CEDRO

CEDRO, with energy efficiency on our mind

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

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5 MW OF NON-RIVER HYDROPOWER

A study commissioned by the UNDP, in collaboration with the Ministry of Energy and Water (MEW), has identified 13 sites with a potential production capacity of 5MW of hydropower. The technical and economic aspects of alternative water systems have been assessed for their potential hydropower generation: Irrigation systems, drinking water systems, electrical power plant outfall pipes, and waste water treatment plants.

The largest and most efficient source of non-river hydropower generation is power plants located along the Lebanese coasts which extract sea water for cooling requirements. About 3.4 MW of energy can be generated from water dumped back into the Mediterranean. The main advantage of this power source over other natural sources of hydropower is that the turbines can operate at a capacity factor of more than 80% because they will be generating energy as long as the power plant is operational. These turbines can be installed during the potential rehabilitations of coastal power plants.

Several irrigation channels have been identified as having a cumulative hydropower generation capacity of 1.27 MW. These sites use pipelines in which pressure builds up to produce energy. Hydropower could also be potentially generated in irrigation channels where there is a significant pressure variation at different levels of the water conveying system. Under this scenario, hydropower production can be continuous during or even outside the irrigation period if the channel can be used and the required flow is available. For the moment, however, the survey has been unable to identify such a site in Lebanon.

Drinking water systems across Lebanon have a power-generation capacity of 408 kW. Distribution pipelines lose some of their hydraulic potential due to the high friction caused by a high flow of water going through relatively narrow pipes. Although this property works as a pressure breaker for high-altitude head water sources, it reduces hydropower generation.

Although waste water treatment plants have been found not to have significant potential for hydro-power generation, they may be subject to substantial energy-efficiency measures. Some of them are still under construction or review, which gives the opportunity to carry out further investigation into their hydropower-generation potential and to do the necessary adjustments to their design in order to integrate the proposed hydropower plants.

In its conclusion, the study recommends improved data management and filing. The hydropower potential the survey was able to identify is only the tip of the iceberg. CEDRO believes that much more potential can be found in water networks and irrigation channels in particular if a more robust data and information system covering a comprehensive list of parameters on water flow, pipeline design and locations, and so forth, can be put in place.

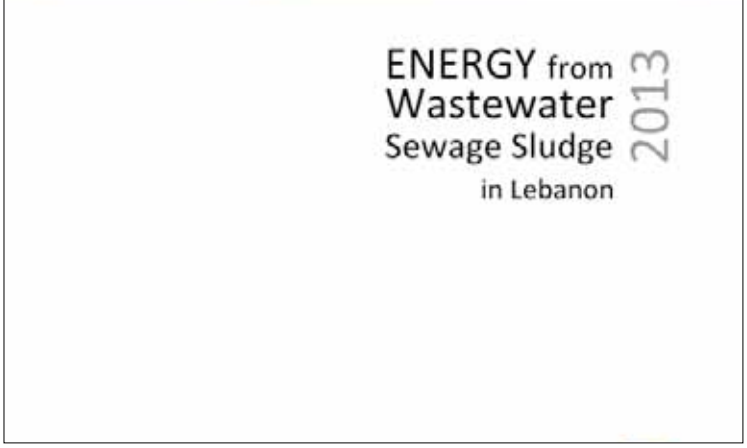
3 – 4% OF LEBANON'S BIOENERGY COULD COME FROM WASTEWATER TREATMENT PLANTS

In a new successful joint study, the Ministry of Energy and Water (MEW) and the UNDP reveal that bioenergy from waste water sludge could account for 3-4% of the national bioenergy potential identified in the Bioenergy Strategy Plan published by CEDRO in 2012.

Five waste water treatment plants (WWTP) in Sour, Aabde, Sarafand, Saida, and Majdal Anjar meet the conditions required for the implementation of a sludge Anaerobic Digestor. The total primary energy expected from these plants is estimated at 143,000 MWh, for an installed electrical power of 5.9 MW.

The report also shows that the addition of sludge from nearby small to medium WWTP and co-substrates allows an average increase of 70% in energy production compared to the digestion of sludge only, and results in an installed electrical power of 11.6 MW for an estimated total primary energy of 237,700 MWh.

Altogether, these projects allow the reduction of greenhouse gas emissions by approximately 35,000 tons of CO2 equivalent per annum.



CEDRO AND THE ITALIAN DEVELOPMENT COOPERATION INSTALL A SOLAR HOT WATER SYSTEM IN CHAHHAR PUBLIC HOSPITAL (MOUNT LEBANON)

In partnership and cost-sharing agreement, the UNDP-CEDRO project and the Italian Development Cooperation have installed a solar hot water system with a capacity of 4,000 liters in Chahhar public hospital. This system will cater for the hot water needs of the hospital which consists of 75 beds, serving the needs of the Chouf area in Mount Lebanon.

Solar Water Heater System

The maintenance team expressed full satisfaction of this SWH system, indicating that they are no longer using the regular boiler to heat water and are, accordingly, already noticing savings on the hospital's diesel bill.

The system includes three way valves, heat exchangers and sensors, which facilitate the handling of the hot water; it operates automatically and does not need any manual control.

The management of the Chahhar public hospital was trained to properly manage the equipment and, in its turn, carried out some awareness sessions aimed at informing its staff about the importance of these systems on the financial and environmental levels, and the need to maintain the system to the best case possible.

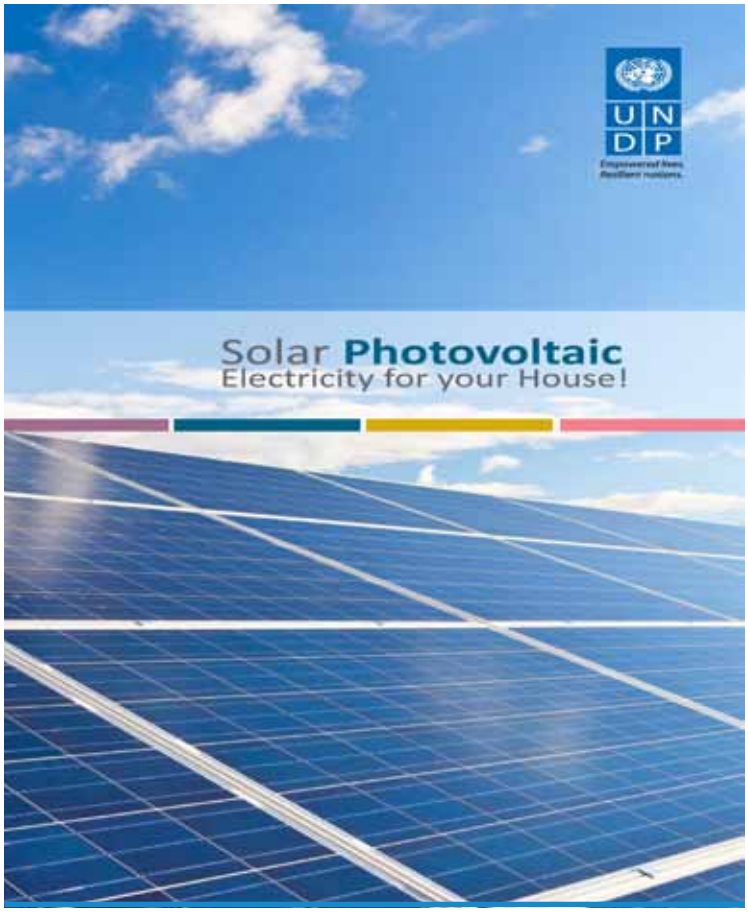
SOLAR PHOTOVOLTAIC ELECTRICITY AT HOME

Exactly 2,716 households across Lebanon have received a brochure entitled "Solar Photovoltaic Electricity for your house" that encourages the general Lebanese public to opt for clean energy decisions at their home or place of business, as the decision will have the dual benefits of saving money in the medium term and assisting in protecting our environment for the current and future generations.

The brochure was published by the UNDP-CEDRO project and the Lebanese Center for Energy Conservation (LCEC) and is available for collection at the CEDRO and LCEC offices.

The initiative comes in a series of cooperation between the Ministry of Energy and Water and the United Nations Development Programme, in their endeavor to support and promote renewable energy systems.

Lebanon indeed needs to quickly reduce its dependence on costly, imported fuel and start shifting towards a more sustainable energy system. Such a change starts with actions at the individual level.



Solar Photovoltaic Brochure

NINE NEW PV SITES

CEDRO has finished the installation of the last group of Photovoltaic systems at nine new sites with a total installed capacity of 18 kWp. The sites consist of three public schools, four municipalities, and two additional buildings on two Lebanese University campuses that are currently powered by solar energy. The installed capacity of each system is either of 1.125 kWp or 2.7 kWp.

Mr. Karl Zouein, Mayor of Yahchouch Municipality, where one of the PV systems was installed, thanked the UNDP for bringing the village one step closer to using green power technology. "Your commitment to help us generate electric power by using solar systems is one major development towards a greener and more sustainable village," he said.

These new installations bring the total number of Photovoltaic sites across Lebanon to 71.

Nr.	Name of Institution	Region
1	Lebanese University - Roumieh Campus	Metn
2	Sultaniyyeh Municipality	Bint Jbeil
3	Yanta Public School	Bekaa
4	Zahleh Public School	Bekaa
5	Dekweneh Technical School	Metn
6	Hamet Municipality	Batroun
7	Kfarhay Municipality	Batroun
8	Lebanese University - Tripoli Campus	Tripoli
9	Yahchouch Municipality	Keserwan

Caption Here

QBAYET: USD 40,000 GRANT TO LIGHT 37 SOLAR-ENERGY STREET LIGHTS

EAs part of the Madinati Khadraa National Renewable Energy Competition, non-governmental organization CDDG won a USD 40,000 grant to install solar-powered street lighting in Qbayet, Akkar. Towards the end of July, a centralized photovoltaic system was installed, supplying a total of 37 LED street lighting fixtures with solar energy.

Initially, a centralized solar photovoltaic system was planned to power 27 street lighting fixtures on Qbayet main road. However, when Qbayet Municipality realized the benefits of the system in keeping the town's streets lit and safe, it upped the project by an additional 10 street lighting fixtures.

In addition to the PV implementation, the project comprises a workshop to raise awareness on energy efficiency and energy conservation among the local population.

Solar Powered Street Lighting

Solar PV Panels

THE NATIONAL ACTION FOR GREEN ENERGY EFFICIENT BUILDINGS (NAGEEB)

NAGEEB is a joint UNDP-Green Future program aiming at providing affordable and sustainable housing technology at a cost comparable to monthly rent and energy expenditures (see Figure 7).

The NAGEEB house has been carefully designed to reflect traditional Lebanese architecture in an effort to preserve the local construction heritage (e.g. Figure 1).

Figure 1: Design inspiration and evolution

According to NAGEEB engineers, 5,000 NAGEEB houses will reduce greenhouse gas emissions by 250,000 tons in construction and 30,000 tons annually in operation costs, reduce waste water production by 0.6 million m3 per annum, lock at least 5,000 hectares of agricultural land in farming, provide decent housing for 5,000 families, and create more than 500 jobs in rural Lebanon.

The proposed eco-friendly model was influenced by extensive research in the field of sustainable buildings, in particular the British Zero-Carbon House, and was designed in collaboration with Prime Design. An architectural, infrastructural, utility, and financial survey of thermal behavior and energy costs of existing houses in rural areas served as the baseline for the model. Findings revealed that, on average, small rural houses require 1-2 m3 of diesel oil for heating during the winter season. Many of the surveyed houses resorted to bottomless septic tanks in order to save on the cost of periodic sewage removal. The excessive blackouts and brownouts accompanied by chronic water (and thus hot water) shortages are a normal occurance. Limited financial support is one of the main reasons behind the lack of construction, construction delays, or the phasing of construction over several years. Based on these survey results, the NAGEEB house was designed to lower the heating and cooling needs thanks to the use of newly-adopted outer thermal insulation coupled with a hybrid concrete and wooden structure and double-glazed, low-emissivity (low-e) windows.

Figure 2: Outer fabric thermal components

Residents will be provided with Grade A equipment in order to ensure better energy performance and help reduce electricity bills.

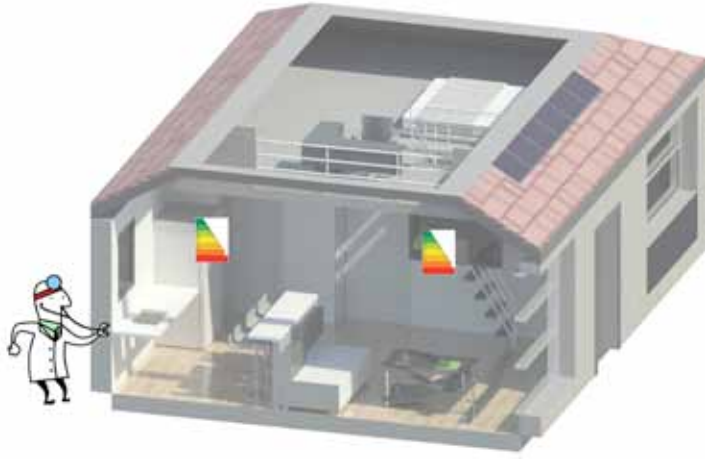


Figure 3: Elements of NAGEEB house

Additional sustainable features will be integrated into the NAGEEB house, such as solar water heaters, Photovoltaic systems, rain-water harvesting systems, water recycling setups (grey water will be used for irrigation), and a compost toilet. The result is a low-waste output house.

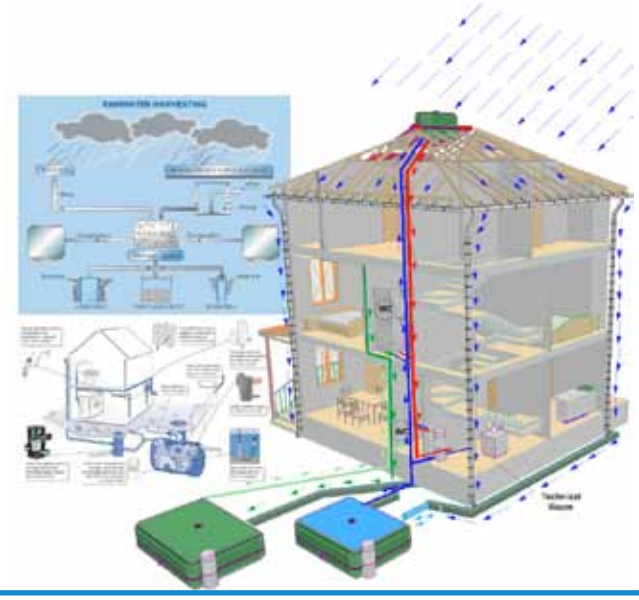


Figure 4: NAGEEB house

The NAGEEB house ranges between 90 and 280 m2 in livable area and can either be a simplex or duplex. NAGEEB can be built within three months from the approval date of the applicant's request. Ideally, NAGEEB will have a footprint area equivalent to 15% of the land's total area, leaving the remaining area green for cultivation or landscaping.

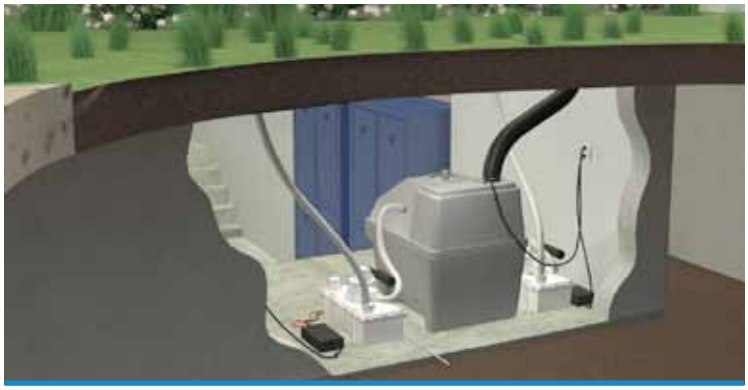


Figure 5: Composting toilet

Figure 6: NAGEEB house

	Chalet	Medium Simplex	Medium Duplex	Large
Total Area (m2)	91	200	240	280
Number of Rooms	2	4	5	7
Building Cost ($)	55,000	100,000	113,000	130,000
Equipment Cost ($)	35,000	40,000	48,000	55,000
Loan Duration (Years)	30	30	30	30
Installments ($)	315	490	565	650
N.B.: Prices are excluding VAT				

Figure 7: Cost breakdown per house type

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