority is PMU	Given the size of the project works, there is a risk of exposure to fraud and corruption.	*Internal Only:* Donor and PMU.	Communications Associate to organize workshops in collaboration with the World Bank for PMU to be trained in procurement rules and requirements prior to pre-qualifications and tendering.	Accountability measures are put in place; PMU is thoroughly aware of Bank guidelines and rules on procurement.	Progress recorded by PMU.

Emergency Response: Liaise with the Emergency Response Plan (ERP) Committee. Responsible Authority is PMU and ERP Committee.	The Separate Committee appointed by the ERP does not meet regularly and does not practice drills.	Internal Audience: ERP Committee for Bisri, CDR, ERP.	Organize biannual drills and workshops for the ERP Committee.	Fully equipped and trained ERP Committee; Crisis messages drafted and spokesperson briefed.	Progress recorded by PMU.
Objective 3: Raising awareness and promoting behavior change in the GBML					
Transition to Public Network: Support the BMLWE **p**romote behavior change on key issues in GBML, such as improving perception of metering among residents and switching over from reliance of wells to public network. Responsible Authority PMU and BMLWE.	Public mistrust of Government intentions during metering reform; Perception of poor public water supply persists even after improvement.	Project beneficiaries and GBML water consumers; Environmental Associations and universities, community leaders.	Support the BMWLE in carrying out awareness raising campaigns around benefits of metering and expected improvements of public water network; Update online website page; Carry out baseline survey building on earlier studies and assess baseline perceptions at start of RA campaign; Hold training sessions with residents on how to use feedback tools/fill out surveys at the PIC.	An increasing number of citizens perceive the metering system as a positive step. Majority of residents report satisfaction with public network and lower coping costs fees upon project completion.	Progress reported by Bank supervision team and final survey conducted upon project completion. Monitoring of the social media space and press by PMU.