



Country Study

Terminal Evaluation of the Country Programme of Lebanon under the Global Solar Water Heating Market Transformation and Strengthening Initiative

PIMS 3611/ ID: 00062901

Final Report

Nadia Bechraoui

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Preamble

This evaluation report has been produced as part of the Terminal Evaluation of the GEF/UNEP/UNDP project entitled 'Global Solar Water Heating Market Transformation and Strengthening Initiative' (GEF ID 2939). The UN Environment led global knowledge management component and United Nations Development Programme (UNDP) implemented country programmes in Albania, Chile, Lebanon and Mexico were evaluated under supervision of the Evaluation Office of UN Environment in 2016. This report serves as an independent evaluation of the Country Programme of Lebanon, but should be considered as part of the overall evaluation together with other country programme evaluations. These evaluation reports and related Terms of Reference are available at UN Environment Evaluation Office webpage (web.unep.org/evaluation/) and UNDP Evaluation Resource Centre (erc.undp.org).

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Project Identification Table

NAME OF THE PROJECT:	The Country Programme of Lebanon under the Global Solar Water Heating Market Transformation and Strengthening Initiative		
GEF ID:	2939	ATLAS ID (Award ID):	50795
UNDP PIMS ID:	3611	UNDP project ID:	62901
Project Type:	Full-size project	Focal Area(s):	Climate Change
GEF OP #:	6	GEF Strategic Priority/Objective:	Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs
Expected Start Date:	March 2009	Actual start date:	March 2009
Planned completion date:	2013	Actual completion date:	April 30, 2014
Planned project budget at approval (USD) ¹ :	3,160,500	Total expenditures reported as of [December 30, 2014] ² :	1,145,548
GEF grant (USD):	1,000,000		

¹ ProDoc: UNDP managed budget 1,100,000

² UNDP and GEF expenditure as per the CDR reports (not comparable figure with the overall budget)

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ACRONYMS

ALME	Association Libanaise pour la Maîtrise de l'Énergie
BDL	Banque du Liban
BEF	Beirut Energy Forum
CEDRO	Community Energy Efficiency and Renewable Energy Demonstration Project
CO	Country Office
CP	Country Programme (referring to the subject of this evaluation report)
EDL	Electricité du Liban
GEF	Global Environment Facility
GSWH	Global Solar Water Heater
GWH	Giga Watt Hour
IEC	International Electro-Technical Commission
IRI	Industrial Research Institute
KM	Knowledge Management
LCEC	Lebanese Center For Energy Conservation
LGBC	Lebanese Green Building Council
LIBNOR	Lebanese Standard Institute
LRF	Lebanon Recovery Fund
LSES	Lebanese Solar Energy Association
M&E	Monitoring and Evaluation
MEHE	Ministry of Education and Higher Education
MEW	Ministry of Energy and Water
MW	Mega watt
NEEREA	National Energy Efficiency and Renewable Energy Action
OME	Observatoire Méditerranéen de l'Énergie
NPC	National Project Coordinator
PPES	Policy Paper for the Electricity Sector
PRODOC	Project Document
RCREEE	Regional Center for Renewable Energy and Energy Efficiency
RTOC	Reconstructed Theory of Change
SESOBEL	Service Social pour le Bien-Etre de l'Enfant au Liban
SIDA	Swedish International Development Cooperation Agency
SHAMCI	Solar Heating Arab Mark and Certification Initiative
SRF	Strategic Results Framework
SWH	Solar Water Heating
TOC	Theory of Change
UNEP	United Nations Environment Programme/UN Environment
UNDP	United Nations Development Programme

1 INTRODUCTION

1. The subject of this evaluation is the Lebanese component (hereafter referred to as “the Country Programme” (CP)) of the GEF/UNEP/UNDP project entitled ‘Global Solar Water Heating Market Transformation and Strengthening Initiative’ (hereafter referred to as “the GSWH initiative”). This evaluation report has been produced as part of the overall Terminal Evaluation³ of the GSWH initiative.

2. This report presents the findings of the terminal evaluation of the Lebanese Country Programme that took place in March – July 2016. The CP received a grant of 1.0 million USD from the Global Environmental Facility (GEF) and was developed in 2008 as part of a UNEP and UNDP initially six-country project⁴ (Algeria cancelled its participation), with the Knowledge Management and Networking component managed by the UNEP, and the individual implementation aspects in the individual countries were managed by the UNDP in the form of six nationally executed (NEX) projects. The project document was signed jointly by the UNDP and the Government of Lebanon in March 2009, for a project duration of 4.5 years. The CP finally concluded on April 30, 2014.

1.1 Evaluation approach and methodology

3. The terminal evaluation was coordinated by the UNEP Evaluation Office and thus follows the UNEP evaluation policy and programme manual. The approach has been adapted and is aligned with UNDP and GEF requirements. This evaluation is guided by the TOR developed for the overall terminal evaluation of the GSWH initiative. Each country programme under the GSWH Initiative (in Albania, Chile, Lebanon and Mexico) is assessed against the evaluation criteria specified in the evaluation TOR (section 4). The evaluation has two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote operational improvement, learning and knowledge sharing through results and lessons learned among UNEP, UNDP, and other partners

4. The evaluation assesses the country programme with respect to a minimum set of evaluation criteria grouped in five categories: (1) Strategic Relevance; (2) Attainment of objectives and planned result, which comprises the assessment of outputs achieved, effectiveness and likelihood of impact; (3) Sustainability and replication; (4) Efficiency; and (5) Factors and processes affecting project performance, including preparation and readiness, implementation and management, stakeholder participation and public awareness, country ownership and drivenness, financial planning and management, supervision and backstopping, and project monitoring and evaluation.

5. The evaluation utilizes the Theory of Change (TOC) approach to depict the impact pathways from outputs through outcomes towards impacts. It will also assess the sustainability and the factors that influenced or could influence the replication and scaling up of the CP results and the state of the enabling environment for a sustainable SWH market in Lebanon after its completion. Efficiency through cost-effectiveness and timeliness of CP execution will also be assessed.

6. Outputs from this TE will provide guidance in view of charting future directions to ensure that the market transformation of solar water heaters in Lebanon is sustained (learning) and aims to feed in to the synthesis and conclusions of the overall terminal evaluation of the GSWH initiative (accountability of the results).

³ Terms of Reference concerning the overall terminal evaluation of the GSWH initiative are available at UNEP evaluation office webpage

⁴ Albania, Algeria, Chile, India, Lebanon, Mexico

7. The methodology adopted for this CP assessment includes a review, prior to the country mission, of all relevant project documentation and pertinent background information. Interviews with key project personnel and other relevant stakeholders from Government, Academia, Associations and Private sector also took place as well as a field visit to SESOBEL⁵ in Ain El Rihani which has benefited from the CP.

8. A full list of documents reviewed and people interviewed are provided in Annexes 1 and 2. The list of questions prepared for the interviews and the detailed agenda of the field mission are also provided in Annexes 3 and 4.

9. Preliminary findings after the in-country mission were shared with the UNDP and CP team prior to the departure of the evaluator. Additional consultations, later in the CP assessment process, were done by email for the checking of the factual errors and omissions.

10. Project outcomes are assessed as per GEF performance ratings as follows:

- Highly Satisfactory (HS): There is no shortcomings in the achievement of the objectives.
- Satisfactory (S): There are minor shortcomings in the achievement of the objectives.
- Moderately Satisfactory (MS): There are moderate shortcomings in the achievement of the objectives.
- Moderately Unsatisfactory (MU): There are significant shortcomings in the achievement of the objectives.
- Unsatisfactory (U): there are major shortcomings in the achievement of the objectives.
- Highly Unsatisfactory (HU): There are severe shortcomings in the achievement of the objectives.

1.2 Limitations of the evaluation

11. The short duration of the in-country mission (3 days) meant that a list of questions, which does not claim to be in any way exhaustive, was prepared with a focus on main issues. However, the range of interviewees was sufficiently wide to represent adequately the variety of the parties involved and to make it possible to collect perceptions and points of views from different sources. The triangulation of the responses was made possible by focusing on the same questions and useful conclusions could therefore be drawn regarding the CP.

2 DESCRIPTION OF THE COUNTRY PROGRAMME

2.1 Country context

12. Lebanon is a small Mediterranean country (with a total area of 10,400 km²) benefiting from a generous amount of sunshine (the average solar radiation is 1,825 Kwh/m², year⁶).

13. During the 1990s and the 2000s, Lebanon enjoyed a sustained economic growth and improved political stability that translated into a substantial growth of electricity demand surpassing additional capacity of the current electricity generation levels. In 2009, the energy required was estimated at 15,000 GWh while the energy produced and purchased amounted to 11,500 GWh, leading

⁵ A Non-Governmental Organization founded in 1976 whose mission is to provide social services to disabled children and their families.

⁶ Project document of the Lebanon component of the GSWH project

to a deficit of 23%. The deficit was a result of the ageing and poorly maintained power plants, a sub-optimal use of power plants fuels (gasoil instead of natural gas) and losses estimated at 40%, which include (15% technical losses, 20% non-technical losses and 5% uncollected bills)⁷. An estimated 7.5%⁸ of the total electricity requirements in 2009 were imported from Syria and Egypt through grid interconnections. Electricity is also produced through renewable sources, mainly hydro-power plants, with an estimated capacity of 274 MW in 2010⁹. Lebanon also imports almost all of its other energy and is highly dependent on fossil fuels (95%¹⁰) making its economy very vulnerable to world oil fluctuations. In addition, the country does not strategically stock up on its energy and retail prices are inevitably affected by market fluctuations.

14. Hot water needs for the domestic sector as well as for commercial end-users are for the most part dependent on electric water heaters. This is mainly due to the relatively low electricity tariff (electricity is, as a matter of fact, heavily subsidized in Lebanon) making electric heating more accessible than other means of heating. The use of diesel and gas for hot water needs has been observed mainly with commercial end-users.

15. However, due to the growing electricity demand, Electricité du Liban (EDL) is not always able to supply the electricity needed and there are often power-cuts which range from 9 hours to 12 hours per day, across the year. Therefore, most households and commercial end-users turn to alternatives, such as subscribing to individual private generators or using UPS (Uninterruptible Power Supply) or APS (Advanced Planning and Scheduling) systems (which they charge when supply is available from EDL, and then discharge during power-cuts).

16. Solar water heating systems started to make their mark on the Lebanese market in the early 1990s. The expected financial savings and reduced electricity bills were the main motivation for their installation. However, the high installation and up-front cost proved to be a major burden which turned away many users from considering this purchase.

17. At the time when the CP was launched in 2009, a substantial number of weaknesses affected the SWH market¹¹. These could be summarized as follows:

- No public institution in place to actively promote a sustainable market growth of SWH financing mechanisms and new delivery models;
- No certification and training system in place for SWH systems installers;
- No specific building regulations, fiscal or public financial incentives in place;
- No specific regulation for SWH standards, certification or quality control mechanisms and no availability of a testing facility for SWH;
- No results and experiences documented and disseminated;
- No specific facilitated financing and new delivery mechanisms offered and marketed for the SWH purchase;
- Lack of effective and focused public awareness efforts and initiatives;
- Lack of capacity of the supply side to offer equipment and associated services at the required level to sustain the market growth; and
- Lack of local capacity in the SWH market.

⁷ Prof Raymond Ghajar, Senior Energy Advisor at MEW « Policy paper for the electricity sector », September 2010

⁸ Marc Ziade, American University of Beirut, September 2012

⁹ In "Regional Market assessment report in the Mediterranean countries" OME/UNEP, 2014

¹⁰ In "Regional Market assessment report in the Mediterranean countries" OME/UNEP, 2014

¹¹ In « Solar Water Heaters' Market Evaluation: case-study of Lebanon, UNEP, November 2015

18. In terms of market situation, there were only 8 small SWH manufacturers and 15 importing and installation companies in 2005. Regarding manufacturing, most manufacturers only construct the water tanks, very few manufacturers of the solar panels. Products are essentially imported from China and Turkey.

2.2 Country programme goal and objectives

19. The CP aims at accelerating and sustaining the market development of solar water heating in Lebanon with an objective to 1) facilitate the installation of 190,000 m² of new installed collectors over the period 2009-2014, an annual sale target of 50,000 m² reached by the year 2014 and, most importantly, it aims at laying the foundation for an expected continuing growth to reach the set target of 1,050,000 m² of total installed solar water heater capacity by 2020; 2) reach 75 m² per 1,000 inhabitants target with a steady average growth rate of 15-20% and continuation until the expected saturation point of 75/1,000 inhabitants, by the time of the conclusion of the project and to reach an additional 200-225 m²/1,000 inhabitants by 2020; and 3) ensure that over 80% of clients who purchased a SWH system report a good experience on the basis of problem-free good quality products and after-sales services.

20. The CP has mainly targeted the residential (individual houses and buildings) and the commercial and services sectors. SWH dealers and installers, SWH manufacturers and importers, engineers and architects, professional associations, students were involved as stakeholders.

21. In terms of energy saving, this corresponds to over 1.0 million MWh of new fossil fuel power capacity offset by using solar power instead of electricity for water heating, as well as an estimated cumulative greenhouse gas reduction potential of over 3 million tons of CO₂ by the end of 2020.

22. The project strategy is clustered by outcomes: sustainable growth in demand by an i) enabling policy framework; ii) enhanced awareness; iii) available financing; iv) supply of reliable technology and services; and v) replication, which together will achieve the project objective.

23. The outputs and activities under the **first outcome** which is a policy component were designed to raise the awareness of the key national policy makers on the benefits of SWH and facilitate the development and adoption of a legal and regulatory framework conducive for sustainable development of the SWH market in Lebanon.

24. The outputs and activities under the **second outcome** were designed to complement the marketing efforts of the private sector by raising the awareness of the targeted end-users on the benefits, economic feasibility and other characteristics influencing a positive purchasing decision. As a neutral actor, independent from commercial ties, the CP would be better positioned to provide impartial and better trusted information to the targeted end users about the characteristics, financial and environmental benefits of the technology, the available suppliers and installers and available public support. General public awareness raising activities were complemented by educational activities at secondary schools and at the architecture, building, energy and environmental engineering branches of the university (linked also to the envisaged use of the testing facility under Component 4 for educational purposes) as well as by specific articles or supplemental annexes in the professional magazines dealing with energy and environment, thereby targeting those professional groups that are often influencing the decision making of the final end-users. In areas where solar thermal is not yet widely used, demonstration projects were seen as a useful tool to support awareness and promotion campaigns.

25. **Third outcome** was designed to generate demand for the technology through applicable consumer financing and, as applicable, financial support schemes with an objective to leverage at least USD 15-25 million (about 25% of the total investments needs) for the set target of 190,000 m² of new SWH capacity through these financing mechanisms. Training sessions would be organized to familiarize the bankers with the SWH panels market, its trends and development and financing experiences from other countries. By building on the outcome of the initial market survey, the project

also aims to support the development and introduction of new financing instruments such as concessional loans, vendor financing or financing through SESCOs to effectively stimulate the market. In this respect, the CP seeks to raise the awareness and build the capacity of the local financing institutions and other key stakeholders, such as local vendors, power utilities, to structure and introduce new or apply existing financing products or other delivery models, which are expected to be attractive for the targeted end users and thus promote the demand.

26. After creating the demand for the technology, the **fourth outcome** was about ensuring that consumers have a satisfactory experience with it. Certification and quality assurance contribute to a trouble-free use of solar water heating and subsequently increase consumer confidence in the technology. Given the level of maturity of the Lebanese market at the time of the project design, the quality control system was expected to start as a voluntary system driven by the supply side.

27. At the product level, the plan was to develop requirements and criteria that proves the conformity of the products with the standards. These criteria were mainly expected to look technical quality issues (safety, performance and durability). Given the voluntary nature of the system, it is also essential for its proper functioning that it will be formally accepted by all the key supply side stakeholders in Lebanon. The thinking behind this approach was that as the market matures, standards can become mandatory and regulated more formally by an independent certification institute such as LIBNOR. Over the time, the certification mechanism will grow to a full sized formal certification system like the Solar Keymark.

28. For the installation part, a set of criteria was planned to develop the know-how of installers (plumbers and mechanical/HVAC engineers) and build their capacity to install units at an acceptable level. A recognition scheme for SWH installers (course and exam) was planned to be introduced to create an incremental value for the companies or individuals involved. The purpose was also to make the training materials available through the Knowledge Management component of the Global SWH project, and the EU-supported SUNTRAIN programme was planned to be utilized to the extent possible and adapted to the Lebanese conditions.

29. **Fifth outcome** was designed to ensure continuing SWH market monitoring and promotion in Lebanon after the CP has ended, and to support next generation project designers and governments with experience and recommendations from the CP by compiling and disseminating the project results and lessons learnt, thereby also serving the knowledge management component of the global SWH project. The outputs and activities under Outcome 5 will facilitate the required follow-up activities in the field of further capacity building, market promotion, supply chain strengthening and financing needs, including support to LCEC which could continue the market monitoring and support for facilitating growth of the SWH market on a self-sustaining basis.

30. The specific country component outputs are presented in table in Section 3.2: Achievement of outputs.

2.3 Changes in country programme design

31. In addition to budget revisions, the CP has not undergone formal changes in design during its implementation but had to adopt an adaptive management approach in respect of several constraints or new developments. Initial information going back in 2008 was updated and during the inception phase, activities were refined while outcome level targets were not modified from the initial project design.

2.4 Implementation arrangements

32. The CP was implemented according to the Support to National Implementation Modality (NIM) of UNDP. The Ministry of Energy and Water (MEW) was the executing agency and had appointed the

Lebanese Center for Energy Conservation (LCEC)¹² as the National Project Coordinator (NPC) for the CP. A Project Steering Committee has been set up to supervise and guide the project implementation. It included representatives of the Government of Lebanon and UNDP and on as needed basis, representatives of other institutions¹³ that have been providing direct cost-sharing for the project activities. However, its role was more about overview of the achievements of the CP and its coordination within national programmes and policies and not really that of technical backstopping per se.

33. A Project Management Unit (PMU) was established within the MEW, for day-to-day management of the project. The UNDP Country office (UNDP CO) was in charge of monitoring the progress made towards planned results and had regular contacts with the PMU. It also provided administrative support upon request and ensured the overseeing of financial matters in accordance with the NEX/NIM guidelines.

34. The Knowledge Management and Networking component of the UNEP GSWH project was responsible for providing a technical backstopping and contributing to global knowledge sharing and dissemination of best-practices and lessons learned.

2.5 Partners

35. The main partners for the CP are the following:

36. The **Ministry of Energy and Water (MEW)** consists of 9 general directorates including Electricité Du Liban (EDL, Electric power utilities). It is responsible for the overall development of the energy sector and has initiated legal and institutional reforms towards re-structuring the country's energy sector and developing a comprehensive energy law that would promote the role to be played by clean energy alternatives.

37. The **Lebanese Center for Energy Conservation (LCEC)** is an NGO affiliated to the MEW and which operates under the direct supervision of the MEW. It addresses end-use energy conservation and renewable energy at the national level. It was created in 2002 as a project financed by the Global Environment Facility (GEF) and the Ministry of Energy Water (MEW) under the management of the United Nations Development Programme (UNDP).

38. The **Ministry of Environment** which is the focal point for the GEF and who is executing several international environmental projects and plays an important role towards promoting the solar thermal applications in Lebanon.

39. The **Order of Engineers and Architects**, which has collaborated with the UNDP/GEF Energy Efficiency Building Project (started in 2002) to develop the Lebanese thermal standards for buildings, and has also recently reached an agreement with mechanical engineers to provide voluntary design drawings for solar water heaters in villas and houses to be included in the application for permits to build.

¹² The LCEC started its operations in early 2005 with the team that was set up back in 2002 to implement a new joint MEW-UNDP/GEF project called "Cross-sectoral energy efficiency and removal of barriers to ESCO operation". The LCEC project succeeded in implementing a number of activities to push for energy efficiency development in Lebanon. LCEC gradually established itself as an independent technical national center offering all kinds of services dedicated to energy efficiency and renewable energy. GEF and UNDP extended their support to the LCEC in 2009 until the end of 2013 when it received its first financial support from the MEW. The MEW support ensured the sustainability of the center for a minimum of 5 years. LCEC also benefits from the support of the European Union (EU) through a contract signed with the Central Bank of Lebanon (BDL).¹

¹³ The Swedish International Development Agency (SIDA), the Spanish Agency for International Cooperation, the Hellenic Aid, the Lebanon Recovery Fund and private SWH system manufacturers, importers and/or installers.

40. The **Ministry of Public Works and Transport** is following up the execution of the Building law and is responsible for granting construction permits. The ministry has also collaborated with developing thermal standards for buildings through its Directorate General on Urban Planning.

41. The **Lebanese Standards Institute (LIBNOR)** is a public organization responsible for developing national standards and for the issuance of the Lebanese Conformity Mark (NL: Normes Libanaises).

42. The **Industrial Research Institute (IRI)** is a semi-public institute, responsible for quality control, the compliance of equipment and goods with the adopted norms, for testing and certifications of all manufactured and imported goods. IRI's role is to regulate the Lebanese market for all imported energy efficiency and solar thermal equipment in close collaboration with the LCEC.

43. The **Lebanese Solar Energy Solar (LSES)** which includes the local manufacturers of solar thermal units in Lebanon and renewable energy experts, respectively, both involved with the promotion of solar thermal systems.

44. The **Association Libanaise pour la Maîtrise de l'Energie (ALME)** includes renewable energy experts and its main objective is to promote renewable energy in Lebanon. It has been involved in many SWH projects as well as in studies and research.

45. **Technical schools and universities** as well as the **Ministry of Education and Higher Education** in Lebanon which are meant to play an important role in the promotion of SWH by developing solar energy courses and research towards the acquisition by engineers of theoretical knowledge in SWH.

46. The banking sector, through the **Banque du Liban (BDL)** and the **private sector**, including SWH manufacturers, importers, sellers and installers who are involved in the important role of developing the market and ensuring its sustainability.

47. The **Lebanon Green Building Council (LGBC)**, founded in 2008, is an independent non-profit organization committed to developing a sustainable green buildings industry for the country. It is a coalition of corporations, contractors, designers, universities, and non-profit organizations working together to promote buildings that are environmentally safe, healthy places to live and work, and to provide stewardship towards a sustainably built environment.

48. The **Community Energy Efficiency and Renewable Energy Demonstration Project (CEDRO project)** is a UNDP managed project funded by the Government of Spain (USD 9.7 M) over the period 2010-2014. CEDRO, in its earlier phases (1, 2 & 3), implemented 13 Solar Water Heater applications in several public hospitals throughout Lebanon. The 4th 2014-2017 phase, is funded by the EU and its aim is to extend the on-going assistance provided by the UNDP to the Government of Lebanon to develop and implement a national sustainable energy strategy and action plans to mitigate climate change.

49. All these organizations have been active partners of the CP and most of them were also represented in the CP steering committee.

2.6 Country programme specific financing¹⁴:

50. The total project budget under the control of the UNDP amounted USD 1,100,000 of which USD 1,000,000 was provided by the Global Environment Facility (GEF) and USD 100,000 by UNDP's regular

¹⁴ Extracted from the project document

resources (TRAC). The Government of Lebanon, for its part, committed itself to the allocation of USD 1,960,000 through various secured donations.

51. Budget by outcomes and project co and parallel financing as per the project document are detailed in Annex V.

2.7 The Reconstructed Theory of Change

52. The theory of change (TOC) is a representation of causal linkages which allows to understand the underlying programme logic, from outputs through direct outcomes to long-term outcomes, and further towards impact. The CP document did not originally include a TOC which therefore was reconstructed based on the Strategic Result Framework (SRF) in the ProDoc. The Lebanese country programme was developed as part of Global Solar Water Heating Market Transformation and Strengthening Initiative thus the underlying project logic in each participating country was based on similar assumption of market transformation mechanisms.

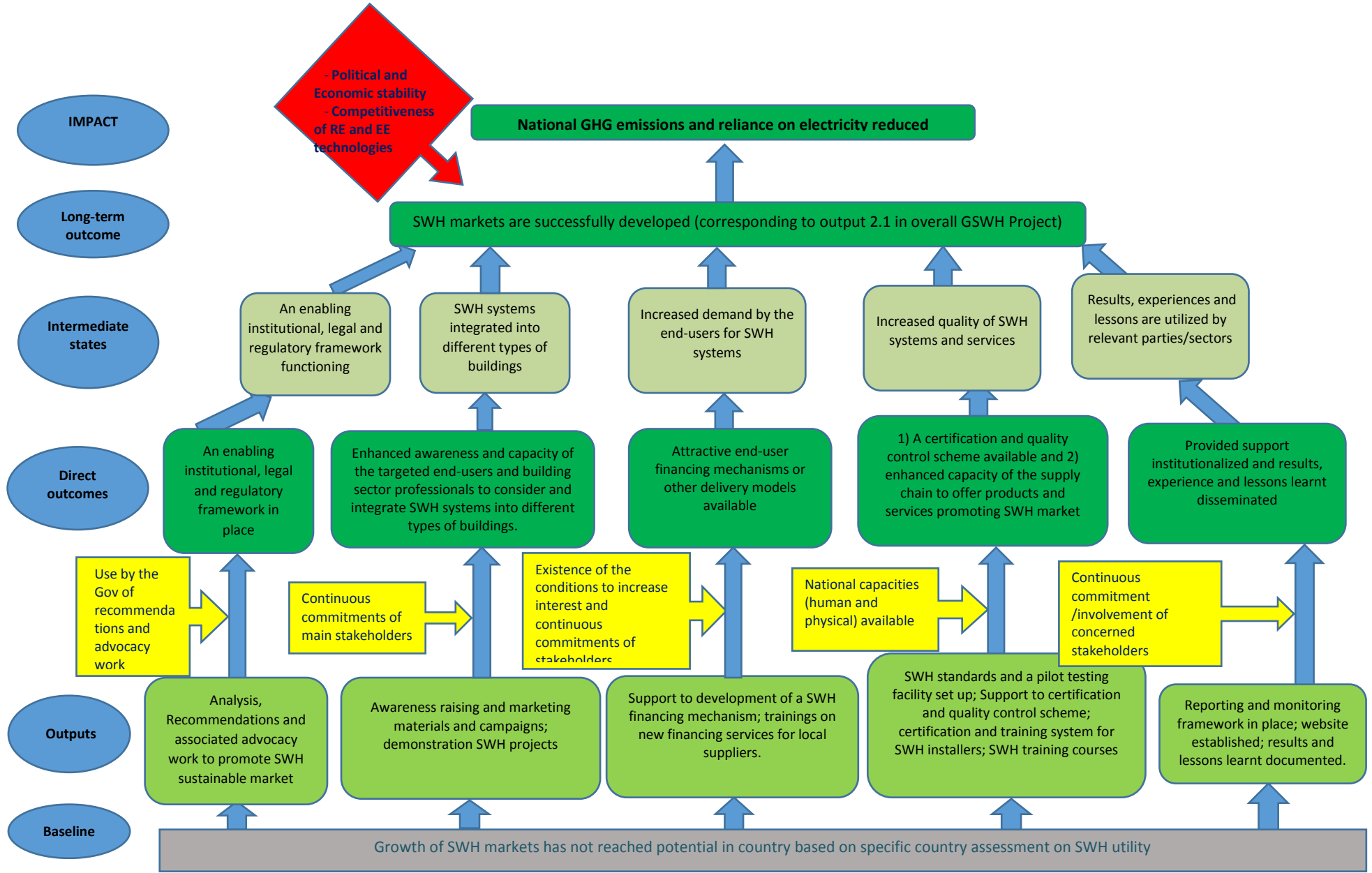
53. The CP activities and outputs were expected to contribute to achievement of 5 direct outcomes which themselves should eventually lead, via intermediate states and towards the long-term outcome and eventually towards the intended impact.

54. Outputs and direct outcomes are direct CP effects while intermediate states are the transitional conditions between the CP's direct outcomes and long-term outcome. The long-term outcome of the reconstructed TOC – SWH markets are successfully developed – corresponds to the ProDoc objective and is measured by the a) estimated amount of installed SWH systems measured as m², and b) growth of the annual sale of SWH systems. Direct outcomes and intermediate states are formulated based on the outcome statements of the ProDoc.

55. The CP's primary goal was to contribute to the reduction of GHG emissions and reduced reliance on electricity. Other objectives as identified in the project documents were poverty reduction, the improvement of the well-being and livelihood and the health of the population through the provision of cleaner energy and other technologies and services.

56. There are a certain number of drivers (yellow rectangles) which are external factors that are expected to contribute to the realization of the intended outcomes and impacts and can be influenced by the CP. Assumptions are also depicted (in the red rectangle) and are needed to achieve the intended impacts but they are largely beyond the control of the CP.

Figure 1: Reconstructed Theory of Change (TOC) diagram



3 EVALUATION FINDINGS

3.1 Strategic relevance

57. National priorities. The CP fits in with the National Energy Strategy (NES) of Lebanon (elaborated for the period 2006-2020 and which is regularly updated) and the objective, which aims to develop an effective energy sector that guarantees the security of the energy supply in general, and of electricity in particular, and promotes an efficient and economic use of energy, with a minimal environmental impact, in order to support the sustainable development of the entirety of the economic sectors. The penetration of solar thermal energy for hot water supply to the household and the service sectors are among the several measures developed in the action plan for the implementation of the NES.

58. UNDP's policy and strategy. Indeed, the UNDP provided support to the Government of Lebanon towards the building of its national capacities and the strengthening of policy formulations for the country to reach sustainable development and sustainable energy in particular. The CP came at the right time to complement several initiatives funded by other donors, aimed at giving vitality to the SWH market. It has been built based on the work done by the UNDP/GEF Lebanese Center for Energy Conservation Project (LCECP) and has brought it one step closer to facilitating the transformation of the market. The LCECP, launched in 2002, has both advocated and implemented measures to promote the increasing use of SWH as one of the measures to reduce electricity consumption.

59. Gender and HRBA issues. These UN-wide programming principles have not been addressed during the implementation phase because they have not been identified as such in the ProDoc.

60. The CP is rated "Satisfactory" (S) in terms of its strategic relevance.

3.2 Achievement of outputs

61. The CP includes 5 independent but inter-related components. The review of the outputs¹⁵ produced during the CP implementation is presented hereafter:

62. Outcome 1: An enabling institutional, legal, and regulatory framework to promote sustainable SWH market

SRF Outputs	Actual outputs delivered:
Output 1.1: Analysis, recommendations and the associated advocacy work for the adoption of adequate public financial and fiscal incentives to promote the SWH market.	The CP has supported the development of the draft energy conservation law which was to set out the national policy framework for energy efficiency and renewable energy in Lebanon. The document has been reviewed by the MEW and was submitted to the Council of Ministers as of mid-2011.
Output 1.2: Analysis, recommendations and the associated advocacy work for the adoption of the required amendments in to the building code to encourage the installation of SWH into new buildings and in those	The CP also worked to advocate a draft law which is to be incorporated as part of the building code and which is aimed at enforcing the use of SWH in new and existing buildings. All concerned stakeholders have been invited by the Higher Council of Urban Planning to collaborate with the drafting of the amendment of the existing building code, initially expected to be finalized by

¹⁵ Outputs are defined as 'the products, capital goods and services which result from a development intervention'(UNEP: http://www.unep.org/QAS/Documents/UNEP_Programme_Manual_May_2013.pdf, UNDP: <http://web.undp.org/evaluation/evaluations/handbook/english/documents/pme-handbook.pdf>)

going through a major renovation including the existing building.	2012. However, in 2016, the new building code is still underway. To date, to obtain the license to build, it is a requirement that thermal plans are included in the construction plans but no control is carried out during the implementation phase.
Output 1.3: Analysis, recommendations and the associated advocacy work for setting up the required regulatory framework for a SWH quality control system and adoption of SWH standards on mandatory basis.	The CP has supported ¹⁶ LIBNOR to work on the development of a set of national quality standards ¹⁷ for components and systems requirements based on the European solar collector standards. Several standards already adopted in 2006 have been updated and implemented as mandatory standards ¹⁸ .
Output 1.4: Proceedings and physical facilities for adequate testing and quality control of SWH systems developed and effectively taken into use	The CP was able to mobilize additional funds (provided by the government of Greece) to help set up a testing facility at the Industrial Research Institute (IRI) which has been operational since 2011. The laboratory's primary aim is to implement a series of tests in accordance with the Lebanese standards, which are themselves inspired by the European standards in place (EN 12975 - 1: Thermal solar systems and components - Solar collectors - Part 1: General requirements and EN 12975 - 2: Thermal solar systems and components - Solar collectors - Part 2: Test methods). The testing laboratory includes a sun-tracking test stand for thermal performance tests, a stand for testing the resilience and reliability of solar collectors and one other for mechanical load tests and also a meteorological station to monitor environmental conditions. However, the limited technical capacity (more equipment is needed with the corresponding financing) of the facility has reduced the number of tests that could be performed on locally manufactured and imported systems (tests performed only to flat plate collectors so far).

63. Outcome 2¹⁹: Strengthen the communication/marketing and awareness to consider and integrate SWH systems into different types of buildings (new and existing buildings):

SRF Outputs	Actual outputs delivered:
Output 2.1: Previous awareness materials for public awareness raising and marketing campaigns reviewed and/or adapted into Lebanon conditions and made available in printed and electronic format.	The CP worked on different aspects of raising public awareness to develop the SWH market in Lebanon which are described hereafter: After those conducted in 2005 and 2007, two market surveys were again undertaken in 2009 and 2012 ²⁰ within the framework of the CP, thus providing a complete overview of the solar market evolution. These nationwide surveys have covered the residential and commercial sectors as well as the dealers and suppliers. A new market survey has recently been completed and the report is
Output 2.2: Updated design of the communication and marketing	

¹⁶ Requests were sent to LIBNOR to update the outdated existing standards based on the SWH market demand; a technical committee with representatives of the main stakeholders including the private sector was set up and met every month (still operational).

¹⁷ NL EN 12975-1 :2015 ; NL EN 12976-1-2 :2015 ; NL EN 12977-1-2-3 :2015

¹⁸ As of 30-11-2010 as per Decree 5305/2010 – Ministry of Industry

¹⁹ As per the SRF in the project document

²⁰ The solar thermal market survey in Lebanon, IPSOS, 2009 and the first national survey on solar energy in Lebanon, Amer Nielsen, 2012

campaign.	about to be published (2 nd quarter of 2016).
Output 2.3: New public awareness raising and marketing campaigns implemented in cooperation with relevant public entities and private SWH suppliers and manufacturers.	<p>Two national campaigns were also launched. The objective of the first was to promote the SWH subsidized loans (following the set-up of the financial mechanism) and the second campaign, organized in 2013, through the media, aimed at a renewed promotion endeavour and at pushing anew for SWH installations among end-users.</p> <p>The CP team was also involved in the organization of the first Beirut Energy Forum (BEF) held in 2010 and which gathered SWH experts, investors and engineers. Since this initial event took place, the CP has become a principal co-organizer of the BEF which takes place annually.</p> <p>In addition, a nationally-distributed newsletter (entitled "Save energy") featuring articles on SWH in particular, is published on a quarterly basis. Leaflets have been distributed to the public during various events and several advertisement campaigns have been organized through media that have included TV channels, billboards, newspapers, the internet.²¹</p> <p>A project web-site was established (www.lcecp.org.lb) and is regularly updated.</p> <p>More than 30 experts from the Lebanese army, the ministries, financial institutions, research institutes, universities and renewable energy companies have attended national and international courses, training sessions and workshops dealing with renewable energy and energy efficiency.</p>
Output 2.4: Develop and implement SWH pilot projects and utilize the results and lessons learnt for the public information dissemination.	<p>Demonstration projects (mainly through the UNDP-CEDRO project funded by the Government of Spain but also by Italian funded projects implemented by the Ministry of Environment as well as other projects by the MEW) also played a significant role in promoting the SWH technology.</p> <p>2 initiatives undertaken by the MEW in 2012-2013 have included the distribution of 1,000 SWHs to households (about 4,000 m²) and installation of 1,000 SWHs in engineers and architects' residences all over the country. Other initiatives include a partnership with the Order of Engineers and Architects and with the syndicate of Lebanese dentists to ensure that each of them will install a SWH unit.</p>

64. Outcome 3: Increased demand for SWH systems by the availability of attractive end-user financing mechanisms or other delivery models, such as SESCOs, utility driven models or programmes:

SRF Outputs	Actual outputs delivered:
Output 3.1: Enhanced awareness²² of the key financial sector stakeholder	A first campaign organized in 2013 targeted the key financial sector stakeholders and local suppliers in promoting the SWH subsidized

²¹ Confirmed by the Interviews conducted during the evaluation mission of 18-21 April 2016 and by Lebanon's first national survey study on the SWH market (March 2014)

²² Enhanced awareness is an outcome level results statement.

and local suppliers on the specific characteristics and financing opportunities in the SWH market.	loans established within the NEEREA (National Energy Efficiency and Renewable Energy Action).
Output 3.2: New consumer financing mechanism(s) in place to offer subsidized loans or leasing for the purchase of SWH systems.	<p>At the time of the launch of the CP, there were no specific financing nor new delivery mechanisms put forward and marketed for SWH purchases. In parallel and as a contribution to the CP, the MEW and the Central Bank of Lebanon (BDL) started in 2010 a USD 200 subsidy²³ programme and an up-to-5-year interest-free loan²⁴ for residential SWHs (NEEREA), aimed at subsidizing 7,500 SWH systems for a total amount of USD 1.5 M.</p> <p>The LCEC, within the framework of the CP and as the NPC, acts as the technical and administrative coordinator of the NEEREA. It provides the technical support for reviewing applications and for assessing their technical feasibility as well as providing a backstopping.</p> <p>To qualify for the USD 200 subsidy, the installation company must be licensed and the SWH system must be certified according to the European Solar Keymark or for local manufactured units, compliant with the Lebanese standards EN12975 and EN 12976, and this, in line with the national certification and quality control system set up by the LCEC.</p> <p>Instead, benefiting from the interest-free loan does not seem to depend on the system's technical standard.</p> <p>NEEREA was created by BDL but the cooperation among BDL, UNDP, MEW and the EU and the support provided by the CP has given NEEREA the weight it deserves and allowed for its development and success.</p> <p>Up to 2015, 5,335 grants have been approved.</p>
Output 3.3: As required, trained SWH supply side stakeholders to effectively operate and/or market the new financing services.	Except for some public marketing campaigns (billboards and TV) to raise awareness on the new financing services (NEERA as well as the subsidised loan programme), nothing seems to have been done in particular to train the SWH supply side stakeholders on how to effectively operate or market the new financing services. No information was made available to the evaluator in this respect.

65. Outcome 4: A certification and quality control scheme applicable for Lebanese conditions adopted and enhanced capacity of the supply chain to offer products and services promoting sustainable SWH market:

²³ Customers who purchase a system that is in compliance with a specific set of quality criteria can in their turn benefit from the USD 200 from the MEW to be discounted from the total price.

²⁴ The National Energy Efficiency and Renewable Energy Action (NEEREA) initiated by the Central Bank of Lebanon is dedicated to the financing of green energy projects. It was launched on 25 November 2010. It provides interest-free long term loans to the residential, commercial, non-profit and industrial users for all EE and RE projects, for new and existing facilities. The green loans are provided through all the Lebanese commercial banks to directly reach the end-user. In 2013, new incentives were introduced to focus on EE, RE and certified green buildings (source: LCEC website).

PRF Outputs	Actual outputs delivered:
Output 4.1: Set of SWH standards and an associated certification and labelling system developed (or adapted) for Lebanon conditions	The CP team was actively involved in the SHAMCI certification programme ²⁵ for the Arab region. The latter was adapted to the Lebanese context through the creation of national quality standards (see output 1.3) and a certification scheme for SWHs which is not yet adopted.
Output 4.2: A pilot testing facility to check compliance with adopted standards.	Industrial Research Institute (IRI) is in the process of joining SHAMCI to be able to certify its SWH testing laboratory as SHAMCI compliant. To date, it complies with IEC ²⁶ and EN (European) standards
Output 4.3: Technical support to local manufacturers and importers to obtain a certification and to improve their product quality in general.	The baseline situation in Lebanon was characterized on the supply side by a lack of capacity to offer equipment and related services at the required level to sustain the SWH market growth. To address this obstacle, the CP organized a series of training courses attended by solar thermal company owners, engineers, engineering students, technical staff, vocational training instructors, and installers. Guiding and training materials were also provided by the online Knowledge tool of the GSWH project (www.solarthermalworld.com). A total of 15 participants completed the training course and got certificates in heating with a specialty of solar thermal systems.
Output 4.4: A certification and training system in place for SWH system installers (trained and certified)	<p>The CP team has also developed a national certification and quality control system which is a set of non-mandatory qualification criteria to evaluate the SWH companies active in Lebanon. The licensing scheme works across two levels: the licensing of the company by a specialized committee across several areas and a product licensing whereby tests are carried out by a qualified test laboratory to measure the performance and reliability of the product, and check its compliance with international good running standards. A company that passes successfully both evaluation stages is granted official Solar Water Heating Company (SWHCO) accreditation and can thereafter take part in, and benefit from, Lebanon's national Solar Water Heaters Action Plan and benefit from international grants offered by or distributed under the supervision of the Lebanese government and the LCEC.</p> <p>A short list of a widely accessible national database of local suppliers has been established and is regularly updated. The number of licensed companies rose from 23 in 2005 to 145 in 2015. All these companies have been invited to the trainings and workshops organized by the CP free-of-charge. Data and information on the latest developments of the SWH market including new bids and projects, is sent to all of them periodically. This database is facilitating knowledge-sharing and is increasing the visibility of SWH installers.</p> <p>Another part of product qualification came through an effort to</p>

²⁵ The Solar Heating Arab Mark and Certification Initiative (SHAMCI) is a quality certification scheme for solar thermal products and services in the Arab region. The project provides a regional industrial and regulatory compliance framework for policy makers, industrial sector, and end-consumers. The project promotes adopting standard quality measures, accreditation systems and quality labels across the Arab region.

²⁶ The International Electro-Technical Commission (IEC) is the international standards and conformity assessment body for all fields of electro-technology.

	<p>adapt the regional certification scheme for the SWH sector developed by RCREEE²⁷ and called SHAMCI to the Lebanese context. Guidelines for its implementation have been developed by the CP to this end with the UNEP support. To support the implementation of the SHAMCI scheme, the project regional partner, RCREEE, launched an online training program on standards and certification processes of solar water heaters for the MENA region.</p> <p>With regard to SWH installers, a certification scheme opened to all plumbers and installers is underway. It aims at creating a workforce which will be able to supervise, understand and manage SWH installation sites.</p>
<p>Output 4.5: trained building designers and other key professionals to consider SWH in the design of new buildings, renovated and existing buildings.</p>	<p>Unspecified number of Architects, Engineers and other key professionals has been informed about the opportunities provided by SWH. They have been involved in the CP activities aimed at pushing for the integration of SWH into the design of new buildings and the renovation of the existing ones.</p>
<p>Output 4.6: Improved curricula of SWH training courses in relevant academic and technical institutions and vocational schools.</p>	<p>The training courses²⁸ organized as project activities have now been officially adopted by the Ministry of Education and Higher Education (MEHE), as part of the curriculum of the technical schools and universities. For information, three levels usually characterize the country's vocational training:</p> <ul style="list-style-type: none"> • Baccalauréat Technique (BT): At this level, graduates are considered to be skilled workers who can operate machinery, install HVAC systems and/or electrical wiring. • Technicien Supérieur (TS): Students at this level will become increasingly aware of some design components of their earlier studies and they are considered to be highly skilled workers, supervisors and/or foremen. • Licence Technique (LT): Students are exposed to in-depth information about designing systems and understanding how they work. They have also taken courses in general and technical studies. At this level, students are expected to fully understand technical drawings and calculations and to be able to design smaller systems themselves. <p>Ecole des Arts et Métiers is particularly involved in the CP for 2 years. Support received from the CP to train their professors and update their curricula to the SWH market needs. The first cohort of school leavers at the "Baccalaureat technique" (BT) level will be graduating in 2016 and the courses for the "Technicien Supérieur" (TS) and the "Licence Technique" (LT) qualifications will be taught during the following academic year (2016-2017). About 30 installers are trained each year. They are currently developing recycling programmes for technicians to take into account technology innovations.</p>

²⁷ RCREEE: Regional Center for Renewable Energy and Energy Efficiency

²⁸ Around 50 teacher trainers took part in the Training of Trainers, at the end of March 2015. The three-day course gathered teachers from most of the key institutions for vocational training in Lebanon with the purpose of explaining the teaching material newly included in the curriculum and to hand over the teacher's guide book.

66. Outcome 5: The provided support institutionalized and the results, experiences and lessons learnt documented and disseminated (including monitoring, learning, evaluation and other feedback for adaptive management):

PRF Outputs	Actual outputs delivered:
<p>Output 5.1: The reporting framework and arrangement for the SWH market monitoring established and continuing after the end of the project.</p>	<p>The LCEC team has progressively become a reference point for SWHs due the extensive experience gained throughout the implementation of the CP. During the CP implementation, it was also in charge of the SWH market monitoring. A very positive achievement is that the team is now embedded within the structure of the LCEC, under the tutelage of the MEW and is therefore continuing with this task.</p>
<p>Output 5.2: Support the existing Solar Thermal Industry Association and other solar NGOs or a similar entity (LCEC) to sustain the required market activities.</p>	<p>Support was provided by the CP to the LSES (the Lebanese Solar Energy association which was created in 1984 and revitalized in 2002 to promote solar energy and all renewable energies and which includes academics and installers). The association was involved in the CP for several activities: It has participated in the development of the Lebanese SWH standards, attended several conferences and round-tables organized by the CP. It was also in charge of organizing training to Thermal Engineers and Technicians on how to install SWH systems.</p>
<p>Output 5.3: The national project website and network successfully established and marketed.</p>	<p>With regards to information sharing and dissemination, all data, surveys, information, statistics, indicators, articles, reports, interviews, etc. that have been produced during the CP implementation are available from the project team and shared publicly through the website (www.lcecp.org.lb) or by direct contact.</p>
<p>Output 5.4: Mid-term and final evaluation.</p>	<p>MTE conducted in September/October 2011. Report dated November is available.</p> <p>TE conducted during April/May 2016</p>
<p>Output 5.5: The project final results and lessons learnt documented and disseminated.</p>	<p>LCEC is constantly updating the GSWH project website (www.solarthermalworld.org) with the Lebanese information including most of the activities that take place in Lebanon. Likewise, LCEC regularly checks the website for updates posted by other countries. The centre is subscribed to the Newsletter to follow-up on the activities of other countries.</p> <p>With the support of the RCREEE, the CP has also initiated an evaluation study of the Lebanese SWH market (November 2015), using the UNEP SWH Techscope Market readiness assessment. This case-study of the successful implementation of the national initiative for SWH market development could serve as a basis to extend this experience to other developing countries.</p>

67. Overall and based on the level of achievement of outputs, the CP is rated “Highly Satisfactory”²⁹.

3.3 Effectiveness (attainment of direct outcomes and likelihood of impact)

3.3.1 Achievement of direct outcomes and intermediate states³⁰

68. **Outcome 1: An enabling institutional, legal, and regulatory framework to promote sustainable SWH market.** Despite the advocacy efforts made by the CP, not much progress has been made towards attainment of the expected results (Output 1.1): approval of the Energy Conservation law is still pending, not much progress either regarding the energy reform which was supposed to reduce/remove fossil fuel subsidies which, in addition of putting a heavy strain on utility finances, make solar heating less competitive against electricity. Regarding SWH standards, those dealing with performance test methods, system performance specification and annual performance measurements for thermal solar systems have been adopted in 2015³¹. However, what remains is for IRI to be equipped enough to start the testing proceedings. The unstable political situation Lebanon has been facing for the past two years has resulted that few legislative proposals have been passed yet. Regarding the issue of fiscal incentives, the political choice has been focused instead on subsidies and loans (see explanation in Output 3.2). Tax discounts on importing SWHs are considered as potentially harming local manufacturing although most local manufacturers do not produce SWH collectors but only some of their components such as tanks and support structures. However, according to many private sector persons interviewed, there is still an urgent need to remove the VAT (10%) applied on SWH and the still prevailing 5% customs duties for those that are imported. Therefore, Outcome 1 is rated “Moderately Satisfactory” (MS).

69. **Outcome 2: Strengthen the communication/marketing and awareness to consider and integrate SWH systems into different types of buildings (new and existing buildings)**³². According to the interviewees met throughout the CP assessment mission, the success of the CP in addressing the lack of awareness among the different stakeholders (decision-makers, users and suppliers) appeared to receive its deserved recognition as did its success in reaching out to user groups, mainly in the residential and commercial sectors. According to the UNDP/GEF/MEW report produced in 2012 on the Residential SWH market in Lebanon in 2011, “... the SWH market witnessed a remarkable increase since 2005 [...]. This growth is the result of an increased market demand driven by a combination of an increased awareness among beneficiaries and most importantly the setup of the national financial mechanism and grant subsidies....”. In addition, on the supply side, the number of companies working in the sector increased from 25 in 2005 to more than 143 in 2013. Therefore, Outcome 2 is rated “Highly Satisfactory” (HS).

70. **Outcome 3: Increased demand for SWH systems by the availability of attractive end-user financing mechanisms or other delivery models, such as SESCOs, utility driven models or programmes.** The financial mechanism established at the early stages of the project was the key that led to the increase in the demand for SWH. However, other factors related to the frequent power cuts and the increase of the price of fuel have also encouraged end-users to turn to other alternatives (such as SWH). In addition, the continuous fall of the price of SWH systems and of installation

²⁹ Only Output 3.3 is considered as not achieved.

³⁰ Outcome statements are as per the project document. The analysis considers the direct outcomes and intermediate states as defined in the reconstructed TOC.

³¹ NL EN 12977-4-5 :2015 ; NL ISO 9488 :2015 ; NL ISO 9459-2 :2015 ; NL ISO 9459-5 : 2015 adopted by Decree 5305/2010

³² Considered against the direct outcome as defined in the reconstructed TOC: ‘Enhanced awareness and capacity of the targeted end-users and building sector professionals to consider and integrate SWH systems into different types of buildings.’

materials has also encouraged the demand and made the SWH more affordable. The availability of low-cost SWH systems deserve a mention and while they generate problems of a different order such as issues which some dealers attribute to unfair competition, they have nevertheless played a role towards boosting the popularity of this technology. Due to the success of the financial mechanism, BDL is planning to increase the ceiling for SWH loans over the coming few years. This will contribute directly to the market growth. Outcome 3 is rated "Highly Satisfactory" (HS).

71. Outcome 4: A certification and quality control scheme applicable for Lebanese conditions adopted and enhanced capacity of the supply chain to offer products and services promoting sustainable SWH market. Due to the establishment of a short list of qualified SWH supplier companies (by the LCEC) and the enforcement of the EN 12975 certification standard on imported products), the number of cheap imported products diminished as well as the number of importers of unqualified products. A shift of several companies (more than five) to the use of new certified products was also noticed. On the other hand, limiting factors relate to the still insufficient number of qualified technicians, in particular for maintenance and after-sales issues, and to the limited roof-space especially in the face of the increase of population density. Another factor is somehow the competition of the Photovoltaic technology which confirms progress towards the acceptance by the Lebanese population of the concept of renewable energy. Then, good progress has been achieved under this outcome but it has yet to reach target expectations. The results can therefore be rated as "Satisfactory" (S) since the issue of quality assurance still need to be addressed rapidly and properly if the vitality of the SWH market is to be preserved (the SHAMCI certification programme has progressed well but was not yet adopted at the time of the evaluation).

72. Outcome 5: The provided support institutionalized and the results, experiences and lessons learnt documented and disseminated (including monitoring, learning, evaluation and other feedback for adaptive management). Expected results have been achieved and are very likely to last thanks in particular to the successful institutionalization of the CP team within the structure of the LCEC and who is now a reference point for SWH related issues. In addition, the Lebanese experience has been largely shared and is accessible by all stakeholders within Lebanon but also by other interested countries. As a result, Outcome 5 is rated as "Highly Satisfactory" (HS).

73. The CP has exceeded its achievements in terms of its main objectives and this is "Satisfactory" (S) with regard to effectiveness.

3.3.2 Likelihood of impact of the CP

74. The SWH market in Lebanon has witnessed a tremendous growth since 2009 (annual average growth rate of 15%) although it has been experiencing a slowdown in the last two years because of the economic and political crisis in the country.

75. The average increase of the demand in terms of SWH equipment purchases reached 41%³³. According to all persons met during the evaluation mission, the major driver of this growth was due to the CP. The estimated contribution of the project to this growth is perceived to be as high as 95% by the most optimistic respondents, and around 30% in the case of the more conservative response. Without the implementation of the project, perceptions are that the SWH market would reflect between 5 and 70% of what it is presently. It can be said, however, that there is no question that the CP played a significant role in accelerating the development of the market.

76. At the completion of the CP, the Lebanese SWH market could be characterized as being mature. In addition, and according to an IEA programme³⁴ evaluating the success of SWH worldwide and their contribution to the energy supply, Lebanon ranked among the top ten markets in 2012.

³³ In "Lebanon's first national survey study on the SWH market", March 2014, p102

³⁴ Source: Mauthner, F.M&Weiss WW (2012) Solar Heat Worldwide (2014)

77. In the case of Lebanon, there is no doubt that the financial mechanism put in place in the early stage of the CP implementation was the main booster of the SWH demand increase in the residential and services sector (in particular, hotels). The existence of a body such as the LCEC was also a great asset for the SWH market development. LCEC's efforts have created an enhanced awareness among end-users, decision makers and professionals as well as a trust in SWH technology thanks to the initial certification and quality control mechanism put in place.

78. In terms of global environment benefits, the CP was expected to definitely contribute to the global cumulative GHG emission reduction of over 80 million tons of CO₂ equivalent, estimated for 2020. Indeed, the cumulative reduction at the national level which was estimated to overtake the 3 million tons of CO_{2eq} target by the end of 2020 is expected to be reached by 2018.

79. The 2012 UNDP/GEF/MEW report on the residential SWH market in Lebanon states the following: "... during 2011, 12,197 SWH systems were installed with a storage capacity of 3,313,427 liters. With an annual saving rate of 8.54 KWh per liter, a total of 28,292 MWh was saved at the national level. This has avoided the need for a capacity of 3.68 MW. Based on a grid emission factor estimated by EDL at 0.65 Kg of CO_{2eq}/KWh, the emissions reductions have been estimated to be 5,246 tons for all solar loan applications. At the national level, a total amount of 18,390 tons of CO_{2eq} emissions has been avoided.

80. More recently and still according to the LCEC, the objective of installing 1,050,000 m² of SWH systems by 2020 is expected to replace 120 MW of fossil fuel production capacity. In addition, the CP has enabled the energy savings of EDL to reach a total amount of 151.2 GWh/year which corresponds to 98.28 tons of avoided CO_{2eq} per year.

81. At the national level, the CP has provided energy consumers with an alternative which has produced direct savings (reduced electricity and gasoil bills for those who previously had an electric water heater and/or an extra generator), has reduced pressure (and peak demand) on the power system and brought with it savings to the economy at the national level and reduced dependency and expenditure on imported fossil fuels. Indeed, just for the year 2011, the 12,197 SWH systems installed which have saved around 28,292 MWh have led to an economic saving of USD 3,754,687 on the consumer level and around USD 145,254 on the EDL in the form of subsidies reduction.

82. The CP has also enhanced employment opportunities in the SWH domain (the number of companies has nearly tripled between 2000 and 2008, from 16 to 36, adding up to 145 as of the end of June 2015).

83. Therefore, likelihood of impact is rated "Likely" (L).

3.3.3 Achievement of the formal CP objective

84. According to the ProDoc, the key indicators of the success of the CP are as follow:

- The installation of 190,000 m² of newly installed collector area over the period 2009-2014;
- An annual sale of 50,000 m² reached by the year 2014; and
- an expected continuous growth to reach the set target of 1,050,000 m² of total installed SWH capacity by 2020.

Table 1. Data collected from the CP's progress reports and provided by the LCEC

	2005	2008	2009	2010	2011	2012	2013	2014	2015
Annual newly installed m²	16,000	19,734	22,694	38,000	43,533	60,458	55,491	51,525	53,339
Growth rate/previous year in%	18						15	15	
Penetration rate in m²/inhabitants	26						76	93.3	
Number of companies	23	36			88	130	145		145

Source: LCEC 2016

85. Over the 2009-2014 CP implementation period, a cumulative area of 271,701 m² of newly installed collectors has been achieved, exceeding by far the expected 190,000 m² target.

86. In addition, the target of 50,000 m² of annual SWH installations had already been reached in 2012 while the set chronological objective was for 2014.

87. The average market growth rate was around 15% although a slight slowdown has been perceptible these last couple of years. This is mainly explained by external causes such as the economic and political crisis currently experienced by the country. However, people are generally confident that the market will continue to grow and the area of installed SWHs targeted for 2020 will be reached by 2018.

88. Indeed, to date, the residential and the commercial sectors have been the main targets as well as the food and catering sub-sector in the industrial sector. According to all parties, there still remains a good margin for expansion and still untapped potential in some regions of the country.

Table 2. The number of SWH systems sold per year and per type of system evolved (residential sector)

Year		2012	2013	2014	2015
Total	Flat Plate	4,591	3,475	3,183	4,390
	Evacuated Tubes	8,05	8,324	8,704	8,193
Grand Total		13,296	11,799	11,887	12,583

Source: LCEC 2016

Table 3. For collective systems, the capacity in m² (for systems that have benefited from the NEEREA loans and not all collective systems)

Year		2012	2013	2014	2015
Total (in m²)	Flat Plate	241.9	722.42	263.9	1,419.3
	Vacuum tubes	237.6	480.84	371	113.5
Grand Total		479.5	1,203.26	634.9	1,532.8

Source: LCEC 2016

89. Therefore, achievement of the formal objective for Lebanon is rated as “Highly Satisfactory” (HS).

3.4 Sustainability and replication

90. The continued involvement of the CP team whose capacity has been built thanks to the Knowledge Management and the Networking component of the Global SWH project³⁵ and its exposure to other country programmes’ experiences through the project’s website (www.solarthermalworld.org) and the continuity of its operations after the project’s completion, consolidated by the institutionalization of the LCEC under the tutelage of the MEW are good signs of sustainability in terms of institutional framework.

91. Both the increasing number of customers who pay for their SWH in cash and no longer rely on a loan, pointing to consumers’ awareness of the benefits of such systems as well as the willingness of the BDL and the Government of Lebanon to go further with the financial mechanism put in place for the development in particular of the SWH market would contribute to the financial sustainability.

92. Results achieved to date in terms of GHG emissions reduction and the fact that the target will be met two years before the deadline are positive factors to ensure the environmental sustainability.

93. The adoption of a vocational training curriculum on SWH related topics by the Ministry of Education and Higher Education which is securing the capacity building in this sector for the future³⁶ and could allow replication in other parts of the country as well as in other segments.

94. However, some hazards could affect the socio-political sustainability and harm the success so far achieved. These risks relate to 1) the political instability experienced by Lebanon which has had no President since 2014 and which has a Parliament almost paralyzed and very slow in approving reforms and new laws; 2) the absence to date of a fully functional and operational quality assurance and certification scheme of SWH systems due, in particular, to the lack of enforcement of the national quality standards elaborated by LIBNOR to all SWH systems either locally manufactured or imported (limited testing capacity at IRI), which has opened up the market to allow the supply of cheap and poorly made SWH systems; and 3) the fact that professionals involved have expressed concerns that the advancement of the SWH sector could be affected by the lack of market regulation (fiscal incentives), lack of qualified labor (certification issue, maintenance issue), unfair competition (in particular from Chinese products) and lack of continued awareness-raising campaigns which are needed to attract, and sustain, the interest of the end-users.

95. In terms of sustainability, the CP is rated “Moderately likely” (ML)³⁷ if the risks which could put it in jeopardy are addressed in time.

3.5 Efficiency

96. In terms of implementation course, the CP has achieved regular progress in accordance with the expected annual work plans as reviewed during the Inception workshop in September 2009,

³⁵ The CP team is reporting that they have used the following documents/tools produced by the Global KM component: 1) the SWH Techscope Market Readiness analysis tool and the GHG reductions calculator; 2) the Solar Heating Arab mark and certification initiative booklet; 3) the Guidebook for the development of a Nationally Appropriate Mitigation Action (NAMA) for SWH.

³⁶ 30 students graduate as installers every year from the École des Arts et Métiers and find employment right away.

³⁷ Ratings on sustainability. All the dimensions of sustainability are deemed critical. Therefore, the overall rating for sustainability will be the lowest rating on the separate dimensions.

except for the last year when it experienced a slowdown in terms of delays and intensity leading to a request for a 4-month extension at the beginning of 2014 to finalize the remaining outputs. This progress is also reflected by the delivery rate (ratio Expenses/budget) which has been above 90% every year, except for the last year of implementation for which it was around 60%).

97. In terms of cooperation and partnerships the CP managed to work efficiently by pooling resources as discussed in the 'Stakeholder participation, cooperation and partnerships' section.

98. Good efforts were done by the CP team to build upon pre-existing structures such as the LCECP team and to have a homogeneous implementation of activities as well as a good orchestration and complementarity with other initiatives such as the CEDRO project.

99. In terms of efficiency, and given the reasons cited above, the CP is rated "Highly Satisfactory" (HS).

Table 4. Time flow of SWH market achievements:

2009	2010	2011	2012	2013	2014
SWH targets	SWH loan programmes	Building mandates	SWH targets	Market survey	Installer certification
Pilot projects Cedro 1	Financial incentives	SWH testing laboratory	Pilot projects Cedro 2	Pilot projects Cedro 3	SWH Vocational training curriculum
Pilot projects LCEC	Product certification requirements	Pilot projects Cedro 2	Market survey		
	Market survey	Outreach campaign	Outreach campaign		

Source: Solar water Heaters' market evaluation; case study of Lebanon, November 2015

3.6 Factors affecting performance

3.6.1 Preparation and readiness

100. With regard to its design, the CP has benefited from a number of strong points such as its very detailed situation analysis which highlighted the specific Lebanese context as well as the relevance of the CP's objective to national priorities.

101. Given that the CP document was written back in 2008, based on baseline information from years 2005 and after, some adjustments have been made to the Strategic Results Framework (SRF) during the Inception workshop, but at the levels of the activities to be carried out and the expected outputs, to take into account new developments or drawbacks. However, change made was not significant and the CP original design remained still valid.

102. Current status of the SWH market in Lebanon, its achievements to date and barriers still facing its development have been adequately identified. In addition, the SRF includes indicators at the objective, outcome and output levels which are more or less SMART and were helpful for personnel of the Project Management Unit.

103. The design did not specify activities related to outreach of UNEP Knowledge Management and Networking component to the CP. The interviews carried out during the in-country mission suggested that there were not many proactive requests from the country. The design did not address Gender and HRBA issues.

104. Due to the global aspect of the CP preparation and readiness not sufficiently taken into account in the design, this factor is rated "Satisfactory" (S).

3.6.2 Project implementation and management

105. The CP followed the course that had been set out for it in the ProDoc. Implementation was well supported and coordinated through the LCEC whose role in particular, was well praised by the persons met during the interviews. It is the view of the Evaluator that the LCEC performed an exemplary and exceptionally role in guiding the CP to its ultimate success, thanks to the professional and personal skills and dedication of the LCEC staff. The re-appointment of an experienced team from a previous UNDP/GEF project and its confirmation within the MEW after the CP completion was a great asset both during the implementation phase but also for the sustainability of the results achieved.

106. However, regarding the link with the KM and Networking component of the umbrella UNEP GSWH project which has been often referred in the CP document, the CP has been in practice operating as if it were a stand-alone project. It is nevertheless true that responsibilities and specific roles between the UNEP and the UNDP have never been clearly defined in the ProDoc. As a matter of fact, direct collaboration has rather tended to be limited to problem-solving administrative issues.

107. The CP's performance in implementation and management is rated "Satisfactory" (S).

3.6.3 Stakeholder participation, cooperation and partnerships

108. The main public and private stakeholders have been listed in the ProDoc and their general responsibilities defined. However, there is no evidence that consultations did occur with all of them during the design phase of the CP. In the original document, it is simply mentioned that these consultations are recommended "during and, as applicable, prior to implementation of the project". On the other hand, several multi-disciplinary working groups and committees have been created during the CP implementation and they are still active according to the interviewees. In addition, the CP team succeeded in establishing itself as a common platform where all the stakeholders joined efforts and work and in ensuring a smooth communication among all parties. This was also confirmed during the interviews made during the in-country mission.

109. Potential cooperation opportunities with other projects and donors have also been mentioned in the CP design document. Indeed, the CP team was very successful in coordinating, ensuring consistency and building on activities already initiated by other projects, as well as building on several SWH pilot projects funded by other donors. The team was also able to build the necessary technical and administrative capacities in the field of energy efficiency and renewable energy, from the GEF/UNDP funded project LCECP which can be considered as the basic milestones for the development of the SWH market. The synergies achieved with the CEDRO project during implementation should also be highlighted.

110. However, an interesting collaboration endeavor had taken place involving one of the regional partners associated in the GSWH project, which is, in this case, the Regional Center for Renewable Energy and Energy Efficiency (RCREEE), about SHAMCI (the Solar Heating Arab Mark and Certification Initiative). There is no evidence that stakeholders met during the mission and were aware that the technical assistance was provided through the UNEP and was part of the GSWH project's component.

111. Stakeholder participation, cooperation and partnership is "Satisfactory" (S).

3.6.4 Communication and public awareness

112. There is a unanimous view to recognize that the CP played a pivotal role in raising awareness of the multiple stakeholders including the population who had little motivation to invest in renewable energy and energy efficiency technologies 2005-06 due to, as previously mentioned, the high

subsidization of electricity and heating fuels and to its limited purchase power. The effectiveness of the CP's outreach activities significantly contributed to the SWH market development.

113. According to the First national survey study of the SWH market undertaken in 2011 and which covered 1850 residential users, 110 commercial users, 29 dealers and suppliers, 20 organizations, institutions and stakeholders, "more than 94% of the households surveyed have heard of SWH and already know about it and 32% of them have been aware of LCEC's initiatives and activities while 99% of commercial end-users have been aware of SWH but only 15% aware of LCEC. Regarding dealers and suppliers, the role of LCEC was reported to have been major in the development of the market and to have had a positive impact on 88% of the companies, of which 41% saw that as a very positive impact. The impact of LCEC initiatives on the market is estimated at a growth rate of 78% with some dealers saying that what LCEC has done in cooperation with the MEW and the BDL (financial mechanism) has improved the market by 400%. According to 56% of the stakeholders and organizations, the LCEC initiative has improved the market and increased the demand [...]. "

114. As a consequence, the CP's performance in ensuring communication and public awareness is rated "Highly Satisfactory" (HS).

3.6.5 Country ownership and drivenness

115. At his launch, the CP had its "champion" in the person of the Minister of Energy at that time. The current political and economic crisis that Lebanon faces, is slowing down the progress made. However, the trend is going on, reinforced by the fact that BDL has decided to extend the duration of the soft loan mechanism put in place and to establish a similar mechanism for SMEs which can benefit from 5-15% cash back on their investment in RE and EE immediately after the measures have been implemented.

116. Country ownership and driven-ness is rated "Satisfactory" (S).

3.6.6 Financial planning and management

117. The government cost-sharing was provided in-kind and used as planned. Regarding the funds mobilized for the implementation of parallel projects, it was confirmed that the CP managed to leverage USD 1,960,000 in co-financing mainly from the Government of Lebanon as well as the Swedish International Development Agency (SIDA), the Spanish Agency for International Cooperation via the Lebanon Recovery Fund and the Hellenic Aid.

118. According to the Financial table provided by the CO, total expenditures per outcome, over the period 2009-2014 amounted USD 980,464 out of a GEF budget of USD 1,000,000, that is a delivery rate of 98% (see Annex V). The overall expenditure ratio (planned cost / actual cost) was 104% with the total expenditure of USD 1,145,548 against the planned UNDP managed budget at design (USD 1,100,000).

119. The financial management is rated "Highly Satisfactory" (HS).

3.6.7 Supervision, guidance and technical backstopping

120. The UNDP Country office is the executing agency with responsibility for supervision of the quality and timeliness of project execution. Activities have been implemented as expected and the CP has only experienced a slowdown in its last year which has resulted in an exceptional request for a 4-month extension in 2014. According to the NPD, UNDP was very present through regular consultations and meetings during all the implementation phase. Critical guidance was also provided to the Government to gear the financial mechanism (NEEREA) put in place towards SWH and to push for synergies between different projects.

121. The UNEP DTIE is the co-executing agency (together with UNDP) with responsibility for global project management, monitoring and progress reporting, technical assistance including financial instruments as well as for the Knowledge Management component.

122. Although no one explicitly mentioned it verbally during the interviews or people seemed having not been aware of the role of UNEP in their production, the use of some knowledge products is confirmed by the CP team and in several of the CP reports.

123. Indeed, the CP/LCEC team is regularly consulting the GSWH website (www.solarthermalworld.org) and is constantly updating it with the Lebanese information. They also regularly check the website for updates from other countries and are subscribed to the newsletter to follow up on the activities of other countries. More specifically, as they are working on improving the qualification of SWH companies, they rely on the guides developed by UNEP and other project partners, particularly relating to solar thermal certification, standards and testing. An active cooperation was developed with the regional partner RCREEE on the SHAMCI initiative and for developing the National Energy Efficiency Action Plan 2016-2020.

124. Apart from this, the collaboration with UNEP have seemed to include regular but limited exchanges during the reporting periods (for the PIRs in particular) and to some administrative problem-solving issues.

125. Considering UNDP's role, the guidance and backstopping criterion is rated as "Satisfactory" (S)³⁸.

3.6.8 Monitoring and Evaluation (M&E)

126. An indicative Monitoring and Evaluation plan and corresponding budget has been developed during the design phase. Activities have been listed with responsible parties and timeframe.

127. It is not clear to the Evaluator if all the activities listed have been implemented and documented. However, and in line with the CP document, an inception report was prepared on February 2010, a mid-term review completed in 2011 by an external and independent consultant recruited by the UNDP Lebanon Country Office. Quarterly progress reports (QPR) and Project Implementation Reviews (PIRs), Steering Committees meetings, a Terminal report have also been done as well a monitoring visits in the country³⁹.

128. PIRs were also reviewed by the UNDP GEF regional team prior to be sent to the global team (UNEP). Therefore, M&E planning and M&E plan implementation are both rated "Satisfactory" (S).

4 CONCLUSIONS, RECOMMENDATIONS AND LESSONS

4.1 Conclusions

129. Today, the SWH market in Lebanon could be safely described as mature. It has steadily developed since 2009 at an average growth rate of 15%, although it has been experiencing a slowdown in the last two years because of the economic and political crisis in the country.

130. According to the various parties interviewed during this evaluation, the SWH sector would not have been what it is now without the country programme (CP). The most optimistic assessments

³⁸ UNEP's back stopping is considered as Moderately Satisfactory based on the evaluation findings of the country component of Lebanon. UNEP's role is further discussed in the main evaluation report.

³⁹ Minutes of the SC meetings and monitoring visit reports not available

claim that the SWH market would have represented only 5 to 10% of its present volume while the more conservative estimations perceive the CP's achievement as having been able to "accelerate" a trend that it was developing in Lebanon.

131. Based on the findings, the CP was implemented at the right time to boost the momentum of the SWH market by addressing various issues that were barriers to progress, such as the lack of technical know-how and of financial means which were hampering the political will. Several initiatives related to SWH were being implemented, the CP team succeeded in coordinating them into synergies.

132. While it is part of a global UNEP initiative, the CP worked as a stand-alone project. There was only limited level of collaboration between the two UN agencies involved (UNDP, UNEP).

133. However, knowledge products produced under the UNEP implementing component have been used as a means of building the capabilities of the CP team.

134. In terms of the CP's main achievements, the most cited are: 1) the raising of the awareness of all the stakeholders including the awareness of decision-makers and the information campaigns organized; 2) the pivotal role in inter-linking all national players and in ensuring effective communication channels between all parties; and 3) The financial mechanism involved (NEEREA and the USD 200 subsidy) which is unanimously recognized to be the main driver of this tremendous development.

135. However, some issues that could affect the sustainability of the SWH market are still to be addressed, namely the quality of the equipment, the certification of the installers, matters of maintenance, the lack of fiscal incentives.

Table 5: Summary of Evaluation Ratings

Criterion	Overall Rating
A. Strategic relevance	S
B. Achievement of outputs	HS
C. Effectiveness: Attainment of objectives and planned results	S
1. Achievement of direct outcomes as defined in the reconstructed TOC	S
2. Likelihood of impact	L
3. Achievement of formal project objectives as presented in the Project Document.	HS
D. Sustainability and replication	ML
1. Socio-political sustainability	ML
2. Financial resources	L
3. Institutional framework	HL
4. Environmental sustainability	L
5. Catalytic role and replication	S
E. Efficiency	HS
F. Factors affecting project performance	
1. Preparation and readiness	S
2. Project implementation and management	S
3. Stakeholders participation, cooperation and partnerships	S
4. Communication and public awareness	HS
5. Country ownership and driven-ness	S
6. Financial planning and management	HS
7. Supervision, guidance and technical backstopping	S
8. Monitoring and evaluation	S

Criterion	Overall Rating
i. M&E plan	S
ii. M&E plan implementation	S
Overall project rating	S

4.2 Recommendations

136. Lebanon needs to sustain its efforts to maintain the market transformation momentum achieved by the SWH market:

To the Lebanese Government:

- The LCEC with the MEW support should be persistent and advocate solving issues still outstanding with the concerned stakeholders to underpin the SWH market, in particular for the establishment of quality standards and certification schemes (not yet achieved at the CP completion), the latter playing a critical role towards guaranteeing good quality products and competent installations for the consumers as well as for developing maintenance-oriented work;
- The MEW should continue to push for reforms in the domain of electricity, in particular in respect of the removal of the heavy subsidies in the electricity sector;
- The LCEC and the MEW should develop other market segments (in addition of hot water production for households and the service sector) such as the collective SWHs or SWH systems used for heating rooms to contribute to the market sustainability;
- The Ministry of Education and Higher Education (MEHE) should consider regular in-service teacher training to make it possible for tutors to keep up with technological advances in the field.

To UNEP:

- With regard to joint (UNDP/UNEP) initiatives, roles and responsibilities must be clearly defined at the level of the project's design and further coordination is needed between the (two UN) agencies during implementation;
- For such types of projects/programmes, the adoption of an approach that brings together geographically close countries might bring benefits in terms of sharing experiences for troubleshooting, collaboration and trade opportunities;
- UNEP must ensure its visibility at the national level but in close collaboration with the co-implementing agencies (UNDP).

4.3 Lessons learned

- In a context such as the one in Lebanon where the population's purchase power is limited and the electricity is produced from fossil fuels and heavily subsidized, the setting up of a national financing mechanism is critical to expand the SWH market. Indeed, such a mechanism should be established when the technology cost is not affordable for the majority of the population and when the renewables cannot compete with electricity. In addition, this measure should be taken at a very early stage of a project's implementation;
- Once the market development has indicated effective results in volume of products produced and installed, the issue of the quality of the products, and of the competence of the installers arises and if not rapidly addressed, could put market development at risk;
- A project management structure that is hosted by the Government during the implementation phase then institutionalized after the project's completion is key to the sustainability of the results achieved and show a strong ownership by the country. However, it is fair to mention

that this is not always feasible and actually, this only happened in Lebanon after 10 years of support by UNDP;

- The current management structure has the status of an NGO. This remains a temporary solution and should be addressed soon to ensure its sustainability.

ANNEX I. LIST OF THE PERSONS MET

UNDP:

Ms Jihan Seoud, Energy and Environment Programme Analyst
Mr Edgard Chehab, Assistant Resident Representative

Other UNDP-GEF projects:

Mr Hassan Harajli, CEDRO Project Manager
Mr Jil Amine, DREG Project Manager

Ministry of Energy and Water:

Mr Mahmoud I. Baroud, Acting General Director of Exploitation, Director of Tutelage, Government Delegate at Electricité Du Liban (EDL), National Focal Point for the SWH project

The Lebanese Centre for Energy Conservation (LCEC):

Mr Pierre El Khoury, General Director and former project manager for the UNDP/GEF Global SWH project
Mr Haykal Khalil, Energy Engineer

Banque du Liban (BDL):

Mr Mazen Halawi, Head of subsidized loans and Financing programs Division, Financing unit

Ministry of Industry:

The Lebanese Standards Institution (LIBNOR):
Ms Rosy Hajj, Head of Engineering Standards Division
Industrial Research Institute (IRI):
Mr Imad Hage Chehade, Technology and Development Director

Ecole des Arts et Métiers (CNAM) :

Ms Antoinette Khanfour, Director of the School
Mr Koubayati Degaulle, Energy Engineer, Head of Thermal Studies unit

Private sector:

Ms Samar Atar Maalouf, co-manager of Kypros (Manufacturer and Commercial company selling solar water heating systems)
Mr Jean-Paul Sfeir, Manager of Solarnet (Installer and Commercial company)
Ms Viviane Abi Rizk , Head of the Maintenance unit, SESABEL (center for handicapped children)

Civil Society:**The Lebanese Solar Energy Society (LSES):**

Mr Jean-Paul Sfeir, Treasurer
The Lebanon Green Building Council (LGBC):
Mr Rabih Khairallah, President and Board member

ANNEX II. LIST OF THE DOCUMENTS CONSULTED

- UNDP/MEW/ LCECP "Solar thermal market survey in Lebanon", May 2008
- Mourtada Adel "Energy Efficiency in the building sector: Lebanese experience", Roundtable Energaia, December 2008
- UNDP "The country programme of Lebanon under the GSWH market transformation and strengthening initiative: inception report", September 2009
- MEW/ Prof. Ghajar Raymond "Policy paper for the electricity sector", September 2010
- MEW/Pierre El Hnoud "the national policies in Lebanon to improve energy efficiency in the construction sector", November 2010
- UNDP/ Andreas Jahr "Mid-term evaluation of the global solar water heating transformation and strengthening initiative", October 2011
- MEW/LCEC "The National Energy Efficiency Action Plan (NEEAP, 2011-2015)", January 2012
- LCEC "The national solar water heating companies' qualification", February 2012
- UNDP/MEW "The residential solar water heaters market in Lebanon in 2011", September 2012
- LCEC/ Pierre El Khoury "the solar water heaters market from 2009 to 2013 and the way beyond", Beirut Energy Forum, September 2013
- UNDP/MEW/ LCEC, Amr Nielsen "Lebanon's first national survey study of the solar water heaters market", March 2014
- UNDP "Establishment of quality standards and certification scheme for SWH sector in Lebanon", April 2014
- UNDP SWH CP "CURRICULUM FOR SOLAR WATER HEATER SYSTEM INSTALLATION FOR VOCATIONAL INSTITUTES" (no date)
- GSWH project's Budget and Expenditures, 2009 - 2014
- UNDP GEF "Project Implementation Reviews", 2010- 2014
- UNEP Global PIRs, 2009 – 2015
- UNEP progress reports 2010 - 2014
- UNDP Annual Work plans, 2011 – 2014
- Project Management Meetings minutes, 2010 - 2014
- UNEP/ Government of Lebanon "Solar water heaters' market evaluation: case study of Lebanon, November 2015

ANNEX III. QUESTIONNAIRE USED

Name and Organization:

General questions:

- How have you been involved in the SWH project?
- From your point of view, what are the main achievements of the project?
- What did the project bring to you professionally speaking?
- Generally speaking, can we say that there is now a real dynamic market for SWH in Lebanon? Why? What are the main drivers according to you?
- What are the main benefits resulting from the project? At national and global levels?
- Do you think that without the project, the situation would have been the same?
- What was the UNDP added value? UNEP added value?
- What are the main factors of success? Which components of the project were the most useful according to you?
- What were the weaknesses of this project? At the design stage? During implementation?
- Do you think that results achieved will last? If yes, why? If no, why and what should be (have been) done?

Specific questions:

To UNDP CO and project team:

- Updated data on installed collector areas and annual sales as well as the number of private companies in this industrial segment
- Data on the budget disbursements
- Information on GHG emissions reduction calculation methodology
- Is the database for monitoring the project impacts in place? What is its status after the project completion?
- Examples of adaptive management adopted (if any) to face constraints
- When was the last market survey undertaken?
- How much was the financial contribution of the private sector? Was it recorded?
- What is the current status of the SWH quality control system? the certification mechanism? The recognition system to be put in place?
- What is the status of the SWH testing facility?

To all:

- Do you think that you have been enough involved/informed in/by the project?

- What is the current status/situation of the solar thermal industry association?
- How and what was the collaboration with the local authorities? What is the situation now? What are the main achievements?
- Since the completion of the project, are there already some examples of upscaling, replication going on or planned?
- What was the quality and the usefulness of the technical backstopping provided by the knowledge management component of the global SWH project and the regional partners?
- Do you have recommendations/lessons learnt for such projects? For their sustainability?

ANNEX IV. AGENDA FOR THE IN-COUNTRY MISSION

TUESDAY 19 APRIL 2016			
TIME	DESCRIPTION	PERSONS	LOCATION & PICKUP
0900 - 1000	Introductory meeting Discussion of mission agenda Scope of project proposal and timeframes	UNDP Senior Management: - Edgard Chehab, Assistant Resident Representative - Jihan Seoud: UNDP Energy and Environment Programme Analyst	UNDP Office 4 th floor conference room <i>Driver: Ahmad Nizar (Toyota Land Cruiser Prado, Plate: XXXXX B)</i>
1000 – 1100	Overview of Energy & Environment Projects on sustainable energy and climate change	- Jihan Seoud: UNDP Energy and Environment Programme Analyst - Hassan Harajli, CEDRO Project Manager	UNDP Office 4 th floor conference room
1100 – 1130	Detailed discussion of mission & project	- Jihan Seoud: UNDP Energy and Environment Programme Analyst - Jil Amine, DREG Project Manager	UNDP Office 4 th floor conference room
1200 - 1330	Ministry of Energy and Water Experience in project implementation Lessons learnt Sustainability	- Jil Amine, DREG Project Manager - Pierre Khoury, Lebanese Centre for Energy Conservation (LCEC): General Director (former Project Manager for the UNDP/GEF Global SWH Project) - Mahmoud Baroud, National Focal Point at the Ministry of Energy and Water - Sandra Rizk	Ministry of Energy and Water Corniche du Fleuve <i>Driver: Ahmad Nizar (Toyota Land Cruiser Prado, Plate: XXXXX B)</i>
1330 – 1430	<i>Lunch break</i>		<i>Ministry of Energy and Water</i>
1500 – 1600	Kypros: Commercial Company selling solar systems	Samar Maalouf	Dora <i>Driver: Ahmad Nizar (Toyota Land Cruiser Prado, Plate: XXXXX B)</i>

1630 - 1730	<p>Lebanese Solar Energy Society (LSES) Experience in the field and impact of the SWH project</p>	<p>Youssef Ghantous</p>	<p>Antelias, centre Hage (FNB Bank on GF) first floor, DEP offices <i>Driver: Ahmad Nizar (Toyota Land Cruiser Prado, Plate: XXXXXB)</i></p>

ANNEX V. BUDGET BY OUTCOME / CO AND PARALLEL FINANCING

Budget by outcome (at the design stage)

Outcomes	Total USD	Of which from GEF: USD	Co-financing USD
Outcome 1: An enabling institutional, legal and regulatory framework to promote sustainable SWH market.	140,000	100,000	30,000 (LRF; AECI) 10,000 (Hellenic Aid)
Outcome 2: Enhanced awareness and capacity of the targeted end users and building sector professional to consider and integrate SWH systems into different types of buildings.	220,000	200,000	20,000 (LRF; AECI)
Outcome 3: Increased demand for SWH systems by the availability of attractive end-user financing mechanisms or other delivery models, such as SESCOs or utility driven models.	1,820,000	190,000 (TA)	675,000 (LRF; AECI) 500,000 (SIDA) 445,000 (Hellenic Aid)
Outcome 4: A certification and quality control scheme applicable for Albanian conditions and enhanced capacity of the supply chain to offer products and services promoting sustainable SWH market.	440,500	160,000	25,000 (LRF; AECI) 255,500 (Hellenic Aid)
Outcome 5 The provided support institutionalized and the results, experiences and lesson learnt documented and disseminated, including monitoring, learning, adaptive feedback and evaluation.	310,000	250,000	10,000 (Gov in-kind) 50,000 (UNDP)
Project management ⁴⁰	230,000	90,000	90,000 (Gov in-kind) 50,000 (UNDP)
Total	3, 160,500	1,000,000	2,060,500 (cash) 100,000 (in-kind)

Source: Project document

According to a table provided by the UNDP country office, budgets and expenses per outcome over the period 2009-2014 were as follow:

⁴⁰ Covering the tasks related to the administrative management of the project. Technical contributions of the PMT covered under the Outcome budgets.

Outcomes	Actual budget	Expenses
Outcome 1: An enabling institutional, legal and regulatory framework to promote sustainable SWH market.	84,000	6,500
Outcome 2: Enhanced awareness and capacity of the targeted end users and building sector professional to consider and integrate SWH systems into different types of buildings.	180,300	198,750
Outcome 3: Increased demand for SWH systems by the availability of attractive end-user financing mechanisms or other delivery models, such as SESCOs or utility driven models.	227,180	181,485
Outcome 4: A certification and quality control scheme applicable for Albanian conditions and enhanced capacity of the supply chain to offer products and services promoting sustainable SWH market.	508,520	591,010
Outcome 5 The provided support institutionalized and the results, experiences and lesson learnt documented and disseminated, including monitoring, learning, adaptive feedback and evaluation.	-	2,719
Total	1,000,000	980,464

Co and parallel financing

Co-financing Sources				
Name of Co-financier (source)	Classification	Type	Amount (US\$)	Status⁴¹
The Government of Lebanon	Government	in-kind	100,000	Confirmed
The Government of Lebanon through:				
- Gov of Spain	Bilateral	Cash	750,000	Confirmed
- Gov of Sweden	Bilateral	Cash	500,000	Confirmed
- Gov of Greece	Bilateral	Cash	710,500	Confirmed
UNDP	Agency	Cash	100,000	Confirmed
Sub-Total Co-financing			2,160 ,500	
Private			> 25,000,000	To be leveraged

⁴¹ Availability of the co-financing was confirmed by each corresponding donor at the project design phase

ANNEX VI. STRATEGIC RESULTS FRAMEWORK

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
<p>Objective: To accelerate and sustain the solar water heating market in Lebanon as a part of the Global SWH Market Transformation and Strengthening Initiative.</p>	<p>The total estimated amount of installed SWH units</p> <p>Growth of the annual sale of SWH units / systems</p> <p>Level of customer satisfaction on the SWH systems installed.</p>	<p>Estimated 26 m² in Lebanon per 1000 inhabitants in year 2005 i.e. 106,817 m² total installed collectors with 16,000 m² of new SWH capacity installed by year 2005.</p> <p>Average Annual Growth 10-15 % in Lebanon as evidenced over the past 5 years with significant risks of not being able to sustain the continuing, steady growth.</p> <p>Mixed</p>	<p>At least 190,000 m² of new installed collector area during the project, and an annual sale of 50,000 reached by the end of the project with expected continuing growth to reach the set target of 1,050,000 m² of installed SWH capacity by 2020.</p> <p>55 – 75 m² per 1000 inhabitants by the end of the project with a steady, average growth rate of 15-20 % reached by the end of the project and continuation until the expected saturation point of 55-75 m² per 1000 inhabitants by the end of the project and 200-225 m² per 1000 inhabitants by year 2020</p> <p>Positive experience by over 80% of the clients, who have purchased a SWH system on the basis of problem free good quality products and after sale services.</p>	<p>Official import and company statistics and vendor / manufacturers interviews</p> <p>Customer surveys incl. eventual ex-post project evaluations.</p> <p>Market surveys</p>	<p>Economic and financial feasibility of the SWH investments to be promoted</p> <p>Continuing commitment of the key partners, such as relevant public entities, financiers and other key interest groups to work towards meeting the project objectives.</p>
<p>Outcome 1 An enabling institutional, legal and regulatory framework to promote sustainable SWH market.</p>	<p>The adoption and effective enforcement of the recommended new legal and regulatory changes to promote sustainable SWH market development</p>	<p>No public institution in place to actively promote sustainable market growth of SWH and other renewable energy</p> <p>No specific building regulations, fiscal or public financial incentives in place to promote sustainable SWH market</p>	<p>The recommended amendments of the legal and regulatory framework to promote sustainable SWH market adopted and effectively enforced, including:</p> <ul style="list-style-type: none"> ▪ setting of specific targets for the heat produced by renewable energy by 2020; ▪ required amendments to the building code to encourage the installation of SWH into new buildings and in those going through a major renovation; including the existing buildings ▪ sustainable financial incentive mechanisms in place by using the resources of the Solar Energy Fund or other public resources; ▪ required fiscal incentives such as exempting the imported SWH equipment and materials from 	<p>Official government publications.</p> <p>Project monitoring and evaluation reports.</p>	<p>See above</p>

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
		No specific regulations for SWH standards, certification or quality control mechanisms in place	import duties and related taxes with associated safeguard mechanisms to prevent their illegal use; <ul style="list-style-type: none"> a decree to set up a SWH quality control system corresponding (to the extent feasible) to the relevant EU regulations and systems in place. 		
Output 1.1 Analysis, recommendations and the associated advocacy work for the adoption of adequate public financial and fiscal incentives to promote the SWH market	Availability of new public financial or fiscal incentives to promote the SWH market.	No specific financial or fiscal incentives to promote the SWH market.	New financial and fiscal incentives / mechanisms and their effective operationalisation submitted for final Government approval.	Project reports Official Gov't publications	Support of the key Government stakeholders mainly Ministry of Finance
Output 1.2 Analysis, recommendations and the associated advocacy work for the adoption of the required amendments into the building code to encourage the installation of SWH into new buildings and in those going through a major renovation including the existing buildings	New regulations for the required amendments into the building code to integrate SWH into the design and construction of new buildings	A voluntary agreement reached with some design bureaus to consider SWH systems in the design of single family houses and villas in Lebanon.	New legislations and regulatory changes (incl. their effective enforcement) encouraging the installation of SWH systems into new buildings and in those going through a major renovation as well as existing buildings submitted for final Government approval.	See above	See above
Output 1.3 Analysis, recommendations and the associated advocacy work for setting up the required regulatory framework for a SWH quality control system and adoption of SWH standards on mandatory basis (including regulations, recommended institutional set-up, etc....)	The status of the proposal for setting up the required regulatory framework for a SWH quality control system. Adoption of SWH standards on Mandatory basis	No legal or regulatory framework for a SWH quality control system in place SWH standards adopted on voluntary basis	Mandatory SWH standards, a quality control and a labelling system for SWH systems and their installation adopted, taking into account the international experiences and efforts (such as the European Solar Keymark system) and best practices.	See above	See above

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
Output 1.4 Proceedings and physical facilities for adequate testing and quality control of SWH systems developed and effectively taken into use.	Availability of adequate testing facilities and proceeding for compliance checking.	No testing facilities and proceedings currently available. Availability of Greek donation for solar testing facilities	Adequate testing facilities and proceeding for compliance checking developed and effectively taken into use.	Project reports	See above
Outcome 2 Strengthen the communication / marketing and awareness to consider and integrate SWH systems into different types of buildings (new and existing buildings)	The demand for additional information, as measured by market surveys. The share of new, renovated and existing buildings (across different types) integrating SWH into their design.	General public awareness campaign initiated in year 2006 According to initial market survey, suppliers and manufacturers requested further and continuous awareness campaign to maintain the general public awareness level	Over 80% of the end users and designers participating the market survey indicate that they have had enough information about SWH systems to make their decision. A 15-20% average annual increase in SWH system sale by the end of the project	Market surveys.	Interest of the key stakeholders to participate the marketing campaign.
Output 2.1 Previous awareness materials for public awareness raising and marketing campaigns reviewed and/or adapted into Lebanon conditions and made available in printed and electronic format.	The availability of suitable new public awareness raising and marketing material.	Shortage of effective and good quality public awareness raising and marketing material.	New and additional public awareness raising, and marketing materials developed and adapted for Lebanon conditions and made available in printed and electronic format. A specific SWH web-site established and regularly updated	Project reports	
Output 2.2 Updated design of the communication and marketing campaign	Design review of the communication marketing campaign agreed with the key stakeholders.	General public awareness campaign initiated in year 2006 No systematic marketing campaign possible to	Agreed design of the communication / marketing campaign with the key stakeholders, including the financing of the implementation on cost-sharing basis	Project reports	Interest of the key stakeholders to participate in the marketing campaign.

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
		organise by the supply chain on its own.			
Output 2.3 New public awareness raising and marketing campaigns implemented in co-operation with relevant public entities and private SWH suppliers and manufacturers.	Enhance the level of public awareness raising through new public campaign implemented	General public awareness campaign initiated in year 2006	New and additional public awareness raising and marketing campaigns tailored to the specific needs and expected decision making “drivers” and information channels of the targeted end users implemented in co-operation with the relevant public entities and private SWH suppliers and manufacturers by using different media channels.	Project reports Market surveys	See above
Output 2.4 Develop and implement SWH pilot projects and utilize the results and lessons learnt for the public information dissemination	Couple of SWH pilot projects implemented	Only one pilot project through Chinese donation of 500 SWH units were delivered and installed (NB: more than 200 SWH units were damaged due to July 2006 war on Lebanon)	At least three SWH pilot projects implemented either individual or collectives and results / lessons learnt integrated within the overall communication / marketing strategy for SWH applications	Project reports Beneficiaries surveys Data collection and analysis	
Outcome 3: Increased demand for SWH systems by the availability of attractive end-user financing mechanisms or other delivery models, such as SESCOs, utility driven models or programme	The amount of financing leveraged through new financing models specifically tailored for SWH market needs.	No specific longer term financing and new delivery mechanisms offered and marketed for the SWH purchase.	The agreed financial support mechanisms and new delivery models in operation with a cumulative target of USD 20 million (about 40-50% of the total investment needs) leveraged by them for SWH financing by the end of the project	Project monitoring reports	Initial demand for the financial services created and interest of the local financing sector to enter new market areas.
Output 3.1 Enhanced awareness of the key financial sector stakeholder and local suppliers on the specific characteristics and financing opportunities in the SWH market.	The level of interest created.	Lack of information on the specific SWH market characteristics and financing models tested in other countries.	All the key financial sector stakeholders and local suppliers informed on the specific characteristics and opportunities provided by the Lebanese SWH market (by building on the results of the market analysis), and on the experiences and lessons learnt from the financing models tested in other	Project reports	See above

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
			countries.		
Output 3.2 New consumer financing mechanism(s) in place to offer subsidized loans or leasing for the purchase of SWH systems.	New financing instruments and, as applicable, delivery models made available.	Suitable long term financing for home appliances systems available, but not applicable for SWH Leasing of SWH systems not working properly yet.	New financing instruments and business models (such as specific purpose bank loans, vendor financing, SESCOs etc.) specifically tailored and marketed for the SWH purchase offered to the end users as a part of the overall marketing package, including, as applicable, the integration of possible public incentives.	Project reports	
Output 3.3 As required, trained SWH supply side stakeholders to effectively operate and/or market the new financing services.	The capacity of the SWH supply side to operate and/or market the new financing services.	Lack of financing knowledge and expertise of the SWH supply side.	Trained SWH supply side stakeholders to effectively operate and/or market the new financing services.	Project reports	See above
Outcome 4 A certification and quality control scheme applicable for Lebanese conditions adopted and enhanced capacity of the supply chain to offer products and services promoting sustainable SWH market.	The share of supply side entities adopting the proposed quality control schemes. The level of customer satisfaction with the systems installed.	Lack of adequate incentives for and, in some cases, lack of capacity of the supply side to offer equipment and associated services at the required level to sustain the market growth.	Adoption of a voluntary quality control, certification and labelling scheme for the SWH equipment and installation services by the majority of the SWH equipment and service providers with a market share of over 80% in the end of the project. Over 90% of customer satisfaction on the certified equipment and services provided.	Project reports and supply side surveys. Demand side market surveys	
Output 4.1 Set of SWH standards and an associated certification and labelling system developed (or adapted) for Lebanon conditions.	Availability of a quality control system for SWH equipment suitable for Lebanon situation.	No system available in Lebanon. International systems are available, but need to be adapted to Lebanon conditions	A quality control system consisting of required standards and associated certification and labelling scheme suitable for Lebanon situation developed and adopted first on a voluntary basis, and which may later graduate to a mandatory requirement.	Project reports	Support of the SWH supply chain recognizing the value added.
Output 4.2 A pilot testing facility to check compliance with adopted standards.	The number of locally tested systems according to adopted standards.	No testing facilities available.	A pilot SWH testing facility fitted to the current market situation in operation with an ability to sustain its services also after the project.	Project reports	See above

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
			SWH systems in the Lebanon market tested for compliance by the end of the project.		
Output 4.3 Technical support to local manufacturers and importers to obtain a certification and to improve their product quality in general.	The number of manufacturers receiving TA The number of missions and trade seminars organized	Lack of local capacity to meet the requirements and to improve their product quality in general.	All the Lebanese SWH manufacturers and suppliers have received technical support to improve their product quality Up to 4 match making missions and an annual SWH trade seminar in Lebanon	Project reports	See above
Output 4.4 A certification and training system in place for SWH system installers (trained & certified)	The availability of the system.	No certification and training system in place for SWH system installers.	A certification and training system in place for SWH system installers. 100 – 150 of the installers in the SWH market development targets trained and recognized by the end of the project	Project reports	
Output 4.5 Trained building designers and other key professionals to consider SWH in the design of new buildings, renovated and existing buildings.	The number of trained professionals The share of new or renovated / existing buildings including SWH as an option.	Lack of information and expertise among the local architects, building engineers, installers and other key professionals about SWH.	150 – 200 architects, building engineers, and other key professional, as well as the students in the associated fields are informed about the opportunities provided by SWH and different types of SWH equipment and are trained to integrate SWH into the design of new buildings and the renovation of the existing ones.		
Output 4.6 Improved curricula of SWH training courses in relevant academic and technical institutions and vocational schools	The curricula adopted by the targeted educational entities	Need to updated the curricula (GTZ vocational project with Ministry of Education)	An improved curricula and training program adopted by the targeted educational entities, including co-operation with vocational training systems	Project reports	Support of the targeted educational entities
Outcome 5 The provided support institutionalized and the results, experiences and lesson learnt documented and disseminated	Continuing support for SWH market development also after	No sustainability of the required market support No results and experiences	Local institution(s) continuing to promote the SWH market after the end of the project.	Final evaluation	

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
(including monitoring, learning, evaluation and other feedback for adaptive management).	the end of the project. Access to project related information by local and international experts	documented and disseminated.	The reports and other public material from the project can be easily found and accessed.	Project reports	
Output 5.1 The reporting framework and arrangement for the SWH market monitoring established and continuing after the end of the project.	Agreed reporting format and institutional arrangements for SWH market monitoring established.	No systematic reporting format and institutional arrangements for SWH market monitoring.	Agreed reporting format and institutional arrangements for SWH market monitoring established and continuing after the end of the project.	Project reports and final evaluation	Agreed co-operation between the vendors and other business entities involved in SWH market
Output 5.2 Support the existing Solar Thermal Industry Association (LASI) and other solar NGOs (LSES) or a similar entity (LCEC) to sustain the required market activities.	Enhance the level of involvement of the existing Solar Thermal Industry Association (LASI) solar NGOs (LSES) and similar entity (LCEC) in the SWH market	Weak institutional the existing Solar Thermal Industry Association (LASI) and other solar NGOs (LSES) or similar entity (LCEC) to support the local SWH industry and to promote the sustainable market growth of SWH in Lebanon in general.	Reactivation of the existing Solar Thermal Industry Association (LASI) and other solar NGOs (LSES) or similar entity (LCEC) with gradual build-up of their capacity to represent, support and train the Lebanon SWH industry to expand and enhance its competitiveness and the quality of the products and services it is providing and to promote the Lebanon SWH market in general.	Project reports	Recognition of the benefits of the proposed institution by the local supply chain.
Output 5.3 The national project web-site and network successfully established and marketed.	Number of visits in the project website The level and type of information in the website. The frequency of updating.	None	Project web-site and network successfully established with information on the scope and results of the project . (The details to be specified later)		

Project Strategy	indicator	Baseline	Target	Sources of Verification	Assumptions
Output 5.4 Mid-term and final evaluation	Delivery of the mid-term and final evaluations	N/A	The mid-term and final evaluations finalized on time.		
Output 5.5 The project final results and lessons learnt documented and disseminated.	Available report	No results and lessons learnt compiled, analysed and disseminated	Final report finalized and disseminated	Project reports and final evaluation	