LEBANON RECOVERY FUND LRF
MPTF OFFICE GENERIC ANNUAL PROGRAMME[1] NARRATIVE PROGRESS REPORT
REPORTING PERIOD: 1 JULY – 30 SEPTEMBER 2018

Programme Title & Project Number	Country, Locality(s), Priority Area(s) / Strategic Results[2]
Programme Title: Access to sustainable energy for lighting to host communities *Programme Number (if applicable)* MPTF Office Project Reference Number:[3] *LRF-32*	*Country/Region*: LEBANON *Priority area:* Governorate of Akkar, Nabatieh and South.
Participating Organization(s)	**Implementing Partners**
United Nations Development Programme (UNDP) Lebanon	*International Partners:* N/A *National Partners:* Council for Development and Reconstruction (CDR); Ministry of Energy and Water (MEW); Ministry of Finance (MoF), Ministry of Interior and Municipalities (MoIM).
Programme/Project Cost (US$)	**Programme Duration**
Total approved budget as per project document: MPTF /JP Contribution[4]: Government Contribution *(if applicable)* Other Contributions (donors) *(if applicable)* **TOTAL: USD 486,000**	Overall Duration (1 year) Start Date5 (01 July 2017) Original End Date6 (30 June 2018) Current End date7 (30 September 2018) Overall Duration (1 year and 3 months)
Programme Assessment/Review/Mid-Term Eval.	**Report Submitted By**
Assessment/Review - if applicable *please attach*	Name: Jihan Seoud

[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.

☐ Yes ☐No Date: *dd.mm.yyyy* Mid-Term Evaluation Report – *if applicable please attach* ☐ Yes ☐ No Date: *dd.mm.yyyy*	Title: Programme Manager Participating Organization (Lead): UNDP Email address: jihan.seoud@undp.org

List of Acronymes

CEDRO	Community energy efficiency and renewable energy demonstration project for the recovery of Lebanon
CDR	Council for Development and Reconstruction
DIM:	Direct Implementation Modality
EDL	Electricity of Lebanon
EE	Energy Efficiency
GoL	Government of Lebanon
GDP	Gross Domestic Product
INDC	Intended Nationally Determined Contributions
ITB	Invitation to Bid
LCRP	Lebanon Crisis Response Plan
LRF	Lebanon Recovery Fund
MEW	Ministry of Energy and Water
MoIM	Ministry of Interior and Municipalities
MoF	Ministry of Finance
MOU	Memorandum of Understanding
MW	Mega Watts
NEEAP	National Energy Efficiency Action Plan
RE	Renewable Energy
UNDP	United Nations Development Programme

EXECUTIVE SUMMARY

As per the Lebanon Crisis Response Plan (LCRP) for 2017 – 2020, the increased electricity demand caused by the Syrian crisis has created additional stress on an already weak electricity system and underscored its lack of resilience. A study undertaken by the Ministry of Energy and Water (MEW) and the UNDP revealed the need to supply an additional 450 to 480 Megawatts (MW) of power to cover the power demand of more than 1 million displaced Syrians (as of September 2018). Already before the crisis, the Lebanese Energy sector was under considerable stress, unable to meet the electricity demand by more than 1000 MW of required power. It had reached a point where electricity reliability and service delivery had become significant impediments to economic development and where financial sustainability was unattainable without major reform.

One key requirement that is required by many Lebanese villages, towns and cities, before the Syrian crisis and exacerbated by the Syrian Crisis (as mentioned in the Energy chapter of the LCRP 2017-2020) is the need for solar off-grid street lighting for informal settlements and municipalities across the country.

This report outlines the accomplishments of the Lebanon Recovery Fund (LRF) project "Access to sustainable energy for lighting to host communities" to procure and install approximately 320 solar street lighting systems across 16 Lebanese villages in Lebanon.

This project is in line with the objectives and ongoing programs of the MEW-UNDP Lebanon Host Community Support Programme, specifically providing support to improve the delivery of basic services at community level and improve the capacities of public schools and municipalities in the response to the crisis among their community, promoting conflict management.

I. PURPOSE

Outcome 1: Increasing community security, providing basic human rights for access to energy, and enhancing well-being through the installation of solar street lighting.

Output 1.1- Implementation of projects: Provide sustainable energy for lighting to host communities.

The energy sector in Lebanon has many shortcomings and faces several barriers. Deteriorating and inadequate infrastructure has resulted in poor reliability and inadequate levels of electricity supply. Service delivery standards are considered low compared to other countries with similar economic standards (for example as measured through gross domestic product – GDP - per capita. Even prior to the Syrian crisis, Lebanon suffered extensive load-shedding, with supply cuts in Beirut of at least 3 hours per day and up to 12 hours per day in Lebanon's rural regions and towns. The majority of consumers are therefore forced to rely on costly and environmentally unfriendly diesel generators to provide the balance of their electricity requirements. The sector is causing a massive drain on the GoL which subsidizes the cost of fuel used in EdL's power plants. The sector cost the government US$3.056 billion in 2014, $2.056 billion in 2015 and $2.1 billion in 2016.

In 2010, even prior to the onset of the Syrian crisis, the Government of Lebanon (GoL) recognized the critical need to address Energy sector issues and endorsed a Policy Paper for the Energy Sector in June 2010[i]. The paper outlines policy, investments and reforms aimed at increasing the level and quality of electricity supply, managing demand growth, decreasing the average cost of electricity production, increasing revenues and improving sector governance. The policy paper also commits to launching, supporting and reinforcing all public, private and individual initiatives to adopt the utilization of renewable energies to reach 12% of electric and thermal supply by 2020 which is part of Lebanon's National Energy Efficiency Action Plan (NEEAP, 2016). This programme also feeds into Lebanon's renewable energy target commitment made under the UN Framework Convention on Climate Change which it presented as part of its Intended Nationally Determined Contributions (INDC) in Paris in 2016.

Using solar energy is a cost-effective way to provide rural communities with an independent source of energy. The use of renewable energy systems, such as those proposed within this project, saves on municipal spending while ensuring basic needs of Syrian refugees and local host-communities are met. Public solar street lighting is a short-to-medium term solution for providing street lighting to growing communities on a sustainable and continuous basis.

Solar street lighting solutions provide the required quality light in public areas and streets that are the most visiting and/or traversed on foot or via vehicles. Lighting sensitive locations within villages have a direct role in enhancing the feelings of security among the inhabitants of the village (both local and refugee population), reduce accidents due to enhanced visibility, and promote active participation in public life.

Over time, the installation of energy efficient lighting solutions in refugee hosting areas will also mitigate the potential environmental impact of extending electric utilities in line with increasing demand.

Outcome	Increased sense of Community security, reduced accidents and enhance the wellbeing of the citizens through the installation of solar street lighting
Output 1	Provision of sustainable energy for lighting to local communities

II. Results

i. Narrative reporting on results:

During the past year since the initiation of the project in July 2017, the project has finalized the project set-up, identified the areas for implementation and progressed in initiating and finalizing all the required installations of the solar street lighting systems, successfully achieving, thereby, the overall outcomes of the project.

At the output level, the project was enabled through:

- **Project team**: The project team at the UNDP CEDRO has allocated a unit headed by the project manager (part-time) and Senior Engineer (full-time) for the optimal implementation of the overall project.

- **Work guidelines:** Building on extensive prior experience in solar street lighting undertaken by the UNDP-CEDRO project, an internal assessment and evaluation of all the prior projects of similar nature was undertaken. From these experiences, the project team developed updated guidelines for works and discussed it with the winning contractor (refer to Annex 1). These are to ensure that the workmanship of the contractor meets the high standards set out for this project.

- **Beneficiary selection criteria:** the project team developed a detailed selection criteria that aided in the determining the beneficiary municipalities (refer to Annex 2). These criteria are set to ensure the selection of the municipalities and villages that would benefit the most from this project. Furthermore, these criteria have played a major role in setting the locations of the solar street lighting poles within each selected village. This means that the location of these poles must have the greatest overall social benefit in terms of enhancing the sense of security, reducing accidents, and enhancing social interaction.

- **Technical Specifications:** given the past experience of CEDRO in solar street lighting, updated technical specifications and guidelines for works have been developed for this project, enhancing both the technology used and the workmanship expected (refer to Annex 3).

- **Site selection:** the CEDRO team has managed to shortlist 13 villages as beneficiaries of the solar street lighting project. The 13 villages are in the Akkar, South and Nabatieh governorates and are: Nabatieh, Qobayat, Touline, Kawthariet el Syad, Ein Ebel, Izza, Maamarieh, Hajje, Wadi el Houjeir, Majdal Selem, Rihaneye, Ghzayle and Sharbila. The budget of the implementation came to be approximately 12.5% below budget expectation, which then has allowed the CEDRO project to reach more beneficiaries in the mentioned governorates. The chosen sites followed the same selection criteria specified before, and shortlisted a further three villages as beneficiaries of the solar street lighting project. The additional 3 villages are: Ghassaniyeh, Souwayse and Kabrikha - making the overall beneficiaries 16 villages (kindly refer to Annex 4 for details of site selection and selected site description).

- **Procurement process:** based on the technical specifications and the site-specific requirements for the selected village, tender documents that were put together. An open call for bids was undertaken based on UNDP standard procurement procedures. The call was posted online for one month and bids received were evaluated technically and financially and the contractor was chosen accordingly. Annex 5 shows several pictures from both the implementation of the systems on particular sites, and pictures of some completed sites.

- **Describe any delays in implementation, challenges, lessons learned & best practices:**
  The original project budget for implementation was $375,000. Originally the solar street lighting poles were budgeted at approximately $1,350 per pole. Thus the project was designed for 280 street lighting poles. However, the price per pole after competitive bidding reached approximately $1,175 per pole, which then enabled to procure an additional 40 solar street lighting poles.

  Given that the savings could only be realized after the first 280 poles were purchased, the procurement of the additional 40 poles was initiated after that. Therefore, the implementation plan shifted accordingly and additional time was granted to install the additional 40 street lighting poles. Accordingly, the project was extended from June 30, 2018 to September 30, 2018) without any change to the project overall budget.

  Minor delays occurred also occurred in the port of Beirut. However this was solved and did not cause any significant problem to the overall timeline required.

- **Implementation:** initially the target for installing street lighting poles was 280, but after the inclusion of 3 more villages, an additional 40 poles were added making the total 320 poles (as mentioned before).

    - The installation of 320 street lighting poles are completed and commissioned on 26 June 2018.
    - In order to ensure the project sustainability and full cooperation of the local municipalities, MOUs were prepared by the project team and signed by both parties.

- **Summary of Results**

Activity	**Brief description**	**Location**	**Direct/Indirect beneficiaries**	**Local partner**	**Status**
Preparation of Technical Specifications	Finalizing the Technical specification for the ITB	NA	NA	NA	Completed
Preparation of Selection Criteria	Finalizing a list of 9 selection criteria	NA	NA	NA	Completed

Selection of beneficiaries	Shortlisted 13 villages and undertook technical site assessment	Akkar South Nabatieh	13 municipalities	Municipality	Completed
Additional Site selection	Shortlisted 3 villages and undertook technical site assessment	South	3 municipalities	Municipality	Completed
Pre-work	Excavation of the selected sites.	Akkar South Nabatieh	16 municipalities	Municipality	Completed
Installation of poles	Installation of street lighting poles in each of the selected sites.	Akkar South Nabatieh	16 municipalities	Municipality	Completed and commissioned

ii. Indicator Based Performance Assessment:

	Achieved Indicator Targets	**Reasons for Variance with Planned Target (if any)**	**Source of Verification**
Outcome 1[8] **Indicator:** - Increased sense of community security - Reduced accidents and enhance the wellbeing of the citizens through the installation of solar street lighting. **Baseline:-** **Planned Target:-**	- 320 poles installed - Expected number of beneficiaries: o 121,500 in Nabatieh o 7,500 in South o 23,000 in Akkar	- Initially 280 poles were expected to be installed, additional 40 poles were added to the initial target to reach more beneficiaries and ensure the wellbeing of a greater portion of the population in the mentioned governorates making it a total of 320 poles. This was made possible due to the budget coming app. 12.5% lower than originally estimated, due to competition and decreasing overall product costs.	- Field visit - Meeting with communities - Pictures of the beneficiaries
Output 1.1 **Indicator 1.1.1** Provision of sustainable energy for lighting to local communities **Baseline:** ITB **Planned Target:** 280 poles	- Finalizing a list of 9 selection criteria to be used to short-list project sites. - Identification of sites completed initially 13 sites were shortlisted and later additional 3 sites were added in the regions of Akkar, Nabatieh and South Lebanon. - Technical specifications and designs completed (invitation to bid prepared). - Procurement process for the purchase of the equipment has been completed and contract		- Certificate of completion based on site surveys upon completion of project installation & commissioning

[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.

	signed. - Excavation of the bases for 320 sites completed. - Installation of the 320 street lighting poles in completed and commissioned.		

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.

  Many stories were recorded that showcase the importance of this project. These can be shown in the LRF video. The video with several stories can be viewed here:

  Long video: https://youtu.be/k80LfUv33Ao
  Short Video: https://www.youtube.com/watch?v=lVP0919HOng&feature=youtu.be

- 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)

Report on any assessments, evaluations or studies undertaken

IV. Programmatic Revisions (if applicable)

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

V. Resources

- National Project Staff include a Site Engineer working on a full-time basis on this project. A project manager is also following up on the implementation of the project however his salary is not being charged to this project.

- Expenditures as of September 30, 2018 (indicative)

CATEGORY	Total Budget (USD)	Exp. 2017	Exp. 2018*	Total Exp. 2017-2018 (USD)
1. Personnel (Incl. staff and consultants)	60,000.00	22,960.20	34,919.84	57,880.04
2. Supplies and commodities (Incl. IT equip and rental & maintenance)	3,000.00	-	575.54	575.54
3. Equipment (including installation)	6,000.00	-	7,747.63	7,747.63
4. Contracts (Incl. companies, professional services)	375,000.00	65,709.00	311,371.00	377,080.00
5. Travel/Transport	705.61	-	1,398.98	1,398.98
6. General Operating and other direct costs	9,500.00	-	9,523.42	9,523.42
9. Agency Management Support (7%)	31,794.39	6,206.84	25,587.55	31,794.39
TOTAL*	**486,000.00**	**94,876.04**	**391,123.96**	**486,000.00**

** 2018 Expenditure figures are indicative until the issuance of the final Combined Delivery Report (CDR).*

Annex 1: Contractor Work Guidelines for Solar Street Lighting

- The contractor is responsible of debriefing the subcontractor on the technical specifications and requirements and must verify that the subcontractor is qualified to handle the tasks given to him.
- The contractor shall provide UNDP with an updated checklist that documents the progress of works, on a bi-weekly basis.
- A foreman from the contractor's side shall be present at all times during works.
- The excavation and installation works shall be done in coordination with the municipality.
- Prior to excavation, the contractor shall ensure that no infrastructure is damaged by consulting the municipality representative.
- The contractor shall not proceed with excavation if the pole is to cause any damage or danger and shall relocate the pole to a location determined by a CEDRO engineer.
- Threaded rods at the base of the pole shall be 110 cm in height so that they protrude 10cm above the surface.
- Threaded rods and knots shall be sprayed with galvanizing spray after the pole is erected.
- The pit space dug for the concrete base of the pole shall not exceed 1.2 sqm. Should the pit space be greater than 1 sqm, the pit shall be completely filled with concrete and not compensated using rubble.

Annex 2: Beneficiary Selection Criteria

The beneficiary villages' qualification was based on the below described criteria:

Criterion	Description
Need for Street Lighting	The village currently lacks the adequate infrastructure of street lighting, therefore, would benefit from the illumination of its roads from the solar street lighting project.
Previously Installed Solar Street Lighting Poles	The villages selected for the installation of the solar street lighting poles must have not benefited from previous solar street lighting projects, or was selected in previous projects and was not provided with a sufficient number of poles.
Social Impact	The installation of solar street lighting poles in the village would allow the villagers to carry on different tasks and activities that they were not able to perform prior to the project.
Road Traffic Safety	The installation of the solar street lighting poles would increase the road traffic safety in the selected village. The need for illumination on certain intersections, roundabouts and sharp turns is essential in the selection criteria.
General Safety	The installation of the solar street lighting poles would alleviate the dangers of theft, murder and other security incidents that the village may be witnessing.
Electrical Infrastructure	The locations selected for the installation of the solar street lighting poles lack the necessary electrical infrastructure to allow the installation of grid powered lighting, and or, generator powered lighting.
Technical Assessment	The locations chosen for the solar street lighting poles are technically viable. (Pit location and support, pole safety, shading, distance from grid lines…)
Syrian Refugee Population	The installation of the solar Street lighting poles in the village would aid the host communities in accommodating the effects of the Syrian crisis.
Maintenance	The selected municipality is made aware of and has confirmed commitment to undertake the necessary maintenance procedures and can carry it out when needed.

Annex 3: Solar Street Lighting Technical Specifications

- **System Components:**

  - The system must include the following components:

- Street lighting pole
- Solar panels
- Lamp
- Dimming system
- Charge controller
- Batteries
- Equipment storage casing
- Wire harness
- Mounting brackets (must allow variable orientation and inclination of the PV module)
- Protection circuit and earthing system

- **General Specifications:**

- Working Voltage: 24V DC.
- Lighting Time: 10 - 12 hours per day.
- Lights shall be dimmed after midnight.
- The system's efficiency must meet or exceed 85%.
- The typical operating conditions are from dawn to dusk.
- The system must be able to operate for a maximum of 3 nights even with an overcast weather of 3 consecutive days.
- Total system weight should be equal or inferior to 160 Kg.
- IP ratings: IP65.
- All system's components should be water and corrosion resistant. Base rods and knots shall be painted or sprayed in anti-corrosion material.
- The system should be fully operational in the following conditions:
  - Relative humidity up to 95%.
  - Ambient temperature from -10˚C to 45˚C.
  - Rural environment with presence of dust, insects…
  - Wind speed up to 120 km/h.
- System components should be manufactured according to International Quality and Environment Management System Standards ISO 9001 and ISO 14001 respectively.
- All system's components datasheets and certificates shall be submitted.
- All system's components manufacturers should have a minimum of seven years of successful experience in the sector. Proof shall be submitted.
- Authorizations by the main goods' manufacturer to Bidder offering to supply the goods in the country of final destination shall be submitted.
- **System Components Specifications:**

- **Street Lighting Pole:**

- Pole height is of 8 m.
- Battery should be located underneath the PV panel.
- Lamp should be located at 6 m height.
- Pole must be water and corrosion resistant and have a conical shape with a minimum pole bottom diameter of 260 mm.
- Poles must a have a minimum thickness of 4mm.
- A concrete base for the pole of at least $1m^3$ is required.
- Pit area (preparation for the concrete base) should not exceed 1.44 sqm^2.

- **Photovoltaic Modules:**
- The PV modules must meet the following:

- Type: Mono or Poly crystalline technology.
- Rated power: 1 module of 240W (or equivalent 2 modules of 120W/ 12V). *(If the proposed lamp is of 60W, a module of 200W is acceptable).*
- Module conversion efficiency: greater or equal to 15%.
- Positive- only power tolerance: greater or equal to 3%.
- Cell protection: cells should be protected by anti-reflective coated tempered glass.
- Module shall withstand load up to 5400 Pascal.
- I-V curve should be supplied.
- PV modules shall be compliant to IEC 61730-1/2: 2004 and IEC 61215-2: 2005 guidelines.
- PV modules shall be tested through an international quality and durability program: Fraunhofer's PV Durability Initiative (PVDI) testing, Atlas 25+ PV durability testing program, PVEL's vendor qualification test program, NREL's Qualification Plus for PV module reliability, VDE Durability Testing Program, TUV Sud Thresher… Proof of positive test results shall be submitted.
- Warranty: minimum 10 years on material and manufacturing.
- Output Warranty: 10 years with 90% power output and 20 years 80% power output warranty.

- **Lamp:**

- Type of lighting: high power Light Emitting Diode LED fixture, suitable for road lighting application, including integrated, high-efficiency dimmable LED driver.
- Power Rating: maximum of 70W; as long as it meets the required luminous flux.
- Luminous Flux: meets or exceeds 6500 lm.
- Life Span: 50,000 hours at ambient temperature of 25˚C.
- Illuminance level on ground surface: 15-27 lux.
- Color Temperature: 2700- 3300˚K (warm white)
- Beam angle of 120˚ (graph must be submitted).
- Luminous Maintenance: minimum 80% of initial lumen output after 50,000 hours.

- Color Rendering Index: greater or equal to 75.
- Power factor: greater than 0.95.
- Dimmable.
- Materials and Finishing: Fixture; die cast aluminum corrosion resistant parts, grey powder coat finish. LED light to be protected by clear acrylic lens, or approved equivalent.
- Ingress Protection Rating: IP65.
- Compliant to IEC 60598-2-3 Luminaires for road and street lighting, or IEC 62031.
- The LED dimmable driver shall have a dimming range of 10%-100%, a lifetime of 50,000 hours and a failure rate less or equal to 0.01% per 1,000 hours.
- Warranty: minimum 3 years.

  - **Controller:**

- Pulse Width Modulator 3- stage charging controller.
- Voltage and Current: 24V, 10A.
- Self- consumption: less or equal to 15 mA.
- High efficiency.
- Feature: automatic dusk/ dawn switch and timer module.
- Protections: overcharging, deep discharging, overload, reverse current, lightning protection and battery overvoltage shutdown.
- Low Voltage Disconnect (LVD) and Battery Temperature Compensation (BTC).
- To be located inside the battery box.
- Safety testing on product compliant to IEC 62109 guidelines or UL listed to UL 1741.
- Warranty: minimum 2 years.

  - **Battery:**

- Battery capacity: 2x 150 Ah at C10, connected in series.
- Battery voltage: 12V each.
- Type: deep- cycle gel battery.
- No leakage.
- Maintenance free.
- Deep of discharge (DoD) capacity: 70%.
- Life cycle: 1400 cycles at 70% DoD, tested according to IEC 61427 cycling test method.
- Self- discharge: less than 3% per month at 25˚C ambient temperature.
- Cycle lifetime over DoD, cycle lifetime over ambient temperature, charge/ discharge characteristic curves and self- discharge rate over temperature graphs shall be supplied.
- Compliant to IEC 60896-21/22.
- Warranty: minimum 2 years.

  - **Protection Circuit:**

- Fuses should be provided for short-circuit conditions.
- All electronic components must take into consideration temperature compensation issues.

- Full protection against open circuit, accidental short circuit and reverse polarity by blocking diode should be provided.
- Lightning protection circuits with surge arrestors must be added to each system.
- Earthing system must be implemented for each system.

- **Electrical Installation:**

- The electrical installation should be designed according to the national standards. All cables and wires shall have an adequate cross section that takes into account the maximum current, total distance and voltage drop less than 3%. Cables and wiring shall be protected from the UV radiation.

[1] Lebanon, Ministry of Energy and Water (June 2010), *Policy Paper for the Electricity Sector*.

Annex 4: Site Selection Report

1. Project Overview

As per the Lebanon Crisis Response Plan (LCRP) for 2017 – 2020, the increased electricity demand caused by the Syrian crisis has created additional stress on the already weak electricity system and underscored its lack of resilience. A study currently undertaken by the Ministry of Energy and Water (MoEW) and UNDP reveals the need to supply an additional 450 to 480 MegaWatts (MW) to cover the demand of the 1.5 million displaced Syrians. Already before the crisis, the Lebanese Energy sector was weak and inefficient and unable to meet the electricity demand. It had reached a point where electricity reliability and service delivery had become significant impediments to economic development and where financial sustainability was unattainable without major reform.

One of the measures mentioned in the LCRP in response to the shortfalls in electricity supply and in support of host-communities, the use of solar off-grid lighting for informal settlements and public municipal streets is a recommended measure.

There isn't one city, town, or village in Lebanon that does not host, to varying extents, Syrian refugees. Given the current shortage in electricity supply in the country, especially in these remote locations in Lebanon that suffer from long hours of black-outs, using solar energy seems to be the only way to provide these rural communities with an additional cost-effective and independent source of electricity and energy. The use of renewable energy systems, such as proposed, saves on municipal spending while ensuring basic needs of Syrian refugees and local host-communities are met. The public solar street lighting is a cost effective short-to-medium term solution of providing street lighting to growing communities on a sustainable and continuous basis. They provide good quality light in public areas that can reduce feelings of insecurity, reduce accidents, and promote active participation in public life. Over time, the installation of energy efficient lighting solutions in refugee hosting areas will also mitigate the potential environmental impact of extending electric utilities in line with increasing demand.

The aim of the project is to increase the community security, to better the living standards of host communities in Lebanon, through the provision of renewable energy outdoor lighting.

2. Selection Criteria

The beneficiary villages' qualification was based on the below described criteria:

Criterion	Description
Need for Street Lighting	The village currently lacks the adequate infrastructure of street lighting, therefore, would benefit from the illumination of its roads from the solar street lighting project.

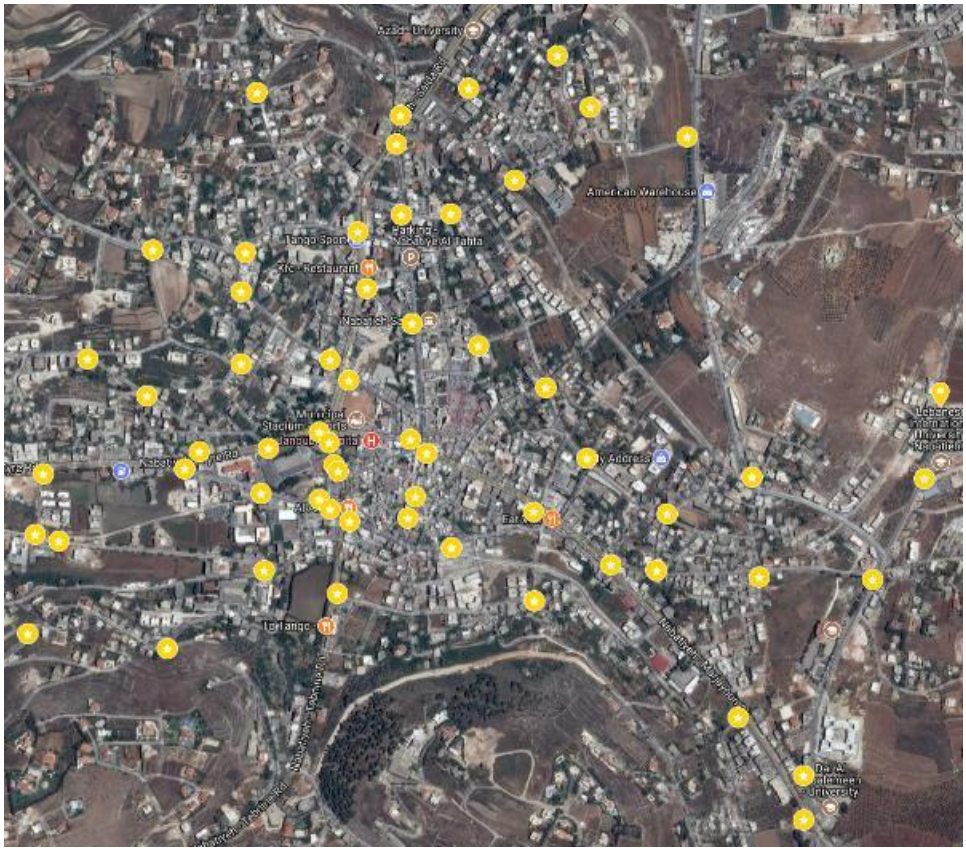
Previously Installed Solar Street Lighting Poles	The villages selected for the installation of the solar street lighting poles must have not benefited from previous solar street lighting projects, or was selected in previous projects and was not provided with a sufficient number of poles.
Social Impact	The installation of solar street lighting poles in the village would allow the villagers to carry on different tasks and activities that they were not able to perform prior to the project.
Road Traffic Safety	The installation of the solar street lighting poles would increase the road traffic safety in the selected village. The need for illumination on certain intersections, roundabouts and sharp turns is essential in the selection criteria.
General Safety	The installation of the solar street lighting poles would alleviate the dangers of theft, murder and other security incidents that the village may be witnessing.
Electrical Infrastructure	The locations selected for the installation of the solar street lighting poles lack the necessary electrical infrastructure to allow the installation of grid powered lighting, and or, generator powered lighting.
Technical Assessment	The locations chosen for the solar street lighting poles are technically viable. (pit location and support, pole safety, shading, distance from grid lines…)
Syrian Refugee Population	The installation of the solar Street lighting poles in the village would aid the host communities in accommodating the effects of the Syrian crisis.
Maintenance	The selected municipality is made aware of the necessary maintenance procedures and can carry it out when needed.

3. Selected Villages

Based on the site visits, as well as the qualification, the 13 villages that were selected for the installation of the 320 Solar Street Lighting Poles are as follows (additional three sites added at the end):

1. Nabatieh

Nabatieh is the capital city of the Nabatieh governorate with an estimated Lebanese population of over 100,000 making it the fifth biggest city in Lebanon. Nabatieh houses multiple universities, schools and governmental offices. According to the latest UNHCR report, there are 4,414 registered Syrian refugees currently residing in Nabatieh. We have not implemented any solar street lighting poles previously in Nabatieh. We have allocated 60 poles of the LRF to Nabatieh with a preliminary distribution as follows:

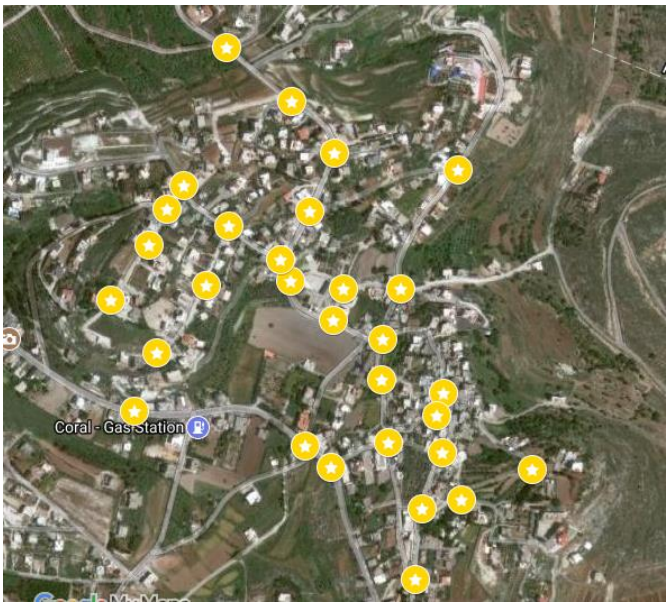


2. Touline

Touline is a small village located in Marjeyoun caza in Nabatieh governorate with an estimated Lebanese population of over 4,000. The residents of the village are mainly poor and depend on agricultural activities. According to the latest UNHCR report, there are 558 registered Syrian refugees currently residing in Touline. We have not implemented any solar street lighting poles previously in Touline. We have allocated 20 poles of the LRF to Touline with a preliminary distribution as follows:

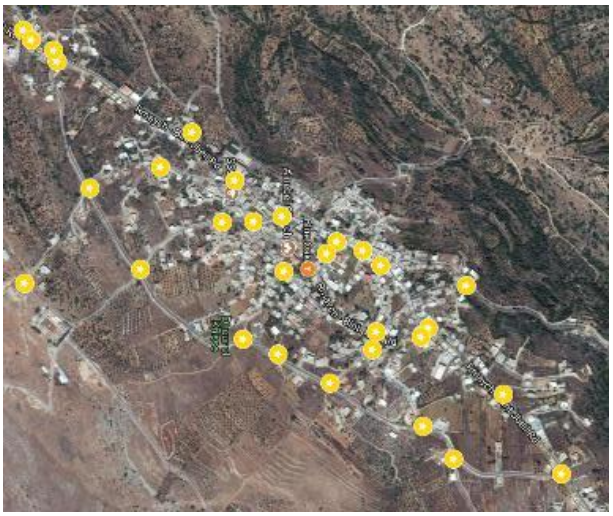
3. Kawthariat el Syad

Kawthariat el Syad is a small village located in Saida caza in South Lebanon governorate with an estimated Lebanese population of over 3,500. According to the latest UNHCR report, there are 132 registered Syrian refugees currently residing in Kawthariat el Syad. We have not implemented any solar street lighting poles previously in Kawthariat el Syad. We have allocated 30 poles of the LRF to Kawthariet el Syad.



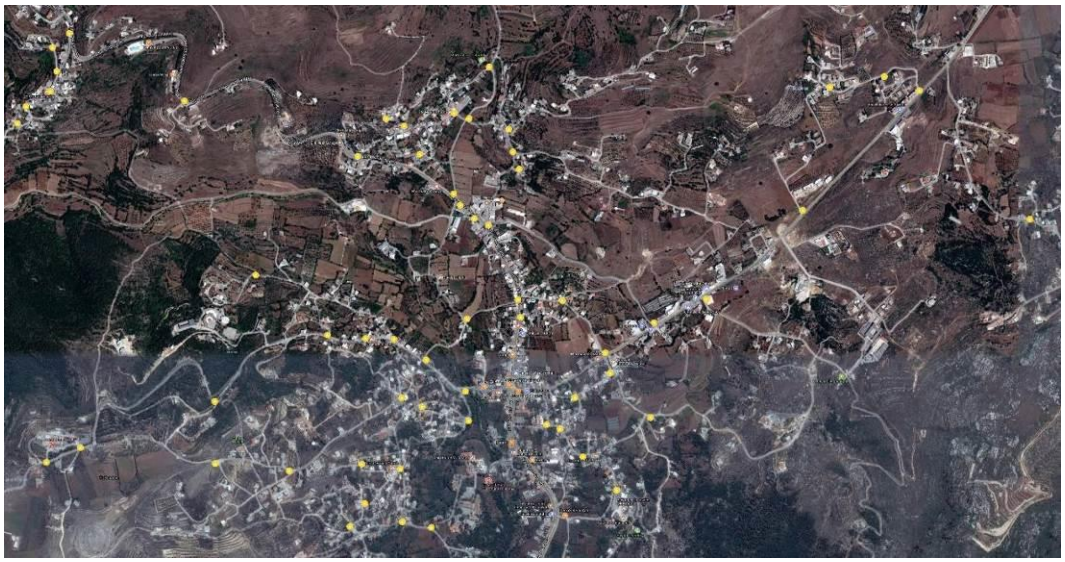
4. Ein Ebel

Ein Ebel is a small village located in Bent Jbeil caza in Nabatieh governorate with an estimated Lebanese population of over 2,000 in winter and 5,000 in summer. Almost half the residents of the village depend mainly on agricultural activities such as tobacco. According to the latest UNHCR report, there are 136 registered Syrian refugees currently residing in Ein Ebel. We have not implemented any solar street lighting poles previously in Ein Ebel. We have allocated 30 poles of the LRF to Ein Ebel with a preliminary distribution as follows:



5. Qobayat

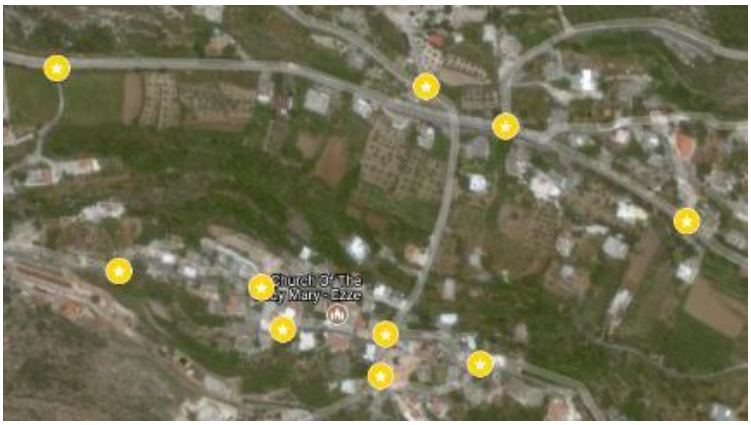
Qobayat is one of the biggest villages of the Akkar governorate with an estimated Lebanese population of over 20,000 during the summer. Qobayat houses many educational and medicinal institutions as well as historic and natural sites. According to the latest UNHCR report, there are 434 registered Syrian refugees currently residing in Qobayat. We have implemented 10 solar street lighting poles previously in Qobayat in 2015. We have allocated 60 poles of the LRF to Qobayat with a preliminary distribution as follows:



6. Izza

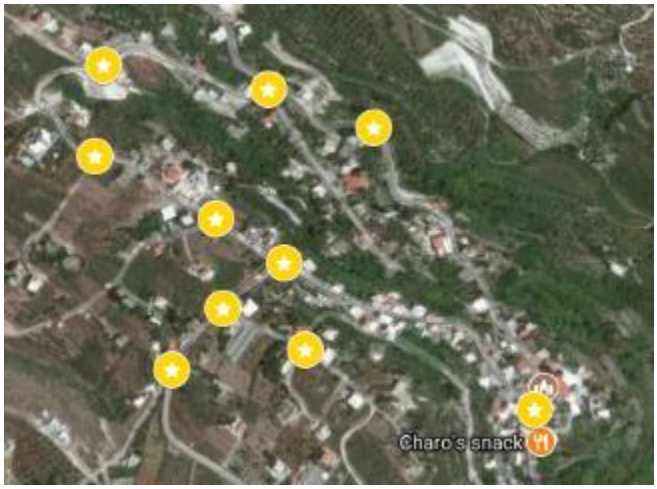
Izza is a small village located in Bent Jbeil caza in Nabatieh governorate with an estimated Lebanese population of 2,500. Almost half of the residents rely on agriculture such as olive plantations. According to the latest UNHCR report, there are no registered Syrian refugees

currently residing in Izza. We have not implemented any solar street lighting poles previously in Izza. We have allocated 10 poles of the LRF to Izza with a preliminary distribution as follows:



7. Maamarieh

Maamarieh is a small village located in Saida caza in South Lebanon governorate with an estimated Lebanese population of 3,000. Almost half of the residents rely on agriculture such as olive plantations. According to the latest UNHCR report, there are 133 registered Syrian refugees currently residing in Maamarieh. We have not implemented any solar street lighting poles previously in Maamarieh. We have allocated 10 poles of the LRF to Maamarieh with a preliminary distribution as follows:



8. Hajje

Hajje is a small village located in Saida caza in South Lebanon governorate with an estimated Lebanese population of over 1,000. Most residents rely mainly on agriculture. Olive plantations form almost 60% of the village's area. According to the latest UNHCR report, there are 17 registered Syrian refugees currently residing in Hajje. We have not implemented any solar street lighting poles previously in Hajje. We have allocated 10 poles of the LRF to Hajje with a preliminary distribution as follows:

9. Wadi el Houjeir Natural Reserve

The reserve is located in Houjeir valley with an historical importance, which runs through a street that connects several villages. The valley is not illuminated at night. Therefore, standalone street lighting poles at several locations between the main street and the village exits will help residence at night to avoid accidents. We have not implemented any solar street lighting poles previously in Wadi el Houjeir. We have allocated 10 poles of the LRF to the reserve with a preliminary distribution as follows:

10. Majdal Selem

Majdal Selem is a rather big village located in Marjeyoun caza in Nabatieh governorate with an estimated Lebanese population of over 10,000. Most residents rely mainly on agriculture such as olive and tobacco plantations. According to the latest UNHCR report, there are 283 registered Syrian refugees currently residing in Majdal Selem. We have not implemented any solar street

lighting poles previously in Majdal Selem. We have allocated 10 poles of the LRF to Majdal Selem with a preliminary distribution as follows:

11. Rihaneye

Rihaneye is a small village located in Akkar governorate with an estimated Lebanese population of over 2,000. Most residents rely mainly on agriculture. According to the latest UNHCR report, there are 382 registered Syrian refugees currently residing in Rihaneye. We have implemented 2 solar street lighting poles previously in Rihaneye in 2017. We have allocated 12 poles of the LRF to Rihaneye with a preliminary distribution as follows:

12. Ghzayle

Ghzayle is a very small village located in Akkar governorate with an estimated Lebanese population of almost 400. Most residents rely mainly on agriculture. According to the latest UNHCR report, there are 62 registered Syrian refugees currently residing in Ghzayle. However, local officials estimate the Syrian refugee population at 700. We have implemented 2 solar street

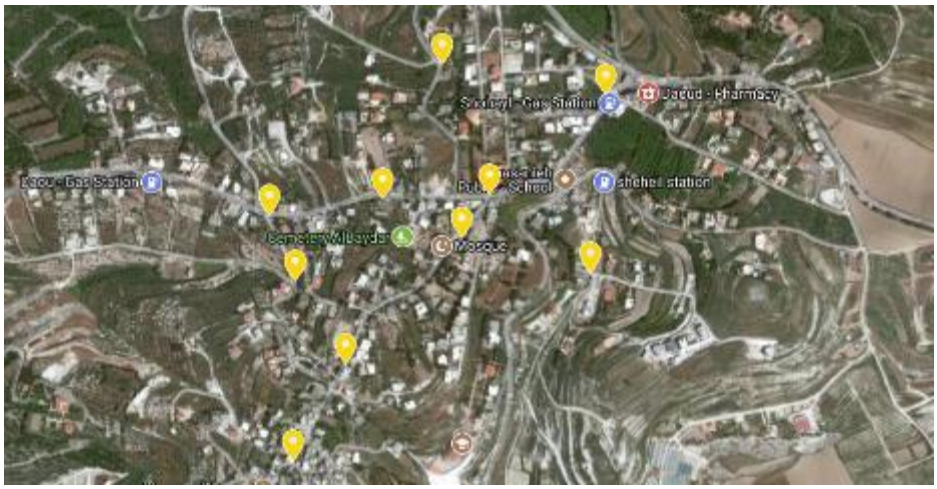
lighting poles previously in Ghzayle in 2017. We have allocated 12 poles of the LRF to Ghzayle with a preliminary distribution as follows:

13. Sharbila

Sharbila is a very small village located in Akkar governorate with an estimated Lebanese population of almost 500. Most residents rely mainly on agriculture. According to the latest UNHCR report, there are 54 registered Syrian refugees currently residing in Sharbila. We have implemented 2 solar street lighting poles previously in Sharbila in 2017. Local officials had requested more poles to be able to illuminate a road used by 8 villages that has witnessed several episodes of crime. We have allocated 14 poles of the LRF to Sharbila with a preliminary distribution as follows:

14. Ghassaniyeh

Ghassaniyeh is a very small village located in South governorate with an estimated Lebanese population of almost 2000. Most residents rely mainly on agriculture. According to local officials estimate the Syrian refugee population at 850. We have allocated 10 poles of the LRF to Ghassaniyeh with a preliminary distribution as follows:



15. Souwayse

Souwayse is a very small village located in Akkar governorate with an estimated Lebanese population of almost 5000. Most residents rely mainly on agriculture. According to local officials estimate the Syrian refugee population at 350. We have allocated 12 poles of the LRF to Souwayse with a preliminary distribution as follows:

16. Kabrikha

Kabrikha is a very small village located in Nabatieh governorate with an estimated Lebanese population of almost 1000. Most residents rely mainly on agriculture. According to local officials estimate the Syrian refugee population at 300. We have allocated 10 poles of the LRF to Kabrikha with a preliminary distribution as follows:

4. Summary of Selected Villages

Village	Governorate	Caza	# of poles	# of previously installed poles	Lebanese Population	Syrian Population
Nabatieh	Nabatieh	Nabatieh	60	0	~100,000	4,414
Aazza	Nabatieh	Nabatieh	10	0	~2,500	NA
Touline	Nabatieh	Marjeyoun	20	0	~4,000	558
Majdel Selem	Nabatieh	Marjeyoun	10	0	~10,000	283
Wadi el Houjeir Natural Resrve	Nabatieh	Marjeyoun	10	0	NA	NA
Ein Ebel	Nabatieh	Bent Jbeil	30	0	2,000 – 5,000	136
Kawthariet el Siyad	South	Saida	30	0	~3,500	132
Maamarieh	South	Saida	10	0	~3,000	133
Hajje	South	Saida	10	0	~1,000	17
Qobayat	Akkar	Akkar	60	10	~20,000 (summer)	434
Rihaneye	Akkar	Akkar	12	2	~2,000	382
Sharbila	Akkar	Akkar	14	2	~500	54
Ghzayle	Akkar	Akkar	12	2	~400	62
Ghassaniyeh	South	South	10	0	~2000	850
Souwayse	Akkar	Akkar	12	0	~5000	350
Kabrikha	Nabatieh	Marjaoun	10	30	~1000	300

Annex 5: Work Progress and Completion

1. Nabatieh:
Installation of street lighting poles in Nabatieh.

2. Hajje
Excavation of the sites in Hajjee village.

3. Touline
Installation of the street lighting in process in Touline Village.

4.b Maamarieh
Completed site in Maamarieh village in Nabatieh, South Lebanon.

4.a Maamarieh
The sites in Maamarieh village are excavated and the installation process has started.

5. Sharbila
Completed site in Sharbila village in Akkar, North Lebanon.

6. Nabatiyeh
Completed site in Nabatiyeh, South Lebanon.