

LEBANON RECOVERY FUND

MPTF OFFICE GENERIC ANNUAL PROGRAMME¹ NARRATIVE PROGRESS REPORT

REPORTING PERIOD: 1 JANUARY 2010 – 30 JUNE 2014

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 <i>LRF 1, 10, 16</i>	Country, Locality(s), Priority Area(s) / Strategic Results² (if applicable) Country/Region Lebanon Priority area/ strategic results CEDRO 1: South, Bekaa and Aakkar CEDRO 2: National coverage CEDRO 3: 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, Ministry of Interior and Municipalities																		
Programme/Project Cost (US\$) <table> <tr> <td>Total approved budget as per project document:</td><td>LRF-funding:</td></tr> <tr> <td>MPTF /JP Contribution⁴:</td><td>Phase 1: \$2.73 million</td></tr> <tr> <td>• by Agency (if applicable)</td><td>Phase 2: \$3.50 million</td></tr> <tr> <td></td><td>Phase 3: \$3.50 million</td></tr> <tr> <td></td><td>+ \$272,827 extension to 30 June 2014</td></tr> </table> Agency Contribution • by Agency (if applicable) Government Contribution (if applicable) Other Contributions (donors) (if applicable)	Total approved budget as per project document:	LRF-funding:	MPTF /JP Contribution ⁴ :	Phase 1: \$2.73 million	• by Agency (if applicable)	Phase 2: \$3.50 million		Phase 3: \$3.50 million		+ \$272,827 extension to 30 June 2014	Programme Duration <table> <tr> <td>Overall Duration (months)</td><td>CEDRO 1: 3 yrs 6 months CEDRO 2: 4 yrs 3 months CEDRO 3: 4 yrs</td></tr> <tr> <td>Start Date⁵ (dd.mm.yyyy)</td><td>CEDRO 1: Oct 2007 CEDRO 2: Jan 2009 CEDRO 3: Jan 2010</td></tr> <tr> <td>Original End Date⁶ (dd.mm.yyyy)</td><td>CEDRO 1: 31-Oct-09 CEDRO 2: 31-Jan-11 CEDRO 3: 31-Oct-12</td></tr> <tr> <td>Current End date⁷ (dd.mm.yyyy)</td><td>CEDRO 1: 31 March 2011 CEDRO 2: 31 March 2013 CEDRO 3: 30 June 2014</td></tr> </table>	Overall Duration (months)	CEDRO 1: 3 yrs 6 months CEDRO 2: 4 yrs 3 months CEDRO 3: 4 yrs	Start Date ⁵ (dd.mm.yyyy)	CEDRO 1: Oct 2007 CEDRO 2: Jan 2009 CEDRO 3: Jan 2010	Original End Date ⁶ (dd.mm.yyyy)	CEDRO 1: 31-Oct-09 CEDRO 2: 31-Jan-11 CEDRO 3: 31-Oct-12	Current End date ⁷ (dd.mm.yyyy)	CEDRO 1: 31 March 2011 CEDRO 2: 31 March 2013 CEDRO 3: 30 June 2014
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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 / 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.

TOTAL:	
Programme Assessment/Review/Mid-Term Eval. Assessment/Review - if applicable <i>please attach</i> ☐ Yes ☐ No Date: <i>dd.mm.yyyy</i> Mid-Term Evaluation Report – if applicable <i>please attach</i> ☐ Yes ☐ No Date: <i>dd.mm.yyyy</i>	Report Submitted By ☐ Name: Hassan Harajli ☐ Title: CEDRO Project Manager ☐ Participating Organization (Lead): ☐ Email address: hassan.harajli@undp-lebprojects.org

List of Acronyms

BDL	Banque du Liban
CDR	Council for Development and Reconstruction
CO	Country Office
GDP	Gross Domestic Product
EDL	Electricity of Lebanon
EE	Energy Efficiency
EIA	Environmental Impact Assessment
GSHP	Ground Source Heat Pump
ITB	Invitation to Bid
LCEC	Lebanese Centre for Energy Conservation
LED	Light Emitting Diodes
LRF	Lebanon Recovery Fund
MoET	Ministry of Economy and Trade
MoEW	Ministry of Energy and Water
MoIM	Ministry of Interior and Municipalities
MoF	Ministry of Finance
MoU	Memorandum of Understanding
PV	Photovoltaic
RE	Renewable energy
SHW	Solar hot water
UNDP	United Nations Development Program
WWTP	Waste Water Treatment Plants

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.

As such, the overall CEDRO project (Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon) now has three 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;
- 3) Setting an enabling environment for the development of a national sustainable energy strategy and action plan.

The overall CEDRO programme, when 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, with an extension of \$245,000 till the 30th of June 2014, on the 13th of April 2013 under CEDRO 3.

CEDRO 1 was completed in 2011 and its output was discussed in previous Annual reports.

CEDRO 2 came to an end Q1 of 2013, and its output was discussed in previous Annual reports.

CEDRO 3 came to an end Q2 of 2014, and its output will be summarised in this Annual report.

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 (EDL) (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.

In light of this draining situation, the government of Lebanon 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.

The proposed CEDRO project aims at complementing the national power sector reform strategy by targeting the necessary counterpart and that is end-use energy conservation.

As such, 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 – June 2014) further supplements the aforementioned two CEDRO objectives (implementation of projects), 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) installation of energy efficiency and renewable energy equipments and systems in public sector buildings and facilities; 2) increased public sector awareness and knowledge on energy efficiency and renewable energy applications; 3) availability of validated data on reduced energy consumption and cost; and 4) 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 to the project formulation and approval, as well as parties to strategic decision making and evaluation throughout the project lifetime.

II. Results

i) Narrative reporting on results:

1. Project Management

- Coordination and follow-up on a regular basis with the technical backstopping agency, Trama TechnoAmbiental (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 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;
- Assess future requirements for renewable market enhancement in Lebanon.

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

The following projects have been implemented by CEDRO 3 in 2012. From 2010 to 2012, the CEDRO project was following the usual pathway for the bidding processes that began with an Expression of Interest (EOI), where firms in the respective technological groups applied and those up to standard were shortlisted early on the project implementation phase. Technical assessments and the procurement documents (invitation to bid) was prepared by CEDRO's team and the backstopping firm, following by the actual bidding process and selection of winners. The project completed in 2012 are the following;

- 10 photovoltaic sites have been implemented in 2012. These sites consist of photovoltaic (PV) modules (panels), inverters, charge controllers and data loggers, and the rest of balance of system (BoS) components. The PV system provides the institutions (mostly public schools and municipalities) with renewable electricity for their lighting and for running their computers and equipment. The sites are indicated in the table below, along with the region and number of beneficiaries (please note that the number of beneficiaries changes year on year):

No.	Institution Name	Region	# beneficiaries
1	Dekweneh Technical School	Metn	200
2	Hamet Municipality	Batroun	14
3	Kfarhay Municipality	Batroun	14
4	Lebanese University- Tripoli Campus	Tripoli	2000
5	Yahchouch Municipality	Keserwan	14
6	Lebanese University- Roumieh Campus	Metn	1025
7	Military Barrack- Fiyadiyeh	Baabda	750
8	Sultaniyeh Municipality	Bint Jbeil	14
9	Yanta Public School	Bekaa	119
10	Zahleh Public School	Bekaa	235

Table 1. Photovoltaic sites

- 10 sites across Lebanon for wind reading measurement studies have been completed by CEDRO, using anemometers (wind speed reading equipment) for some, while relying on computer modelling for others. 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.

The following 7 sites were installed with microwind turbines or with a hybrid PV-microwind site:

Pure wind sites

No.	Beneficiary	Region	# of Beneficiaries
1	El Mkyteaa Intermediate Public School	Akkar	128
2	Karha Public School	Akkar	15
3	Ras Baalback Community Center	Bekaa	3 (+patients)

Table 2. Pure wind sites

PV-wind hybrid sites

No.	Beneficiary	Region	# of Beneficiaries
1	Rihannieh Public School	Akkar	123
2	Chebaa Secondary Public School	South	435
3	Deir el Ahmar Public School	Bekaa	200
4	Aarsal Telecom Outpost	Bekaa	-

Table 3. PV-wind hybrid sites

These systems will enable the above sites to become almost 100% autonomous from the diesel generator while also minimizing the use of EDL electricity (national grid).



Microwind Turbine in Ras Baalbeck Community Center

- 1 solar hot water systems (SHW) was installed at the army barracks in Fayadieh, Baabda. The 12,000 liters system is made up of flat-plate collectors and storage tanks, including data recording equipment. This system will provide 60 – 75% of the hot water demand by the barrack which accommodates between 700 – 800 soldiers per year, and therefore save similarly on the fuel consumption, fuel cost, and reduction of CO₂ emissions.

- Solar hot water (SHW) systems were installed on three buildings of Roumieh Prison in Beirut (Built to accommodate 1,000 prisoners yet is currently housing 3,000 prisoner).

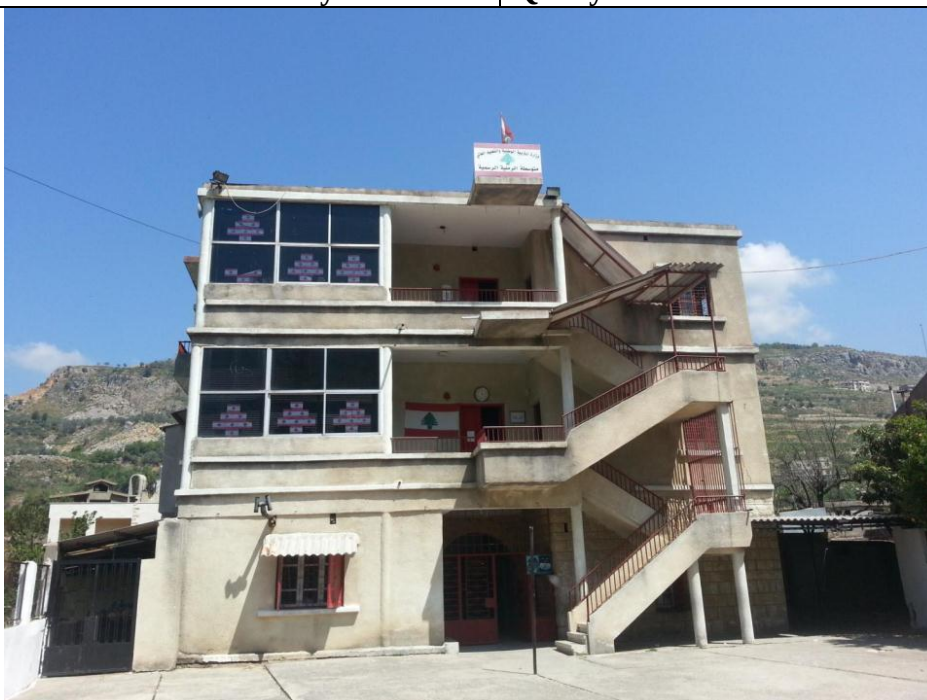
On another front, the Madinati Khadra competition was undertaken and awarded to three winners (out of approximately 30 applications). Originally, the three winners are the recipients of 40,000 USD each. The first is the Aley Prison, where a solar hot water and a 4 kWp PV system have been installed to deliver both hot water and electricity, the second in Qobeyeet, where solar PV street lighting and energy efficient lighting were installed and the third is in Roumin where a pico-hydro power system was installed. Madinati Khadra competition was coordinated between the UNDP-CEDRO project, the Ministry of Interior and Municipalities, and the Youth Shadow Government of Annahar newspaper. The idea was to allow municipalities themselves to come up with innovative ideas in the field of renewable energy. A competitive process was put forward, announced to all municipalities through the MoIM, on the UNDP and UNDP-CEDRO website, and in the Annahar newspaper. Approximately 30 municipalities applied and three were selected through a robust evaluation process.



Aley Prison Dual SHW and PV system



Qubeyeet centralized solar street lighting



Ramliyah Public School benefiting from hydropower

The following four projects have been implemented in 2013:

- The solar-powered street lighting in Roumin, South Lebanon was implemented. Twenty solar PV street lighting fixtures, with LED lighting, PV panels, and battery storage are installed, providing lighting to Roumin at night – enhancing the feeling of security and lowering the risks of accidents;



Roumin Street Lighting (PV system with LED lighting)

- The installation of a 7.5 KWp Photovoltaic system powering the LED lighting in the Batroun Port was commissioned late 2013. The Batroun Port is an old port used by fishermen in the area. The fishermen leave the port before sunrise every morning (except in stormy seas), and used to rely on the faint lights of their boats to prepare their nets. Solar street lighting now has provided them with sufficient lighting to carry out their work. To enhance the beauty of the port, the PV system was centralized in one location. The system comprises 57 PV panels spread over two pergolas. The generated energy is stored in 24 lead-acid batteries. The system powers 62 LED lamps of 30W each installed on poles of 5-meters height, 20 LED lamps of 27W each installed in the canopy of the fishermen working area, in addition to 14 LED floodlights of a 100W each spread over the perimeter of the port;



Batroun Port

- The Italian Cooperation Agency worked with the Ministry of Environment to install hundreds of small solar hot water systems across institutions in Lebanon. On one particular site, Chahhar Public Hospital, the agency decided on a large SHW system yet requested coordination on the project given CEDRO's experience with similar projects. Therefore, the CEDRO project delivered the technical specifications and shared in the cost of this project, purchasing large hot water tanks and heat exchangers for the large solar hot water system in

Chahhar Public Hospital. All other parts and works, including installation, were undertaken by the Italian Cooperation. The system is sized at 4,000 liters and will deliver 60-70% of the hot water needs of the hospital. The Hospital has 4 floors and caters for approximately 70 beds;

- The pico-hydro project in Ramliyah in Mount Lebanon was completed. The project will provide 10 kWp of hydropower from the irrigation channel in Ramliyah, powering the public school in Ramliyah and feeding the excess power into the grid through the net metering arrangement. The public school has approximately 120 students, who will all be benefiting from the power that will be generated for lighting, computer use, photocopiers and other electrical requirements the students and staff use;



Pico-hydro project in Ramliyah

The following four projects have been implemented in 2014:

- CEDRO launched the green roof application on the Central Bank of Hamra on the 30th of June, 2014 in the presence of the Governor, the Resident Representative of the UNDP and the representative of the Spanish Ambassador to Lebanon. The green roof (834 m²) was esthetically designed using colorful and varied local species of plants, monitored and irrigated with an automated system. The Green Roof has an energy efficiency component where the use of air conditioning in summer is expected to be reduced at this building block by 10%;



Green Roof, Central Bank (June 30, 2014)

- The solar-powered street lighting systems in Bechtoudar village, North of Lebanon, was completed. The project provided 8 solar LED street lighting fixtures, along with their poles, to provide lighting during the nighttime, along with the provision of residential energy efficient lighting (196 energy efficient lighting were distributed, amount to 3 bulbs per home);



Solar Street Lighting - Bechoutodar

- Three data logging equipment were installed for three sites in three regions in Lebanon: a micro-wind site in El Mkayteaa- Akkar, a hybrid (wind-photovoltaic) site in Deir El Amhar- Bekaa, and a photovoltaic site in Zahleh- Bekaa, for data collection purposes in order to monitor and improve the energy yield and the performance of these systems. The new data loggers will provide a more comprehensive analysis on the operation of the systems, using real-time data that is connected between the sites and the office. This process improved former data logging attempts by CEDRO, where simple loggers were used;
- CEDRO provided energy efficient lighting for the Sultaniyeh Technical Public School in the South, 341 light emitting diode fixtures (LEDs) were installed in order to reduce the energy consumption in the campus. The school has over 1300 students that will benefit from this lighting and 217 staff members.

- The solar-powered LED street lighting systems in Menjez village, Akkar, was completed in August 2014. The project provided 8 solar LED street lighting fixtures, along with new poles, to provide lighting during the nighttime. This would significantly impact Menjez given the excessive blackout hours in the area;



Solar Street Lighting - Menjez

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

- CEDRO published 9 newsletters and 10 exchanges discussing the projects' achievements, and technical topics related to the energy sector respectively. The newsletters and exchanges were sent to CEDRO stakeholders/contact members, as well as they can be found on CEDRO's website www.cedro-undp.org);
- CEDRO launched the National Bioenergy Strategy for Lebanon on March 05, 2012, under the auspices of the Minister of Energy and Water and Spanish Ambassador to Lebanon, and with the attendance of over 100 people. The report with the annexes on a CD was given out to all attendees of the conference. The invitation card and the agenda can be found in Annex1;



Launching the National Bioenergy Strategy (March 05, 2012)

- CEDRO and the Minister of Energy and Water inaugurated the study on ‘energy from wastewater treatment plants’ in a conference at the Ministry of Energy and Water on February the 22nd (2013), attended by the Minister himself, the Spanish Ambassador, representatives from the CDR and various stakeholders in the sector;



Launching the Energy from Wastewater Treatment Plants report (February 22, 2013)

- CEDRO held a conference on the 24th of March 2014 to launch the National Geothermal Resource Assessment of Lebanon Report under the auspices of the Minister of Energy and Water, the UNDP Resident Representative represented by the Country Director, and the Spanish Ambassador with the attendance of 65 people; the event was mentioned in several local newspapers. The launched study showed that Lebanon has a potential of 1×10^8 GWh of usable geothermal energy, more than the country’s foreseeable demand in 2025 (put in perspective, Lebanon’s demand for currently stands at 20,000 GWh). It is with the help of the key stakeholders and the private sector that such technologies will implement and will contribute the national commitment of 12% RE in 2020. The invitation card and the agenda can be found in Annex 2;



Geothermal Launching Event (March 24, 2014)

- Opening ceremony of 3 PV sites in the South of Lebanon on March 31, 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;



Cutting ribbon to commission PV site in South Lebanon (March 31, 2012)

- CEDRO awarded the three municipalities winners of Madinati Khadra Awards on the 17th of February, 2012 in the presence of the Spanish Ambassador and the Director General of the Ministry of Municipal Affairs;



- CEDRO inaugurated the Batroun Port on October 13, 2013 with the presence of the Minister of the Energy and Water, the Spanish Ambassador to Lebanon, The head of Batroun Municipality, the Head of the Fisherman Association, and the Assistant Resident Representative of the UNDP;



Batroun Port Inauguration (October 13, 2013)

- A 2-day renewable energy technical workshop was held on May 21 and 22, 2012; more than 80 participants attended this workshop, it focused on the microwind and geothermal source heat pump systems. The invitation card and the agenda of the workshop can be found in Annex 3;



Workshop on microwind and GSHP (May 21 & 22, 2012)

- CEDRO organized a technical workshop on the 8th of April 2013 on wind energy development and conversation of migratory soaring in coordination with the Ministry of Energy and Water, Ministry of Environment, the Lebanese Center for Energy Conservation, Birdlife International, and the Society for the Protection of Nature in Lebanon (SPNL) with the attendance of 45 people. This workshop focused on soaring birds, where mitigation technologies for wind farms were discussed, particularly radar technology that identifies migratory birds passing over a wind farm and signals wind turbines to shut down;



Workshop on wind energy development and conservation of migratory soaring birds (April 08, 2013)

- The UNDP-CEDRO project has initiated an intensive 1 week training for the installation of PV system, in coordination with RENAC, a renowned renewable energy capacity building consultancy in Berlin, Germany, where 2 CEDRO engineers were sent along with 5 technical people that work in this sector;
- The theatre awareness raising theatre production that targets all public school children in Lebanon on issues related to climate change, renewable energy, water conservation, and energy efficiency was launched on the 20th of February 2012 and it visited several schools targeting school children (both public and private);



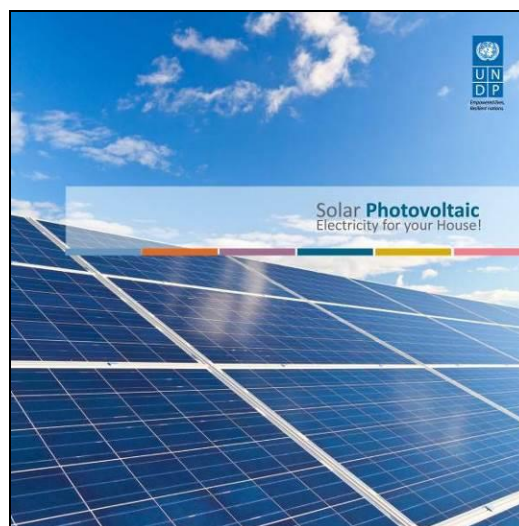
Launching of the theatre awareness campaign (February 20, 2012)

- Beirut Energy Forum (BEF) is the largest event in Lebanon related to energy efficiency, renewable energy, and green buildings. The event is distinguished by a 2-day conference sessions with highly selected interventions and presentations from all over the world, including 2 internationally-renowned keynote speakers, as well as a large exhibition area allowing direct interaction among decision makers, commercial companies, and professionals. CEDRO participated in Beirut Energy Forum with a stand (photo of the stand shown below) and a presentation that summarized all of CEDRO's achievements to date. BEF regrouped 730 delegates from 28 countries, and provided a platform for professionals, policymakers, practitioners, donors, academics, and private companies to meet and discuss the latest updates on the Lebanese, Arab, and Euro-Mediterranean initiatives in the renewable energy and energy efficiency sectors;



Beirut Energy Forum, CEDRO Stand (September 24, 2013)

- CEDRO, in collaboration with the LCEC, published an informative brochure on PV systems targeting non-engineers and the Lebanese community at large. 3,000 copies were printed and 2,700 copies were distributed to selected individuals across the country in 2013;

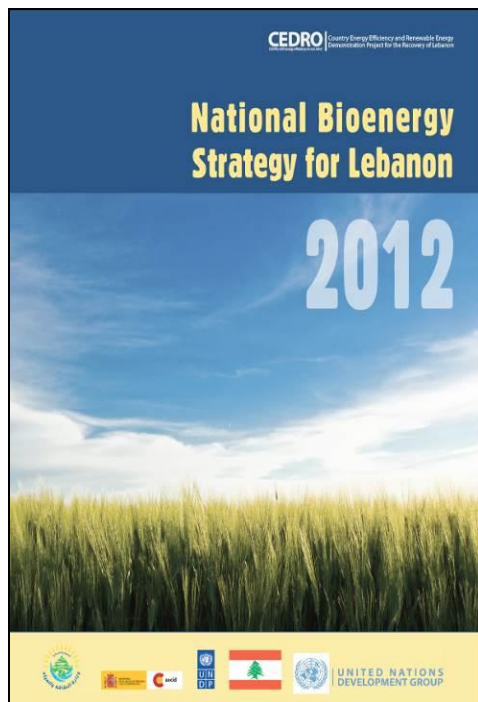


Cover of the Solar Photovoltaic Electricity for your House!

- An artistic video clip has been prepared by CEDRO to summarize all the achievements of the CEDRO project. This video is now online on CEDRO's website (<http://www.youtube.com/watch?v=nzpNrA6O23w>);
- CEDRO project shared the learnt lessons with the members of the Order of Engineers and Architects in Beirut on the 15th of April 2014. Presentations were delivered, starting with the introduction to project, detailing its aim, its objectives, the implementations over the past 5 years ranging from solar, wind, geothermal, and hybrid, in addition to the results from photovoltaic sites across Lebanon, their efficiencies, the performance compared to the design criteria used and the savings to the beneficiaries;
- 38 participants attended the board meeting that stakeholders was held on the 23rd of July 2013, the meeting was in the presence of Mr. Luca Renda, UNDP Country Director, and the Ministry of Energy & Water Focal Point, Mr. Mahmoud Baroud, as well as the main partners and national stakeholders of CEDRO. The meeting was important to communicate CEDRO's past, current, and future work, in order to receive feedback and recommendations. The invitation card and the agenda can be found in Annex 4.

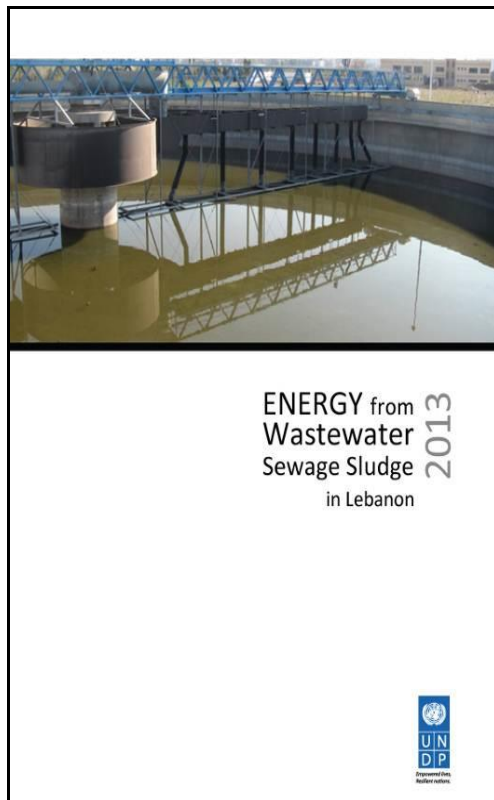
4. Assisting the establishment of a sustainable Energy Strategy for Lebanon

- The National Bioenergy Assessment for Lebanon has been published and distributed. This study scuds the entire country and filters 10 potentially very viable bioenergy streams. The most important outcome is the identification of forestry and agricultural residues' potential in contributing to the national heating requirements of the country. This fact was built upon for further funding under the CEDRO 4 program. The study pushes the Lebanese policy makers to think in alternative ways, in order to secure more energy from locally found biomass;



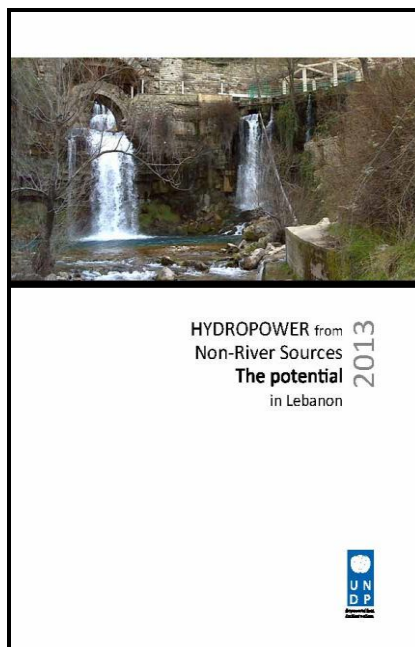
National Bioenergy Strategy for Lebanon Cover

- A study for energy from sewage sludge from wastewater treatment plants (WWTP) was published in 2013. The study was prepared in cooperation with the Ministry of Energy and Water and the Council for Development and Reconstruction and assessment. This study will push thinking towards synergizing the WWTPs in Lebanon so that they make use of the energy production potential that these plants contain, and even include co-digestion of other wastes to increase or boost energy production. Approximately 12 MW of power was indicated in the report, power that can assist in a small yet important way in alleviating the energy shortages in the country.



Energy from Wastewater Sewage Sludge Report Cover

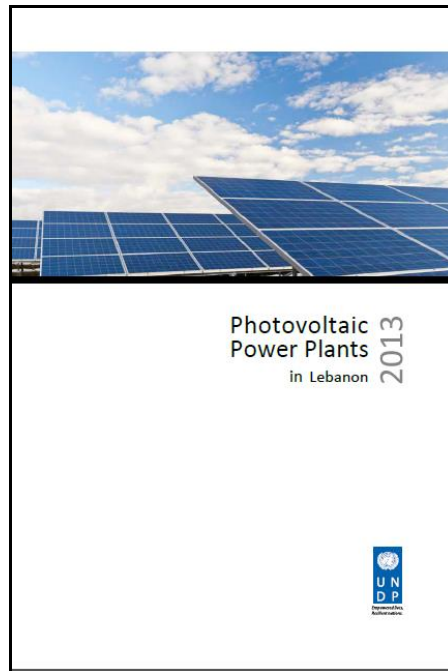
- CEDRO published the Hydropower from Non-River Sources, particularly irrigation streams, water networks, and cooling systems of onshore power plants. The findings are very encouraging, indicating, as a minimum, 5 MW of power capacity from these sources, with particular emphasis on the main power plants on the shore line of Lebanon, where the cooling system that takes water from the sea and dumps it back, can be used to generate power in the return process;



Hydropower from Non-River Sources Report Cover

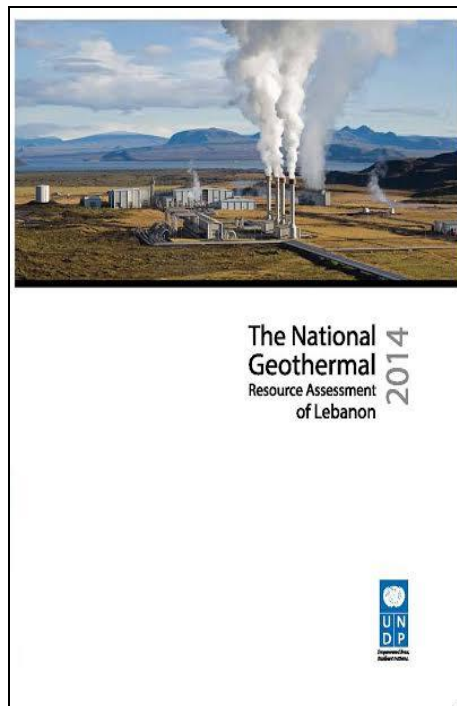
- The PV farm study, undertaken by TTA, has been published in 2013. The report outlines photovoltaic farm technology for Lebanon through a technical and economic analysis. The report goes in details as to the design of such farms in the context for Lebanon, focusing on various

strands of the technology currently being implemented worldwide. A financial model that can be used for pricing PV farms was also included in the results and could be used by the private sector in Lebanon to model their respective financial offers. Results indicate that PV farms are becoming a highly competitive form of power, and should be given more policy focus;



Photovoltaic Power Plants Report Cover

- The National Geothermal Resource Assessment study has been released (see picture below). Hard copies were distributed to over 200 stakeholders in the field. The objectives of the geothermal atlas are to estimate the current overall potential of geothermal heat and power generation in Lebanon and to estimate the ability of geothermal power to assist in meeting the objective of the Lebanese government in meeting 12% of its total energy needs from renewable energy sources by 2020 and beyond. Two prospective areas seem to be interesting in Lebanon for further geothermal power investigation. These prospects could be suitable for the construction of pilot installations for the generation of electricity. The most promising area in the Akkar region in the North, where water is supposed to be found at a temperature of 130°C due to a thermal anomaly. The second area is the Bekaa Valley, where the aquifer is deep enough to reach suitable temperatures. The estimations provided by this study shows temperatures of around 80-90°C. The gross resource is the total energy stored in the underground in Lebanon at a temperature high enough to produce electricity (higher than 100°C) and at a depth that could be reached by present technologies (less than 7,000 meters below ground level). It is in theory of 1.0·10⁹ GWh, the equivalent of around 70,000 times the yearly energy demand in Lebanon. Unfortunately, only a very small part of this heat could be technically extracted by means the current state of the art techniques (net resource). An optimistic but realistic scenario could consider the implementation of a maximum 1 pilot installation of 1.3 MWe_{el} by 2020. In case of success and positives results, 4 additional power plants could be installed until 2025. The total electricity production by 2020 by means of geothermal energy would be around 6 GWh_{el}. By 2025, the total production would be 30 GWh which corresponds to around 0.2% of the total energy demand at that time;



National Geothermal Resource Assessment of Lebanon Cover

- A nation-wide survey to assess the willingness to pay (WTP) for small-scale and utility renewable energy systems in Lebanon for both the residential sector and the commercial sector has been completed by CEDRO. The study is finalized and will be put on CEDRO's website in Q1 of 2015;
 - The assessment of the industrial potential, job creation, and local capacity for renewable energy systems in Lebanon study was finalized, the report is completed and will be published in Q1 2015 after editing and design requirements;
 - All in all, CEDRO aims to assist the government in Lebanon in deciding which energy source to utilize to reach its objective of 12% of its energy mix to come from renewable energy sources by 2020 – an objective approved by the Council of Ministers and asserted in the Copenhagen Summit. The UNDP-CEDRO has delivered many studies related to the potential available in Lebanon from renewable energy resources. This potential is the key element in drafting an action plan to reach the target of 12%.
- **Delays in implementation, challenges, lessons learned & best practices:**

The CEDRO 3 project worked with a lot of beneficiaries and a lot of projects. Each project had its own small problems, such as the Batroun Port's design being changed after belated fishermen comments. The real lesson learned is that no matter how much you prepare for a project and take account of all the views of stakeholders, you cannot but expect some kind of amendment, small or large, during the construction phase. CEDRO has worked very closely with the beneficiaries and has successfully met all their expectations. The only worry that the project has is that the systems' will be well maintained to serve their expected lifetimes. Although MOUs were signed to this end, the financial capacity of various institutions may not allow them to undergo the necessary maintenance. However, CEDRO's goals have been met in stirring the market, bringing down prices of renewables and increasing competition, and in many sites (the overwhelming majority), the sites are being well taken care of.

- **Qualitative assessment**

The overall achievement of the CEDRO Project can be summarized as below:

- 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.

2012 achievements	2013 achievements	2014 achievements
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	A centralized solar powered street lighting, through the Batroun Port, has shown an innovative way of street lighting in the country	- Launched the green roof application on the Central Bank of Lebanon that has an energy efficiency component; - Implementation of 2 solar-powered street lighting systems
Demonstrated, first-hand, the applications of small-scale renewable energy on the ground	In 2013, the first pico-hydro system has been installed in Ramliyah. This is a showcase that will be marketed in 2014	
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	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	Advisory role and participatory role in the upcoming Lebanese Renewable Energy Strategy during this year with the LCEC and the MEW
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.	Assessment of national renewable energy resources (Bioenergy finalized, PV Farm study published, Energy from wastewater treatment plant published, Hydro-power from non-river sources study published)	- The national geothermal power assessment study published; - Study on Industry and Renewable Energy finalized; - Data analysis of the WTP study finalized;
Spread awareness on renewable energy nationally, and in specific on the younger generation through interactive workshops and plays.	A PV brochure has been published and given out to 2,700 people	- Put together all CEDRO's work on RE and EE in one document; a national document for RE and EE

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.

	<u>Achieved</u> Indicator Targets	Reasons for Variance with Planned Target (if any)	Source of Verification
Outcome 1⁸: Enable activation of energy efficiency and renewable energy applications in Lebanon Indicator: (1) Availability of end-use EE/RE demonstration projects; (2) Availability of relevant technical tools for the spread of EE/RE applications; and (3) Availability of national EE/RE strategy and action plan. Baseline: Limited application of EE/RE technologies in Lebanon Planned Target:	<u>Targets (2009)</u> - Terms of Reference: RE potential <u>Targets (2010)</u> - 30 pilot projects - Draft data base - Study: RE potential <u>Targets (2011)</u> - 30 pilot projects - Complete data base - Study: EE potential <u>Targets (2012)</u> - 30 pilot projects EE/RE - EE/RE policies <u>Targets (2013)</u> - 4 sites		

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 Implementation of end-use EE/RE pilot projects Indicator 1.1.1 Number of beneficiary buildings and facilities Baseline: Planned Target: - Identification of beneficiary sites - Development of tender documents - Procurement of goods / services - Site Supervision and hand-over - Monitoring of system performance Indicator 1.1.2 Baseline: Planned Target:	<u>2012 implementation:</u> - 10 PV sites - 3 microwind sites - 4 hybrid PV-microwind sites - 1 hybrid SHW and PV site - 1 large SHW site - 1 Solar PV street lighting site <u>2013 implementation:</u> - 1 Pico-hydro site - 2 street lighting <u>2014 implementation:</u> - 1 Green Roof - 2 street lighting systems		- Survey of beneficiary sites utilising installed equipment; - Energy bills and energy measuring equipment used to collect data.
Output 1.2 Outreach and technology transfer to enable the conversion of other public sector buildings and facilities into energy efficient modalities Indicator 1.2.1: Number of participating beneficiaries and stakeholders Baseline: Planned Target: - Establishment of energy saving data base for public sector facilities - Development & Implementation of capacity building & awareness programs - Development of relevant EE/RE policies and procedures - Validation of project results	- Development and implementation of technical workshops and awareness tools - Development of GIS energy data base and EE/RE procurement specs - Validation of project results and development of replication schemes		- Workshops reports and material - GIS database - EE/RE technology reports that include system specifications

Output 1.3 Research and development to enable the formulation of a national sustainable energy strategy and action plan Indicator 1.3.1 Baseline: Planned Target: - Assessment of national RE potential - Assessment of national EE potential - Identification of viable EE/RE actions - Identification of Implementation tools and funding mechanisms	- Assessment of national renewable energy resources (Bioenergy Report, PV Farm Study, Energy from wastewater treatment plant, Hydro-power from non-river sources study, and the national geothermal power assessment study) - Renewable energy strategy in cooperation with LCEC and own CEDRO report on renewable energy resources (compilation of CEDRO studies) to be published in Q1 of 2015. - Development of national EE/RE strategy & action plan	Delay has occurred in publishing the National Study that puts together CEDRO's work because it was decided to put the work, in collaboration with the LCEC and the Ministry of Energy and Water, into a Renewable Energy Strategy. The Strategy however has been postponed to 2015 by the Ministry, and therefore CEDRO published its own work separately	- Research publications - Sustainable energy strategy or action plan for RE and EE
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iii) A Specific Story (Optional)

- This could be a success or human story. It does not have to be a success story – often the most interesting and useful lessons learned are from experiences that have not worked. The point is to highlight a concrete example with a story that has been important to your Programme in the reporting period.
- In ¼ to ½ a page, provide details on a specific achievement or lesson learned of the Programme. Attachment of supporting documents, including photos with captions, news items etc, is strongly encouraged. The MPTF Office will select stories and photos to feature in the Consolidated Annual Report, the GATEWAY and the MPTF Office Newsletter.

Problem / Challenge faced: Describe the specific problem or challenge faced by the subject of your story (this could be a problem experienced by an individual, community or government).

Programme Interventions: How was the problem or challenged addressed through the Programme interventions?

Result (if applicable): Describe the observable *change* that occurred so far as a result of the Programme interventions. For example, how did community lives change or how was the government better able to deal with the initial problem?

Lessons Learned: What did you (and/or other partners) learn from this situation that has helped inform and/or improve Programme (or other) interventions?

III. Other Assessments or Evaluations (if applicable)

IV. Programmatic Revisions (if applicable)

Indicate any major adjustments in strategies, targets or key outcomes and outputs that took place.

V. Resources (Optional)

Human Resources:

National Project Staff:

- Project Manager
- Project Assistant
- Site Engineers (x3)
- Researcher
- Graphic designer
- Marketing expert
- GIS specialist
- Driver/clerk

International Staff: Trama TechnoAmbiental (TTA - Spain); Technical Backstopping Agency for CEDRO, up to December 2012.

Expenditures to date (as of June 2014):

	CEDRO3	
CATEGORY	Total Budget (USD)	Total Exp. to date (USD)
1. Personnel* (Incl. staff and consultants)	252,000	874,082.72*
2. Contracts (Incl. companies, professional services)	599,050	1,379,991.16
3. Training (incl. AV printing / production)	41,000	75,579.60
4. Transport (local)	11,000	54,826.73
5. Supplies and commodities (Incl. IT equip and rental & maintenance)	55,000	97,578.51
6. Equipment (including installation)**	2,505,000	823,553.98
7. Travel	15,000	89,317.81
8. Miscellaneous	31,539	113,435.56
9. Agency Management Support (7%)	263,238	264,460.93
TOTAL	3,772,827.00	3,772,827.00

*Total expenditure for the personnel (staff and consultants) exceeds the total allocated budget because most of the technical design and supervision of works is being implemented by project personnel and not sub-contracted to third-party companies as originally planned. The total expenditure (USD 874,082.72) is distributed over the staff salaries (USD 781,631.76) and the local and international consultants fees (USD 92,450.96) starting 2011.

** Given the difference in budget line description between UNDP and the LRF accounts, the expenditures being reported under this budget account "equipment" and because the implementation projects' contracts should be considered under the budget account "contracts" not "equipment"

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

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Annex 1. Invitation Card and Agenda of the Bioenergy Strategy Report Launching Event

برعاية وحضور معالي وزير الطاقة والمياه المهندس جبران باسيل
وبحضور سعادة سفير اسبانيا في لبنان السيد خوان كارلوس غافو
وسعادة الممثل المقيم لبرنامج الأمم المتحدة الإنمائي في لبنان السيد روبرت واتكنز

يتشرف مشروع سيدرو التابع لبرنامج الأمم المتحدة الإنمائي
بدعوتكم للمشاركة في مؤتمر إطلاق

"دراسة الطاقة الحيوية في لبنان" رسم خارطة طريق نحو إنتاج الطاقة من الكتلة الحيوية

المكان: فندق الحبثور - سن الفيل، قاعة بيروت هول
الزمان: الإثنين الموافق ٥ آذار ٢٠١٢ الساعة: ١٠:٣٠ صباحاً، يليه حفل غداء

للتأكيد الحضور أو الاعتذار الرجاء الإتصال على أحد الرقمين التاليين: ٩٤٤ ٠١/٩٨١ - ١٠٨ ٠١/٥٦٥



UNITED NATIONS
DEVELOPMENT GROUP

برنامج المؤتمر:

١٠:٣٠ - ١٠:٥٠ الإستقبال وتسجيل الحضور

١١:٣٠ - ١٠:٣٠ مقدمة لمنسق العلاقات العامة في المركز اللبناني لحفظ الطاقة السيد زياد الزين

كلمة مدير مشروع سيدرو الدكتور حسان حراجلي

كلمة سعادة سفير اسبانيا في لبنان السيد خوان كارلوس غافو

كلمة سعادة الممثل المقيم لبرنامج الأمم المتحدة الإنمائي في لبنان السيد روبرت واتكنز

كلمة صاحب الرعاية معالي وزير الطاقة والمياه المهندس جبران باسيل

١١:٣٠ - ١١:٤٥ استراحة

١:٣٠ - ١١:٤٥ تقديم المحاضرات التالية:

1. Introduction and scope of the work performed: Nada Boulos, Director ECE - Sergio Ugarte, Project Director
2. Biomass resource assessment in Lebanon: Thierry Noel, Director AMANE group
3. Technology conversion options for Lebanon: Sergio Ugarte, Director SQ Consult
4. Sustainability impact assessment and future scenarios: Jinke van Dam, Senior Associate SQ Consult
5. Barriers for bioenergy development: Clémentine Labreux, Senior Consultant AMANE group
6. Conclusions of the project: Sergio Ugarte, Director SQ Consult
7. Follow up work: Roland Gemayel, Consultant ECE

١:٣٠ توزيع نسخ عن دراسة الطاقة الحيوية في لبنان وتناول طعام الغداء في مطعم Le Giel

Annex 2. Invitation Card and Agenda of the National Geothermal Resource Assessment of Lebanon Report launching event



LEBANESE REPUBLIC
MINISTRY OF ENERGY
AND WATER

The Ministry of Energy and Water
&
The UNDP - CEDRO Project



UNDP
Empowered lives.
Resilient nations.

Cordially invite you to the launching of

The National Geothermal Resource Assessment of Lebanon

On the 24th of March 2014, at 9:00 am
Mövenpick Hotel - Beirut

AGENDA

9.00 – 9.30 am	Registration
9.30 – 10.30 am	Opening Ceremony – Moderated by Mr. Ziad Zein, LCEC Public Relations Coordinator CEDRO Renewable Energy Assessments, UNDP CEDRO Project Manager, Mr. Hassan Harajli Speech of H.E. the Spanish Ambassador, Ms. Milagros Hernando Speech of H.E. the UNDP Resident Representative, Mr. Ross Mountain Speech of H.E. the Minister of Energy and Water, Mr. Arthur Nazarian
10.30 – 11.00 am	Coffee Break
11.00 – 12.30 am	Technical Presentations Energy context in Lebanon - Mr. Karim Osseiran, Advisor to the Minister of Energy and Water Introduction to geothermal energy technologies – Mr. Thomas Megel, Geowatt AG Geothermal resource assessment in Lebanon – Mr. Vincent Badoux, Geowatt AG Environmental impacts - Dr. Michael Gruenenfelder - POYRY Energy Legal aspects – Mrs. Roula Abou Chabke, Kobeissi & Frangié
12.30 – 01.00 pm	Questions and Answers
01.00 pm	Lunch









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

Kindly confirm your attendance before Thursday, 20th March, 2014 by contacting us on 01-981944
or via email to Ms. Krystel Rizk: krystel.rizk@undp-lebprojects.org

Annex 3. Invitation Card and Agenda of the Renewable Energy Technical Workshop

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 Solarmet

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

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Annex 4. Agenda of the UNDP Energy and Environment Programme Meeting



UNDP Energy and Environment Programme Meeting
Location: Gefinor Rotana Hotel- Beirut, Lebanon
Tuesday, 23 July 2013, 6:00 p.m. – 9:00 p.m.

Agenda of the Event

6:00 p.m. – 6:15 p.m.	Reception and Registration (Welcome Coffee & Breakfast)
6:15 p.m. – 6:30 p.m.	Welcome Notes: - Mr. Mahmoud Baroud, National Focal Point, Ministry of Energy and Water - Mr. Luca Renda, Country Director, United Nations Development Programme (UNDP)
6:30 p.m. – 7:00 p.m.	The GEF Global Solar Water Project, by Mr. Pierre El Khoury, UNDP Project Manager
7:00 p.m. – 7:30 p.m.	The CEDRO Project and the ENPI MED-SOLAR Project, By Dr. Hassan Harajli, CEDRO Project Manager
7:30 p.m. – 8:00 p.m.	Questions and Answers (Q&A) and Open Discussion
8:00 p.m.	Iftar