**Final Evaluation of
“CEDRO - Community Energy Efficiency and
Renewable Energy Demonstration Project
for the Recovery of Lebanon (South, Bekaa and Akkar)”**

**Reference Number: 00047251 (CEDRO)
on behalf of UNDP Beirut**

**Final Report**

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**Berlin / Beirut, October 2011**

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**Please note: All comments given in this final evaluation report are exclusively based on the completion of the CEDRO 1 project,
findings and recommendations on CEDRO 2 and CEDRO 3
are not part of this report.**

**Abbreviations**

APR Annual Progress Report

AUB American University of Beirut

BoL Central Bank of Lebanon

CCF Country Cooperation Framework

CDM Clean Development Mechanism

CDR Council for Development and Reconstruction

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

CFL Compact fluorescent lamps

CIDA Canadian International Development Agency

CO Country Office (UNDP)

CSP Concentrated solar power

EC European Commission

EDL Electricité du Liban- Lebanese Electric Utility

EE Energy Efficiency

ESCO Energy Service Company

EU European Union

GEF Global Environment Facility

GHG Greenhouse Gas

GoL Government of Lebanon

GSWH Global Solar Water Heating Transformation and Strengthening Initiative

GTZ Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH

IP Implementation Progress

IPP Independent power producer

IRI Industrial Research Institute

LAS League of Arab States

LASI Lebanese Association for Solar Industries

LCEC Lebanese Center for Energy Conservation

LED Light Emitting Diode

LGBC Lebanon Green Buildings Council

LIBNOR Lebanese Standards Institution

LRF Lebanese Recovery Fund

LSES Lebanese Solar Energy Society

M&E Monitoring and evaluations

MDG Millennium Development Goal(s)

MED-EMIP Euro Mediterranean Energy Market Integration Project

MED-ENEC Euro Mediterranean Project on Energy Efficiency in the Construction Sector

MEW Ministry of Energy and Water, GoL

MoA Ministry of Agriculture, GoL

MoE Ministry of Environment, GoL

MoF Ministry of Finance, GoL

MoJ Ministry of Justice, GoL

MoU Memorandum of Understanding

MSP Medium-sized Project (GEF)

MTR Mid-term Review

MYFF Multi-year Funding Framework

NAP National Action Programme (for UNCCD)

NEX National Execution (UNDP)

ODA Official Development Assistance

OECD Organisation for Economic Cooperation and Development

PIR Project Implementation Report

PM Project Manager

PMT Project Management Team

PSC Project Steering Committee

PV Photovoltaic

RAF Resource Allocation Framework

RCREEE Regional Center for Renewable Energy and Energy Efficiency

RCU UNDP Regional Co-ordination Unit of UNDP

ROAR Result Oriented Annual Report

SESCO Solar Energy Service Company

SIDA Swedish International Development Cooperation Agency

SNC Second National Communication (to UNFCCC)

SRF Strategic Results Framework

SWH Solar Water Heater

TA Technical Assistant

TE Terminal Evaluation

TOR Terms of References

UN United Nations

UNDAF United Nations Development Assistance Framework

UNDG United Nations Development Group

UNDP United Nations Development Programme

UNDP-CO UNDP - Country Office

UNEG United Nations Evaluation Group

UNEP United Nations Environment Programme

UNFCCC United Nations Framework Convention on Climate Change

UNOPS United Nations Office for Project Services

USAID US Agency for International Development

WB World Bank

**1 Executive summary of the evaluation of the CEDRO project**

A **final evaluation of the CEDRO project** (Community Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon - South, Bekaa and Akkar) has been carried out in September and October 2011 in Beirut based on a number of documents provided by the Lebanese side and based on interviews with all main stakeholders in the project and the CEDRO project team itself. The methodology of this final evaluation uses current UNDP and GEF procedures for project evaluation.

The **documents reviewed** were as follows: The Inception Report dated September 2009 and all documents and files in the office of CEDRO. All publications and reports have been evaluated; a two-day seminar “2nd Beirut Energy Forum” with a presentation on CEDRO has been attended in September 2011. In total **17 meetings** with the main stakeholders of the CEDRO project were held during September 2011 and 18 external experts had been interviewed using these UNDP and GEF evaluation schemes. And in addition **6 meetings** with the CEDRO team were organized during this period. In addition **2 demonstration sites** have been visited.

The main findings from the project are as follows: Work has been completed on a good level and the foreseen main activities are finalized. The main benefit from the project and therefor **the main outcome is the increased interest in renewable energy in Lebanon, which is to a large extent based on the successful implementation of the CEDRO demonstration projects**. The project reporting is clear and fully adopted to the content of the project. In total we acknowledge the results achieved during this period as “Satisfactory” (S).

For the future of the project we have the following comments and recommendations: On **the formal side we have the following recommendations:**

* Data analysis so far only started, there is a need to agree with UNDP to delay the data collection from the sites to the CEDRO office and especially the **data analysis** to a later period, when CEDRO 2 and CEDRO 3 project implementation will be completed and data analysis for all CEDRO 1 to CEDRO 3 projects will be done using a common procedure, so far no publications on data analysis made.
* The CEDRO team must ensure continuous back-up of project results. This means that not only all contents of different laptops and PCs are stored in one main computer in the office but also that **two external hard-disks** are being used for weekly or at least be-monthly data storage on an alternate base. At least one external hard-disk must be kept outside the office. This applies not only for the CEDRO 1 project but also for all other projects of the CEDRO team. In addition, a CD-ROM with all reports, documents and data produced during the course of the project should be handed over to UNDP office in Beirut. We urgently recommend establishing an internal and external system to back-up all data from the CEDRO project.
* **Capacity building for management level at beneficiary side** has not been completed, this will be done during CEDRO 2 and CEDRO 3, letter exchange between the CEDRO team and UNDP on time extension for this activity is required.

On **the content side there have been a quite large number of in total 32 recommendations given by stakeholders, out of this long list the main proposals are**.

* Ensuring sustainability by **follow-up of current instalments of SWH** in Lebanon, paying regular site visits to all instalments on a half-year base and inviting them for workshops on proper maintenance and exchange of expertise **(“CEDRO Club”).**
* Simple and **more directed information to the final consumers**, with easy to understand information and best practice, more direct information to potential users of PV, SWH and other renewable energies, especially in the rural and remote areas.
* Ensuring the **quality of products and quality of maintenance** is one of the main concerns. A more rigid follow-up for the entire quality insurance should be established by the CEDRO team for implementation of renewable projects outside CEDRO project and continuous training and certification of dealers and installers within the CEDRO project.
* The project team should prepare a **full list of possible new and advanced projects.** A clear strategy should be developed together with L.C.E.C. team on future co-operation together with the MEW and UNDP/GEF.

**2 Introduction and description of the work conducted during final evaluation of the CEDRO project**

**2.1 Methodology used for the evaluation**

The evaluation methodology used is mainly based on the UNDP and GEF procedures as described in the relevant documents:

* UNDP – United Nations Development Programme: Handbook on Planning, Monitoring and Evaluating for Development Results, New York, 2009
* GEF - Global Environment Facility, Evaluation Office: Guidelines for GEF Agencies in Conducting Terminal Evaluations, Evaluation Document No 3, Washington, DC 2008

Although these are the main documents for this final evaluation, other evaluation methodologies had been partly used, namely:

* UNDP - United Nations Development Programme, Evaluation Office: Handbook on Monitoring and Evaluating for Results, New York 2002
* UNIFEM – United Nations Development Fund for Women: Guidance: Quality Criteria for Evaluation Reports, in: Evaluation Guidance Note Series, No. 8, October 2009
* UNEG: UNEG Ethical Standards for Evaluation, 2007
* UNEG: UNEG Standards for Evaluation in the UN System, 2005
* GEF: Evaluation of the GEF Cycle and Modalities. Joint Evaluation of the GEF Evaluation Office and the Evaluation Offices of the Implementing and Executing Agencies of the GEF, GEF/ME/C.30/6 (GEF Council December 5-6, 2006)
* Executive Board of the United Nations Development Programme and of the United Nations Population Fund: The evaluation policy of UNDP, New York February 2011

The questions given to the external stakeholders of the CEDRO project and given to the CEDRO project team itself include:

* **Relevance** of all project activities and the achievements in relation to the given ToR
* **Appropriateness** of the project design, original design of the project in its relation to the objectives and the ToR
* Revised logical framework matrix and **indicators**
* **Effectiveness** of project implementation
* Status of all **project activities**
* **Performance** of the project compared to the ToR
* Project **achievements**
* **Assessment of given recommendations** of the project received
* **Impact** of the project compared to government and UNDP scopes
* Monitoring and **management activities**
* **Recommendations for future** follow-up
* **Additional new approaches** and technical options
* **UNDP partnership** strategy in relation to the project achievements
* **Sustainability** of the project and its outcomes
* **New impacts** from the project

Those questions were given to the stakeholder and to the project team to discuss both the “approach to the project” and “the expected outcomes of the project”. The assessment in this final evaluation follows the guidelines for GEF agencies in conducting terminal evaluations as given in the evaluation document No 3 dated 2008. For the assessment of project results we follow three criteria, namely

* Relevance,
* Effectiveness, and
* Efficiency

The outcomes from the project will be rated as follows:

* Highly satisfactory (HS)
* Satisfactory (S)
* Moderately satisfactory (MS)
* Moderately unsatisfactory (MU)
* Unsatisfactory (U)
* Highly unsatisfactory (HU)

**2.2 Description of the current situation in Lebanon with reference to the CEDRO project**

The situation for implementing renewable energy in Lebanon is - in general - somehow favourable to achieving the aims of the CEDRO project. On political level there is new support to the CEDRO initiative on Minister level, however on technical level implementation of renewables in Lebanon - compared to neighbouring countries Cyprus and Turkey - proceed slowly, but continuous improvements are achieved. The following documents have been reviewed in order to understand the current political situation in Lebanon in relation to the CEDRO project and the implementation of renewable energy:

* GoL: Setting the stage for long term reconstruction: The national early recovery process. Stockholm, Conference for Lebanon’s Early Recovery. 31 August 2006. – Beirut 2006
* GoL: Recovery, reconstruction, and reform. “International Conference for Support to Lebanon” 25th January 2007, Paris 2007
* MoE: Country Programme. – Ministry of Environment, Institutional Strengthening Project for the Implementation of the Montreal Protocol in Lebanon, Beirut 2005
* Lebanese Center for Energy Conservation (L.C.E.C.): The National Energy Efficiency Action Plan for Lebanon NEEAP 2011-2015, Beirut July 2011
* Ministry of Energy and Water: Policy Paper for the Electricity Sector, Beirut June 2010

The general context of the CEDRO project has to be seen also in the light of international institutions, in general there is full compatibility between CEDRO and the general aims of international organisations:

* UNDP: Common Country Assessment Lebanon 1998. - UNDP, Beirut 1998
* UNDP: Common Country Assessment Lebanon 2000. - UNDP, Beirut 2002
* CDR & UNDP: Millennium Development Goals. Lebanon Report. - Beirut September 2003
* EU: European Neighbourhood and Partnership Instrument: Lebanese Republic Country Strategy, Paper 2007-2013 and National Indicative Programme 2007-2013. - European Commission, Brussels 2007

**2.3 The CEDRO project – description of the project, its status and project documents reviewed**

The following two documents describing the CEDRO project had been reviewed in detail. The first document named as **“Project Document”** serves as a kind of general information on the aims of the CEDRO project; the second document is explicitly named as **“Completion Report”** and serves as the main document for evaluation:

* Government of Lebanon, United Nations Development Programme: “CEDRO” Community Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon (South, Bekaa and Akkar), **Project Document**, Beirut 31/9/.2007
* CEDRO: Lebanon Recovery Fund, **Completion Report**, CEDRO I, 00056604, Beirut, completed as of March 31, 2011.

Additional documents considered during this evaluation process are the two following reports, which give an overview on a **former evaluation** with reference to the CEDRO project:

* Kasparek, Max: Lebanon: Evaluation of the Energy & Environment Programme, An Outcome Evaluation, Beirut, December 2007

Besides these two main documents we have considered a number of **additional documents**, which are linked to the GSWH project, especially political and technical background papers:

* <http://www.undp.org.lb/ProjectFactSheet/projectDetail.cfm?projectId=56>
* http://[www.](http://www.)cedro-undp.org; other related information has been published on this side.

**In addition to these documents** all documents and files in the office of CEDRO including publications and reports have been evaluated; a two-day seminar “2nd Beirut Energy Forum” had been attended in September 2011. **In total 17 meetings** with the main stakeholders (18 external experts) were held during September 2011 and **6 meetings** with CEDRO staff interviewed using a standard procedure based on UNDP and GEF evaluation schemes. In addition, **2 demonstration sites** have been visited.

Based on the review of documents available and based on the interviews and discussions with the all stakeholders in the project the **outcomes of the project were compared to the given contract**, in this case the given Completion Report. As described in the following table the overall achievements are in general good, the main aim of the project *“Increase the use of renewable energy sources in Lebanon“* has been met by the project team. Work has been completed on **satisfactory level**.

**Side-effect on energy policy:** And, besides the contracted work of “implementing demonstration sites with renewables and energy efficiency projects” we definitely appreciate the **overall and long-term positive effects of the CEDRO project on national energy policy in Lebanon**, namely the great value of the project on **new MEW policy with regard of renewables and energy efficiency**. Before CEDRO there was extremely low attention on renewables and energy efficiency in the country, nearly all efforts of energy policy were focussing on providing new electricity to the country (new power stations and transmission network improvements). With implementation of first demonstration projects, the general attendance within the Ministry and Government has **considerably changed as recent activities of MEW with reference to net-metering and the NEEAP plan clearly show** (from our point of view this change in energy policy was mainly influenced by CEDRO project and similar demonstration projects).

**Side-effect on market development:** Besides the positive effect on energy policy by the project we have seen that this project has a long-term effect on the market of energy efficiency measures and renewable products by paving the way for a market for these technologies. Without the pilot projects and without the assistance from the Spanish backstopping experts this market would operate on a much lower level. Suppliers from a large number of countries have implemented their technologies in Lebanon in these demonstration projects and paved the way for renewable energy energy efficiency technologies in the country – this is a side effect of the project but we would rate and judge this side effect even higher then the “pure” implementation of demonstration project all over Lebanon.

|  |  |  |  |
| --- | --- | --- | --- |
| Criteria | Comments | (a) | (b) |
| **General objective: The CEDRO project will install energy efficiency / renewable energy equipment in selected areas based on a comprehensive community needs assessment and will monitor the direct impacts and benefits of the installed equipment**  | **In general, good implementation of the demonstration projects in Lebanon, which leads to larger awareness on energy efficiency and renewable energy within the public, scientific and private sector. Demonstration projects were the main source for the establishment of a large number of equipment dealers and installers, finally also maintenance capacity has been improved due to the high number of installments of renewable energy and energy efficiency projects.** |  | S |
|  |  |  |  |
| **Output 1: Installation of energy efficiency / renewable equipment**  | **In general, excellent project output achieved, all demonstration projects implemented and completed.**  | 100 | HS |
| **Output 2: Energy-related data collection and analysis** | **Data loggers are installed at all demonstration sites, therefore the data are collected at the different locations. Data analysis so far only started, there is a need to agree with UNDP to delay the data collection from the sites to the CEDRO office and especially the data analysis to a later period, when CEDRO 2 and CEDRO 3 project implementation will be completed and data analysis for all CEDRO 1 to CEDRO 3 projects will be done using a common procedure, so far no publications on data analysis made.** | 50 | MU  |
| **Output 3: Increase awareness on energy efficiency and renewable energy on both private and public levels** | **With the completion of the demonstration projects in Lebanon it is first time that these projects are implemented on a larger scale, therefore positive effects on developing a market for renewables and raising awareness both on public and private levels. In parallel with the installations of renewable energy projects the infrastructure for renewable energy (dealers, installers, maintenance companies) had been created. Project output is quite higher then expected.** | 100 | HS |
| **PROJECT OUTPUTS (total)**  |  | **90** | **S** |
|  |  |  |  |
| **Activity 1: Undertake needs assessment at community level in project sites** | **Fully completed. A comparatively huge number of public institutions had shown interest in participating in the CEDRO project, therefore from the long list the short list had been produced and the respective data and drawings for these buildings had been processed.**  | 100 | HS |
| **Activity 2: Identify energy efficient / renewable energy beneficiaries** | **Fully completed. A ranking system had been developed and using a clear list of technical criteria the proposals had been validated for implementation.** | 100 | HS |
| **Activity 3: Develop technical project documentation for all identified beneficiaries** | **Fully completed. All technical specifications and documentations as well the bidding documents for the demonstration projects have been completed based on detailed site visits.**  | 100 | HS |
| **Activity 4: Capacity building plan and development of tariff and management schemes to assure sustainability** | **Partly completed. There has been training measures implemented for both beneficiaries and equipment providers. And there was training for maintenance companies. Capacity building for management level at beneficiary side has not been completed, this will be done during CEDRO 2 and CEDRO 3, letter exchange between the CEDRO team and UNDP on time extension for this activity is required.** | 75 | MS |
| **Activity 5: Procurement / installation / testing / commissioning of equipment and supervision** | **Fully completed. A list of qualified dealers and installers had been developed from a long list to a short list using both local, national and international companies.**  | 100 | HS |
| **Activity 6:** **Capacity building and awareness raising**  | **Fully completed. After an assessment of required capacity building and on awareness raising a large number of measures had been successfully implemented, for example brochures, tv campaign, newsletters, conferences, workshops and homepage for internet access.**  | 100 | HS |
| **Activity 7:** **Data collection and impact analysis**  | **Data collection had been completed at the sites using data logger systems. Transfer of data to the CEDRO office on a certain level has started, only minor data analysis has been completed. There is an urgent need to agree with UNDP on a time extension for the completion of this activity during the implementation period of CEDRO 2 and CEDRO 3.** | 50 | MU |
| **Activity 8: Reporting and documentation of the project and project results** | **Reporting had been completed on a high level, all information necessary for the project completion are very well documented.**  | 100 | HS |
| **PROJECT ACTIVITIES (total)** |  | **90** | **S** |
|  |  |  |  |

Notes: (a) Progress since start of the project (percentage shows the overall progress for the entire project, 25/50/75/90%)

(b) Criteria according to GEF evaluation scheme: •Highly satisfactory (HS), •Satisfactory (S), •Moderately satisfactory (MS), •Moderately unsatisfactory (MU), •Unsatisfactory (U), •Highly unsatisfactory (HU)

*Table 1: Comparison of the main achievements during the CEDRO project as in the “Completion Report” compared to the given terms of reference in the “Project Document”*

The evaluation of the project clearly shows that the tasks given in the “Project Document” for the CEDRO project are still valid and valuable for Lebanon (Relevance), “renewable energy” still needs the support of the CEDRO team to be brought on a wider scale into the Lebanese market. The project implementation has been lacking with implementation compared to the original plan dating back to September 2007 but has now been (as in the March 2011plan) completed (Efficiency). The work programme and its implementation are still valid and effective for Lebanon, even as there are several implementation measures (Effectiveness) started and some have been completed, but continuous input from the team is necessary as the work in CEDRO 2 and CEDRO 3 clearly shows.

**2.4 Stakeholders in the CEDRO project**

The project is financed by MDTF Fund contribution with a total budget of USD 2,732,240, where in total USD 2,702,240 had been spent until March 2011. The entire budget comes through a grant from the Spanish Government via the LRF.

The National Focal Point for the project is Mr Mahmoud Baroud, Director General at the Ministry of Energy and Water (MEW). The project is supervised by UNDP, Ms Jihan Seoud, United Nations Development Programme, Officer in Charge (OIC), Energy and Environment.

Execution of the project is done by the CEDRO project team. The respective Project Manager responsible for project implementation is since 2009 Mr Hassan Harajli, who followed the former Project Manager Mrs Matilda Khoury (2007-2009).

**2.5 Time schedule in the CEDRO project**

The following time schedule is applicable for the project:

* 2007, September Project Document for CEDRO 1 completed
* **2007, October Start of the project (effective start)**
* 2011, March Revised end date
* **2011, March Operational closure**
* 2011, October Final evaluation of CEDRO 1 project
* 2012, March Financial closure for the project

**3 Findings and conclusions**

With reference to the **project content** of CEDRO we have seen only a few deficits, the project is highly welcomed by the “energy community” in Lebanon. All energy and building experts understand this CEDRO project as a unique chance to implement renewable energy to the market. All experts questioned confirm the necessity of the project and welcome the contributions received from outside the country. Renewable solar energy has great potential in Lebanon, because of its reliability. Political factions and organisational problems made it impossible to establish a well-organised energy infrastructure, electrical power supply is instable.

With reference to CEDRO 2 and CEDRO 3, which are currently under implementation the following proposals for a certain modification of the new CEDRO projects could be considered. All in all, we have received a huge number of proposals and proposals for amendment out of which we have identified 32 proposals by combining the same aspects of remarks and recommendations and grouped them into 7 areas:

1. General strategic aspects
2. Public Relations, communication and training
3. Quality aspects
4. Sustainability
5. Legal and regulatory aspects
6. Proposals for new projects
7. Organizational aspects

which are explained and discussed in detail:

1. **General strategic aspects**
2. CO-FINANCING / FULL COST COVERING: It is recommended to start introducing partly co-financing project by the beneficiary of the project in order to attract the owners’ interest at a higher level, this could lead for example to 90/10 financing between public finance and individual financing and this will attract more “really convinced people” with real initiative which will lead to a higher success rate of the projects. It is clear that according to the contracts signed, CEDRO can exclusively operate in the public sector.
3. NEW INSTALLATIONS / ADDITIONAL INSTALLATIONS: At those places, where projects have been installed, maintained and used effectively it is recommended to offer those who successfully implemented the projects a chance for applying for new additional supporting projects. For example, the Saida hospital’s use and maintenance of the SWH system is a success story. And they would like to add an installation of a PV system as the hospital is facing continuous shortages of electricity of about 4 to 6 hours a day.
4. RURAL AND REMOTE AREAS / LARGE CONSUMERS IN URBAN AREAS: There are proposals to concentrate on urban areas with multi-owner houses to promote and install in urban areas renewable energy as a comprehensive solution, especially for multi-owner-houses and large scale users, for example apartment buildings, hotels or dormitories for students while other recommendations are to concentrate on rural and remote areas.
5. PUBLIC / PRIVATE SECTOR: There is the proposal to move from projects for the public sector to projects in the private sector. Other statements say that as this is public money, the need to support the public sector is the priority as there are very limited financial resources in the public sector for renewable energy. This could start covering “all” kind of public buildings, for example in addition to currently served schools and hospitals, for example army, airport or security units. Again, it is clear that according to the contracts signed, CEDRO can exclusively operate in the public sector.
6. REGIONAL COVERAGE PRIORITY REGIONS / ALL LEBANON: There is a strong recommendation to support projects also in the Northern and other parts of Lebanon and end exclusive support to the Southern parts of Lebanon following the 2006 war. The project should cover the entire area of Lebanon. Concentration on remote areas would mean that comparatively poor people would benefit from savings of electricity bills. For example this could be organized with the respective chiefs of the municipalities. And, installment could be also concentrated for new resort villages, which are newly constructed as the additional costs compared to the overall cost can be neglected. Here we will have the advantage that the management of the resorts could ensure proper maintenance of the solar installations. Other proposals were on implementing PV systems in remote houses, and concentrate for SWH on non-Beirut areas. Urban areas: better maintance and higher success rate; rural areas: for the poor and would help to bridge the big city-countryside gap.
7. ENTIRE BUILDING versus COMPONENTS: It was recommended that demonstration projects should cover an entire building and improve the performance of the entire building, or, if only main components of a building should be upgraded. A full upgrading of an building in terms of energy efficiency and renewables use would require a reduction of the number of sites for renewables energies. For the moment, “electricity” is the main topic in Lebanon, and therefore other energy carriers are of non-priority level, for example heating with oil.
8. NUMBER OF INSTALLATIONS / SIZE OF INSTALLATIONS: It was discussed, whether the goal of the project is to “reach a high number of customers” or to “reach a high number of installed m2 of solar panels”. For example, the installments at the Lebanese army have a large number of beneficiaries, in this case 3,000 soldiers, which is by the number more beneficiaries then installments on hundreds of rural houses or, “reach a high number of beneficiaries” (for example 3,000 soldiers).
9. **Public Relations, communication and training**
10. PUBLIC AWARENESS: It is strongly recommended by a number of stakeholders that more publicity should arrive in the media, especially interviews with TV, which is usually cost free. For the demonstration projects a more directed P.R. work (“How attractive is PV?”) is requested in order to stimulate the market introduction of renewable energy. The CEDRO project should develop a market and sales drive within the next years and target on a more active level the private consumers in order to attract them to financing renewable energy. It was seen as one of the main obstacles for the use of renewable energy in a more clear structure, showing how much investors and house owners could save with the installation of renewable energy. It is recommended to reduce the gap of guidance by better and more directed information to possible investors, with easy to understand information on solar energy, especially continuous presentations of real case results of individual house owners having implemented renewable energy.
11. CONSTRUCTION COMPANIES AND ARCHITECTS: These experts should be more targeted same as the newly constructed “large scale” buildings.
12. DECREASING COST FOR INVESTMENTS BY INCREASING COMPETITION: Increased competition between installers and dealers would help to reduce total costs for renewable energy in Lebanon. It was reported that the costs for SWH installations in Lebanon are about twice the price level in Jordan due to import tax (which is currently only 5%), but especially for customs clearance papers, but also VAT (which is currently also at the moderate level of 10%) and due to currently limited **competition between dealers and installers.**
13. **Quality aspects**
14. QUALITY ASSURANCE: Quality of products should by all means assured. Product quality should be regulated by the government as there is negative experience with products from countries like China. Same applies for the installation companies, which should work with qualified staff. There were a number of installations problems with corrosion occurring, therefore it was recommended to introduce a system of certifications to Lebanon. For example Chinese SWHs are offered at a price of 900 USD, while conventional European systems cost 1,500 USD. The difference between the systems is due to different quality of material, for example the vacuum systems have 0.5 mm while others have 1.5 mm of steel in the pipes, therefore corrosion more often leads to leakages. And this damages the entire reputation of solar energy. On the other hand the subsidies and the 0% loans are very helpful for the market introduction. Also due to inappropriate quality two banks have stopped their co-operation with GSWH as they received heavy complaints from customers on quality of SWHs. Another urgent need is the qualification of installers, all Lebanese installers should pass a three-day-training course and pass through a test (“real test”). This could be done by accredited certifiers like IRI, the Ministry or a NGO.
15. QUALITY ASSURANCE: It was agreed that quality controlled products, quality controlled suppliers and quality controlled maintenance for renewable energy equipment in Lebanon would help the entire industry for renewable energy. *There was a strict quality assurance system implemented for the demonstration sites, which were part of the CEDRO project. For some other NON-CEDRO projects with similar installations (solar water heating and PV) it has been reported that due to some unqualified dealers a number of consumers did not receive the foreseen subsidies and 0% loans. Other reports on low quality of equipment were given. Of course the CEDRO project can not be judged for inappropriate renewable projects, but as one of the main aim is the dissemination of renewable projects on the country this quality aspect of NON-CEDRO installations can not be neglected as this influence the market for renewable energy in Lebanon.* This should be tackled with priority with measures on continuous training of dealers and installers and a parallel well followed certification process for dealers and installers.
16. WIND TESTING STATIONS AND CALIBRATIONS: In order to better validate the results from the wind atlas, for example one station for one year as a field test could be made available.
17. PLANNING PROCESSES: It should be ensured that the final beneficiary should be included to the planning process from the beginning as the momentum on renewable energy systems is up in Lebanon. We understand the difficulty of implementing first demonstration projects in Lebanon, where nearly no experience and infrastructure for renewable projects was existing. Of course the selection process at the beginning of the project requested the participation of the respective beneficiaries, otherwise these projects would not have been started and these processes were coordinated by the CEDRO team. On the other hand, as the implementation of CEDRO projects was strictly limited to the public sector, we are now facing the “normal” procedures of investments and maintenance in the public sector. Therefore there was no complain on the selection and construction process of the CEDRO projects, but there is request for better co-operation between stakeholders for the maintenance and continuation phase.
18. **Sustainability**
19. CONTINUATION: It is recommended to carry out a “Study of possibilities for continuation of the demonstration projects completed by the CEDRO project” and implement the recommendations at an early stage of the project. This means that during the remaining period considerable efforts should be allocated to ensure continuation of the started and completed projects on SWHs. So far any maintenance of the equipment installed was usually – with minor exceptions – organized and financed by the CEDRO project. After completion of the project continuous maintenance has to be ensured and the procedures to cover the respective cost for this maintenance as well cost for replacing parts of the equipment (life time of batteries are in average 5 to 7 years) will have to solved. This is crucial for the long-term success of CEDRO.
20. KNOWLEDGE TRANSFER: Recommendation is given for ensuring knowledge transfer to future projects considering the goals given in the NEEAP.
21. IN-HOUSE TRAINING COURSES: Recommendations were given to arrange for all installments from CEDRO and exchange of experience between users.
22. MAINTENANCE TRAINING: The topic of ensuring and allocating funds for long-term proper maintenance of the demonstration projects of the public sector was discussed. At least the batteries will have to be changed after 5 to 6 years operation, therefore training of technicians and training of operators of hospitals and schools should increase the long-term effect. With this kind of maintenance training in order to get a better understanding of the installed system and improved awareness raising and more continuous information on the benefits for individuals on installing SWH is needed.
23. CEDRO-CLUB (CC): This is a place where the participants and beneficiaries of the different CEDRO project phases meet on a regular base in order to exchange lessons learned.
24. **Legal and regulatory aspects**
25. BETTER LABELLING: It is recommended to ensure better labeling of the renewable energy systems to be sold on the Lebanese market.
26. SMART METERING WITH NET-METERING: This topic was raised by a number of stakeholders as the finalization of “Net-Metering-Regulation” should be given priority within the CEDRO project in order to stimulate the private sector for investments in solar energy. Net-Metering has been put into the discussion within Lebanon by the CEDRO project team due to installations of PV systems and the impossibility to sell any over-capacity to the grid or at least to balance against payments to EdL, the Lebanese electric utility.
27. **Proposals for new projects**
28. GREEN MODEL VILLAGES: A proposal was given for five different municipalities in each of the five main regions of Lebanon to get a support on construction of PV and SWH and wind/biomass as a “green” model village as examples in other countries show. This could lead to project costs of about 5 Mio USD. This has been identified as priority compared to the other proposals and recommendations for new project given.
29. PV OFF-GRID-PV-APPLICATIONS: Priority to be given for the remote areas with PV systems was recommended.
30. WIND FARMS: The support for the development of projects for wind energy farms was given by some stakeholders to be understood as a next step for narrowing down the results from the wind atlas, for example the planning of a 80 MW wind farm in the North of Lebanon (West of Tripoli).
31. NEW BUILDINGS: New apartment buildings, new hotels and other new multi storey buildings with high hot water consumption should be attracted to the use of solar energy as hot water consumption is relatively high in these buildings (shower, pools, washing/cleaning).
32. GREEEN BUILDING: It was recommended for a full design of a Future Green Building of the MEW near Bourj Hammoud, which could use all types of renewable energy and have all energy efficiency measures included at a possible size of about 2,000 m2. Additional investment costs for the “green” part of the building including design are estimated at about 2 Mio USD.
33. SOLAR HEATING: Some proposals were made to start investigating in solar heating, as this could be useful for mountain areas, at least a kind of pre-heating in these areas in order to avoid use of wood for heating. This is of lower priority compared to the other proposals.
34. ENERGY BUS: A proposal on an “energy bus” or an extension of the current vehicle demonstrating the use of SWH was discussed where demonstration of prototypes of solar heating and PV could be demonstrated in remote areas at a larger extent in order to penetrate the market in remote areas in all part of Lebanon.
35. **Organizational aspects:**
36. PLANS READY FOR FUTURE PROJECTS: It was recommended to have ready proposals for a continuation of the current CEDRO activities, just in case a CEDRO IV project could be launched.
37. ADDITIONAL NEW FUNDS: Also various stakeholders recommended the need to add additional new funds to the CEDRO project from other country sources in order to strengthen the use of renewables in Lebanon.
38. “OPEN FORUM”: Proposal was given for a public conclusion on the CEDRO project evaluation. We document this opinion here and clearly understand the interest of the scientific and business community in Lebanon to follow the projects, but we do not recommend to accept this proposal. We understand that a presentation of the evaluation could be given at the “end-year seminar”, which is planned anyhow for December 2011.
39. ONE TEAM, ONE UNIT, ONE LOCATION: Given the size of Lebanon as small country and with reference to CEDRO and GSWH it was recommended to see one common approach or one unit continuing at one common place in the long term after completion of the two individual projects. This can be discussed and planned at a later stage of the projects.

These recommendations based on a large number of interviews will have to be seen in relation to the agreed work programme and the budget available. Therefore any recommendation within Chapter 4 should be linked to a recommendation on an equivalent in reduction of other working steps or reduction of original work plans of CEDRO 2 and CEDRO 3 projects.

**4 Recommendations**

Taking into consideration the achievements until today, the current project planning and given budget restrictions the following recommendation as an outcome of the evaluation are presented here.

For the future of the project CEDRO 2 and CEDRO 3 we have the following comments and recommendations: On the **formal side** we have the following recommendations:

* **Data analysis** so far only started, there is a need to agree with UNDP to delay the data collection from the sites to the CEDRO office and especially the data analysis to a later period, when CEDRO 2 and CEDRO 3 project implementation will be completed and data analysis for all CEDRO 1 to CEDRO 3 projects will be done using a common procedure, so far no publications on data analysis made.
* The CEDRO team must ensure continuous **back-up of project results**. This means that not only all contents of different laptops and PCs are stored in one main computer in the office but also that two external hard-disks are being used for weekly or at least be-monthly data storage on an alternate base. At least one external hard-disk must be kept outside the office. This applies not only for the CEDRO 1 project but also for all other projects of the CEDRO team. In addition, a CD-ROM with all reports, documents and data produced during the course of the project should be handed over to UNDP office in Beirut. We urgently recommend establishing an internal and external system to back-up all data from the CEDRO project. We see a deficit in securing the results from CEDRO 1, but this applies also to CEDRO 2 and CEDRO 3. As there is no continuous back-up of the projects and data collected we urgently recommend establishing an internal and external system to back-up all data from the project. The CEDRO team must ensure continuous back-up of project results. This means that not only all contents of different laptops and PCs are stored in one main computer in the office but also that two external hard-disks are being used for weekly or at latest be-monthly data storage on an alternate base. At least one external hard-disk must be kept outside the office.
* **Capacity building for management level at beneficiary side** has not been completed, this will be done during CEDRO 2 and CEDRO 3, letter exchange between the CEDRO team and UNDP on time extension for this activity is required.

On **the content side there have been a quite large number of in total 32 recommendations given by stakeholders,** From our point of view nearly all of them are worthwhile and constructive, some of the recommendations given are contradictive, but all recommendations were given in a positive way. Taking into account those arguments and the budget restrictions we recommend the following for the two current CEDRO projects, namely CEDRO 2 and CEDRO 3. **Out of this long list the main proposals are**.

* Ensuring sustainability by **follow-up of current instalments of SWH** in Lebanon, paying regular site visits to all instalments on a half-year base and inviting them for workshops on proper maintenance and exchange of expertise **(“CEDRO Club”).**
* Simple and **more directed information to the final consumers**, with easy to understand information and best practice, more direct information to potential users of PV, SWH and other renewable energies, especially in the rural and remote areas.
* Ensuring the **quality of products and quality of maintenance** is one of the main concerns. A more rigid follow-up for the entire quality insurance should be established by the CEDRO team for implementation of renewable projects outside CEDRO project and continuous training and certification of dealers and installers within the CEDRO project.
* The project team should prepare a **full list of possible new and advanced projects.** The CEDRO project team should prepare a **full list of possible new and advanced projects** to have ready for presentation in order to allow continuation of successfully completed work and avoid loss of “common technical, organisational and regional know-how from CEDRO project implementation”, a priority for project for the Management of the CEDRO project. In addition, a clear strategy should be developed together with L.C.E.C. team on future co-operation together with the MEW and UNDP/GEF.

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**6 Annexes**

**6.1 Brief summary of the key documents reviewed**

The main document for the evaluation is the **“Completion Report”** dated March 2011. This text is the basis for the conclusions drawn from the project in comparison to the **“Project Document”** dated September 2007.

Besides this, all publications of the CEDRO team have been reviewed in the premises of CEDRO, for example **newsletters, homepage, conference proceedings and project reports**. Finally the files in the **internal filing system** of the CEDRO project have been reviewed.

**6.2 Brief summary of meetings with persons interviewed**

Besides 6 meetings with staff of the CEDRO team, in this chapter the minutes of meetings held in Beirut and other Lebanese cities during period 12th September to 16th September 2011 are summarized, the minutes are presented in an alphabetical order. In total **17 meetings with in total 18 external experts** from outside the CEDRO project had been held *(please note that yellow highlighted parts of the minutes indicate that proposals are given for the future of the CEDRO project, but sometimes the interviewed persons mixed CEDRO project with other projects in this field, for example the GSWH project or other initiatives of the CEDRO project team)*.

(Abiak) 14th September 2011, Mr Jahad Abiak, Lebanese Norm Institute (LIBNOR)
Mr Abiak was replacing Mrs Lena Degham, who was not available for personal reasons and illness within the family. Mr Abiak stated that he considers the project as very useful for the country, especially the new and innovative financing system. He said that the only comment from his side is, that he would have had the project implemented at a quite earlier time (about 10 years before). Mr Abiak promised to hand over the given questions to Mrs Degham and Mrs Degham will comment the position of LIBNOR in relation to CEDRO and GSWH in written form to the evaluator.

(Abusaid/Houri) 13th September 2011, Mr Ramzi Abusaid and Mr Ahmad F. Houri, the Lebanese Solar Energy Society
Both members of LSES highlighted the important impact of the GSWH project on the Lebanese energy situation, the project is absolutely necessary for Lebanon in order to meet the challenge of 12% renewables energies in 2020. The members gave a number of recommendations for the second half of the GSWH project, for example to move the projects to a partly self-financing in order to attract the owners interest at a higher level, this could lead for example to 90/10 financing between public and private sector and attract more “really convinced people”; those should be included to the planning process from the beginning as the momentum on SWH is up in Lebanon. With reference to CEDRO the recommendations are to move from projects for the public sector to projects in the private sector. And there is a strong recommendation to support projects also in the Northern part of Lebanon and end the exclusive support to the Southern part of Lebanon. And, the combination of smart metering with net-metering as well the finalization of the “Feed-in-Law” or at least the “Net-Metering-Regulation” should be given priority within the GSWH project in order to stimulate the private sector for investments in solar energy. In detail, an addendum to the GSWH project was discussed and designed, where 5 different municipalities in each of the five main regions of Lebanon get a support on construction of PV for 20 different applications (per installment costs will occur at 4,000 USD, while the production of 1,600 kWh/a could be subsidized by 14 c/kWh, which will require subvention of about 100,000 USD and a similar sum of 200,000 USD for project implementation and project management).

(Alana) 16th September 2011, Mrs Alana, Director of the General Saida University Hospital
Mrs Alana states that the hospital takes full benefit from the installed 68 solar water heating panels on the roof of the hospital (water temperature in summer 60 – 100 degree C, in winter 15 to 30 degree C). Since then diesel consumption has been reduced by 50% during the entire phase of the project. A recommendation given by the hospital is the organization of a 2/3 day in-house training course in the hospital on the use of the SWH system. And they would like to add an installation of a PV system as the hospital is facing continuous shortages of electricity of about 4 to 6 hours a day.

(Alaya) 12th September 2011, Mr Mohamad Alaya, EdL
Mr Alaya welcomes the GSWH project as this project will reduce electricity consumption for water heating, while EdL is facing continuous shortages of electricity. All EdL prices are subsidized, therefor there is limited economic interest by Lebanese house owners on SWH installments. For the future he recommends to promote and install in urban areas SWH as a comprehensive solution, especially for multi-owner-houses. And he recommends to narrowing down the results from the wind atlas to develop projects for wind energy farms. Finally he recommends to supporting the Lebanese government with a specific law on feed-in-tariffs.

(Baroud) 13th September 2011, Mr Mahmoud I. Baroud, MEW
Mr Baroud stated that current co-operation with the L.E.C.E. in the GSWH project team is excellent and mentioned the good experience of the team and stabile work. With reference to the GSWH project he would like to see a broader approach covering “all” public buildings, for example in addition to currently served schools and hospitals, for example army, airport or security units. And, he proposes to concentrate for SWH on non-Beirut areas. Mr Baroud recommends to extent the project from a demonstration project to a legal implementation project, therefore widening the horizon of the project from “pure” demonstration to more legal and regulatory implementation, for example a modification of the regulations on newly constructed houses should be reviewed on usability for renewable energies. With reference to CEDRO and GSWH he would like to see one team and one unit. Finally he highlighted the need to add additional new funds to the GSWH project from other country sources in order to strengthen the GSWH initiative.

(Chaaban) 12th September 2011, Mr Farid Chaaban, AUB
The GSWH initiative is, according to Mr Chaaban, very important to the country as the strategy is 12% renewables energies in 2020 and to diversify energy sources. Mr Chaaban welcomes the new dimension of capacity building and awareness raising combined with the new financing schemes. For the future he recommends to more widespread the SWH installments also to other regions then the South, and more publicity in the media, especially interviews with TV, which is usually cost free. For the CEDRO project he recommends a testing stations and calibrations in order to better validate the results from the wind atlas, for example one station for one year as a field test. Finally he recommends a kind of “Open Forum” for the conclusions on CEDRO/GSWH project evaluation.

(Chbat) 12th September 2011, Mr Wissam Chbat, MEW
Main topic for MEW is the electricity shortages and the construction of 700 MW new capacity as combined cycle process in the North at Delaware station. In order to reduce shortages, MEW understands the necessity to reduce water heating by electrical installments with SWH. Important is the public awareness and the innovative financing of the project. And, Energy Conservation Law is ready to be discussed by the Parliament. He is satisfied with the work output of the L.C.E.C. team and considers the team as well experienced. His intention is to make the L.C.E.C. team responsible for energy efficiency and for carbon trading. About 8,000 loans had been launched, which is a challenge for a region, where there is no specific culture on energy efficiency. The incentives for installment of SWH should continue, without continuation of the project there are risks for sustainability. For the future, Mr Chabat recommends to target more on construction companies and architects, and to target on “big” buildings. Mr Chabat also mentioned off-grid-PV-applications as a topic for L.C.E.C. in the future. The move of CEDRO project to MEW building was also discussed.

(De Clercq/Hakim/Choucair) 13th September 2011, Mr Christian De Clercq / Mrs Lea Hakim / Mrs Farah Choucair, Ministry of Finance (MoF)
The participants of the meeting see both projects as main step forward for the implementation of the target of 12% renewable energy in 2020. They recommend a more directed P.R. work (“How attractive is SWH?”) in order to stimulate the market introduction of SWH. The GSWH should develop a market and sales drive for the next two years. The participants welcomed the National Energy Efficiency Action Programme, but also stated that the lack of communication has to be reduced as they received the NEEAP just the same day when the NEEAP was planned to bereleased to the public.

(Haijar) 14th September 2011, Mr Mohamad Hajjar, Industrial Research Institute (IRI)
Mr Hajjar presented the testing site for solar water heating equipment at his institute. The development of the testing field is a joint co-operation between IRI and L.C.E.C., where samples are drawn from imported SWH equipment, which usually arrive at one of Lebanese harbors. Samples are drawn and the testing procedure is done according to the norm of EN 12975. Currently the site is used for “testing the testing equipment”. Inauguration is foreseen for mid October 2011. The testing circle includes performance tests and reliability tests for 5 days. All SWH is being imported as there is no production line for SWH equipment. It is clear for this visit, that the testing field has never been in operation, chairs are not unpacked, computer have not been installed, and there is definitely no solar collector installed in the testing field (photos of the empty testing field are available on request). Even testing of vacuum pipes for SWH is technically not possible with this equipment and should be made available. Two proposals were given for future project extension; one is on an improved training in Europe, where well equipped test fields are in operation since long time and, a possible extension of the test field for the solar panels to a testing field for solar systems including the collectors, storage system, pumps and control system. For the evaluation it is clear that there should not be any extension before the current installed system is successfully running for a longer period.

 (Harajli) 14th September 2011, Mr Hassan Harajli, Country Energy Efficiency and Renewable Energy Demonstration Project for the Recovery of Lebanon (CEDRO), Project Manager
Mr Harajli gave an overview on the starting period of the CEDRO project, namely the CEDRO I project, which was launched in October 2007 and had been completed in March 2010. He referred to the Quarterly and Yearly Reports that had been published. Since then CEDRO II and CEDRO III have started, he expects the total cost at the end of the three CEDRO projects at 9.7 Mio USD. Cooperation with the funding agency AECID is excellent, they are informed on all activities and the Spanish Ambassador from time to time participates in the inauguration of the demonstration projects. Newsletters are published on a regular base, i. e. twice a year. Invoices of the project are controlled by UNDP. CEDRO I has completed 20 projects for PV and 4 projects for SWH. As to time delays in the beginning of the CEDRO I project, the spending of the budget for the demonstration projects was very weak, which means, that also the completion of the demonstration projects was not as foreseen in the original ToR. Considerable delays were handled through a time extension. For the next periods of CEDRO there are some discussions on a moderate change in the philosophy of the project, if the demonstration projects should cover an entire building and improve the performance of the entire building, or, if only main components of a building should be upgraded. A full upgrading of an building in terms of energy efficiency and renewables use would require a reduction of the number of sites for renewables energies, for example from 100 sites to 30 to 40 sites pending on the total investment costs. And there are concerns about the knowledge transfer to future projects considering the goals given in the NEEAP. Finally a project which could be considered as important would be the full design of a Future Green Building of the MEW near Bourj Hammoud, which could use all types of renewable energy and have all energy efficiency measures included at a possible size of about 2,000 m2.

(Osseiran) 12th September 2011, Mr Karim M. Osseiran, MEW
Mr Osseiran welcomes the work of the CEDRO team, especially as the Ministry itself has nearly no internal resources to work on operational level. Therefore he is thankful for the help by UNDP especially for the projects on “waste to energy”, “hydropower extension”, micro hydropower”, and “geothermal atlas”. Mr Osseiran is the correspondent in the Ministry for the CEDRO project. He meets with the Minister and reports about any progress of the projects. Without the CEDRO project by UNDP all internal resources would be allocated within the Ministry to the extension of conventional power stations. He recommends extension of the project and highlighted that with CEDRO there is the “luxury” of promoting and implementing renewables in Lebanon.

(Roda) 14th September 2011, Mrs Irene Cabrera Roda, Spanish Agency for International Development Cooperation (AECID)
Mrs Roda stated at the beginning of the meeting that she is in Lebanon since one year and that she follows about 45 projects of the Spanish government in parallel. Spain has a number of 1,200 troops in Southern part of Lebanon and therefore gives priority to projects in this region. Mrs Roda finds the project important for Lebanon and proposes two topics as the financing of the projects will end in October 2014. Within the remaining period the contractor should emphasis on a “Study of possibilities for continuation of the demonstration projects completed by the CEDRO project”. This means that during the remaining period considerable efforts should be allocated to ensure continuation of the started projects and started project approach. And, it was recommended that the team should have ready proposals for a continuation of the current CEDRO activities, just in case a CEDRO IV project could be launched.

(Sarkis) 15th September 2011, Mr Richard Sarkis, Order of Engineers and Architects Beirut (OoE)
Mr Sarkis is positive for the results achieved in the two projects, GSWH and CEDRO, even as there is very slow implementation. He proposes to reduce the gap of guidance by better and more directed information, with easy to understand information on solar energy. In his opinion the incentives given in the projects help a lot for the promotion of solar energy. But he states, that quality of products should by all means ensured. Product quality should be regulated by the government as there is negative experience with products from China. Same applies for the installation companies, which should work with qualified staff. He proposes to concentrate on remote areas as there are comparatively poor people live, which would benefit from savings of electricity bills. This could be organized with the respective chiefs of the municipalities. And, installment could be concentrated for new resort villages, which are newly constructed as the additional costs compared to the overall cost can be neglected. Here we will have the advantage that the management of the resorts could ensure proper maintenance of the solar installations. Also new hotels and other new buildings with high hot water consumption should be attracted for the use of solar energy as hot water consumption is relatively high in these buildings (shower, pools, cleaning).

(Sfeir) 15th September 2011, Mr Jean Paul Sfeir, Solarnet
Mr Sfeir highlights the efforts by the two projects to introduce renewable energy into Lebanon. He has seen that for a number of installations problems with corrosion occurring, therefore he recommends to introduce a system of certifications to Lebanon. For example Chinese SWHs are offered at a price of 900 USD, while conventional European systems cost 1,500 USD. The difference between the systems is due to different quality of material, for example the vacuum systems have 0.5 mm while others have 1.5 mm of steel in the pipes, therefore corrosion more often leads to leakages. And this damages the entire reputation of solar energy. On the other hand the subsidies and the 0% loans are very helpful for the market introduction. Also due to inappropriate quality two banks have stopped their co-operation with GSWH as they received heavy complaints from customers on quality of SWHs. Another urgent need is the qualification of installers, all Lebanese installers should pass a three-day-training course and pass through a test (“real test”). This could be done by accredited certifiers like IRI, the Ministry or a NGO. And, in order to allow a long-term effect from solar energy with reference to the CEDRO project he recommends allocating funds for long-term proper maintenance of the demonstration projects of the public sector. At least the batteries will have to be changed after 5 to 6 years operation, therefore training of technicians and training of operators of hospitals and schools should increase the long-term effect. Finally he recommends to put efforts on the net-metering initiative, which will allow a considerable increase in the installation of PV systems.

(Sroud) 16th September 2011, Mr Sroud, Director Middle School Sfeir
Mr Sroud is very thankful for the donation given by the UNDP programme in installing a 2,05 kW photovoltaic system on roof of the school. The school is not linked to the national grid of EdL, a link to the network would cost about 14,000 USD, therefore the PV system is the only source for energy. Inspection of the equipment was made and data logger was connected to the computer in order to allow a transfer of the data from last 6 months. The school, which could serve about 300 pupil serves only 45 pupil as most of the pupil go to the four religious schools in the neighborhood. With the PV system the school runs a computer, a printer, lighting and a refrigerator. Unfortunately the school is closed in summer for holidays while the PV production is the highest during year. Currently the headmaster takes care on batteries and on the panel. A view to the panels show heave dust on the panel, after cleaning the radiation increased from 654 W/m2 to 750 W/m2, which is an increase of 18%. The Director promised to ensure continuous cleaning of the panels in the future. Two recommendations were given by him, first he would like to participate in a kind of maintenance training in order to get a better understanding of the installed system and second, he would recommend for future projects to implement PV systems to remote houses, which are located in this region.

(Tassi) 15th September 2011, Mr Mohammad Tassi, American University of Beirut (AUB)
Both programmes, GSWH and CEDRO have had a considerable positive effect on the market for renewables. Still improved awareness raising and more continuous information on the benefits for individuals on installing SWH is needed. Especially the 0% loans make the investment attractive and this message should be continuously disseminated. The selected partners should deliver high quality equipment and installation. Improper dealers should be kept out of the business. And, the project should cover the entire area of Lebanon. With a standardization process we can proof that the installation and maintenance is properly done. Mr Tassi discusses the question, whether the goal of the project is to reach a high number of customers or to reach a high number of installed m2 of solar panels; in this case he proposes to add to the project installments in the large cities and there at large scale consumers, for example hotels or dormitories for students. We also proposes to start investigating in solar heating, as this could be useful for mountain areas, at least a kind of pre-heating in these areas in order to avoid use of wood for heating. Finally the possibility of an “energy bus” was discussed, where demonstration of prototypes of solar heating and PV could be demonstrated in remote areas.

(Traboulsi) 13th September 2011, Mr Samir Traboulsi, LGBC
Mr Traboulsi highlights the efforts taken by UNDP and the L.C.E.C. expert team on implementing solar water heating in Lebanon. He confirms the strict need for solar water heating, especially for rural regions, where continuous shortages of electricity happen. With reference to the GSWH project he recommends to decrease the lack of information and data on water consumption in Lebanon, to ensure better labeling of the solar panel system, more public awareness raising (continuous presentations of real case results of individual house owners having implemented SWH) and modifications of construction laws for up-to-4 floor buildings (allow 33 degree roofing instead of 22 degree roofing). And, Mr Traboulsi stated that the costs for SWH installations in Lebanon are about twice the price level in Jordan due to import tax (which is currently only 5%), but especially for customs clearance papers, but also VAT (which is currently also at moderate level of 10%), increased competition between installers and dealers would help to reduce costs.