LEBANON RECOVERY FUND
MPTF OFFICE GENERIC ANNUAL PROGRAMME[1] NARRATIVE PROGRESS REPORT
REPORTING PERIOD: 1 JANUARY – 31 DECEMBER 2012

Programme Title & Project Number

- Programme Title: Country energy efficiency and renewable energy demonstration project for the recovery of Lebanon (CEDRO)
- Programme Number *(if applicable)*
- MPTF Office Project Reference Number:[3] *LRF 10*

Country, Locality(s), Priority Area(s) / Strategic Results[2]

(if applicable)
Country/Region
Lebanon

Priority area/ strategic results
CEDRO 2: National coverage

Participating Organization(s)

- Organizations that have received direct funding from the MPTF Office under this programme

Implementing Partners

- International Partners: Spanish Agency for International cooperation
- National Partners: Council for Development and Reconstruction; Ministry of Energy and Water; Ministry of Finance.

Programme/Project Cost (US$)

Total approved budget as per project document: MPTF /JP Contribution[4]: • *by Agency (if applicable)*	LRF-funding: Phase 2: $3.50 million
Agency Contribution • *by Agency (if applicable)*	
Government Contribution *(if applicable)*	
Other Contributions (donors) *(if applicable)*	
TOTAL:	

Programme Duration

Overall Duration *(months)*	CEDRO 2: 4 yrs 3 months
Start Date[5] *(dd.mm.yyyy)*	CEDRO 2: Jan 2009
Original End Date[6] *(dd.mm.yyyy)*	CEDRO 2: 31-Jan-11
Current End date[7] *(dd.mm.yyyy)*	CEDRO 2:31 Dec 2012

Programme Assessment/Review/Mid-Term Eval.

Assessment/Review - if applicable *please attach*
☐ Yes ☐ No Date: *dd.mm.yyyy*
Mid-Term Evaluation Report – *if applicable please attach*
☐ Yes ☐ No Date: *dd.mm.yyyy*

Report Submitted By

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[1] The term "programme" is used for programmes, joint programmes and projects.
[2] Strategic Results, as formulated in the Strategic UN Planning Framework (e.g. UNDAF) or project document;
[3] The MPTF Office Project Reference Number is the same number as the one on the Notification message. It is also referred to as "Project ID" on the project's factsheet page the MPTF Office GATEWAY
[4] The MPTF or JP Contribution, refers to the amount transferred to the Participating UN Organizations, which is available on the MPTF Office GATEWAY
[5] The start date is the date of the first transfer of the funds from the MPTF Office as Administrative Agent. Transfer date is available on the MPTF Office GATEWAY
[6] As per approval of the original project document by the relevant decision-making body/Steering Committee.
[7] If there has been an extension, then the revised, approved end date should be reflected here. If there has been no extension approved, then the current end date is the same as the original end date. The end date is the same as the operational closure date which is when all activities for which a Participating Organization is responsible under an approved MPTF / JP have been completed. As per the MOU, agencies are to notify the MPTF Office when a programme completes its operational activities.

EXECUTIVE SUMMARY

With the approval of the 3 phases of the CEDRO project (CEDRO 1, CEDRO 2 and CEDRO 3), CEDRO became part of a larger project framework which aims not only at supporting Lebanon's recovery activities, but also at supporting Lebanon's recovery, reconstruction and reform activities, namely the power sector recovery, reconstruction and reform plan. CEDRO aims to assist the GoL in moving towards a more sustainable energy system.

The overall CEDRO programme, if defined as being composed of CEDRO 1 - 3 projects, has a total budget of over 9.7 million USD and a total time frame of over 6 years. This report focuses on CEDRO 2's activities, although the overarching objective cannot be assessed except when all CEDRO projects are taken together.

Furthermore, funding from other sources had been received to the UNDP-CEDRO Project such as the SCHI Foundation for CEDRO 2 (amounting to 60,000 USD).

As for CEDRO 2 Project (Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon), it had two objectives:

1) Implementation of end-use energy efficiency and renewable energy projects to reduce national energy consumption and costs;
2) Setting an enabling environment for the conversion of all public sector buildings and facilities into energy efficient modalities.

I. Purpose

Lebanon imports around 97% of its energy needs in the form of fossil fuel. In 2004, the national energy bill amounted to around 1.6 billion USD (around 20% of the annual public expenditure), and in 2005 it reached 2.1 billion USD (around 26% of the annual public expenditure). Despite major steps taken by the Government of Lebanon since 1990 towards improving the electricity sector, the sector is still facing major challenges including inability to meet increasing national energy demand and large financial subsidies for Electricite du Liban (around 1.0 billion USD in 2006).

As a result of the July 2006 conflict, the situation of the energy sector in Lebanon was further aggravated, resulting in a reduction in electricity supply on a national level and an increase in electricity rationing. This only added to the existing electricity supply challenges faced by Lebanon and further deteriorated the living conditions in the country. This project is an initiative by the Government of Spain to assist the Government of Lebanon in its recovery and reconstruction efforts with a clear focus on promoting sustainable energy services and concentrating on public sector buildings and facilities.

In light of this draining situation, the Government of Lebanon has placed the reform of the power sector among its highest national priorities, as outlined in the recovery, reconstruction and reform paper submitted at the Paris 3 conference. However, given the enormity of the challenges faced by the power sector, the reform strategy has concentrated on addressing the energy supply side, without extending the scope to the demand side of energy management. CEDRO 2 project aims at complementing the national power sector reform strategy by targeting the missing component and that is demand-side management and end-use energy conservation.

The objective of the CEDRO project is to support recovery, reconstruction and reform activities through the implementation of an energy efficiency and renewable energy program for public sector buildings and facilities. To achieve this, the first phase of the CEDRO project (October 2007 – March 2009) targeted around 30 public sector buildings and facilities in three recovery areas (South, Bekaa and Akkar) highly affected by the July 2006 conflict, while the second phase of the CEDRO project (January 2009 – January 2011) targeted around 10 larger scale public sector buildings and facilities across all Lebanon and approximately 30-40 smaller ones. The third phase of the CEDRO project (January 2010 – October 2013) further supplements the aforementioned two CEDRO objectives, by a third key objective which is the setting of an enabling environment for the development and implementation of a national sustainable energy strategy and detailed action plan. The third phase of the CEDRO project is the final key component to enable sustainability and a nationwide multi-sectoral scope.

The key outputs of the CEDRO project include: 1) situation analysis and assessment; 2) installation of energy efficiency and renewable energy equipments and systems in public sector buildings and facilities; 3) establishment of database on energy saving measures and results; 4) increased public sector awareness and knowledge on energy efficiency and renewable energy applications; 5) availability of validated data on reduced energy consumption and cost; and 6) establishment of relevant policies and procedures to enable the continued implementation of sustainable energy measures in public sector buildings and facilities.

The CEDRO project builds on the objectives of the Ministry of Energy and Water to meet increased national energy demand, and the objectives of the Ministry of Finance to reduce government financial burdens.

The project's main national implementing partners are: the Council for Development and Reconstruction (CDR), the Ministry of Energy and Water (MEW), and the Ministry of Finance, who are parties the project formulation and approval, as well as parties to strategic decision making and evaluation throughout the project lifetime.

II. Assessment of Programme Results

i) Narrative reporting on results:

1. Project Management

- Coordination and follow-up on a regular basis with the Technical Backstopping Agency, TTA, on all technical assessments for the selection of new sites, installation designs, supervision and monitoring of works;
- Preparation of regular progress reports and financial management of expenditures;
- Organization of field missions and stakeholder meetings (regular meetings with the Ministry of Energy and Water (MEW) and with EDL);
- Daily follow-up with site engineers and project staff;
- Coordination with all national stakeholders and beneficiaries;
- Providing technical and policy advice to decision-makers (MEW) and UNDP CO on renewable energy issues, in particularly CEDRO played an important role in.

2. Implementation of end-use energy efficiency and renewable energy demonstration projects for public sector buildings and facilities

CEDRO 2 has indicated, in its Project Document, a target of 50-60 public buildings; "Select definitive project sites and beneficiaries (around 50-60 public buildings). The beneficiary selection criteria and process will be coordinated and agreed with UNDP, PMU, LCECP/MEW and other stakeholders".

CEDRO has installed approximately 46 photovoltaic sites, delivering renewable electricity to the respective institutions. These installations have, in most cases, removed the need to the diesel back-up generator, and have dramatically reduced the electricity bill from EDL. The sites are listed below.

Nr.	**Institution Name**	**Region**
1	Al Mafadel Public School	Akkar
2	Jwar El Hashish Public School	Akkar
3	Al Nour Public School- Mina	North
4	Gebrayel Municipality	Akkar
5	Ijdabra Municipality	North
6	Ibreen Municipality	North
7	Khraybet El Metn Public School	Metn
8	Mayfouq Municipality	Mount Lebanon
9	Akoura Municipality	Mount Lebanon
10	Jeb Jennine Secondary School	Bekaa
11	Manara Secondary School	Bekaa
12	Hermel Municipality	Bekaa
13	Ain Deleb Public School	South
14	Ayta El Shaeb Municipality	South
15	Bouday Municipality	South
16	Nabatieh Public School	South
17	Al Ein Municipality	South
18	Al Taybeh Municipality	South
19	Kabrikha Public School	South
20	Kantara Municipality	South
21	Hammana Community Center	Mount Lebanon
22	Shiah Secondary Public School	Beirut
23	Kfarzabad Natural Reserve	Bekaa
24	El-Qaa Intermediate School	Bekaa
25	Bkesine Intermediate School	South
26	Kherbet Kanafar- Bekaa	Bekaa
27	El-Kalaa Community Center	Shouf
28	Shouf Technical School	Shouf
29	Khelwet Public School	Shouf
30	Ehmej Intermediate School	Mount Lebanon
31	Zouk Mosbeh Intermediate School	Mount Lebanon
32	Halat Intermediate School	Mount Lebanon
33	Kartaba Municipality	Mount Lebanon
34	Hrajel Municipality	Mount Lebanon
35	Jran Intermediate School	North
36	Kfarhelta Public School	North

No.	Institution Name (Costs shared with CEDRO 3	Region
37	Dekweneh Technical School	Metn
38	Hamet Municipality	Batroun
39	Kfarhay Municipality	Batroun
40	Lebanese University- Tripoli Campus	Tripoli
41	Yahchouch Municipality	Keserwan
42	Lebanese University, Roumieh	Metn
43	Military Barrack- Fiyadiyeh	Baabda
44	Sultaniyyeh Municipality	Bint Jbeil
45	Yanta Public School	Bekaa
46	Zahleh Public School	Bekaa

- The assessment of 10 sites across Lebanon for wind reading measurement studies has been completed by CEDRO 2, using anemometers (wind speed reading equipment) for 4 sites, while relying on computer modelling for the other 6. After 12 months of wind readings, 3 of these sites have been identified with sufficient wind for the installation of microwind installations alone, i.e., the combination of wind speeds and electricity demand are congruent, while 4 sites were selected for a combination of hybrid wind-PV systems, where PV power augments the wind's power in times of low wind speeds. Three sites did not have any wind resources to justify a wind turbine installation. Installations are being done under CEDRO 3's costs. The sites upon which a wind measurement assessment was undertaken are listed below;

Site	Institution Name
1	El Mkayteaa Intermediate Public School
2	El Rihannieh Public School
3	Karha Public School
4	Deir el Ahmar Secondary Public School
5	Kamed Ellouz Intermediate Public School
6	Ras Baalback Community Center
7	Lebanese Army Communication Post - Aarsal
8	Chebaa Secondary Public School
9	Debaal Public School
10	El Kleile Kindergarden Public School

- Several solar hot water systems were also installed in/through CEDRO 2. These have ensured a reduction of 60-70% of diesel use for hot water purposes. The below are the sites that have been installed;

Site	Institution Name	Comments
1	Baalbeck Barracks	2 x 12,000 liters
2	Keserween Public Hospital	6,000 liters
3	Roumieh Prison	5 buildings total of 32,000 liters
4	Sibline Public Hospital	6,000 liters
5	Tripoli Public Hospital	12,000 liters
6	Sir El Donneih Public Hospital	2,000 liters
7	Ehden Public Hospital	500 liters
8	Qartaba Public Hospital	500 liters

- Street lighting applications were also installed in/through CEDRO 2. These have ensured a reduction of 35% of electricity use for street lighting. The below are the sites that have light emitting diodes (LED) street lighting been installed (app. 500 fixtures in total);

Site	Institution Name
1	Ghalboun
2	Kfour Aarbeh
3	Saida
4	Choufiet
5	Kfarnabrakh
6	Jeb Jennine
7	Lala
8	Tell Znoub
9	Moukhtara

- Internal lighting applications were also installed in/through CEDRO 2. These have ensured a reduction of 30-50% of electricity use for lighting. The below are the sites that have had internal energy efficient lighting installed;

Site	Institution Name
1	Bassel Fleihan Institute
2	VAT building
3	Council for Development and Research
4	Lebanese University Faculty of Agriculture
5	Ministry of Social Affairs
6	Lebanese Agricultural Research Institute
7	Zahleh Municipality
8	Hammana Municipality
9	Central Bank – Bekfaya
10	Regie – Hadath

- A ground source heat pump project, for cooling, heating, and hot water, was implemented in Bejji Municipality's new building. The system is the first of its kind.

In total, 84 sites where targeted in CEDRO 2. This is above the objective of CEDRO 2, however compensates CEDRO 1's objective. CEDRO 2 has benefitted from the learning and price reduction pressure that CEDRO 1 has caused.

Setting an enabling environment for the conversion of public sector buildings and facilities into energy efficient modalities

- Issuing of newspaper releases and magazine articles (national coverage);
- Networking and coordination with national project partners and stakeholders such as the Lebanese Order of Engineers, Ministry of Energy and Water, Ministry of Public Works, etc.,
- Synergy with the on-going UNDP project at the Ministry of Energy and Water, the Lebanese Centre for Energy Conservation (LCEC), on ongoing energy audits and activities to build on the project's technical know-how, experience on the ground, and lessons learnt during the implementation of energy efficiency and renewable energy activities. This entails exchange of technical data and lessons learnt as well as brainstorming session to coordinate and maximise efforts for project implementation;
- The CEDRO website (www.cedro-undp.org) has been upgraded and renewed in 2012;
- Opening ceremony of 3 PV sites in the South of Lebanon was undertaken on 31 March 2012 in the presence of the Spanish Ambassador, the UNIFIL South East Commander, 2 Deputies of the region of Marjeyoun, and heads of municipalities of the region (see photo below);

Deputy from South Lebanon, Spanish Ambassador, and UNDP representative cutting ribbon to commission PV site in South Lebanon

- Two technical workshops have occurred in May 2012. The event was a huge success with more than 80 people attending. The invitation card and the agenda of the workshop can be found in Annex 1 (see photo below);

80 + people attending the workshop on microwind and GSHP

- Many Newsletters were prepared and printed in CEDRO 2 (7 in total CEDRO's so far). These newsletters can be downloaded from the website on; http://www.cedro-undp.org/en/CEDRO-COMMUNICATION/Newsletter

3. Assisting the establishment of a sustainable Energy Strategy for Lebanon

CEDRO 3 is mostly responsible for this activity. However, CEDRO 2 has undergone main studies on upgrading and rehabilitating several existing hydropower plants, particularly Jeita and Richmaya power plants. Electrical, mechanical and civil work terms of reference where prepared and delivered to the Ministry of Energy and Water and the Electricity of Lebanon (EDL). These studies will assist in returning the hydropower plants to deliver their nameplate capacity, increasing thus the renewable energy power delivery in the country.

- **Qualitative assessment:** Provide a qualitative assessment of the level of overall achievement of the Programme. Highlight key partnerships and explain how such relationships impacted on the achievement of results. Explain cross-cutting issues pertinent to the results being reported on. For Joint Programmes, highlight how UN coordination has been affected in support of achievement of results.

The overall achievement of the CEDRO Project can be characterized in three words; renewable energy initiation in Lebanon. The CEDRO project has done the following;

- Created the necessary architecture for small-scale RE systems in the country before which most contractors did not know how best to design their systems in a country that is like no other in terms of electricity supply (i.e., characterized by power cuts and brown outs when electricity received is much lower in voltage than what it should be).
- Demonstrated, first-hand, the applications of small-scale renewable energy on the ground
- Created strong partnerships with the Ministry of Energy and Water, the Lebanese Centre for Energy Conservation, and Electricity of Lebanon (EDL). This partnership has enabled policy-level work to happen, such as the net metering concept that was introduced by CEDRO to the LCEC and the Ministry, and they in turn, together with CEDRO, lobbied EDL for its implementation.

- Shed light on the renewable energy potential in Lebanon, showing that Lebanon, although a small country, has significant renewable energy resources that is should harness to lower its dependence on imported fuel.
- Spread awareness on renewable energy nationally, and in specific on the younger generation through interactive workshops and plays.

ii) Indicator Based Performance Assessment:

Using the **Programme Results Framework from the Project Document / AWP** - provide an update on the achievement of indicators at both the output and outcome level in the table below. Where it has not been possible to collect data on indicators, clear explanation should be given explaining why, as well as plans on how and when this data will be collected.

	Achieved Indicator Targets	**Reasons for Variance with Planned Target (if any)**	**Source of Verification**
Outcome 1[8]: National capacities and policy formulations supported and strengthened to reach sustainable energy (or CEDRO: Enable activation of energy efficiency and renewable energy applications in Lebanon) **Indicator:** (1) Availability of relevant public sector human resources for the sustainability of EE/RE applications; (2) Availability of relevant institutional procedures and policies for the advancement of EE/RE applications; and (3) Reduction in energy consumption/cost and related reduction in CO2 emissions. **Baseline**: Limited application of EE/RE technologies in Lebanon	Targets (2009) - Terms of Reference: RE potential Targets (2010) - 30 pilot projects - Draft data base - Study: RE potential Targets (2011) - 30 pilot projects - Complete data base - Study: EE potential Targets (2012) - EE/RE policies	- 84 sites have been implemented by CEDRO 2.	

[8] Note: Outcomes, outputs, indicators and targets should be **as outlined in the Project Document** so that you report on your **actual achievements against planned targets**. Add rows as required for Outcome 2, 3 etc.

Output 1.1 Situation analysis and assessment **Indicator 1.1.1** - Survey report and database on public sector buildings and facilities - Report on energy assessment and identification of beneficiary sites **Baseline:** **Planned Target:** - Carry out a survey of public sector buildings and facilities - Undertake targeted energy assessment - Identify project beneficiaries sites - Undertake Energy Audits - Propose EE/RE applications	- Questionnaires filled from interested public sector institutions - All institutions that submitted filled applications have been visited by CEDRO engineers and data on their energy use has been registered.	Energy audits where undertaken for sizing of renewable energy systems only.	
Output 1.2 Implementation of EE/RE projects **Indicator 1.2.1** - Complete set of tender documents - Award of contracts - Satisfactory execution of works **Baseline:** **Planned Target:** - Development of tender documents - Procurement of goods / services - Commissioning of works - Site Supervision and monitoring	- Identification and Implementation of EE/RE projects across Lebanon; - sites listed above (84 in total)		

Output 1.3 Establishment of database on energy saving measures and results **Indicator 1.3.1:** Data on reduced energy consumption and cost **Baseline:** **Planned Target:** - Testing of performance and data collection - Set-up of a GIS based database on public sector buildings and facilities - Set-up of related energy consumption and savings	- Development of GIS energy data base - Validation of project results and development of replication schemes		
Output 1.4 Increase public sector awareness and knowledge on energy efficiency and renewable energy applications and policies **Indicator 1.4.1:** Number of participating beneficiaries and stakeholders **Baseline:** **Planned Target:** - Development of capacity building and info dissemination plan - Development of material for technical workshops - Implementation of technical workshops - Development of material for awareness raising activities - Implementation of awareness raising activities	- Development and implementation of technical workshops and awareness tools - Development of GIS energy data base and EE/RE procurement specs		

Output 1.5 Establishment of relevant institutional policies and procedures for the application of EE/RE measures in public sector buildings and facilities **Indicator 1.5.1:** - Updated TORs and procurement documents - O&M management plan **Baseline:** **Planned Target:** - Development of relevant TORs for new publicly funded buildings and facilities - Propose operation and management modality - Development of relevant procurement documents	- O&M manual submitted to each institutions that had a RE source installed. - Guidelines for RE systems to be published.		
Output 1.6 Project Validation and Sustainability **Indicator 1.5.1:** - Report on validation of project results - Independent project evaluation report - New project proposal **Planned Target:** - Validation of project results - Enable project replication - Final project evaluation - Project handover	- Finalization of the final evaluation report by - Report attached in Annex 2 of this report		

iii) Evaluation, Best Practices and Lessons Learned

The public sector in Lebanon is a difficult sector to work with. This is due to the overarching problems of the Government of Lebanon in terms of finance, public administration, human capital, and so forth. Many, if not all, of the buildings built that CEDRO worked in have not had energy consumption taken into account. The pipes of hot water in public schools, for example, are oversized, insulation of buildings is below par, and all the electricity consuming equipment and lighting are not energy efficient. The issue of maintenance is another difficult issue. Financing for these institutions is both below requirement and difficult to process and obtain (bureaucratic). We fear that maintenance post-CEDRO would face difficulties given the current situation in the country.

However, the impact of the CEDRO project is beyond the direct implementation of the projects. The project has impacted knowledge, awareness, prices, and so forth in the sector, enabling the private sector to follow suite through teaching the contractors the proper design of the systems catered to the Lebanese case, and through enhancing competition. The CEDRO project is a success to this end.

Abbreviations and acronyms:

- BDL Banque du Liban
- CDR Council for Development and Reconstruction
- CEDRO Community energy efficiency and renewable energy demonstration project for the recovery of Lebanon
- CO Country Office
- DEX Direct Execution
- EDL Electricite du Liban
- EE Energy Efficiency
- GIS Geographic Information System
- GoL Government of Lebanon
- LCEC Lebanese Center for Energy Conservation
- LED Light Emitting Diodes
- LRF Lebanon Recovery Fund
- MEW Ministry of Energy and Water
- PMU Project Management Unit
- PV Photovoltaic
- RE Renewable Energy
- SHW Solar Hot Water
- TTA Trama TechnoAmbiental
- UNDP United Nations Development Programme
- UNIFIL United Nations Interim Force in Lebanon
- UNV United Nations Volunteers
- WWTP Waste Water Treatment Plants

Annex 1. GSHP and microwind workshops.

CEDRO | Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon

CEDRO Renewable Energy Technical Workshops 2012

MicroWind workshop – Monday 21 May 2012

9:00 – 9:20	Registration
9:20 – 9:25	Welcome Note UNDP
9:25 – 10:30	Introduction to Microwind systems Trama TecnoAmbiental (General description, Typical schemes, Main components, case studies)
10:30 – 11:15	Wind speed measurement and modeling Solarnet
11:15 – 11:30	Questions&Answers (Q&A)
11:30 – 11:50	Coffee Break
11:50 – 12:50	Design of the Microwind projects as developed by CEDRO for Lebanon Trama Tecno Ambiental (General schemes and layouts, components characteristics, design criteria)
12:50 - 1:20	Catalogue of Micro wind turbine providers Trama Tecnoambiental (Models and characteristics, references from international markets)
1:20 – 2:00	Q&A, debate with audience
	END OF MICROWIND WORKSHOP

Geothermal workshop – Tuesday 22 May 2012

9:00 – 9:20	Registration
9:20 – 9:25	Welcome Note UNDP
9:25 – 10:15	Introduction to Geothermal Source Heat Pump systems (GSHP) Trama TecnoAmbiental (General description, Typical schemes, Main components)
10:15 – 11:00	Case Studies – European experiences Trama TecnoAmbiental
11:00 – 11:20	Questions&Answers (Q&A)
11:20 – 11:35	Coffee Break
11:35 – 12:35	Design of the Geothermal project developed in CEDRO, Bejjeh Trama TecnoAmbiental (General schemes and layouts, components characteristics, design criteria) (Site characterization, geothermal resource, adequate spaces, demand calculation, components sizing, sizing tools)
12:35 - 13:10	CEDRO field experience: Installation of GSHP in Bejjeh (Organization, steps followed, critical considerations, lessons learnt) NEC & Khater
13:10 – 13:30	Q&A, debate with audience
13.30	Lunch
	END OF GEOTHERMAL WORKSHOP

GSHP & Microwind Agenda

Annex 2. CEDRO 2 evaluation report (independent consultant)

EVALUATION FOR COMMUNITY ENERGY EFFICIENCY AND RENEWABLE ENERGY \ DEMONSTRATION PROJECT FOR THE RECOVERY OF LEBANON (CEDRO II)

FINAL REPORT

Presented to: United Nations Development Programme – UNDP
Beirut - Lebanon

Prepared by: Souheil H. Abboud
April 15, 2013

In response to:
LEB/CO IC/6/13

About CEDRO

In partnership with the Ministry of Energy and Water, the Ministry of Finance and the Council for Development and Reconstruction, the United Nations Development Programme (UNDP) is managing the country energy efficiency and renewable energy demonstration project for the recovery of Lebanon (CEDRO). Created in October 2007, the project has a mandate of five years lasting till October 2013 and a budget of $9.73 million funded by the Lebanon Recovery Fund by means of a donation from Spain[1].

[1] *http://www.cedro-undp.org/en/ABOUT-CEDRO*

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Acronyms

BUR	Biennial Update Reports
CAS	Central Administration of Statistics
CDM	Clean Development Mechanism
CDP	Carbon Disclosure Program
CDR	Council for Development and Reconstruction
CFL	Compact Fluorescent Light
COP 15	The 15th Session of the Conference of the Parties
EE	Energy Efficiency
EDL	Electricite Du Liban
GHG	Greenhouse Gases
IPCC	Intergovernmental Panel on Climate Change
KP	Kyoto Protocol
kW	Kilowatt
LCEC	Lebanese Center for Energy Conservation
LED	Light Emitting Diode
LECB	Low Emission Capacity Building
LEDS	Low-Emissions Development Strategy
MOE	Ministry of Environment
MOEW	Ministry of Energy and Water
MRV	Monitoring, Reporting and Verification
NAMA	Nationally Appropriate Mitigation Actions
NCs	National Communications
NEEAP	National Energy Efficiency Action Plan for Lebanon
NEEREA	National Energy Efficiency and Renewable Energy Action
O&M	Operations & Maintenance
PDP	Plasma Display Panels
PV	Photovoltaic
RE	Renewable Energy
SNC	Second National Communication
SWH	Solar Water Heater
TNC	Third National Communication
TTT	Train the Trainers
UNDP	United Nations Development Programme

I. Executive Summary

The final evaluation of the CEDRO II project concluded that the renewable energy and energy efficiency installations were done properly and of high standards. The objectives of the CEDRO II program were met and the proposed benefits were attained. The evaluation, review and assessments were conducted taking into consideration the limitations of working with the public sector in Lebanon where significant challenges need to be overcome in order to achieve the set milestones. These challenges include:

- Dealing with public entities with limited financial resources whereby the need for minor investment or financial decision could be a major hindrance;
- Dealing with public institutions that are purely beneficiaries with no financial commitment and accountability with respect to the CEDRO installation;
- Working with a mindset that is focused on specific scope of work where external projects, such as CEDRO, will be dealt with lesser priority;
- Working with public entities that are seriously short, or nonexistent in some cases, on technical human resources that could have significant contribution to the implementation and continuity of the CEDRO II project;
- Working with a sector that is relatively not incentivized therefore restricting system optimization and innovation.

The benefits that the CEDRO II projects, total of 66, delivered to the local communities are substantial; the impacts were on many fronts, the most tangible of which are financial, environmental, social, sector and sustainable development. Another material benefit is CEDRO II's ability to share constructive experience, data and information with other energy and/or environmental programs managed by other Lebanese ministries and authorities.

A number of recommendations were made that are designed to enhance the CEDRO II project or future programmes from a sector, monitoring & reporting, technical and sustainable development perspectives. In most cases, the recommendations are relatively simple to implement requiring reasonable human and financial resources, but yielding an outcome that will further optimize, engage, educate, reduce and share.

II. Introduction

Lebanon's energy sector faces major challenges, the most important of which are its deteriorating infrastructure, political complexity, inability to meet growing local demand and its dependency on imported fossil fuel. The 2006 conflict intensified the problem and called for drastic measures to be implemented to get the country's energy infrastructure back to its semi-functioning state.

The CEDRO II project is designed to work in parallel / complement the national power sector reform strategy, which aims to install renewable energy and energy efficiency projects throughout the country. The CEDRO II project is an initiative by the Government of Spain to assist the Government of Lebanon through the Lebanon Recovery Fund (LRF} in its recovery, reconstruction and reform efforts. The focus of the CEDRO II project is to service public buildings and facilities.

The CEDRO II project ought to be assessed from 3 different perspectives:

1) Standalone / decentralized renewable energy installations that are designed to electrify public institutions that are off-the-grid or cover EDL's shortfalls.

2) Grid connected renewable energy installations that are designed to feed EDL's system with clean power as well as boost its grid system. From a policy perspective, the CEDRO II project will be helping Lebanon meets its 12% renewable energy commitment made in Copenhagen during the Conference of the Parties 15 (COP15).

3) Energy Efficiency installations that are designed to improve the efficiency of Lebanon's public buildings / facilities; reduce the country's power demand and; help Lebanon become a low carbon economy.

The final evaluation of CEDRO II, which was conducted in March and April of 2013, was based on desk review of relevant project documentation and direct consultations with the CERDO team, beneficiaries and vendors. The guidance material used was provided by the UNDP, which included:

- Handbook on Planning, Monitoring and Evaluating for Development Results (2009).
- UNEG Ethical Guidelines for Evaluation.
- Evaluating Renewable Energy Programs - Clean Energy States Alliance.

Internal documents were supplied by CEDRO included:

- Annual Reports
- Quarterly Progress Reports
- Project Documentation
- CEDRO Newsletters
- Invitation to Bid
- Site Selection Documents

The evaluation started with an initial kickoff meeting with Dr. Hassan Harajli, CEDRO's Project Manager, who provided a brief on CEDRO's projects and team. Six site visits were conducted that included two hospitals, three schools and one municipality. The site visits were conducted in collaboration with CEDRO's power engineer Mr. Wassef Kodeih. The purpose of the site visits was to seek the beneficiaries' perspective on the CEDRO II project and assess the effectiveness of the installations from a technical, social, environmental and financial standpoint. Three suppliers were also consulted about their contribution, experience and perspective of the CEDRO II programme.

During the site visits and consultations, some internal documents were developed (attached in Appendix B).

III. Process Evaluation:

Selection of Beneficiaries – CEDRO communicated its renewable energy and energy efficiency programme description through newspapers and ministries; the aim was to reach the beneficiaries of the public sector and engage them in filling out the application. A total of 548 forms were submitted by public schools, municipalities, hospitals and prisons and they were ranked based on the criteria below for CEDRO II installations. This selection process is based on a rating system which takes into consideration technical criteria (70%) and Social criteria (30%) of each beneficiary. The evaluation concluded that the beneficiaries were indeed in need for these installations for primarily financial and infrastructure purposes.

Weight	Criteria		Observation	Target Technology	Indicator	Weight	Range
70%	Technical Criteria	Electrical consumption	Total monthly energy consumption estimated	PV	kWh/month	3	less than 600 and more than 6000 (0) ; between 600 and 800 and between 5500 and 6000 (2); between 800 and 5500 (3)
		Hot water consumption	Daily estimated demand of hot water	SHW	liters/day	3	less than 200 and more than 3000 (0) ; between 200 and 400 and between 2100 and 3000 (2); between 400 and 2100 (3)
		Technical benefit	That the equipement fulfills a need during power cuts that otherwise is not provided	PV	yes/no	2	yes (2) / no (0)
			That the equipement fulfills a need during power cuts that otherwise is not provided	SHW	yes/no	3	yes (3) / no (0)
		Technological match between need and solution	Use of Electricity and/or Hot water during all the year	PV, SHW	nb of months without use	1	more than 3 months (0) / between 1 and 3 months (0,5) / less than one month (1)
			Use of Electricity mainly during daytime	PV	yes/no	1	yes (1) / no (0)
30%	Social and Visibility Criteria	Remoteness	That the facility is far from a major village or town center	PV, SHW	km	1	?
		Facility ownership	Public ownership (A) / private ownership (NGO) but public service (B) / private onwership and management (C)	PV, SHW	A, B or C	2	A=2 points; B=0; C=0

Selection of Contractors – An invitation to bid for the supply and installation of renewable energy and energy efficiency systems is posted on the UNDP website for the vendors' review and consideration. A total of 14 suppliers were selected to service the beneficiaries that were divided into regional lots. Suppliers were initially shortlisted from lowest to highest price, where the lowest bidder for each lot was technically assessed by the consulting company Trama Techno Ambiental (TTA). If the lowest bidder did not meet 70% of the technical requirements, the next technically compliant supplier with the lowest bid is selected.

Post Selection Process – Pursuant to allocating the lots to suppliers, a two year-maintenance contract between CEDRO and the vendor is executed to ensure periodic visits (every 6 months) and maintenance of the system. A memorandum of understanding (MoU) between the UNDP and the beneficiaries was also signed allowing CEDRO's engineers to conduct regular visits in order to collect data and ensure that the system is properly operating. Overall, CEDRO's role is to supervise the contractor's installation and maintenance operation as well as the beneficiary's cooperation and involvement.

IV. Outcome Evaluation and Findings

The CEDRO II project successfully managed to meet the objectives of the programme. This section will illustrate these objectives and the project's benefits from a financial, environmental, social, sector development and sustainable development perspective.

Financial – The public sector in Lebanon operates on very limited financial and human resources, especially for coping with power interruptions, maintenance and improvement of physical assets. Managing power shortages was costly and/or non-existent in some cases for schools where the only method of handling power shortages was via generating or buying electricity from diesel-powered generators, which in both cases is expensive. The CEDRO II PV installation not only solved a pressing financial need, but also helped improve the efficiency of the beneficiaries' operations, which it too translates into reducing cost and improving their respective financial standing. The PV systems are currently either the only source of electricity for schools that are off-the-grid, such as the Kfour public school, or the replacement to diesel-powered generators. The observation from the site visits was that the PV systems were overdesigned for their intended use. The justifications received from CEDRO and the vendors are primarily to extend the lifetime of the energy storage components from avoiding excessive drainage of the system / batteries as well as eventually benefiting these government facilities from net metering or feed-in-tariffs when the latter scheme is introduced.

PV systems require little maintenance and do not require the purchase of fuel (solar radiations are free). Similar arguments can be made to the Solar Water Heater (SWH) installations in public hospitals and prisons with a difference that SWH systems reduce diesel cost that is used in boilers for heating purposes as opposed to generating electricity.

LED bulbs that are installed as part of the CEDRO II project in public buildings / streets are technically up to 70% more efficient than other bulb technologies available in the Lebanese market. This efficiency in power consumption can be easily quantified / translated into dollar value saving attained.

The other aspect of the financial benefits attained by the implementation of the CEDRO II project is the exponential growth and financial returns of the renewable energy and energy efficiency technology and service providers in Lebanon. Prior to the CEDRO projects, the decentralized clean energy sector was mainly servicing small household installations; the CEDRO projects are large, from an installed capacity and number of projects perspective.

The CEDRO II project had obvious reduction to the public facilities' operational costs yet not quantified by either CEDRO or the recipients. The stakeholders visited had imprecise figures on financial savings that have been achieved since the installation of the systems. It is the understanding though that CEDRO is in the process of collecting such information to quantify the savings realized.

Environment – the CEDRO II project has significant environmental benefits on the local communities as well as on the national level. The utilization of PV, wind or hybrid systems reduced or eliminated the need to purchase backup power from highly polluting and inefficient diesel-powered generators. The Solar Water Heater (SWH) installations in public hospitals, on the other hand, significantly reduced the burning of diesel for water heating purposes. The SWH systems have either completely replaced conventional boiler, during the summer months, or reduced the boiler's utilization / fuel consumption by supporting with the heating of water using solar. The replacement of bulbs to the highly efficient LED lights also contributed to reducing power consumption from Lebanon's grid.

According to the Second National Communication submitted to the United Nations by the Lebanese Ministry of Environment (MOE), the Greenhouse Gas emissions related to Energy Production accounted for 53.45% of the country's total GHG emissions. The CEDRO II projects that are primarily renewable energy and energy efficiency, serve to support the Lebanese economy reduce its GHG emissions from energy production and help comply with the commitment made during the Copenhagen COP 15 to increase the proportion of renewable energy to 12% by 2020. Similar arguments can be made on reducing GHG emissions from transport of diesel to power generator sets and boilers in the towns and villages that have benefited from the CEDRO II installations. It is important to note that the GHG emissions from transport accounted for 21.41% of the country's total emissions as per Lebanon's Second National Communication.

Noise pollution was observed to be a major problem that was resolved by the installation of renewable energy systems. The public schools were the most impacted since noise levels from the diesel-powered generators hindered the school's ability to conduct classes. PV systems generate no noise at a time where generators that are not acoustically insulated produce noise volume that is in excess of 70 decibels.

Environmental benefits are one of the core elements that make up what is referred to as sustainable development. The CEDRO II project had obvious environmental benefits, but not quantified by either CEDRO or the recipients.

Social – Public schools and hospitals as well as small municipalities in Lebanon operate on limited budgets. The impacts of strained resources were clearly observed in the site visits from operational and social aspects. Schoolteachers had to travel in order to photocopy papers at times when EDL's power was down; the same applied to small businesses in the village of Houla. The installation of PV systems in public schools solved this problem since teachers can now conduct their photocopying needs in school. The end result is the obvious increase in productivity, but so is the feeling of accomplishment and/or not feeling inferior. The Houla municipality now provides the locals and local businesses with photocopying services during power shortage periods. The modification made by the Houla municipality to the PV system, whereby providing street lighting at times when the solar power is not needed in the building, is having positive social impact in the Houla village; it provides more security, mobility and road safety at night.

Another tangible social benefit is providing villagers with infrastructure improvements that will prompt them to develop small businesses at home as opposed to migrating to larger cities where services are better provided.

The CEDRO II project increased the local communities' awareness on the practicality and performance of the clean energy and energy conservation systems and prompted locals to explore financial mechanisms to install similar systems at home.

Sector Development – Lebanon's renewable energy sector was not well developed or integrated in the country's power infrastructure, which was mainly due to the lack of policies, incentives as well as the high cost of installed capacity. The CEDRO II project helped the clean energy sector progress via increasing the demand and setting standards for installations and aftersales technical support; the drop in the global price of renewable energy technologies was also a major factor in the utilization / integration of decentralized small wind and solar power systems.

The CEDRO II project with its large demand for decentralized renewable energy and energy efficiency technologies helped the sector develop and restructure. The quality of the physical installations, including supporting documents that were observed during the site visits were of good standard. Installation time was reduced from weeks to days; vendors invested in their human resource and process capabilities in order to streamline installation and reduce cost as they implement CEDRO's projects. The meetings held with the vendors confirmed that the bulk of their renewable energy business is actually for CEDRO II, but nevertheless they have seen demand generally increase from referrals and people's conviction that these technologies are efficient and actually work.

Installation of decentralized and small renewable energy systems should be also assessed from the benefits they provide to EDL's infrastructure via the connection that can be done under the Net Metering scheme and the proposed feed-in-tariff program. The CEDRO II renewable energy installations are designed to provide power to public buildings / institutions as well as charge the battery banks to help them cope with EDL's power shortages. These renewable energy installations will be utilized differently when Lebanon's Ministry of Electricity and Water energy plan is implemented and power is indeed provided on 24 hour basis; the utilization of the CEDRO II installations will transform from primarily charging battery banks to fulfilling power needs and feeding the national power grid with green energy.

The success of CEDRO II project, the high price of fuel, the weak state of Lebanon's EDL infrastructure and the sharp drop in prices of renewable energy and energy efficiency technologies have and will continue to boost the clean energy sector development for the foreseeable future.

Sustainable Development – The term sustainable development is loosely used in various industries and sectors. For clarification purposes, the definition used for Sustainable Development in this evaluation report refers to project implementation with positive impact on the: a) environment; b) transfer of technology; c) utilizing natural renewable resources; d) job creation / wealth creation and; e) improving level of education. The CEDRO II project, with all the challenges of working with the Lebanese public sector, has managed to score well on the sustainable development achievements. The CEDRO II project positively impacted Lebanon's renewable energy and energy efficiency sector by systematically implementing projects throughout the country, on larger scale and in public institutions that are in need for energy improvement or alternative energy sources. The successful penetration of renewable energy and energy efficiency in the public sector solidified the confidence in this technology and paved the way for further development across the Lebanese economy; therefore, significantly contributing to fulfilling the Sustainable Development elements.

On the supply, design, engineering and service front, the impacts were also rather substantial. The scale of the CEDRO projects prompted vendors to invest in their operation through expanding, training and improving their human resources and processes.

After thorough review of the CEDRO II outcomes, it was concluded that the project:

i) Helped Lebanon's environment via the installation of renewable energy and energy efficiency systems that reduced the GHG emissions of 104 public buildings;
ii) Helped with integrating / introducing clean energy / transfer of technologies to Lebanon's economy via the implementation of a large number of projects;
iii) Helped with developing Lebanon's power sector via utilizing renewable energy resources to cope with EDL's electricity shortfalls;
iv) Helped with job creation especially on the supply, engineering and services front;
v) Helped with improving the level of renewable energy and energy efficiency education in the public sector as well as on the supply side.

V. Recommendations

The recommendations are based on visual inspection, meetings and interviews conducted during the site visits as well as reviewing of documents provided to the beneficiaries by the vendors. The recommendations take into consideration the challenges and limitations of working with the public sector, the state of Lebanon's infrastructure and the objectives of the CEDRO II programme.

The following five recommendation areas were identified and elaborated on:

Sector Recommendations

i) Realizing the importance of supporting the public sector in Lebanon via the installation of renewable energy systems, it is recommended to include the private sector in future initiatives / schemes. The importance of the private sector is the financial and human resource allocations that they would assign which will certainly result in system optimization. The private sector will be more engaged during the identification, technology selection, financial feasibility and installation of the renewable energy and energy efficiency systems; this proactive engagement will result in the market penetration of new technologies that have not yet been adopted in Lebanon, such as geothermal and biogas. The private sector's engagement and resource contribution will result in system optimization and ensure continuity of these installations given the importance that this sector puts on the financial bottom line. The private sector will be more organized in providing information related to the financial and environmental benefits, thus helping CEDRO and the relevant ministries in using this data and information for purposes they are mandated with, such as the Ministry of Environment (MOE) and its Biennial Update Reports (BUR) mandate and for MOE's Third National Communication (TNC).

Monitoring & Reporting Recommendations

i) Only one of the CEDRO II beneficiaries that were visited was aware of the financial benefits attained from the renewable energy installation. Financial monitoring and reporting system should have been introduced from the beginning of the CEDRO project to quantify the financial benefits from CEDRO's renewable energy and/or energy efficiency installation. This data will also be helpful for other government-supported programs in Lebanon.
ii) A GHG audit for the "before and after" scenarios will be helpful in understanding the impact of the CEDRO II project (or future initiatives) from a GHG emission perspective, thus supporting MOE with several of the projects that it is working on that are related to monitoring, reporting and reducing Lebanon's GHG emissions.

iii) Article 5 of law 1793/1797 stipulates "All government units have to provide the Central Administration of Statistics (CAS) with all data requested. Private sector as well, has an obligation to respond to surveys conducted by CAS". Sharing environmental data, for example, about the CEDRO II project will bolster the role of CAS and through it share the lessons learned to benefit Lebanon's environmental sector.

Technical Recommendations - PV systems

i) Optimize the usage of the PV systems in public schools. The CEDRO PV installations are designed to power a number of CFL bulbs, a photocopy machine and a desktop in administration. The PV systems are neither used to power donated desktops (knowing that the installed capacity can easily service them) nor utilized after 2:00 PM, on weekends and during the summer months. Minor technical adjustments should be made to the existing CEDRO installations to optimize their usage to power desktops during schools hours as well as light external common areas in the school in after hours, which will not only give lights to the school, but to the surrounding streets as well.

ii) The CEDRO project could have specified the installation of LED instead of CFL bulbs that would have resulted in providing just over double the lights powered by the PV system.

iii) Install a Plasma Display Panel (PDP) screen showing the power generated by the PV system, similar to the ones installed for the SWH systems; its importance is to show the amount of power generated by the PV system to the relevant stakeholders, as well as provide easier accessibility for this data.

iv) Visible and easy to read warning and instruction signs be included to help the operators and technicians of the PV systems. Example signs include instructions to not store goods on top of any of the PV components or block the ventilation grills of the control panel. Use of distilled water for the batteries and so forth.

v) The CEDRO project could have specified the Installation of 2-way meters on all PV systems installed in schools to benefit from the Net Metering scheme as well as maximize the usage of these installations.

vi) The English manuals are professionally prepared, but the observations made are that these manuals will be difficult to comprehend by the available staff operating and maintaining the PV systems. It is recommended that a separate one-pager be developed that is visually illustrative and uses simple and systematic steps to be followed, preferably in Arabic.

Technical Recommendations - Solar Water Heater systems

i) Visible and easy to read warning and instruction signs be included to help the operators and technicians of the SWH systems. Example signs include instructions to not store goods on top of any of the SWH components or block the ventilation grills of the control panel.

ii) The English manuals are professionally prepared, but the observations made are that these manuals will be difficult to comprehend by the available staff operating and maintaining the SWH systems. It is recommended that a separate one-pager be developed that is visually illustrative and uses simple and systematic steps to be followed, preferably in Arabic.

iii) The SWH system diagnostic / monitoring software is professionally developed and is designed to support the O&M team with their monitoring, reporting and operation of the SWH system. Unfortunately though, the technical teams of some of the beneficiaries are not equipped nor qualified to use such tools. The recommendation is for CEDRO / vendor to assign other qualified individuals, such as the IT department in these public institutions, to manage and operate the tools /monitoring software.

Sustainable Development Recommendations

i) The benefits of the CEDRO II project from a Greenhouse Gas perspective were not communicated to the beneficiaries. Given the importance of this topic and its impact on Climate Change, the recommendation is that GHG emission reductions attained by the implementation of renewable energy or energy efficiency projects be well communicated and included in the manuals / briefing documents provided to the beneficiaries.

ii) The CEDRO II project has tremendous benefits onto the Lebanese public school educational system especially when the PV systems are visible to the naked eye and are actually filling a dire need in the schools. The “educational benefit” is not communicated to the students or the staff in the schools that were visited. It is recommended that educational signs / messages be provided throughout the schools to improve the awareness / education on both the renewable energy and energy efficiency fronts (the PV panels and the CFL bulbs). To reiterate, none of the schools visited were benefiting from the solar power to run their desktops in classes, which if implemented can have even more direct and significant educational benefits to the Lebanese public schools.

iii) The observation from the site visits is that the CEDRO II project did not directly impact Job creation among the beneficiary institutions, but have done so among vendors and contractors. This outcome was expected given the reality in the financial limitation that the Lebanese public sector have. Future CEDRO initiatives that may target the private sector will certainly achieve the “job creation benefit” among the beneficiaries as well as the vendors / contractors.

Marketing / Communication Recommendations

Internal communication

i) Install a PDP screen showing the power generated by the PV system, similar to the ones installed for the SWH system. The importance of the PDP screen is to educate the students on the installed PV system and visibly communicate its output / performance.

ii) Install signs inside the classes to identify and differentiate the lights and switch lights that are powered by the PV System as opposed to the ones powered by EDL.

iii) Lebanon's young generation is far more informed on environmental issues than that of the older generation. To build on this fact, the recommendation is to develop a small program for teachers to give to students to better communicate the PV installation and its financial, environmental and social benefits. It was observed that these benefits are not comprehended by the head principle, supervisors and teachers and are therefore not communicated to students. The aim is for students to educate their parents on the benefits of renewable energy.

iv) Better inform the recipients on the capabilities / limits of the systems installed to ensure that they are neither over-utilized nor under-utilized.

External marketing / communication

i) Engage municipalities in the project. It was clear from the site visits made (excluding the Houla Municipality) that the role, support and involvement of the local municipality were not present. Engaging municipalities is exceptionally important for raising awareness and help with optimizing the system in manner that benefits the municipality, as is the case with the Houla Municipality that is using the PV system to provide street lighting at times where electricity is not needed in the building.

ii) Engage the Ministry of Environment (MOE). Realizing that the CEDRO II project installation are minor in retrospect with the work that MOE is doing re developing a better GHG inventory system; having said that, the engagement of MOE will eventually support it with Lebanon's drive to becoming a Low Carbon Economy.

VI. Appendix A

Stakeholders Mapping and Reports

The consultant, in collaboration with the CEDRO, opted to conduct one-to-one stakeholder consultations as opposed to public or focused workshops. The goals to be attained are:

- Meet the beneficiaries as well as the vendors to obtain their honest, relevant concerns and precise feedback as well as conduct a visual assessment of the installations;

- The public sector stakeholders that were consulted are small public institutions (schools, hospitals and municipalities) with limited resources; their exposure to seminars and workshops that are held in Lebanon related to energy and the environment is restricted by the lack of resources;

- Duration of meetings was another factor that was taken into consideration by the consultant. The average meeting with the stakeholders was an average of 2 hours. The consultations were focused and interactive. This level of concentrated communication would have not been achieved in a workshop setting.

Three private sector vendors and 6 public sector beneficiaries were identified and site visits were conducted.

AIN EL DILB INTERMEDIATE PUBLIC SCHOOL

Date of the site visit: March 20, 2013

APPROACH & ENGAGEMENT

The Ain El Dilb Intermediate Public school has 220 students and teaches up to Grade 9 level (Brevet).

The School's supervisor, Mr. Nicolas, was our contact and accompanied us on the site visit. He noted that the school's principal was made aware of the CEDRO II renewable energy and energy efficiency initiatives by the municipality of Ain El Dilb. The CEDRO II application was filled by the principle with support from the CEDRO team, which resulted in the installation of a 1.8 kW Photovoltaic system.

The school does not have a technical person / team; minor maintenance work is carried out by the teachers / staff. Budget allocation for maintenance, restoration and infrastructure development is very limited. Teachers were provided with the O&M instructions and are currently operating the PV system, which seemed to be running well.

INSTALLATION AND PROCESS

The PV system was installed just under 6 months ago by Al Bina, which consists of 15 PV panels with an installed capacity of 1.8 KW of electricity. The Balance of System (BOS) includes a control panel, battery bank, data logger and CFL light bulbs. The PV system provides electricity, powers the photocopy machine and one desktop; the consultant recommended that CEDRO modifies the electrical wiring to power the 12 desktops that are funded by the Malaysian Embassy in Lebanon.

Minor maintenance to the batteries and the PV cells are carried out by the teachers; problems and/or more complicated maintenance are done by Al Bina upon the request of the school. An English Operation and Maintenance manual was provided. CEDRO visits the school twice a year where they collect data logs.

The system was in good shape and seemed to be properly maintained and operated. Minor comments were provided to Mr. Nicholas with respect to storing goods on top of the PV control panel, which is also partially blocking ventilation as well as on the need to utilize the system since Mr. Nicholas had some misunderstanding on how best to benefit from the PV system.

Communication

Mr. Nicolas was clearly supportive of the CEDRO initiative and was keen on supporting further similar initiatives that will eventually provide the school with more power capacity. The PV

system was communicated to students and staff, CEDRO also did a session for the students to illustrate the benefits of the PV system installed.

Communication between the school and CEDRO / Al Bina is excellent.

SOCIAL, ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

The installation of the PV system in Ain El Dilb Intermediate Public school fills a social, financial, efficiency, educational and environmental need.

i) The school's existing power infrastructure is basic and relies on the interrupted EDL as well as backup diesel powered generator sets. The PV system provided the school with much needed power supply for classrooms, offices, copy machine and soon the desktops
ii) The PV system will soon power a large number of desktops (around 12), which otherwise are not utilized when EDL's power is off; therefore having significant positive impact from an educational perspective
iii) Sustainability impact is significant from an environmental, transfer of technology, skill improvement and utilization of renewable energy resources

All of the above noted benefits are fully attained by the school

Stakeholder's Feedback

The school's administration was pleased with CEDRO and Al Binas' work and responsiveness. It was clear that the staff did not know how much power the system can give, and would like to know what to do during summer. They would welcome similar initiative and more awareness to both teachers and students.

HOULA MUNICIPALITY

Date of the site visit: March 27, 2013

APPROACH & ENGAGEMENT

The Houla Municipality was informed of the CEDRO II project through the Ministry of Interior, filled the application and with the support of CEDRO received a 1.6 kW PV system.

The municipality's technician was trained and given instructions about the system. He does not have the O&M manual for operating the system, but obviously was well aware of what needs to be done … he is an electrician.

INSTALLATION AND PROCESS

SolarNet installed the PV system over 2 years ago, with an installed capacity of 1.12 kW. The Balance of System (BOS) includes a control panel, battery bank, data logger and CFL light bulbs. The PV system powers the photocopy machine, 16 computers, heater and one air condition unit.

The technician carried out minor maintenance to the batteries and the PV cells; SolarNet solves problems and/or performs more complicated maintenance upon the request of the municipality. CEDRO visits the school twice a year where they collect data logs.

The technician is very enthusiastic about the project; he fully understood the PV system's capabilities and managed to optimize its usage. For example, in the evenings when the system is not utilized and the batteries are fully charged, he uses the electricity for power 5 projectors that light up the street and the municipality building.

The control box had goods stored on top and around it; therefore blocking the ventilation grills. Upon giving him the remark, the technician immediately cleared the space.

Communication

The Technician was clearly supportive of the CEDRO initiative and was keen on supporting further similar initiatives that will eventually provide the town with more power capacity to light all the streets.

The community is fully aware of the PV installation in the municipality especially since they all use the photocopy machine when power from EDL is not available.

Communication between the school and CEDRO / SolarNet is excellent

SOCIAL, ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

The installation of the PV system in Houla Municipality fills a social, financial, efficiency, educational and environmental need.

i) The municipalities' existing power infrastructure is basic and relies on the interrupted EDL as well as backup diesel powered generator sets. The PV system provided the municipality with much needed power supply where the backup diesel generator was no longer in need.
ii) The PV system has significantly improved the efficiency of the town via lighting the streets surrounding the municipality building at night as well as benefiting from the photocopy and desktops by the locals when power from EDL is interrupted.

All of the above noted benefits are fully attained by the municipality

Stakeholder's Feedback

The Municipality's administration was pleased with CEDRO and SolarNet work and responsiveness.

KESERWAN PUBLIC HOSPITAL

Date of the site visit: March 14, 2013

APPROACH & ENGAGEMENT

The Keserwan Public Hospital is a 57-bed hospital, located in the village of Bwar, Keserwan.

The hospital's director, Dr. Charbel Azar initially heard about the CEDRO II project from the minister of environment HE Tony Karam, and was later contacted by the current minister of energy and water HE Gebran Bassil for engagement. Dr. Azar was not aware of the CEDRO communication channels nor was it communicated to him in an official manner. Dr. Azar filled the CEDRO II application with support from his technical team and CEDRO.

The hospital has a small technical team, total of 3, with no renewable energy or Solar Water Heater (SWH) experience. Budget allocation for maintenance, restoration and infrastructure development is very limited. The hospital's technical team was poorly equipped, primarily mandated to cope with technical emergencies and lacked the basic knowledge on how to operate and maintain SWH installation. The SWH system was installed by Solarnet and operated by the hospital. It was clear that Solarnet had done its installation in a professional manner, but could not engage the hospital's technical team to ensure continuity and proper operation of the system.

INSTALLATION AND PROCESS

The SWH system was installed two years ago by Solarnet, it consists of 54 solar panels providing 8,000 liters of hot water that are divided into 4 tanks. Solarnet's SWH tanks feed into the hospital's main water system (consisting of 3 tanks), which was old and incompatible with the new SWH infrastructure. The incompatibility of the 2 systems caused the hospital's hot water tanks to rapture since they were not designed to withstand the pressure required. Replacing the hospital's water tanks took 2 years, resulting in keeping the SWH system idle for the noted period. It is anticipated that the SWH will be re-commissioned in the coming 10 days.

The hospital's technical team was provided with 3 training sessions on how to Operate and Maintain the SWH system; an English O&M manual was provided, which was never reviewed or read by the head technician. It was clear that none of the technicians spoke or understood English.

The software provided by the contractor is not utilized and the hospitals technical team does not understand its benefits.

COMMUNICATION

Dr. Azar was clearly supportive of the CEDRO initiative, but disappointed with the fact that SWH system did not operate since it was commissioned 2 years ago. Dr. Azar has spoken about the SWH system to his employees and in the social / professional events.

Communication between the hospital's technical team and CEDRO / Solarnet was dysfunctional, which is mainly attributed to:

a) The hospital's technical team is not incentivized and unengaged
b) Lack of financial resources to upgrade the hospital's infrastructure causing serious delays in implementing required upgrades
c) Though CEDRO / Solarnet have fulfilled their duties in a professional manner, it was clear that there is a level of frustration that is causing tensed communication and therefore lack of cooperation

SOCIAL, ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

The installation of a SWH in Keserwan Public Hospital fills a social, financial and environmental need.

iv) The hospital's existing water heating infrastructure is poor, unreliable and powered by fossil fuel. The hospital did not properly provide hot water to its patients for the past 2 years. A SWH system can bypass the boilers and provides hot water in a more efficient manner
v) The hospital has a very limited budget for operation and maintenance (O&M). A SWH system will reduce O&M cost and improves the financial standing of the hospital
vi) Sustainability impact could be significant from an environmental, transfer of technology, skill improvement and utilization of renewable energy resources.

Unfortunately none of the above noted benefits were attained, as the SWH did not operate since it was installed.

STAKEHOLDER'S FEEDBACK AND FUTURE INVOLVEMENT

When asked whether the hospital would support future CEDRO initiatives, Dr. Azar noted that he would certainly do especially if it involves the installation of PV systems. The hospital's technical team, on the other hand, seemed less interested and confident in renewable energy technologies and CEDRO initiatives.

Date of the site visit: March 27, 2013

APPROACH & ENGAGEMENT

The Kfour Public School has 94 students and teaches up to Grade 7 level.

In 2009, Wassef Kodeih from the CEDRO team was approached by one the school's supervisors complaining about the government's delay in connecting the school to the grid. This was the approach that the Kfour Public School heard and benefited from CEDRO's decentralized renewable energy program. It is important to note that the school is still off-the-grid as of the date of this site visit and is entirely reliant on the power generated from the 2.025 kW CEDRO PV installation.

The school does not have a technical person / team; minor maintenance work is carried out by the teachers / staff. Budget allocation for maintenance, restoration and infrastructure development is very limited. Teachers were provided with the O&M instructions and are currently operating the PV system, which seemed to be running well, but seriously underutilized.

INSTALLATION AND PROCESS

The PV system was installed just under 3 years ago by ECOSYS, which consists of 27 PV panels with an installed capacity of 2.025 kW of electricity. The Balance of System (BOS) includes a control panel, battery bank, data logger and CFL light bulbs.

The school's staff later on modified the PV system to provide electricity for one desktop.

The teachers carry out minor maintenance to the batteries and the PV cells; problems and/or more complicated maintenance are done by ECOSYS upon the request of the school. An English Operation and Maintenance manual was provided but is not located in a place that is accessible for all teachers. CEDRO visits the school twice a year where they collect data logs that are forwarded to LCEC for analysis. ECOSYS, on the other hand, follows up periodically to make sure that the system functions properly.

During summer period, when the school is closed, the system is left operational but not used.

The 2.025 kW PV system is seriously under-utilized and could be used to power almost all of the school's needs for electricity. It was clear that the schools' staff were unaware of the PV system's capacity.

Communication

The schools' principle and staff were clearly supportive of the CEDRO initiative and were keen on supporting further similar initiatives that will eventually provide the school with more power capacity. The principal communicated the PV system to students and staff.

A ceremony was held to launch / promote the CEDRO II renewable energy installations in the South of Lebanon in the Kfour school. Municipality officials, the Spanish ambassador and the locals attended the event.

Communication between the school and CEDRO / ECOSYS is excellent

SOCIAL, ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

The installation of the PV system in Kfour Intermediate Public school fills a social, financial, efficiency, educational and environmental need.

i) The school's existing power infrastructure is non-existent. The PV system provided the school with much needed power supply for classrooms, offices, copy machine and the desktops.
ii) The PV system has significantly improved the efficiency of the school since it eliminated the need to commute for copying purposes
iii) Sustainability impact is significant from an environmental, transfer of technology, skill improvement and utilization of renewable energy resources

All of the above noted benefits are fully attained by the school

Stakeholder's Feedback

The school's administration was pleased with CEDRO and ECOSYS' work and responsiveness. They would welcome similar initiative and more awareness to both teachers and students.

SAIDA PUBLIC HOSPITAL

Date of the site visit: March 20, 2013

APPROACH & ENGAGEMENT

The hospital's Head Engineer, Mr. Hisham Abbas initially heard about the CEDRO II project in a workshop for the ministry of finance in 2008. Mr. Hisham Abbas was not aware of the CEDRO communication channels nor was it communicated to him in an official manner. Mr. Hisham Abbas filled the CEDRO II application with support from CEDRO.

The hospital has a small technical team, total of 4, with minor renewable energy or Solar Water Heater (SWH) experience. This project was dealt with enthusiastically and lead to the enlightenment of the technical team on the renewable energy subject. Budget allocation for maintenance, restoration and infrastructure development is available, yet not prioritized and limited. The hospital's technical team was well equipped and well informed. The SWH system was installed by Solarnet and operated by the hospital. It was clear that Solarnet had done its installation in a professional manner, and the hospital's technical team ensured its continuity and proper operation.

INSTALLATION AND PROCESS

The SWH system was installed by the end of 2009 by Solarnet, it consists of 54 solar panels providing 8,000 liters of hot water that are divided into 4 tanks. Solarnet's SWH tanks feed into the hospital's main water system. The system has been properly functioning since its installation.

CEDRO also funded the staircase leading to the SWH on the roof, which was needed for ease of access and safety.

The hospital's technical team was provided with training sessions on how to operate and maintain the SWH system; an English O&M manual was provided, read and understood by the head engineer. The contractor also provided software that records the temperature in several locations in the system every 5 minutes, which was also properly utilized by the technical team and used to feed information to CEDRO.

COMMUNICATION

Mr. Hisham was clearly supportive of the CEDRO initiative, which was well communicated to the entire staff of the hospital (including physicians, nurses, technicians and management) upon the hospitals request.

Communication between the hospital's technical team and CEDRO / Solarnet was very transparent; the hospital's technical team is incentivized and engaged.

SOCIAL, ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

The installation of a SWH in Saida's Public Hospital fills a social, financial and environmental need.

i) The system can bypass the boilers and provides hot water in a more efficient manner. It has reduced around 50% of the diesel consumptions from the boilers.
ii) The hospital has a limited budget for operation and maintenance (O&M). A SWH system has reduced O&M cost and improved the financial standing of the hospital.
iii) Sustainability impacts are significant from an environmental, transfer of technology, skill improvement and utilization of renewable energy resources.

STAKEHOLDER'S FEEDBACK AND FUTURE INVOLVEMENT

When asked whether the hospital would support future CEDRO initiatives, Mr. Abbas noted that he would certainly do, especially if it involves the installation of PV systems. The hospital already completed an energy audit and is aware of the areas that require energy improvement.

CEDRO attributes the successful O&M of the system to the hospital's well-defined and organized management team.

ZOUK MOSBEH INTERMEDIATE PUBLIC SCHOOL

Date of the site visit: March 14, 2013

APPROACH & ENGAGEMENT

The Zouk Mosbeh Intermediate Public school has 227 students and teaches up to Grade 9 level (Brevet).

The principal of the school, Mrs. Dibis was made aware of the CEDRO II renewable energy and energy efficiency initiatives when she was contacted by CEDRO. Mrs. Dibis was not aware of the CEDRO communication channels nor was it communicated to her in an official manner. Mrs. Dibis filled the CEDRO II application with support from the CEDRO team, which resulted in the installation of a 1.8 kW Photovoltaic system.

The school does not have a technical person / team; minor maintenance work is carried out by the teachers / staff. Budget allocation for maintenance, restoration and infrastructure development is very limited. Teachers were provided with the O&M instructions and are currently operating the PV system, which seemed to be running well.

INSTALLATION AND PROCESS

The PV system was installed just under 2 years ago by ECOSYS, which consists of 15 PV panels with an installed capacity of 1.8 KW of electricity. The Balance of System (BOS) includes a control panel, battery bank, data logger and CFL light bulbs for 19 rooms. The PV system provides electricity, powers the photocopy machine and will soon power the desktops donated by USAID.

The teachers carried out minor maintenance to the batteries and the PV cells; problems and/or more complicated maintenance are done by ECOSYS upon the request of the school. An English Operation and Maintenance manual was provided and is located in a place that is accessible for all teachers. CEDRO visits the school twice a year where they collect data logs that are forwarded to LCEC for analysis. ECOSYS, on the other hand, follows up periodically to make sure that the system functions properly.

During summer period, when the school is closed, the system is left operational but not used.

Communication

Mrs. Dibis was clearly supportive of the CEDRO initiative and was keen on supporting further similar initiatives that will eventually provide the school with more power capacity. Mrs. Dibis communicated the PV system to students and staff, but hoped to have more professional

support from CEDRO on how best to communicate the benefits to the students and answer any questions they may have.

Communication between the school and CEDRO / ECOSYS is excellent

No support, coverage or incentives were provided outside from CEDRO to this project (i.e. from the municipality, Ministry of Environment or Ministry of Water and Electricity).

SOCIAL, ENVIRONMENTAL AND SUSTAINABILITY IMPACTS

The installation of the PV system in Zouk Mosbeh Intermediate Public school fills a social, financial, efficiency, educational and environmental need.

i) The school's existing power infrastructure is basic and relies on the interrupted EDL as well as backup diesel powered generator sets. The PV system provided the school with much needed power supply for classrooms, offices, copy machine and soon the desktops
ii) The PV system has significantly improved the efficiency of the school since it eliminated the need to commute for copying purposes
iii) The PV system is visible from most of the school premises and surrounding buildings, which gives teachers easier visual access to communicate and educate the students about it
iv) The PV system will soon power a large number of desktops (around 30), which otherwise are not utilized when EDL's power is off; therefore having significant positive impact from an educational perspective
v) Sustainability impact is significant from an environmental, transfer of technology, skill improvement and utilization of renewable energy resources

All of the above noted benefits are fully attained by the school

Stakeholder's Feedback

The school's administration was pleased with CEDRO and ECOSYS' work and responsiveness. They would welcome similar initiative and more awareness to both teachers and students.

ENERGY AND CONTROL SYSTEMS (ECOSYS)

Energy and Control Systems (ECOsys) is a provider of renewable energy and power solutions servicing corporate, government institutions and homes. ECOsys offering includes photovoltaic panels, hybrid energy solutions and related electronic components. ECOsys also offers direct current (DC) Telco power solutions as well as industrial batteries for reserve power.

ECOsys won the tender for 17 PV installations under the CEDRO 2 project. ECOsys faced a problem with only one site where the lack of responsiveness from the host halted the project, which led CEDRO to allocate an alternative site. ECOsys' high success installation rate, which we attest to in our site visits to Zouk Mosbeh and Ain Deleb schools, confirms the viability of the CEDRO project and process.

ECOsys thinks highly of CEDRO's technology and vendors' selection process and communication mode, which they summarized as transparent and professional.

ECOsys noted that the CEDRO II project contributed to the development of the renewable energy and energy efficiency sector and as importantly resulted in the classification of vendors. ECOsys' is concerned that unprofessional vendors and suppliers will tarnish the reputation of the renewable energy industry in Lebanon and therefore would urge the relevant ministry(s) to adopt the CEDRO standards.

ECOsys was not mandated with promoting the environmental benefits of the PV system that they installed, but will be happy to do so in future CEDRO projects if mandated. ECOsys seemed to understand the social, environmental and financial issues that ought to be communicated to the beneficiaries.

ECOsys is strong supporter of including the private sector in future CEDRO projects / initiatives given the better resource allocations and commitment that private companies have.

ALBINA

AlBina is a highly specialized company in the marketing and distribution of electro-mechanical, heating, renewable energy systems, automation and home appliances products. AlBina's leading position in the market gets its source from its dedication to propose & implement actual solutions as opposed to the traditional idea of mere "static" products.

Al Bina won the tenders for 28 projects under the scope of CEDRO II, two lots for PV installations ranging from 1 KW to 2.5 KW in 20 public buildings, 4 Solar Water Heater systems in 3 hospitals and 1 prison as well as 4 wind turbines in public schools and community centers. 3 out of the 26 projects were problematic and are due to the following reasons:

i) The incompletion of civil works on a municipality building resulted in postponing the installation of the SWH system;
ii) Riots, excessive security and corruption obstructed the implementation works on the Roumieh prison sites and;
iii) Conflict zone that forced the cancelation of one site.

The Operation & Maintenance (O&M) manual is in English and Arabic. AlBina provided O&M training for the beneficiaries' focal peoople. Some sites had qualified technicians, but others were substandard or did not have a technical team on board.

AlBina have a maintenance contract that obliges the beneficiaries to submit a report on a weekly/monthly basis; otherwise, the contract would be cancelled and results in voiding the warrantee.

The working relationship between CEDRO and AlBina was transparent and professional. Al Bina hopes that future CEDRO and/or CEDRO-like projects be introduced since they contribute to the development of the renewable energy industry in Lebanon. AlBina is supportive of the idea of including awareness campaigns that go in parallel with the project.

AlBina believes that incentives should be provided in order to push the Renewable Energy sector in Lebanon; a sector that has significant benefits to the Lebanese economy.

THE ROUMIEH PRISON PROJECT:

The Roumieh prison is made up of 5 buildings. Al Bina was mandated to install SWH systems on all 5 buildings, but was only able to implement 3, of which 1 installation was destroyed during the riot in 2012. The other 2 buildings were never completed due to a number of reasons, the most important of which are: a) excessive security measures making accessing the prisoners cells very difficult; b) bureaucracy; c) corruption and; d) ongoing security problems in the prison.

On the roof, the bad insulation and existing prison infrastructure lead to problems in the installation of the Solar Water Heater.

The problems were significant and out of AlBina and CEDRO's control, which resulted in transferring the remaining work of the project to the Internal Security Forces to complete with AlBina. The project is currently in hold.

SOLAR NET

SOLARNET is in the business of engineering, managing, supervising, supplying and installing Electromechanical, Energy & Environmental System for building and industrial applications. SOLARNET activities are divided into two segments:

1 - Renewable Energy systems that includes Solar Water Heating, Photovoltaic, Wind and Biomass energy.

2 - Electromechanical activities that includes energy auditing, HVAC, firefighting and irrigation.

Solarnet is working on 7-8 projects under the scope of CEDRO; they stated that CERDO's work was transparent and professional. Solarnet believes that the CEDRO II project has a good impact on the development of the Renewable Energy industry in Lebanon, since it mandated high quality technologies and enforced monitoring and reporting via data logging. Solarnet praised CEDRO's selection criteria, noting that a lot of Renewable Energy companies in Lebanon don't have extensive experience and thorough understanding of the sector.

Solarnet's system is working properly in all sites except in Keserwan public hospital, where a solar water-heating system was installed two years ago. The hospital's technical team was given 3 trainings on the Operation and Maintenance (O&M) of the system upon installation as well as defined the exact role of the technician. An English and Arabic O&M manual was provided.

Solarnet was responsive to the hospital's needs. Data logging didn't take place in the hospital since the system has only been operational for a short period; a 4^{th} training session will take place once the system is fully commissioned. Solarnet noted that the difficulty faced with the Keserwan hospital has primarily been due to the incompetence of the hospital's technical team and the very limited financial resources available to implement minor adjustments to the hospitals water infrastructure.

VII. Appendix B

PUBLIC HOSPITALS

Presented to: United Nations Development Programme – UNDP
Beirut – Lebanon

Prepared by: Souheil H. Abboud
March 13, 2013

Questions to Manager

- How did you hear about the CEDRO project? Were you involved in filling in the application for CEDRO?
- In the application, you noted preference for SWH can you please explain why did you chose SWH over PV, EE or wind for example?
- Does the hospital have a technical team? If not, how do you conduct maintenance in the hospital / for the SWH?
- If yes, was the technical team involved in filling in the application?
- How did you find the reception / response from the CEDRO team throughout the process?
- How was the mode of communication with CEDRO? Could have it been done better?
- Were any of the decisions made based on financial analysis? Do you monitor the savings attained?
- If you were asked to financially contribute to the project, would you have been in a position to do so?
- Did the hospital communicate the project to staff, syndicate or other public hospitals? If so, did you get any support from CEDRO?
- Did CEDRO communicate the benefits of this project from a GHG perspective?
- What was the contribution of the hospital towards this project?
- What did you expect from the project and where your expectations met?
- Would you have preferred if you have installed another system instead?
- Would you like another program to be initiated to follow up on this system? If yes, what system would it be?
- Give us your general feedback on the project?

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Questions to Technical Team

- Were you given an O&M manual? If so, was it easy to understand? Would you have rather had it in Arabic?
- Did the contractor give you any training on the system?
- What sort of regular maintenance do you do? Do you have a logging system?
- Did you ever need to fix the system since it was installed? If so, how was the reception from the contractor?
- What do you think of the choice of technology? Were you informed of its specification and efficiency?
- When was the system installed?
- The contractor has an obligation to maintain the system for 2 years. How are the contractors following up?
- Did the technical team get involved in the commissioning?
- Did you have any problems with the installation of the SWH due to incompatibility with the existing infrastructure?
- What are the problems of the SWH system?
- What is the hot water from the SWH system used for?
- Is the system working in parallel with the boilers?
- Is the system done for a specific section in the hospital?
- Give us your general feedback on the project?

PUBLIC SCHOOLS

Presented to: United Nations Development Programme – UNDP
Beirut – Lebanon

Prepared by: Souheil H. Abboud
March 13, 2013

Questions to Manager

- How did you hear about the CEDRO project? Were you involved in filling in the application for CEDRO?
- In the application, you noted preferences for power generation using PV can you please tell us why did you chose PV over SWH, EE or wind for example?
- Does the school have a technical team? If not, how do you conduct maintenance in the school?
- Was the technical team involved in filling in the application?
- How did you find the reception / response from the CEDRO team throughout the project?
- Were any of the decisions made based on financial analysis? Do you monitor the savings achieved?
- If you were asked to financially contribute to the project, would you have been in position to do so?
- How was the mode of communication with CEDRO?
- Did the school communicate the project to staff and students? If so, did you get any support from CEDRO?
- Did the school communicate the project with other public schools?
- Did CEDRO communicate the benefits of this project from a GHG perspective?
- What was the contribution of the school towards this project?
- What did you expect from the project and where your expectations met?
- Did the ministry of education get involved?
- Would you have preferred to have installed another system instead?
- Would you like another program to be initiated to follow up on this system? If yes, what system would it be?
- Give us your general feedback on the project.

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Questions to Technical Team

- Were you given an O&M manual? If so, was it easy to understand? Would you have rather had it in Arabic?
- Were you given any training on the system by the contractor?
- What sort of regular maintenance do you do? Do you have a logging system?
- Did you ever need to fix the system since it was installed? If so, how was the reception from the contractor?
- When the school is closed in the summer, is the PV system operated, maintained or shut down?
- What do you think of the choice of technology? i.e. the PV? Were you informed of its specification and efficiency?
- When was the system installed?
- The contractor has an obligation to maintain the system for 2 years. How are the contractors following up?
- What is the PV system used for?
- What are the problems of the PV system?
- Are you using CFL or LED lights for the system that is fed by the PV?
- Is there a data logging system?
- Give us your general feedback on the project.