Country Study

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

PIMS 3611/ ID: 00063281

Final report

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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 UNEP led global knowledge management component and UNDP implemented country programmes in Albania, Chile, Lebanon and Mexico were evaluated under supervision of the UNEP Evaluation Office in 2016. This report serves as an independent evaluation of the Country Programme of Chile, 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 UNEP Evaluation Office webpage (unep.org/evaluation/) and UNDP Evaluation Resource Centre (erc.undp.org).

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Project Identification Table

NAME OF THE PROJECT:	**The Country Program of Chile under the Global Solar Water Heating Market Transformation and Strengthening Initiative (PIMS 3611)**		
GEF ID:	2939	ATLAS ID:	00063281
UNDP PIMS ID:	3611		
GEF project ID:	63281	Project Type:	Full-size project
GEF OP #:	6	Focal Area(s):	Climate Change
GEF approval date:	July 29, 2008	GEF Strategic Priority/Objective:	Promoting the Adoption of Renewable Energy by Removing Barriers and Reducing Implementation Costs
Expected Start Date:		Actual start date:	May 1, 2009
Planned completion date:	December 1, 2013	Actual completion date:	December 2015
Planned project budget at approval:	3,331,500[1]	Total expenditures reported as of [date]:	1.499.763,30
GEF grant (USD):	1,500,000		

[1]This amount includes co finance of the government and other entities. As per ProDoc (English version), total UNDP managed budget was 1,500,000 USD

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ACRONYMS

ACESOL	Chilean Solar Energy Association
AWP	Annual Workplan
CChC	Chilean Chamber of Construction
CER	Centro de Energias renovables
CDT	Corporation for Technological Development
CNE	National Energy Commission
CORFO	Economic Development Agency
CO_2	Carbon dioxide
CP	Country Programme
GEF	Global Environment Facility
GIZ/GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
GSWH	Global Solar Water Heating
ICA Procobre	Chilean Center for the Promotion of Copper
M&E	Monitoring & Evaluation
MdE	Ministry of Energy
MINVU	Ministry of Housing and Urbanism
MTR	Mid-term Review
PMU	Project Management Unit
PIR	Project Implementation Review
PRODOC	Project document
SEC	Superintendent's Office for Electricity and Fuels
SRF	Strategic Results Framework
SWH	Solar water heater
TE	Terminal evaluation
TOC	Theory of Change
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Program
UNEP	United Nations Environment Program

1 INTRODUCTION

1. The subject of this evaluation is the Chilean 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 Evaluation[2] of the GSWH initiative.

2. This report presents the findings of the terminal evaluation of the Chilean Country Programme. This program was called "Programa Solar" in Chile (Solar Program). The CP, that received a USD 1.5 million grant from the Global Environmental Facility (GEF), was implemented between March 2009 and December 2015 managed by UNDP Chile and executed by National Energy Commission (CNE) and after 2010, by the Ministry of Energy (MdE).

1.1 Evaluation approach and Methodology

3. The terminal evaluation (TE) was coordinated by the UNEP Evaluation Office and thus follows the UNEP evaluation policy and guidelines. 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 GSWH Initiative (in Albania, Chile, Lebanon and Mexico) is assessed against the evaluation criteria specified in the evaluation TOR (section 4).

4. The terminal CP evaluation aims at providing a comprehensive and systematic account of the performance of the completed CP by evaluating its relevance in terms of UNDP/UN strategic programming documents, its consistency with global, regional and national environmental issues and needs as well as with the GEF climate change focal area, strategic priorities and operational programmes as well as its success in producing the programmed outputs and the extent to which its objectives and planned results were effectively achieved or are expected to be achieved.

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 Chile after its completion. Efficiency through cost-effectiveness and timeliness of CP execution will also be assessed.

6. Findings from this TE will provide guidance in view of charting future directions to ensure that the market transformation of solar water heaters in Chile is sustained and will also be used for accountability purposes.

7. The methodology adopted for this CP assessment includes a review 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. A full list of documents reviewed and people interviewed will be found in Annexes 1 and 2.

8. 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, was done by email for the checking of the factual errors and /or omissions.

[2] Terms of Reference concerning the overall terminal evaluation of the GSWH initiative is available at UNEP evaluation office webpage

9. 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

10. The evaluation of the Chilean component was designed as part of the TOR and budget of the overall evaluation of the GSWH initiative. The preparations of the evaluation mission to Chile were constrained by the UNEP's contractual procedures, which led to a delayed confirmation of the mission dates. Despite these challenges the UNEP Evaluation Office decided that it was not an option to delay the Chile mission/evaluation which would be also feeding to the overall evaluation of the GSWH initiative. Thus the time given to the UNDP Country Office to support in mission preparation was relatively short.

11. The short duration of the in-country mission (3 days) also meant that a list of questions, which does not claim to be in any way exhaustive, was prepared with a focus on main issues. For instance, the mission to Chile did not allow meeting all the relevant stakeholders; this is why the evaluation findings are based on the interviews held during the mission with the limited number of stakeholders and some additional interviews by phone held after the mission. Also, due to the changes in the Chilean Government, the some of the Ministry of Energy's employees had changed since the beginning of the project. Also, several were not reached for interviews because of their busy agenda and could not meet the evaluator.

12. In addition, it was difficult for the evaluator or the UNEP Evaluation Office to retrieve all the needed documentation from the UNDP Chile Country Office. This also caused delays with the evaluation process.

2 DESCRIPTION OF THE COUNTRY PROGRAMME

2.1 Country context

13. Chile's average solar radiation is 1,606 kWh/m^2 year[3] and thus it offers good conditions for the use of SWH in the majority of the regions (expected Southern regions). Chile SWH sector was classified as a very small market with a total installed capacity of only 6,700 m^2 prior the start of the CP. The annual production was approximately 8,861 MWh.

14. The market review conducted in early 2006 identified 25 SHW companies operating in Chile: 58% of these companies were solely involved in the commercialization of SWH equipment, as a complement to sales of other types of equipment and 40% of these local companies directly sold and installed the equipment. Independent installers did not exist in Chile. Only 25% of installed

[3] Source : Clean Energy Solutions Center – Daily average 4.4 kWh/m^2/day

capacity came from nationally manufactured products by small and undercapitalized firm with very limited marketing capacities.

15. With regard to the technology used, the flat plate collectors[4] were estimated to account for about 75% of the total installed area.

16. The SWH market was affected by the following barriers:

- Prohibitively high up-front costs of SWH systems;
- Lack of consumer awareness,
- Lack of fully operational technical standards or quality control of the systems and their installation,
- Lack of quality control and trust on product quality, installations and after-sale services; and
- Lack of suitable and attractive financing mechanism to alleviate the higher up-front costs of SWH systems
- Lack of access to capital markets for the Chilean SWH manufacturers

2.2 Country programme goal and objectives

17. The goal of this country component of the global UNDP/UNEP Solar Water Heating Market Transformation and Strengthening Initiative was to accelerate and sustain the solar water heating (SWH) market growth in Chile and to use the experiences and lessons learnt in promoting a similar growth in other countries. It was designed to develop a supportive regulatory environment, build up the market demand and strengthen the supply chain with the aim to facilitate the installation of 29,000 m^2 of additional SWH capacity in order to reach a target of 35,700 m^2 of installed SWH systems in Chile by 2011 and a continuing, sustainable growth rate of 45% (in total installed capacity) by the end of the project. The focus was to be on: i) enhancing the awareness of the key stakeholders on the use of SWH systems; ii) supporting the establishment of a supporting regulatory environment for sustainable development of the SWH market in Chile, including a voluntary quality control and certification scheme for SWH systems; iii) building the capacity of the supply chain; and iv) supporting the establishment of attractive consumer financing mechanisms in co-operation with local financial institutions.

18. To achieve overall goal and objective, the CP was designed for the removal of barriers with the following expected project outcomes (section 2 will provide details on the actual CP outcomes):

- **Outcome 1:** An enabling legal and regulatory framework to promote a sustainable SWH market
- **Outcome 2**: Enhanced awareness and capacity of the targeted end-users and housing developers to facilitate the integration of SWH into new housing developments and existing homes
- **Outcome 3**: Increased demand for SWH systems based on the availability of attractive end-user financing mechanisms

[4] A type of solar collector consisting of a series of flat glass or plastic plates with black metal surfaces that absorb solar energy.

- **Outcome 4**: An effective and affordable certification and quality control scheme applicable for all SWH manufactured and/or installed in Chile, and enhanced capacity of the supply chain to offer products and services promoting a sustainable SWH market
- **Outcome 5**: The provided support institutionalized and the results, experiences and lessons learned documented and disseminated (including monitoring, learning, evaluation and other feedback for adaptive management)

2.3 Country Program Start and Duration

19. The CP design document (ProDoc) was signed on March 31, 2009 with formal Project operations commencing with the Inception Workshop on November 19, 2009. The ProDoc indicated that the CP was a 5 year project. The CP was extended for another 1.5 years to its current terminal date in September 2015. Therefore, the project ended operationally in September 2015 and three extra months was used to close the project in December 2015 according to UNDP rules and regulations. The total budget of USD 3,331,500, with a GEF financial contribution of USD 1.5 million and a Chilean counterpart (co-financing) of USD 1,831,500, from the State of Chile and contributions from institutions participating in the project was the budget defined in the ProDoc.

2.4 Changes country programme design

20. To our knowledge, in addition to budget revisions, the CP has undergone two substantive revisions. After the mid-term evaluation, the steering committee decided to reallocate the budget planned to implement activities towards Outcome 3 to "increase of the demand for the SWH systems based on an attractive financial mechanism available for the final users" to the "the development of a pilot to implement Solar Water Heating in social collective households". A justification of the modifications of the Outcome 3 was developed on April 1st 2013 and update on July 24th 2013. The first substantive revision was signed during the first semester of 2014 by UNDP, the MdE and the Ministry of Foreign Affairs. The second substantive revision modified the termination date to September, 30 2015 and was justified by the cancelation of a "call for proposals" for an activity "Installation, monitoring and maintenance of SWH systems in existing social multi-family housing" due to too high economic proposals compared to the planned budget. The requirements of the terms of reference were modified before launching the second "call for proposals".

2.5 Implementation arrangements

21. The MdE (formerly CNE) implemented the CP, under the UNDP national execution modality. A National Project Director (NPD), within the ministry, had been appointed and was in charge of supporting the implementation of the CP. The NDP changed in 2013. A National Project Steering Committee (PSC) was set up to supervise and guide the project implementation. It included representatives of institutions sharing a common interest in the issue, the UNDP Country Office (CO) and representatives of other institutions: the Ministry of Housing and Urbanism (MINVU), the Economic Development Agency (CORFO), the Center of Renewable energies (CER) and the Electricity and Fuels Superintendence (SEC).

22. As for the day-to-day management of the project, a separate Project Management Unit (PMU) was established in Santiago located MdE facility, and was led by a full time national project coordinator. The National Project Coordinator was also changed during the project implementation in 2013.

23. The PMU also benefited from the input of a part-time International Technical Advisor (ITA), i.e. an international SWH source of expertise to support the monitoring and provision of advice for the implementation of the project, thus aiming to ensure that best practice and lessons learnt from similar activities in other countries were adequately taken into account in the implementation and management of the project.

24. The UNDP Country Office in Chile was in charge of monitoring the progress towards intended results, of providing administrative support upon request and of ensuring that financial oversight is in accordance with the guidelines for nationally-executed UNDP projects.

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

2.6 Main Stakeholders

26. The main stakeholders of the Chilean CP are listed in an approximate order of ownership and involvement:

- Ministerio de Energia (MdE) (formerly Comision Nacional de Energía (CNE)): MdE is the main supporter of the policy related activities of the project and facilitated the participation of other government entities, such as those involved with environmental, housing, financing and tax policy issues. In addition, MdE's role facilitated the project design, implementation, and awareness promotion by being the executing agency for the CP;
- Ministerio de Vivienda y Urbanismo (MINVU): MINVU promotes and facilitates SWH installation in social housing with collaboration from housing developers with which it already works; MINVU was part of the Project Steering Committee (PSC);
- Superintendencia de Electricidad y Combustibles (SEC): The SEC is responsible of the development and enforcement of standards in the field of energy. The SEC was part of the PSC;
- CORFO: This Chilean development bank develops financing mechanisms adapted to the Chilean market. Finally, CORFO did not participate actively in the CP;
- Corporación de Desarrollo Tecnológico (CDT): As part of the Chilean Chamber of Construction, the CDT's mission is to promote innovation and technological development amongst firms in the country's construction sector. The involvement of CDT in the promotion of SWH in Chile was the following: organization of a training on design and sizing of SWH system and tax benefit in 2010. The CDT was part of the consultative committee of the CP;
- ICA-Procobre: Development and co-financing for regulation and activities of promotion for SWH. The involvement of ICA Procobre in the promotion of SWH in Chile was the following: training on design and sizing of SWH system and tax benefit in 2010, "Vivienda Movil Solar" in 2011, creation of a technical degree at secondary school levels in 2013;
- ACESOL: ACESOL represents the solar community in Chile and integrates the points of view of the academic community and of the solar industry into the project. ACESOL was part of the consultative committee of the CP;
- GIZ (formerly GTZ): The GIZ co-financed of activities of the CP related to housing and construction sector;
- Centro de Energias renovables CER (formerly CIFES): The CIFES was part of the PSC. Finally, CER/CIFES did not participate actively in the CP, they only participated in the annual steering committees;
- Aiguasol: This engineering company was selected, after winning a competitive bid, to develop several projects during the CP; and
- University: Several universities were involved in the CP. The most active are the Universidad Federico Santa Maria (Valparaiso), and the Universidad de Chile's (Santiago), Mechanical Engineering Department, IDIEM, Department of Architecture. Electrical Engineering Department and Program for Studies and Research on Energy (PRIEN). In particular, Universidad de Chile was part of the consultative committee of CP.

2.7 The Reconstructed Theory of Change

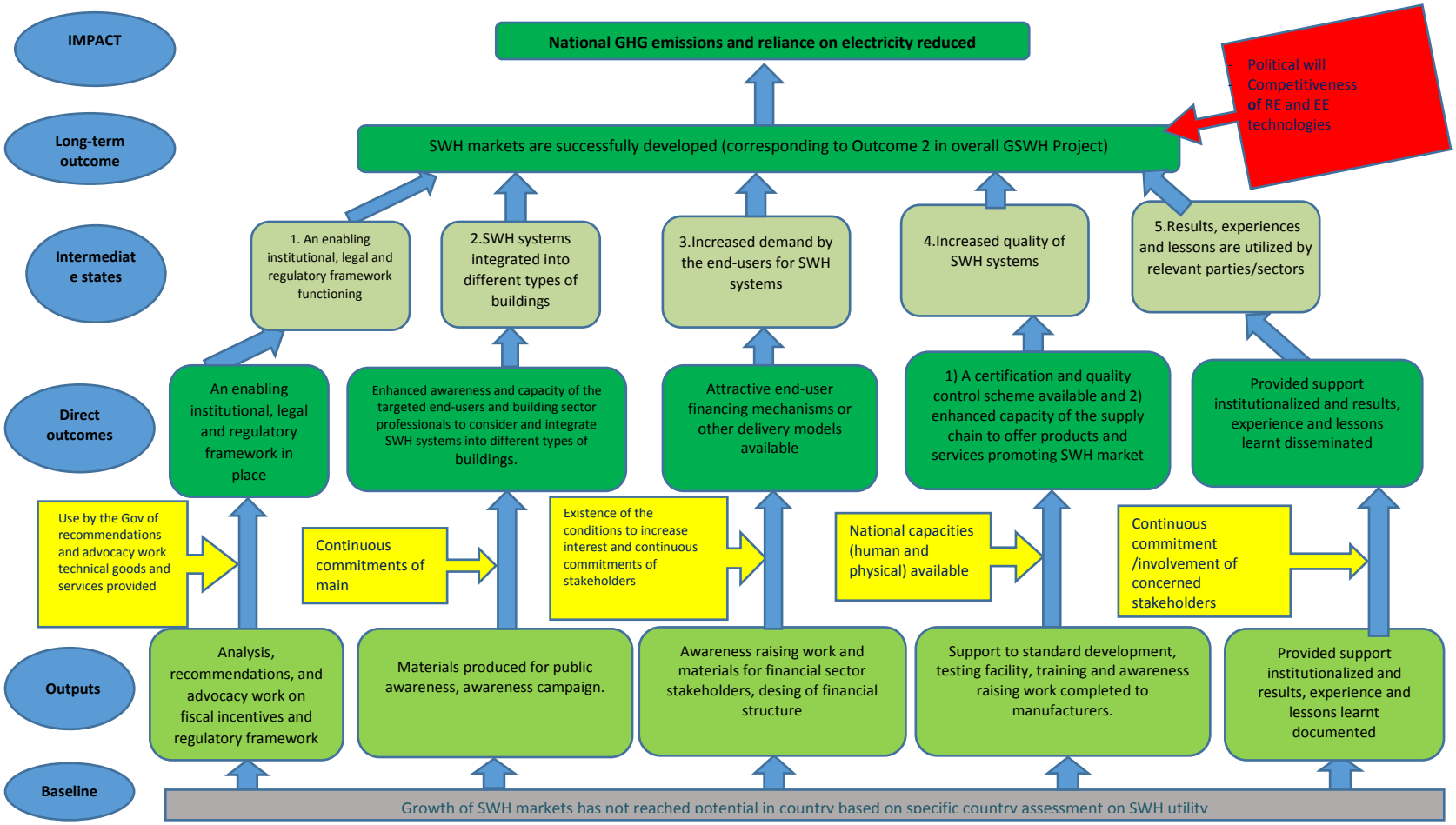
27. The theory of change (TOC) is a representation of causal linkages which allows understanding the underlying programme logic, from outputs through direct outcomes to long-term outcomes, and furthering towards impact. The CP document did not originally include a TOC which therefore was reconstructed based on the Strategic Result Framework (SRF) in the ProDoc. The Chilean 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.

28. The CP activities and outputs were expected to contribute to achievement of 5 direct outcomes which themselves should eventually lead, via intermediate states towards the long-term outcome and eventually towards the intended impact. The CP's intended long-term impact was reduction of GHG emissions and reduced reliance on electricity.

29. 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 (as m^2), and b) growth of the annual sale of SWH systems. Direct outcomes and intermediate states are formulated based on the outcome statements in the ProDoc.

30. 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

31. This section presents the main findings of the final evaluation of the Chilean country program.

3.1 Strategic relevance

32. This criterion assesses the alignment of the project objectives with Chilean country priorities and initiatives, UNDP strategies and other programming principles

33. National priorities. The country program is aligned with the Chilean government priorities. While the country is focusing in increasing the production of renewable electricity, the 2014-2018 Energy Programme plans to extend and improve the fiscal incentives for solar water heating, as well as providing subsidies for installation of solar water heaters in reconstruction of disaster-affected areas (Arica, Iquique and Valparaíso). Also, in February 2012, Chile implemented the new National Strategy for the Energy Sector, aimed at expanding the sector capacity, supporting non-conventional renewable sources and promoting the sustainable financing of the system.

34. UNDP's policy and strategy. In the action plan for the national program established for 2011-2014 period between UNDP and the Chilean government, it is stated that the program is based on the support of adoption of policies and with technical assistance to national actions and the strengthening of national capacities. The CP's outputs are clearly aligned with this action plan.

35. UNDAF. Also, the United Nations Development Assistance Framework (UNDAF) for the period 2007-2010 integrates three main areas of cooperation including the reduction of economic, social, demographic, gender, territorial and ethnic inequities and the strengthening of decentralization and local development. The UNDAF Chile for 2011-2014 framed the assistance of the United Nations System to Chile around five main areas of cooperation: 1) inequality and poverty reduction; 2) strengthening of democracy and citizenship; 3) climate change, environmental and energy sustainability; 4) south-south cooperation; 5) support to reconstruction. The UNDAF for 2015-2018 includes an area of cooperation aligned with the objectives of the GSWH initiative: Environmental sustainability and risk management.

36. Alignment with GEF focal areas and strategic priorities. The project aligns as part of the GEF supported activities related to Climate Change Mitigation and Climate Change Adaptation. The GEF projects are expected to achieve several objectives related to these activities and one of these is "investment in renewable energy technologies". The CP activities planned and developed in Chile are evidently aligned with the GEF Climate Change strategic priorities.

37. Gender and HRBA issues. These issues have not been addressed during the implementation phase because they have not been identified as such in the ProDoc.

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

3.2 Achievement of outputs

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

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

Outputs (Project logical framework)	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 finalized.	The 2009 Regulatory Framework for Solar Water Thermal (Law 20365) provides technical standards, certification systems and fiscal incentives for solar water heating systems in new houses. It was adopted before the start of the CP. The fiscal incentives started to be available on August 24, 2010. The tax benefit ended in December 2013. Hence the CP worked both towards obtaining an extension of the tax credit beyond 2013, as well as mobilizing the market so that it would take full advantage of the opportunities offered by the facility. The new government, since March 2014, renewed the Law 20.365 utilizing the same mechanism. The CP developed a study of economic and social impact of the tax benefit. The results of this study were important in designing the new modifications in the new tax benefit approved in 2016. The Law 20.365 was extended to 2019. The CP supported the enforcement of the law providing the technical guidelines to obtain the fiscal benefits. Also, regarding the technical aspects of the systems installed in Chile, the CP prompted the design of technical tools to make the architectural integration of SWH easier in buildings and to work with previously certified configurations (for the system and for each element of SWH, in hard copy and digital format). These documents were based on international literature and were only adapted to Chilean context. The CP supported MINVU in developing technical regulatory framework that improved the assignation of subsidies to install SWH in existing households. The CP worked to extend the Law 20365, but did not make any recommendations on other public incentives to promote SWH in other sectors than the residential sectors and neither for non-social existing housing. Concerning the regulatory framework for SWH quality control, it was finalized for the SWH systems under the Law 20365 but no exhaustive regulatory framework analysis for any SWH systems installed in Chile, particularly the SWH systems in the commercial and industrial sectors, was developed. The CP did not work on building regulation to consider the integration of SWH systems into the design and construction of new buildings.
Output 1.2: Analysis, recommendation and associated advocacy work for setting-up the required regulatory framework for SWH quality control to be finalized	
Output 1.3: Adoption of new regulations to consider or oblige the integration of SWH systems into the design and construction of new buildings[5]	

41. Outcome 2: Enhanced awareness and capacity of the targeted end-users and housing developers to facilitate the integration of SWH into new housing developments and existing homes:

SRF Outputs	Actual outputs delivered:
Output 2.1: Materials for public awareness raising and marketing campaigns developed or adapted into Chilean conditions	An International expert in Solar Thermal Energy was hired for developing two important deliverables/purposes a) prepare three technical material studies and supervise the

[5] The formulation of output 1.3 'Adoption of new regulation…' is an outcome level results. Thus it won't be discussed in this level.

Output 2.2: Public awareness raising and marketing campaigns implemented in co-operation with relevant public entities and private SWH suppliers and manufacturers.	technical products generated by the project and b) implement the planned training activities. The technical materials were produced and available on the CP webpage (www.programasolar.cl/). Based on evaluation assessment, these reports produced are generic and such basic documentation could have benefitted from synergies with other countries by utilizing SWH materials from Spanish-spoken countries (such as Spain and Mexico) and slightly adapted to the Chilean conditions, instead of being completely new reports. Several tools have been developed to reach SWH market stakeholders and inform them on the latest development in the market. These tools include a newsletter. The focus of the materials is the Programa Solar webpage which had not been updated since March 2016[6]. The CP supported the development of a didactic showcase of SWH system in the residential sector: "Vivienda Móvil Solar". This movable house included other energy efficiency and water-savings technologies. This house was exposed in 2011 during 15 days in Viña del Mar. In 2010, the CDT, ICA Procobre and the Cámara Chilena de la Construcción (CChC) conducted a training to address real estate and construction professionals. Also, a leaflet was developed in collaboration with the MINVU and 100 pieces were diffused in each regional office of MINVU. The CP supported the creation of the "Mesa Solar", Solar Thermic Sectorial Meeting coordinated by ACESOL. This "Mesa Solar" only met three times in six months. The purpose of these meetings was to present and discuss the results of the study of economic and social impact of the tax benefit, as well as the subsidies provided by MINVU, and to encourage all stakeholders to promote the extension of the tax benefit.

42. Outcome 3: Increased demand for SWH systems based on the availability of attractive end-user financing mechanisms[7]

SRF Outputs	Actual outputs delivered:
Output 3.1: Enhanced awareness[8] of the key financial sector stakeholder and local suppliers on the specific characteristics and financing opportunities in the SWH market.	The CP worked with leading retail companies in the second half of 2011, with the purpose of exploring the availability of implementing a financial mechanism. Based on the interviews, the CP did not collaborate actively with CORFO or Fundación Chile to develop an adapted financial mechanism for the SWH market even though these institutions had already a large experience in

[6] Information from January 2017

[7] After the mid-term evaluation, the steering committee decided to reallocate the budget planned to implement the Outcome 3 "Increase of the demand for the SWH systems based on an attractive financial mechanism available for the final users" to the "Development of a pilot to implement Solar Water Heating in social collective households". A justification of the modifications of the Outcome 3 was developed on April 1st 2013 and update on July 24th 2013. See also paragraph 19. This section discusses outputs and activities conducted under the original and revised component/outcomes.

[8] The output is formulated as an outcome level result (enhanced awareness).Thus this section discusses mainly about the CP activities and deliverables, and the focus on change process and outcome level results in the following sections of the report.

	this field. Based on the developments in financing market at the end of the CP implementation, the CP did not enhanced awareness of the key financial sector stakeholder and local suppliers as no adapted financing mechanism was available on the market apart from CORFO loan lines.
Output 3.2: Design the financial structure and implementation arrangements for specific purpose financing vehicles that will address consumer needs in the SWH market.	The Solar Program prepared Terms of Reference of a Request For Proposal (RFP), aiming at bidding the financial mechanism to any retail company. The RFP, even if it was launched twice, did not create an interest in the SWH market and the CP did not receive any proposal. Since the study to evaluate alternative financing mechanisms for SWH was declared void due to the lack of proposal received, the CP decided to redirect the resources allocated for this output to pilot projects to establish a business model to support the SWH installation in multifamily social housing in collaboration with MINVU (see Section 2.4). The Solar Program strategy was to develop a financial mechanism to implement an incentive directly focusing on end-users through the introduction of a social building pilot for a collective of 20 or 40 low-income families, implemented together with Ministry of Housing and Urbanism (MINVU). The tool for develop this mechanism is the design of the technical solution for implementing SWH systems in existing collective social housing (4 social building). To implement the Pilot Solar Program had a budget of US $ 200.000 for develop the technical solution and its respective implementation. The pilot project for emplacing a solar water heating program in existing social housing was not finalized. There were difficulties experienced with the inhabitants of the pilot site who did not accept the installation of the SWH system which ultimately resulted in the pilot project discontinuation. The CP did not succeed in initiating and implementing the financial structure. The CP adapted to the situation and revised the outcome and related outputs to implement a social housing pilot. For this initiative, the CP developed the design of a delivery model to install the SWH in social housing approved by the MdE and MINVU. This initiative, however, was never finalized.

43. Outcome 4: An effective and affordable certification and quality control scheme applicable for all SWH manufactured and/or installed in Chile, and enhanced capacity of the supply chain to offer products and services promoting a sustainable SWH market

SRF Outputs	Actual outputs delivered:
Output 4.1: Set of SWH standards and associated certification system developed (or adapted) for Chilean conditions	In the Superintendent's Office for Electricity and Fuels (SEC), the institution charged to develop standards for the energy market in Chile, created a unit specialized in SWH in 2010. The Law 20365 planned a budget for the SEC to develop the required SWH standard. The CP supported the SEC in this work.
Output 4.2: An effective and affordable testing facility to check compliance with standards	As a result of the monitoring study of SWH systems, the SEC received information about a tool that quantifies the performance of the panels installed under Franchise Tax (FT) of Law 20,365, provided by the CP contracted AIGUASOL company. The company AIGUASOL also provided a theoretical training on software operation and two practical training to the SEC. At the time of the evaluation, the SEC has not applied the introduced tool and did not even have the capacities to use the system, such as the software, bags, cables, materials and technical manuals of the measuring system. The software

	was available in AIGUASOL offices by the time of the mission.
Output 4.3: Technical support to local manufacturers and importers to obtain certification and improve product quality.	The CP supported the development of two technical guides: • Technical Guide for Architects and Designers: Thermosiphon Systems for Single Family Houses • Technical Guide for Architects and Designers: Centralized Systems for Multi-Family Houses These technical guides were written by UNDP in cooperation with the MdE, the Chilean Association of Solar Energy (ACESOL) and the College of Architects of Chile. These reports have been produced by the CP; however, the usefulness of the reports is questionable as these reports could have been adapted from existing technical literature (from Spain for instance) and not developed from scratch. In addition, the CP did not support directly the local manufacturers or importers to obtain the certification developed by the SEC (Output 4.1).
Output 4.4: A training and recognition system in place for SWH system installers	The CP supported and implemented program training directly to the public and private sector through international experts to promote best practices of the international solar industry. Specifically, in the public sector there were trained 1) professionals from all regional offices of Ministry of Housing and Urbanism and, 2) teachers of thirteen[9] technical colleges of different regions of the country. Also, teams of teacher of Architectural Department of University Católica del Norte; Department of Mechanical Engineering of University of La Serena and Department of Chemical Engineering of University of Santiago were trained by technical advisor in training activity \"train the trainer\". The aim was that these universities offer subsequent technicians' certification and incorporate Solar Thermic Energy knowledge in their curriculums. Four additional Universities in 4 regions were also part of this training programme. The importance of doing so was that these 4 regions were severely affected by natural disasters in Chile during 2014-2015, this was part of a strategy to implement a reconstruction programme that includes SWH in affected areas, and capacities were enhanced in educational entities of each region (Centro de formacion tecnica de Tarapacá (Arica y Parinacota), Universidad Arturo Prat (Tarapacá), Universidad de Atacama (Atacama), and DUOC Valparaíso (Valparaíso). The CP supported these universities by purchasing a SWH testing facility for each university.

44. 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):

SRF Outputs	Actual outputs delivered:
Output 5.1: The reporting framework and arrangement for the SWH market monitoring established and continuing after the end of the project.	The first market study was elaborated in 2012 and is published in the solar Programme website. The second market study was developed during a transitional period of the tax benefit. There was strategic decision not to share this study because stakeholders where more interested in extending the tax benefit, this study was perceived of having a negative impact on

[9] Information from UNDP (11 as per PIR reporting)

	achieving the extension, mainly because the study showed a decline of the SWH market supported by statistics of SEC. The CP developed a market study. Based on the interviews, the results of this study were not presented. The annual SWH installation rate is monitored by ACESOL and this institution will continue to monitor this data after the end of the CP. Based on the available information, it is not possible to state if the SWH market will be monitored after the end of the CP.
Output 5.2: Project mid-term and final evaluation	The project had its MTR on September 2012, which showed interesting feedback about how the project has changed due to market conditions and positive public policies implemented by the government. The final evaluation was schedule for mid-2016.
Output 5.3: The project final results and lessons learned documented and disseminated	The CP worked in order to spread results and lessons learned, mainly through their web platform www.programasolar.cl, hosted in Ministry of Energy servers. In this webpage and on UNDP webpage, a summary of the results is presented.

45. As a conclusion, the CP is rated "Moderately Satisfactory" (MS) in terms of the achievement of outputs. Major shortcomings in delivering the intended outputs can be observed under Component 3. Output 3.1 and Output 3.2 were not delivered. The evaluation acknowledges that the CP did corrective actions to change the outcome and related activities, but based on the evaluation findings, despite these efforts the CP didn't manage to deliver the intended pilots under the revised plan. Equally the evaluation acknowledges that despite several activities targeting SWH market players were implemented, outputs on awareness raising activities were not sufficiently focusing on public as planned the project design (Component 2). Equally the activities under Component 5 are assessed as insufficient to support the intended outcome (the provided support institutionalized and the results, experiences and lessons learnt documented and disseminated).

46. The moderately satisfactory rating is also supported by the CP exit strategy document which acknowledges that the completion of the majority of the activities took longer than had been initially anticipated. Some tasks are still to be carried out under most of the component, to secure and sustain the initial results that were achieved.

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

3.3.1 Achievement of direct outcomes[10]

47. Outcome 1: An enabling institutional, legal, and regulatory framework to promote sustainable SWH market. The immediate outcome is highly related to government willingness to enforce new regulations to promote SWH market. The Law 20,365 was voted before the start of the CP, so it cannot be considered as an outcome of the program. Also, even though this law was renewed in 2016, the financial mechanism was not optimized. It has to be noted that the CP did provide technical backstopping and develop modifications for the Law, which did contribute to the content if renewed law (approved after the termination date of the CP). From 2009 to 2013, the SWH market was supported by the Law 20.365. However, when the law expired, the SWH market growth (in installed area of solar panels) decreased to 13.6% in comparison with, the

[10] Outcome statements are as per the project document. The analysis considers the direct outcomes as defined in the reconstructed TOC.

growth rate between 2009 and 2013 which was from 35% to 50%. Also, the Law supported only the residential sector.

48. It seems that the project has not been fully integrated into the national institutional context; hence, its contribution to Outcome 1 is somewhat limited. While international experiences have for the most part demonstrated that mandatory regulation pertaining the SWH installation has been the single most effective tool to rapidly accelerate the SWH market[11], the evaluation did not find evidence that the CP was promoting such mandatory regulation for the building sector as an effective option to accelerate the market and mainly, sustain this market.

49. The CP managed to create interest in the SWH in several public institutions: MINVU and the ministry of education.

50. The rating of the level of success of this outcome is therefore "Moderately Satisfactory" (MS).

51. Outcome 2: Enhanced awareness and capacity of the targeted end-users and housing developers to facilitate the integration of SWH into new housing developments and existing homes. The CP worked in close collaboration with the Ministry of Education to increase awareness at high school level. The CP also collaborated to some extent with other SWH market actors to increase awareness of end users, even though it was highly related to the enforcement of the Law 20.365. Moreover, the CP developed manuals and a series of capacity building training for local SWH manufacturers. The CP implemented awareness activities were not targeted to those that would be considered as SWH decision makers in the residential sector. There is no evidence that the CP would have raised the public awareness of SWHs in Chile significantly. In addition, the outputs and activities completed under Component 2 lack a marketing campaign targeting end-users/public at medium or large scale. It has to be noted that the CP assigned this role to ACESOL which was part of the steering committee. However, the CP did not collaborate with ACESOL to develop a promotion campaign. The CP dedicated more work in raising awareness among SWH professionals through training and collaboration with the college or architects

52. At the start of the CP, an online information and outreach platform was put into place: www.programasolar.cl. This webpage has been maintained although no news has been uploaded since March 2016[12].

53. Outcome 2 has been achieved and the rating of its level of success is "Moderately Unsatisfactory" (MU).

54. Outcome 3: a) Availability of attractive end-user financing mechanisms[13] / b) Development of a pilot to implement Solar Water Heating in social collective households. Considerable effort has been given for to develop an end-user financing mechanism, although the results are not as good as expected. The CP helped to develop the technical documentation required to implement the grant mechanism from MINVU for low income housing which existed since 2011. As

[11] Source: Policy Opportunities for More Efficient Residential Water Heating, CLASP, November 2015

[12] January 2017

[13] After the mid-term evaluation, the steering committee decided to reallocate the budget planned to implement the Outcome 3 "Increase of the demand for the SWH systems based on an attractive financial mechanism available for the final users" to the "Development of a pilot to implement Solar Water Heating in social collective households". A justification of the modifications of the Outcome 3 was developed on April 1st 2013 and update on July 24th 2013. See also paragraph 19. This section discusses outputs and activities conducted under the original and revised component/outcomes.

discussed earlier, the Law 20.635, which came in force before the beginning of the CP, provided (and is still giving) tax benefits for newly built houses with SWH systems. For this mechanism, the CP helped also in the development of the technical documentation and dissemination. Thus, indirectly support for financial incentives in SWH sector were given.

55. The CP tried to develop a financing mechanism focusing on end-users but the market responded negatively to this proposal. In order to utilize the CP budget reserved for these purposes, the CP initiated a pilot for existing social housing buildings, which was designed and approved by the MdE and MINVU. This pilot initiative was not completed.

56. The evaluation acknowledges the CP endeavors to adapt and revise the plans. Nevertheless, it is difficult to evaluate why these both initiatives failed. Based on the evaluator's experience, the first attempt to build a financing mechanism for end-users was developed by technical professionals not by those specialized in financing mechanisms. Thus, the CP was not capable to design a useful tool considering the market requirements. It is also acknowledged that Chile already has institutions that have knowhow in developing such financial tools. The CP did not work in close collaboration with CORFO or Fundacion Chile (part of the consultative group), which are institutions specialized in financing mechanism development and already have financing mechanisms for renewable energy in their portfolio. Also, the risks and challenges related to the development of such initiatives were not analyzed in depth.

57. Therefore, the rating of the level of achievement of this outcome 4 (considering the original and revised outcome formulation) is "Moderately Unsatisfactory" (MU).

58. Outcome 4: An effective and affordable certification and quality control scheme applicable for all SWH manufactured and/or installed in Chile, and enhanced capacity of the supply chain to offer products and services promoting a sustainable SWH market. The CP collaborated with different stakeholders to train technical specialists, universities and high school's professors. The CP supported several cooperation agreements with several education institutions. At least, seven high schools integrated a SWH course in their curriculum.

59. The quality of SWH system installation is enhanced thanks to an increase of installers' capacity even if Chile has no installer certification program. More than 300 persons received trainings.

60. A solar thermal product national certification has been introduced in 2012 with the support of the CP to ensure that the SWH systems installed under the Law 20,365 corresponds to a minimum quality and performance. The SEC is responsible for overseeing the approval, testing and certification of solar collectors and storage tanks. The SWH standards are voluntary and do not seem very stringent (based on the evaluation interviews) decreasing the effectiveness of the introduced systems. Moreover, there is no roadmap considering to increase the technical requirements of SWH equipment neither to enforce a mandatory standard, thus the outcome 4 rating is lowered from satisfactory to Moderately Satisfactory" (MS).

61. 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). The CP developed a webpage which still exists after the completion of the CP with relatively low activity since end of 2014. Due to change in key personnel, some of CP documentation was difficult to retrieve, indicating weaknesses in knowledge management endeavor of the CP. Moreover, based on the evaluation findings the lessons learned were not disseminated to the SWH market stakeholders. The MdE monitored the SWH market and provided two market studies during the CP, but haven't developed any process to monitor continuously the area and the supplied energy of the installed SWH systems. The institutionalization of the SWH market support is guaranteed in MINVU and in MdE. Chile is

working in developing an Energy Strategy by 2050 which include a minimum energy supply with solar energy. However, the photovoltaic technology appears to be more encouraged than the SWH technology in Chile. Several months after the completion of the CP, a report summarizing the results had not been produced.

62. Given the results achieved at the CP completion date, the rating of the level of success of this outcome is "Moderately Unsatisfactory" (MU)

63. In conclusion, the achievement of direct outcomes of the CP is evaluated as "Moderately Unsatisfactory" (MU).

3.3.2 Likelihood of impact of the CP

64. This section explores the relation between the CP outcomes and the intermediate states of the re-constructed TOC and to what extent these have contributed to the long-term outcome ('SWH markets are successfully developed') which is expected to eventually contribute to the decreased level of GHG emissions.

65. According to an IEA Solar Heat Worldwide[14], the Chilean market is considered as an "evolving market" and still not as mature. Based on TechScope report 2015, the GHG emission reduction from the 72,984 m^2 of SWH systems installed was estimated to be more than 25.2 tons of CO_{2eq} per year. As also discussed in the Section 3.3.3 the CP country target in terms of installed SWH panels (m^2) was achieved during the life span of the project.

66. Based on the analysis of the outcome areas (Section 3.3.1) the CP performed relatively well under outcome areas 1 and 4 as well as under outcome 2 in terms of targeting building sector professionals. The CP contributed to establishing technical regulations which increase the quality of the SWH systems installed under the Law 20.365 and Minvu program for low income housing:

- The CP supported the regulation that allows implementing the Law, and thus increases the performance of the SWH systems installed under the Law, which might have speed up its enforcement. However, the impact of the CP in installed area of SWH panels remains low as the majority of the installed SWH systems were due to the Law which was approved before the start of the CP.

- Around 25% (December 2015) of the newly installed SWH during the CP was under the subsidy provided by MINVU. The technical regulations of this subsidy were elaborated by the CP. The design of the incentive mechanism was developed by MINVU and MdE and the incentives come from MINVU budget, so the CP's contribution to the newly installed SWHs has been very limited.

- Several technical documentations were developed under the Outcome 1 and 4 that are expected to increase the quality of the SWH panels and of the SWH systems, especially under the Law 20,635. Activities to spread information among professionals were developed under the Outcome 2 and 4.

67. Based on the above, it can be assessed that, the CP's contribution to achieving country level target in terms of newly installed SWH systems measures in m^2 has been low. Nevertheless, the higher quality of the SWH installations, both in terms of equipment and of installation, can increase in the long-run the production of each installed m^2.

[14] https://nachhaltigwirtschaften.at/resources/iea_pdf/reports/iea_shc_solar_heat_worldwide_2016.pdf

68. The country level target in terms of the growth rate was not achieved (see paragraph 72). To increase the demand of a market, in general, the following components are required:

- Good quality of the product (Outcome 4)
- Trained professionals (Outcomes 2 and 4)
- End-user interest (Outcome 2 and 5) to increase the demand
- Support from the government (Outcome 1)
- Easy access to adapted financial mechanism (Outcome 3)

69. As for the evaluation of the CP's contribution to the intermediate state of the re-constructed TOC is difficult to assess in a quantitative terms. Nevertheless, based on the above discussion, progress was made towards Intermediate State 4 (increased quality of SWH systems) and Intermediate State 1 (enabling institutional, legal and regulatory framework). At the same time, the enhanced quality of SWH equipment only concerns those SWH systems that are installed under MINVU program and the Law 20,635. No mandatory regulation concerning the quality of the SWH systems or the obligation to install SWH systems in buildings was developed under the CP.

70. The CP was designed to increase the end-user demand (Intermediate State 3) by establishing an attractive financing mechanism. However, the CP failed in providing adapted financial mechanism to the end-users. At the same time, awareness raising activities towards consumer end-users were very limited, indicating that the CP did not achieve Intermediate State 3.

71. Even though the CP was designed wisely and it englobed all the components required accelerating the Chilean SWH markets, it is still evident that the CP did not achieve several direct outcomes nor intermediate states required to contribute to the development of the SWH market in Chile. The likelihood of impact of the country program is evaluated as "Moderately Unlikely" (MU).

3.3.3 Achievement of the formal CP objective:

72. The set country level targets were reached partially. The objective of 35,700 m^2 was exceeded with 56,733 m^2 but the growth rate was lower than the expected target (the target was a sustainable growth rate of 45% by the end of the project and the growth rate was 13.6% in 2014) and highly depend to the incentives provided by the Law 20.635.

73. In the Solar Heat Worldwide of IEA, the total installed area of flat plate collectors was 134,101 m^2 in 2014 and 26,730 m^2 in 2009, which means an added area of approximately 100,000 m^2. Thanks to the Law 20.635, 55,266 m^2 were installed up to June 2014 and 17,718 m^2 of SWH thanks to Minvu program between 2011 and 2014. These two initiatives account for more than half of the total expansion in m^2.

74. The market was driven completely by the Law 20,635 which was voted before the start of the CP. The growth rate was lower than expected in 2014[15] and this is why it is rated as "Moderately Satisfactory" (MS).

[15] No data available for 2015 at the time of the evaluation.

3.4 Sustainability and replication

75. In terms of the Institutional and financial sustainability of the CP the Ministry of Energy of Chile, as the organization in charge of SWH development in the country, created a division dedicated to SWH. This division supervises the implementation of the Laws' main objectives, amongst these, the new component that delivers subsidies for new residential homes. It is planned that the Law will provide incentives until the end of 2020. However, in the 2050 energy roadmap of MdE, it seems that the available resources will be more dedicated to photovoltaic technologies. The sustainability and replication of the CP in terms of financial resources is evaluated as "Likely" (L). As there is not a national program planned to pursue the activities started under the country programme, the catalytic role of the CP is rated as "Moderately Satisfactory".

76. In terms of the sociopolitical sustainability, the main concern is the next general election that will be held in 2017 could affect greatly the sustainability of the reached outcomes. The tax breaks for SWH is only guaranteed up to 2020. The new government might not renew this incentive. As the growth of SWH market was highly linked to this tax break, the growth of the SWH market will likely decrease once the subsidies stop. The sustainability and replication of the program is evaluated in terms of institutional framework as "Moderately Likely" (ML) and in terms of socio-political risks as "Moderately Likely" (ML).

77. The environmental sustainability of the CP is guaranteed as SWH technology has a positive influence on the reductions of CO_2 emission. The sustainability of the program in terms of environmental factors is evaluated as "Likely" (L).

78. In terms of its sustainability, the rating of the level of success of the CP is "Moderately Likely"(ML).

3.5 Efficiency

79. In this section, the cost-effectiveness and the timeliness of CP execution is assessed. In the next table, the disbursement ratio of CP's budget is presented yearly until 2015. It should be noted that the disbursement rate of the project has been consistently lower than planned. Based on the information included in the steering committee presentations, the budget dedicated to the Outcome 1 and to the management of the CP was higher than the budget defined in the Prodoc. Resources spent for the activities related to Outcome 3 were not successful (financing mechanisms for end-users and pilot project with MINVU in social multifamily household). In this outcome, more than 60,000 USD were spent between 2009 and 2012 without outputs that would contribute to outcome level results of the project. The delivery rate was low during the first year with less than 1.9% of the GEF fund (2009). However, CP activities accelerated between 2011 and 2014 to reach a disbursement rate of close to 15%, with the disbursement rate over 20% during the last year of implementation.

Table 1: Disbursement per year of GEF funding (in %)

Year	Actual cost (in cash USD)	Disbursement ratio (in %)
2009	$29,257.44	1.9%
2010	$176,880.36	11.7%
2011	$219,430.80	14.7%
2012	$254,371.91	17.0%
2013	$234.816,58	15.7%
2014	$265.754,33	17.7%
2015	$319.242,88	21.3%
Total	$1.499.763,22	100%

Source: CRDs

80. The cooperation between UNDP and UNEP did not increase greatly the efficiency of the CP's activities. The collaboration was very limited with UNEP during the whole program. Moreover, the CP had almost no interaction with the other countries participating in the GSWH project. The project was also extended with 1.5 years.

81. In terms of efficiency, and given the reasons cited above, the CP is rated "Moderately Satisfactory" (MS).

3.6 Factors affecting performance

3.6.1 Preparation and readiness

82. The concept and design of the project was consistent with the conditions, context and baseline existing at the time of its preparation. Its formulation is detailed and exhaustive in many ways and should be considered appropriate and satisfactory. The CP design included the main public and private stakeholders and all the sectors in which SWH systems could be installed. CP's planned stakeholder participation plans were holistic to include all levels of stakeholders from regulators to end-users.

83. The project was well designed because its aim was to tackle the different barriers of the SWH market. However, the last version of the Prodoc does not considered the work of the government on a tax benefit related to the installation of SWH system. The law proposal was received by the Chilean Senate in October 2008 (before the start of the CP). Also, considering the low level of achieving some of the outputs and intended outcomes the evaluation team assesses that this could have been partially caused by a design weakness, that didn't fully reflect the context of Chile.

84. Moreover, in the Prodoc, several other design weaknesses have been identified:

- The baseline was not modified after the adoption of the Law No. 20,365
- The indicators do not allow assessing the effectiveness of the CP, in particular, in terms of awareness raising for the public and of SWH systems costs reduction.
- A survey should have been planned and budgeted for (at least one at the beginning of the project: baseline, and one at the end) to evaluate the market transformation among the end users.

85. The CP preparation and readiness was assessed as "Moderately Unsatisfactory" (MU).

3.6.2 Project implementation and management

86. Based on the evaluation findings the following external factors negatively affected the project implementation and the achievement of results: administrative reorganization of the CNE (as a consequence of the creation of the Ministry of Energy); the challenges experienced in the placing the project in the new ministry organization; the changes that occurred within the Ministry of Energy upon the change of government after March 2010; and the high turnover of officials of the project's setting in the Ministry of Energy;

87. UNDP was periodically meeting with the Ministry of Energy expressing its concern with the slow project implementation. The slow implementation led to slow disbursement rate, especially the first year, which was followed by the project extension. The last year of CP operation (2015) the disbursement rate was higher than on previous year of implementation (over 20 % of the whole GEF budget). At the same time, the pilot for MINVU program in social multifamily household was not delivered (the budget for this SWH installation was around 200,000 USD). In the UNDP Combined Delivery Report of 2015, an amount of 142,143 USD was spent for

engineering and construction but based on the information in received by the evaluation the pilot SWH systems were not installed.

88. As also stated in the project documentation the project had difficulties in finding qualified experts in the Solar Thermal Energy Chilean market and to reduce any risks on implementing activities, the Solar Program hired an international expert in Solar Thermal Energy to support the CP in the technical work. The issue of finding qualified people was described as influencing significantly in the development of the financial mechanism for end-users. In addition, difficulties were experienced in selecting consultants with the approrpriate capacity and expertise related to the development of surveys.

89. While the organizational design of the project is deemed appropriate and functional for its purposes, its insertion in the Ministry of Energy presented uncertainty concerning the project's location within the organization during the early days of the CP. Nevertheless, its location in the Renewable Energies Division is considered as suitable, as the project has positioned itself well, keeping its high relevance, being an important element for the development of the Solar Program implemented by the same division.

90. The project also demonstrated certain level of adaptive management when conducting a MTE and adapting some of the project outcomes/outputs.

91. Concerning the management budget, it exceeded the GEF budget indicated in the Prodoc (135,000 USD) during the first three years of CP operation based on the presentation for the steering committee in December 2014. For the last two years of implementation, the management budget represented a very minor portion of the overall budget (around 6,000 USD for 2014 and 0 USD for 2015). The evaluation team did not have data to assess the reasons for this.

92. The CP's performance in implementation and management is rated "Moderately Unsatisfactory" (MU) due to high budget dedicated to the management and the issue with the disbursement in 2015.

3.6.3 Stakeholder participation, cooperation and partnerships

93. The main public and private stakeholders have been listed in the ProDoc and their general responsibilities defined.

94. Cooperation with the private sector was encouraged with the development of the "Mesa Solar". But this initiative did not last over the years. Collaboration with public institutions: SEC, MINVU and the ministry of Education was assessed as fruitful. However, the CP did not collaborate with existing institutions that have a role concerning renewable energy markets in Chile. Such are CER, CORFO, Fundacion Chile or even the energy efficiency agency of Chile (AChEE). Especially in terms of development of the financial mechanism, the evaluation team considers that the CP could have benefitted from better partner selection.

95. The CP has made an effort to cooperate other existing initiatives on SWH in Chile. Several stakeholders co-financed the program as GIZ and ICA Procobre. However, during the interviews, the lack of synergies between the activities developed by these stakeholders was raised.

96. Stakeholder participation, cooperation and partnership is rated as "Moderately Satisfactory" (MS).

3.6.4 Communication and public awareness

97. There is a unanimous view to recognize that the Law 20.635 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 back in the years 2005/2006 due to the high upfront cost of such technology. However, the CP did not develop any general public awareness activities at large scale even if it was defined at output level of the CP design (under outcome 2).

98. The CP focused on the communication to the SWH market stakeholders through on-site activities and virtual communication channels. The main communication channel with the public was the webpage of the CP: www.programasolar.cl. This webpage presents the activities developed by the CP, includes the developed technical reports and some general national and international news on solar energy (thermal and photovoltaic). This webpage might not have been advertised sufficiently as there is less than 300,000 views (January 10, 2017).

99. Several isolated awareness raising activities were supported by the CP in some technical schools and universities and the movable Solar House in two regions (V and the Metropolitan). Based on the above, the CP's performance in ensuring communication and public awareness is rated "Moderately Satisfactory" (MS).

3.6.5 Country ownership and drivenness

100. Chile's government was closely involved in the program as the CP was executed by the MdE. However, some public institutions were not involved closely with the CP, such as CORFO and CER/CIFES, which are considered as leaders in renewable energy development in Chile. Thus, the evaluation team considers that lack involvement of these parties might have had negative influence on country owner and driven-ness of the CP.

101. Country ownership and drivenness is rated as "Moderately Satisfactory" (MS).

3.6.6 Financial planning and management

102. The GEF budget execution (USD 1.5 million) was low at least up to 2011 (see 3.5). Table 3 presents the delivery rates in percentages until 2015.

Table 2: GEF Project Expenditures for 2009-2015 (in USD)

Year	Estimated cost at design (budget) (in cash USD)	Actual cost (in cash USD)	Expenditure ratio (actual/planned) (in %)
2009	130,000	29,257.44	22.5%
2010	406,000	176,880.36	43.5%
2011	383,000	219,430.80	57.3%
2012	303,000	254,371.91	84.0%
2013	278,000	234.816,58	84.5%
2014	-	265.754,33	N/A
2015	-	319.242,88	N/A
Total	1,500,000	1.499.763,22	99.9%

Source: CDRs

103. The financial planning and management was adapted to the situation over the years, as explained in Section 3.5 on efficiency. The remaining budget from one year was passed to the next year. The deviation between the designed budget and the real budget were explained. All the combined delivery reports are clear and transparent. However, the budget dedicated to the project management component was higher than planned in the Prodoc and the 2015 budget.

104. The accounting information available to the evaluation team concerning the GEF funds was clear. Based on the project document, at the time of the project design USD 1,831,500 of Co-financing was confirmed (in cash and in-kind) from various sources (CNE, CDT, INN, PPEE, GTZ, Procobre). As only the GEF funds (USD 1,500,000) were under UNDP management, only CDRs covering this funding portion was provided to the evaluation team. The evaluation team does not have detailed information regarding actual realization of the co-financing.

105. The financial management is rated "Moderately Satisfactory" (S)

3.6.7 Supervision, guidance and technical backstopping

106. The UNDP Country office is the executing agency with responsibility for supervision of the quality and timeliness of project execution. According to MdE, UNDP was closely present through regular consultations and meetings during all the implementation phase. UNDP program officers approved the annual Program of Activity and ensured its alignment with the CP's objectives.

107. The exchange between the CP and UNEP was scarce during the whole project. During the first years, the relationship was more sustained but in general, UNEP supervision and backstopping was unsatisfactory. After the mid-term review of the CP, no communication was exchanged between UNDP Chile and UNEP GSWH management team. The UNDP CO only had exchanges with the UNDP Regional Technical Advisor (RTA). During the interviews conducted for the evaluation mission, no one seemed to be aware of the role of UNEP neither in the CP nor in the production of knowledge products.

108. UNDP guidance and backstopping is rated as "Satisfactory" (S) (UNEP's performance is discussed and rated as part of the overall evaluation report).

3.6.8 Monitoring and Evaluation

109. **Monitoring and Evaluation Plan:** The M&E design defined in the Prodoc was sufficient in terms of reporting requirements but it lacked some indicators to assess the effectiveness of the program. In particular, in terms of awareness raising of the public and of SWH systems cost reduction to assess the market evolution. No additional indicators were measured to evaluate the impact of the outcomes, in particular, for the outcome 2. The M&E design is rated as "Moderately Satisfactory" (MS).

110. **Monitoring and Evaluation Implementation:** Generally speaking the provisions relating to M&E in the Project Document and the requirements of the GEF - UNDP in this regard seemed to have been complied with. The M&E plan implementation analysis is based on interviews and the MTR. The management unit of the CP needed regular supervision and monitoring in order to closely monitor the development and progress of the activities programed in the Annual Work Plans (AWP) and the status of disbursements and budget execution and this monitoring was not sufficient, at least, during the first years of the CP. The M&E plan implementation is rated as "Moderately Satisfactory" (MS).

4 CONCLUSIONS, RECOMMENDATIONS AND LESSONS

4.1 Conclusions

111. The Chilean country program has been on-going for over 6.5 years under three governments. Yet, the SWH market penetration in Chile remains low with 5.7 kW_{th}/1000 people[16],

[16] Mauthner & Weiss, 2015

the country level target in terms of installed m^2 of SWH was reached during the project implementation. However, the growth rate was estimated to be lower than the set target (+30% in 2014[17]).

112. Based on the findings, the majority of the newly installed SWH systems during the CP implementation were due to the enforcement of the Law 20.365 with a tax incentive that was approved prior implementation of the CP. Nevertheless, the CP had a role in providing technical support to the national partners by developing several technical reports contributing to the implementation and renewal of this fiscal incentive law. At the same time the CP supported the integration of the SWH quality requirements under the law 20.365.

113. Thus the evaluation concludes that the CP contributed to the enhanced quality of the SWH systems in Chile and supported the enabling legal and regulatory framework in the country. The evaluation also recognizes the CP's contribution to the SWH related capacity and knowledge through activities that were developed with 4 universities and more than 10 technical high schools and several other partners. Training of a significant number of SWH professionals in Chile is expected to have positive impacts in terms of the quality.

114. At the same time, several shortcomings were found. The CP had a role in supporting and enhancing existing law with the fiscal incentive; further analysis of the first phase concerning the long-term effectiveness of the law could have helped the partners to enhance the future effectiveness of the incentive. In addition, the CP did not sufficiently contribute to increased end-user demand. This was assessed to be caused by the unsuccessful completion of the end-user financing mechanisms and related initiatives as well as limited communication activities targeting general public.

115. The political context affected strongly the implementation of the CP. Each change of government slowed down the CP implementation. The programme director changed three times during the project. Also, the coordinator changed once during the course of the CP. The structure of the project with few people in charge affected the overall project strategy and implementation, which focused mainly on tackling technical barriers of the SWH market.

116. The evaluator also considers that the partner selection was not necessarily suitable to deliver the financial mechanisms. At the same time, CP could have also considered working with the diversity of commercial sectors such as the tourism or health sectors, which were also identified in the ProDoc.

117. The overall rating of the 'Country Programme of Chile under the Global Solar Water Heating Market Transformation and Strengthening Initiative' is Moderately Unsatisfactory (MU).

Table 3: Summary of Evaluation Ratings

Criterion	Overall Rating
A. Strategic relevance	**S**
B. Achievement of outputs	**MS**
C. Effectiveness: Attainment of objectives and planned results	**MU**
1. Achievement of direct outcomes	MU
2. Likelihood of impact	MU
3. Achievement of formal project objectives as presented in the Project Document.	MS

[17] Source: Solar Water Heating Market Evaluation – Case Study of Chile, November 2015, Prepared for UNEP, Division of Technology, Industry and Economics, Global Solar Water Heating Initiative

Criterion	Overall Rating
D. Sustainability and replication	**ML**
1. Socio-political sustainability	ML
2. Financial resources	L
3. Institutional framework	ML
4. Environmental sustainability	L
5. Catalytic role and replication	MS
E. Efficiency	**MS**
F. Factors affecting project performance	
1. Preparation and readiness	MU
2. Project implementation and management	MU
3. Stakeholders participation, cooperation and partnerships	MS
4. Communication and public awareness	MS
5. Country ownership and driven-ness	MS
6. Financial planning and management	MS
7. Supervision, guidance and technical backstopping	S
8. Monitoring and evaluation	MS
i. M&E design	MS
ii. M&E plan implementation	MS
Overall project rating	**MU**

4.2 Recommendations

118. The following recommendations have been developed based on the analysis of evaluation findings and interviews with SWH market stakeholders.

Recommendation #1	There is no methodology or guidance given in the ProDoc for the CP to calculate the target indicators. The target indicators reflect the achievement of the outcomes and by calculating them each year, they help to plan the effort to put in each activity. These methodologies and parameters to calculate the indicators should be defined in the M&E plans. In this particular program of market transformation, the end-user awareness and the cost of the SWH systems were not defined as indicators whereas they allow understanding the market evolution. The definition of adapted target indicators together with the development of clear methodology to monitor these indicators would help UNDP, UNEP and the country counterparts to understand the progress towards the project goals.
Responsibility:	UNDP and MdE
Time-frame:	Design phase for follow-on project
Recommendation #2	The ProDoc was developed several years before the implementation started and the situation might have changed in-between. Moreover, in order to develop a program meeting the specific needs of the context, exact information of the situation is vital to develop the specific solutions to tackle the main barriers. It is recommended that a timely market analysis is needed at the beginning of program involving market transformation activities, to ensure integration of all the important market stakeholders and address the country specific, real existing barriers of the market. This market study should be used as a baseline in order to compare the former situation with the market at the end of the program.
Responsibility:	UNDP and partners
Time-frame:	Follow-on project or similar market transformation projects

Recommendation #3	Establish a system for information collection and monitoring energy performance of SWH installations. The MdE needs to capture the positive impact of the SWH market through the setup of a robust monitoring and reporting system to evaluate the capacity and the energy performance of the installed SWH systems. Currently, the area of installed SWH in m^2 is established by the AEE INTEC, but the methodology is based on estimation and the MdE should monitor more accurately the SWH market
Responsibility:	UNDP and MdE
Time-frame:	follow-on project / similar market transformation initiatives

4.3 Lessons learned

- **The key persons in charge of the CP influenced significantly the program development and the achievement of the outputs.** Therefore, the recruitment process of the project management unit should be carefully planned to ensure that all required expertise to implement such programmes are included, not only technical skills but also, in management and planning.
- **UNDP should take a more active role in the risk management.** Several situations created burdens which influenced the effectiveness of the CP: failed financing mechanism development, failed pilot project with MINVU, change of the management unit and lack of local experts. UNDP should take a more active role in the risk management of the programmes asking the partners to assess carefully the risks of the activities or situations and to develop a risk management plan, if required.
- **The national counterparts should be closely involved in the project design and planning in order to fulfill objectives defined in the ProDoc.** The country management unit which is often in charge of the project management and implementation, not always have the experience and capacities to plan, manage and monitor such comprehensive program. UNDP could further contribute to training on national partners in terms of project design and management and ensure their close involvement in the design stage of projects/programmes.
- **UNDP country office doesn't necessarily have the sufficient technical capacity to analyze in details the program of activities proposed by the management unit.** In this case UNDP's role was to solely validate whether the proposed activities were aligned with the program objectives. The activities can be aligned with the program objectives but are not necessarily appropriate considering the country context. One example reflecting the capacity gap was the failed financing mechanism which should have been developed in closer collaboration with relevant Chilean institutions and by expert in renewable energy financing mechanism.
- **UNDP played an important role during institutional transition.** The Chilean government changes had significant consequences in terms of turnover of key project personnel: the program implementation was slowed down and the person in charge of the program in MdE had to change. This situation created a discontinuity in the project's activities and the directions that were taken since the beginning were modified in the middle of the program. UNDP played a crucial role in the redeployment of CP after the managerial transition.
- **Regional/global relationship and feedback should have more focus to promote exchange of lessons learned and best practices between countries.** The experience in other countries, especially in the same region, should be enhanced to ensure information sharing on the barriers in promotion of SWH and how these countries overcame these barriers. Brainstorming sessions or workshops could help each country to find more adapted solutions to their issues.

ANNEX I. LIST OF THE PERSONS MET

UNDP:
Ms Ignacia Holmes, Program Officer
Ms Paloma Toranzos, Program Associate

Project team:
Mr Andres Veliz, CP coordinator since 2013
Mr Leonardo Pimentel, CP technical assistant since 2013

GOVERNMENT:

Ministry of Energy:
Mr Emilio Rauld, Director of the CP (Coordinator of the CP between 2009 and 2013)
SEC
Mr Carlos Cerda, Director of the Solar Division

MINVU
Mr Camilo Lanata, architect at the División Técnica de Estudios y Fomento Habitacional

ACADEMIA:

Unfortunately, after several intents to organize conference calls with universities, it has not been possible to reach them.

PRIVATE SECTOR:

Mr Alferdo Gonzalez, Aiguasol
Mr Matias Grandel, GIZ
Ms Veronica Munita, ACESOL

ANNEX II. LIST OF THE DOCUMENTS CONSULTED

- UNDP-GEF "Global Solar Water Heating Market Transformation and Strengthening Initiative: Chile Country Program", Project Document, April 2008;
- GSWH Project AWP s -2009 -2010 and 2012 to 2015
- GSWH Project PIR
- GSWH Project CDR from 2008 to 2015
- Project Inception Report, The Country Program of Chile under the Global Solar Water Heating Market Transformation and Strengthening Initiative (PIMS 3611), Gobierno de Chile, GEF, UNDP, UNEP; March 2010
- Minute of Project Appraisal Committee (PAC), February 2009
- Presentation of the steering committee- 2012, 2013 and 2014
- Mid-Term Review Country Program of Chile (Project 63 281), UNDP Chile, Carlos Canales Castaner, September 2012
- Mid-Term Review Country Program of Chile (Project 63 281), Management response, September 2012
- Justification of relevance of activities under Outcome N° 3 of POA 2013; April 1st 2013 (updated 7/24/2013)
- Revision sustantiva, UNDP, March 2014
- Plan de acción del programa nacional (PAPN) entre el gobierno de Chile y el programa de las naciones unidas para el desarrollo (PNUD) – 2011-2014
- Solar Heat Worldwide 2016, Markets and Contribution to the Energy Supply 2014, June 2016
- Solar Heat Worldwide 2015, Markets and Contribution to the Energy Supply 2013, June 2015
- Solar Heat Worldwide 2014, Markets and Contribution to the Energy Supply 2012, June 2014
- SOLAR WATER HEATING MARKET EVALUATION, Case Study of Chile, November 2015, Prepared for UNEP, Division of Technology, Industry and Economics, Global Solar Water Heating Initiative
- Law 20.635 and Law 20.897
- MANUAL SISTEMAS SOLARES TÉRMICOS, MINVU
- Norma Técnica que determina algoritmo para la verificación de la contribución solar mínima de los Sistemas Solares Térmicos acogidos a la franquicia tributaria de la Ley Nº 20.365
- Informe N°2, Juan Carlos Martínez Escribano, Septiembre 2015
- Instructivo de procedimientos, comité directivo del proyecto, Gobierno de Chile, GEF, UNDP, December 2010
- Estrategia de seguimiento "Programa Solar", Ministry of Energy, May 2013
- UNDAF Chile 2007-2011
- UNDAF Chile 2012-2014
- UNDAF Chile 2015-2018