

Validated Terminal Review of the UNEP-GEF Project 'Solar Water Heater Market Development and Energy Efficiency Project' (GEF ID 5287)

2018 – 2022



UNEP Climate Change Division

Validation date: April 2025



Photos Credits:

Front cover: Pablo Caldeiro. SWH system at Panamian Bank, Panama City

© UNEP/Pablo Caldeiro, United Nations Environment Programme, Review Mission (2024)

This report has been prepared by an external consultant as part of a Terminal Review, which is a management-led process to assess performance at the project's operational completion. The UNEP Evaluation Office provides templates and tools to support the review process and provides a formal assessment of the quality of the Review report, which is provided within this report's annexed material. In addition, the Evaluation Office formally validates the report by ensuring that the performance judgments made are consistent with evidence presented in the Review report and in-line with the performance standards set out for independent evaluations. As such the project performance ratings presented in the Review report may be adjusted by the Evaluation Office. The findings and conclusions expressed herein do not necessarily reflect the views of Member States or the UN Environment Programme Senior Management.

For further information on this report, please contact:

UNEP Climate Change Division
Portfolio Latin America and the Caribbean
Casa das Nações Unidas no Brasil
SEN, Quadra 802, Conjunto C, Lote 17, Módulo II
CEP: 70800-400 | Brasília - DF
Tel. (55) 61 30389233

(Solar Water Heater Market Development Project)
(GEF Project ID 5287 – UNEP PIMS ID 00928)
(11/2024)

All rights reserved.
© (2024) UNEP

ACKNOWLEDGEMENTS

This Terminal Review was prepared for UNEP Climate Change Division by Pablo Caldeiro Sarli, as an external consultant.

The reviewer would like to express its gratitude to all persons met and who contributed to this review, as listed in **Annex II**.

The review team would like to thank the project team and in particular Mr Jesús González Mar for their contribution and collaboration throughout the review process, providing the logistical support and coordination of meetings and on-site visits. Sincere appreciation is also expressed to Roberto Borjabad and the UNEP-ROLAC team, Guadalupe González at the Secretary of Energy and Melani Acosta at the Ministry of Environment. The review team would also like to thank University of Technology, Panama Bank and Solar Chamber of Panamá.

The reviewer hopes that the findings, conclusions and recommendations will contribute to the successful finalisation of the current project, formulation of a next phase and to the continuous improvement of similar projects in other countries and regions.

BRIEF EXTERNAL CONSULTANT BIOGRAPHY

Pablo Caldeiro is an independent consultant with more than 15 years of experience in the energy field, especially in renewable energies, contributing from the public sector to develop wind energy in Uruguay, through the design and implementation of public policies.

He has worked for the Ministry of Industry, Energy and Mining of Uruguay, in close interaction with different government offices and agencies, industrial chambers, public service companies, international experts, public service companies, suppliers and developers, and the financial sector. His work includes assessment for renewable energy projects to be installed in the country, mainly those presented through tenders, being the state counterpart to the financing entities, in order to provide the guarantees of the regulatory framework and techniques to support long-term investments.

He also has shared experience in the region through OLADE meetings, triangular aid, and technical working groups in Irena meetings to evaluate projects presented to the Abu Dhabi fund.

Since 2022 is the energy expert in the Investment Committee of the Renewable Energy Innovation Fund (REIF) – Uruguay, supporting second energy transition projects and technologies as Heat Pumps, Hydrogen, Power-to-x, and Electro mobility.

Previous experience in GEF projects evaluation:
2023 – Bolivia MTR (5299), Chile MTR (10087)

Review Team

Pablo Caldeiro – Independent Consultant – Mid-Term Project Reviewer

ABOUT THE REVIEW

Joint Review: No

Report Language(s): English

Review Type: Terminal Review

Brief Description: This report is a management-led Terminal Review of a UNEP/GEF project implemented between 2018 and 2022. The project's overall development goal was to implement cost-effective CO₂ reduction measures initiated by developing the market for solar thermal heating systems in Panama. The review sought to assess project performance (in terms of relevance, effectiveness and efficiency), and determine outcomes and impacts (actual and potential) stemming from the project, including their sustainability. The review has two primary purposes: (i) to provide evidence of results to meet accountability requirements, and (ii) to promote learning, feedback, and knowledge sharing through results and lessons learned among UNEP, the GEF and the relevant agencies and institutions of the project participating countries.

Key words: Climate Change; Demonstration Projects; Financial Incentives; Green Buildings; Solar Water Heaters; Standards Compliance and Quality Control; Sustainable Market Development.

Primary data collection period: January 19th, 2024, until February 30th, 2024

Field mission dates: February 19th, 2024, until February 23th, 2024

TABLE OF CONTENTS

ACKNOWLEDGEMENTS	3
ABOUT THE REVIEW.....	4
TABLE OF CONTENTS.....	5
LIST OF ACRONYMS	6
PROJECT IDENTIFICATION TABLE	8
EXECUTIVE SUMMARY	10
I. INTRODUCTION	13
II. REVIEW METHODS	14
III. THE PROJECT	18
A. Context.....	18
B. Results Framework	19
C. Stakeholders	21
D. Project implementation structure and partners.....	23
E. Changes in design during implementation	24
F. Project financing	25
IV. THEORY OF CHANGE AT REVIEW	26
V. REVIEW FINDINGS	31
A. Strategic Relevance.....	31
B. Quality of Project Design	32
C. Nature of the External Context.....	33
D. Effectiveness	33
E. Financial Management	52
F. Efficiency.....	53
G. Monitoring and Reporting	54
H. Sustainability.....	55
I. Factors Affecting Performance and Cross-Cutting Issues	57
VI. CONCLUSIONS AND RECOMMENDATIONS	64
A. Conclusions	64
B. Summary of project findings and ratings.....	66
C. Lessons learned.....	70
D. Recommendations	71
ANNEX I. RESPONSE TO STAKEHOLDER COMMENTS	76
ANNEX II. PEOPLE CONSULTED DURING THE REVIEW	77
ANNEX III. REVIEW FRAMEWORK/MATRIX	78
ANNEX IV. KEY DOCUMENTS CONSULTED.....	80
ANNEX V. PROJECT BUDGET AND EXPENDITURES.....	82
ANNEX VI. FINANCIAL MANAGEMENT	83
ANNEX VII. BRIEF CV OF THE REVIEWER.....	85
ANNEX VIII. REVIEW TORS (WITHOUT ANNEXES).....	86
SOLAR WATER HEATER MARKET DEVELOPMENT AND ENERGY EFFICIENCY PROJECT	86
ANNEX IX. QUALITY ASSESSMENT OF THE REVIEW REPORT (PROVIDED BY THE UNEP EVALUATION OFFICE).....	111
ANNEX X. LIST OF MEDIA APPEARANCES, PERFORMED EVENTS AND DEMONSTRATIVE PROJECTS.....	119
ANNEX XI. GEF PORTAL INPUTS	123
ANNEX XII. IMPLEMENTATION PLAN OF RECOMMENDATION	126

LIST OF ACRONYMS

ANAM	Autoridad Nacional del Ambiente (National Environment Authority)
APATEL	Asociación Panameña de Hoteles (Panama Association of Hotels)
ASEP	Autoridad Nacional de Servicios Públicos (National Public Services Authority)
ATP	Autoridad de Turismo de Panamá (Tourism Authority)
CEO	Chief Executive Officer
CAPAC	Cámara Panameña de la Construcción (Panama Chamber of Construction)
CAPES	Cámara Panameña de Energía Solar (Panama Solar Chamber)
CCM	Climate Change Mitigation
CONACOM	Comisión Nacional de Competencia (National Commission of Competences)
CONEP	Consejo Nacional de la Empresa Privada (Council of Private Enterprises)
COPANIT	Comisión Panameña de Normas Industriales y Técnicas (Industrial and Technical Standards Commission)
COPANT	Pan American Standards Commission
CO ₂	Carbon dioxide
CSO	Civil society organization
EE	Energy efficiency
ESCO	Energy Service Company
GCS	Guía de la Construcción Sostenible (Sustainable Construction Guide)
GEF	Global Environment Facility
GEFTF	GEF Trust Fund
GHG	Greenhouse gas
IADB	Inter-American Development Bank
INADEH	Instituto Nacional para el Desarrollo Humano (National Institute for Human Development)
LPG	Liquefied Petroleum Gas
MiAmbiente	Ministerio de Ambiente (Ministry of Environment -former ANAM-)
MICI	Ministerio de Comercio e Industrias (Ministry of Commerce and Industry)
MIDA	Ministerio de Desarrollo Agropecuario (Ministry of Agricultural Development)
MINSA	Ministerio de Salud (Ministry of Health)
Mtoe	Million tons of oil equivalent
MTR	Mid-term review
MTS	UNEP Medium term strategy
MW	Megawatt (million Watts)
NEP	National Energy Plan
NGO	Non-governmental organization
PAC	Project Advisory Committee
NPD	National Project Director
PGBC	Panama Green Building Council
PIF	GEF Project Identification Form
PIU	Project Implementation Unit
PM	Project Manager
PoW	UNEP Plan of Work
PPG	GEF Project preparation grant
ProDoc	Project Document – CEO Endorsement Document
PSC	Project Steering Committee
RES	Reglamento de Edificaciones Sustentables (Sustainable Building Regulation)
SIP	Sindicato de Industriales de Panamá (Panama Industrial Association)

SME	Small and medium-sized enterprises (pequeñas y medianas empresas)
SNE	Secretaría Nacional de Energía (National Secretariat for Energy)
SPIA	Sociedad Panameña de Ingenieros y Arquitectos (Panama Society of Engineers & Architects)
SWH	Solar water heater
tCO ₂	ton of CO ₂
TOC	Theory of change
UN	United Nations
UNDP	UN Development Programme
UNEP	UN Environment Programme
UNEP-DTIE	UNEP Division of Technology, Industry and Economics
UREE	(Law on) Rational and Efficient Use of Energy
USD	US dollar
UTP	Universidad Tecnológica de Panamá (University of Technology)

PROJECT IDENTIFICATION TABLE

Table 1. Project Identification Table

GEF Project ID/SMA ID ¹ :	5287		
Implementing Agency (UNEP Division/Branch/Unit):	UNEP Climate Change Division	Executing Agency:	UN Environment, Regional Office for Latin America and the Caribbean
Sources of Funding (Co-finance):	Country ² (ies): Panama	Institution ³ Name/Type: ANAM (Government) SNE (Government) Panamian Bank (Private sector) PGBC (CSO) UTP (CSO) UNEP (GEF Agency)	
Relevant SDG(s):	SDG goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all. Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix 7.2.1: Renewable energy share in the total final energy consumption		
MTS (at approval):	MTS 2014-2018	UNEP approval date:	28/01/2015
POW Direct Outcome(s) number/reference(<i>applicable for projects approved from 2022</i>):	POW Direct Outcome: N/A	MTS 2025 Outcome(s) number/reference(<i>applicable for projects approved from 2022</i>): OR POW Expected Accomplishment(s) number/reference(<i>applicable for projects approved pre-2022</i>):	MTS 2025 Outcome: N/A
OR POW Output(s) number/reference (<i>applicable for projects approved pre-2022</i>)	POW Output: <i>Technical support provided to countries to implement and scale up renewable energy and energy efficiency projects</i>		POW Expected Accomplishment: <i>Countries increasingly adopt and/or implement low greenhouse gas mission development strategies and invest in clean technologies</i>
Sub-programme:	Subprogramme 1: Climate change	Programme Coordination Project:	
UNEP approval date:	28/01/2015	GEF approval date:	28/01/2015
GEF Operational Programme #:	N/A	GEF Strategic Priority:	CCM-3Promoteinvestment in renewable energy technologies
Project type:	Medium Size Project (MSP)	Focal Area(s):	Climate change
Expected start date:	09/1/2018	Actual start date:	09/1/2018
Planned completion date:	31/12/2021	Actual operational completion date:	31/12/2022
Planned total project budget at approval:	USD 10,060,182	Actual total expenditures reported as of [31-12-2022]:	USD 4,018,074

¹ SMA refers to the ID provided by the Integrated Planning, Management and Reporting Solution (IPMR) system, which was introduced by UNEP in July 2023.

² Where applicable, list countries who have provided project funds and/or co-finance.

³ Indicate where funding institutions are any/all of the following: Foundation/NGO; Private Sector; UN Body; Multilateral Fund; Environment Fund.

GEF grant allocation:	USD 1,918,182	GEF grant expenditures reported as of [31-12-2022]:	USD 1,651,140
Expected Medium-Size Project/Full-Size Project co-financing:	<i>Cash: USD 2,605,550</i> <i>In-kind: USD 2,436,450</i> <i>Loan: USD 3,100,000</i>	Secured Medium-Size Project/Full-Size Project co-financing:	<i>Cash*: USD 1,010,950</i> <i>In-kind**: USD 1,355,984</i> <i>Loan: USD 0</i>
No. of formal project revisions:	5	Date of last approved project revision:	19/10/2022
No. of Steering Committee meetings:	6	Date of Last Steering Committee meeting:	23/06/2022
Mid-term Review/ Evaluation (<i>planned date</i>):	01/08/2020	Mid-term Review/ Evaluation (<i>actual date</i>):	26/08/2020
Terminal Review (<i>planned date</i>):	01/10/2022	Terminal Review (<i>actual date</i>):	30/11/2024
Coverage - Country(ies):	Panama	Coverage - Region(s):	Latin America & Caribbean
Dates of previous project phases:	N/A	Status of future project phases:	N/A

* includes Direct private and public investment (860,950) and collaboration from EU (150,000).

** in-kind co-financing from original partners

EXECUTIVE SUMMARY

Project background

1. The “Solar Water Heater Market Development Project - CSA Panama” (GEF ID 5287) was a Medium-Sized Project (MSP) who run from January 2018 to December 2022. The project was implemented by the UNEP Climate Change Division, executed by UNEP-ROLAC (on request of Panama Government), in partnership with the National Energy Secretariat (SNE) and the Ministry of Environment (MiAmbiente, formerly ANAM). Other key stakeholders were Panama Bank, University of Technology (UTP) and Solar Chamber of Panama (CAPES).
2. The project was approved on January 28, 2015 by GEF and further approved on December 2017 by UNEP. The project started on January 9, 2018 and outlined an initial timeline of 48 months, intended to end on February 28, 2021, but finally ending on December 31, 2022. The Project financing is US\$ 1,918,182, and the anticipated co-financing is US\$ 8,142,000, hence a total planned budget of US\$ 10,060,182, including cash, in-kind and loan contributions.
3. The project had an intended impact of reducing GHG emissions from electricity and heat sectors, using cost-effective CO₂ reduction measures by developing the market for solar thermal heating systems. The project contributes to the following Expected Accomplishment in UNEP’s Programme of Work: (b) Countries increasingly adopt and/or implement low greenhouse gas emission development strategies and invest in clean technologies
4. Key barriers have been identified for the intervention: i) Lack of specific regulations and incentives to stimulate the SWH market, ii) Lack of quality standards and training, and iii) Insufficient consumer awareness about SWH systems. Based on them, the project was structured in four components: 1.Knowledge and information for informed policy decision-making, 2.Quality control and supply side strengthening, 3.End-user supportive mechanisms and enhanced awareness, and 4.Solar Water Heaters (SWH) pilot projects and demonstration.
5. A Theory of Change (TOC) was reconstructed for the purposes of the Review which shows the causal pathways from outputs to project outcomes to intermediate states, and finally the project long-term impact, where the drivers and assumptions were proposed by the reviewer in the inception report stage.

This Review

6. The Terminal Review (TR) was conducted with two main purposes: (1) to provide evidence of results to meet accountability requirements, and (2) to promote operational improvement, leaning and knowledge sharing through results and lessons learned among UNEP and its key partners
7. In line with the UNEP Evaluation Policy, the UNEP Programme Manual and the Guidelines for GEF Agencies in Conducting Terminal Evaluations, this TR has been carried out using a set of 9 commonly applied review criteria which include: (1) Strategic Relevance¹, (2) Quality of Project Design, (3) Nature of External Context, (4) Effectiveness (incl. availability of outputs; achievement of outcomes and likelihood of impact), (5) Financial Management, (6) Efficiency, (7) Monitoring and Reporting, (8) Sustainability and (9) Factors Affecting Project Performance and Cross-Cutting Issues.
8. Most review criteria are rated on a six-point scale. The ratings against each criterion are ‘weighted’ to derive the Overall Project Performance Rating. The greatest weight is placed on the achievement of outcomes, followed by dimensions of sustainability.
9. In addition to the 9 review criteria outlined above, the Terminal Review addresses a number of strategic questions that were formulated in the Terms of Reference. Also findings from the

review are to be uploaded in the GEF Portal; in order to support this process, review findings related to the 5 topics of interest to the GEF were prepared in the review process.

10. Review process was held from January 2024 until November 2024, with field mission carried out on February 2024.

Key findings

11. In general terms, the project successfully fulfilled its purpose and reasonably achieved its stated objectives, executing the work plan appropriately and obtaining the expected outcomes to a high degree across the various components.
12. The execution timeline turned out to be significantly longer than initially planned, largely due to the COVID-19 pandemic, which made meetings and fieldwork difficult. Delays in execution were also affected by inefficiencies stemming from inadequate procedures and the lack of experience of the Executing Agency.
13. Stakeholders were properly identified to achieve the results, and despite the pandemic restrictions, engagement was very high. Significant efforts and commitment were observed from the PMU and personnel involved, who overcame a series of challenges.
14. The project document did not include an explicit Theory of Change to show a causal pathway, but four components forming the basis of the project formulation addressed the main factors driving the development of conditions for the introduction and sustainability of the technology.
15. Responsibility transferred from SNE to UNEP as the Executing Agency (EA) was an issue that negatively affected performance and effectiveness, and at the same time blurred boundaries between EA and IA, as they were the same.
16. Co-financing was significantly lower—approximately 30% of what was initially committed by the institutions. Part of this shortfall was due to the failure to consolidate a key financing tool from Banco General, which accounted for 40% of the total co-financing
17. The project had some weaknesses in defining specific activities, objectives, indicators, targets and verification methods at the design stage. This led to the reformulation of the project's key indicators for GHG emission reductions and the adjustment of targets accordingly.

Conclusions

18. Based on the findings from this review, the project demonstrates performance at the 'Satisfactory' level. The project has demonstrated strong performance in the areas of leadership and stakeholder's partnership, focus on results and adaptive management, demonstration projects implementation and social and gender mainstreaming. Areas that would benefit/would have benefited from further attention are causal pathway assessment, indicators and target definition at design stage, procurement processes for laboratory and pilot projects equipment, and the development of robust financial mechanisms.
19. The work plan was nearly fully implemented, achieving the expected outcomes satisfactorily, with an overall output availability of 97%. Additionally, complementary activities arose during execution to improve performance.
20. Significant groundwork was laid for the future development of solar thermal technology, including the installation of physical capacities for equipment testing and certification, creation of performance and quality standards, training and certification for design and installation, academic curricula, successful implementation of demonstration projects in various economic sectors, and extensive dissemination of the technology

21. Dissemination was evaluated as highly satisfactory, based on the preparation of a communication plan with a positive effect as a guide for all institutions, considering different target audiences for effective dissemination.
22. Aspects of gender mainstreaming and participation of ethnic minorities had lesser strength on project design but they have since been properly managed by the project team, taking positive action, ensuring training and capacity building activities fostering women and indigenous people participation as well as assigning GEF project-funded SWH installations with a strong social look.
23. The GEF project has laid the groundwork for the development of solar thermal energy in Panama, and the prospects in this regard are promising. A detailed Action Plan was prepared and approved by key public stakeholders and incorporated into the National Energy Plan 2015-2050 and the 2020-2030 energy transition agenda.
24. Challenges to be tackled have to do with the market evaluation follow-up, as residential sector counts with 90% of the share to achieve SWH target by 2050, and the UREE Fund is not yet operational, and its funding and implementation can be a key element for banks to offer green credits with favorable conditions for SWH projects.

Lessons Learned

25. Lesson 1: Effective leadership and creation of a strong stakeholder's network is key to adaptive management and project success
26. Lesson 2: Identification and commitment of the Executing Agency (EA) must be evaluated and agreed upon by all parties before the start of execution, ensuring the direct responsibility of state institutions
27. Lesson 3: Involvement during execution can elevate outputs in areas of gender, social integration, and indigenous community inclusion beyond mere symbolic actions

Recommendations

28. Recommendation 1: Prepare and validate project objectives with a S.M.A.R.T. approach and set targets accordingly, building the causal pathway to achieve them.
29. Recommendation 2: Calculate project co-financing based on effective contributions from institutions and within the project execution timeframe
30. Recommendation 3: Approve the budget for the Termosolar Panama Action Plan as key to the technology's sustainability and development, and review market potential and adoption barriers
31. Recommendation 4: Establish a robust knowledge base and website for the project, and adapt it for the future development of the technology

Validation

The report has been subject to an independent validation exercise performed by UNEP's Evaluation Office. The Evaluation Office highlights para 83, which explains that the Executing Agency arrangements were adjusted in 2017, making this an internally executed project, with UNEP's Regional Office of Latin America and the Caribbean taking on the role of EA.

The performance ratings for the 'Solar Water Heater Market Development and Energy Efficiency' project, set out in the Conclusions and Recommendations section, have been adjusted as a result. The overall project performance is validated at the Satisfactory level. Moreover, the Evaluation Office has found the overall quality of the report to be 'Moderately Satisfactory' (see Annex X).

I. INTRODUCTION

32. The “Solar Water Heater Market Development Project - CSA Panama” (GEF ID 5287) was a Medium-Sized Project (MSP) who run from January 2018 to December 2022. The project was implemented by the UNEP Climate Change Division, executed by UNEP-ROLAC (on request of Panama Government), in partnership with the National Energy Secretariat (SNE) and the Ministry of Environment (MiAmbiente, formerly ANAM). Other key stakeholders were Panama Bank, University of Technology (UTP) and Solar Chamber of Panama (CAPES).
33. The project was approved on January 28, 2015 by GEF and further approved on December 2017 by UNEP. The project started on January 9, 2018 and outlined an initial timeline of 48 months, intended to end on February 28, 2021, but finally ending on December 31, 2022. The Project financing is US\$ 1,918,182, and the anticipated co-financing is US\$ 8,142,000, hence a total planned budget of US\$ 10,060,182, including cash, in-kind and loan contributions.
34. The project had an intended impact of reducing GHG emissions from electricity and heat sectors, using cost-effective CO₂ reduction measures by developing the market for solar thermal heating systems. The project contributes to the following Expected Accomplishment in UNEP’s Programme of Work: (b) Countries increasingly adopt and/or implement low greenhouse gas emission development strategies and invest in clean technologies.
35. Despite the existence of technology and the availability of abundant solar resources, additional efforts were needed to promote and accelerate a nascent market for solar water heaters in Panama. The potential for reducing electricity demand was significant, decreasing fossil fuel generation during peak hours and delaying investments in generation, transmission, and distribution. On the other hand, a considerable economic benefit can be generated for those who install solar water heaters, from companies to house-holds. With the right package of policy instruments including incentives, financial products, demonstration projects, and quality assurance and awareness campaigns, the market can be stimulated into a self-sustained take-off.
36. Key barriers have been identified for the intervention: i) Lack of specific regulations and incentives to stimulate the SWH market, ii) Lack of quality standards and training, and iii) Insufficient consumer awareness about SWH systems. Based on them, the project was structured in four components: 1. Knowledge and information for informed policy decision-making, 2. Quality control and supply side strengthening, 3. End-user supportive mechanisms and enhanced awareness, and 4. SWH pilot projects and demonstration, which are described in section III.B of the present document.
37. A Theory of Change (TOC) was reconstructed for the purposes of the Review which shows the causal pathways from outputs to project outcomes to intermediate states, and finally the project long-term impact, where the drivers and assumptions were proposed by the reviewer in the inception report stage.
38. The Terminal Review (TR) was conducted with two main purposes: (1) to provide evidence of results to meet accountability requirements, and (2) to promote operational improvement, leaning and knowledge sharing through results and lessons learned among UNEP and its key partners.

II. REVIEW METHODS

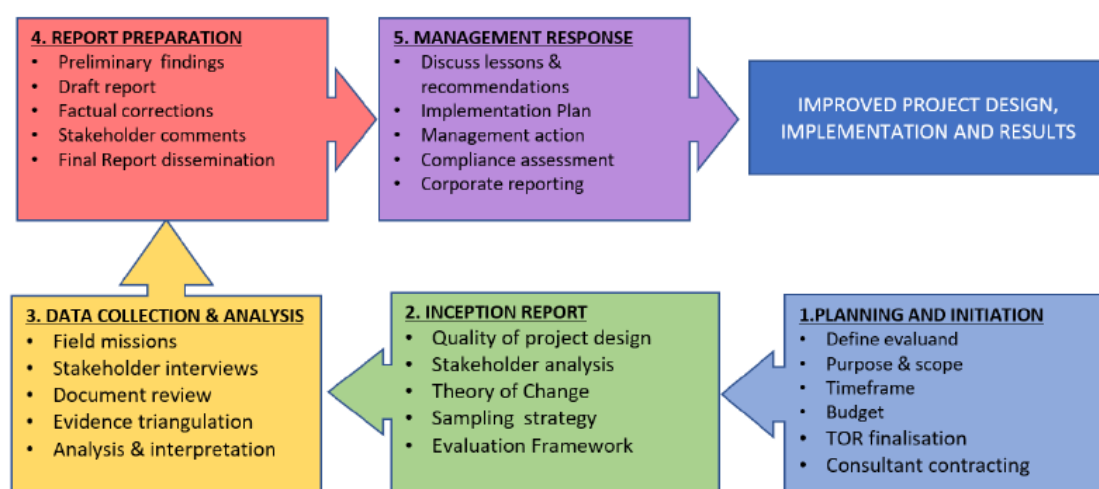
UNEP's review model/approach

39. In line with the UNEP Evaluation Policy, the UNEP Programme Manual and the Guidelines for GEF Agencies in Conducting Terminal Evaluations, this TR has been carried out using a set of 9 commonly applied review criteria which include: (1) Strategic Relevance¹, (2) Quality of Project Design, (3) Nature of External Context, (4) Effectiveness (incl. availability of outputs; achievement of outcomes and likelihood of impact), (5) Financial Management, (6) Efficiency, (7) Monitoring and Reporting, (8) Sustainability and (9) Factors Affecting Project Performance and Cross-Cutting Issues (see Annex III: Review Framework/Matrix for more details on each review criterion).
40. Most review criteria are rated on a six-point scale as follows: Highly Satisfactory (HS); Satisfactory (S); Moderately Satisfactory (MS); Moderately Unsatisfactory (MU); Unsatisfactory (U); Highly Unsatisfactory (HU). Sustainability and Likelihood of Impact are rated from Highly Likely (HL) down to Highly Unlikely (HU) and Nature of External Context is rated from Highly Favourable (HF) to Highly Unfavourable (HU). The ratings against each criterion are 'weighted' to derive the Overall Project Performance Rating. The greatest weight is placed on the achievement of outcomes, followed by dimensions of sustainability.
41. The UNEP Evaluation Office has developed detailed descriptions of the main elements required to be demonstrated at each level (i.e. Highly Satisfactory to Highly Unsatisfactory) for each review criterion. The review team has considered all the evidence gathered during the review in relation to this matrix in order to generate review criteria performance ratings
42. In addition to the 9 review criteria outlined above, the Terminal Review addresses a number of strategic questions that were formulated in the Terms of Reference. These questions were posed by the UNEP Evaluation Office in conjunction with members of the Project Team. The strategic questions are:
 - Q1:** What changes were made to adapt to stakeholders' actual engagement and how did any changes affect the project's performance and impact?
 - Q2:** What changes were made to adapt to the effects of COVID-19 and how did any changes affect the project's performance?
 - Q3:** What was the cost- effectiveness of the demonstration projects in terms of impact (expected direct and indirect emissions reductions)
43. For projects funded by the GEF, findings from the review are to be uploaded in the GEF Portal. To support this process, review findings related to the 5 topics of interest to the GEF are summarised in Chapter VI - **Conclusions and Recommendations**. The intended action/results on the 5 topics were described in the GEF CEO Endorsement and Approval documents. The 5 topics are: i) performance against GEF's Core Indicator Targets; ii) engagement of stakeholders; iii) gender-responsive measures and gender result areas; iv) implementation of management measures taken against the Safeguards Plan and v) challenges and outcomes regarding the project's completed Knowledge Management Approach

Review Process

44. This review adopted a participatory approach, consulting with project team members, partners and beneficiaries at several stages throughout the process. Central to the review was the analysis (and reconstruction) of the project's Theory of Change. Consultations were held during the review inception phase to arrive at a nuanced understanding of how the project intended to drive change and what contributing conditions ('assumptions' and 'drivers') would need to be in place to support such change. The (reconstructed) Theory of Change, supported by a graphic representation and narrative discussion of the causal pathways, was discussed further with respondents during the data collection phase, and refined as appropriate. The final iteration of the Theory of Change is presented in this final review report and has been used throughout the review process.

Figure 1: UNEP Review Process



Data collection

Primary data sources

45. During and after the inception stage, the evaluator undertook a thorough review of all project-related documents provided by the Implementing Agency (UNEP) and the Executing Agency (UNEP Regional Office for Latin America and the Caribbean), and also virtual meetings with IA Project Specialist and EA Project Manager. The full list of documents can be found in **Annex 4**.
46. Sampling Strategy: The selection of key stakeholders to be interviewed was made by the reviewer and the Project Manager. Several documents were used for identification, e.g. stakeholder's description in CEO Endorsement Document, Minutes from Steering Committee, dissemination meetings, technical committees, and validated through experience in project development. The overall sampling frame for interviews can be found in **Table 1** below

Table 1: Respondents' Sample

		# people involved (M/F)	# people contacted (M/F)	# respondent (M/F)	% respondent
Project team (those with management responsibilities)	Implementing agency	1 (0/1)	1 (0/1)	1 (0/1)	100%
	Executing agency/ies	4 (3/1)	4 (3/1)	4 (3/1)	100%

	# entities involved	# entities contacted	# people contacted (M/F)	# respondent (M/F)	% respondent
Project (implementing/ executing) partners (receiving funds from the project)	3	10	10 (6/4)	8 (5/3)	80%
Project partners (collaborating/contributing ⁴) (not receiving funds from the project)	8	9 (7/2)	7 (6/1)	5 (5/0)	71%
Direct beneficiaries Indirect beneficiaries Civil society representatives	5	5 (4/1)	3 (2/1)	3 (2/1)	100%

47. Data collection tools: All meetings to stakeholders were conducted during the field mission, mostly in-person, except from Panama Bank that was conducted virtually due to a partner's scheduling problem. Some identified people referred the interviews for reasons of force majeure to others involved in their institution, and in some cases there was no response from the person proposed by the PM.
48. Interviews with the implementing partners were requested from the institution's representatives in the steering committees and were directed to their direct advisors in the case of the Secretary of Energy and the Ministry of Environment. In most cases, the consultations were individual; however, a group meeting was held with UTP on issues related to the testing laboratory, with UTP lab technicians and representatives from the Solar Chamber in attendance. A table with the consulted people during the review can be found in **Annex II**.
49. Based on schedule and logistical limitations, three sites were selected to visit the demonstration projects, aiming for a balance between public and private entities that had received financial support from the GEF project. All the projects were located in the vicinity of Panama City.

Table 2: Selected demonstration projects to visit during the review

Selected site	Sector
San Miguel Arcángel Hospital	Health – Public
Melo Poultry	Food (poultry) – Private
Panama Bank – Operations centre	Financial - Public

50. Throughout this review process and in the compilation of the Final Review Report efforts have been made to represent the views of both mainstream and more marginalised groups. Data were collected with respect for ethics and human rights issues. All pictures were taken, and other information gathered after prior informed consent from people, all discussions remained anonymous and all information was collected according to relevant UNEG guidelines and UN standards of conduct.
51. Actions taken to increase response: In order to improve the response rate of the institutions involved, specific contacts provided by the (former) project manager were used, with an introduction via email. Daily follow-ups were conducted to receive a response or to be

⁴Contributing partners may be providing resources as either cash or in-kind inputs (e.g. staff time, office space etc.).

directed to other representatives of the institutions. If there was no response to the emails, contact was attempted by phone. In the case of being unable to confirm meetings, the participation of another institution or group representative was sought.

Secondary data sources

52. A great deal of information is gathered from secondary sources and these should be described, as well as providing a reference to the Annex where the full list of consulted documents is presented. Some items to consider, apart from the project design documents are: documents collected direct from partners or while in the field; monitoring data (this may be in an external system or may be found in the records from one person); regular reports including PIMS, IPMR, the GEF portal, Umoja, etc.).
53. Where there are seminal reports/materials relevant to the main topic of the project, which the review team may be very familiar with, but which are less likely to be known to the reader, these should be explicitly referenced and a footnote can be added to explain the significance of the document. This could also include reference to relevant peer-reviewed material.

Limitations and mitigation strategy

54. The reviewer did not encounter any significant limitations during the Review. Project documentation and data sources were available and accessible. Willingness to provide information was evident and sincere openness from stakeholders, describing the execution process and at the same time raising the aspects that could have been made, and are still to do.

Some respondents did not participate (they either did not reply or were too busy), but alternatives were chosen to find representatives for every group (policy-makers, regulators, supply side, academia, and demand side). The most notable absence was PGBC, but response was very limited at the final times of the project.

Analysis

55. The Synthesis phase: The study has been guided by the review questions for each stakeholder and the expertise field of the interviewed, as well as by the key questions included in the Terms of Reference (TOR) of the MTR. The list of all the documents reviewed is annexed (**Annex IV – Key documents consulted**).
56. The findings were clustered by review questions grouped under the main performance criteria. The financial analysis is limited to the assessment of the consistency of actual versus planned contributions and their correspondence to the project implementation needs (cost-effectiveness analysis). It is based on the project budget breakdown and connected, where feasible, to the main activities identified in the project's implementation.
57. Preliminary findings were presented in a meeting on October 26th, 2023 to the UNEP's Climate Change Division and The Ministry of Energy and ASE representatives.

III. THE PROJECT

A. Context

58. Globally, in the past 50 years primary energy production has more than tripled, accompanying population and market growth, and despite the efforts to enhance energy efficiency and promote a rational consumption. UNEP MTS 2022-2025, maps out the actions needed to reshape our consumption and production patterns towards sustainability⁵. On the other hand, energy supply is mainly based on fossil-fuels (globally more than 85% by 2010), contributing to climate instability. To tackle this issue, actions must be taken to deploy solutions, where net zero GHG emissions and resilience in the face of climate change are achieved.
59. Panama has a fair share of installed renewable energy capacity, mainly consisting of large hydropower schemes, but still thermal generation is almost 40% by 2012. 30 generating companies fed into the National Interconnected grid system, self-generating companies and isolated systems, with a total installed capacity of 2,390 MW by 2012. All fossil fuels are imported. Between 1970 and 2013, electricity consumption in Panama multiplied by eleven, and petroleum-derived fuels by four and a half times⁶.
60. Planning has traditionally focused on power generation and improving efficiency in power consumption. In reality, not only potential exists in power generation, but also in energy for heating purposes, both in improving efficiency and replacing fossil fuels by cleaner alternatives.
61. The aim in energy policy is to reduce energy consumption by 30% compared to Business-as-usual (BAU) scenario by rational and efficient use of energy on the medium-term and have 100% coverage and energy access as well as security in energy supply⁷. SWH systems can have an outstanding role to reduce electricity and fossil fuels consumption, impacting on a significant CO₂ emissions reduction.
62. But the SWH market is nascent, with few reliable statistics on the sale of SWH systems in Panama. The analysis in the project design stage shows that customers are most likely in hotels, health sector (hospitals and clinics), enterprises (agro-industries, sports clubs, restaurants, laundries, industry) and high-income families.
63. Despite the existence of technology and the availability of abundant solar resources, additional efforts were needed to promote and accelerate a nascent market for solar water heaters in Panama. The potential for reducing electricity demand was significant, decreasing fossil fuel generation during peak hours and delaying investments in generation, transmission, and distribution. On the other hand, a considerable economic benefit can be generated for those who install solar water heaters, from companies to house-holds. With the right package of policy instruments including incentives, financial products, demonstration projects, and quality assurance and awareness campaigns, the market can be stimulated into a self-sustained take-off.
64. Some other barriers may show-off after a market assessment that need to be embodied into the National Energy Policy, targets and a specific SWH action plan.

⁵<https://www.unep.org/resources/people-and-planet-unep-strategy-2022-2025>

⁶<https://www.energia.gob.pa/nuevo-inicio/documentos-2/> - Plan Energético Nacional 2015-2050

⁷ PENSIN 2012 (Plan de Expansión de Transmisión): Hydropower (730 MW; 2010-2014); wind energy (200 MW, 2013), solar PV (2.5-5 MW), LNG installations (200 MW), geothermal (24 MW) as well as regional interconnections with Colombia (600 MW) and Central America (SIEPAC, 300 MW)

B. Results Framework

65. Key barriers have been identified for the intervention: i) Lack of specific regulations and incentives to stimulate the SWH market, ii) Lack of quality standards and training, and iii) Insufficient consumer awareness about SWH systems.
66. Based on them, the project was structured into four components: 1. Knowledge and information for informed policy decision-making, 2. Quality control and supply side strengthening, 3. End-user supportive mechanisms and enhanced awareness, and 4. SWH pilot projects and demonstration, which are described later in this section.
67. This project seeks to address the before-mentioned barriers to the more widespread introduction and availability on the market in Panama. An integrated approach will combine demonstration projects that have high replication potential with interventions that seek to establish a market environment conducive to investments in clean energy practices and technologies.
68. The project goal is to support the national efforts to establish the market for solar thermal heating systems and promote cost-effective CO₂ measures (through capacity building, institutional strengthening and technology demonstration).
69. The project should be assessed against its intended results, but these were rephrased, re-aligned in the Inception Report stage to make them consistent with UNEP results definitions and to create the Theory of Change (TOC). Outputs, outcomes, long term impacts and objectives/goals, revisions/changes were presented in the Inception Report, showing the original version and the revisions proposed for use in the Review. After the review, the final Results Framework table is presented as **Table 3**.

Table 3: Results Framework as presented and revised in the Inception Report

Project Components	Project Outcomes	Project Outputs
1. Knowledge and information for informed policy decision-making	1. Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development	1.1 - One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework 1.2 – A market assessment and economic analysis of SWH options is prepared, including recommendations for an action plan 1.3 - Government-endorsed SWH action plan

2. Quality control and supply side strengthening	2. Quality control system in place and enhanced capacity of supply chain to offer SWH products and services.	2.1 – Assessment on capacity building and training needs for SWH systems is prepared. 2.2 - SWH incorporated into curricula of relevant educational institutions 2.3 - Training activities implemented for SWH installers and technology providers; recognition scheme for installers established 2.4 - Two SWH and green building training designed and implemented 2.5 - One SWH standards and a quality control for SWH products and installations scheme developed 2.6 a – Institutional capacity and gap assessment to establish a national accredited testing laboratory is prepared 2.6 b – Laboratory equipment acquired, civil works finished and one testing laboratory is installed and running 2.7 – Laboratory equipment acquired, civil works finished and one testing laboratory is installed and running
3. End-user supportive mechanisms and enhanced awareness	3. Enhanced end-user awareness on SWH and availability of end-user financial mechanisms	3.1 - Awareness creation and info events for key decision-makers in financial sector, end-use sectors and technology providers sector 3.2 - At least one end-user financing mechanisms established that can be used for investment in SWH 3.3 - A campaign with marketing and publicity activities, targeting different SWH market segments completed
4. SWH pilot projects and demonstration	4. SWH applications demonstrated and replicated	4.1 – Up to 100 SWH systems are identified, with primary energy audits undertaken 4.2 – At least 430 m2 of SWH pilot systems are installed and running in public sector, resulting from a call for bids to local companies to design, supply and install them

C. Stakeholders

70. Besides the IA and the EA, stakeholders are identified broadly as all those who are affected by, or who could affect (positively or negatively) the project's results, including a spectrum of collaboration and partnership that had roles to play in attaining the project results. At a disaggregated level key groups are identified
71. The **National Secretary of Energy (SNE)** was the key change agent as implementing partner, and held the most prominent role, interest and influence over the project's results. It provided the political and institutional supervision and chaired the Steering Committee, to guide and oversee the technical progress and performance of the Project, and to enhance and optimize the contributions of partner organizations. It is a key influencer for this project to convert proposals into effective regulations and incentives for SWH. We can mention the preparation of an Action Plan for SWH, which takes into account sustainability in the sector. They have great influence to create or adapt financial and fiscal incentives.
72. The **Ministry of Environment (MiAmbiente, former ANAM)** also played key role acting (as co-chairs) in the steering committee to commit other ministries, agencies, financial, academia and suppliers pursuing outputs achievement, and promoting a regulatory framework for the development of SWH as a sustainable technology. They significantly increased end-users awareness supporting the communication campaign, and knowledge management, as well as to ensure the engagement of large public buildings to join the demonstration pilots.
73. To a lesser degree of influence but with a high level of interest and participation, we find the **University of Technology (UTP)** and the **Panamian Bank**, both members of the Steering Committee. The University of Technology (UTP) played a decisive role in building capacities in the sector, developing specific SWH courses for installers that were included in the curriculum as a basis for a certification scheme and adapting its facilities to build and set up the first (and only) testing and certification laboratory for SWH equipment in Panama.
74. The Panamanian Bank had a very high participation in the Steering Committees, providing valuable contributions to identify the most attractive market sectors and searching for financing mechanisms. They worked together with CAPES to promote financing for safe and quality installations. They approved a green fund for the development of solar energy, which, according to bank representatives, did not have a decisive impact because many of the demonstration projects were self-financed. They play an active role in the dissemination of the technology, even installing an SWH project at their operations center. They acted as a representative of the Panama Green Building Council from the third PSC onwards.
75. The **Solar Chamber of Panama (CAPES)** was created at the behest of the Termosolar GEF project during its development and had a significant catalytic role, being the main representatives from the supply side. It allowed importers, designers, and installers of SWH systems to come together, promoting the training and education of technicians and the creation of certification schemes. Together with the Panamanian Bank, they promoted financing for SWH based on the certification schemes for installers and the quality standards of the equipment. They also participated in calls for bids to carry out pre-feasibility studies for the selected pilots and their subsequent installation and start-up, and to disseminate the success stories in pilot projects, their economic convenience, and the existing financial incentives in the market.
76. The other ministry involved, to a lesser degree, was the **Ministry of Commerce and Industry (MICI)**. They were meant to play a decisive role during project execution, as it is responsible for the planning, coordination and control of activities that promote local industry, external trade and modernization and normative framework, including incentives for trade and industry. Interest was moderate, as they promoted the creation of high-value testing standards for quality and safety of SWH systems (via **COPANIT**), but incentives and creation

of a national industry were practically not addressed, and just included as part of the SWH Action Plan.

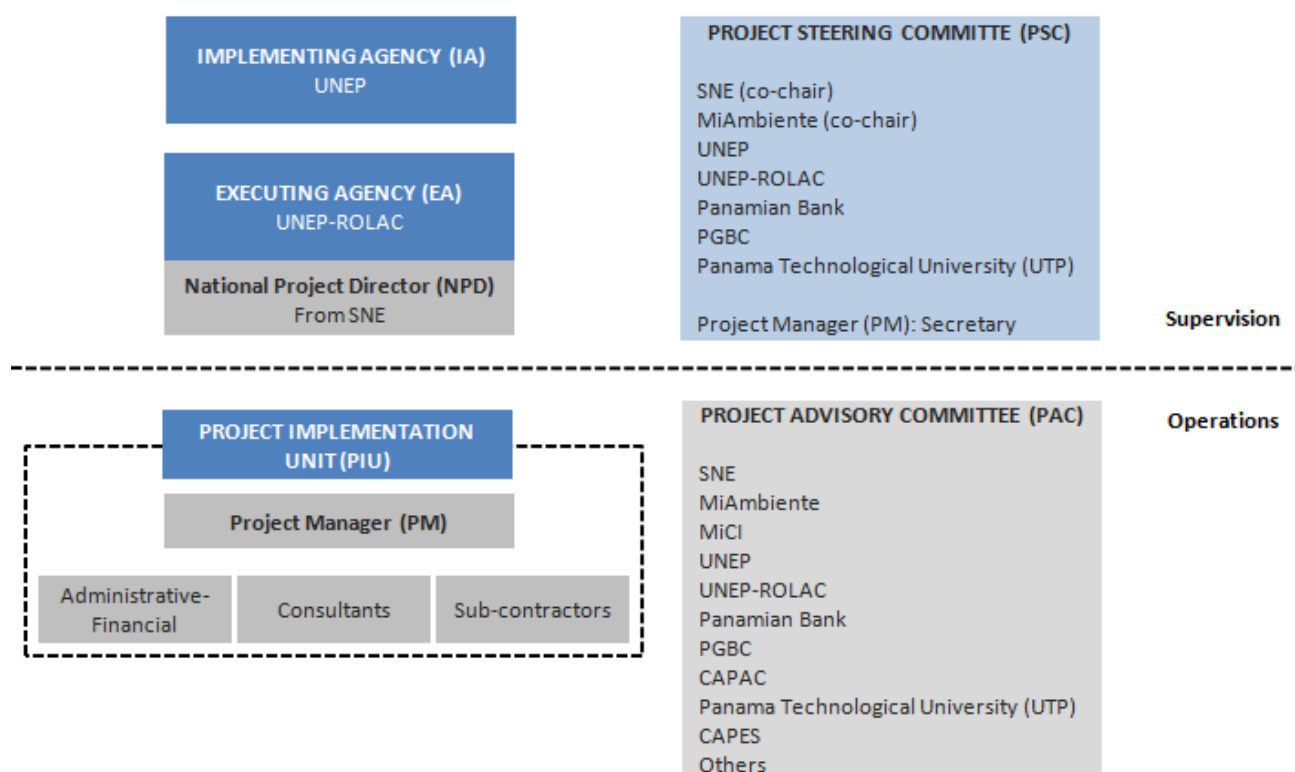
77. **Panama Green Building Council (PGBC)** and **Panama Chamber of Construction (CAPAC)** were important stakeholders who took part at the beginning of the project, but later were out because of sector crisis due to covid-19 pandemic. PGBC was a member of the Steering Committee. They had a role to play to promote General energy performance requirements in regulations of (new) buildings that create a basis for green technologies, including SWH, and also in the formulation of a new UREE Law, but these subjects did not prosper in the project.
78. **Panamanian Association of Hotels (APATEL)** was identified as an important representative from the demand side. Power is moderate, as they can support pre-feasibility and pilot projects, and dissemination in the market. They can be of interest as seeds to show potential of SWH technology, but due to pandemic they did not participate in practice in the project.
79. **National Institute for Human Development (INADEH)** had moderate power, but very high interest. They acted to set up a training course on SWH for technical staff on installation and maintenance of SWH systems, and provided contribution on dissemination through solar bus.
80. Main beneficiaries as **end-users** were public and private institutions, which received energy audits and pre-feasibility studies for the installation of SWH systems. Additionally, a selected group of end-users received financial support for the system's investment. The focus was on public buildings such as hospitals, where the benefits were transferred to civil society. 3 main hospitals were selected as pilot projects, and SWH equipment was donated and installed in the healthcare institution "*Los Años Dorados*". **Households** were not represented as they were not part of the target sectors for SWH.
81. The project made an effort to promote **participation and empowerment of women** and indigenous people, through project activities, especially after MTR recommendations. Public event "Solar thermal energy for women" (2021), and A specific course for women, co-organized with the NGO "*Mujer y Energía*" was developed, with a total of 44 people attending during three days. Two of the beneficiaries in demonstrative projects were indigenous population.

D. Project implementation structure and partners

82. UNEP Climate Change Division was the Implementing Agency for the project. It was responsible for coordinating activities, monitoring the implementation of UNEP's standard monitoring and reporting procedures, and transmitting financial and progress reports to the GEF. These responsibilities are conducted through the Task Manager. The Task Manager is supported through a Programme Assistant (supporting with logistical matters and assists in monitoring and online reporting), and the Fund Management Officer (FMO) who gives final approval to all expenditure and financial reports.
83. The UNEP Regional Office for Latin America and the Caribbean was the Executing Agency. National Environment Authority (ANAM) from Panama Government was appointed as the EA when the project was endorsed by the GEF on 9 January 2015. Later on September 17th, 2017 a delegation of authority as EA was made in favour of UNEP-ROLAC. The project was internalized and an Internal Cooperation Agreement (ICA) signed in January 2018, where the role of UNEP-ROLAC was outlined.
84. The National Project Director (NPD), as a high-ranking official, assumes responsibility for the Project on behalf of the national Government. First appointed from ANAM, SNE took the responsibility after EA delegation of authority.
85. The Project Steering Committee (PSC) is the highest decision-making authority of this project. The PSC include high level representatives from MiAmbiente (former ANAM), SNE, UNEP, UNEP-ROLAC, Panamian Bank, PGBC, UTP with the Project Manager as the secretary of the PSC. The PSC meetings will be formally called by the National Project Director (as Chairperson of the PSC)
86. A Project Implementation Unit (PIU) will be set up by the EA (UNEP-ROLAC)⁸, responsible of the overall operational and financial management and reporting of the UNEP/GEF funds. The PIU will be formally headed by the Project Director (in-kind contribution of SNE⁸), while the Project Manager (PM) will manage day-to-day operations of the Project with the support of an Administrative-Financial assistant.
87. Technical Advisors and Experts will not be permanent staff, but recruited from time to time to support the Project Manager in assuring quality of outputs of the project as a whole.
88. To interact with stakeholders at the institutional level, a Project Advisory Committee (PAC) will be formed consisting of the government entities participating in PSC, supply-side representatives, building associations, consumer organizations, universities/institutes and NGOs
89. An organigram has been edited from the original in the Project Document after ANAM delegation of authority on September 2017, and can be found in **Figure 2**.

⁸ Originally modified from ANAM, as Project Implementation Structure changes after delegation of authority on September 2017

Figure 2: Revised implementation structure for the Project (original source: Project Document, 2015)



E. Changes in design during implementation

90. One of the most significant changes in the project occurred from the design and endorsement by GEF and UNEP in 2015, to the entry into execution, with the change of the Executing Agency, which was described in literal E –Project Implementation Structure. During implementation, a few changes in design took place that deserves an explanation.
91. The Project had a total of 5 revisions, with minor amendments regarding execution. None of them affected the total budget that remained unchanged, and the reasons of the revisions were to re-phase the activities in the Work Plan and update budget for the unspent funds. Execution of pilot projects and consultants' administrative processes are mentioned as main delays—mainly due to COVID-19-. Laboratory and testing equipment suffered considerable increase for freight costs, and pilot projects were also higher than planned, but they were compensated by cost reduction in other activities, including dissemination and training, which were virtual in several cases. Revision #5 eliminated Activity 3.2.3 and its deliverables from the workplan, with small impact in both budget and outcomes achievement.
92. Partners: The Panama Solar Chamber (CAPES) came into board to support the project, becoming an important partner to gather supply-side companies.
93. Project extension: One no-cost extension was requested and granted for the project, proposed in PSC #4 on 5 August 2021. Planned project duration was of 48 months at design stage (CEO Endorsement Document). The project starting date was 9 January 2018, and the extended project technical completion date was 31 December 2022. Total duration was of 60 months. The extension was granted based on the expected 12 months delay to implement three major pilot projects in public hospitals, due to administrative reasons (bidding process, construction and commissioning).
94. In occasion of the 4th project revision, emission reduction targets were modified, with a significant downward reduction. Emission reduction relied at the design stage mainly on a large number of SWH installations being materialized by the private sector over the coming

years. New targets focused on direct emissions only under control of the project –thus, by the pilot projects implementation with project grants- and indirect emissions reduction pulled by private and public funding with technical support from the project.

95. Financial mechanism: Development of a financial mechanism for SWH technologies to be used as a reference for financial institutions activity was cancelled, at the time of the 5th project revision in October 2022. The Panama National Secretary of Energy (SNE) was currently working with the Inter American Development Bank to strengthen legal and financial capacities for the Energy Transition in Panama in order to develop the “Energy Transition Fund”, as an alternative to support the SWH technology developments and goals.

F. Project financing

96. The total project budget at approval was USD 10,060,182, of which the GEF allocation was **USD 1,918,182**, with planned co-financing of **USD 8,142,000**.
97. Total budget expenditure and committed post-project was USD 1,761,382 (93% execution), and total co-financing realised was USD 2,366,934 (29% of committed). Completed tables of: (a) budget at design and expenditure by components, and (b) planned and actual sources of funding/co-financing can be found in **Annex VI**. USD 1,651,140 was the total expenditures as of 31 December 2022 according to last ER.

IV. THEORY OF CHANGE AT REVIEW

98. The (reconstructed) Theory of Change is a particularly important framework for assessing project performance and results-achievements of the review. While it maintains the elements of the original targets and intended results of the project, it also needs to allow the reviewer to understand the causal pathways from outputs through to project outcomes, intermediate states to the eventual long-lasting impact of the project, and the long-term impact to which the project aims to contribute.
99. The project did not develop a Theory of Change at design, counting only on the presentation and development of the outputs and outcomes, and on the other hand the objective and expected impact of the project. There was no clear articulation of the causal pathways from the outputs to the long-term impact, which was reconstructed in the TOC at review. The change processes between outcomes requires certain conditions to hold considered the project “assumptions” (conditions that are beyond the direct control of the project) and may be facilitated by supporting actions or project “drivers” (where the project has a measure of control and can make a meaningful influence). The abovementioned Assumptions and Drivers were created.
100. In this TOC at review, they were considered several inputs when a TOC diagram was prepared in the Mid-Term Review, including a set of assumptions and drivers. The final TOC at Review intended to make a balance and enhance the work of the Mid-Term Reviewer. Interconnections among outputs and outcomes are wide, and causal pathways may become tricky and too complex to analyze as they were presented in the Mid-Term Review; in this regard, the reviewer has chosen to present a simplified TOC, where the causalities can be visualized in a cleaner way.
101. The Mid-Term Reviewer re-constructed a Theory of Change as part of the MTR. This Theory of Change kept the original logical framework in place, i.e. outputs and outcomes were left as is. In the Terminal Review, some of the outcomes y outputs were re-formulated, to make them consistent with UNEP results definitions or to reconstruct the Theory of Change (TOC). Also some differences (tables and text content) show up in the ProDoc regarding outcomes and outputs definition.
102. Finally, drivers and assumptions were created to connect long-term impact to outcomes, allowing preparing the casual pathways. Although the ProDoc did not explicitly state the drivers and assumptions, the main guidelines could be extracted from reading the document. For example, in the analysis of barriers and gaps for the development of an SWH market in Panama in the ProDoc⁹, the necessary drivers can be deduced, as well as their connection to the outputs and the elements that need to be present for their development, which can be associated with the assumptions.
103. The re-shuffling and re-wording of impacts, intermediate states, outcomes and outputs (and the comparison from design to TR, as well as justification for changes) can be found in
104. **Table 4.**

Table 4: Justification for Reformulation of Results Statements

Formulation in original project document(s)	Formulation for Reconstructed TOC at Review Inception	Justification for Reformulation
---	---	---------------------------------

⁹Chapter A.5 1) Barriers to SWH in Panama

(LONG LASTING) IMPACT		
No text available	GHG emissions from electricity sector are reduced	
	Local jobs and local capacities to design, install and operate SWH systems are created	
	Urban and Power sector Resilience is enhanced	
INTERMEDIATE STATES		
No text available	Government and private companies implement policies and action plans investing to create capacities and install SWH projects, to accelerate the development of a cost-effective CO2 market.	
PROJECT OUTCOMES		
1. Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development policy instruments and regulatory framework to encourage sustainable SWH market development	1. Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development	Text duplication error
OUTPUTS		
1.2 - One market assessment and economic analysis of SWH options	1.2 – A market assessment and economic analysis of SWH options is prepared, including recommendations for an action plan	
1.4 - Project monitoring and evaluation; impact assessment and monitoring	(remove) or (adjust to items not included in project supervision plan)	Project monitoring and progress evaluation are related to a supervision plan
2.1 - One capacity and training needs assessment supply side, building design and quality control system	2.1 – Assessment on capacity building and training needs for SWH systems is prepared.	The statement is not clear. Later, 2.6 refers to the creation of a testing facility
2.6 - Capability to verify and test for compliance with the quality standards present	2.6 a – Institutional capacity and gap assessment to establish a national accredited testing laboratory is prepared 2.7 b – Laboratory equipment acquired, civil works finished and one testing laboratory is installed and running	The statement is not clear enough, and the outputs shall mention a product/service instead of a condition (capability) It was also divided into TA activities, and investment.
4.1 - Identification, energy audits and SWH system proposal/feasibility	4.1 – Up to 100 SWH systems are identified, with primary energy audits undertaken.	There is no reference to any target

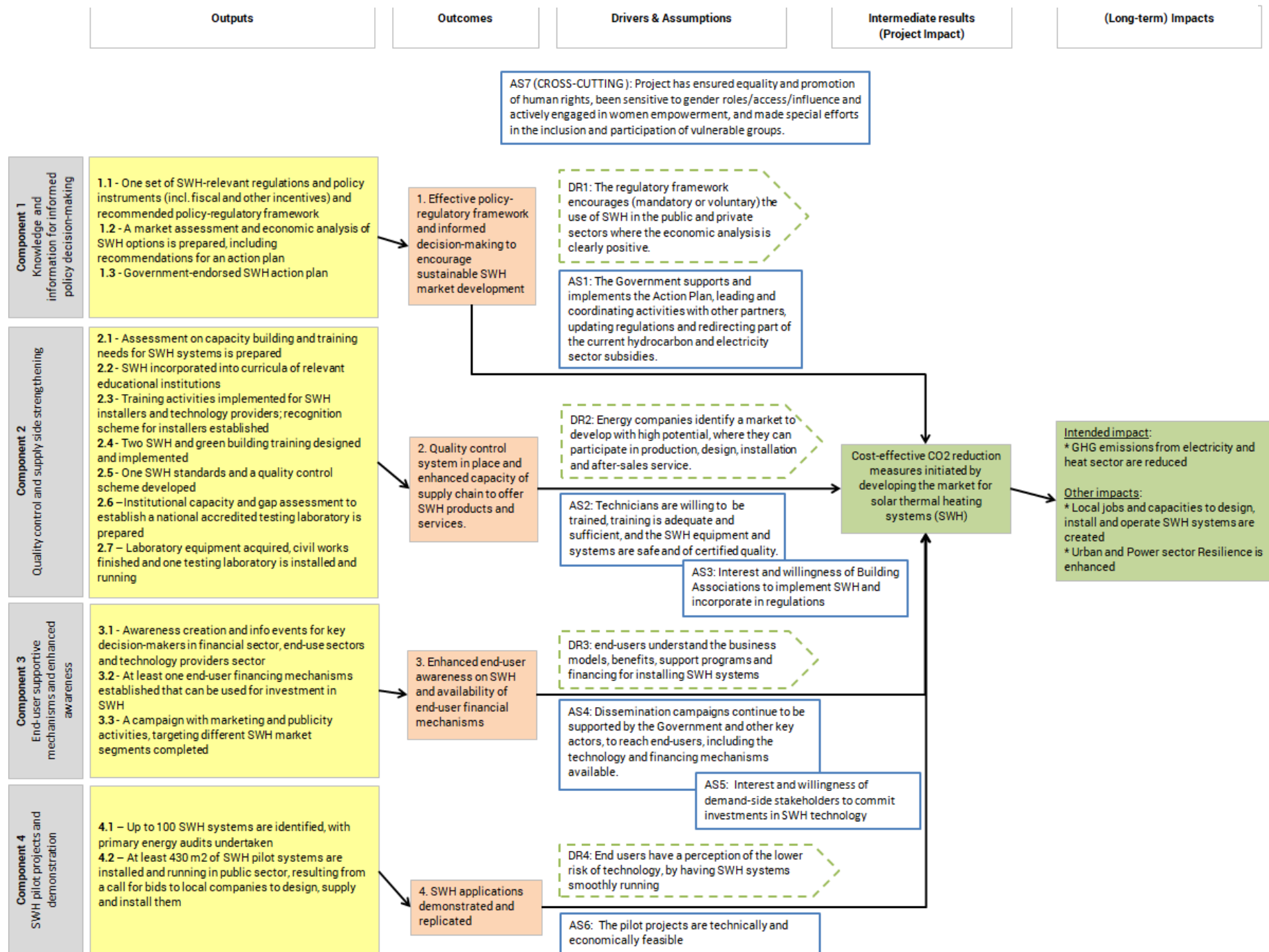
4.2 - 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m2 of SWH; direct and 60 Mi kWh	4.2 –At least 430m2 of SWH pilot systems are installed and running in public sector, resulting from a call for bids to local companies to design, supply and install them	Rephrasing and changes in the indicator are in line with project revision changes, in order to separate direct and indirect impact –out of control of the project-
---	---	--

105. There are four causal pathways demonstrated in the Theory of Change diagram (see **Figure 3**). The causal pathways all contribute to the intermediate states which flow into one pathway towards long-lasting project impact and eventually towards the long-term impact the project contributes to.
106. The first causal pathway combines the outputs related to market assessment and economic analysis, the creation of an adequate regulatory framework for SWH, attractive incentives (including fiscal ones) and an Action Plan supported by the Government, which can lead to encourage sustainable SWH market development (Outcome 1). The assumption means that it will be necessary for political will to exist mainly at the level of SNE and MiAmbiente, to generate a framework that is attractive to end users, coordinating mandatory or voluntary schemes with other institutions (PGBC, CAPAC) and promoting adoption in relevant public sectors (Health, Swimming Pools), and coordination with budget officers (Ministry of Finance) to redirect subsidies and provide possible incentives at different stages for the development of SWH. More involvement of MICI shall be needed, in order to grant a local market development, with proper incentives to SMEs.
107. The second causal pathway aims to create a national accredited testing laboratory to ensure quality control of SWH systems, and at the same time creating related staff capacities to offer high-value services, to build credibility on SWH systems (Output 2). The assumption is based on the market equipment being of quality, an aspect that depends on the UTP laboratory being installed, operational, and accredited—an aspect that seems to be covered by the project’s progress—and on the existence of testing standards. But it also needs to have economic sustainability for the UTP, for which a minimum market is required, which can be generated with a mandatory framework with labeling by SNE and regulators, or a voluntary framework that can be associated with regulations for new buildings and/or subsidies or financing. The role of SNE is key, as well as for private chambers as PGBC, CAPAC. Regarding quality of training, it has been proved to accomplish with very positive precedents in UTP, INADEH and ITSE. As SWH energy companies identify the market potential, an adjustment to meet the demand in quantity is highly likely. The creation of SWH local factories or assemblers to boost long-term impacts on employment will depend strongly on the size of the market, as well as incentives coming from Outcome 1. The assumption #2 is visualized as the weakest in the project, with the need to delve deeper into it, in particular referring to the establishment of the accredited laboratory at UTP and the way (voluntary, mandatory) of establishing the certification schemes for SWH systems.
108. The third causal pathway is to have enhanced end-user awareness on SWH and availability of end-user financial mechanisms. The assumption raised is connected to the economic convenience of market evaluation (Output 1.2), as a basis for making a connection with the financial sector (Panamanian Bank and others) to offer convenient lines of credit, and have adequate dissemination. Bank engagement seems to be MiAmbiente has a very important role, which can be supported by the sector's own installers. Financing instruments seem to be achievable, since it is associated with the visualization of a potential market. Eventually it will be pulled by the end users themselves who want to join. It will be necessary for these green

credits to have a more attractive condition than other commercial credits, so as not to be offset by other investment decisions.

109. The fourth causal pathway was confirmed, as SWH applications were demonstrated in several developed projects. The assumption of successful implementation was validated also on the field visits, where technically and economic benefits were mentioned. More than 100 pre-feasibility studies were also carried out, and replicated by private beneficiaries. The project achieved many public buildings in health and care sectors, but also supported agri-industry projects, as a way to showcase the applications and take-up for users. SNE and Ministry of health were key partners, and in the future sector chambers are called to foster SWH technology.
110. Work to promote human rights and gender equality is central to the aims of UNEP but does not appear within results framework. As the project document does not include commitments to gender equality/gender strategies, expectations were included as a Cross-cutting assumption: "Project has ensured equality and promotion of human rights, been sensitive to gender roles/access/influence and actively engaged in women empowerment, and made special efforts in the inclusion and participation of vulnerable groups".

Figure 3: Reconstructed Theory of Change



V. REVIEW FINDINGS

A. Strategic Relevance

Alignment to UNEP's UNEP Medium Term Strategy¹⁰ (MTS), Programme of Work (POW) and Strategic Priorities

111. The project is in line with UNEP Medium-Term Strategy 2014-2017, 2018-2021 and their Work Programs, as well as with UNEP's climate change sub-programme strategy, where the Expected Accomplishment 2 refers to Low emission growth: Energy efficiency is improved and the use of renewable energy is increased in partner countries to help reduce greenhouse gas emissions and other pollutants as part of their low emission development pathways.

Alignment to Donor/GEF/Partners Strategic Priorities

112. The project is highly relevant to Donors, as it is in consistency with the GEF-6 Climate Change Focal Area covering fundamental objectives described under its strategy: CCM 3 - Promote investment in renewable energy technologies, with the expected Focal Area Outcomes: Favourable policy and regulatory environment created, Investments in renewable energy technologies increased and GHG emissions avoided. The project is linked to relevant SDG targets and indicators: SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all. Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix. 7.2.1: Renewable energy share in the total final energy consumption

Relevance to Global, Regional, Sub-regional and National Priorities

113. The project document clearly outlines its alignment and relevance to national environmental priorities. National Energy Plan 2009-2023 (NEP) highlights the major importance of energy efficiency as a planning. NEP was later updated for the period 2015-2050. Law on the Rational and Efficient Use of Energy (UREE) was approved in December 2012 by the National Assembly, which gives a sounder legal basis for the lines of actions of the NEP.

114. The aim in energy policy is to reduce energy consumption by 30% compared to Business-as-usual (BAU) scenario by rational and efficient use of energy on the medium-term and have 100% coverage and energy access as well as security in energy supply. SWH systems can have an outstanding role to reduce electricity and fossil fuels consumption, impacting on a significant CO₂ emissions reduction.

115. According to the revised 2020 National Determined Contribution (NDC), Panama improved its mitigation ambition since the first NDC. Set specific greenhouse gas (GHG) emissions targets for the energy and forestry sectors, committing to a 24% reduction in the country's total energy sector emissions by 2050 (and 11.5% by 2030)¹¹

Complementarity with Existing Interventions/Coherence

¹⁰UNEP's Medium-Term Strategy (MTS) is a document that guides UNEP's programme planning over a four-year period. It identifies UNEP's thematic priorities, known as Sub-programmes (SP), and sets out the desired outcomes, known as Expected Accomplishments (EAs), of the Sub-programmes. <https://www.unenvironment.org/about-un-environment/evaluation-office/our-evaluation-approach/un-environment-documents>.

¹¹<https://climatepromise.undp.org/es/what-we-do/where-we-work/panama>

116. UNEP is engaged in a number of projects and programs designed to promote energy efficiency and renewable energy technologies. With regard to solar water heating, UNEP is supporting the following programs and projects that are relevant for the project and from which it will also benefit: The global knowledge management component of the “Global Solar Water Heating Market Transformation and Strengthening Initiative” (GEF ID: 2939); SWH activities under the Mediterranean Investment Facility, including SWH programs in Egypt (EGYPSOL), Tunisia (PROSOL) and Montenegro (MONTESOL); Energy for Sustainable Development in Caribbean Buildings (GEF ID: 4171); and Promoting Energy Efficiency and Renewable Energy in Buildings in Jamaica (GEF ID: 4167)

Rating for Strategic Relevance:	Highly Satisfactory
--	----------------------------

B. Quality of Project Design

117. A detailed review of the project design was completed and elaborated in the Inception Report of the Terminal Evaluation and thus only the summarized version will be presented here.
118. The project outlined a strong baseline situation with an intensive stakeholder participation process during the Project Preparation Grant (PPG) phase that enhanced the quality and relevance of the project to the country.
119. Stakeholders were carefully selected, identifying those closer to carry out the proposed actions, both at the government and agency level, as well as academia and private sector actors in energy, construction, health, and finance. Roles and responsibilities were assigned appropriately according to expertise.
120. The structuring in its four components with outputs and outcomes was very appropriate, implicitly covering the elements that lay the foundations for the sustainability and scaling up of solar thermal energy once the project is completed.
121. The allocation of budget and execution planning is realistic and consistent with the proposed scope. An extension needed to be granted to extend the project from 48 to 60 months, but it has to be considered that the project ran within COVID-19 pandemic.
122. The project’s intention in terms of its causal pathways to impact was not stated in the project, nor in the results framework. The reviewer had to re-phrase the project in terms of outcomes and outputs, and prepare a set of drivers and assumptions based on scattered –and somehow implicit– information in the ProDoc, to better understand the intention of the project and have a clear view of the causal pathways. After all, a Theory of Change was prepared, where reasonable assumptions and drivers were raised to achieve the desired impact.
123. The indicators are a weakness to remark, and are they disagree with MTR rating, as long as they do not meet SMART principles: they do not always seem directly related to the result they intend to measure, measure it partially, or have subjective elements for measurement. In any case, the means of verification deserve a review for lack of specificity, being mentioned at a general level for several outputs, and referring to documents such as “supplier company reports” or “company publications.”
124. Knowledge management and communication at design stage are a weak point of the project. There is no specific section describing the knowledge management approach, and though knowledge and information management are mentioned in several sections of the ProDoc, there is no strategic approach, resulting in an *ad hoc* management. In terms of communication, it is noteworthy a considerable effort

during the implementation, developing a communication strategy, but the project could have benefited from previous experience to guide the activities.

Rating for Project Design: Moderately Satisfactory

C. Nature of the External Context

125. In this section, external features of the project's implementing context that may have been reasonably expected to limit the project's performance¹² are assessed. The Project Document identified a set of risks, that reasonable describe the most likely events to happen. Panamá is a stable country in terms of economy established as a financial and logistic hub for the region, with a significant decrease of poverty in the last three decades¹³.

126. Nevertheless, some other external features/risks may have been presented, as a way to fully cover issues and mitigation actions (when needed) as: change in government and possible delay, or decreased ship traffic crossing the Channel due to prolonged drought caused by El Niño and economic impact in Government budget committed.

127. The project experienced one main external event during implementation, the COVID-19 pandemic, which took place at the mid-run of project completion, but had minor implications on project implementation as many activities were switched to virtual mode. Also it was hard to foresee at this time. No events had a significant impact on the achievement of project results, although will be discussed under findings in terms of sustainability.

Rating for Nature of the external context: Favourable

D. Effectiveness

128. Review findings follow the review criteria presented in the TORs, aiming to be objective, relate to the review objectives/questions, be easily identifiable and clearly stated and supported by sufficient evidence. Outputs will be reviewed in accordance to latest version of workplan, and changes proposed in TR Inception Report, as some of them were changed in project revisions.

Availability of Outputs

129. Prior to the extended description of each Output, a summary table is presented for the Outputs Availability. It should be highlighted that the progress rating has differences with the evaluation from the project (through the last PIR) and the mid-term review. In the latter case, the rating given by the reviewer is even lower in some outputs (i.e. 2.5) than that given in the MTR.

¹² As described in Main Review Guidelines prepared by UNEP's Evaluation Office: (e.g. conflict, natural disaster, political upheaval)

¹³ <https://www.bancomundial.org/es/country/panama/overview>

Table 5 - Project Output Availability Summary Table

Project Outputs	Availability	Comments
Output 1.1: One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework reviewed	100%	
Output 1.2: A market assessment and economic analysis of SWH options is prepared, including recommendations for an action plan	100%	
Output 1.3: A Government-endorsed SWH action plan	100%	
Output 1.4.: End-of-project impact assessment	100%	
Output 2.1: 2.1 – Assessment on capacity building and training needs for SWH systems is prepared.	100%	
Output 2.2: SWH incorporated into curricula of at least two relevant educational institutions	100%	
Output 2.3: Training for SWH installers and technology providers; one recognition scheme for installers completed	90%	Certification Scheme for SWH installers was not created by CONACOM.
Output 2.4: Two SWH and green building training courses designed and implemented	100%	
Output 2.5: One SWH standards and a quality control for SWH products and installations scheme developed	90%	No evidence of approval for quality minimum standards for SWH products and installation
Output 2.6 a –Institutional capacity and gap assessment to establish a national accredited testing laboratory is prepared	100%	
Output 2.6 b – Laboratory equipment acquired, civil works finished and one testing laboratory is installed and running	75%	Due to COVID-19 and delays in the acquisition process and test facility construction, the installation of the SWH test equipment has not been performed. Some equipments are missing, as they were detected in the site visit.
Output 2.7: Agreed business plan for the reinforcement of the Panamanian Solar Energy Chamber	100%	
Output 3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector	100%	
Output 3.2: At least one end-user financing mechanisms established that can be used for investment in SWH	100%	Banco General's financial mechanism available for its clients.
Output 3.3: A campaign with marketing and publicity activities, targeting different SWH market segments completed	100%	
Output 4.1: Up to 100 SWH systems are identified, with primary energy audits undertaken	100%	
Output 4.2: At least 430 m2 of SWH pilot systems are installed and running in public sector, resulting from a call for bids to local companies to design, supply and install them	100%	
Overall availability of outputs	97%	

130. **Output 1.1:** One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework reviewed. This output was fully delivered.

131. A thorough assessment of existing legal and regulatory framework in Panama was prepared and discussed in seminars in 2019 to gather feedback, and identify gaps in order to foster the technology. The assessment included recommendations at regulations-change, quality control and certification of SWH incentives (including fiscals), and promotion on dissemination and R&D. A final version was distributed among the stakeholders in June 2019. There is solid evidence of achievement through reports, but also confirmed in the interviews process with key stakeholders as SNE, MiAmbiente.
132. **Output 1.2: One market assessment and economic analysis of SWH options.** This output was fully delivered.
133. A detailed market study was prepared in 2019 regarding SWH actual situation and market potential, for both supply and demand side. In the report, delivered in September 2019, were identified the most promising sectors (hotels, health, industry and households) and quantifying energy demand, installed area (m2), investment employment/training needs. Besides, benchmarking with more developed markets (Brazil, Barbados, etc.) was undertaken to ensure more realistic market growths and expectations, to determine a national SWH plan and goals.
134. Together with report from Output 1.1, awareness-raising & discussion seminar among key stakeholders were undertaken, to set the basis for SWH goals, impacts over economy and employment, recommendations and feedback aimed at developing a robust market. As a result, Output 1.3 was achieved.
135. It is noteworthy the preparation of an “End-of-project Market evaluation report” and an “End-of-project impact study report”, to contrast the impact of the project, with a specific analysis of market penetration in terms of installed capacity. Both studies were planned as specific activities.
136. **Output 1.3: A Government-endorsed SWH action plan.** The output was successfully delivered.

Figure 4 - Endorsement of SWH Action Plan and creation of Thermosolar National Programme (PNTP)



137. This was probably the most important output of the project in terms of sustainability, as it aimed to create a strategy for 2015 with the highest-level political commitment (Ministry of Presidency – National Secretariat of Energy) through an Action Plan that sets future goals. Additionally, the discussion of the plan included a workshop prior to its approval to inform various stakeholders and beneficiaries and to receive their feedback. The report mentions 26 people at the event on June 6, 2019, including representatives from the health, public, university, banking, and Solar Chamber sectors, among others. Unfortunately, there is no record of the individuals and entities that were invited and attended, which will be a general recommendation for the project.

138. In September 2019, a meeting was held with the new authorities of the SNE to present the draft Action Plan, with the goal of obtaining their endorsement. Due to the COVID-19 pandemic, the project suffered a considerable delay in the process, but the SWH Action Plan was finally approved in August 2021 and issued in the national

official gazette. In the same document, the National Thermosolar Program (PNTS) was created; a key milestone for SWH sustainability, as it will be responsible for managing the necessary actions to develop and strengthen a trustworthy, quality, and safe local SWH market. The Panama National Thermosolar Program (PNTS) will be coordinated by the National Secretariat of Energy but is designed with the broad participation of the main institutions that shall ensure its success.

139. **Output 1.4: End-of-project impact assessment.** This output was achieved.
140. An end-of-project report was prepared successfully, assessing the impact on key indicators of the project. It also sets the basis to follow-up the deployment of the action plan for SWH.
141. **Output 2.1: 2.1 – Assessment on capacity building and training needs for SWH systems is prepared.** This output was completed satisfactory.
142. Based on discussion meetings with public technical educational institutions (UTP, INADEH, ITSE) and several organizations (*Fundación Calicanto*, PGBC, marketers and service providers), the existing academic offerings, teacher capacities, and laboratory facilities were determined, resulting in a comprehensive training needs report. A full analysis was conducted to identify training requirements and gaps for various target groups: engineers, professionals, and providers. Institutions were also provided with the expected annual need for teachers and an economic feasibility analysis to support the creation of specific training in SWH. This output serves as the foundation for Output 2.2, which involves the design of curricula by educational institutions.
143. **Output 2.2: SWH incorporated into curricula of at least two relevant educational institutions.** This output was successfully delivered, exceeding the minimum.
144. SWH curricula are incorporated in three institutions: UTP Solar thermal energy Diplomat, ITSE Solar thermal installers, and INADEH Solar thermal installers and *Solar Bus* for nationwide education in Panama. For that, supportive material was prepared by Termosolar Panama, as follows: Training of trainers for UTP, ITSE, INADEH and teacher Training of trainers for SPIA. Information was triangulated with UTP and checked through websites to confirm to certain extent the existence of training diplomat and courses: <https://utp.ac.pa/primera-version-del-diplomado-en-colectores-solares>, <https://www.inadeh.edu.pa/energiaren/>,

DEPARTAMENTO DE GESTIÓN CURRICULAR



DISEÑO CURRICULAR DE:

INSTALACIÓN Y MANTENIMIENTO DE SISTEMAS DE CALENTAMIENTOS SOLAR DE AGUA

Figure 5 - Training Manuals for Teachers and students



145. **Output 2.3: Training for SWH installers and technology providers; one recognition scheme for installers completed.** This output was partially delivered, as the recognition scheme draft was prepared but is still not available.
146. This output has two components, of which the first was achieved completely, and the second partially. Unlike what was expressed in the PIR, the reviewer understands that it was not fully achieved.
147. Regarding training for SWH installers and providers, two workshops were delivered in UTP and Cobitel congress, during April 2020, as it was scheduled. Total duration of each was four hours, and total attendees were 55. The number of women and men is not established. Also 10 students were certified as solar thermal installers by CENACER (Mexico National Center for Labor Competence Standard Certification), under Mexican competence standard EC 0325, and 21 students certified as solar thermal design and maintenance under UTP Diplomate. 19 students are graduated as solar thermal installers at INADEH (national Institute for Human Development in Panama) by 2023.
148. For the second component of the output, recognition schemes (2) for SWH installers are not available in Panama. CONACOM (National Competence Commission) is responsible for issuing labour competence norms and certification of workers. CONACOM is a tripartite entity made up of the business sector, the labor sector and the government sector. CONACOM is established in INADEH. Technical secretary of CONACOM has the duty –among others- to “develop and submit to CONACOM the draft Technical Standards for Labor Competences (NCL) for approval” and “Issue the Labor Competences Certifications”.
149. Drafts were prepared and shared with PNUMA and SNE, and a workshop was held in November 2019 for awareness-raising, emphasizing the key role of practice.

According to MTR, UTP and the Engineers and Architects associations (SPIA) were still reviewing the Developed certification Scheme by January 2021, and in PIR FY 2022 is stated that "... there is no labour competence standard regarding solar thermal in Panama". No evidence was found on websites of CONACOM or INADEH of the existence of a recognition scheme for SWH installers.

150. PIR FY 2022 stated that "graduated students from the different educational levels are recognized as suitable" (by the market). The reviewer believes that this was not the spirit set forth in the Output, and as such, it has not been achieved.

151. **Output 2.4:** Two SWH and green building training courses designed and implemented. Output was successfully completed.

152. Training courses were prepared and implemented, according to evidence provided by PM and reports. Preparation and proposal of course content –including ppt slides- is part of the report presented to the reviewer, dated June 2019. Training courses were not possible to triangulate with PGBC, but it was possible to confirm with UTP and Solar Chamber members. SWH training is introduced in specific seminars and LEED & Sustainable training at PGBC. 26 attendees are mentioned, photos are presented, and PIR FY 2023 refers to 10 people graduated from the course by 2023.

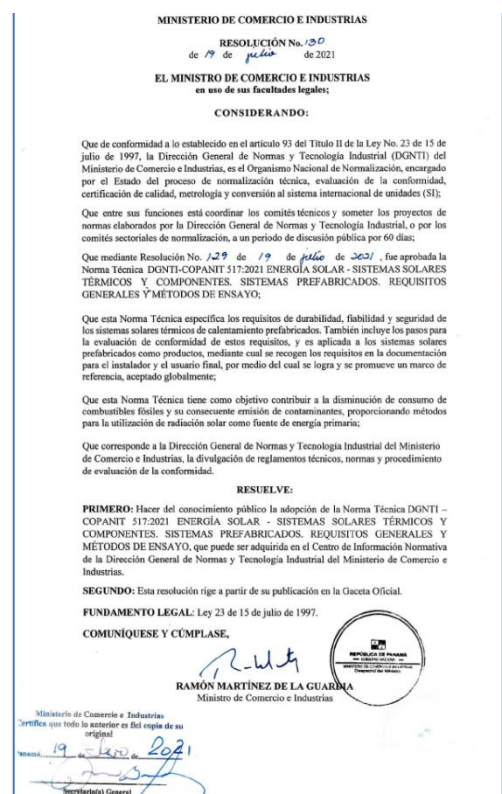
153. **Output 2.5:** One SWH standards and a quality control scheme for SWH products and installations developed. This output was partially delivered. Status does not match with last PIR.

154. A full set of SWH standard has been developed, with three approved DGNTI – COPANIT norms, as follows: Norm 517: Solar power – Solar thermal systems and their components. Pre-made system. General requirements and testing method, Norm 518: Solar power – Testing methods for solar collectors, and Norm 519: Solar power – Vocabulary. Resolutions from MICI are in place, as evidence.

155. It is also important to mention a participative process during the set of norm's development, as the first drafts were prepared by project specialists taking ISO norms as a baseline. Those drafts were presented in a set of three workshops to building and industry associations and DGNTI, where they were addressed not only the specific aspects of the norms, but also - upon request- technical aspects of SWH for a better understanding. All the feedback was later used to speed up the process in the technical committee. Internal processes for approval grant themselves a wide participation of stakeholders.

156. Quality control scheme for SWH systems was still under discussion by the time of the Terminal Review. A standard has been prepared for "Solar water heating installation and minimum quality requirements", and comprises of One minimum quality requisites standard for SWH products, and One standard for SWH installation. It was expected to be implemented after the end of the project in 2023. Once published, the requirements become mandatory for all imported or locally manufactured equipment. This means that quality requirements of solar

Figure 6 - DGNTI-COPANIT 517 Norm Endorsement by MICI



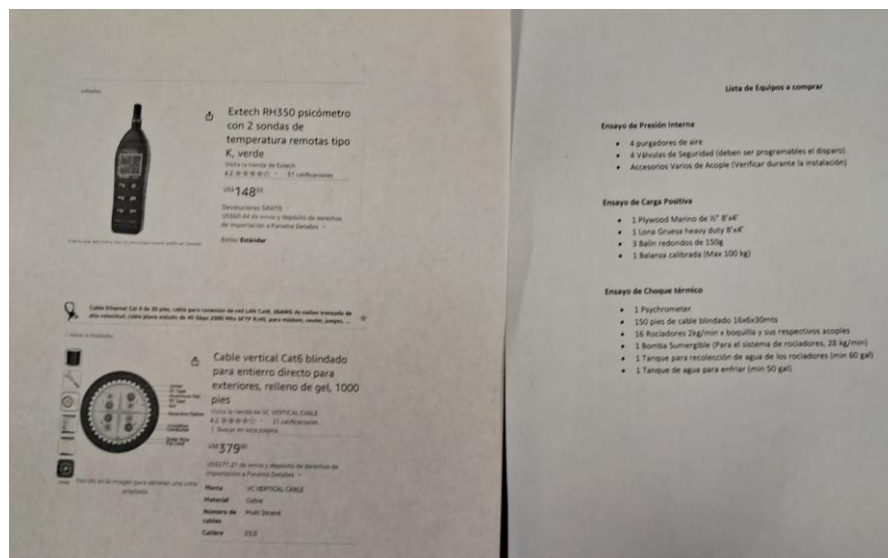
thermal equipment will be checked in all the equipment that are imported or manufactured in Panama.

157. **Output 2.6 a – Institutional capacity and gap assessment to establish a national accredited testing laboratory is prepared.** This output is completely available.
158. Comprehensive reports (2) have been prepared, identifying UTP labs as the most promising one to be updated for SWH products testing, stating the institutional capacity and existing gaps, recommending the laboratory acquisitions to be made, civil works, and recommendations to acquire international accreditation. These reports were available by November 2019.
159. **Output 2.6 b – Laboratory equipment acquired, civil works finished and one testing laboratory is installed and running.** This output has not been fully delivered yet.
160. As stated in the internal reports prepared by the PM, the acquisition of equipment and materials for the UTP suffered many delays. The process was validated by UTP members in the interview, and also by the reviewer checking installation site in progress, and existing laboratory equipment.
161. On the one hand, there are the delays associated with the execution of the purchase. It was decided to request a quote from 3 different suppliers for each of the equipment to be purchased, with all the difficulty that comes with obtaining 3 suppliers of equipment that is not common to find in Panama. On the other hand, there are delays associated with UNEP's own administration, which did not know what the best procedure was to purchase equipment and materials. Finally, there are the payment times handled by UNEP administration, exceeding the stipulated 30 days to almost 60 or 90 in some cases. As time progressed, fewer and fewer suppliers wanted to sell their products to UNEP. Finally, the laboratory equipment was delivered to the UTP in June 2020 in the middle of the pandemic. In 2021 UTP resumes in-person operations, asking UNEP-ROLAC the acquisition of construction materials. Several delays in the RFQ process undertaken by UNEP led to an year-delay. Construction process also suffered delay from UTP side, as the testing facility field was transferred to other uses. At the time of the reviewer visit, civil works were finished, but some equipment was still missing. UTP prepared a list of missing equipment –valued in USD 5.000-, and members from CAPES committed to deliver in order to have completely installed and running by end of 2024. Accreditation process of the laboratory will need of additional resources, as they are foreseen in the SWH Action Plan.

Figure 7 - Current situation of SWH test facility and pending equipment to be mounted during site visit



Figure 8 - Pending instruments to be acquired to fully implement SWH test laboratory



162. For better use of project resources, even without the testing laboratory, virtual training was carried out for technicians from the UTP and the solar chamber during 2020.

163. **Output 2.7:** Agreed business plan for the reinforcement of the Panamanian Solar Energy Chamber. This output is delivered.

164. All required outputs were achieved as scheduled. A business plan for the Panamanian Solar Energy Chamber was developed and presented in a workshop in 2019, with 22 attendants. A participative process was undertaken, as validated with solar chamber members, including (2) meetings and feedback from other stakeholders (APATEL, National Association of Poultry Farmers of Panama (ANAVIP), Panamanian Association of Insurance Companies (APADEA), MICI, among others.

Figure 9 - Business Plan developed for the CAPES



165. **Output 3.1: Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector.** This output has been delivered, according to the target set in the logical framework.
166. Awareness creation is related to both a communications strategy and its implementation, involving dissemination campaigns and workshops and other events for target sectors. Output 3.3 refers to the strategy and its implementation, as well as specific events that include financial, technology and end-use sectors.

167. Involvement efforts are evident in all components of the project, seeking broad participation of all actors involved and potential stakeholders. This is included in documents such as the PSC minutes, workshops with educational entities to carry out diplomas, and communication with chambers and associations of end users (see Output 2.7 for example).
168. Some associations have shown low participation, such as APATEL or even PGBC and CAPAC, which have seen their operations seriously affected after covid-19 pandemic, and even the continuity of their members compromised. This also does not offset the efforts made from the Project Management Unit (PMU).
169. A list of the events held and audiences reached can be seen in **Annex X**.
170. **Output 3.2:** At least one end-user financing mechanisms established that can be used for investment in SWH. This output has been delivered.
171. Banco General has a credit line for energy transition named “Green finance”, aimed at electric mobility, solar photovoltaic and solar Thermal. The credit has a slightly lower rate than conventional credit lines, but dissemination can be improved in order to focus on SWH. Banco General’s website shows pictures of solar PV installations, and no thermal systems are presented in the [link](#).

Figure 10 - Banco General Website for Green Finance, showing no pictures of SWH systems

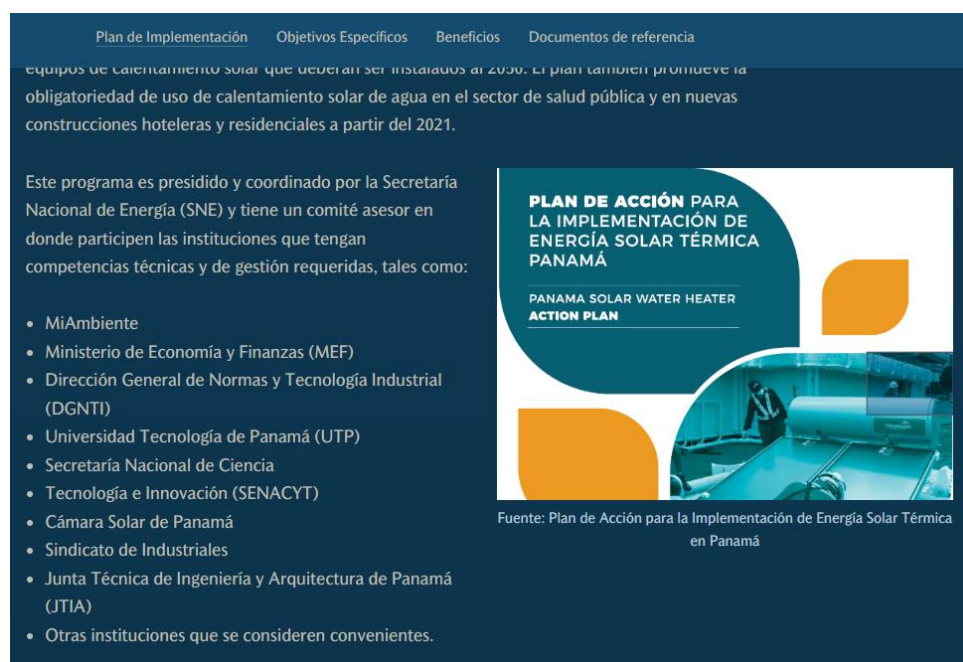


172. It is noteworthy that, according to the interview with Banco general representative, they made contacts with some of the companies that installed pilot projects in private sectors, and specific funding was not required. As projects were already feasible and convenient they were executed with equity or using existing credit lines. This aspect can be a lesson learned to evaluate the needs of the market in terms of financing, and which sectors need it. But certainly, financing for households will be needed in order to accelerate the uptake of the technology.
173. UREE Fund implementation is pending for the Ministry of Economy and Finance Approval (stated in MTR). Also it is mentioned that the SNE is working with Interamerican Development Bank (IADB) to develop an “Energy Transition Fund” that

will allow public financing or renewable energies, electric mobility and energy efficiency in Panamá. Solar Thermal is included as one of the renewable energy options. The fund is expected to be operational by 2023. The IDB project code is [ATN/OC-18916-PN \(PN-T1290\)](#) (Stated in PIR)

174. **Output 3.3: A campaign with marketing and publicity activities, targeting different SWH market segments completed.** This output was delivered. Indicator and target for the output are too open, but public media campaign has proved to be executed and extensive.
175. A key element for the marketing and advertising campaign was the creation of a communications strategy with an advertising agency at the beginning of the project (2019). The strategy identified different target audiences (students and professionals, authorities and other organizations, hospitals, end-users, and other key actors), segmented messages by audience, and communication channels (television, radio, internet, and social media). This provided a framework for the members of the Project Management Unit (PMU) and the Steering Committee to plan and execute the campaigns and activities. Additionally, a consultancy was conducted with a communications company to support the identity of the Thermosolar Panama project.
176. Several materials were created, such as banners, cards, PPT templates, and marketing items (cups, t-shirts, pens, caps, bags, and notebooks) to be handed out to potential beneficiaries in all four sectors during in-person events. An example of the application of these marketing items can be seen at the following [link](#), where t-shirts were distributed at an in-person event oriented towards women.
177. Furthermore, scripts for several videos to be used in different media were defined. An example of the promotional videos can be seen at the following [link](#). This strategy was planned to be carried out throughout the entire project. In 2020, a slight modification to the strategy was introduced, primarily increasing virtual events as opposed to in-person due to COVID-19. In this case, an example worth noting is the change of in-person “Café Solar” events to a virtual format. An example of both in-person and virtual Café Solar events can be seen at the following [link](#).
178. The creation of the Thermosolar Panama website was a milestone worth highlighting for communication purposes and as a knowledge management tool, an aspect that will be addressed later in this report.

Figure 11 Snapshot of Thermosolar Panama Website



179. Regrettably, the project did not receive the necessary support from the contracted company and UNEP for dissemination. For this reason, the progress in communications was carried out by PMU personnel, with the limitations of having non-expert staff in the field. It is worth noting that throughout the project, a record was kept of actions such as workshops, webinars, and Café Solar instances. There are also records of publications in various digital media (government, press, and others).
180. The execution was satisfactory, and it can be said that the dissemination objective was achieved, with many actions carried out to reach the target audience and raise awareness. Through all awareness activities, the project has embedded the concept of solar thermal water heaters as a clean energy option in the minds of every Panamanian, from the government to the private sector. A list of media appearances and events can be found in **Annex X**.
181. It is worth noting that, based on recommendations from the MTR, some workshops and outreach efforts were directed towards specific minority groups, such as women and indigenous populations (INADEH - Training on Installation and Maintenance of Solar Panels - Solar Bus - Women & Indigenous, March 2022), and the promotion of gender-equal participation was encouraged. The lack of recording sensitive information, such as the participation of women in the activities, is an important issue.

Figure 12 - Snapshot of live Café Solar #19 presentation



182. **Output 4.1:** Identification, energy audits and SWH system proposal/feasibility. Fully delivered.
183. Through the different awareness raising activities of the project, a list 108 possible beneficiaries of the technical economical assessment for solar water heaters was presented to the project stakeholders in order to select a short list of high potential candidates. It was finally agreed to perform the entire 108 energy audits and technical economical feasibility assessments, which totalized 6,604 m². 81 assessments

resulted to be technically and economically viable. All reports were accessible to the reviewer.

184. **Output 4.2:** At least 10 systems operating with a total SWH surface area of 430 m² operating installed by the project

185. This output is fully available. Although the activity has been reported as delayed according to schedule, due to covid-19 pandemic and duration of UNEP procurement processes, it was finally achieved before project-end. It is to mention that this output has been reviewed and changed in the 5th project revision, as a result of an extremely large target to achieve in terms of installed area, and that assumptions for the target included indirect installations (mostly from privates) that were out of control of the project. A final and more realistic target of direct 430 m² installed within the project timeframe was set. Private investments are of 339 m² in 9 projects. In some cases, some degree of unattendance was observed. This associated with a rapid change in maintenance employees, mostly in the public sector. A complete list of the projects can be accessed in **Annex XI**.

186. Project Manager said that all projects –including those assessed in pre-feasibility stage- were available in Termosolar website. After the page was down and transferred to SNE servers, the projects and pre-feasibility studies are not visible anymore. Some of the existing projects are at the Energy Information System (SIE) [website](#) for Panama, a GIS tool developed by OLADE.

Figure 13 - Site visits to Panamanian Bank, Hospital San Miguel Arcángel & Melo Poultry pilot projects



Achievement of Project Outcomes

187. The achievement of the project's outcomes was evaluated based on the reconstructed Theory of Change's causal pathways between outputs and outcomes, and the strategic questions provided in the Terms of Reference.
188. **Outcome #1. Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development.**
189. This outcome was partially achieved. According to indicator and target proposed. Though is important to mention that the assumption "Timely implementation of regulations under UREE Law and other relevant Laws" for the outcome did not fully happen.
190. There is ample evidence of the creation of a policy framework where SWH is present in key documents: The Action Plan for SWH has been endorsed by the Government, and a key element is the creation of the PNTP, defining the body within the Executive of Panama. It is also important to mention the connection of the main objective to have 1 million square meters of SWH installed by 2050 with the NDC, as well as the incorporation of the action plan into the National Energy Transition Agenda 2020-2030 and the National Energy Plan 2015-2050, or the UREE Strategy, where the lines of action have strong synergy with those outlined in the SWH Action Plan. All these elements demonstrate and reinforce Panama's commitment to creating a policy framework that supports SWH technology.
191. Within the framework of the project, the objective of having a policy and regulatory instrument to promote the framework was achieved; however, it is important to mention that there are still aspects of the regulatory framework that need to be incorporated to ensure sustained growth of the SWH market.
192. The inclusion of the mandatory use of SWH as a solution for hot water in the Sustainable Building Guide (SBG) and the subsequent approval of the Sustainable Building Regulation (RES) was achieved. These are the minimum requirements for new constructions and existing public buildings. However, the implementation of the RES by the municipalities has been significantly delayed, and it is likely that it will take several more years for its effective enforcement.
193. Other operational aspects are related to incentives, which were expected to be redirected from the electricity and hydrocarbons sectors, but there is no evidence that they have been modified. Law 37 of June 2013 remains the main incentive for solar energy installation, where imports are exempt from taxes, tariffs, fees, etc., and there is a tax credit of up to 5% on the investment.
194. Within the framework of the Termosolar Panama project, part (i) of the consultancy contracted to Sergio Quirós: "Energy Subsidies Analysis and Business Model," was not executed. Additionally, the Fund for the Rational and Efficient Use of Energy (Fondo UREE) has not yet been established in the National Bank of Panama, which promotes the UREE Law; the Fund is not operational. This fund is the mechanism that the State has selected to promote efficiency projects—including solar thermal—in sectors of interest, and it operates with a combination of refundable and non-refundable resources. While there is a very favorable policy environment, incentives for the sector have not yet been created, and they continue to exist for other more polluting technologies and fuels.
195. In summary for this Outcome: solar thermal energy is included in Panama's main energy and sustainability policy frameworks, but further development of certain instruments and effective implementation is needed to encourage a sustainable SWH market in Panama.

196. **Outcome #2. Quality control system in place and enhanced capacity of supply chain to offer SWH products and services.**
197. The outcome has been partially achieved, with efforts made to the possible extent within the project timeframe.
198. SWH standards (3) for testing have been approved by the national normalization entity, and minimum quality requisites standard for SWH products and installation has been prepared during project duration. It is expected to be implemented soon, and requirements will become mandatory for all imported or locally manufactured equipment.
199. Solar thermal testing facilities operational at UTP has not been achieved so far, disagreeing with PIR conclusions on this regard, based on the site visits and meetings with UTP and Solar Chamber. It is likely to be available soon, but further steps and economic support will be needed to accreditation. This will be boosted when requirements for equipment becomes mandatory. Also, there is no evidence of what was stated in the MTR: “The 6 current SWH Panamanian providers are importing SWH equipment complying the Norms and Standards development by de project”. This is because test laboratory is not yet in place and operational.
200. For installers, the project prepared a Guide to develop competency standards associated with SWH in Panama together with a Certification scheme on SWH for SWH-qualified technicians and installers. The certification scheme is still being discussed with the National Institute of Professional Training for Human Development (INADEH) and its National Competition Commission (CONACOM). The (6) SWH equipment providers that supply Panama have already taken the SWH installation and maintenance course designed and taught by the project, which is the basis of the certification of installers, so they will be in conditions to be certified once the certification scheme is approved.
201. PIR states that beneficiaries of pilot projects are satisfied with SWH installations, what was possible to confirm in the site visits and interviews with both managers and operations staff.
202. Assumptions for the outcome are valid to-date
203. **Outcome #3. Enhanced end-user awareness on SWH and availability of end-user financial mechanisms.** This outcome has been achieved.
204. Awareness activities were developed in different ways, both virtual and in-person, and there is evidence that a large number of users was reached, though is not possible to outline an exact number, as many activities were social media content. A complete material issued and end-user awareness events are described in **Annex X**. A comprehensive campaign was implemented nationwide to promote SWH Technology, based on a Strategy prepared for the project.
205. Government and specifically Ministry of health, APATEL, Poultry Association ANAVIP, CAPAC have been invited to workshops, regulatory discussions and standards committees, among others, to cover the most promising sectors for SWH development. Demonstrative solar thermal projects proved to be large effective tools, not only by inviting end-users to prepare a feasibility assessment but also to communicate success stories. At least a total of 102 SWH end-users are aware of the technical and financial aspects of SWH applications in the following market segments: Agro industry 11, Public Health 22, Hotels 46 and Residential 23.
206. A good dissemination campaign through “Café Solar” and general campaigns in social media allowed reaching an extensive audience of residential to foster the solar

thermal market. The indicator for the percentage of end-users aware was difficult to measure, given that the number of end-users reached on each target sector by certain activities is hard to determine (i.e. are hotel users be reached/represented inviting the association to a specific event? How can I measure that for the largest end-users sector: residential? It is clear that a survey is not realistic). That said, indicator of end-user's awareness has been reasonably achieved.

207. Regarding financial mechanisms available, there is full evidence of Green loans from Panamanian Bank, as all the information is in the website, and confirmed by Solar Chamber members to be available. For what is stated at PIR as other financial mechanisms, the "Energy Transition Fund" developed by IADB and SNE, there is no clear evidence to be available. Latin America Development Bank (CAF) supports the energy transition with specific loans, but is not possible to link it directly with financial mechanisms availability. At last, [Liberr app](#) was consulted and it does not seem to be a powerful financing instrument, however its effectiveness in the future must be analyzed.
208. To conclude for this outcome, end-users awareness proved to be effective and sufficient to end-users, and financial mechanisms were minimally achieved. On this regard, there is still a way to have a more effective network of supportive financing, in synergy with UREE Fund and incentives (outcome 1). SWH action plan includes the key mentioned issues.
209. Assumptions for the output do not fully stand. Demand-side stakeholder's commitment to invest in SWH technology was somehow confirmed in demonstration projects, but CAPAC and PGBC had a drop in participation and support of the project in the last years, after the covid-19 pandemic. Besides it, incentive financial schemes as UREE Fund were not put in place to support Green loans.
210. **Outcome #4. SWH applications demonstrated and replicated.** This outcome was fully delivered.
211. In terms of indicators as a percentage of SWH demonstration projects confirmed to be technically and financially viable. When field visits were carried out, they confirmed that aspect that was backed up with a thorough feasibility study prior to move forward with the project. The project has selected as SWH 108 pilot projects, of which 81 already have design and financial viability developed, assuming context (fuel prices) conditions and investment and operational costs. Payback period of investment and future savings were assessed in each report, resulting in a 4 years payback with 2023 fuel prices.
212. After that, they were selected 10 pilot projects to be economically supported by Termosolar Panama for the acquisition and installation, to prove viability. Health, public sectors and civil society (foundations) were chosen to install 430 m² of solar panels. Together with private investments of 339 m² in 9 projects, in Hotels, Residential, Industry and Commerce sectors. Those projects consist in the demonstrated applications. A full list of projects –both direct and indirect- can be accessed in **Annex XI**.
213. The assessments were carried out across four activity sector, the most promising ones in Panama, to enhance the replication component.
214. [Strategic question #1: What changes were made to adapt to stakeholders' actual engagement and how did any changes affect the project's performance and impact?](#) Main stakeholders' involvement in the different components and activities is clear, representing the government and main agencies, academia, laboratories, financial sector and supply-side and end-users. Some associations have shown low

participation especially after COVID-19 lockdown, such as APATEL or even PGBC and CAPAC, representing key beneficiaries. The PMU made efforts to replace the representation of these associations in the different areas provided (regulatory, academic, PSC, etc.), finding in some cases actors who had a double role such as the Panamanian Bank, and in other cases on-boarding new members such as the CAPES, which had an articulation role as an NGO with some sectors such as the hotel industry. The impact on project performance can be seen in the lack of mandatory inclusion of SWH technology in sustainable construction regulations, where a better scope for discussion and participation could have accelerated goals and incentives for the use of solar thermal energy. Likewise, a more thriving hospitality sector could have replicated more projects with the consequent technology dissemination.

215. [Strategic question #2: What changes were made to adapt to the effects of COVID-19 and how did any changes affect the project's performance?](#) During the lockdown and the pandemics, many activities halted in Panama, particularly those that had no virtual alternative. Awareness activities transformed mostly into virtual mode: seminars, symposium, etc and they had no practical impact in the project's performance. On the other hand, almost everything that needed a physical intervention such as construction was halted, affecting testing laboratory instrument's imports, as well as pilot project's installation. Lockdown also affected some of the target sector as hotels and health, whom were not able to fulfil the project needs and many requests were paused to serve their own customers or population. Although some actions were taken to use the resources and carry out field visits for pre-feasibility studies with the mandatory preventive measures, the most critical phases of COVID-19 impacted in delays in purchasing laboratory equipment, and especially in the installation of the laboratory and pilot projects.
216. [Strategic question #3: What was the cost- effectiveness of the demonstration projects in terms of impact \(expected direct and indirect emissions reductions\).](#) A total of 10 SWH systems were installed by the project, with a total surface of 430 m², considered as direct installed area. The SWH systems are expected to result in 90 tCO₂ reductions per year, for a total of 1,800 tCO₂ over the lifetime of the assets. According to procurement and contracts, Solar water heater installation and measurement from the project accounted for a total of USD 329,863. Thus, we can consider a cost-effectiveness of 5.45 tCO₂ avoided per 1,000 USD invested.
217. Another 339 m² were installed by private sector with technical aid from the project, and will be considered as indirect impact during the project lifespan. In terms of emission reductions, 339 m² indirect total installed area accounts for an annual reduction of 104 tCO₂ and a total of 1,560 tCO₂ over the 15 years of guaranteed lifetime of the assets. Considering indirect impact with zero cost for the project, the GEF project investment on demonstration projects had an impact of 10.2 tCO₂ avoided per 1,000 USD invested.
218. Calculations have been performed by the reviewer, based on project data, as the information was not founded in the reports and files provided for the Terminal Review.

Achievement of Likelihood of Impact

219. Achievement of likelihood of impact, as directly connected to what the project is able to control, is rated as "Moderately likely".

220. Some of the Outcomes were not fully achieved, and some assumptions were not completely met, which is relevant when analyzing the extent to which the impact was achieved.
221. The SWH project has laid the institutional framework for SWH market development. The project prepared the Action Plan for SWH, endorsed by the government, with an overall goal of having 1,000,000 m² of SWH installations by 2050, with an estimated reduction of 2.3 MtCO₂. A specific program has been endorsed by MINPRE to create the structure for implementing and monitoring the Action Plan. To date, incentives need to be redirected to boost the technology implementation to fulfill assumption #1.
222. On the supply side, significant momentum is seen with the creation of the Solar Chamber and the emergence of importers and installers who have identified an important potential market. Regarding the assumptions, there is interest among equipment and service providers in training their staff to install systems with adequate quality, which will build confidence in solar thermal energy and develop the market. Although progress has been made during the project, some aspects mentioned in the description of Outcome #2 need to be further developed, such as the mandatory certification of SWH systems and a labor competence certification scheme.
223. On the demand side, there is evident interest in the technology, stemming from the project's communication campaigns, multiple events, and the invitation to have a pre-feasibility assessment, with more than 100 projects being presented. The successful implementation of pilots in various sectors has likely contributed to the perception of lower risk, as they are functioning correctly and demonstrating economic savings, as evidenced by the on-site interviews conducted by the reviewer. End-users financial mechanisms are nascent, and though they exist, UREE Fund is called to play an important role both for public buildings and to foster households credits.
224. Based on the final report prepared by the project, market development can be seen in the doubling of the number of importers of this technology from 2018 to 2022, a trend that coincides with the development of the dissemination activities of the Termosolar Panama project. Furthermore, the amount of imported equipment increased during the same period, with a component directly from the project's installations, but also with an indirect component. However, no exponential impact on market growth has been detected.
225. The covid-19 situation must be taken into account, in which in-person and infrastructure activities were stopped, and there were target sectors (i.e. hotels, construction) that saw their continuity compromised. As activity normalizes, an increase in interest in SWH technology is expected.
226. It is worth noting that no detractors of the technology were detected in the interviews with stakeholders; in the case of public buildings, its installation is mandatory when they use hot water, and similarly, the GCS and RES have incorporated the use of SWH. Combined with the positive experiences from demonstration projects and dissemination campaigns, these elements could allow the SWH market to continue its positive trend.
227. Assumption #6 is in place, and assumptions #4 and #5 have proven valid. Solar Chamber members mentioned in the interview that the number of queries from end-users is growing, and market development is promising.

228. To continue evaluating the project's impact and long-term impact, it is recommended to have a tracking tool for SWH installations by sector, with information on the technologies and the area installed.

Rating for Effectiveness: Satisfactory

E. Financial Management

Adherence to UNEP's Financial Policies and Procedures

229. There is strong evidence of adherence to UNEP's procedures in the financial management of the project. However, the procurement processes underwent adjustments, even during implementation, to address aspects that were initially incompletely addressed. This is particularly evident in the procurement of equipment for components 2 and 4, where adjustments and delays were attributed to the entire process. Delays in supplier payments of up to 60 days, which negatively impacted the project's reputation, were also noted.
230. The evidence indicates that UNEP's procurement procedures are suitable for hiring consultants but not for contracting companies to supply equipment. This aspect is noteworthy and relates to the eventual designation of UNEP ROLAC as the Executing Agency, a role that was not anticipated during the design phase but was approved due to the lack of another entity available for this function.
231. Another issue to highlight is the potential confusion in approvals between the IA (Implementing Agency) and the EA (Executing Agency), as both belong to UNEP. In the case of a request to adjust the project's indicator objectives during the fourth review, there is no clear evidence of UNEP's approval granted to UNEP ROLAC.
232. Since this was an ICA (Inter-Agency Agreement) between UNEP offices, a financial audit was not conducted.

Completeness of Financial Information

233. Project financial information is complete, the reviewer received all the financial expenditure reports, which include in the Justification (XI) column any delay, amendment, re-assignment or postponed expenditure.
234. Although the changes in the budget have been minor, transposing some activity/output funds and re-phasing the budget for the following years due to delays in execution, all project revisions (5) include a detail sheet and document with budget review. Total budget was not changed, but several re-assignments in activities happened, and were reflected in the budget revision, impacting activities and component's budget. Changes are presented in the last revision budget per component in **Table 9 in Annex V**.
235. Co-financing information was complete and timely, through the annual report provided at project approval stage. Last co-finance report is presented in **Figure 16 in Annex V**.
236. **Annex VI** has the **Table 10 - Financial Management Table**

Communication between Finance and Project Management Staff

237. Communications and the application of procedures were reported on several occasions, leading to differences in interpretations and changes to purchasing activities, resulting in delays in processes and execution.

238. This particular issue was already reported during the MTR, where it was stated that “larger purchases encompassing pilot project (component 4) or testing laboratory (component 3) equipment have reportedly suffered significant delays and experienced internal communication problems on technical changes”
239. Significant expenses require an internal authorization chain within UNEP, with purchases exceeding \$200,000 USD needing approval from the Board in Nairobi, Kenya. Despite the recommendations provided, the processes did not see substantial improvement, according to the Project Manager and as established in the project's final report.
240. The last PIR states that the procurement process with UNEP failed for two entire years due to a lack of internal administrative control (apparently, the system has no feedback loop regarding the status of procurement procedures). After that failure, procurement management was handed over to UNDP, which caused another year of delays in developing procurement processes.
241. During the field mission and exchanges, UNEP ROLAC financial staff made no comments beyond what was already stated.

Rating for Financial Management: Satisfactory

F. Efficiency

242. The project was satisfactory in terms of efficiency. In total, a reasonable extension was given, taking into account that the covid-19 pandemic was present during the execution of the project, which generated lockdowns in the activity in general, and in particular in sectors directly involved. Likewise, progress was made in dissemination tasks, as well as virtual events and workshops with the imposed sanitary measures. A high participation of key stakeholders was achieved, except for PGBC after the pandemic, or APATEL, with other partners such as CAPES participating strongly.
243. In terms of activities, a very high number of events were generated in terms of awareness such as the 28 solar cafes, material on social networks and YouTube, website, and 109 pre-feasibility studies were carried out, as well as equipment purchased for the UTP testing laboratory, and the purchase and construction of 10 demonstrative pilots. All this with the planned budget, re-allocating funds based on savings generated and other needs detected. Execution was even achieved with much less co-financing than expected (29%).
244. The quality of the work carried out in many areas is relevant, highlighting the selection of consultants with great commitment and knowledge, which resulted in a high value-for-money. Just to name a few, we can mention the Action Plan for SWH, market evaluation and the regulatory framework assessment and recommendations, training needs evaluation, support material for teachers, with a very deep and detailed scope.
245. In exchanges with PM, they were reported delays on staff and consultant recruitment throughout the project timeline. It was confirmed what was stated in the MTR, that to the possible extent, consulting products were grouped on a single contract to reduce recruitment activities.
246. In terms of efficiency, a negative aspect should be highlighted mainly in acquisitions. The equipment purchasing processes suffered significant delays, both for laboratory equipment and for demonstration pilot equipment. To this low efficiency in procurement, administrative and coordination issues on the part of the UTP must be

added, which led to the fact that the testing laboratory for SWH is not yet fully installed and available.

Rating for Efficiency: Satisfactory

G. Monitoring and Reporting

Monitoring Design and Budgeting

247. The monitoring design, work plan and budget were detailed in the project document. Supervision plan for monitoring execution progress was detailed, including PIR, ER, CO-Finance report, MTR and TR.
248. Regarding indicators for Outputs and Outcomes, it was mentioned that not all were geared by SMART principles. Some outputs, i.e. 3.1 for “awareness creation ...”, look more than outcomes than outputs, and the indicator states the “... quality of events organized”, for whom there is no Mean of verification nor Target set. Some other Outputs (i.e. 1.1, 1.2, 2.4, 2.5, 3.2) refer to the indicator in the Output itself (“at least one ...”). Some outcomes were geared more at output-level (mostly because the outcomes read more like outputs) and mixed-up participation numbers and tools with demonstrated level of capacity or behaviour change.
249. Some aspects of interest for the project were not contemplated in the Logical Framework, such as the participation of women, indigenous people or vulnerable populations, which is why they were not surveyed in a timely manner by the project team. The contributions made in the MTR were of interest to address this issue.

Monitoring of Project Implementation

250. Highly satisfactory monitoring was evident, starting at the highest level of project management (PSC), with 6 committees carried out. In the minutes you can see detailed monitoring of each of the components, especially at the level of compliance in the execution of activities and outputs.
251. Monitoring budget has reportedly been appropriate throughout the project, both through PSC committees involving key stakeholders and ER with UNEP.
252. Strong adaptive management was implemented with covid-19. Many of the activities planned to be in-person were adapted to virtual mode so as not to stop the execution and to be able to achieve the outputs, especially in aspects of training and holding workshops. Another aspect to mention is that some stakeholders (CAPAC, APATEL) from the demand side did not have the engagement at the end of the project, and their participation could not be resolved or replaced by another partner. On the other hand, CAPES was able to be incorporated into the project, with the ability to involve it in different activities from the supply side, which provided very positive results to achieve the Outcomes.
253. [Question a\) required for the GEF Portal: What was the performance at the project's completion against Core Indicator Targets?\(For projects approved prior to GEF-7, these indicators will be identified retrospectively and comments on performance provided\).](#) The GEF core indicator 6: GHG emissions mitigated, is aligned with the Project Objective Outcome indicators presented at the CEO endorsement stage. Nevertheless, the indicators were rephrased during the project's 4th revision in October 2021, based on the MTR recommendations from February 2021, where the concept of direct impact was corrected as the installed area (m²) directly financed by the project. Indirect impact was defined as installations primarily relying on private

and public investments without project support. Additionally, the direct impact of the project and post-project impact were differentiated. Based on this, new targets for direct and indirect impact were adjusted, including area (m²), energy avoided (MWh/year), and GHG emissions (tCO₂ over the lifespan). The project has reached the end of project target regarding direct impacts and exceeded it regarding indirect impacts, once reformulated during 4th revision.

Project Reporting

254. All main reports were completed timely, including the annual reports, PIRs, PSC minutes, expenditure reports. Also a clear and full access was evident by the reviewer, especially in terms of the structuring of the information in Outcomes, outputs and activities. This standardized folder structure is evident to be improved after MTR, when it was labeled as an Opportunity for improvement, as follows in the next paragraph.

255. MTR recommendation (#4): *“During interviews it was discovered some of the documents were initially missing and not readily available on the relevant project folders. It is recommended that the project manager and task manager jointly establish project information storage criteria in order to ensure all project information is readily available at all times”*. Stated and recognized in the PIR, an improvement took place in order to solve it. Task manager and the PM agreed a single and harmonic storage strategy, and since 2020 the implementing agency has set up a standardized folder structure that consolidates all the information related to the project. It was shared that way with the reviewer.

Rating for Monitoring and Reporting:	Satisfactory
---	---------------------

H. Sustainability

256. This chapter focuses on the discussion of the key conditions or factors that are likely to undermine or contribute to the persistence of those benefits achieved at the project outcome level.

Socio-political Sustainability

257. MTR comments on this regard are shared, as political factors appear supportive of the continuation and further development of project outcomes after project conclusion. The project has already gone through a national administration change with strengthened support from both the NSE and MiAmbiente.

258. National Energy Transition Agenda 2020-2030, National Energy Plan 2015-2050 and the UREE Strategy all include SWH as one of the ways to reduce GHG emissions in Panama. The existence of a National Target and an endorsed Action Plan are also of great support. All this can be seen as a socio-political endorsement, as CSOs took part different associations and chambers.

259. It can be mentioned that end-users and general public are supportive, and SWH is seen as a green technology to help towards decarbonization. No negative aspect in the technology in terms of environment show up by interviews with end-users. In any case, equipment quality certification and installer accreditation scheme must be addressed, since quality issues can undermine confidence in the technology, especially in the early stages of market development.

260. An aspect not yet resolved and likely to undermine the benefits –or slow down the market growth- is the incentives framework, still in place for electricity sector and hydrocarbons, but not redirected to other clean technologies as SWH.

Financial Sustainability

261. We can analyze financial sustainability first of all from the resources to support the Panama National Thermosolar Program (PNTTP), created by resolution of the MINPRE in August 2021, and to be led by the SNE. The Action Plan includes a detailed budget that must be approved in the following government periods. The existing consensus at the political level suggests that the resources will be available; however at the time of the meeting with the SNE in February 2024, the elections and approval of the funds were still awaited. Some of the elements to be financed will be the installation and accreditation of the equipment testing laboratory, commissions to approve standards, among others.
262. On the other hand, financial contribution will be necessary for the execution of the projects. The market analysis foresees a potential market of between 500 and 1000 MM USD, which must be financially supported. The UREE Fund is not yet operational, and its funding and implementation can be a key element for banks to offer green credits with favorable conditions for SWH projects.
263. On the other hand, measures are required to encourage public investment, not so much with the availability of money, but by adapting the regulations so that savings can be captured by institutions, and thus be motivated to incorporate SWH.
264. Notwithstanding the above, there is a green line from Banco General that is operational and other banks are replicating with ease to access to industry and households, and many of the projects were executed with lines of credit existing in local banks -and even with equity- as mentioned during the visits to demonstration projects. This shows that the technology is economically attractive and technologically safe, which promotes its adoption even with regular financing lines.

Institutional Sustainability

265. The creation of the National Thermosolar Program has given it a very robust framework at the institutional level, led by the SNE but involving the institutions that are relevant to the development of the market. This was one of the main successes of the project, creating effective partnerships and professional relationships among the actors that will allow for more agile progress in the implementation of the Action Plan. Some institutions must join in the future, such as the municipalities, responsible for the implementation of the RES at the national level.
266. The website has been an important support for the institutions, this site was a reference for progress, and despite this it was down for a few months due to administrative transitions at the end of the Thermosolar project. Fortunately, the site was built and it is expected that it will have a cohesive role for sustainability, involving the participating institutions. As it was mentioned in the MTR, The national climate action plan will be implemented by 2024 by the leadership of MiAmbiente. Under *Line action #4: Update and expand the Climate Transparency Platform to monitor the progress of the country's climate commitments*, progress on SWH installations will be monitored as it is mandatory to demonstrate targets and GHG emission reduction.

Rating for Sustainability: **Likely**

I. Factors Affecting Performance and Cross-Cutting Issues

Preparation and Readiness

267. The project execution and management arrangements were appropriate for implementation. Project took time between first GEF CEO approval and starting. Approved by the GEF CEO on January 2015 and by UNEP on December 2017, after several meetings where UNEP-ROLAC was appointed as the EA instead of ANAM. The ICA was signed on January 2018, including a workplan, procurement plan, and partners were selected to constitute the Steering Committee. Legal agreements with co-finance commitment were signed and timely, and adequate governance arrangements established. First disbursement was in March 2018, and first PSC meeting was held on August 2018.

268. Preparation and Readiness is rated as “Satisfactory”.

Quality of Project Management and Supervision

269. Project management was carried out through the PMU, a team with the role of executor through the PM, in turn leading the associated consultants for the different activities. The PM was hired by the EA, UNEP-ROLAC, who contributed to the administration and finance team. In the interviews carried out with PM Jesus Gonzalez, the degree of management of the project was revealed, being aware of the objectives in terms of Outcomes and outputs, and at the same time paying attention to the execution of the activities. The documents and evidence in different communications show the active exchanges with stakeholders, which were evidenced in the visits and interviews on site.

270. The national project director (NPD) was appointed by the SNE, showing his active participation in call bodies such as the PSC. The AI supported the project and provided guidance when required, especially standing out through the PSC minutes with its contributions. Particularly noteworthy is the creation of a committee on the occasion of the covid-19 pandemic, where very important support is evident for the operational team, to adjust the proposed actions to a reality associated with virtuality.

271. Quality of Project Management and Supervision is rated as “Highly Satisfactory”.

Stakeholders Participation and Cooperation

272. Involvement efforts are evident in all components of the project, seeking broad participation from PMU of all the stakeholders, introduced and supported by MiAmbiente and SNE into government and related agencies. This can be verified in documents such as the PSC minutes, workshops with educational entities to carry out diplomas, and communication with chambers and associations of end users, as well as direct interviews. SNE provided with a physical space in the SNE building, so that PM could keep advancing in the project and have a better interaction towards completing project goals.

273. The participation of the main stakeholders in the different components and activities is evident, representing the government and main agencies, academia and laboratories, financial sector and supply-side and end-users.

274. Some associations have shown low participation, such as APATEL or even PGBC and CAPAC, which have seen their operations seriously affected after covid-19 pandemic, and even the continuity of their members compromised. This also does not offset the efforts made from the Project Management Unit (PMU) to seek for alternatives and keep on increasing to onboard new associations (i.e. CAPES). No doubt that

Involvement from Stakeholder has been broad and encouraged by the EA during the project extent.

275. As it was stated in the MTR, informative and participative workshops, continued virtually during COVID-19 pandemic, constituting a strength and showing the ability of the project to adapt.
276. On the other hand, an element that was not positive was the participation of stakeholders in co-financing, since the funds provided by SNE, MiAmbiente and Banco General were disbursed well below what was committed. The project reached only 29% of the co-financing commitments.
277. Stakeholders Participation and Cooperation is rated as “Satisfactory”
278. [Question b\) required for the GEF Portal: What were the progress, challenges and outcomes regarding engagement of stakeholders in the project/program as evolved from the time of the MTR?](#) (This should be based on the description included in the Stakeholder Engagement Plan or equivalent documentation submitted at CEO Endorsement/Approval). The CEO Endorsement document describes how stakeholders will be engaged in project implementation, mainly through project administration. The planned instances for project administration and execution proceeded as expected, under the leadership of the PMU, involving stakeholders in various activities that ensured representation of different groups. The main challenge was the COVID-19 pandemic, which halted activities and in-person meetings, prompting stakeholders to quickly adapt to virtual settings to keep the project’s planned activities on track. At the same time, the pandemic severely impacted some stakeholders’ sectors, causing them to suspend their activities -PBGC did not participate in most meetings-. To address this, participation or collaboration with other actors not initially included was sought. The MTR highlights in its lessons learned “the effective cooperation and shared ownership”. Co-financing has been one of the major issues where the project did not achieve the expected results and shall be a lesson learned on how to include co-financing: by the end of the project, only 29% of the committed co-financing was executed.

Responsiveness to Human Rights and Gender Equality

279. The project in its design phase had some mentions of gender issues, although it did not manage to materialize a strategy to be applied during execution. In chapter B.2 Socio-economic benefits of the ProDoc, it states that “gender aspects will be taken into account as part of the market surveys...” and other vague expressions, all of them as “gender mainstream action will be integrated ...”.
280. Nonetheless, the project showed concrete efforts on gender equity and indigenous group’s involvement beyond project design. Communication and training strategies were designed accounting for specific gender and social environment particularities.

281. The National Institute of Capacity Building and Professional Training (INADEH) performed several courses for solar thermal installers, with a focus on women, and with 11 students completing the course. Regarding INADEH, the project donated a bus equipped with solar thermal teaching equipment (Solar bus). Additional courses were conducted for 20 professionals from the Panamanian Engineers and Architects Association. A specific course for women, co-organized with the NGO “*Mujer y Energía*” was developed, with a total of 44 people attending during three days. Courses were co-managed with small and middle size enterprises association (AMPYME) and women association INAMU. The solar bus allowed reaching less accessible regions, as *Ngäbe-Buglé*, where 33 women were trained on solar energies. The graduates are part of a program where they are trained in other soft skills and administration, and they will be provided with seed capital (AMPYME). The course was held in February 2022.

We can also mention the holding of a workshop for women to raise awareness and

Figure 14 - Participants and instructor of the Solar Panel Installation and Maintenance courses, using Solar Bus. Comarca Ngäbe Buglé.



training to manage projects and undertake solar thermal energy in Panama, where 75 women took part during 2021. [Link](#).

282. Two of the SWH pilot projects beneficiaries are indigenous populations: Mulatupo (small hospital) and *Ngäbe-Buglé* (cooperative chocolate factory).

283. [Question c\)](#) required for the GEF Portal: [What were the completed gender-responsive measures and, if applicable, actual gender result areas?](#) (This should be based on the documentation at CEO Endorsement/Approval, including gender-sensitive indicators contained in the project results framework or gender action plan or equivalent). As it was identified by the reviewer during project design stage assessment, and highlighted during the MTR, aspects of gender mainstreaming and participation of ethnic minorities had lesser strength on project design but they have since been properly managed by the project team through ensuring training and capacity building activities fostered women participation as well as developing pilot project SWH installations for indigenous people. SWH technology appears as gender-indifferent and with no negative impact on indigenous communities. Nonetheless, the PMU made efforts to have a positive impact, promoting specific training for women, and fostering women and indigenous participation as it is described in previous paragraphs,

supporting not only gender issues but also fair transition. A specific course of three days was organized together with “Fundación Mujer y Energía”, an ONG aimed towards women working in Energy. An additional course for rural women was developed together with “Fundación Calicanto. a specific activity for women called “Solar thermal awareness workshop for women” was developed as one of the first gender oriented event post pandemics during 2021. As an activity within the National Energy Transition Agenda and the Energy-Women link, a second educational and dissemination activity oriented towards energy, climate change and solar thermal was performed with women in indigenous communities. The activity was performed for a total of 133 women in two different indigenous communities. Support for local communities was also shown by the time to select SWH pilot projects location, as two of the SWH pilot projects are located in indigenous populations.

284. Rating for Responsiveness to Human Rights and Gender Equality is Highly Satisfactory.

Figure 15 - Women in solar thermal energy awareness workshop with the solar bus, and training workshop for women on SWH



Environmental and Social Safeguards

285. An environmental and social risks assessment was prepared in the design stage of the project, showing that technology and project itself had no negative impacts associated, and keeping at low-risk. No specific measures were set as part of the safeguards, so no monitoring or reporting on issues was needed.

286. Regarding social aspects, the project took advantage of the possibility of supporting society and population by implementing the pilots in specially selected places. Focus was set in the most vulnerable beneficiaries. Two SWH systems were donated to elderly residences, and two were installed in indigenous populations (small rural hospital and a school). Complimentary, and three largest demonstrative projects were installed at public hospitals.

287. The project contributed with a total of 769 m² (direct and indirect) of SWH, and the country set a target of 1 MM m² by 2050. This will reduce 2.3 MM tCO₂ by 2050.

288. One aspect to comment on is related to the long-term impact of the project and its adoption, which was not addressed in the design stage, which is the disposal and recycling of SWH equipment. Although during the project it did not deserve a special safeguard due to the low volume, this aspect was not adequately foreseen or visualized in future regulations and management.

289. Question d) required for the GEF Portal: What was the progress made in the implementation of the management measures against the Safeguards Plan submitted at CEO Approval? The risk classifications reported in the latest PIR report should be verified and the findings of the effectiveness of any measures or lessons learned taken to address identified risks assessed. (Any supporting documents gathered by the Consultant during this Review should be shared with the Task Manager for uploading in the GEF Portal). An environmental and social risks assessment was prepared in the design stage of the project, showing that technology and project itself had no negative impacts associated, and keeping at low-risk. No specific measures were set as part of the safeguards, so no monitoring or reporting on issues was needed. Regarding social aspects, the project took advantage of the possibility of supporting society and population by implementing the pilots in specially selected places. Focus was set in the most vulnerable beneficiaries. Two SWH systems were donated to elderly residences, and two were installed in indigenous populations (small rural hospital and a school). Complimentary, and three largest demonstrative projects were installed at large public hospitals, spilling the benefits onto the surrounding population. In this way, pilot projects were distributed along different sector and locations, enhancing the technology awareness at the same time.

290. Environmental and Social Safeguards are rated as Highly Satisfactory.

Country Ownership and Driven-ness

291. There is clear evidence to state that Key Government ministries (MINPRE/SNE and MiAmbiente) took a leadership role for moving from outputs to project outcomes and from project outcomes to project goal. Strategic guidance was confirmed mainly during PSC minutes, where it was shown main interest in evaluation and goal-driven attitude towards project delivery and higher level results achievement. Endorsing of SWH Action Plan was one of the key results to make visible the country ownership.

292. Some other ministries like MICI had an important role, accompanying implementation and guidance from SNE and MiAmbiente. They promoted the creation of high-value testing standards for quality and safety of SWH systems (via COPANIT), but incentives and creation of a national industry were practically not addressed, and just included as part of the SWH Action Plan.

293. Provision of co-financing contributions was one of the issues of the project, as they were not as expected, both from the government and from the financial sector. But it has to be said, co-finance from tax exemptions were more inspirational than realistic, since the area to be installed planned in the design stage turned out to be overvalued.

294. Country Ownership and Driven-ness rating is Satisfactory.

Communication and Public Awareness

295. The communication had as its starting point the preparation of a strategy, which accompanied the activities throughout the project, even during the covid-19 pandemic, which forced the approach to be reformulated in many cases, proposing a virtual mode instead of in-person.

296. The efforts made by the project are evident; we have already mentioned 28 instances of Café Solar, where the technology was disseminated to the broadest level of the population to create awareness. Likewise, the material was made available in social media campaign, and these communication actions were reinforced by workshops for specific audiences, and a dissemination of success stories with demonstration projects.
297. The website was a key element to group the content and deliverables for the general public, but also to disseminate information to the main partners at the political level (resolutions and approval of the Action Plan for example), financial (Banking and also demand), supply-side with resolutions and regulations applicable in sustainable construction, trials, and academia and end users for personnel training, among others.
298. Other websites and events have allowed the project's communication efforts to increase, such as CAPES, where its partners have expressed in interviews that they have seen a growing interest on the part of users in installing SWH systems.
299. Question e) required for the GEF Portal: What were the challenges and outcomes regarding the project's completed Knowledge Management Approach, including: Knowledge and Learning Deliverables (e.g. website/platform development); Knowledge Products/Events; Communication Strategy; Lessons Learned and Good Practice; Adaptive Management Actions?(This should be based on the documentation approved at CEO Endorsement/Approval). The project information and progress reports analyzed were provided to the consultant at the beginning of the review, showing clear storage criteria based on the same structure as the project design (Outputs, activities, and deliverables) and easy to follow. This was not the case during the MTR review, where it was recommended that the project manager and task manager jointly establish a project information storage system, as some key project documents were not easy to locate at the time. On the other hand, the project prepared a specific communication strategy, considering different target audiences through action plans for effective dissemination, demonstrating an adaptive management approach to a virtual reality. Moreover, the project's efforts are evident: 28 Café Solar sessions were held to disseminate the technology widely and raise awareness. Additionally, materials were shared through a social media campaign, and these communication actions were reinforced with workshops for specific audiences and the dissemination of success stories through demonstration projects. Regarding the website, it was created and launched during the project's implementation, featuring relevant information about activities conducted, such as training, dissemination, regulations, and studies. However, it is worth noting that, by the beginning of the Terminal Review, the website was offline due to administrative and management transfer issues after the conclusion of the GEF project. By the end of the review process in August 2024, it was confirmed that the management transfer to SNE had been completed, and the website was back online with information about SWH technology. While this is a positive sign, the relaunched website presents challenges for knowledge management, as it is halfway between the Termosolar project executed by GEF, and Panama's future goals and roadmap (Action Plan). There is a need to align the results achieved, future goals, and the site's focus on its various users and information needs. Importers and producers may be interested to access standards for testing and certification, bachelors and companies on training programs for technicians and certification schemes, potential customers on interviews and success stories featuring videos/photos, financing schemes, and so on.

300. Rating for Communication and Public Awareness is Highly Satisfactory

Rating for Factors Affecting Performance and Cross-Cutting Issues: Highly Satisfactory

VI. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

301. In general terms, the project successfully fulfilled its purpose and reasonably achieved its stated objectives, executing the work plan appropriately and obtaining the expected outcomes to a high degree across the various components.
302. The execution timeline turned out to be significantly longer than initially planned, largely due to the COVID-19 pandemic, which made meetings and fieldwork difficult due to restrictions imposed in the country, with some stakeholder offices even closed to employees. Delays in execution were also affected by inefficiencies in acquiring laboratory and demonstrative project equipment, stemming from inadequate procedures and the lack of experience of the Executing Agency.
303. Despite the pandemic restrictions, stakeholder participation was very high, with notable contributions from official entities such as the National Secretariat of Energy, the Ministry of the Environment, and the Technological University of Panama, as well as UNEP as the Implementing Agency. Significant efforts and commitment were observed from the personnel involved, who overcame challenges to carry out equipment installations, field visits, and other activities while taking the necessary health precautions.

Design Stage

304. The project included an adequate analysis of the context, considering that at the start of the project; solar thermal energy had virtually no development in Panama but showed great potential based on preliminary studies and local radiation conditions.
305. The project document did not include an explicit Theory of Change analysis to show a logical path between activities, results, and objectives. However, conceptually, the four components forming the basis of the project formulation addressed the main factors driving the development of conditions for the introduction and sustainability of the technology.
306. Stakeholders were appropriately identified to achieve the results, with no key institutions left out. However, some stakeholders had low participation during execution, such as private sector chambers (construction and hospitality), justified by the fact that the project was executed during the COVID-19 pandemic. The hotel and construction sectors faced significant crises during the project's timeline. Some actors, like Banco General, a GBC partner, acted as intermediaries with associations.
307. The project implementation structure and partners were appropriate, with the Implementing Agency initially planned to be the National Energy Secretariat (SNE), one of the primary stakeholders in an energy project focused on emission reductions. However, the SNE later claimed it could not execute the project, transferring the responsibility to UNEP. The cited reason was the lack of a framework for managing a budget to execute procurement and tenders, an issue that should have been detected in advance. Procurement and contracting were transferred to UNDP in agreement, but this remains a topic to address in future projects.
308. The project had some weaknesses in defining specific activities, objectives, indicators, and verification methods. Examples include the use of mid-term and final reports as evaluation and monitoring objectives (Output 1.4) or setting a solar thermal area installation target that included private entities, which exceeded the GEF executors' action capacity (Output 4.2, later revised). This led to the reformulation of

the project's key indicators for GHG emission reductions and the adjustment of targets accordingly.

Execution

309. The work plan was nearly fully implemented, achieving the expected outcomes satisfactorily, with an overall output availability of 97%. Additionally, complementary activities arose during execution to improve performance, such as the Solar Bus initiative.
310. Significant groundwork was laid for the future development of solar thermal technology, including the installation of physical capacities for equipment testing and certification, creation of performance and quality standards, training and certification for design and installation, academic curricula, successful implementation of demonstration projects in various economic sectors, and extensive dissemination of the technology.
311. Demonstrative projects were thoroughly and successfully developed, even surpassing the initial scope in terms of the number of projects. Over 100 applications were submitted for evaluation, where project technicians conducted energy audits and pre-feasibility analyses for 100 projects. From this total, the National Energy Secretariat helped select the 30 most promising projects, for which equipment procurement and installation quotes were requested from private entities. Ten public projects were selected and financed, while other private projects were implemented with self-financing. Field visits and user feedback yielded highly positive results, recommending the adoption of the technology.
312. On the other hand, co-financing was significantly lower—approximately 30% of what was initially committed by the institutions. Part of this shortfall was due to the failure to consolidate a key financing tool from Banco General, which accounted for 40% of the total co-financing.
313. Regarding dissemination, the preparation of a communication plan had a highly positive effect as a guide for all institutions, considering different target audiences for effective dissemination. It is to highlight a demonstrating an adaptive management approach to virtual engagement. Audiovisual materials were produced, still available to the general public, to promote solar thermal energy and its key benefits. The Ministry of the Environment played a significant role in dissemination through its website and social media. Project's efforts are also evident in 28 Café Solar sessions that were held to disseminate the technology widely and raise awareness. Additionally, materials were shared through a social media campaign, and these communication actions were reinforced with workshops for specific audiences and the dissemination of success stories through demonstration projects.
314. Aspects of gender mainstreaming and participation of ethnic minorities had lesser strength on project design but they have since been properly managed by the project team through ensuring training and capacity building activities fostered women participation as well as developing pilot project SWH installations for indigenous people. SWH technology appears as gender-indifferent and with no negative impact on indigenous communities. Nonetheless, the PMU made efforts to have a positive impact, promoting specific training for women, and fostering women and indigenous participation. Support for local communities was also shown by the time to select SWH pilot projects location, as two of the SWH pilot projects are located in indigenous populations.

Sustainability and scaling-up

315. The GEF project has laid the groundwork for the development of solar thermal energy in Panama, and the prospects in this regard are promising. A detailed Action Plan was prepared and approved by key public stakeholders and incorporated into the National Energy Plan 2015-2050 and the 2020-2030 energy transition agenda. While its execution depends on the allocation of resources, there is optimism due to its alignment with sustainable development goals.
316. Some elements recommended for the implementation of the Action Plan include the development of other competitive technologies, such as heat pumps, and the realistic potential for market sector uptake. The 2050 target is set at 1 million m² installed, with the potential market comprising over 90% of the residential sector. Various factors, such as the available installation area, property ownership, and financing capacity, may play a role in influencing market development and achieving the proposed goals.
317. During the development of the GEF project, there has been growth among private actors, including both equipment suppliers and installers, who are now grouped under the Solar Chamber with more than 80 members. This has created capacities for the design and assembly of solar thermal systems. Training courses for technical personnel are available through several institutions to support professionalization and quality services in the technology. Additionally, more than 100 projects have been evaluated by the project's technicians, all economically viable and ready for implementation by the applicants, which could contribute to rapid scaling and adoption.
318. There is also a clear need to resolve the transfer of the website and app to the National Energy Secretariat (SNE) and to reorient them to meet the needs of different users. Currently, the website information is scarce and scattered, which does not aid in the dissemination of regulatory frameworks, training opportunities, benefits, and educational materials, among other resources. It is recommended to focus on referencing the regulatory framework, training opportunities, success stories across different sectors, and creating a platform for tracking objectives.

B. Summary of project findings and ratings

319. The table below provides a summary of the ratings and finding discussed in Chapter V - **Review Findings**. Overall, the project demonstrates a rating of '**Satisfactory**'.

UNEP Evaluation Office Validation of Performance Ratings:

The UNEP Evaluation Office formally quality assesses (see Annex IX) management led Terminal Review reports and validates the performance ratings therein by ensuring that the performance judgments made are consistent with evidence presented in the Review report and in-line with the performance standards set out for independent evaluations.

The Evaluation Office assesses a Terminal Review report in the same way as it assesses the initial draft of a Terminal Evaluation report. It applies the following assumptions in its validation process:

- That what is being assessed is the contents of the report and the extent to which it makes a consistent and justifiable case for the performance ratings it records.
- That the consultant has, within the report, presented all the evidence that was made available to them.
- That the Review has been based on a robust Theory of Change, reconstructed where necessary, which reflects UNEP's definitions at all levels of results.
- That the project team and key stakeholders have already reviewed a draft version of the report and provided substantive comments and made factual corrections to the Review Consultant, who has responded to them. The Evaluation Office assumes, therefore, that it has received the Final (revised) version of the report.

In this instance the Evaluation Office validates the overall project performance rating at the '**Satisfactory**' level.

Table 6 - Summary of project findings and ratings

Criterion	Summary assessment	Rating	Justification for any ratings' changes due to validation (to be completed by the UNEP Evaluation Office – EOU)	EOU Validated Rating
Strategic Relevance		HS	Rating validated	HS
1. Alignment to UNEP MTS, POW and strategic priorities	In line with UNEP Medium-Term Strategy 2014-2017, 2018-2021 and their Work Programs	HS	Rating validated	HS
2. Alignment to Donor/Partner strategic priorities	Strong alignment with donor priorities, in consistency with the GEF-6 Climate Change Focal Area	HS	Rating validated	HS
3. Relevance to global, regional, sub-regional and national environmental priorities	Highly relevant to country's priorities and goals	HS	Rating validated	HS
4. Complementarity with relevant existing interventions/coherence	Strong complimentary with previous interventions on SWH in Panama	HS	There is no evidence of the project's complementarity with other existing interventions, only a listing of other UNEP initiatives focused on solar water heating implemented in other parts of the world.	S
Quality of Project Design	The project outlined a strong baseline situation, with an appropriate structuring, but no TOC was prepared and results framework was weak.	MS	Rating validated	MS
Nature of External Context	The assessment was properly prepared	F	Rating validated	F
Effectiveness		S	Rating adjusted as a result of the EOU's standard weighted aggregation of the sub-categories making up 'Effectiveness'	MS
1. Availability of outputs	Mostly completed on every component, or with high degree of execution	S	Rating validated	S
2. Achievement of project outcomes	Outcomes were achieved satisfactory to a reasonable extent, though causal pathway was not prepared properly at design stage	S	The EOU notes that of the 4 outcomes, two that are important to attain the intermediate states are only partially achieved. Based on its standard approach, the EOU validates the achievement of outcomes as 'Moderately Satisfactory'	MS
3. Likelihood of impact	Strong foundations, but some aspects need special care	ML	Rating validated	ML
Financial Management		S	Rating validated	S

Criterion	Summary assessment	Rating	Justification for any ratings' changes due to validation (to be completed by the UNEP Evaluation Office – EOU)	EOU Validated Rating
1. Adherence to UNEP's financial policies and procedures	There is evidence of strong adherence, but several delays occurred during procurement processes	S	Rating validated	S
2. Completeness of project financial information	All reporting received with accurate and detailed information	HS	Rating validated	HS
3. Communication between finance and project management staff	Communication was enough to execute, but several changes and misunderstandings were reported by PMU	MS	Rating validated	MS
Efficiency	Very efficient in terms of use of resources, despite delays in execution	S	Rating validated	S
Monitoring and Reporting		S	Rating validated	S
1. Monitoring design and budgeting	Detailed design in monitoring, but needed adjustments later on.	MS	Rating validated	MS
2. Monitoring of project implementation	Close follow-up from high level to PMU	S	Rating validated	S
3. Project reporting	Reporting complete and timely, available for the reviewer	HS	There is no evidence that data reported was disaggregated by vulnerable/marginalized groups, including gender.	S
Sustainability		L	Rating validated	L
1. Socio-political sustainability	Leading from political high-level institutions	L	Rating validated	L
2. Financial sustainability	Support to Action Plan but budget is still to be approved	L	Rating validated	L
3. Institutional sustainability	All stakeholders are strongly involved with SWH development	L	Rating validated	L
Factors Affecting Performance		HS	Rating validated	HS
1. Preparation and readiness	Good in general, but change of EA was a major issue not foreseen	S	Rating validated	S
2. Quality of project management and supervision	Outstanding performance of PMU led by strongly committed PM	HS	Rating validated	HS
2.1 UNEP/Implementing Agency:		HS	Rating validated	HS
2.2 Partners/Executing Agency:		HS	Rating validated	HS
3. Stakeholders' participation and cooperation	Strongly involved from the beginning in general, with some losses especially from COVID-19 on.	S	Rating validated	S

Criterion	Summary assessment	Rating	Justification for any ratings' changes due to validation (to be completed by the UNEP Evaluation Office – EOU)	EOU Validated Rating
4. Responsiveness to human rights and gender equality	Strong efforts to deliver, though this aspects were not fully developed at design stage	HS	Rating validated	HS
5. Environmental and social safeguards	Project was kept as low-risk, social aspects were fostered	HS	Even though no risks were identified at design, there is no evidence that the risk rating was reviewed during implementation, to include, for example, disposal and recycling of SWH equipment (mentioned in para 287).	S
6. Country ownership and driven-ness	Satisfactory with involvement through execution, though co-finance was under committed funds	S	Rating validated	S
7. Communication and public awareness	Outstanding from communication strategy development to execution	HS	Rating validated	HS
Overall Project Performance Rating	Performance was satisfactory, successfully fulfilled its purpose and reasonably achieved its stated objectives and outcomes	S	Rating validated	S

C. Lessons learned

Lesson Learned #1:	Effective leadership and creation of a strong stakeholder's network is key to adaptive management and project success
Context/comment:	The project design phase appropriately considered the stakeholders, management structure, and partnerships, with the leadership of SNE and MiAmbiente proving crucial during the execution phase, involving key actors in decision-making. Likewise, UNEP's work as a coordinator and in strategic monitoring is highly commendable, particularly through the PSCs, where relevant project issues were addressed, knowledge was exchanged, and main issues were tackled and actions taken. At the executive level, a very effective and results-focused Project Management Unit (PMU) was evident, striving to execute activities to achieve the intended outcomes rather than merely completing the planned tasks. The presence of strong leadership and the creation of a sense of ownership among all stakeholders were key elements that enabled the project to overcome challenges, including a pandemic with a lockdown, by adapting activities and effectively managing stakeholders.
Lesson Learned #2:	Identification and commitment of the Executing Agency (EA) must be evaluated and agreed upon by all parties before the start of execution, ensuring the direct responsibility of state institutions
Context/comment:	The Termosolar Panamá project was designed and its content and execution agreed upon during an extended phase, where responsibilities were assumed by the participating institutions, with particular attention to SNE and MiAmbiente (former ANAM). These institutions were expected to take leadership from the State and assume responsibility as the Executing Agency (EA). However, at the start of the project, SNE raised concerns about their perceived lack of capacity to take on this role, which was then assumed by UNEP ROLAC to resolve an issue that otherwise would have made execution unfeasible. In hindsight, the designation of UNEP as EA revealed weaknesses in the procurement processes for pilot projects and in internal authorizations when approving changes with the Implementing Agency (IA), as both institutions belonged to UNEP but operated at different hierarchical levels, leading to blurred boundaries. Moreover, although SNE and MiAmbiente demonstrated notable engagement, the Government's detachment from the EA is not a

	positive indicator of commitment to the project.
--	--

Lesson Learned #3:	Involvement during execution can elevate outputs in areas of gender, social integration, and indigenous community inclusion beyond mere symbolic actions
Context/comment:	It is common for cross-cutting areas such as gender, indigenous community integration, and social development to take a secondary role in projects and to be addressed only through specific activities in the work plan. In the case of solar thermal energy, as it is a neutral technology without negative impacts on these components, the lack of actions is not linked to blocking outreach activities or demonstrative projects. However, the project demonstrated concrete efforts to address development in these areas, adopting a just transition approach and taking positive action for the inclusion of these groups. Communication and training strategies were designed and implemented to include vulnerable socioeconomic groups. From the outset, active participation of women and indigenous populations was encouraged, aiming to achieve 50/50 gender equity in general training sessions while considering existing qualification gaps to avoid limiting access. Additionally, specific training sessions were provided to indigenous populations and women's groups through associations. In the context of demonstrative projects, while maintaining the focus on reaching targeted sectors, the social impact played a significant role in assigning projects to institutions. Two projects were donated to nursing homes; four of the largest projects were assigned to public reference hotels, two to indigenous communities for a local hospital and a school, and two others to a veterinary clinic and a park ranger's house. These actions are assessed as having a high impact within the current project and deserve consideration for future projects, particularly to integrate similar ideas from the design phases.

D. Recommendations

Recommendation #1:	Prepare and validate project objectives with a S.M.A.R.T. approach and set targets accordingly, building the causal pathway to achieve them
Challenge/problem to be addressed by the recommendation:	During its design phase, the project defined indicators for the main emissions objective and other objectives related to the outcomes. However, these indicators exhibited some weaknesses due to a lack of clarity in their connection to the objectives and challenges in measuring

	them. Specifically, for the main objective, the indicator was reformulated during the fourth project review, adjusting the concepts of direct and indirect project impact and reducing the target accordingly, lowering it to approximately 15% in direct emissions reduction. While the proposed change is reasonable, its consequences are significant from a conceptual standpoint, as avoided emissions are a key measure in evaluating the project's presentation to the GEF. These must be presented as clearly as possible. Additionally, other project indicators and their targets required review, alongside the preparation of a Theory of Change, which could reflect the causal pathway and validate assumptions and drivers. These elements are essential for preparing outputs and activities and linking them to overarching objectives. It is recommended to place greater emphasis on these aspects, especially during the project design phase
Priority Level:	Important
Type of Recommendation	Partners: UNEP
Responsibility:	
Proposed implementation time-frame:	3 months

320. Cross-reference(s) to rationale and supporting discussions:

- Section III.B- Results Framework
- Section IV – Theory of Change at Review
- Section V.D –Effectiveness

Recommendation #2:	Calculate project co-financing based on effective contributions from institutions and within the project execution timeframe
Challenge/problem to be addressed by the recommendation:	Co-financing emerged as one of the weaker points regarding budget execution, with contributions amounting to around 30% of those committed. This shortfall was primarily due to the absence of funds from Banco General for a financial mechanism and subsidies from SNE through the UREE Energy Fund, which did not become operational during the project execution. From another perspective, however, these committed funds appear to be overestimated when real contributions expected during GEF project execution are evaluated. For example, Banco General's contribution was tied to non-GEF-funded projects, ultimately resulting in 339 m² of installed systems. The expected investment in these systems was about 10% of Banco General's commitment (USD 3.1 million). Furthermore, since these contributions were loans, it would be advisable to value

	them based on the preferential rate offered compared to other market loans, further reducing the real expected contributions. A 5% discount rate on a USD 300,000 investment over two years could translate into a real contribution of USD 30,000 to the project. For SNE's contributions via UREE subsidies, a similar calculation approach could be used, where co-financing is estimated based on effective subsidies rather than project or asset value. Likewise, the estimation should align with the GEF project timeframe. Post-project contributions should be considered part of financial sustainability.
Priority Level:	Opportunity for improvement
Type of Recommendation	Partners: UNEP, SNE
Responsibility:	
Proposed implementation time-frame:	3 months

321. Cross-reference(s) to rationale and supporting discussions:

- Annex V. Project budget and expenditures

Recommendation #3:	Approve the budget for the Termosolar Panama Action Plan as key to the technology's sustainability and development, and review market potential and adoption barriers
Challenge/problem to be addressed by the recommendation:	The Termosolar Panama Action Plan was successfully prepared and supported during GEF project execution, as outlined in the project objectives. The scope and depth are noteworthy, including various perspectives that enable sustainable technology development, such as technical standards, testing capacity, staff training, local industry, financing mechanisms, and more. Additionally, the plan considers activities, stakeholders involved, and the budget. Government approval of the latter is essential to implement the plan. Regarding objectives, the target is to install 1 million m² of solar thermal technology by 2050. Preliminary market information supports this, with sectors like hospitality, healthcare, and industry contributing around 10% of the target, while the remaining 90% is expected to come from households. This residential sector target seems challenging, considering potential barriers such as the real availability of installation space, tenant reluctance to invest, interior renovations, and access to suitable financing. Another element to consider is the emergence of competing or complementary technologies to solar thermal, such as heat pumps for water heating. Trends indicate these are cost-effective solutions and could complement or substitute solar thermal in terms of emissions reduction. Therefore, a deeper market evaluation is recommended, with

	intermediate targets set over specific intervals—every five years, for example—to track progress and adapt short- and medium-term plans accordingly.
Priority Level:	Important
Type of Recommendation	Project
Responsibility:	SNE, MiAmbiente
Proposed implementation time-frame:	3 months

322. Cross-reference(s) to rationale and supporting discussions:

- Section V.H - Sustainability

Recommendation #4:	Establish a robust knowledge base and website for the project, and adapt it for the future development of the technology
Challenge/problem to be addressed by the recommendation:	During its design phase, the project planned for the creation of a website to host all relevant information, including regulations, available training, market studies, calls for interest, pilot project success stories, and more. At the project's conclusion, the website and its administration were to be transferred to SNE. However, delays in this process resulted in the site being down for several months. Once restored, the content was adjusted, with a regulatory focus and minimal references to the GEF project. It is important to note that once the GEF project concluded, motivations and dissemination interests shifted toward future development. However, it is advisable to maintain a comprehensive view of all prior steps. Additionally, experience shows that user access depends on their area of interest (e.g., investors, installers, financiers, importers, academics, government agents), and SNE could consider a redesign from this perspective. Regarding UNEP, it is recommended that, based on its experience, UNEP develop a set of recommendations for structuring web content, focusing on guiding various government actors involved in further technology development.
Priority Level:	Opportunity for improvement
Type of Recommendation	Partners: UNEP, SNE
Responsibility:	
Proposed implementation time-frame:	6 months

323. Cross-reference(s) to rationale and supporting discussions:

- Section V.I – Communications and Public Awareness

ANNEX I. RESPONSE TO STAKEHOLDER COMMENTS

Table 5: Response to stakeholder comments received but not (fully) accepted by the reviewers, where appropriate

Page Ref	Stakeholder comment	Reviewer Response
	Xxx	Xxx

ANNEX II. PEOPLE CONSULTED DURING THE REVIEW

Table 7: People consulted during the Review

Organization	Name	Position	Gender
UNEP	Paula Cobas	Project specialist	F
UNEP-ROLAC	Roberto Borjabad		M
UNEP-ROLAC	Jesús Gonzalez	Project manager	M
UNEP-ROLAC	Priscilla Chavarría	Financial and Budget Assistant	F
UNEP-ROLAC	Vladimir Sánchez	Financial and Budget Assistant	M
SNE – National Secretary of Energy	Guadalupe Gonzalez	Electricity National Directorate	F
SNE – National Secretary of Energy	Carlos Iglesias	Energy planner	M
MiAmbiente* - Ministry of Environment	Melani Acosta	Project Leader/Coordinator	F
UTP – University of Technology Panamá	Félix Henriquez	Director - Investigation and innovation centre	M
UTP – University of Technology Panamá	Hedda Pinzón	Laboratory technician	M
UTP – University of Technology Panamá	Luis Mogollón	Laboratory technician	M
UTP – University of Technology Panamá	Orlando Melgar	Laboratory technician	M
Solar Chamber of Panamá	Rafael Galue	Partner	M
Solar Chamber of Panamá	Carlos Bolanos	Partner	M
Panama Bank	Carlos Alberto Rivas	Environmental, Social, Reputation Risk Manager	M
Panama Chamber of Construction (CAPAC)	Leonel Morales	Technical and Security Management	M
Hospital San Miguel Arcángel - Field visit	Mónica Escalante	Facilitator	F
Avícola Melo - Field visit	Julio Coronado	Maintenance manager	M
Panama Bank - Field visit	Tito Arias	Chief Engineer - Engineering and Architecture	M

* Former ANAM

ANNEX III. REVIEW FRAMEWORK/MATRIX

Table 8 - Justification for Reformulation of Results Statements for the purpose of the reconstruction of the TOC to guide the Terminal Evaluation

Formulation in original project document(s)	Formulation for Reconstructed TOC at Review Inception	Justification for Reformulation
(LONG LASTING) IMPACT		
No text available	GHG emissions from electricity sector are reduced	
	Local jobs and local capacities to design, install and operate SWH systems are created	
	Urban and Power sector Resilience is enhanced	
INTERMEDIATE STATES		
No text available	Government and private companies implement policies and action plans investing to create capacities and install SWH projects, to accelerate the development of a cost-effective CO2 market.	
PROJECT OUTCOMES		
1. Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development; policy instruments and regulatory framework to encourage sustainable SWH market development	1. Effective policy-regulatory framework and informed decision-making to encourage sustainable SWH market development	Text duplication error
OUTPUTS		
1.2 - One market assessment and economic analysis of SWH options	1.2 – A market assessment and economic analysis of SWH options is prepared, including recommendations for an action plan	
1.4 - Project monitoring and evaluation; impact assessment and monitoring	(remove) or (adjust to items not included in project supervision plan)	Project monitoring and progress evaluation are related to a supervision plan
2.1 - One capacity and training needs assessment; supply side, building design and quality control system	2.1 – Assessment on capacity building and training needs for SWH systems is prepared.	The statement is not clear. Later, 2.6 refers to the creation of a testing facility

2.6 - Capability to verify and test for compliance with the quality standards present	2.6 a –Institutional capacity and gapassessment to establish a national accredited testing laboratory is prepared 2.7 b – Laboratory equipment acquired, civil works finished and one testing laboratory is installed and running	The statement is not clear enough, and the outputs shall mention a product/service instead of a condition (capability) It was also divided into TA activities, and investment.
4.1 - Identification, energy audits and SWH systemproposal/feasibility	4.1 – Up to 100 SWH systems are identified, with primary energy audits undertaken.	There is no reference to any target
4.2 - 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m2 of SWH; direct and 60 Mi kWh	4.2 –At least 430m2 of SWH pilot systems are installed and running in public sector, resulting from a call for bids to local companies to design, supply and install them	Rephrasing and changes in the indicator are in line with project revision changes, in order to separate direct and indirect impact –out of control of the project-

ANNEX IV. KEY DOCUMENTS CONSULTED

Project planning and reporting documents

- ✓ GEF Project Document and Appendixes
- ✓ Initial Budget and Workplan
- ✓ Appendix 5 - Supervision Plan
- ✓ Appendix 6 – Procurement Plan
- ✓ Appendix 15 MiAMBIENTE - SNE delegation of authority to ROLAC
- ✓ ICA (Internal Cooperation Agreement) between UNEP and UNEP-ROLAC
- ✓ ICA (Internal Cooperation Agreement) amendment (2021, Project extension)
- ✓ Project Steering Committee (PSC) minutes (6)
- ✓ Project revisions (Budget and Workplan) (5)
- ✓ Project Implementation Review (PIR) - 2019, 2020, 2021, 2022, 2023
- ✓ Co-finance reports 2018 to 2023
- ✓ Expenditure reports 2018 to 2023
- ✓ Inventory of non-expendable equipment report

Project outputs – Overall

- ✓ Outreach and Communications materials
- ✓ Training reporting
- ✓ Termosolar website

Project Component#1

- ✓ Assessment report of current legal and regulatory framework for SWH technology¹⁴
- ✓ Recommended Solar Water Heater policy -regulatory framework Report¹⁴
- ✓ Report: seminar on the recommended SWH regulatory framework for Panama (May 2019)¹⁴
- ✓ Market assessment and analysis of SWH systems
- ✓ Report on the Market Study presentation workshop (August 2019)¹⁵
- ✓ Evaluation and analysis report of the market and impact of the project on the market (December 2022)¹⁵
- ✓ Report on the presentation of the market analysis and project impact to partners (February 2023)
- ✓ Termosolar Panamá Action Plan (August 2021)
- ✓ Meeting Report High Level meeting on SWH draft Action Plan Presentation Sep-2019

Project Component #2

- ✓ Assessment on Capacity building and training needs for SWH 2019
- ✓ Report on meetings with UTP, INADEH, ITSE nov.19
- ✓ SWH Course Manual for teachers
- ✓ Training Manual on installation, operation and maintenance in SWH
- ✓ INADEH - Diploma in Training course on SWH installation and maintenance dec.19
- ✓ ITSE - Diploma in Training course on SWH installation and maintenance dec.19
- ✓ UTP - Diploma in design, quality assurance & green building measures SWH dec.19
- ✓ Workshop - Presentation of labor competency standards -SWH installers certif- to CONACOM nov.19
- ✓ CENCER - Alignment Course in the Labor Competency Standard EC0325 and EC0473 oct.2020
- ✓ Training on SWH systems for PGBC students dec.2019
- ✓ Workshop - Presentation to DGNTI of draft standards Norm 517, 518 and 519 jun.19
- ✓ Res MICI approval technical standard DGNTI-COPANIT 517, 518 and 519 mar-21 to jul.21
- ✓ Institutional capacity and recommendations for enhancement at UTP SWH testing facility set.2019
- ✓ Recommendations to acquire international accreditation for SWH testing nov.2019

¹⁴ Mónica Escalante

¹⁵ Dr. Ing. Luis Christian Navntoft

- ✓ Report for acquisition of UTP testing laboratory equipment
- ✓ Report - training provided to 20 participants (UTP & Solar Chamber) for the use of SWH testing facility jun.2020
- ✓ SWH Business Plan - Developed for CAPES

Project Component#3

- ✓ Termosolar Panamá: Communications Strategy (June 2019)
- ✓ Thermosolar Identity Design - Additional survey
- ✓ Investment manual to establish manufacturing or assembly plants for solar water heaters in Panama - Termosolar Panamá
- ✓ Status report on the implementation of the awareness-raising strategy
- ✓ Dissemination events report- List of events attended and media appearances

Project Component#4

- ✓ Pre-feasibility studies (109)
- ✓ Technical proposals from bidders (2)
- ✓ Technical reports on SWH pilot projects site-visits

Previous reviews/evaluations

- ✓ Mid-term review
- ✓ External Financial Audit (to confirm)
- ✓ Final report by EA (UNEP-ROLAC)

Reference documents

- ✓ Terminal Review Terms of Reference
- ✓ National Energy Plan 2009-2023 (2015-2050)
- ✓ The Energy Transition as a key driver of the Covid-19 economic recovery in Panama
- ✓ Termosolar website
- ✓ Termosolar app
- ✓ SIE website (Sistema de Información de Energía)
- ✓ Panamian Bank website – Green loans
- ✓ CAPES website

ANNEX V. PROJECT BUDGET AND EXPENDITURES

Table 9 - Expenditure by Outcome/Output

Component/sub-component/output All figures as USD	Estimated cost at design	Adjusted cost by Final Budget Revision (5)	Actual Expenditure	Expenditure ratio (actual/planned)
Component 1	323,802	304,484	277,540	91%
Component 2	399,000	337,073	323,417	96%
Component 3	353,000	314,642	240,527	76%
Component 4	668,000	741,403	630,069	85%
Project Management	174,380	172,880	159,386	92%
Monitoring & Evaluation		47,500	20,200	43%
Total	1,918,182	1,918,182	1,651,139	87%

Notes:

- All figures are in USD (US dollars)
- Actual expenditure come from ER S2 2022. Signed in August 2023 by UNEP
- Expenditure + Committed budget is a total of USD 1,761,382 according to ER S2 2022, with an expenditure ratio of 93%.

Figure 16 - Overall Co-finance report (S2 2022)

ANNUAL CO-FINANCE REPORT - OVERALL PROJECT REPORT											
Project title:		SOLAR WATER HEATER MARKET DEVELOPMENT PROJECT (PANAMA CSA)									
Project number:		5287									
Project Implementing Agency:		Project Implementing Agency: UN Environment - Climate Change Mitigation Unit									
Project Executing Agency:		Project Executing Agency: UN Environment - Regional Office for Latin America and the Caribbean (ROLAC)									
Project implementation period:		From:	1 July 2018		To:	31 December 2022					
Co-finance reporting period:		From:	1 July 2022		To:	31 December 2022					
No.	Co-finance partner name	Type of co-finance	Prior Years Actual Total	Current reporting period						Planned Total	Cummulative Actual Total
				C1	C2	C3	C4	PMC	Total		
1	Banco General	In-Kind	78.038	3.849	3.849	7.849	7.500	-	23.046	3.100.000	101.084
2	Secretaria Nacional de Energía	In-Kind	299.391	19.523	24.773	12.190	40.919	-	97.404	2.184.000	396.795
3	United Nation Environmental Programm	In-Kind	127.598	5.234	5.294	8.492	9.768	-	28.788	100.000	156.387
4	Panama Green Building Council	In-Kind	61.746	826	826	733	465	-	2.849	860.000	64.594
5	Universidad Tecnológica de Panamá	In-Kind	455.971	10.369	43.417	6.040	3.918	-	63.744	650.000	519.715
6	Ministerio de Ambiente	In-Kind	84.058	4.784	3.110	14.604	10.854	-	33.352	1.248.000	117.410
7									-		-
8									-		-
9									-		-
10									-		-
Total			1.106.801	44.584	81.269	49.906	73.424	-	249.183	8.142.000	1.355.984
Name: PIEDAD MARTIN Head of Climate Change Division Signature:  Date: 9/3/2023											

Direct private and public investment add to USD 860.950 and collaboration from EU add to USD 150.000. Adding all this contributions total co-finance is USD 2,366,934 or 29% of expected original co-finance.

Additional co-finance (not foreseen at the design stage) has been leveraged by the investment of private sector companies in solar thermal. In each case, the project designed the solar thermal system and a local supplier executed the project

ANNEX VI. FINANCIAL MANAGEMENT

Table 10 - Financial Management Table

NON-GEF AND GEF PROJECTS			
Financial management components:		Rating	Evidence/ Comments
1. Adherence to UNEP's policies and procedures:		S	
Any evidence that indicates shortcomings in the project's adherence ¹⁶ to UNEP or donor policies, procedures or rules		No	
2. Completeness of project financial information¹⁷:		HS	
Provision of key documents to the reviewer (based on the responses to A-H below)		HS	
A.	Co-financing and Project Cost's tables at design (by budget lines)	Yes	Co-financing by component. Costs table by budget line
B.	Revisions to the budget	Yes	Total (5) are available and complete
C.	All relevant project legal agreements (e.g. SSFA, PCA, ICA)	Yes	ICA and amendment (1)
D.	Proof of fund transfers	Yes	
E.	Proof of co-financing (cash and in-kind)	Yes	
F.	A summary report on the project's expenditures during the life of the project (by budget lines, project components and/or annual level)	Yes	Annual level on each budget line
G.	Copies of any completed audits and management responses (<i>where applicable</i>)	N/A	
H.	Any other financial information that was required for this project (list):	No	
3. Communication between finance and project management staff		MS	
Project Manager and/or Task Manager's level of awareness of the project's financial status.		HS	
Fund Management Officer's knowledge of project progress/status when disbursements are done.		MS	
Level of addressing and resolving financial management issues among Fund Management Officer and Project Manager/Task Manager.		MS	

¹⁶ If the Review raises concerns over adherence with policies or standard procedures, a recommendation maybe given to cover the topic in an upcoming audit, or similar financial oversight exercise.

¹⁷ See also document 'Criterion Rating Description' for reference

Contact/communication between by Fund Management Officer, Project Manager/Task Manager during the preparation of financial and progress reports.	MS	
Project Manager, Task Manager and Fund Management Officer responsiveness to financial requests during the review process	MS	Information request to PNUMA-ROLAC was slow.
Overall rating	S	

ANNEX VII. BRIEF CV OF THE REVIEWER

Name	Pablo Caldeiro Sarli
Profession	Industrial Mechanical Engineer
Nationality	Uruguay
Country experience	- Europe: Spain - Americas: Uruguay, Argentina, Brazil
Education	- UDELAR – University of the Republic, Uruguay – Engineer Degree - EUDE Business School, Spain – Master in Renewable energies and Environment - IEEJ, Japan – Specialization in Energy Policies - Fundación Bariloche, Argentina – Specialization in Tariffs and Regulation

Short biography

Pablo Caldeiro is an independent consultant with more than 15 years of experience in the energy field, especially in renewable energies, contributing from the public sector to develop wind energy in Uruguay, through the design and implementation of public policies.

He has worked for the Ministry of Industry, Energy and Mining of Uruguay, in close interaction with different government offices and agencies, industrial chambers, public service companies, international experts, public service companies, suppliers and developers, and the financial sector. His work includes assessment for renewable energy projects to be installed in the country, mainly those presented through tenders, being the state counterpart to the financing entities, in order to provide the guarantees of the regulatory framework and techniques to support long-term investments.

He also has shared experience in the region through OLADE meetings, triangular aid, and technical working groups in Irena meetings to evaluate projects presented to the Abu Dhabi fund.

Since 2022 is the energy expert in the Investment Committee of the Renewable Energy Innovation Fund (REIF) – Uruguay, supporting second energy transition projects and technologies as Heat Pumps, Hydrogen, Power-to-x, and Electro mobility

Key specialties and capabilities cover

- Renewable energies, Energy efficiency, multi-stakeholder approach, Public Policies design and evaluation, Project Assessment.

Selected assignments and experiences

Independent reviews/evaluations:

Reviews for UNEP

- 2023 – GEF 5299 Bolivia MTR - Delivering the transition to energy efficient lighting
- 2023 – GEF 10087 Chile MTR - Accelerating investment in efficient and renewable district energy systems in Chile

ANNEX VIII. REVIEW TORS (WITHOUT ANNEXES)

TERMS OF REFERENCE

Terminal Review of the UNEP/GEF projects

“Solar Water HeaterMarketDevelopment and Energy Efficiency Project”, GEFID:5287

Section 1: PROJECT BACKGROUND AND OVERVIEW

Project General Information

FROM THE PROJECT 'S PIR REPORT (use latest version):

1.IDENTIFICATION Identification Table	GEF ID: 5287	Umoja no.: SB-009265
Project Title	SOLAR WATER HEATER MARKET DEVELOPMENT AND ENERGY EFFICIENCY PROJECT	
Duration months	Planned	48 months
Extension(s)	N/A	N/A
Division(s) Implementing the project	UNEP Climate Change Division	
Name of co-implementing Agency	N/A	
Executing Agency(ies)	UN Environment, Regional Office for Latin America and the Caribbean	
Names of Other Project Partners	Secretaría Nacional de Energía SNE (National Energy Secretariat)	
	Ministerio de Ambiente - MiAMBIENTE (Ministry of Environment)	
	Universidad Tecnológica de Panamá – UTP (Technological University of Panama)	
	Panama Green Building Council – PGBC	
	Banco General Panamá	
Project Type	Medium Size Project	

Project Scope	National
Region	Latin America and Caribbean
Countries	Panama
Programme of Work	Programme of Work 2020-2021, subprogramme 1: climate change.
GEF Focal Area(s)	Climate Change
UNSDCF / UNDAF linkages	Effect 3.1 By 2020, the State develops and implements public policies and enabling conditions for encourage sustainable economic growth that produces social benefits, avoids environmental degradation and help move towards a low-emission economy, efficient in the use of resources, socially inclusive and that generate growth opportunities and decent work.
Link to relevant SDG target(s) and SDG indicator(s)	SDG 7: Ensure access to affordable, reliable, sustainable and modern energy for all. Target 7.2: By 2030, increase substantially the share of renewable energy in the global energy mix. 7.2.1: Renewable energy share in the total final energy consumption
GEF financing amount	US\$ 1,918,182
Co-financing amount	US\$ 8,142,000
Date of CEO Endorsement	28 January 2015
Start of Implementation	9 January 2018
Date of first disbursement	19 March 2018
Total disbursement as of 31 December 2022	US\$ 1,752,374
Total expenditure as of 31 December 2022	US\$ 1,651,140
Mid-Term Review Date	December 2020
Completion date	Planned 28/2/2022

	Revised 31/12/2022
Expected Terminal Evaluation Date	April 2023
Expected Financial Closure Date	28/2/2024

Project Rationale

1. Energy sector

Power in Panama is generated by about 30 generating companies and fed into the National Interconnected grid system (89%, of which three companies have 68% of the market), self-generating companies (10%, such as the Panama Canal Authority) and isolated systems (1%). Installed capacity was 2,390 MW, of which 61% hydropower and 39% thermal generation⁸. Panama gross generation was 8,716 GWh in 2012 of which 62.8% produced by hydro, 25.8% by bunker fuel, 7.8% coal and 3.6% by diesel. All fossil fuels are imported.

Energy consumption totaled 7,710 GWh in 2012 (an increase of 8.6% over 2011) with maximum power demand at 1386 MW. Firm power capacity at 1,779 MW in 2012 and this implies that the reserve margin was only 335 MW, which should be over 510 MW according to some studies. The national expansion plans include additional power capacity of around 2,000 MW⁹.

Due to the importance of hydroelectricity in the power generation mix, Panama has a fair share of installed renewable energy capacity, mainly consisting of large hydropower schemes. Other potential sources include wind power, while also solar, geothermal and peat resources are available. Planning has traditionally focused on power generation and improving efficiency in power consumption. In reality, not only potential exists in power generation, but also in energy for heating purposes, both in improving efficiency and replacing fossil fuels by cleaner alternatives.

The aim in energy policy is to reduce energy consumption by 30% by rational and efficient use of energy on the medium-term and have 100% coverage and energy access as well as security in energy supply.

2. Potential of solar water heating technology

Since early 1990's, the global solar thermal market has experienced a steady annual growth. At the end of 2010, the share of renewable energy in global final energy consumption (8,823 Mtoe)¹⁰ was 8.2% and that of traditional biomass 8.5%. The solar thermal water and heating production was estimated at 60 TWh¹¹, compared to 520 TWh produced by wind and 63 TWh produced by solar PV applications. Solar thermal technologies contribute significantly to hot water production in several countries and increasingly also to cooling. In 2010 solar capacity grew with 44 GW or 27% to 232 GW (in comparison with 17% annual growth over 2006-2011). Market leaders are China (64% of installed capacity), Turkey, Germany, Japan, Brazil, India, Italy, Australia, Spain, France, Israel, Austria, Greece and USA.

Although strong development has been evidenced in some GEF program countries, notably in China and Turkey, in many others, such as Panama, solar water heating (SWH) is still hardly utilized despite favorable climatic conditions. To accelerate the global commercialization and sustainable market transformation of SWH, a global SWH project was launched in 2009, funded by GEF. The project consists of a global knowledge management component implemented by UNEP and a second component of national

programs implemented by UNDP in Albania, Algeria, Chile, India, Lebanon and Mexico. As a follow-up phase, similar market transformation activities were to be initiated in at least 10 new countries. While administratively these second phase projects was not considered as a part of the ongoing global SWH project, they could still benefit from its global knowledge management component, which was foreseen to continue to operate also after the global project on a self-sustaining basis by the Global Solar Thermal Energy Council (GSTEC). The Panama SWH market development initiative was one of the new SWH projects proposed for GEF 5.

3. Project Results Framework

This project seeks to address the barriers to the more widespread introduction and availability on the market in Panama. An integrated and holistic approach will combine demonstration projects that have high replication potential with interventions that seek to establish a market environment conducive to investments in clean energy practices and technologies.

Project goal

To support the national efforts to establish the market for solar thermal heating systems and promote cost-effective CO₂ measures (through capacity building and institutional strengthening and technology demonstration)

The project activities are arranged into four components:

Component 1: Knowledge and information for informed policy decision-making

The outputs of the project will raise awareness of key decision-makers in public and private sector on the benefits of SWH and the development of adequate regulations and incentives. The last group of activities (output 1.4) is the formulation of an Action Plan³⁰, which will be important for creating and maintaining support on the part of policy makers for dedicating state resources to SWH (as part of overall development, environmental and industrial strategies), thereby facilitating post-project replication and its evolution into a government-enabled sustainable program.

Component 2: Quality control and supply side strengthening

One main barrier to adoption of SWH technology by building owners is the lack of trust in proper installation of these systems, which normally is not part of the training of electricians or water system technicians. In most cases, installation is to be undertaken by a professional. To guarantee performance, the quality of the installation is as important as the quality of the system. The project will support setting up of training courses at the Technological University of Panama (UTP) and possibly other institutions as well as integrating SWH in existing courses. This will be accompanied with a 'recognition scheme' that guarantees certain minimum requirements in terms of training and qualification of installers. Each installer or professional passing the exam will be recognized as 'trained solar thermal' installer and will be able to display a quality logo. As far as possible, materials and technical manuals will also be made available through the project's website.

Component 3: End-user supportive mechanisms and enhanced awareness

In Panama, solar thermal is not perceived as a standard option for water heating or drying, instead relaying on conventional electric or gas-fired equipment. With support of the project and based on the market assessment of Output 1.2, a communication strategy will be

defined and a promotion campaign implemented, aiming at end-users, building developers and decision-makers in companies in the commercial and productive sectors. This will be reviewed regularly. It will also promote the lessons learned and best practices in the Project as well as obtained in similar activities in the region. The dissemination strategy would take into consideration promotional activities by SWH technology providers as well as public organizations and NGOs (including business associations, Green Building Council) through a number of deliverables, such as events (press conferences, participation in relevant workshops) , in newspapers and magazines (articles, press releases), radio and TV (promotional videos), brochures, billboards, posters for public buildings.

Component 4: SWH pilot projects and demonstration

For both promotion and technical (experimental) reasons demonstrations projects are extremely useful. Projects implementing technologies that are not market ready, but which have an important potential, will allow testing and improving the solution, gather data, monitor functioning and finally demonstrate the feasibility to the general public and the industry in order to prepare the introduction on the market. The pilot demonstrations will be carried out first in those buildings and/or sectors that are deemed to have high potential for SWH market development: a) tourism sector and hotels; b) health sector (hospitals and clinics) and c) agro-industries. The focus will be on low-temperature applications, i.e. applications with water heated to 50-100°C. Examples of applications are warm water supply, (e.g. for showers and washing, heating of swimming pools), drying, cleaning and washing of agricultural products, as well as pre-heating of water (e.g. cloth washing, boilers, pasteurization, etc.).

Further information may be found in the project CEO document.

4. Executing Arrangements

Institutional arrangement for project implementation

1) Project administration

The project is co-financed with funding from the Global Environment Facility (GEF) with the United Nations Environment Programme (UNEP) acting as the GEF Implementing Agency. UNEP as the GEF Implementing Agency will be responsible for the supervision of project execution to ensure consistency with GEF and UNEP policies and procedures, and will be responsible for overall project reporting. UNEP will formally participate in meetings, the midterm and final evaluations, clearance of half yearly and annual reports, technical review of project outputs, and additional technical assistance for the execution of the project as may be requested. UNEP will cooperate with ANAM; however, ANAM will be accountable to the Government and UNEP/GEF for ensuring (i) the proper achievement of the objectives of the Project; (ii) the monitoring and evaluation of the project outputs and outcomes; (iii) the effective use of both international and national resources allocated to it; (iv) the timely availability of financing to support project implementation; (v) the proper coordination among all project stakeholders; in particular national parties; and (vi) the timely submission of all project reports, including work plans and financial reports.

The project implementation is arrangements comprise the following:

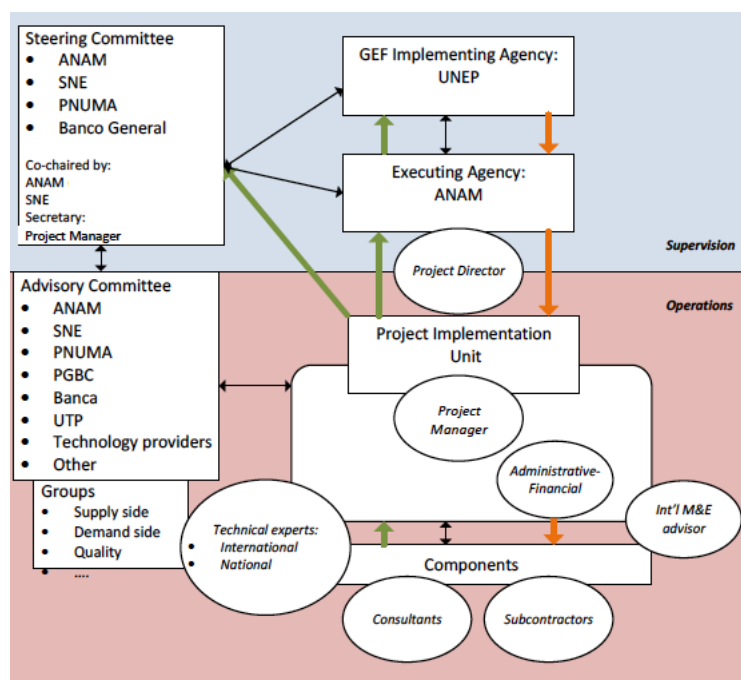
- National Project Director (PD)
- Project Steering Committee (PSC)
- Project Implementation Unit (PIU)
- Technical Working Group (TWG)

- Project Director

Within ANAM, responsibility will be with a high-ranking official, who will act as National Project Director and thus assumes responsibility for the Project on behalf of the national Government.

Project Steering Committee (PSC)

The PSC is the highest decision-making authority of this project. The main role of the PSC is (i) to guide and oversee the technical progress and performance of the Project, and (ii) to enhance and optimize the contributions of various partner organizations through coordination of all activities and inputs. The PSC meetings will be formally called by the National Project Director (as Chairperson of the PSC) at least twice a year to discuss the project performance and provide future guidance. Extraordinary meetings will be held if deemed necessary by one of the PSC members. The PSC is likely to include high level representatives from ANAM, SNE and UNEP with the Project Manager as the secretary of the PSC. Other stakeholders (e.g. other ministries and public agencies, private sector, associations, NGOs) can be invited on a permanent basis (to be decided during project inception) or to attend meetings on an as-needed basis.



Project Advisory Committee (PAC) and Technical Working Groups (TWG)

To interact with stakeholders at the institutional level, a Project Advisory Committee (PAC) will be formed consisting of the government entities participating in PSC, supply-side representatives, building associations, consumer organizations, universities/institutes and NGOs. The PAC will meet regularly during project implementation and will provide overall comments and advice on key project activities including fund commitments and co-financing arrangements. Depending on the thematic issues, Technical Working Groups can be formed, e.g. one on the supply chain and technical strengthening, and one on the demand side and financial issues.

Project Implementation Unit (PIU)

A Project Implementation Unit will be set up by ANAM, responsible of the overall operational and financial management and reporting of the UNEP/GEF funds in accordance with the rules and regulations for nationally executed projects. The PIU will be formally headed by the Project Director (in-kind contribution of ANAM), while the Project Manager (PM) will manage day-to-day operations of the Project with the support of an Administrative-Financial assistant. The PIU may be established at ANAM's premises or elsewhere.

5. Project Cost and Financing

Project Objective: cost-effective CO2 reduction measures initiated by developing the market for solar thermal heating systems						
Project Component	Grant Type	Expected Outcomes	Expected Outputs	Trust Fund	Grant Amount (\$)	Confirmed Co-financing (\$)
1. Policy-regulatory framework for SWH promotion and informed policy decision-making	TA	Effective policy-regulatory framework-endorsed by the government (see Indicator C in Annex A)	1.1 One set of SWH-relevant regulations and policy instruments (incl. fiscal and other incentives) and recommended policy-regulatory framework reviewed 1.2 One market assessment and economic analysis of SWH options, and one end-of-project market and impact assessment completed 1.3 A Government-endorsed SWH action plan 1.4 Monitoring and evaluation (see Indicators 1.-5. in Annex A)	GEFTF	323,802	229,800
2. Quality control and supply side strengthening	TA	Voluntary quality control systems in place in the SWH industry to offer SWH products and services that customers are satisfied with (see Indicators D)-F) in Annex A)	2.1 One capacity assessment for training needs completed on supply side, and building design and quality control system 2.2 SWH incorporated into curricula of at least two relevant educational institutions; 2.3 Training for SWH installers and technology providers; one recognition scheme for installers completed 2.4 Two SWH and green building training programs designed and implemented 2.5 One SWH standards and a quality control scheme developed 2.6 Capability to verify and test for compliance with the quality standards present 2.7 Agreed business plan for the establishment of a national solar thermal energy association (see Indicators 6.-13. in Annex A)	GEFTF	399,000	810,000
3. Enhanced awareness and end-user supportive mechanisms	TA	- Enhanced end-user awareness of the technical and financial viability of SWH applications and increased use of end-user financial mechanisms (see Indicators H)-I) in Annex A)	3.1 Awareness creation and info events for key decision-makers in financial sector, end-use sectors and the technology providers sector 3.2 At least one end-user financing mechanisms established that can be used for investment in SWH 3.3 A campaign with marketing and publicity activities, targeting different SWH market segments completed (see Indicators 14.-17. in Annex A)	GEFTF	353,000	1,040,000
4. SWH pilot projects and demonstration	ENV	- SWH applications demonstrated and financial and technical viability confirmed (see Indicators J)-K) in Annex A)	4.1 Identification, energy audits and SWH system proposal/feasibility 4.2 220 SWH pilots supported with the installation of at least 70 units equivalent of 3,220 m ² of SWH, direct and 60 MWh (see Indicators 18.-20. in Annex A)	GEFTF	668,000	5,310,000
Subtotal					1,743,802	7,389,800
Project management Cost (PMC)				GEFTF	174,380	752,200
Total project costs					1,918,182	8,142,000

6. Implementation Issues

The project required an extension due to COVID and also delays related to internal procurements processes and administrative procedures. The project also initially

encountered a lack of vendors. Notwithstanding such delays, the project is rated as satisfactory with regards to outputs

Section 2. OBJECTIVE AND SCOPE OF THE REVIEW

7. Objective of the Review

In line with the UNEP Evaluation Policy¹⁸ and the UNEP Programme Manual¹⁹, the Terminal Review (TR) is undertaken at operational completion of the project to assess project performance (in terms of relevance, effectiveness and efficiency), and determine outcomes and impacts (actual and potential) stemming from the project, including their sustainability. The Review 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, Secretaría Nacional de Energía SNE (National Energy Secretariat) and Ministerio de Ambiente - MiAMBIENTE (Ministry of Environment). Therefore, the Review will identify lessons of operational relevance for future project formulation and implementation.

8. Key Review principles

Review findings and judgements will be based on **sound evidence and analysis**, clearly documented in the Review Report. Information will be triangulated (i.e. verified from different sources) as far as possible, and when verification is not possible, the single source will be mentioned (whilst anonymity is still protected). Analysis leading to evaluative judgements should always be clearly spelled out.

The “Why?” Question. As this is a Terminal Review, particular attention will be given to learning from the experience. Therefore, the “why?” question should be at the front of the consultant(s)’ minds all through the review exercise and is supported by the use of a theory of change approach. This means that the consultant(s) need to go beyond the assessment of “what” the project performance was and make a serious effort to provide a deeper understanding of “why” the performance was as it was (i.e. what contributed to the achievement of the project’s results). This should provide the basis for the lessons that can be drawn from the project.

Attribution, Contribution and Credible Association: In order to *attribute* any outcomes and impacts to a project intervention, one needs to consider the difference between what has happened with, and what would have happened without, the project (i.e. take account of changes over time and between contexts in order to isolate the effects of an intervention). This requires appropriate baseline data and the identification of a relevant counterfactual, both of which are frequently not available for reviews. Establishing the *contribution* made by a project in a complex change process relies heavily on prior intentionality (e.g. approved

¹⁸<https://www.unenvironment.org/about-un-environment/evaluation-office/policies-and-strategies>

¹⁹<https://wecollaborate.unep.org>

project design documentation, logical framework) and the articulation of causality (e.g. narrative and/or illustration of the Theory of Change). Robust evidence that a project was delivered as designed and that the expected causal pathways developed supports claims of contribution and this is strengthened where an alternative theory of change can be excluded. A *credible association* between the implementation of a project and observed positive effects can be made where a strong causal narrative, although not explicitly articulated, can be inferred by the chronological sequence of events, active involvement of key actors and engagement in critical processes.

Communicating Review Results. A key aim of the Review is to encourage reflection and learning by UNEP staff and key project stakeholders. The consultant should consider how reflection and learning can be promoted, both through the review process and in the communication of review findings and key lessons. Clear and concise writing is required on all review deliverables. Draft and final versions of the main Review Report will be shared with key stakeholders by the Task Manager. There may, however, be several intended audiences, each with different interests and needs regarding the report. The consultant will plan with the Task Manager which audiences to target and the easiest and clearest way to communicate the key review findings and lessons to them. This may include some, or all, of the following; a webinar, conference calls with relevant stakeholders, the preparation of a review brief or interactive presentation.

9. Key Strategic Questions

In addition to the review criteria outlined in Section 10 below, the Review will address the **strategic questions**²⁰ listed below (no more than 3 questions are recommended). These are questions of interest to UNEP and to which the project is believed to be able to make a substantive contribution. Also included are five questions that are required when reporting in the GEF Portal and these must be addressed in the TR:

Q1: What changes were made to adapt to stakeholders' actual engagement and how did any changes affect the project's performance and impact?

Q2: What changes were made to adapt to the effects of COVID-19 and how did any changes affect the project's performance?

Q3: What was the cost-effectiveness of the demonstration projects in terms of impact (expected direct and indirect emissions reductions)?

Address the questions required for the GEF Portal in the appropriate parts of the report and provide a **summary of the findings in the Conclusions section of the report**:

a) Under Monitoring and Reporting/Monitoring of Project Implementation:

What was the performance at the project's completion against Core Indicator Targets? (For projects approved prior to GEF-7, these indicators will be identified retrospectively and comments on performance provided²¹).

²⁰The strategic questions should not duplicate questions that will be addressed under the standard review criteria described in section 10.

²¹This does not apply to Enabling Activities

b) Under Factors Affecting Performance/Stakeholder Participation and Cooperation:

What were the progress, challenges and outcomes regarding engagement of stakeholders in the project/program as evolved from the time of the MTR? *(This should be based on the description included in the Stakeholder Engagement Plan or equivalent documentation submitted at CEO Endorsement/Approval)*

- c) Under Factors Affecting Performance/Responsiveness to Human Rights and Gender Equality:What were the completed gender-responsive measures and, if applicable,actual gender result areas? *(This should be based on the documentation at CEO Endorsement/Approval, including gender-sensitive indicators contained in the project results framework or gender action plan or equivalent)*
- d) Under Factors Affecting Performance/Environmental and Social Safeguards:What was the progress made in the implementation of the management measures against the Safeguards Plan submitted at CEO Approval? The risk classifications reported in the latest PIR report should be verified and the findings of the effectiveness of any measures or lessons learned taken to address identified risks assessed. *(Any supporting documents gathered by the Consultant during this Review should be shared with the Task Manager for uploading in the GEF Portal)*
- e) Under Factors Affecting Performance/Communication and Public Awareness:What were the challenges and outcomes regarding the project's completed Knowledge Management Approach, including: Knowledge and Learning Deliverables (e.g. website/platform development); Knowledge Products/Events; Communication Strategy; Lessons Learned and Good Practice; Adaptive Management Actions?*(This should be based on the documentation approved at CEO Endorsement/Approval)*

10. Review Criteria

All review criteria will be rated on a six-point scale. Sections A-I below, outline the scope of the review criteria.The set of review criteria are grouped in nine categories: (A) Strategic Relevance; (B) Quality of Project Design; (C) Nature of External Context; (D) Effectiveness, which comprises assessments of the availability of outputs, achievement of outcomes and likelihood of impact; (E) Financial Management; (F) Efficiency; (G) Monitoring and Reporting; (H) Sustainability; and (I) Factors Affecting Project Performance.

Annex 1 of these Terms of Reference provides a table with a list of various tools, templates and guidelines that can help Review Consultant(s) to follow a thorough review process that meets all of UNEP's needs.

A. Strategic Relevance

The Review will assess the extent to which the activity is suited to the priorities and policies of the donors, implementing regions/countries and the target beneficiaries. The Review will include an assessment of the project's relevance in relation to UNEP's mandate and its alignment with UNEP's policies and strategies at the time of project approval. Under strategic relevance an assessment of the complementarity of the project with other interventions addressing the needs of the same target groups will be made. This criterion comprises four elements:

i. *Alignment to the UNEP's Medium-Term Strategy²² (MTS), Programme of Work (POW) and Strategic Priorities*

The Review should assess the project's alignment with the MTS and POW under which the project was approved and include, in its narrative, reflections on the scale and scope of any contributions made to the planned results reflected in the relevant MTS and POW. UNEP strategic priorities include the Bali Strategic Plan for Technology Support and Capacity Building²³ (BSP) and South-South Cooperation (S-SC). The BSP relates to the capacity of governments to: comply with international agreements and obligations at the national level; promote, facilitate and finance environmentally sound technologies and to strengthen frameworks for developing coherent international environmental policies. S-SC is regarded as the exchange of resources, technology and knowledge between developing countries.

ii. *Alignment to Donor/GEF/Partner Strategic Priorities*

Donor strategic priorities will vary across interventions. The Review will assess the extent to which the project is suited to, or responding to, donor priorities. In some cases, alignment with donor priorities may be a fundamental part of project design and grant approval processes while in others, for example, instances of 'softly-earmarked' funding, such alignment may be more of an assumption that should be assessed.

iii. *Relevance to Global, Regional, Sub-regional and National Environmental Priorities*

The Review will assess the alignment of the project with global priorities such as the SDGs and Agenda 2030. The extent to which the intervention is suited, or responding to, the stated environmental concerns and needs of the countries, sub-regions or regions where it is being implemented will also be considered. Examples may include: UN Development Assistance Frameworks (UNDAF) or, national or sub-national development plans, poverty reduction strategies or Nationally Appropriate Mitigation Action (NAMA) plans or regional agreements etc. Within this section consideration will be given to whether the needs of all beneficiary groups are being met and reflects the current policy priority to leave no-one behind.

iv. *Complementarity with Relevant Existing Interventions/Coherence²⁴*

An assessment will be made of how well the project, either at design stage or during the project inception or mobilization²⁵, took account of ongoing and planned initiatives (under the same sub-programme, other UNEP sub-programmes, or being implemented by other agencies within the same country, sector or institution) that address similar needs of the same target groups. The Review will consider if the project team, in collaboration with Regional Offices and Sub-Programme Coordinators, made efforts to ensure their own intervention was complementary to other interventions, optimized any synergies and avoided duplication of effort. Examples may include work within UNDAFs or One UN programming. Linkages with other interventions should be described and instances where UNEP's comparative advantage has been particularly well applied should be highlighted.

²²UNEP's Medium Term Strategy (MTS) is a document that guides UNEP's programme planning over a four-year period. It identifies UNEP's thematic priorities, known as Sub-programmes (SP), and sets out the desired outcomes, known as Expected Accomplishments (EAs), of the Sub-programmes. <https://www.unenvironment.org/about-un-environment/evaluation-office/our-evaluation-approach/un-environment-documents>

²³<http://www.unep.fr/ozonaction/about/bsp.htm>

²⁴This sub-category is consistent with the new criterion of 'Coherence' introduced by the OECD-DAC in 2019.

²⁵A project's inception or mobilization period is understood as the time between project approval and first disbursement. Complementarity during project implementation is considered under Efficiency, see below.

Factors affecting this criterion may include:

- Stakeholders' participation and cooperation
- Responsiveness to human rights and gender equity
- Country ownership and driven-ness

B. Quality of Project Design

The quality of project design is assessed using an agreed template during the review inception phase. Ratings are attributed to identified criteria and an overall Project Design Quality rating is established. The complete Project Design Quality template should be annexed in the Review Inception Report. Later, the overall Project Design Quality rating²⁶ should be entered in the final review ratings table (as item B) in the Main Review Report and a summary of the project's strengths and weaknesses at design stage should be included within the body of the Main Review Report.

Factors affecting this criterion may include (at the design stage):

- Stakeholders participation and cooperation
- Responsiveness to human rights and gender equity

C. Nature of External Context

At review inception stage a rating is established for the project's external operating context (considering the prevalence of conflict, natural disasters and political upheaval²⁷). This rating is entered in the final review ratings table as item C. Where a project has been rated as facing either an *Unfavourable* or *Highly Unfavourable* external operating context, and/or a negative external event has occurred during project implementation, the ratings for Effectiveness, Efficiency and/or Sustainability may be increased at the discretion of the Review Consultant and Task Manager together. A justification for such an increase must be given.

D. Effectiveness

i. Availability of Outputs²⁸

The Review will assess the project's success in producing the programmed outputs and making them available to the intended beneficiaries as well as its success in achieving milestones as per the project design document (ProDoc). Any formal modifications/revisions made during project implementation will be considered part of the project design. Where the project outputs are inappropriately or inaccurately stated in the ProDoc, reformulations may be necessary in the reconstruction of the Theory of Change

²⁶In some instances, based on data collected during the review process, the assessment of the project's design quality may change from Inception Report to Main Review Report.

²⁷Note that 'political upheaval' does not include regular national election cycles, but unanticipated unrest or prolonged disruption. The potential delays or changes in political support that are often associated with the regular national election cycle should be part of the project's design and addressed through adaptive management of the project team. From March 2020 this should include the effects of COVID-19.

²⁸Outputs are the availability (for intended beneficiaries/users) of new products and services and/or gains in knowledge, abilities and awareness of individuals or within institutions (UNEP, 2019).

(TOC). In such cases a table should be provided showing the original and the reformulation of the outputs for transparency. The availability of outputs will be assessed in terms of both quantity and quality, and the assessment will consider their ownership by, and usefulness to, intended beneficiaries and the timeliness of their provision. It is noted that emphasis is placed on the performance of those outputs that are most important to achieve outcomes. The Review will briefly explain the reasons behind the success or shortcomings of the project in delivering its programmed outputs available and meeting expected quality standards.

Factors affecting this criterion may include:

- Preparation and readiness
- Quality of project management and supervision²⁹

ii. Achievement of Project Outcomes³⁰

The achievement of project outcomes is assessed as performance against the outcomes as defined in the reconstructed³¹ Theory of Change. These are outcomes that are intended to be achieved by the end of the project timeframe and within the project's resource envelope. Emphasis is placed on the achievement of project outcomes that are most important for attaining intermediate states. As with outputs, a table can be used to show where substantive amendments to the formulation of project outcomes is necessary to allow for an assessment of performance. The Review should report evidence of attribution between UNEP's intervention and the project outcomes. In cases of normative work or where several actors are collaborating to achieve common outcomes, evidence of the nature and magnitude of UNEP's 'substantive contribution' should be included and/or 'credible association' established between project efforts and the project outcomes realised.

Factors affecting this criterion may include:

- Quality of project management and supervision
- Stakeholders' participation and cooperation
- Responsiveness to human rights and gender equity
- Communication and public awareness

iii. Likelihood of Impact

Based on the articulation of long-lasting effects in the reconstructed TOC (*i.e. from project outcomes, via intermediate states, to impact*), the Review will assess the likelihood of the intended, positive impacts becoming a reality. Project objectives or goals should be incorporated in the TOC, possibly as intermediate states or long-lasting impacts. The

²⁹For GEF funded projects 'project management and supervision' will refer to the project management performance of the Executing Agency and the technical backstopping provided by UNEP, as Implementing Agency.

³⁰Outcomes are the use (*i.e. uptake, adoption, application*) of an output by intended beneficiaries, observed as changes in institutions or behavior, attitude or condition (UNEP, 2019)

³¹UNEP staff are currently required to submit a Theory of Change with all submitted project designs. The level of 'reconstruction' needed during a review will depend on the quality of this initial TOC, the time that has lapsed between project design and implementation (which may be related to securing and disbursing funds) and the level of any changes made to the project design. In the case of projects pre-dating 2013 the intervention logic is often represented in a logical framework and a TOC will need to be constructed in the inception stage of the review.

Evaluation Office's approach to the use of TOC in project reviews is outlined in a guidance note and is supported by an excel-based flow chart, 'Likelihood of Impact Assessment Decision Tree'. Essentially the approach follows a 'likelihood tree' from project outcomes to impacts, taking account of whether the assumptions and drivers identified in the reconstructed TOC held. Any unintended positive effects should also be identified and their causal linkages to the intended impact described.

The Review will also consider the likelihood that the intervention may lead, or contribute to, unintended negative effects (e.g. will vulnerable groups such as those living with disabilities and/or women and children, be disproportionately affected by the project?). Some of these potential negative effects may have been identified in the project design as risks or as part of the analysis of Environmental and Social Safeguards.

The Review will consider the extent to which the project has played a catalytic role³² or has promoted scaling up and/or replication as part of its Theory of Change (either explicitly as in a project with a demonstration component or implicitly as expressed in the drivers required to move to outcome levels) and as factors that are likely to contribute to greater or long lasting impact.

Ultimately UNEP and all its partners aim to bring about benefits to the environment and human well-being. Few projects are likely to have impact statements that reflect such long-lasting or broad-based changes. However, the Review will assess the likelihood of the project to make a substantive contribution to the long-lasting changes represented by the Sustainable Development Goals, and/or the intermediate-level results reflected in UNEP's Expected Accomplishments and the strategic priorities of funding partner(s).

Factors affecting this criterion may include:

- Quality of Project Management and Supervision (including adaptive management)
- Stakeholders participation and cooperation
- Responsiveness to human rights and gender equity
- Country ownership and driven-ness
- Communication and public awareness

E. Financial Management

Financial management will be assessed under three themes: *adherence* to UNEP's financial policies and procedures, *completeness* of financial information and *communication* between financial and project management staff. The Review will establish the actual spend across the life of the project of funds secured from all donors. This expenditure will be reported, where possible, at output/component level and will be compared with the approved budget. The Review will verify the application of proper financial management standards and adherence to UNEP's financial management policies. Any financial management issues that

³²The terms catalytic effect, scaling up and replication are inter-related and generally refer to extending the coverage or magnitude of the effects of a project. Catalytic effect is associated with triggering additional actions that are not directly funded by the project – these effects can be both concrete or less tangible, can be intentionally caused by the project or implied in the design and reflected in the TOC drivers, or can be unintentional and can rely on funding from another source or have no financial requirements. Scaling up and Replication require more intentionality for projects, or individual components and approaches, to be reproduced in other similar contexts. Scaling up suggests a substantive increase in the number of new beneficiaries reached/involved and may require adapted delivery mechanisms while Replication suggests the repetition of an approach or component at a similar scale but among different beneficiaries. Even with highly technical work, where scaling up or replication involves working with a new community, some consideration of the new context should take place and adjustments made as necessary.

have affected the timely delivery of the project or the quality of its performance will be highlighted. The Review will record where standard financial documentation is missing, inaccurate, incomplete or unavailable in a timely manner. The Review will assess the level of communication between the Project Manager and the Fund Management Officer as it relates to the effective delivery of the planned project and the needs of a responsive, adaptive management approach.

Factors affecting this criterion may include:

- Preparation and readiness
- Quality of project management and supervision

F. Efficiency

Under the efficiency criterion the Review will assess the extent to which the project delivered maximum results from the given resources. This will include an assessment of the cost-effectiveness and timeliness of project execution.

Focusing on the translation of inputs into outputs, *cost-effectiveness* is the extent to which an intervention has achieved, or is expected to achieve, its results at the lowest possible cost. *Timeliness* refers to whether planned activities were delivered according to expected timeframes as well as whether events were sequenced efficiently. The Review will also assess to what extent any project extension could have been avoided through stronger project management and identify any negative impacts caused by project delays or extensions. The Review will describe any cost or time-saving measures put in place to maximise results within the secured budget and agreed project timeframe and consider whether the project was implemented in the most efficient way compared to alternative interventions or approaches.

The Review will give special attention to efforts made by the project teams during project implementation to make use of/build upon pre-existing institutions, agreements and partnerships, data sources, synergies and complementarities³³ with other initiatives, programmes and projects etc. to increase project efficiency.

The factors underpinning the need for any project extensions will also be explored and discussed. Consultants should note that as management or project support costs cannot be increased in cases of 'no cost extensions', such extensions represent an increase in unstated costs to UNEP and Executing Agencies.

Factors affecting this criterion may include:

- Preparation and readiness (e.g. timeliness)
- Quality of project management and supervision
- Stakeholders participation and cooperation

G. Monitoring and Reporting

The Review will assess monitoring and reporting across three sub-categories: monitoring design and budgeting, monitoring implementation and project reporting.

i. Monitoring Design and Budgeting

³³Complementarity with other interventions during project design, inception or mobilization is considered under Strategic Relevance above.

Each project should be supported by a sound monitoring plan that is designed to track progress against SMART³⁴ results towards the achievement of the project's outputs and outcomes, including at a level disaggregated by gender, marginalisation or vulnerability, including those living with disabilities. In particular, the Review will assess the relevance and appropriateness of the project indicators as well as the methods used for tracking progress against them as part of conscious results-based management. The Review will assess the quality of the design of the monitoring plan as well as the funds allocated for its implementation. The adequacy of resources for Mid-Term and Terminal Evaluation/Review should be discussed, where applicable.

ii. Monitoring of Project Implementation

The Review will assess whether the monitoring system was operational and facilitated the timely tracking of results and progress towards project objectives throughout the project implementation period. This assessment will include consideration of whether the project gathered relevant and good quality baseline data that is accurately and appropriately documented. This should include monitoring the representation and participation of disaggregated groups, including gendered, marginalised or vulnerable groups, such as those living with disabilities, in project activities. It will also consider the quality of the information generated by the monitoring system during project implementation and how it was used to adapt and improve project execution, achievement of outcomes and ensure sustainability. The Review should confirm that funds allocated for monitoring were used to support this activity.

The performance at project completion against Core Indicator Targets should be reviewed. For projects approved prior to GEF-7, these indicators will be identified retrospectively and comments on performance provided.

iii. Project Reporting

UNEP has a centralised project information management system (Anubis) in which project managers upload six-monthly progress reports against agreed project milestones. This information will be provided to the Review Consultant(s) by the Task Manager. Some projects have additional requirements to report regularly to funding partners, which will be supplied by the project team (e.g. the Project Implementation Reviews and Tracking Tool for GEF-funded projects). The Review will assess the extent to which both UNEP and GEF reporting commitments have been fulfilled. Consideration will be given as to whether reporting has been carried out with respect to the effects of the initiative on disaggregated groups.

Factors affecting this criterion may include:

- Quality of project management and supervision
- Responsiveness to human rights and gender equity (e.g disaggregated indicators and data)

H. Sustainability

³⁴SMART refers to results that are specific, measurable, achievable, relevant and time-oriented. Indicators help to make results measurable.

Sustainability³⁵ is understood as the probability of the benefits derived from the achievement of project outcomes being maintained and developed after the close of the intervention. The Review will identify and assess the key conditions or factors that are likely to undermine or contribute to the endurance of achieved project outcomes (i.e. 'assumptions' and 'drivers'). Some factors of sustainability may be embedded in the project design and implementation approaches while others may be contextual circumstances or conditions that evolve over the life of the intervention. Where applicable an assessment of bio-physical factors that may affect the sustainability of direct outcomes may also be included.

i. Socio-political Sustainability

The Review will assess the extent to which social or political factors support the continuation and further development of the benefits derived from project outcomes. It will consider the level of ownership, interest and commitment among government and other stakeholders to take the project achievements forwards. In particular the Review will consider whether individual capacity development efforts are likely to be sustained.

ii. Financial Sustainability

Some project outcomes, once achieved, do not require further financial inputs, e.g. the adoption of a revised policy. However, in order to derive a benefit from this outcome further management action may still be needed e.g. to undertake actions to enforce the policy. Other project outcomes may be dependent on a continuous flow of action that needs to be resourced for them to be maintained, e.g. continuation of a new natural resource management approach. The Review will assess the extent to which project outcomes are dependent on future funding for the benefits they bring to be sustained. Secured future funding is only relevant to financial sustainability where the project outcomes have been extended into a future project phase. Even where future funding has been secured, the question still remains as to whether the project outcomes are financially sustainable.

iii. Institutional Sustainability

The Review will assess the extent to which the sustainability of project outcomes (especially those relating to policies and laws) is dependent on issues relating to institutional frameworks and governance. It will consider whether institutional achievements such as governance structures and processes, policies, sub-regional agreements, legal and accountability frameworks etc. are robust enough to continue delivering the benefits associated with the project outcomes after project closure. In particular, the Review will consider whether institutional capacity development efforts are likely to be sustained.

Factors affecting this criterion may include:

- Stakeholders participation and cooperation
- Responsiveness to human rights and gender equity (e.g. where interventions are not inclusive, their sustainability may be undermined)
- Communication and public awareness
- Country ownership and driven-ness

³⁵As used here, 'sustainability' means the long-term maintenance of outcomes and consequent impacts, whether environmental or not. This is distinct from the concept of sustainability in the terms 'environmental sustainability' or 'sustainable development', which imply 'not living beyond our means' or 'not diminishing global environmental benefits' (GEF STAP Paper, 2019, Achieving More Enduring Outcomes from GEF Investment)

I. Factors Affecting Project Performance and Cross-Cutting Issues

(These factors are rated in the ratings table but are discussed within the Main Review Report as cross-cutting themes as appropriate under the other review criteria, above. If these issues have not been addressed under the Review Criteria above, then independent summaries of their status within the reviewed project should be given in this section)

i. Preparation and Readiness

This criterion focuses on the inception or mobilisation stage of the project (i.e. the time between project approval and first disbursement). The Review will assess whether appropriate measures were taken to either address weaknesses in the project design or respond to changes that took place between project approval, the securing of funds and project mobilisation. In particular the Review will consider the nature and quality of engagement with stakeholder groups by the project team, the confirmation of partner capacity and development of partnership agreements as well as initial staffing and financing arrangements. *(Project preparation is included in the template for the assessment of Project Design Quality).*

ii. Quality of Project Management and Supervision

For GEF funded projects 'project management and supervision' may refer to the project management performance of the Executing Agency and the technical backstopping and supervision provided by UNEP as Implementing Agency. The performance of parties playing different roles should be discussed and a rating provided for both types of supervision (UNEP/Implementing Agency; Partner/Executing Agency) and the overall rating for this sub-category established as a simple average of the two.

The Review will assess the effectiveness of project management with regard to: providing leadership towards achieving the planned outcomes; managing team structures; maintaining productive partner relationships (including Steering Groups etc.); maintaining project relevance within changing external and strategic contexts; communication and collaboration with UNEP colleagues; risk management; use of problem-solving; project adaptation and overall project execution. Evidence of adaptive management should be highlighted.

iii. Stakeholder Participation and Cooperation

Here the term 'stakeholder' should be considered in a broad sense, encompassing all project partners, duty bearers with a role in delivering project outputs, target users of project outputs and any other collaborating agents external to UNEP and the executing partner(s). The assessment will consider the quality and effectiveness of all forms of communication and consultation with stakeholders throughout the project life and the support given to maximise collaboration and coherence between various stakeholders, including sharing plans, pooling resources and exchanging learning and expertise. The inclusion and participation of all differentiated groups, including gender groups should be considered.

The progress, challenges and outcomes regarding engagement of stakeholders in the project/program occurring since the MTR should be reviewed. This should be based on the description included in the Stakeholder Engagement Plan or equivalent documentation submitted at CEO Endorsement/Approval.

iv. Responsiveness to Human Rights and Gender Equality

The Review will ascertain to what extent the project has applied the UN Common Understanding on the human rights-based approach (HRBA) and the UN Declaration on the

Rights of Indigenous People. Within this human rights context the Review will assess to what extent the intervention adheres to UNEP's Policy and Strategy for Gender Equality and the Environment³⁶.

The report should present the extent to which the intervention, following an adequate gender analysis at design stage, has implemented the identified actions and/or applied adaptive management to ensure that Gender Equality and Human Rights are adequately taken into account. In particular the Review will consider to what extent project, implementation and monitoring have taken into consideration: (i) possible inequalities (especially those related to gender) in access to, and the control over, natural resources; (ii) specific vulnerabilities of disadvantaged groups (especially women, youth and children and those living with disabilities) to environmental degradation or disasters; and (iii) the role of disadvantaged groups (especially women, youth and children and those living with disabilities) in mitigating or adapting to environmental changes and engaging in environmental protection and rehabilitation.

The completed gender-responsive measures and, if applicable, actual gender result areas should be reviewed. This should be based on the documentation at CEO Endorsement/Approval, including gender-sensitive indicators contained in the project results framework or gender action plan or equivalent.

v. Environmental and Social Safeguards

UNEP projects address environmental and social safeguards primarily through the process of environmental and social screening at the project approval stage, risk assessment and management (avoidance, minimization, mitigation or, in exceptional cases, offsetting) of potential environmental and social risks and impacts associated with project and programme activities. The Review will confirm whether UNEP requirements³⁷ were met to: review risk ratings on a regular basis; monitor project implementation for possible safeguard issues; respond (where relevant) to safeguard issues through risk avoidance, minimization, mitigation or offsetting and report on the implementation of safeguard management measures taken. UNEP requirements for proposed projects to be screened for any safeguarding issues; for sound environmental and social risk assessments to be conducted and initial risk ratings to be assigned are reviewed above under Quality of Project Design).

The Review will also consider the extent to which the management of the project minimised UNEP's environmental footprint.

Implementation of the management measures against the Safeguards Plan submitted at CEO Approval should be reviewed, the risk classifications verified and the findings of the effectiveness of any measures or lessons learned taken to address identified risks assessed. Any supporting documents gathered by the Consultant should be shared with the Task Manager.

³⁶The Evaluation Office notes that Gender Equality was first introduced in the UNEP Project Review Committee Checklist in 2010 and, therefore, provides a criterion rating on gender for projects approved from 2010 onwards. Equally, it is noted that policy documents, operational guidelines and other capacity building efforts have only been developed since then and have evolved over time. https://wedocs.unep.org/bitstream/handle/20.500.11822/7655/-Gender_equality_and_the_environment_Policy_and_strategy-2015Gender_equality_and_the_environment_policy_and_strategy.pdf.pdf?sequence=3&isAllowed=y

³⁷For the review of project concepts and proposals, the Safeguard Risk Identification Form (SRIF) was introduced in 2019 and replaced the Environmental, Social and Economic Review note (ESERN), which had been in place since 2016. In GEF projects safeguards have been considered in project designs since 2011.

vi. Country Ownership and Driven-ness

The Review will assess the quality and degree of engagement of government / public sector agencies in the project. While there is some overlap between Country Ownership and Institutional Sustainability, this criterion focuses primarily on the forward momentum of the intended projects results, i.e. either: a) moving forwards from outputs to project outcomes or b) moving forward from project outcomes towards intermediate states. The Review will consider the involvement not only of those directly involved in project execution and those participating in technical or leadership groups, but also those official representatives whose cooperation is needed for change to be embedded in their respective institutions and offices (e.g. representatives from multiple sectors or relevant ministries beyond Ministry of Environment). This factor is concerned with the level of ownership generated by the project over outputs and outcomes and that is necessary for long term impact to be realised. Ownership should extend to all gender and marginalised groups.

vii. Communication and Public Awareness

The Review will assess the effectiveness of: a) communication of learning and experience sharing between project partners and interested groups arising from the project during its life and b) public awareness activities that were undertaken during the implementation of the project to influence attitudes or shape behaviour among wider communities and civil society at large. The Review should consider whether existing communication channels and networks were used effectively, including meeting the differentiated needs of gendered or marginalised groups, and whether any feedback channels were established. Where knowledge sharing platforms have been established under a project the Review will comment on the sustainability of the communication channel under either socio-political, institutional or financial sustainability, as appropriate

The project's completed Knowledge Management Approach, including: Knowledge and Learning Deliverables (e.g. website/platform development); Knowledge Products/Events; Communication Strategy; Lessons Learned and Good Practice; Adaptive Management Actions should be reviewed. This should be based on the documentation approved at CEO Endorsement/Approval.

Section 3. REVIEW APPROACH, METHODS AND DELIVERABLES

The Terminal Review will be an in-depth review using a participatory approach whereby key stakeholders are kept informed and consulted throughout the review process. Both quantitative and qualitative review methods will be used as appropriate to determine project achievements against the expected outputs, outcomes and impacts. It is highly recommended that the consultant(s) maintains close communication with the project team and promotes information exchange throughout the review implementation phase in order to increase their (and other stakeholder) ownership of the review findings. Where applicable, the consultant(s) should provide a geo-referenced map that demarcates the area covered by the project and, where possible, provide geo-reference photographs of key intervention sites (e.g. sites of habitat rehabilitation and protection, pollution treatment infrastructure, etc.)

The findings of the Review will be based on the following:

- (a) A **desk review** of:
 - Relevant background documentation, inter alia;
 - Project design documents (including minutes of the project design review meeting at approval); Annual Work Plans and Budgets or equivalent, revisions to the project (Project Document Supplement), the logical framework and its budget;

- Project reports such as six-monthly progress and financial reports, progress reports from collaborating partners, meeting minutes, relevant correspondence and including the Project Implementation Reviews and Tracking Tool etc.;
- Project deliverables (e.g. publications, assessments etc): (to be shared separately)
- Mid-Term Review or Mid-Term Evaluation of the project;
- Evaluations/Reviews of similar projects.

(b) **Interviews** (individual or in group) with:

- UNEP Task Manager (TM);
- Project Manager (PM)
- Project management team;
- UNEP Fund Management Officer (FMO);
- Portfolio Manager and Sub-Programme Coordinator, where appropriate;
- Project partners, including co-financing partners. A list will be developed by the executing agency and shared with the evaluator;
- Relevant resource persons;
- Representatives from civil society and specialist groups (such as women's, farmers and trade associations etc).

(c) **Surveys** – to be determined as required

(d) **Field visits** – one mission to the country will be undertaken

(e) **Other data collection tools**– to be determined as required

11. Review Deliverables and Review Procedures

The Review Consultant will prepare:

- **Inception Report:** (see Annex 1 for a list of all templates, tables and guidance notes) containing an assessment of project design quality, a draft reconstructed Theory of Change of the project, project stakeholder analysis, review framework and a tentative review schedule.
- **Preliminary Findings Note:** typically in the form of a PowerPoint presentation, the sharing of preliminary findings is intended to support the participation of the project team, act as a means to ensure all information sources have been accessed and provide an opportunity to verify emerging findings.
- **Draft and Final Review Report:** containing an executive summary that can act as a stand-alone document; detailed analysis of the review findings organised by review criteria and supported with evidence; lessons learned and recommendations and an annotated ratings table.

Review Brief (a 2-page overview of the evaluation and review findings) for wider dissemination through the UNEP website may be required. This will be discussed with the Task Manager no later than during the finalization of the Inception Report.

Review of the Draft Review Report. The Review Consultant will submit a draft report to the Task Manager and revise the draft in response to their comments and suggestions. The Task Manager will then forward the revised draft report to other project stakeholders, for

their review and comments. Stakeholders may provide feedback on any errors of fact and may highlight the significance of such errors in any conclusions as well as providing feedback on the proposed recommendations and lessons. Any comments or responses to draft reports will be sent to the Task Manager for consolidation. The Task Manager will provide all comments to the Review Consultant for consideration in preparing the final report, along with guidance on areas of contradiction or issues requiring an institutional response.

The final version of the Terminal Review report will be assessed for its quality by the UNEP Evaluation Office using a standard template and this assessment will be annexed to the final Terminal Review report.

At the end of the review process, the Task Manager will prepare a **Recommendations Implementation Plan** in the format of a table, to be completed and updated at regular intervals, and circulate the **Lessons Learned**.

12. The Review Consultant

The Review Consultant will work under the overall responsibility of the Task Manager, Asher Lessels, in consultation with the Fund Management Officer, Fatma Twahir, the Head of Unit/Branch, Mark Radka, the Portfolio Managers, Geordie Colville and Ruth Coutto, and the Sub-programme Coordinators of the Climate Change Sub-programme, Niklas Hagelberg.

The Review Consultant will liaise with the Task Manager on any procedural and methodological matters related to the Review. It is, however, the consultant's individual responsibility (where applicable) to arrange for their visas and immunizations as well as to plan meetings with stakeholders, organize online surveys, obtain documentary evidence and any other logistical matters related to the assignment. The UNEP Task Manager and project team will, where possible, provide logistical support (introductions, meetings etc.) allowing the consultants to conduct the Review as efficiently and independently as possible.

The Review Consultant will be hired over a period of 6 months Q4 2022 to Q1 2023 and should have the following: a university degree in environmental sciences, international development, energy, climate, economics or other relevant area is required and an advanced degree in the same areas is desirable; a minimum of 5 years of technical / evaluation experience is required, preferably including evaluating large, regional or global programmes and using a Theory of Change approach; and a good/broad understanding of energy is desired. English and French are the working languages of the United Nations Secretariat. For this consultancy, fluency in oral and written English and Spanish is a requirement. Working knowledge of the UN system and specifically the work of UNEP is an added advantage. The work will be home-based with possible field visits.

The Review Consultant will be responsible, in close consultation with the Task Manager, for overall quality of the review and timely delivery of its outputs, described above in Section 11 Review Deliverables, above. The Review Consultant will ensure that all review criteria and questions are adequately covered.

13. Schedule of the Review

The table below presents the tentative schedule for the Review.

Table 3. Tentative schedule for the Review

Milestone	Tentative Dates
-----------	-----------------

Review Mission	February 2024
Inception Report	April 2024
Final Review Report	May 2024
Final Review Report shared with all respondents	June 2024

14. Contractual Arrangements

The Review Consultant(s) will be selected and recruited by the Task Manager under an individual Special Service Agreement (SSA) on a “fees only” basis (see below). By signing the service contract with UNEP/UNON, the consultant certifies that they have not been associated with the design and implementation of the project in any way which may jeopardize their independence and impartiality towards project achievements and project partner performance. In addition, they will not have any future interests (within six months after completion of the contract) with the project’s executing or implementing units. All consultants are required to sign the Code of Conduct Agreement Form.

Fees will be paid on an instalment basis, paid on acceptance and approval by the Task Manager of expected key deliverables. The schedule of payment is as follows:

Schedule of Payment:

Deliverable	Percentage Payment
Approved Inception Report (<i>as per Annex I document #9</i>)	30%
Approved Final Main Review Report	70%

Fees only contracts: Where applicable, air tickets will be purchased by UNEP and 75% of the Daily Subsistence Allowance for each authorised travel mission will be paid up front. Local in-country travel will only be reimbursed where agreed in advance with the Task Manager and on the production of acceptable receipts. Terminal expenses and residual DSA entitlements (25%) will be paid after mission completion.

The consultant may be provided with access to UNEP’s information management systems (e.g. PIMS, Anubis, SharePoint, etc.) and, if such access is granted, the consultants agree not to disclose information from that system to third parties beyond information required for, and included in, the Review Report.

In case the consultant is not able to provide the deliverables in accordance with these guidelines, and in line with the expected quality standards by UNEP, payment may be withheld at the discretion of the Head of Branch or Portfolio Manager until the consultants have improved the deliverables to meet UNEP’s quality standards.

If the consultant fails to submit a satisfactory final product to the Project Manager in a timely manner, i.e. before the end date of their contract, UNEP reserves the right to employ additional human resources to finalize the report, and to reduce the consultant’s fees by an amount equal to the additional costs borne by the project team to bring the report up to standard or completion.

ANNEX IX. QUALITY ASSESSMENT OF THE REVIEW REPORT (PROVIDED BY THE UNEP EVALUATION OFFICE)

Review Title: **Solar Water Heater Market Development and Energy Efficiency Project** (GEF ID 5287)

Consultant: Pablo Caldeiro Sarli

All UNEP Reviews are subject to a quality assessment by the UNEP Evaluation Office. This is an assessment of the quality of the review product (i.e. Main Review Report).

	UNEP Evaluation Office Comments	Final Review Report Rating
Report Quality Criteria		
Quality of the Executive Summary <u>Purpose:</u> acts as a stand alone and accurate <u>summary</u> of the main review product, especially for senior management. To include: • concise overview of the review object • clear summary of the review objectives and scope • overall review rating of the project and key features of performance (strengths and weaknesses) against exceptional criteria • reference to where the review ratings table can be found within the report • summary response to key strategic review questions • summary of the main findings of the exercise/synthesis of main conclusions • summary of lessons learned and recommendations.	Final report (coverage/omissions): It is missing summary responses to the key strategic review questions. Final report (strengths/weaknesses): It concisely describes the project and highlights some of the projects performance strengths and weaknesses. However, it does not provide enough detail on the assessment of most of the criteria, especially of effectiveness (outputs, outcomes and impact), nor on the sustainability of project results—the two highest weighted criteria.	3
Quality of the 'Introduction' Section <u>Purpose:</u> introduces/<u>situates</u> the evaluand in its institutional context, establishes its main parameters (time, value, results, geography) and the purpose of the review itself. To include: • institutional context of the project (sub-programme, Division, Branch etc) • date of PRC approval, project duration and start/end dates • number of project phases (where appropriate) • results frameworks to which it contributes (e.g. POW Direct Outcome) • coverage of the review (regions/countries where implemented) • implementing and funding partners • total secured budget • whether the project has been reviewed/evaluated in the past (e.g. mid-term, external agency etc.) • concise statement of the purpose of the review and the key intended audience for the findings.	Final report (coverage/omissions): It is missing reference to the UNEP results framework to which the project contributes. It is also missing the total secured budget, as it only references the planned budget. Further, it does not explicitly state that the objective of the project was focused on Panama. Final report (strengths/weaknesses):	4
Quality of the 'Review Methods' Section <u>Purpose:</u> provides reader with clear and comprehensive description of review methods, demonstrates the <u>credibility</u> of the findings and performance ratings. To include: • description of review data collection methods and information sources • justification for methods used (e.g. qualitative/quantitative; electronic/face-to-face) • number and type of respondents (<i>see table template</i>) • selection criteria used to identify respondents, case studies or sites/countries visited	Final report (coverage/omissions): It includes mostly all required information, except for details on how data were verified (triangulation). Final report (strengths/weaknesses): It describes selection criteria for respondents and site visits, and also methods to increase respondent rates. However, the description of the secondary data (document review) seems to have been copied (and not edited) from the TOR, as the text is	3

• strategies used to increase stakeholder engagement and consultation • methods to include the voices/experiences of different and potentially excluded groups (e.g. vulnerable, gender, marginalised etc) • details of how data were verified (e.g. triangulation, review by stakeholders etc.) • methods used to analyse data (scoring, coding, thematic analysis etc) • review limitations (e.g. low/ imbalanced response rates across different groups; gaps in documentation; language barriers etc) • ethics and human rights issues should be highlighted including: how anonymity and confidentiality were protected. Is there an ethics statement? E.g. <i>'Throughout the review process and in the compilation of the Final Review Report efforts have been made to represent the views of both mainstream and more marginalised groups. All efforts to provide respondents with anonymity have been made.'</i>	general and seems more instructive. The description of data analysis is also lacking.	
Quality of the 'Project' Section <u>Purpose:</u> describes and <u>verifies</u> key dimensions of the evaluand relevant to assessing its performance. To include: • <i>Context:</i> overview of the main issue that the project is trying to address, its root causes and consequences on the environment and human well-being (i.e. synopsis of the problem and situational analyses) • <i>Results framework:</i> summary of the project's results hierarchy as stated in the ProDoc (or as officially revised) • <i>Stakeholders:</i> description of groups of targeted stakeholders organised according to relevant common characteristics • <i>Project implementation structure and partners:</i> description of the implementation structure with diagram and a list of key project partners • <i>Changes in design during implementation:</i> any key events that affected the project's scope or parameters should be described in brief in chronological order • <i>Project financing:</i> completed tables of: (a) budget at design and expenditure by components (b) planned and actual sources of funding/co-financing	Final report (coverage/omissions): All required elements are included. Final report (strengths/weaknesses): It describes many of the <i>changes in design during implementation</i>, but it would have been more effective to list each project revision in chronological order. The section on <i>stakeholders</i> could have been improved by organizing the entities based on common characteristics, instead each key group was listed and described individually. Sections of the <i>project implementation structure</i> section seemed to have been taken from the Prodoc and not edited for tense.	4
Quality of the Theory of Change <u>Purpose:</u> to set out the TOC at Review in diagrammatic and narrative forms to support consistent project performance; to articulate the causal pathways with drivers and assumptions and justify any reconstruction necessary to assess the project's performance. To include: • description of how the <i>TOC at Review</i>³⁸ was designed (who was involved etc)	Final report (coverage/omissions): All required elements are included. Final report (strengths/weaknesses): The description of how the TOC at Review was constructed is helpful, as is the TOC diagram. However, articulation of the causal pathways could have been clearer and more comprehensive. The narrative was	3

³⁸ During the Inception Phase of the review process a *TOC at Review Inception* is created based on the information contained in the approved project documents (these may include either logical framework or a TOC or narrative descriptions), formal revisions and annual reports etc. During the review process this TOC is revised based on changes made during project intervention and becomes the *TOC at Review*.

- confirmation/reconstruction of results in accordance with UNEP definitions - articulation of causal pathways - identification of drivers and assumptions - identification of key actors in the change process - summary of the reconstruction/results re-formulation in tabular form. <i>The two results hierarchies (original/formal revision and reconstructed) should be presented as a two-column table to show clearly that, although wording and placement may have changed, the results 'goal posts' have not been 'moved'.</i> This table may have initially been presented in the Inception Report and should appear somewhere in the Main Review report.	missing clear articulation and identification of the Outputs and Outcomes. Some Assumptions were identified and discussed, but Drivers were not explicitly identified. And the causal pathways toward the Intermediate States and Impact were not described. The EOU notes that Table 4 appears to be missing 3 outcomes, but these are represented in the TOC, Figure 3.	
Quality of Key Findings within the Report <u>Presentation of evidence:</u> nature of evidence should be clear (interview, document, survey, observation, online resources etc) and evidence should be explicitly triangulated unless noted as having a single source. <u>Consistency within the report:</u> all parts of the report should form consistent support for findings and performance ratings, which should be in line with UNEP's Criteria Ratings Matrix. <u>Findings Statements (where applicable):</u> The frame of reference for a finding should be an individual review criterion or a strategic question from the TOR. A finding should go beyond description and uses analysis to provide insights that aid learning specific to the evaluand. In some cases a findings statement may articulate a key element that has determined the performance rating of a criterion. Findings will frequently provide insight into 'how' and/or 'why' questions.	Final report (coverage/omissions): The report does not include explicitly labelled findings. Final report (strengths/weaknesses): Most of the evidence of the analysis is clear.	5
Quality of 'Strategic Relevance' Section <u>Purpose:</u> to present evidence and analysis of project strategic relevance with respect to UNEP, partner and geographic policies and strategies at the time of project approval. To include: Assessment of the evaluand's relevance vis-à-vis: - Alignment to the UNEP Medium Term Strategy (MTS), Programme of Work (POW) and Strategic Priorities - Alignment to Donor/GEF/Partners Strategic Priorities - Relevance to Regional, Sub-regional and National Environmental Priorities - Complementarity with Existing Interventions: complementarity of the project at design (or during inception/mobilisation³⁹), with other interventions addressing the needs of the same target groups.	Final report (coverage/omissions): All required elements were covered. Final report (strengths/weaknesses): It describes relevance to national priorities well. However, there is no evidence of complementarity with other interventions, only a list of other UNEP initiatives focused on promoting solar water heating.	4
Quality of the 'Quality of Project Design' Section <u>Purpose:</u> to present a summary of the strengths and weaknesses of the project design, on the basis that the detailed assessment was presented in the Inception Report.	Final report (coverage/omissions): All required elements were covered. Final report (strengths/weaknesses): It describes some of the project designs strengths well. However, the	4

³⁹ A project's inception or mobilization period is understood as the time between project approval and first disbursement. Complementarity during project implementation is considered under Efficiency, see below.

	description of some of the weaknesses is hard to follow due to language formulation.	
Quality of the 'Nature of the External Context' Section <u>Purpose:</u> to describe and recognise, when appropriate, key <u>external</u> features of the project's implementing context that limited the project's performance (e.g. conflict, natural disaster, political upheaval⁴⁰), and how they affected performance. While additional details of the implementing context may be informative, this section should clearly record whether or not a major and unexpected disrupting event took place during the project's life in the implementing sites.	Final report (strengths/weaknesses): It includes a description of the COVID-19 pandemic as an external factor.	5
Quality of 'Effectiveness' Section (i) Availability of Outputs: <u>Purpose:</u> to present a well-reasoned, complete and evidence-based assessment of the outputs made available to the intended beneficiaries. To include: • a convincing, evidence-supported and clear presentation of the outputs made available by the project compared to its approved plans and budget • assessment of the nature and scale of outputs versus the project indicators and targets • assessment of the timeliness, quality and utility of outputs to intended beneficiaries • identification of positive or negative effects of the project on disadvantaged groups, including those with specific needs due to gender, vulnerability or marginalisation (e.g. through disability).	Final report (coverage/omissions): Final report (strengths/weaknesses): The assessment is supported by reference to various sources, e.g., interviews, reports, meeting documentation. It would have been helpful to include the formal names of the documents. There is also some mention of triangulations efforts. The section includes many visuals to complement the narrative assessment. However, there is no discussion of the outputs in relation to indicators and targets. The outputs are written like indicators (e.g., one market assessment; a government endorsed SWH action plan) and it is unclear if they have any indicators. Outputs should have been reformulated during Inception to be aligned with UNEP's definition of outputs.	4
ii) Achievement of Project Outcomes: <u>Purpose:</u> to present a well-reasoned, complete and evidence-based assessment of the uptake, adoption and/or implementation of outputs by the intended beneficiaries. This may include behaviour changes at an individual or collective level. To include: • a convincing and evidence-supported analysis of the uptake of outputs by intended beneficiaries • assessment of the nature, depth and scale of outcomes versus the project indicators and targets • discussion of the contribution, credible association and/or attribution of outcome level changes to the work of the project itself	Final report (coverage/omissions): Final report (strengths/weaknesses): It includes a well-reasoned and evidence-supported assessment of each of the project outcomes.	5

⁴⁰ Note that 'political upheaval' does not include regular national election cycles, but unanticipated unrest or prolonged disruption. The potential delays or changes in political support that are often associated with the regular national election cycle should be part of the project's design and addressed through adaptive management of the project team.

- any constraints to attributing effects to the projects' work - identification of positive or negative effects of the project on disadvantaged groups, including those with specific needs due to gender, vulnerability or marginalisation (e.g. through disability).		
(iii) Likelihood of Impact: <u>Purpose:</u> to present an integrated analysis, guided by the causal pathways represented by the TOC, of all evidence relating to likelihood of impact, including an assessment of the extent to which drivers and assumptions necessary for change to happen, were seen to be holding. To include: - an explanation of how causal pathways emerged and change processes can be shown - an explanation of the roles played by key actors and change agents - explicit discussion of how drivers and assumptions played out - identification of any unintended negative effects of the project, especially on disadvantaged groups, including those with specific needs due to gender, vulnerability or marginalisation (e.g. through disability).	Final report (coverage/omissions): Final report (strengths/weaknesses): It presents a good narrative of the aspects of the causal pathways that were achieved, and those aspects of project Outcomes that were not fully achieved and the assumptions that did not fully hold. However, it does not include assessment of drivers.	4
Quality of 'Financial Management' Section <u>Purpose:</u> to present an integrated analysis of all dimensions evaluated under financial management and include a completed 'financial management' table (may be annexed). Consider how well the report addresses the following: <i>adherence</i> to UNEP's financial policies and procedures <i>completeness</i> of financial information, including the actual project costs (total and per activity) and actual co-financing used <i>communication</i> between financial and project management staff	Final report (coverage/omissions): All required elements are covered. Final report (strengths/weaknesses): It presents an informational analysis of the three dimensions of financial management.	5
Quality of 'Efficiency' Section <u>Purpose:</u> to present an integrated analysis of all dimensions evaluated under efficiency (i.e. the primary categories of cost-effectiveness and timeliness). To include: - time-saving measures put in place to maximise results within the secured budget and agreed project timeframe - discussion of making use, during project implementation, of/building on pre-existing institutions, agreements and partnerships, data sources, synergies and complementarities with other initiatives, programmes and projects etc. - implications of any delays and no cost extensions - the extent to which the management of the project minimised UNEP's environmental footprint.	Final report (coverage/omissions): All required elements are covered. Final report (strengths/weaknesses): It presents a good assessment of the rationale and minimal implications of the no-cost extension, as well as the project's cost-efficiency related to having received a fraction of the planned co-financing.	5
Quality of 'Monitoring and Reporting' Section <u>Purpose:</u> to present well-reasoned, complete and evidence-based assessment of the evaluand's monitoring and reporting. Consider how well the report addresses the following: quality of the monitoring design and budgeting (including SMART results with measurable indicators, resources for MTE/R etc.)	Final report (coverage/omissions): All required elements are covered. Final report (strengths/weaknesses): It describes some of the monitoring-related shortcomings well, such as the confusing and incorrect formulation of results statements in	4

- quality of monitoring of project implementation (including use of monitoring data for adaptive management) - quality of project reporting (e.g. PIMS and donor reports) \	the Monitoring Plan. However, it is missing assessment of some key aspects such as the extent to which reporting data disaggregated by vulnerable/ marginalized groups	
Quality of 'Sustainability' Section Purpose: to present an integrated analysis of all dimensions evaluated under sustainability (i.e. the endurance of benefits achieved at outcome level). Consider how well the report addresses the following: - socio-political sustainability - financial sustainability - institutional sustainability	Final report (coverage/omissions): All required elements are covered. Final report (strengths/weaknesses): It assesses the three dimensions of sustainability well. However, it does not discuss all key aspects, including whether an exit strategy has been developed.	5
Quality of Factors Affecting Performance Section Purpose: These factors are not always discussed in stand-alone sections and may be integrated in the other performance criteria as appropriate. However, if not addressed substantively in this section, a cross reference must be given to where the topic is addressed and that entry must be sufficient to justify the performance rating for these factors. Consider how well the review report, either in this section or in cross-referenced sections, covers the following cross-cutting themes: - preparation and readiness - quality of project management and supervision⁴¹ - stakeholder participation and co-operation - responsiveness to human rights and gender equality - environmental and social safeguards - country ownership and driven-ness - communication and public awareness	Final report (coverage/omissions): All required elements are covered. Final report (strengths/weaknesses): The assessment of Responsiveness to Human Rights and Gender presents the project's efforts to consider and engage women and other marginalized groups (e.g., indigenous populations) well. The information on the <i>Preparation and Readiness</i> is written with little to no detail about the various elements of this phase, including regarding completeness and quality (e.g. inception meeting, workplan). There is also very little detail about the <i>Project Management and Supervision</i>. It would have been helpful to have examples of the project manager's and Steering Committee's excellent leadership. However, there is evidence for quality of project management in other sections of the report, including on effective adaptive management.	4
Quality of the Conclusions Section (i) Conclusions Narrative: Purpose: to present summative statements reflecting on prominent aspects of the <u>performance of the evaluand as a whole</u>, they should be derived from the synthesized analysis of evidence gathered during the review process. To include:	Final report (coverage/omissions): Final report (strengths/weaknesses): It presents a comprehensive view of the project's performance based on the previously presented criteria analysis, describing key	5

⁴¹ In some cases 'project management and supervision' will refer to the supervision and guidance provided by UNEP to implementing partners and national governments while in others, specifically for GEF funded projects, it will refer to the project management performance of the executing agency and the technical backstopping provided by UNEP. This includes providing the answers to the questions on Core Indicator Targets, stakeholder engagement, gender responsiveness, safeguards and knowledge management, required for the GEF portal.

• compelling narrative providing an integrated summary of the strengths and weakness in overall performance (achievements and limitations) of the project • clear and succinct response to the key strategic questions • human rights and gender dimensions of the intervention should be discussed explicitly (e.g. how these dimensions were considered, addressed or impacted on)	achievements and limitations. Responses to the key strategic questions are interwoven, as is a discussion of the project's consideration and inclusion of women and other marginalized groups.	
ii) Utility of the Lessons: <u>Purpose:</u> to present both positive and negative lessons that have potential for wider application and use (replication and generalization) Consider how well the lessons achieve the following: • are rooted in real project experiences (i.e. derived from explicit review findings or from problems encountered and mistakes made that should be avoided in the future) • briefly describe the context from which they are derived and those contexts in which they may be useful • do not duplicate recommendations	Final report (strengths/weaknesses): The lessons learned are appropriately linked to findings in the report and could be generalizable.	5
(iii) Utility and Actionability of the Recommendations: <u>Purpose:</u> to present proposals for specific action to be taken by identified people/position-holders to resolve concrete problems affecting the project or the sustainability of its results. Consider how well the lessons achieve the following: • are feasible to implement within the timeframe and resources available (including local capacities) and specific in terms of who would do what and when • include at least one recommendation relating to strengthening the human rights and gender dimensions of UNEP interventions • represent a measurable performance target in order that the UNEP Unit/Branch can monitor and assess compliance with the recommendations. NOTES: (i) In cases where the recommendation is addressed to a third party, compliance can only be monitored and assessed where a contractual/legal agreement remains in place. Without such an agreement, the recommendation should be formulated to say that UNEP project staff should pass on the recommendation to the relevant third party in an effective or substantive manner. The effective transmission by UNEP of the recommendation will then be monitored for compliance. (ii) Where a new project phase is already under discussion or in preparation with the same third party, a recommendation can be made to address the issue in the next phase.	Final report (strengths/weaknesses): Some of the recommendations are presented clearly and actionable (e.g., establishment of a website to sustain and continue dissemination of project knowledge). Others are not so clear (although well-intentioned) and the performance target not well defined (e.g., preparation of problem objective with SMART design).	4
Quality of Report Structure and Presentation (i) Structure and completeness of the report: To what extent does the report follow the UNEP Evaluation Office structure and formatting guidelines? Are all requested Annexes included and complete?	Final report (coverage/omissions): The Review Framework Annex is listed as Annex III, but instead, the Justification for Reformulation of Results Statement is presented. Therefore, the Framework is missing. Final report (strengths/weaknesses): The report mostly follows the Evaluation Office's format and guidelines. However, the numbering	3

	of tables was not reviewed in the final report, and as a result the tables are all numbered chronologically, some numbers are repeated, and there is inaccurate reference to some tables (e.g., para 235 references the Financial Management Table as table 8, but it is labelled Table 10)	
(ii) Writing and formatting: Consider whether the report is well written (clear English language and grammar) with language that is adequate in quality and tone for an official document? Do visual aids, such as maps and graphs convey key information?	Final report (strengths/weaknesses): The report includes many visual aids that complement the assessments and findings. The tone of the report is adequate. However, the grammar and sentence formulation is not always correct and, as a result, some paragraphs and sections were not always clear.	4
OVERALL REPORT QUALITY RATING		4.1

A number rating 1-6 is used for each criterion: Highly Satisfactory = 6, Satisfactory = 5, Moderately Satisfactory = 4, Moderately Unsatisfactory = 3, Unsatisfactory = 2, Highly Unsatisfactory = 1. The overall quality of the review report is calculated by taking the mean score of all rated quality criteria.

ANNEX X. LIST OF MEDIA APPEARANCES, PERFORMED EVENTS AND DEMONSTRATIVE PROJECTS

Table 11 - List of media appearances of GEF Termoslar Project

Media	Attendants	Date	Facebook	Twitter	Instagram	You Tube	Linkedin	Web
Telemetro	Abierto	14/2/2020	688520	885969	1500000	173000		www.telemetro.com
La Estrella Panama	30000	14/2/2020	123954	308685	110	24700	198	www.laestrella.com.pa
SUMARSE	Abierto	S/D	6947	5909	5602	810	S/D	www.sumarse.org.pa
Ministerio de Obras Publicas Panama	0	18/4/2020	0	64622	0	0	0	"@MOPPma"
Telemetro Reporta	-	18/4/2020	-	864177	-	-	-	"@TReporta"
MetroLibre	Abierto	18/4/2020	89000	132243	106000	1770	21	www.metrolibre.com
Telemetro Reporta	-	18/4/2020	-	864177	-	-	-	"@TReporta"
Presidencia Panamá	-	18/4/2020	-	62640	-	-		
Presidencia Panamá	-	18/4/2020	-	62640	-	-		
Ministerio de salud Panama		18/4/2020	184091	237362	573000	1600	450	www.minsa.gob.pa
		18/4/2020	688520	885969	1500000	173000		www.telemetro.com
En segundos	S/D	18/4/2020	8800	8027	15100	2480	S/D	www.ensegundos.com.pa
Newsroom Panama	S/D	18/4/2020	1800	S/D	S/D	S/D	S/D	www.newsroompanama.com
La Estrella Panama	30000	19/4/2020	123954	308685	110	24700	198	www.laestrella.com.pa
Radio Panama	S/D	18/4/2020	12000	92493	34500	1030	7	www.radiopanama.com.pa
wao 97.3 RADIO		19/4/2020	228682	218278	182000	7310	S/D	www.wao975.com
Ministerio de Obras Publicas	S/D	18/4/2020	6465	64622	21600	2480	0	
Mi Diario		19/4/2020	223337	360279	549000	5330	S/D	www.midiario.com
UNEP	S/D	18/4/2020	S/D	S/D	S/D	S/D	S/D	www.unep.org
Municipalidad de Panamá		30/7/2020	49225	111608	117000	2280	556	www.mupa.gob.pa
Crisol FM (SerTV Panama)		29/6/2020	141466	71874	147000	62700	207	www.sertv.gob.pa
Panamá America		28/6/2020	115589	300154	106000	11700	1464	www.panamaamerica.com.pa
Crítica		27/6/2020	934292	206140	208000	22100	S/D	www.critica.com.pa
Ministerio de Ambiente		26/6/2020	14729	60711	46500	1740	1604	www.miambiente.gob.pa
Energía Estrategica		29/1/2021	20000	9859	3236	1990	24634	www.energiaestrategica.com
La Estrella Panama	30000	5/12/2021	123954	308685	110	24700	198	www.laestrella.com.pa
UNEP	S/D	28/1/2021	S/D	S/D	S/D	S/D	S/D	www.unep.org
Ministerio de Ambiente		11/5/2021	14729	60711	46500	1740	1604	www.miambiente.gob.pa
Enlace empresarial		26/6/2020	9000	16000	7000	1000	S/D	www.enlaceempresarialcciap.com
ENSA servicios			482	282	5813	100	11831	www.ensaservicios.com
Hosteltur		17/5/2021	S/D	105641	S/D	S/D	S/D	www.hosteltur.com
UTP		12/1/2021		39393	64800	9380	53642	www.utp.ac.pa
Centro de Información sobre Empresas y Derechos Humanos		23/5/2021	9370	27799	S/D	S/D	S/D	https://www.business-humanrights.org/es/
Revista Agenda		19/6/2019	21000	4343	1664	30	S/D	www.revistaagenda.net
Energías Renovables		12/5/2021	316939	77349	S/D		44212	

ITSE		17/11/2020	1900	2702	25800	755	602	www.itse.ac.pa
dplnews		10/5/2022	895	14622	470	3030	2323	www.dplnews.com
ENSA		19/6/2019	15181	34382	47500	1910	S/D	www.ensa.com.pa
Panamá America		20/6/2019	115589	300154	106000	11700	1464	www.panamaamerica.com.pa
Inmobilia		4/11/2019	73894	3092	6392	S/D	S/D	www.inmobilia.com
SeTv		28/1/2021	141466	71874	147000	62700	207	www.sertv.gob.pa
Forbes Centroamérica		12/5/2021	209231	41286	20700	1240	S/D	www.forbescentroamerica.com
Prensa real Estate		20/6/2019	7182	1683	S/D	31	S/D	www.prensarealestate.com
Efe		19/6/2019	81353	2098076	71400	872000	S/D	www.efecom
MiDiario		1/7/2020	223354	360350	549000	5330	S/D	www.midiario.com
Telemetro		30/4/2021	688520	885969	1500000	173000		www.telemetro.com
Ministerio de Ambiente		22/6/2021	14729	60711	46500	1740	1604	www.miambiente.gob.pa
somos IMpacto Positivo		25/6/2021						www.somosimpactopositivo.com
SeTv		30/4/2021	141466	71874	147000	62700	207	www.sertv.gob.pa
Press reader		1/5/2021						www.pressreader.com
UNEP		22/9/2020	S/D	S/D	S/D	S/D	S/D	www.unep.org
La Estrella Panama		22/5/2019	123954	308685	110	24700	198	www.laestrella.com.pa
Telemetro		19/7/2022	688520	885969	1500000	173000		www.telemetro.com
Camara Solar Panama		23/10/2019						www.camarasolarpanama.org

Table 12 -Event participation list

Event	Date	Attendants	Mode
Taller de discusión sobre normativa de calentamiento solar de agua	23/5/2019	25	Presencial
Tecnología solar térmica y su regulación legal	4/4/2019	Unknown	Presencial
Análisis del mercado solar térmico en Panamá	12/4/2019	Unknown	Presencial
Capacitación en Diseño de sistemas de calentamiento de agua y construcción sostenible (LEED)	24/4/2019 al 27/04/2019	25	Presencial
Taller de discusión del plan de acción para la implementación de la tecnología solar térmica	6/6/2019	Unknown	Presencial
Lanzamiento de campaña de sensibilización del proyecto Termosolar Panamá	19/6/2019	Unknown	Presencial
Reunion de Junta directiva	19/6/2019	Unknown	Presencial
Curso Energía Solar Térmica	9/07/2019 al 10/7/2019	Unknown	Presencial
Curso de Guía de Construcción Sostenible para el Ahorro en Energía en Edificaciones de Panamá	11/7/2019	Unknown	Presencial
Seminario LEED Green Associate	12/04/2019 al 13/07/2019	Unknown	Presencial
Seminario en Design-Lighting 2019- COBITEL	25/07/2019 al 26/07/019	Unknown	Presencial
Jornada virtual-Alcance de la implementación de Termosolar Panamá	30/7/2019	Unknown	Presencial
Oportunidades de negocio en el sector industrial asociado al uso de la tecnología solar térmica en Pan	21/8/2019	Unknown	Presencial
Taller de discusión Manual de Fabricación y Norma de Insatallacion para calentadores solares de agua	22/8/2019	Unknown	Presencial
Taller en EXPOCAPAC 2019	11/09/2019 al 15/09/2019	Unknown	Presencial
Presentación en RENPOWER , El salvador	25/09/2019 al 26/09/2019	Unknown	Presencial
Curso Energía Solar Térmica	15/10/2019 al 16/10/2019	28	Presencial
Curso de Guía de Construcción Sostenible para el Ahorro en Energía en Edificaciones de Panamá	17/10/2019	28	Presencial
Seminario LEED Green Associate	18/10/2019 al 19/10/2019	28	Presencial
Curso de entrenamiento de profesores en energía solar térmica	28/10/2019 al 31/10/2019	Unknown	Presencial
Taller de discusión sobre normativa de calentamiento solar de agua	21/11/2019	Unknown	Presencial
Taller de entrenamiento en diseño, instalación, mantenimiento y servicios post-venta de calentadores	22/11/2019	Unknown	Presencial
Jornada Virtual: Como cuidar tu calentador de agua	3/12/2022	Unknown	Presencial
Métodos de prueba para aseguramiento de la calidad en colectores solares	12/2/2020	Unknown	Virtual
Presentación Plan de negocio de sistemas de calentamiento solar de agua para la cámara panameña de energía solar		Unknown	Presencial
WEBINAR PERSPECTIVAS TÉCNICAS Y ECONÓMICAS; RECOMENDACIONES Y MEDIDAS PARA LA REACTI	4/5/2020	Unknown	Virtual
CURSO DE CAPACITACIÓN EN MANEJO DE EQUIPOS DE LABORATORIO PARA EVALUAR CALIDAD DE CO	8/06/2020 al 17/06/2020	22	Virtual
¿Por qué Latinoamérica debe asegurar la presencia de las Energías Renovables durante la construcció	22/5/2020	Unknown	Virtual
Construyendo desarrollo sostenible en tiempos de crisis-Presentacion virtual	14/5/2020	Unknown	Virtual
Reunion de Junta directiva-Virtual	6/7/2020	Unknown	Virtual
Presentacion de avances del Proyecto termosolar Panama-Virtual	7/7/2020	26	Virtual
Taller virtual para proveedores de CSA sobre cálculos de amortización y ahorro de combustible	26/8/2020	12	Virtual
Seminario sobre energía solar térmica en barbados-virtual	19/11/2020	Unknown	Virtual
¿Cómo avanza la energía solar térmica en Panamá? (Programa conexión tierra)	20/11/2020	Unknown	Virtual
Aprende a vender: Mi experiencia con la venta de calentadores solares de agua en latinoamérica-virtu	17/11/2020	Unknown	Virtual
Café Solar			
Café solar 1: Beneficios de la tecnología solar térmica	24/10/2018	53	Presencial
Café Solar 2: Hablemos sobre los beneficios de la tecnología solar térmica	30/11/2018	Unknown	Presencial
Café solar 3: Experiencias de la Asociación Nacional de Energía Solar (ANES) en el desarrollo del merca	13/3/2022	Unknown	Presencial
Café solar 4: Energía solar térmica-Innovación e industria	14/3/2019	Unknown	Presencial
Café solar 5: Energía solar térmica: lo que deben saber los periodistas	14/5/2019	Unknown	Presencial
Café solar 6: Energía Solar Térmica: oportunidades económicas para el sector hotelero.	23/5/2019	Unknown	Presencial
Café solar 7: Beneficios de la tecnología solar térmica y oportunidades laborales	24/5/2019	Unknown	Presencial
Café solar 8: Oportunidades para la energía solar térmica en el sector indutrial	21/11/2019	Unknown	Presencial
Café solar 9: Termosolar Panama	19/11/2019	Unknown	Presencial
Café solar 10: sin datos		Unknown	
Café solar 11: Los grandes beneficios de la energía solar al ambiente	14/4/2021		Virtual
Café solar 12: Casos de éxito de la aplicaión de la energía solar térmica en latinoamérica	26/5/2021		Virtual
Café solar 13: Experiencias del control de calidad en equipos de calentamiento solar d eagua en latino	30/6/2021		Virtual
Café solar 14: perspectivas de género en la energía solar y la acción climática	26/7/2021		Virtual
Café solar 15: Refrigeración y cocción solar	25/8/2021		Virtual
Café solar 16:Concentración y desalación solar	29/9/2021		Virtual
Café solar 17: Beneficios de la energía solar térmica en el sector salud	27/10/2021		Virtual
Café solar 18: Innovación y nuevos productos para la energía solar térmica	24/11/2021		Virtual
Café solar 29: Estado actual de la energía solar térmica en el mundo	18/1/2022		Virtual
Café solar 20: Requisitos estructurales, hidráulicos y de seguridad industrial para la instalación de siste	26/1/2022		Virtual
Café solar 25: Evaluación de la conformidad-Casos de éxito en Chile	9/11/2022		Virtual
Café solar 26: Secador Solar: Principios básicos y principales aplicaciones	26/11/2022		Virtual
Café solar 28: Estado actual de los proveedores y el mercado solar térmico a nivel internacional	9/11/2022		Virtual

Table 13 – List of demonstrative projects installed (direct and indirect) within the project timeframe

	Institution	Sector	Area (m ²)	Type
1	Veterinaria Summit	Health	5	Direct
2	Hospital Panama Solidario	Health	12	Direct
3	Residence Los Años Dorados	Health	4	Direct
4	Hospital Rural Inabaguíña	Health	4	Direct
5	Parque Internac. La Amistad	Public	4	Direct
6	Hato Chami Rural School	Public	6	Direct
7	Hospital San Miguel Arcangel	Health	104	Direct
8	Hospital Obaldía	Health	186	Direct
9	Hospital Chicho Fabregas	Health	104	Direct
10	Fundación “Nueva Vida”	CSO	8	Direct
11	ENSA Servicios	Commerce	8	Indirect
12	Hotel Albrook Inn	Hotel	8	Indirect
13	Panama City	Residential	30	Indirect
14	Panamá Oeste	Residential	2	Indirect
15	Panama Pacifico	Residential	5	Indirect
16	Hotel Riverside Inn	Hotel	2	Indirect
17	Avicola Melo	Industry	210	Indirect
18	Cocina Central Pio Pio	Industry	64	Indirect
19	Business Park	Commercial	10	Indirect

ANNEX XI. GEF PORTAL INPUTS

The following table contains text to be uploaded to the GEF Portal. **It will be drawn from the Review Report, either as copied or summarised text.** In each case, references should be provided for the paragraphs and pages of the report from which the responses have been copied or summarised.

Table 14 - GEF portal inputs

Question: What was the performance at the project's completion against Core Indicator Targets? (For projects approved prior to GEF-7²⁰, these indicators will be identified retrospectively and comments on performance provided²¹).

Response: The GEF core indicator 6: GHG emissions mitigated, is aligned with the Project Objective Outcome indicators presented at the CEO endorsement stage. Nevertheless, the indicators were rephrased during the project's 4th revision in October 2021, based on the MTR recommendations from February 2021, where the concept of direct impact was corrected as the installed area (m²) directly financed by the project. Indirect impact was defined as installations primarily relying on private and public investments without project support. Additionally, the direct impact of the project and post-project impact were differentiated. Based on this, new targets for direct and indirect impact were adjusted, including area (m²), energy avoided (MWh/year), and GHG emissions (tCO₂ over the lifespan). The project has reached the end of project target regarding direct impacts and exceeded it regarding indirect impacts, once reformulated during 4th revision.

Question: What were the progress, challenges and outcomes regarding engagement of stakeholders in the project/program as evolved from the time of the MTR? (This should be based on the description included in the Stakeholder Engagement Plan or equivalent documentation submitted at CEO Endorsement/Approval)

Response: The CEO Endorsement document describes how stakeholders will be engaged in project implementation, mainly through project administration. The planned instances for project administration and execution proceeded as expected, under the leadership of the PMU, involving stakeholders in various activities that ensured representation of different groups. The main challenge was the COVID-19 pandemic, which halted activities and in-person meetings, prompting stakeholders to quickly adapt to virtual settings to keep the project's planned activities on track. At the same time, the pandemic severely impacted some stakeholders' sectors, causing them to suspend their activities - PBGC did not participate in most meetings-. To address this, participation or collaboration with other actors not initially included was sought. The MTR highlights in its lessons learned "the effective cooperation and shared ownership". Co-financing has been one of the major issues where the project did not achieve the expected results and shall be a lesson learned on how to include co-financing: by the end of the project, only 29% of the committed co-financing was executed.

Question: What were the completed gender-responsive measures and, if applicable, actual gender result areas? (This should be based on the documentation at CEO Endorsement/Approval, including gender-sensitive indicators contained in the project results framework or gender action plan or equivalent)

Response: As it was identified by the reviewer during project design stage assessment, and highlighted during the MTR, aspects of gender mainstreaming and participation of ethnic minorities had lesser strength on project design but they have since been properly managed by the project team through ensuring training and capacity building activities fostered women participation as well as developing pilot project SWH installations for indigenous people. SWH technology appears as gender-indifferent and with no negative impact on indigenous communities. Nonetheless, the PMU made efforts to have a positive impact, promoting specific training for women, and fostering women and indigenous participation as it is described in previous paragraphs, supporting not only gender issues but also fair transition. A specific course of three days was organized together with "Fundación Mujer y Energía", an ONG aimed towards women working in Energy. An additional course for rural women

was developed together with “Fundación Calicanto”, a specific activity for women called “Solar thermal awareness workshop for women” was developed as one of the first gender oriented event post pandemics during 2021. As an activity within the National Energy Transition Agenda and the Energy-Women link, a second educational and dissemination activity oriented towards energy, climate change and solar thermal was performed with women in indigenous communities. The activity was performed for a total of 133 women in two different indigenous communities. Support for local communities was also shown by the time to select SWH pilot projects location, as two of the SWH pilot projects are located in indigenous populations.

Question: What was the progress made in the implementation of the management measures against the Safeguards Plan submitted at CEO Approval? The risk classifications reported in the latest PIR report should be verified and the findings of the effectiveness of any measures or lessons learned taken to address identified risks assessed. *(Any supporting documents gathered by the Consultant during this review should be shared with the Task Manager for uploading in the GEF Portal)*

Response: An environmental and social risks assessment was prepared in the design stage of the project, showing that technology and project itself had no negative impacts associated, and keeping at low-risk. No specific measures were set as part of the safeguards, so no monitoring or reporting on issues was needed. Regarding social aspects, the project took advantage of the possibility of supporting society and population by implementing the pilots in specially selected places. Focus was set in the most vulnerable beneficiaries. Two SWH systems were donated to elderly residences, and two were installed in indigenous populations (small rural hospital and a school). Complimentary, and three largest demonstrative projects were installed at large public hospitals, spilling the benefits onto the surrounding population. In this way, pilot projects were distributed along different sector and locations, enhancing the technology awareness at the same time.

Question: What were the challenges and outcomes regarding the project's completed Knowledge Management Approach, including: Knowledge and Learning Deliverables (e.g. website/platform development); Knowledge Products/Events; Communication Strategy; Lessons Learned and Good Practice; Adaptive Management Actions? *(This should be based on the documentation approved at CEO Endorsement/Approval)*

Response: The project information and progress reports analyzed were provided to the consultant at the beginning of the review, showing clear storage criteria based on the same structure as the project design (Outputs, activities, and deliverables) and easy to follow. This was not the case during the MTR review, where it was recommended that the project manager and task manager jointly establish a project information storage system, as some key project documents were not easy to locate at the time. On the other hand, the project prepared a specific communication strategy, considering different target audiences through action plans for effective dissemination, demonstrating an adaptive management approach to a virtual reality. Moreover, the project's efforts are evident: 28 Café Solar sessions were held to disseminate the technology widely and raise awareness. Additionally, materials were shared through a social media campaign, and these communication actions were reinforced with workshops for specific audiences and the dissemination of success stories through demonstration projects. Regarding the website, it was created and launched during the project's implementation, featuring relevant information about activities conducted, such as training, dissemination, regulations, and studies. However, it is worth noting that, by the beginning of the Terminal Review, the website was offline due to administrative and management transfer issues after the conclusion of the GEF project. By the end of the review process in August 2024, it was confirmed that the management transfer to SNE had been completed, and the website was back online with information about SWH technology. While this is a positive sign, the re-launched website presents challenges for knowledge management, as it is halfway between the Termosolar project executed by GEF, and Panama's future goals and roadmap (Action Plan). There is a need to align the results achieved, future goals, and the site's focus on its various users and information needs. Importers and producers may be interested to access standards for testing and certification, bachelors and companies on training programs for technicians and certification schemes, potential customers on interviews and success stories featuring videos/photos, financing schemes, and so on.

Question: What are the main findings of the evaluation?

The Evaluation Office of UNEP validated the overall performance rating at the 'Satisfactory' level.

Response:

Performance was satisfactory, successfully fulfilling its purpose and reasonably achieving its stated objectives and outcomes.

The project was conceived with an adequate assessment of the external and local context, aligned with UNEP MTS strategies, as well as the country's priorities in energy and sustainability aspects. It was also complementary to previous interventions both in the region and in Panama related to SWH. The project outlined a strong baseline situation with appropriate structuring, but no Theory of Change (TOC) was prepared, and the results framework was weak. Outputs were mostly completed in every component or had a high degree of execution. At the same time, outcomes were satisfactorily achieved to a reasonable extent, though the causal pathway was not properly prepared during the design stage. Some assumptions were not fully met, which is relevant when analyzing the extent to which the impact was achieved.

Execution was very efficient in terms of resource use, despite delays mainly due to the COVID-19 pandemic and administrative issues regarding procurement for the testing facility and pilot projects. Institutional arrangements were generally adequate. However, changes in the Executing Agency led to an undesirable situation with notable impacts on execution timelines.

Management and supervision had an outstanding performance, with the Project Management Unit (PMU) being led by a highly committed Project Manager, along with a strong Stakeholders' participation and cooperation.

Monitoring had close follow-up from high levels down to the PMU, and reporting was complete and timely, available to the reviewer. However, the monitoring design lacked consistency, as indicators and outputs were not aligned with SMART principles, requiring adjustments during review instances. In terms of sustainability, a specific SWH Action Plan was prepared, aiming for long-term targets and activities for the coming decades. However, the budget is still pending approval. It is noteworthy that stakeholders are strongly involved in SWH development, as market conditions indicate a thriving sector that supports sustainable technology.

ANNEX XII. IMPLEMENTATION PLAN OF RECOMMENDATION

Project Title and Reference No.: Solar Water Heater Market Development Project UNEP (GEF ID 5287)

Contact Person (TM/PM): Jone Orbea (jone.orbeaotazua@un.org)

RECOMMENDATIONS	PLANS			
	ACCEPTED (YES/NO/PARTIALLY)	WHAT WILL BE DONE?	EXPECTED COMPLETION DATE	RESPONSIBLE OFFICER/ UNIT/ DIVISION/ AGENCY
Prepare and validate project main objective with a S.M.A.R.T. approach with focus on emissions per dollar indicator. Review other indicators and set targets accordingly, building the causal pathway to achieve them		Validate main indicator of avoided emissions to calculate avoided emissions per invested dollar – both direct and indirect-, as a key measure in evaluating the project and impact for the GEF.	30/6/2025	UNEP, UNEP ROLAC
Calculate project co-financing based on effective contributions from institutions and within the project execution timeframe		Re-formulate co-financing for the project, as committed funds appear to be overestimated when real contributions were evaluated. Build a specific recommendation on how to include loans in co-financing, using simple but strong rules that allow an estimate of the actual contributions.	30/6/2025	UNEP ROLAC, SNE.
Approve the budget for the Termosolar Panama Action Plan as key to the technology's sustainability and development, and review market potential and adoption barriers		Approval of Action Plan, to enable sustainable technology development, such as technical standards, testing capacity, staff training, local industry, financing mechanisms, and more. Additionally, the plan considers activities, stakeholders involved, and the budget. Prepare a brief market evaluation, considering the	31/8/2025	SNE

		emergence of competing or complementary technologies to solar thermal, such as heat pumps for water heating. Evaluate how they might affect mid and long-term goals and activities in the Action Plan.		
Establish a robust knowledge base and website for the project, and adapt it for the future development of the technology		Review the Solar Thermal website and resources, to host relevant information for every stakeholder in a structured way. Experience shows that user access depends on their area of interest (e.g., investors, installers, financiers, importers, academics, government agents), and SNE could consider a redesign from this perspective. It should also be kept in mind to clearly present goals and progress from the beginning.	31/10/2025	SNE

The following is a summary of lessons learned from some of the project's experiences and based upon explicit findings of the review. They briefly describe the context from which the lessons are derived, and the potential for wider application:

Lesson Learned #1:	Effective leadership and creation of a strong stakeholder's network is key to adaptive management and project success
Context/comment:	The project design phase appropriately considered the stakeholders, management structure, and partnerships, with the leadership of SNE and MiAmbiente proving crucial during the execution phase, involving key actors in decision-making. Likewise, UNEP's work as a coordinator and in strategic monitoring is highly commendable, particularly through the PSCs, where relevant project issues were addressed, knowledge was exchanged, and main issues were tackled and actions taken. At the executive level, a very effective and results-focused Project Management Unit (PMU) was evident, striving to execute activities to achieve the intended outcomes rather than merely completing the planned tasks. The presence of strong leadership and the creation of a sense of ownership among all stakeholders were key elements that enabled the project to overcome challenges, including a

	pandemic with a lockdown, by adapting activities and effectively managing stakeholders.
Lesson Learned #2:	Identification and commitment of the Executing Agency (EA) must be evaluated and agreed upon by all parties before the start of execution, ensuring the direct responsibility of state institutions
Context/comment:	The Termosolar Panamá project was designed and its content and execution agreed upon during an extended phase, where responsibilities were assumed by the participating institutions, with particular attention to SNE and MiAmbiente (former ANAM). These institutions were expected to take leadership from the State and assume responsibility as the Executing Agency (EA). However, at the start of the project, SNE raised concerns about their perceived lack of capacity to take on this role, which was then assumed by UNEP ROLAC to resolve an issue that otherwise would have made execution unfeasible. In hindsight, the designation of UNEP as EA revealed weaknesses in the procurement processes for pilot projects and in internal authorizations when approving changes with the Implementing Agency (IA), as both institutions belonged to UNEP but operated at different hierarchical levels, leading to blurred boundaries. Moreover, although SNE and MiAmbiente demonstrated notable engagement, the Government's detachment from the EA is not a positive indicator of commitment to the project.
Lesson Learned #3:	Involvement during execution can elevate outputs in areas of gender, social integration, and indigenous community inclusion beyond mere symbolic actions
Context/comment:	It is common for cross-cutting areas such as gender, indigenous community integration, and social development to take a secondary role in projects and to be addressed only through specific activities in the work plan. In the case of solar thermal energy, as it is a neutral technology without negative impacts on these components, the lack of actions is not linked to blocking outreach activities or demonstrative projects. However, the project demonstrated concrete efforts to address development in these areas, adopting a just transition approach and taking positive action for the inclusion of these groups. Communication and training strategies were designed and implemented to include vulnerable socioeconomic groups. From the outset, active participation of women and indigenous populations was encouraged, aiming to achieve 50/50 gender equity in general training sessions while considering existing qualification gaps to avoid limiting access. Additionally, specific training sessions were provided to indigenous populations and women's groups through associations.

	In the context of demonstrative projects, while maintaining the focus on reaching targeted sectors, the social impact played a significant role in assigning projects to institutions. Two projects were donated to nursing homes; four of the largest projects were assigned to public reference hotels, two to indigenous communities for a local hospital and a school, and two others to a veterinary clinic and a park ranger's house. These actions are assessed as having a high impact within the current project and deserve consideration for future projects, particularly to integrate similar ideas from the design phases.
--	--