United Nations Development Programme
Government of Egypt

Terminal Evaluation of UNDP-GEF Project: Grid-Connected Small-Scale Photovoltaic Systems (Egypt-PV Project)

(GEF ID number 5064, UNDP PIMS ID: 4998)

Final Report

Mission Members:
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Cover Photos:
Left side: Roof Top PV system in El-Hayat International School
Right side: Solar PV on car shed at the main Administrative Building of Sodic Real Estate Development Company

TABLE OF CONTENTS

Page

ABBREVIATIONS

Acronym	Meaning
ACUD	Administrative Capital for Urban Development
APRs	Annual Project Reports
AWPs	Annual Work Plans
BAPV	Building Attached Photovoltaic
BIPV	Building-integrated PV
CCM	Climate change mitigation
CDR	Combined Delivery Reports
CEO	Chief Executive Officer
CER	Certificate of Emission Reduction
CO	UNDP Country Office
CO_2	Carbon dioxide
COP	Conference of Parties
CPD	UNDP Country Program Document
CSP	Concentrated Solar Power
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EEAA	Egyptian Environmental Affairs Agency
EEHC	Egyptian Electricity Holding Company
EETC	Egyptian Electricity Transmission Company
EEU	Energy Efficiency Unit
EgyptERA	Electric Utility and Consumer Protection Regulatory Agency
EGP	Egyptian Pound
EIA	Environmental impact assessment
EOP	End of the Project
EPC	Energy performance contract
ESCO	Energy Service Company
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEFF	Green Economy Financing Facilities (EBRD)
GHG	Greenhouse Gas
GIZ	German Agency for International Cooperation
GoE	Government of Egypt
GoO	Guarantee of Origin
HQ	UNDP Headquarters
IEA	International Energy Agency
ICT	Information and Communication Technology
IMC	Industrial Modernization Centre of the Ministry of Trade and Industry
INDC	Intended Nationally Determined Contribution
IRENA	International Renewable Energy Agency
kW	kilowatt
MAP	Mitigation action plan
M&E	Monitoring and Evaluation
MoERE	Ministry of Electricity and Renewable Energy
MoFA	Ministry of Foreign Affairs
MoTI	Ministry of Trade and Industry
MRV	Monitoring, Reporting and Verification

Acronym	Meaning
MTR	Midterm review
MWp	Megawatt peak
NAMA	Nationally Appropriate Mitigation Action
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organization
NIM	UNDP's National Implementation Modality
NREA	New and Renewable Energy Authority
O&M	Operation & Maintenance
PAB	Project Advisory Board
PB	Project Board
PIF	Project identification form
PIR	Project Implementation Review
PMU	Project Management Unit
PPA	Power purchase agreement
PRF	Project Result Framework
ProDoc	UNDP Project Document
PV	Photovoltaic
PWMSP	EU-funded regional project, "Paving the Way for the Mediterranean Solar Plan"
QPR	Quarterly Progress Report
RCREEE	Regional Centre for Renewable Energy and Energy Efficiency
RE	Renewable Energy
RoI	Return on investment
RTA	Region-Based Technical Advisor (UNDP)
SDG	Sustainable Development Goal
SESP	UNDP Social and Environmental Screening Procedure
SGP	GEF Small Grants Project
SMART	Specific, measurable, achievable, relevant, and time-bound
SME	Small-to-medium enterprise
SWH	Solar water heater
TE	Terminal Evaluation
ToC	Theory of change
ToRs	Terms of Reference
TWh	Terawatt hour
WB	World Bank
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNSDCF	United Nations Sustainable Development Cooperation Framework

EXECUTIVE SUMMARY

E-1. This Termination Evaluation (TE) report assesses the design and formulation, implementation, results (at goal, objective, outcome, outputs levels), targets (against the indicators in the July 2016 Project Result Framework, hereinafter referred to as the PRF), GEF additionality, catalytic effect, and progress to impact of the "Grid-Connected Small-Scale Photovoltaic Systems" Project (hereinafter referred to as the Egypt-PV Project or the Project). It also evaluates the Project's relevance, effectiveness, efficiency, sustainability, country ownership, gender equality, and cross cutting issues.

E-2. The Project received the CEO endorsement on 30 September 2014. However, the Project did not start implementation until 6 December 2016 with the Project inception workshop held on 3 December 2017. The Project applied for an 18-month no-cost extension in 2021, which was granted by the GEF with the end date of the Project extended to 6 June 2023.

E-3. The duration of the TE assessment is from the ProDoc signature on 6 December 2016 until 31 March 2023, while also providing estimations on the emission reduction results by the End of the Project (EOP). The TE and this report follow the *Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects*, copyrighted by UNDP in 2020.

Project Description

E-4. The Egypt-PV Project was designed to overcome key barriers to large-scale deployment of solar-PV in Egypt including (Para **Error! Reference source not found.**):

- Legal and regulatory barriers including the preparation of secondary legislation after adoption: of the Electricity Law;
- Technical barriers including adjustments to the grid code and required technical criteria for PV products offered on the Egyptian market;
- Financial barriers including no attractive financing mechanisms available for households to obtain financing for small-scale renewable energy projects and interest rates of available consumer loans in Egypt hovering between 13-15% per year;
- Information/Awareness and Perception Barriers including poor awareness with regards to renewable energy amongst the public and in the private sector;
- Capacity barriers and weak supply chain including the absence of a well-developed PV market and a lack of suppliers, competition and marketing and no adequate maintenance or repair services in 2015;
- Lack of adequate quality control including no systematic quality control mechanism for imported solar PV equipment.

E-5. The objective of the Egypt-PV Project was to "*remove the barriers that restrict increased power generation by small, decentralized, grid-connected PV systems implemented by households and small- and medium-size enterprises*". The Project was designed to do this by:

- developing small PV systems (of a few kW each) that can be easily replicated and scaled-up;
- providing a supportive policy, institutional and regulatory framework for sustainable growth of the small, decentralised RE (in particular PV) power generation market together with related market monitoring mechanisms;

- strengthening domestic supply chains and quality control systems and, as applicable, increasing domestic manufacturing and assembly of PV panels; and
- facilitating the financing of small, decentralised PV systems for a broad range of consumers within a financing framework and a network of local financial institutions.

E-6. EOP results expected from the Project were:

- Outcome 1: A total of 4 MWp of small PV systems (of a few kW each) installed based on easily replicable and scalable system design;
- Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralised RE (in particular PV) power generation market;
- Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels; and
- Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralised PV.

Project Summary Table

Project Title:	*Grid-Connected Small-Scale Photovoltaic Systems (Egypt-PV Project)*			
UNSDCF Outcome and CPD Output:	*UNSDCF Strategic Priority Outcome 3: Institutions, communities and people actively apply and implement low carbon development, sustainable natural resources management, and disaster resilience approaches that are all gender sensitive* *CPD Output 3.2: Government and private sector have increased capacity to develop policy options and access to financing for renewable energy and energy efficiency towards reducing GHG emission*			
SDGs served	*SDG 1, to end poverty in all its forms everywhere;* *SDG 7.3.1* Primary energy intensity. Cross Reference: % of renewable energy out of national energy mix; and* *SDG 13, to take urgent action to combat climate change and its impacts.*			
GEF Project ID:	5064		*at endorsement (million US$)*	*at the time of evaluation (million US$)*
UNDP Project ID:	4998	GEF financing:	3.536	2.605
Country:	Egypt	IA/EA own:	0.450	0.447
Region:	Africa	Government:	29.610	20.300
Focal Area:	Climate Change	Other:	0.200	17.390
FA Objectives, (OP/SP):	FA Objective #3 for GEF 5: Climate Change Mitigation Objective-2: Promote Market Transformation for Energy Efficiency in Industry and the Building Sector	Total co-financing:	30.260	38.137
Implementing Partner:	Industrial Modernization Center of the Ministry of Trade and Industry (MoTI)	Total Project Cost:	33.796	40.742
Other Partners involved:	N/A	ProDoc Signature (date project began):		6 December 2016
		(Operational) Closing Date:	Proposed: 28 February 2023	Actual: 6 June 2023

E-7. Actual outcomes of the Egypt-PV Project are summarized on Table A in comparison with intended outcomes.

Table A: Comparison of Intended Project Outcomes from the ProDoc to Actual Outcomes

Intended Objective and Outcomes in Project Results Framework of December 2016 (see Appendix F)	Actual Outcomes as of 30 April 2023
Objective: To remove the barriers that restrict increased power generation by small, decentralized, grid-connected PV systems implemented by households and small- and medium-size enterprises	**Actual achievement toward objective**: All barriers have been removed to increased power generation by small, decentralized, grid-connected PV systems implemented by households as well as large industrial, commercial, hotel, educational and public sector buildings. The result is a plethora of solar-PV investments implemented and the achievement of GHG emission reductions is 296 kilotonnes, exceeded the target by a factor of 4.5.
Intended Outcome 1: A total of 4 MWp of small PV systems (of a few kW each) installed based on easily replicable and scalable system design.	**Actual Outcome 1**: A total of 18.319 MWp was installed leading to over 30,000 MWh of annual energy production, serving more than 18,000 beneficiaries, based on easily replicable and scalable system design
Intended Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralized RE (in particular PV) power generation market together with related market monitoring mechanisms	**Actual Outcome 2**: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralized solar PV has been effectively implemented and supported with capacities built for NREA employees and engineers on how to use the PV hub, a website with regulations and a database for small and medium scaled decentralized grid-connected PV systems.
Intended Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels	**Actual Outcome 3:** The domestic supply chain has been strengthened with project investors being able utilize a "one stop shop" with competitive prices, an established quality control system, and capacities built for 530 trainees of various backgrounds from government to the private sector to make this system functional.
Intended Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralised PV systems for a broad range of consumers	**Actual Outcome 4:** A small network of local financial institutions has raised US$31 million within a financing framework and is prepared to facilitate the financing of small, decentralized PV systems for a broad range of consumers.

Conclusions

E-8. The Egypt-PV Project has transformed the market for solar-PV by provided significant support to the design and implementation of solar-PV investments to further climate change mitigation actions in renewable energy generation. The Project has leveraged the GEF investment by a factor of more than 18 to implement rooftop solar-PV investments. The IMC is now in a position to scale up the results of the Egypt-PV Project by:

- establishing a solar-PV or an RE/EE facilitation center that takes the place of technical services provided by the Egypt-PV Project. Without such a center, progress on further penetration of the solar-PV market would slow down;
- considering measures to reduce the RoI period down to acceptable levels. This could be done if the GoE was intent on setting up strong MRV systems and protocols in place for carbon trading;
- liaising with the GEFF credit line and GIZ's *Egypt Industry Solar PV Programme (Egypt In PV)* to assist and facilitate solar-PV investments. The GIZ project will have challenges in getting SME investments financed due to the historical lack of liquidity of SME industries.

E-9. The frequent devaluation of the Egyptian pound from late 2016 and to early 2022 has contributed to market stagnation, notwithstanding the resilience shown by the solar-PV market in 2017-18 and again in 2022. Another hoped for development will be another hike in electricity tariffs as a part of the Government's actions to remove electricity subsidies. Despite the unknown date of this proposed tariff hike, the hike will provide another possible revival to the solar-PV market.

Evaluation Ratings[1]

1. Monitoring and Evaluation	*Rating*	2. IA & EA Execution	*Rating*
M&E design at entry	5	Quality of Implementation Agency - UNDP	6
M&E Plan Implementation	6	Quality of Execution - Executing Entity (MEMR)	6
Overall quality of M&E	6	Overall quality of Implementation / Execution	6
3. Assessment of Outcomes	**Rating**	**4. Sustainability[2]**	**Rating**
Relevance[3]	2	Financial resources	3
Effectiveness	6	Socio-political	3
Efficiency	6	Institutional framework and governance	3
Overall Project Outcome Rating	6	Environmental	4
		Overall likelihood of sustainability	3

Recommendations and Lessons Learned

E-10. *Recommendation 1 (to the Government of Egypt): Setup a semi-autonomous RE investment facilitation center dedicated to supporting private and public sector development efforts for commercial RE projects (Paras 144-145)*

E-11. *Recommendation 2 (to the Government of Egypt): Build capacities to implement an MRV system with the certification of GHG auditors and award of Certificates of Emission Reduction (CERs) (Paras 146-147)*

E-12. *Recommendation 3 (to the Government of Egypt): Provide follow-up projects where there have been high successes (Para 148).*

E-13. *Lesson #1: As a best practice, the Egypt-PV Project had an increased focus on strategic partnerships with stakeholders who can induce a larger replication impact (Paras 149-150).*

E-14. Lesson learned #2: As a best practice, pilot solar PV implementation provided a good basis for co-financed solar PV implementation (Para 151).

[1] Evaluation rating indices (except sustainability – see Footnote 2, and relevance – see Footnote 3): 6=*Highly Satisfactory (HS)*: The project has no shortcomings in the achievement of its objectives; 5=*Satisfactory (S)*: The project has minor shortcomings in the achievement of its objectives; 4=*Moderately Satisfactory (MS)*: The project has moderate shortcomings in the achievement of its objectives; 3=*Moderately Unsatisfactory (MU):* The project has significant shortcomings in the achievement of its objectives; 2=*Unsatisfactory (U)* The project has major shortcomings in the achievement of its objectives; 1=*Highly Unsatisfactory (HU):* The project has severe shortcomings in the achievement of its objectives.

[2] Sustainability Dimension Indices: *4 = Likely (L):* negligible risks to sustainability; *3 = Moderately Likely (ML):* moderate risks to sustainability; *2 = Moderately Unlikely (MU):* significant risks to sustainability; and *1 = Unlikely (U):* severe risks to sustainability. *Overall rating is equivalent to the lowest sustainability ranking score of the 4 dimensions.*

[3] Relevance is evaluated as follows: 2 = Relevant (R); 1 = Not relevant (NR)

E-15. Lesson learned #3: Direct interaction is the preferred means of communication amongst all stakeholders rather than online web-tools or educational modules (Para 152).

E-16. Lesson learned #4: The Egypt-PV Project's successes come from the Project's excellent responsiveness to the needs of all relevant stakeholders (Para 153).

1. INTRODUCTION

1. The Terminal Evaluation (TE) for the Project entitled "*Grid-Connected Small-Scale Photovoltaic Systems*" (otherwise referred to as "Egypt-PV Project" or "the Project") was conducted for UNDP-GEF as an impartial assessment of Egypt-PV activities, mainly comprised of investment and capacity building activities. The Project objective is to "remove the barriers that restrict increased power generation by small, decentralized, grid-connected PV systems implemented by households and small- and medium-size enterprises".

1.1 Evaluation Purpose

2. This Terminal Evaluation (TE) for the Egypt-PV Project is to *evaluate the progress towards the attainment of global environmental objectives, project objectives and outcomes, capture lessons learned and suggest recommendations on major improvements.* The TE is to serve as an agent of change and play a critical role in supporting accountability. As such, the TE will serve to:

- measure to what extent the Project has contributed to solve the needs identified in the design phase;
- measure Project's degree of implementation, efficiency and quality delivered on expected results (outputs) and specific objectives (outcomes), against what was originally planned or officially revised;
- measure the project contribution to the objectives set in the UNDP Country Program Document (CPD), United Nations Sustainable Development Cooperation Framework (UNSDCF), Egypt's Intended Nationally Determined Contribution (INDC) submitted to UNFCCC, Strat_EGY – Egypt's Five-Year Macroeconomic Framework and Strategy FY14/15-FY18/19, Egypt's First Updated NDCs (July 2022), Egypt National Climate Change Strategy 2050 (issued in 2021), and Egypt's national renewable energy (RE) targets (Para 18);
- assess both negative and positive factors that have facilitated or hampered progress in achieving the Project outcomes, including external factors, weakness in design, management and resource allocation;
- assess the extent to which the application of the rights-based approach and gender mainstreaming are integrated within planning and implementation of the Project;
- generate substantive evidence-based knowledge by identifying best practices and lessons learned that could be useful to other development interventions at national (scale up) and international level (replicability) and to support the sustainability of the Project or some of its components promote accountability and transparency, and to assess and disclose levels of project accomplishments.

3. Outputs from this TE will provide an outlook and guidance in charting future directions on sustaining current efforts by UNDP, the Government of Egypt, their donor partners, and the private sector, to sustain the momentum built by the Project to continue with solar-PV deployment and with the goal of reducing GHG emissions.

1.2 Scope and Methodology

4. The scope of this TE was to evaluate all activities funded by GEF and activities that are parallel-financed. The Terms of Reference (ToRs) for the TE are contained in Appendix A. Key issues addressed on this TE include:

- that the TE is independent of Egypt-PV Project management to ensure independent quality assurance;
- the application of UNDP and UNDP-GEF norms and standards for evaluations[4];
- assessment of achievements of outputs and outcomes, likelihood of the sustainability of outcomes, and if the Project met the minimum M&E requirements; and
- reporting basic data of the evaluation and the Project, as well as provide lessons from the Project on broader applicability. This would include an outlook and guidance in charting future directions by UNDP and their future support for a possible subsequent phase to the MTRE3 Project.

5. With this scope, the following issues were identified for further discussion in this TE:

- the lessons learned from the pilot solar-PV installations of Outcome 1 to formulate a supportive policy, institutional and regulatory framework for sustainable growth of the small, decentralised RE, in particular solar PV;
- the impact of efforts to strengthen the solar PV supply chain;
- the benefits of MRV system that was setup for the Project and its institutionalization on net metered installations and GHG emission reductions;
- the impact of the Project on financing opportunities.

1.3 Approach and Methodology

6. The evaluation approach adopted was non-experimental evaluation[5] where questions needed to be answered concerning policy and market for government stakeholders and Project developers, and the benefits and impacts of solar PV investments for Project beneficiaries. Interviews with government stakeholders were to bring up key issues with respect to the process of prioritizing solar PV measures and enhancing market diffusion of solar PV technologies; this was to strengthen learning within the Egypt-PV Project team and its stakeholders to support better decision-making to attain the Project objective. Project developers and beneficiary stakeholders were interviewed using a participatory approach on their experiences applying for credit from the Project and the impacts of the programme. These approaches delivered an impartial assessment of the Egypt-PV Project.

7. The Evaluation methodology consisted of:

- setting up the TE report in the context of evaluation criteria of relevance, effectiveness, efficiency, sustainability, and impact, as defined and explained in the August 2020 version of the

[4] This TE was conducted to closely adhere to GEF guidelines for evaluations. The Table of Contents of this report reflects these GEF guidelines that were accepted by UNDP in the Evaluator's Inception Report from April 2021.
[5] From the UNEG Compendium of Evaluation Methods: http://www.unevaluation.org/document/detail/2939

UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects" [6];

- document review of Project findings in the context of progress, effectiveness and pace of awareness raising, sustained engagement of national implementation teams (including training of these teams), level of implementation, and Project management (including M&E performance);
- interviews conducted with selected stakeholders (i.e. government stakeholders, Project developers, and Project beneficiaries) to gauge effectiveness and efficiency of capacity building efforts and investments of the Project. This was important as these evaluation criteria were likely undocumented. The interview process was conducted in a participatory manner and in a spirit of collaboration with Egypt-PV Project personnel with the intention of providing constructive inputs that can inform activities of a potential subsequent phase of the Egypt-PV Project;
- triangulation of the various data sources that ensured optimum validity and quality of the information and data sources (i.e. interviews, focused group discussions and documents);
- compile and evaluate the progress and quality of implementation against the indicators of each objective and outcome in the Project Results Framework (PRF) as provided Appendix F;
- formulation of TE conclusions and recommendations that focus on the current setup of the Egypt-PV Project and its completion by 6 June 2023.

8. The evaluation of the Project is based on evaluability analysis consisting of formal (clear outputs, indicators, baselines, data) and substantive (identification of problem addressed, theory of change, results framework) inputs. Considering the information provided into this evaluation (which is mainly whether or not the technical and financial assistance of the Project was effective to the Government of Egypt and its stakeholders), the implication of this methodology is that it should be effective in the evaluation process and should inform stakeholders and the Egypt-PV Project team as it possibly transitions into a subsequent phase.

1.4 Data sources and analysis

9. Data and information for this TE was sourced from:

- a review of Project documentation as listed in Appendix C notably the final country reports from the UNDP Egypt office. This was important in establishing information pertaining to the country's efforts in implementing the Project. This was done primarily at the home bases of the Evaluator;
- the combination of in-depth interviews, field visits and focused groups discussions (full list of persons interviewed in Appendix B) which were semi-structured interviews with key stakeholders within an interview schedule. These discussions were based on questions designed for different stakeholders based on evaluation questions around relevance, coherence, effectiveness, efficiency, and sustainability. Interviews were conducted with:
  - *Project Management Unit (PMU) personnel*, the purpose of which was to deal with implementation and execution issues;
  - *Implementing partners*, notably Industrial Modernization Center (IMC) technical personnel, personnel from IMC management, and consultants to IMC to gauge the effectiveness of training and institutional strengthening as well as other execution issues;
  - *Project partners* involving entities which worked in close collaboration with the executing partners, including other government agencies, Project consultants, project developers,

[6] http://web.undp.org/evaluation/documents/guidance/GEF/mid-term/Guidance_Midterm%20Review%20_EN_2014.pdf

financial institutions and banks, contractors, and suppliers. Exhaustive information was to be obtained from these stakeholders on how solar-PV projects were financed and the details of procuring and installing equipment;
- *Beneficiaries* include households, commercial and industrial establishments and educational institutes.

A complete listing of stakeholders interviewed is found in Appendix C.

10. There were several sectors who have benefited from the Egypt-PV Project. Sampling and surveys of these sectors were done in a manner that was smart and cost-effective to generate representative results. Communications with all relevant stakeholders was achieved through face-to-face interviews in Cairo within a limited time span. In instances where stakeholders were not available during the period of 1-5 April 2023, interviews with these stakeholders were conducted by Zoom from the International Evaluator's homebase. Questions posed for these stakeholders are included in Annex D.

1.5 Structure of the Evaluation

11. This evaluation report is presented as follows:

- An overview of Project activities from commencement of operations in December 2016 to the present activities of the Egypt-PV Project;
- A review of all relevant sources of information including documents prepared during the preparation phase (i.e. PIF, UNDP Social and Environmental Screening Procedure/SESP), the Project Document, project progress reports, and any other materials that the team considers useful for this evidence-based evaluation;
- Interview information from a participatory and consultative approach that ensured close engagement with stakeholders who have Project responsibilities including the PMU, government counterparts, implementing partners, the UNDP Country Office (CO), Regional Technical Advisors, and other stakeholders;
- An assessment of results based on Project objectives and outcomes through relevance, effectiveness and efficiency criteria;
- Assessment of sustainability of Project outcomes;
- Assessment of monitoring and evaluation systems;
- Assessment of progress that affected Project outcomes and sustainability; and
- Conclusions, recommendations and lessons learned.

12. This evaluation report is designed to meet GEF's "Guidelines for Conducting Terminal Evaluations of UNDP-Supported, GEF Financed Projects" of 2020[7] as well as UNDP guidelines "Evaluation during COVID-19" (updated to June 2021)[8].

[7] Available at: http://web.undp.org/evaluation/guideline/documents/GEF/TE_GuidanceforUNDP-supportedGEF-financedProjects.pdf
[8] Available at: http://web.undp.org/evaluation/guideline/documents/covid19/update/June2021/UNDP%20DE%20Guidance%20Planning%20and%20Implementation%20during%20COVID19%203%20June%202021.pdf

1.6 Ethics

13. This Terminal Evaluation has been undertaken as an independent, impartial and rigourous process, with personal and professional integrity and is conducted in accordance with the principles outlined in the UNEG Ethical Guidelines for Evaluations, and the UNDP GEF M&E policies, specifically the August 2020 UNDP "Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects".

1.7 Limitations

14. There were limitations to this TE process, mainly due to limited time frame for the International Evaluator to travel to Cairo to conduct face-to-face meetings with stakeholders and the PMU. These meetings, despite the limited time frame, were an opportunity to get to know the stakeholders better. Actual visits to the offices of the stakeholders and the PMU by the International Evaluator were an opportunity for the stakeholders and the PMU to make a 2-3 hour presentations followed by question-and-answer period. This has many intangible benefits including the collection of information not documented. The only limitation to the International Evaluator was the inability to meet with stakeholders who were not available during the 1-5 April interview period; this was resolved by meeting with these stakeholders on Zoom from the International Evaluator's home base in Canada. There were minimal limitations to the Terminal Evaluation in terms of findings.

2. PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

2.1 Project Start and Duration

15. The Egypt-PV Project commenced as of 6 December 2016. The Project is being implemented up to the time of writing of this report (as of April 2023). The Project is scheduled to close as of 6 June 2023.

2.2 Development Context

16. With a population of 108 million in 2023, Egypt is the most populous country in North Africa and the Arab region and home to one of the fastest-growing populations globally. In 2014, the rapidly swelling number of inhabitants led to a rapid increase in energy demand, putting a strain on the country's domestic energy resources even amid substantial offshore natural gas finds. As fuel shortages heightened in 2014, the country's electricity generating capacity struggled to keep pace with rising energy demand. In 2015, Egypt had been experiencing significant power shortages. Load-shedding in major and blackouts in rural areas were indicative of the power supply issues facing Egypt.

17. In 2007, the Supreme Energy Council of Egypt adopted an ambitious plan to increase the share of electricity produced by renewable energy sources up to 20% of total electricity generation by 2020 with hydropower envisaged to contribute 6%, wind 12% and other renewable energy sources, in particular solar energy, 2%. To complement this plan, the Cabinet of Ministers agreed in July 2012 to enforce the Egyptian Solar Plan, which aimed to establish 3,500 MW of installed solar capacity by 2027, including 2,800 MW of CSP and 700 MW of PV and with the participation of the private sector in 67% of this capacity.

18. To meet burgeoning energy demand, the Egyptian government has pursued an energy diversification strategy in October 2016, known as the Integrated Sustainable Energy Strategy (ISES) to 2035, to ensure the continuous security and stability of the country's energy supply. The 7th Five Year Plan (2012-2017) witnessed the construction of over 12,400 MW of thermal power plants, owned and operated by the Egyptian Electricity Holding Company (EEHC) and the private sector. However, this Strategy also involved the development of renewable energy and energy efficiency, in part through vigorous rehabilitation and maintenance programmes in the power sector. Egypt has been committed to the widespread deployment of renewable energy technologies since 2015. This led to RE targets of 20% by 2022 and 42% by 2035[9].

19. At the time of the Egypt-PV Project Inception phase in 2017, there was no specific renewable energy law in Egypt apart from Law 102, which as adopted in 1986, established the New and Renewable Energy Authority (NREA). The new Electricity Law, which was promulgated in July 2015, does include several provisions on how subsequent phases of renewable development should proceed in Egypt:

    - Article 45 sets out the process for the procurement of electricity from renewable energy sources using several options, including competitive bidding and feed-in tariffs. The intention is to use competitive bidding for larger projects on state-owned land together with complementary (to the extent feasible) criteria for the domestic content of such projects to support the

[9] http://nrea.gov.eg/test/en/About/Strategy

development of a national RE industry. This competitive bidding is also expected to inform the Government about the prices that developers will accept, thereby providing a basis for feed-in tariffs to be introduced and applied for smaller projects;

- Article 46 requires the holders of transmission and distribution licenses to connect renewable energy generators to their networks and to make the required investments to strengthen their networks to facilitate this;
- Articles 47-50 includes provisions for the establishment of a Renewable Energy Fund to compensate the Egyptian Electricity Transmission Company (EETC) for the extra costs of purchasing electricity from RE power producers. The Fund was foreseen to be financed mainly from the State budget with its statutes and governance to be defined in a separate Decree;

20. Other measures to support renewable energy development in Egypt in 2016 include:

- the Ministry of Finance reducing customs duties from 5% to 2% for all renewable energy equipment and spare parts;
- licences for RE projects are requiring to be obtained from a single point of contact, the Egyptian Electricity Regulatory Agency (EgyptERA);
- support for long-term PPAs of 20-25 years, while the Central Bank of Egypt guarantees all financial obligations of EETC under those PPAs;
- wind and solar atlases are now available to investors at a low price of US $100 each;
- dissemination of a new grid code that accounts for specific requirements of RE integration into the Egyptian grid with an appendix to the distribution grid code for PV;
- EgyptERA provides information to producers, developers and consumers including mutual information exchanges between transmission and distribution utilities and new IPPs. This includes capacity data, load generation patterns and other useful information. EgyptERA supplies all relevant information (except confidential investor information) via a dedicated website.

21. In 2014, Egypt's electricity consumption was 175 TWh. In 2021, it has grown to 202.25 TWh, an annual growth rate of 1.48% over the past 7 years[10]. With more than 99% of the population having access to grid electricity, the growth in demand is driven by higher consumption of existing customers and growth of the customer base rather than by increasing connectivity through grid expansion. The total installed power generation capacity as of 2021 was 59,500 MW[11]. Close to 90% of this capacity is thermal power generation running primarily (80%) on natural gas. Heavy fuel oil is used as complementary fuel with electricity produced by renewable energy representing less than 10% of all power generation in 2011 and 2021. However, this energy mix is changing with a growing trend in renewable energy as illustrated in Figure 1.

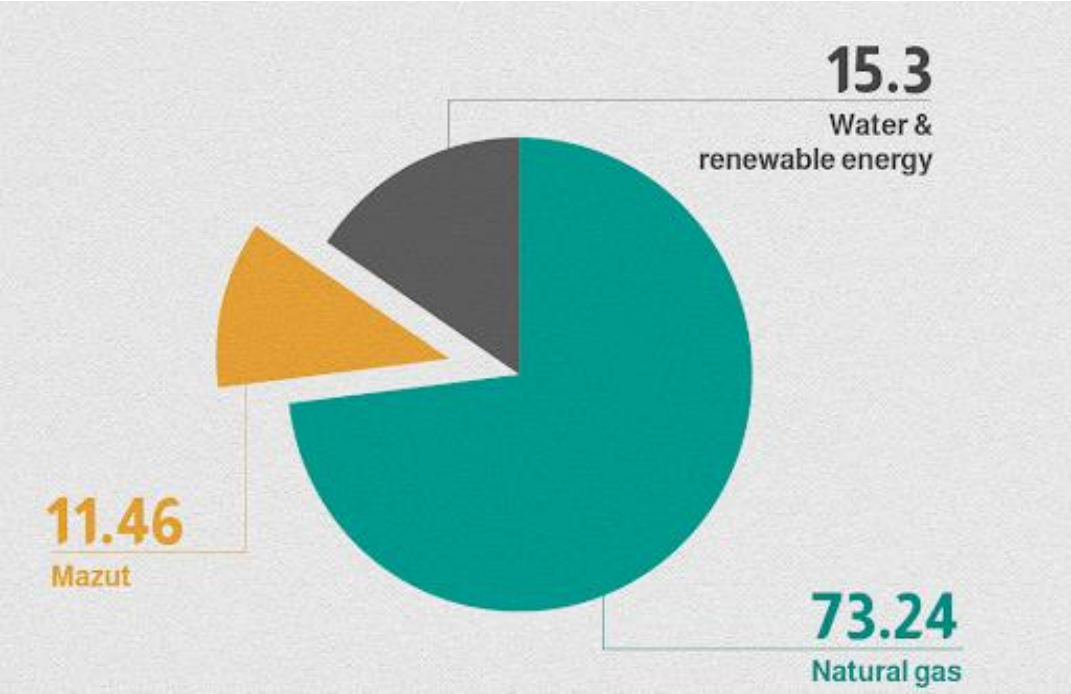
2.3 Problems that the Egypt-PV Project sought to address

22. Renewable energy technologies typically face a range of barriers to achieving wide-scale deployment and maturity in the market. The nature of these barriers also depends on the type of technology: solar-PV, utility-scale concentrated solar power (CSP), and wind power face different barriers than small, decentralized RE applications. The most common barrier for all types of systems, however, is the cost of the technology, although technology and market development over the past several years

[10] https://ourworldindata.org/energy/country/egypt
[11] https://www.globaldata.com/store/report/egypt-power-market-analysis/

has narrowed the gap with fossil fuel-based power generation. It is also essential for grid-connected systems to have an "RE-friendly" grid code and power purchasing arrangements in place and that, for all systems, the performance and quality of the RE installations meet expectations of investors. To ensure the latter, there is a need to adopt an adequate quality control and certification scheme with associated testing standards and enforcement mechanisms, and to build the capacities of the local supply-side and targeted end-users so as to prevent early market failure due to poor-quality hardware or installation. In many countries, policymakers, potential investors and the general public are not yet sufficiently aware of the current costs and opportunities provided by new RE technologies. Thus, marketing and public awareness-raising activities needed to be included in all RE market development support.

Figure 1: Egypt's energy mix in 2022[12]



23. A number of steps have already been taken by the Government of Egypt (GoE) from 2014 to 2017 to create the enabling framework to accelerate the development of renewable energy power generation, including small-scale decentralized PV systems. Among the remaining key barriers and support needs that the Egypt-PV Project sought to address in 2016 included:

    - Legal and regulatory barriers: While the Electricity Law included several provisions essential to boost RE development in Egypt, there were several items of secondary legislation that needed to be prepared after the adoption of the Law to facilitate actual implementation of the measures. New secondary legislation, for instance, was required for obliging the distribution companies to install meters for consumers with PV systems and giving them the authority to charge customers based on net-metering rather than gross-metering. This required modification of standard

[12] http://egyptera.org/ar/download/Report/Elec_ob_May2022.pdf

contracts and the charters of distribution companies, as they were originally established as entities that could strictly sell electricity to consumers and not to purchase;

- Technical barriers: Technical assistance was required to review and adjust the grid code and required technical criteria for solar-PV products offered on the market to match the specific characteristics of the power supply system in Egypt;
- Financial barriers: There were no attractive financing mechanisms available for households and small businesses to obtain financing for small-scale renewable energy projects by using a PPA or a Renewable Energy Certificate as security. Low-income households and businesses often do not have financial documentation or loan histories required by the banks to issue loans. The interest rates of available consumer loans in Egypt are now 13-15% per year, unattractive for financing RE projects that require long-term financing at moderate interest rates;
- Information/Awareness and Perception Barriers: There was little awareness with regards to renewable energy amongst the public and in the private sector. Although many citizens and institutions support the idea of the development of renewable energy in general, many of them do so without having adequate awareness and education about the characteristics of these products and the possibility of using RE as a preferred consumer choice;
- Capacity barriers and weak supply chain: In the absence of a well-developed solar-PV market in 2015, the capacity for building, installing and maintaining solar-PV systems in Egypt was low. As a consequence, there was a lack of suppliers, competition and marketing and no adequate maintenance or repair services, making potential owners wary of long-term ownership;
- Lack of adequate quality control: Equipment suppliers import products of varying quality levels. In 2015, there was no systematic quality control mechanism. All kind of products and systems were brought into the market with an objective of making short-term profits without considering market sustainability. As such, consumers faced a high risk of acquiring systems that do not meet the expected performance. Energy standards for different type of products were adopted, but the controls on domestic production and imports were not yet adequately organised.

2.4 Objective of Egypt-PV Project

24. The objective of the Egypt-PV Project was to "*to remove any barriers to increase power generation by small, decentralized, grid-connected PV systems implemented by households and small- and medium-size enterprises*". Actions of the Project are contained in the PRF in Appendix F.

2.5 Description of the Project's Theory of Change

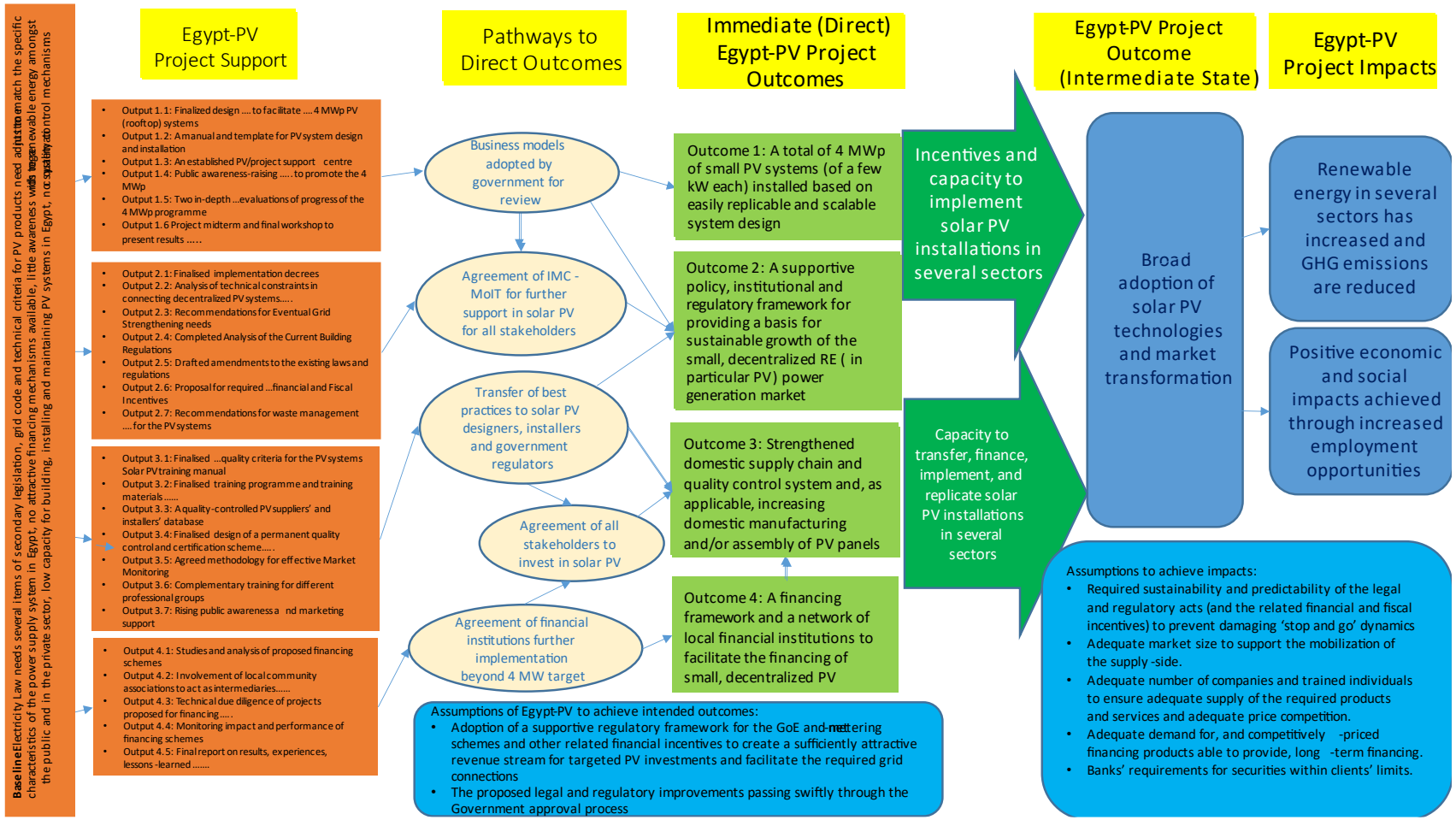
25. A Theory of Change (ToC) was completed for this Project in 2014. Due to the differences of opinion by the Evaluators on how to setup a ToC, a revised ToC is provided on Figure 2.

2.6 Expected Results

26. The expected results of the Egypt-PV Project are as follows:

- Outcome 1: A total of 4 MWp of small PV systems (of a few kW each) installed based on easily replicable and scalable system design;
- Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralized RE (in particular PV) power generation market;

Figure 2: Theory of Change for the Egypt-PV Project



- Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels; and
- Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralized PV.

2.7 Total Resources for Egypt-PV Project

27. The total resources allocated to this Project at time of ProDoc signature is provided in Table 1.

Table 1: Total Resources for MTRE3 Project

Component	GEF Resources	Planned Co-Financing Resources
Outcome 1	$2,300,000 (Inv)	$28,200,000
	$190,000 (TA)	$300,000
Outcome 2	$225,000	$400,000
Outcome 3	$448,000	$150,000
Outcome 4	$207,000	$350,000
Project Management	$166,364	$860.000
Total	**$3,536,364**	**$30,260,000**

2.8 Main Stakeholders and Key Partners

28. The main stakeholders on the Egypt-PV Project are listed in Table 2. Key partners for the Egypt-PV Project are the Industrial Modernization Center (IMC) under the Ministry of Trade and Industry (MoTI). More details on these stakeholders are provided in Sections 3.1.4. and 3.2.2.

Table 2: Main Stakeholders on Egypt-PV Project

Stakeholder	Role
Ministry of Trade and Industry (MoTI) Industrial Modernization Center (IMC)	As implementing Partner of the Egypt-PV Project in close coordination with the MoTI, IMC's principal role will be to support the development of a local supply chain of components to ensure economic and accessible equipment needs are met and to help create opportunities for skilled jobs. As the sustainability of small-scale solar-PV installations relies on the development of local technical and manufacturing capacity, the IMC under MoIT is ideally suited to assist local industry to be able to sustain itself after the EOP.
Ministry of Electricity and Renewable Energy (MoERE)	Main stakeholder of solar-PV and EE lighting programme for Government buildings and other renewable energy targets and regulations
Egyptian Electricity Holding Company (EEHC) and the distribution companies working under it	Key project stakeholders in supporting and supervising the connection of solar-PV systems into the grid.
Ministry of Water Resources and Irrigation	A key stakeholder on any solar-PV applications dealing with irrigation and other water pumping, and/or rural energy applications generally
Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA)	EgyptERA plays a central role in establishing the "Guarantee of Origin" or GoO (see Para 38, 1st bullet) and net-metering schemes (which provide the architecture and partial financing to purchase solar-PV power), in designing the legislation and policy to support the

Stakeholder	Role
	development of a PV market, and in administering the funds obtained through the GoO scheme
New and Renewable Energy Authority (NREA)	NREA serves as the focal point for expanding the use of renewable energy sources in Egypt and implements projects involving the use of wind energy, solar energy and biofuels. NREA also has a well-equipped testing laboratory for different electric and renewable appliances and serves as the key stakeholders in testing related activities.
Energy Efficiency Unit of the Cabinet of Ministers (EEU)	Project co-financing partner to promote the small solar-PV market, with a particular focus on public buildings
Egyptian Environmental Affairs Agency (EEAA)	The Egyptian Environmental Affairs Agency (EEAA) is the body responsible for climate change mitigation in Egypt and is the UNFCCC focal point. The EEAA is currently developing several climate finance-related tools, including Nationally Appropriate Mitigation Actions (NAMAs), which supports Project actions.
Banks and financial institutions	Possible project financing partners to be engaged in detailed discussions during project implementation with regard to the complementary financing for solar-PV system upfront costs
Investors (households and small and medium-sized enterprises)	The investors will buy and operate the PV units and sell power to the grid. A significant aspect of the Project was to involve coordination with the owners and providing them with support as they work with financial institutions, unit suppliers and installers, and as they fulfil the regulatory requirements for installation of solar-PV units and connecting to the grid.
Regional Centre for Renewable Energy and Energy Efficiency (RCREEE)	Project partner in the areas of policy dialogue, capacity development, drafting of supportive policies and regulations, research and market monitoring, public awareness raising and international cooperation, support for further developing the GoO and net-metering schemes

3. FINDINGS

3.1 Project Design and Formulation

29. The Egypt-PV Project design was formulated in close consultation with a number of government institutions, financing agencies, energy experts and private sector energy development companies concerning their engagement on the Project. The result was a well conceived Project that was relevant to address the prevailing barriers and to achieve the overall objective.

30. Stakeholder discussions and research undertaken during PPG phase of the Project indicate that the installation of approximately 1,500 PV systems of 2.5 - 3 kWp each on households and small SMEs, up to the total capacity of 4 MWp, would be a realistic target by the EOP. Together with the ongoing Government initiatives to install PV systems on the rooftops of public buildings, this would create an initial demand for meaningful strengthening of the supply chain. For reaching this target, the Project was to establish a central information and support centre, initially served by the PMU, to help to screen and select the first investors and provide information and support to interested participants. Other supporting activities and outputs under all Outcomes consisted of:

- a finalized support scheme to initiate the market for the first 4 MWp of small, decentralized, privately-owned, rooftop grid-connected PV power generation systems including finalization of procedures, templated documents, and assistance to apply for this support;
- a manual and template for solar-PV system design and installation (with a link to Output 3.1), including sizing, orientation, technical requirements and economics to be released as a hard copy, internet-based or eventual smartphone application;
- public awareness-raising and marketing campaigns to promote the 4 MWp programme and to support the implementation of the planned GoO (see Para 38, 1st bullet) and net-metering schemes;
- 2 in-depth reviews and evaluations on the progress of the 4 MWp programme and issues faced including:
  - customer satisfaction surveys among the programme participants who have invested in a PV system;
  - technical analysis of system performance and their interaction with the grid;
  - supply-side analysis and surveys;
  - analysis of the performance of the financial support mechanisms implemented;
  - lessons-learned and recommendations for further development of the scheme.
- mid-term and final workshop to present and discuss the results and potential next steps.

31. These consultations were to provide valuable inputs to Project design, particularly during the workshop on the PRF. This workshop finalized activities to remove the barriers to increased power generation by small, decentralized, grid-connected PV systems implemented by households and SMEs. The Project strategy was built on planned Government initiatives to develop a market for small, decentralized renewable energy power generation by ensuring adequate returns on targeted private sector investments through tradable GoO certificates in combination with a net-metering scheme for the highest tariff category residential and commercial customers.

32. These mechanisms were to be complemented by initial market support provided by the Egypt-PV Project together with its financing partners consisting of US$2,300,000 of GEF funds allocated from Outcome 1. This US$2,300,000 was to be used as a complementary investment grant to attract

investments for developers who enter the solar-PV market at an early development phase. The GEF funds were not to be mingled with the other resources but used as a complementary financial incentive without expected payback. The remaining US$190,000 for Outcome 1 was to cover the costs of technical assistance to facilitate further development of the proposed financial support schemes and ensure the first investments with an aggregate capacity of 4 MWp are successfully implemented. GEF financing for Outcomes 2, 3 and 4 consisted of grants for technical assistance to support the GoE to further develop and implement a supportive policy and regulatory environment for attracting investments for privately-owned, grid-connected renewable energy power generation. It was also to be used for developing effective monitoring and quality control, and dissemination of the results of the RE investments, made to leverage more complementary financing for more RE investments that support sustainable growth of the solar-PV market in Egypt.

3.1.1 Analysis of Project Results Framework for MTRE3 Project

33. The Project was designed based on a PRF that includes SMART indicators for the Project objective and for each Project outcome, with the corresponding target values. These indicators and their targets are listed in the PRF shown in Appendix F. While the indicators and targets all meet SMART criteria, the only issue with the targets were its qualitative nature, not quantitative as would be expected in measuring targets. Notwithstanding, this is a minor issue considering the achievements of the Project.

3.1.2 Assumptions and Risks

34. There were a number of assumptions made under the Egypt-PV PRF:

- under the Objective and Outcome 1, adoption of a supportive regulatory framework for the GoO and net-metering schemes and other related financial incentives to create a sufficiently attractive revenue stream for targeted PV investments and facilitate the required grid connections;
- under Outcome 2:
  - proposed legal and regulatory improvements passing swiftly through the Government approval process;
  - required sustainability and predictability of the legal and regulatory acts (and the related financial and fiscal incentives) to prevent damaging ‘stop and go’ dynamics;
- under Outcome 3:
  - adequate market size to support the mobilisation of the supply‐side.
  - adequate number of companies and trained individuals to ensure adequate supply of the required products and services and adequate price competition;
- under Outcome 4:
  - adequate demand for, and competitively priced financing products able to provide, long-term financing;
  - Banks’ requirements for securities within client limits.

These assumptions as well as others appear to be reasonable.

35. Risks are also discussed in detail in Paras 107-120 in the ProDoc. They are summarized in 7 risks as listed in the Project risk log comprising of:

- lack of political will or strength to adopt the required legal and regulatory changes to promote small, decentralized RE (in particular PV) power generation and the related financial and fiscal incentive schemes;
- unstable and unpredictable market, policy and financing environment;
- lack of available financing to cover the initial investment costs;
- technical failures of the promoted PV technology;
- inadequate or non-capacitated human resources on the supply-side;
- climate change having an adverse impact on the market; and
- Project management risk including timely recruitment of the key project staff and effective planning and day-to-day monitoring of the progress towards set targets.

3.1.3 Lessons from Other Relevant Projects Incorporated into Egypt-PV Project Design

36. There was one relevant project incorporated into the Egypt-PV Project design, the EU-funded regional project, "Paving the Way for the Mediterranean Solar Plan" (PWMSP) that launched in September 2010 and concluding in late August 2013 with a budget of €4.6 million. The project involved a number of Mediterranean Partner Countries, including Algeria, Egypt, Israel, Jordan, Lebanon, Morocco, Palestine, Syria and Tunisia. For three years, PWMSP provided a platform for regional debate on the Plan and supported it with studies covering a wide range of related issues, including financial, legal and regulatory frameworks, electricity network analysis and sustainable energy policy development. These studies and country reports presented a good overview of the different drivers and inhibitors influencing RE development, both in Egypt and other countries of the region. Updates to these studies were to provide an invaluable source of information for the planned technical assistance activities of the Egypt-PV Project.

3.1.4 Planned Stakeholder Participation

37. The Egypt-PV ProDoc details in very specific terms, how stakeholders were to participate on the Project. The stakeholders identified for engagement can be classified as follows:

- other GoE line ministries and regulatory agencies;
- energy engineers and other professionals;
- suppliers and installation personnel; and
- the financing sector.

Details of their participation are found in Section 3.2.2.

3.1.5 Linkages between the Egypt-PV Project and other interventions in the sector

38. In 2016, the Egypt-PV Project was supposed to be linked with baseline initiatives as listed on Paras 23-34 of the Egypt-PV ProDoc. Some of these initiatives are listed as follows:

- *EgyptERA developed a GoO scheme*, which allows the sale of electricity from renewable energy sources at a premium price. EgyptERA has already received training and support for compiling information for the establishment and administration of such a system;
- *GoE had a target of 7,200 MW of new installed wind energy capacity by 2020*, of which 2,200 MW was to be operated by NREA, 2,500 MW (10 x 250 MW) to be operated by the private sector on the basis of competitive bidding with guaranteed purchase of electricity by EETC for 20-25

years, and another 2,500 MW to be implemented by the private sector with the support of feed-in tariffs*;*

- *The first solar thermal power plant in Egypt started commercial operation in June 2011*, supported by financing from the GEF and the Japan Bank for International Development. The Kuriemat power plant has total installed capacity of 140 MW, which solar accounts for 20 MW. For solar thermal power generation, the plant is using parabolic mirror technology to first convert solar energy into thermal energy, which is then fed into the integrated combined cycle power plant using natural gas as the primary fuel;
- *Feasibility studies for the construction of the Assiut Barrage hydropower plant with an installed capacity of 32 MW* were being prepared by the Hydro Power Plants Execution Authority and the EEHC. Commissioning was expected by 2017.

3.1.6 Gender responsiveness of Project design

39. Gender issues of the Project were only addressed with the opportunity for women homemakers to generate income from the solar PV systems without leaving their homes and without substantial physical burden or time investment. This was designed to have a number of beneficial impacts, allowing women to participate in a more meaningful manner in the income generation of their households, as well as introducing women to a new technology in which they may participate and therefore contribute to gender income convergence. Otherwise, there were no other gender issues discussed in the ProDoc.

3.1.7 Social and Environmental Safeguards

40. The environmental impact of the Project was deemed to be minimal as it involved the installation of solar PV panels on rooftops of existing buildings to reduce GHG emissions. One potential negative impact mentioned under UNDP's SESP for this Project, "a possible waste management issue. As solar PV units reach the end of their operational lifetimes (generally 20 to 30 years), they will need to be disposed of in their component parts recycled. The Project will seek to maximize the use of recycling where it is practically and economically feasible and will undertake an assessment of waste management and recycling options during Project implementation under Output 2.7.

3.2 Project Implementation

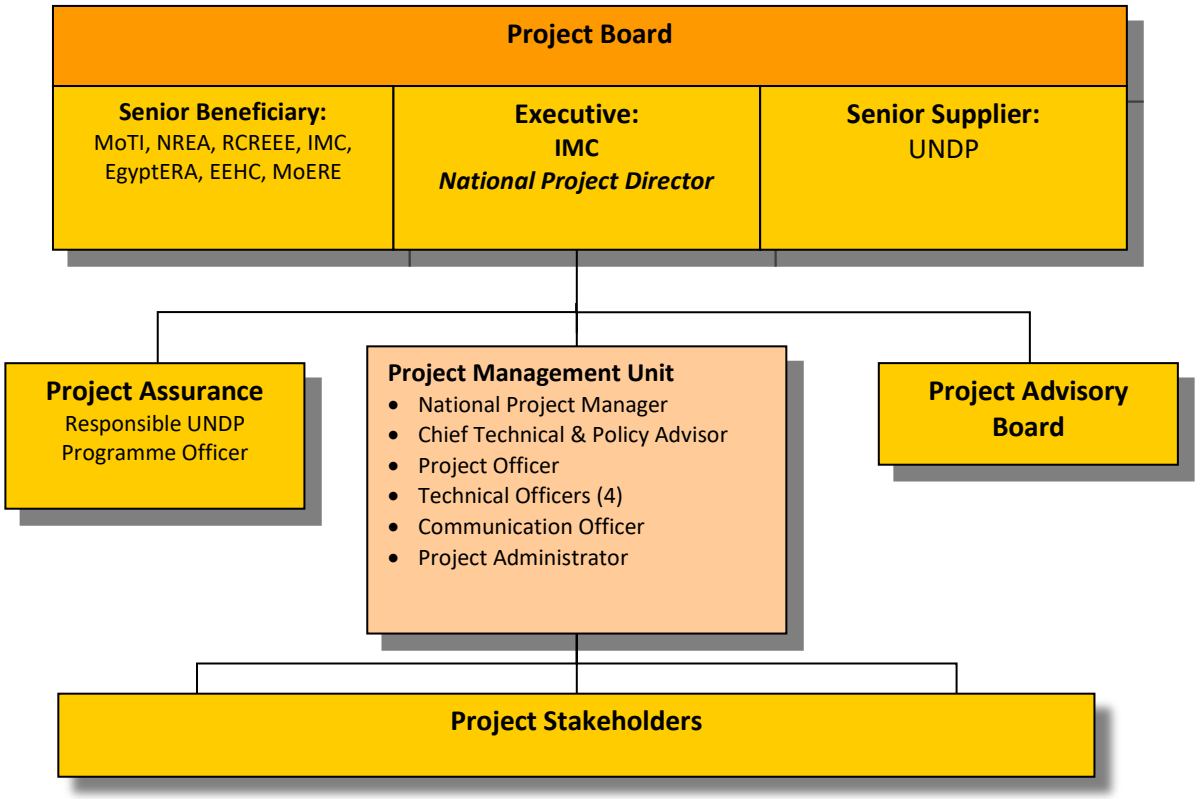
41. The following is a compilation of significant events during implementation of the Egypt-PV Project in chronological order:

- PIF Approved under GEF January 2013;
- GEF CEO Endorsement on 6 December 2014;
- ProDoc signature on 6 December 2016;
- Preparatory phase: the Inception Workshop held in Cairo on 13 December 2017;
- RTA mission took place on February 2018 to meet with Project team and present the key M&E requirements;
- 16 solar-PV plants (installed capacity of 2.1 MW) became operational in 2018;
- technical guidelines to regulate the technology and quality of the solar-PV systems were developed and approved by NREA in 2019;
- 16 solar-PV plants (installed capacity of 5.5 MW) became operational in 2019;

- 13 solar-PV plants (installed capacity of 2.2 MW) became operational in 2020;
- 5 solar-PV plants (installed capacity of 1.1 MW) became operational in 2021;
- reports on solar desalination and solar pumping were issued in 2022;
- 36 solar-PV plants (installed capacity of 7.5 MW) became operational in 2022 and 2023;
- On 21 November 2022, the Project formally received its second extension to 6 June 2023.

42. The Egypt-PV Project has been implemented according to the management arrangements in the ProDoc and as illustrated in Figure 3. The Project was managed using UNDP's National Implementation Modality (NIM). The Director-General of IMC under MoTI is the main national implementing partner, executing the Project on behalf of the GoE. MoTI, NREA, MoERE, EgyptERA and RCREEE remain as the Senior Beneficiaries of the Project, while UNDP takes the role of the Senior Supplier.

Figure 3: Egypt-PV Project Organization Structure



43. Project is overseen and strategically guided by a Project Board (PB), which is chaired by the Director General of IMC and composed of key Project stakeholders: MoTI, NREA, RCREEE, IMC, EgyptERA, MoERE and UNDP. Other stakeholders include financial institutions, private sector, academia, civil society and local communities. The PB has been meeting on annual basis since December 2017 to review and approve annual work plans and budgets, review annual progress, and to provide guidance on implementation related issues and bottlenecks. However, in the context of guiding the PMU to optimize its effectiveness of Project interventions and results, the role of the Project Advisory Board

(PAB) was significant involved in providing strong support to the Project meeting its objectives and outcomes. Consisting of personnel from IMC, NREA, EgyptERA, Ministry of Tourism, RCREEE, academia and UNDP, the PAB met on a monthly basis with the PMU covering evaluation of Project activities against the new policies, regulations and standards; changed Project activities to suit the new regulatory framework; and anticipation of changes to the solar-PV market in terms of the supply chain and beneficiaries.

44. The Director General of IMC was the designated National Project Director (NPD). The NPD has been responsible for the overall achievement of Project objectives through institutional coordination with the key stakeholder members of the PB and overall alignment of the Project with relevant national RE and EE programs of Egypt. The NPD had oversight for timely Project reporting, including the submission of Annual Work Plans (AWP), Annual Project Reports (APRs), Project Implementation Reviews (PIRs), and financial reports. The NPD took full ownership of the Project by leading and implementing the Project with keen interest and providing facilitation, management and oversight support during implementation of the Project in tandem with the PAB.

45. A Project Management Unit (PMU) was established for day-to-day management and implementation of all Project activities. The main functions of PMU included provision of implementation support, coordination among stakeholders, monitoring and evaluation, progress reporting, and formulation of annual work plans. The PMU was managed by a National Project Manager (NPM), who was supported by a Project Main Consultant, a Project Executive Coordinator, a Project officer, 4 technical officers, to provide technical and policy related guidance to Project implementation. A Communications Team and a Project Administrative Team round out the PMU positions. The NPM led both the technical and administrative affairs and looking to the CO for necessary technical advice. The Project was well managed due to intense and well-coordinated communication with IMC and all stakeholder teams with the Project.

3.2.1 Adaptive Management

46. Adaptive management is discussed in UNDP evaluations to gauge performance of Project personnel to adapt to changing regulatory and environmental conditions and unexpected situations encountered during the course of implementation, both common occurrences that afflict the majority of UNDP projects. Without adaptive management, donor investments into UNDP projects would not be effective in achieving their intended outcomes, outputs and targets. Much of the adaptive management by Egypt-PV staff was implemented to reduce Project risks as described in Para 64. UNDP's efforts to adaptively manage this Project were sincere and ***satisfactory*** in consideration of the limitations under the COVID-19 pandemic situation and the highly successful outcomes from the Egypt-PV Project.

47. With regards to the target of Output 1.1: Finalized design of the support scheme to facilitate market take-off for the first 4 MWp, the Project developed project design documents in 2018 including proposed budget allocations for an expanded support programme covering 6 sectors (covered in Para 48); detailed description of technical and financial support schemes for all the targeted sectors; eligibility criteria for selection of the pilot projects; plan for the expected number of projects to be installed, capacity, grants and leverage in each sector for each of the remaining 4 years of the Project. Adaptive management included the updating of technical and budgetary allocation support schemes at the beginning of each year based on the Project's experience gained from the past years.

48. From a higher perspective, one significant adaptive management measure was the increased focus on strategic partnerships with investors who can promote large-scale PV installations in specific regions or sectors in Egypt that aims to induce larger replication impact. This included an increased focus on industrial, commercial, hotel, educational and iconic public building establishments instead of the residential and SME sectors as originally envisaged. While the residential sector provided numerous opportunities for small-scale decentralized solar PV installations, the opportunities for scaling up the other sectors became much more attractive, with entities in these sectors not having good knowledge of solar-PV but having the wherewithal and resources to pilot solar PV investments. For almost all stakeholders, the pilot investments catalyzed strong interest in further investments into decentralized small-scale solar PV investments to offset electricity costs.

49. Further to this adaptive management measure, UNDP, the Project and the Ministry of Environment also used the selection of the City of Sharm El-Sheikh to host UNFCCC COP27 to advocate support for the greening of Sharm ahead of COP 27 through the promotion of rooftop solar-PV systems through the Project with additional funds mobilized from non-UNDP-GEF resources. In early 2022, the Project organized a campaign supported by high level government officials that resulted in Sharm El-Sheikh Airport administration as well as nine hotels signing contracts and installing rooftop solar-PV systems. The number of signed contracts increased significantly after COP27.

3.2.2 Actual Stakeholder Participation Partnership Arrangements

50. The key to successful stakeholder participation arrangements for the Egypt-PV Project was the close involvement and consultations between key ministries to collect information on their key baseline activities, and to secure their collaboration during the Project. The same can be said for CSOs, private sector firms and Project beneficiaries who were contacted for their willingness to be involved on the Project, notably on the outreach activities of Component 3.

51. During Project implementation, this translated into useful Project activities, much of which was facilitated by IMC, and harnessed into useful activities involving:

- line ministries directly involved with the Project including MoERE, EgyptERA, NREA, EEU, EEAA, and EEHC and their distribution companies. These ministries and agencies were central to the design, implementation, commissioning and oversight of maintenance of all installed capacities of the Project;
- public sector that includes government ministries that were beneficiaries of the Project including the Egyptian Atomic Energy Authority, the General Authority for Educational Buildings, the General Organization for Standardization and Quality, Medium and Small Enterprises Development Agency, the Cairo Economic Court, and the Housing and Building National Research Center;
- the industrial sector that includes Nissan Motors, MCV, Rockal and Pharco;
- the transportation sector including Cairo International Airport and Ramsees Railway Station;
- the commercial sector including shopping centres;
- health care sector including several hospitals and health care centres;
- the tourism sector including several hotels;
- the educational sector including several schools; and
- the residential sector.

52. Overall efforts by the Egypt-PV team to forge effective partnership arrangements with various stakeholders have been ***highly satisfactory***.

3.2.3 Project Finance

53. The total GEF budget for the Egypt-PV Project was US$3.536 million that was to be disbursed over a 60-month period, managed by a UNDP-PMU under the direction of a Project Board. Table 3 depicts disbursement levels up to 31 March 2023, 2 months prior to the actual terminal date of the Egypt-PV Project of 6 June 2023, revealing the following:

- The Project had a slow start in 2017 with only 32% of the intended budget expended;
- There were increases in spending in 2018 and onwards to 2022 with expenditures ranging from 47% to 72% of the intended budget being spent mainly on Outcome 1. With expenditures reaching 72% intended targets in 2019, expenditures were 57% and 45% during the pandemic years of 2020 and 2021 with the balance spent in 2022 and 2023;
- There were deviations of actual expenditures from the ProDoc budget. The largest deviations were the under-expenditure of all outcomes, notably Outcome 1 where US$693,670 remains out of a budget of US$2.49 million;
- The majority of funds were expended on Contractual Services – Companies National (72100a) for US$1.6 million and Contractual Services – Individual Impl. Partner (71800) for US$484,883, all for the installation of pilot solar-PV projects. These are revealed in Table 4.

54. The Project has also demonstrated that appropriate financial controls are in place, notably through:

- Combined Delivery Reports (CDRs) and Project Budget Balance Report which shows the expenditure and commitments in the current year up to date (both as generated by Atlas);
- manual monitoring of Project expenditures against budget lines to attain an in-depth understanding of the financial progress and the pending commitments.

55. Project co-financing was estimated to be more than US$38.137 million, above the expected co-financing of US$30.26 million. Co-financing summary and details can be found on Tables 5 and 6 respectively. The TE team observes the following details of Project co-financing:

- The majority of co-financing was in cash (US$17.8 million) from the MoERE for government buildings in the New Capital and the private sector and bilateral donors where equity reached US$19.19 million, in part from pilot project equity of US$5.38 million, and replication of pilot project for an equity of US$13.81 million[13];
- In-kind support was brought in from IMC and RCREEE;
- It is likely that in-kind contributions from GoE were underreported.

56. Overall, the cost effectiveness of the Egypt-PV Project has been **highly satisfactory** in consideration of the excellent results achieved in the capacity building of the stakeholders involved, and the high amounts of co-financing leveraged for solar PV projects.

[13] This stems from the private sector (US$15.14 million), public buildings of the GoE and NGOs (US$ 2.00 million), EU contribution (US$ 1.2 million) and Japan contribution (US$0.85 million).

Table 3: GEF Project Budget and Expenditures for Egypt-PV Project (in USD as of 31 March 2023)

Outcomes	Budget (from Inception Report)	2017[14]	2018	2019	2020	2021	2022	2023[15]	Total Disbursed	Total to be expended in 2023	Total remaining
Outcome 1: A total of 4 MWp of small PV systems (of a few kW each) installed based on easily replicable and scalable system design	2,490,000	4,705	300,341	492,462	298,940	236,250	440,981	22,651	1,796,330		693,670
Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralized RE (in particular PV) power generation market	225,000	4,159	28,167	43,273	71,913	30,140	36,000	0	213,652		11,348
Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels	448,000	82,644	-16,111	71,004	36,323	68,308	99,227	7,175	348,571		99,429
Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralized PV	207,000	3,304	2,912	15,198	20,912	22,310	56,932	3,700	125,270		81,730
Project Management	166,364	-17,329	55,347	17,079	24,406	17,667	24,506	0	121,676		44,688
Total (Actual)	**3,536,364**	**77,484**	**370,656**	**639,016**	**452,494**	**374,676**	**657,646**	**33,527**	**2,605,499**	**0**	**930,865**
Total (Cumulative Actual)		77,484	448,140	1,087,156	1,539,650	1,914,326	2,571,972	2,605,499			
Annual Planned Disbursement (from ProDoc)	3,536,364	241,850	780,975	892,875	788,350	832,314					
% Expended of Planned Disbursement		**32%**	**47%**	**72%**	**57%**	**45%**					

[14] Starting 6 December 2016
[15] Up to 31 March 2023

Table 4: Expenditures by ATLAS Code

ATLAS Code	Expenditure Description	Spent to 31 March 2023 (US$)	To be spent before the EOP (US$)
71200	International Consultants	90,680	
71300	Local Consultants	67,422	
71400	Contractual Services - Individuals		
71500	UN Volunteers		
71600	Travel	47,361	
71800	Contractual Services-Individual Impl.Partner	484,883	
72200	Equipment and Furniture	46,932	
72300	Materials & Goods		
72400	Communications and Audio Visual Equipment	1,068	
72600	Micro Capital Grants - Credit		
73400	Rental and maintenance of other office equipment	21,325	
74200	Audio Visual & Print Prod Costs		
74500	Miscellaneous Expenses	15,955	
76100	Realized loss/gain	4,383	
75700	Training, Workshops and Conference	25,013	
72100a	Contractual Services - Companies / Nat	1,656,971	
72100b	Contractual Services - Companies / Int		
72800	Information Technology Equipment	12,334	
64397	Services to projects -CO staff	30,448	
74596	Services to projects	9,152	
72500	Supplies	9,744	
73100	Rental & Maintenance-Premises	61,795	
74100	Professional Services	20,031	
Total		**2,605,499**	**0**

Table 5: Co-Financing for Egypt-PV Project (as of 31 March 2023)

Co-financing (type/source)	UNDP own financing (million USD)		Government (million USD)		Partner Agency (million USD)		Private Sector (million USD)		Total (million USD)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants							0.200	0.200	0.200	0.200
Loans/Concessions									0.000	0.000
• In-kind support	0.450	0.447	14.610	20.300					15.060	20.747
• Other (equity investment)							15.000	17.190	15.000	17.190
Totals	0.450	0.447	14.610	20.300	0.000	0.000	15.200	17.190	30.260	38.137

Table 6: Co-Financing Details

Classification	Name of Co-financier (source)	Type	Financing Committed	Actual committed
Partner agency	UNDP	In-kind	400,000	400,000
Partner agency	UNDP	Cash	50,000	47,091
Government	IMC	In-kind	500,000	500,000
Government	Ministry of Electricity and Renewable Energy	Cash	10,000,000	17,800,000
Government	Energy Efficiency Unit	Cash	4,110,000	2,000,000
Private Sector	EgyptERA and Private Sector	Equity investment	15,000,000	15,140,000
Donor	EU	Cash		1,200,000
Donor	Government of Japan	Cash		850,000
Civil Society Organization	RCEEEE	In-kind	200,000	200,000
Total Co-financing			**30,260,000**	**38,137,090**

3.2.4 M&E Design at Entry and Implementation

57. The ProDoc does provide for an M&E design on pages 55-58 in the ProDoc. The design is presented in a fairly generic manner, similar to other M&E designs from other GEF projects, and with preparations for a detailed M&E plan left to the implementation phase of the Project. Moreover, in terms of budgeting for M&E activities, US$100,000 was the total M&E budget (as broken down on page 58 of the ProDoc) for a number of indicators that were easy to be monitored. As such, the M&E design is rated as ***satisfactory***.

58. In terms of M&E plan implementation, the Evaluator had access to PIRs from 2018 to 2022 and a March 2023 progress report on the Egypt-PV Project, which were informative in terms of the progress made on various studies, actions taken by the Project, indicators against Project targets and extra activities in collaboration with other donors. In addition, there was an MTR report completed in August 2019, as well as Productivity Monitoring reports and PMU personnel receiving strong encouragement by the Chair of the PB, Board members and Technical Advisory Committee members to meet Project targets[16].

59. As such, *M&E plan implementation is rated as* ***highly satisfactory***. Ratings according to the GEF Monitoring and Evaluation system[17] are as follows:

- *M&E design at entry – 5;*
- *M&E plan implementation – 6;*
- *Overall quality of M&E – 6.*

3.2.5 Performance of Implementing and Executing Agencies

60. IMC and UNDP have been efficient in managing the execution of the Project. They have been responsive to stakeholders and proactive in seeking expert inputs from chief technical and policy advisor, technical officers and the Project Advisory Committee for achieving the Project's outcomes. This includes manufacturer and supplier requests for clarification on procedures for installation and equipment types which was managed by the Project's Main Consultant and technical team. This was a strong and common opinion of all Project stakeholders.

61. There was positive collaboration between the IMC, the PMU and UNDP for the Project's execution and alignment to developing national policy, training of solar PV equipment supply and installation personnel and financing personnel and supporting solar PV installations. UNDP has provided timely advice on Project implementation, monitoring, and reporting to PMU and IMC personnel. The private sector developers, solar PV suppliers and manufacturing companies, and sub-contractors all mentioned that they have been able to participate in and contribute meaningfully to Project

[16] Information from interviewees and PB meeting notes.

[17] 6 = HS or Highly Satisfactory: There were no shortcomings;
5 = S or Satisfactory: There were minor shortcomings,
4 = MS or Moderately Satisfactory: There were moderate shortcomings;
3 = MU or Moderately Unsatisfactory: There were significant shortcomings;
2 = U or Unsatisfactory: There were major shortcomings;
1 = HU or Highly Unsatisfactory
U/A = Unable to assess
N/A = Not applicable.

implementation due in large part to Project management by the PMU, IMC's cooperation, and UNDP's coordination and facilitation.

62. As examples of IMC and UNDP collaboration, Project activities consisted of:

- joint representation at high level meetings and negotiations;
- joint signing of MOUs and contracts with various public and private stakeholders to advance progress of Project activities;
- IMC assistance in coordinating with other government agencies such as the EEHC, NREA and EgyptERA, to further advance regulatory issues with decentralized solar PV installations;
- strong engagement with all stakeholders that has facilitated the opening of the PV market in Egypt. There are no noticed challenges in dealing with any stakeholder.

63. The performance of implementing and executing entities can be summarized as follows:

- *Implementing Partner (IMC)* – 6;
- *Implementing Entity (UNDP)* – 6;
- *Overall quality of implementation/execution (IMC/UNDP)* – 6

3.2.6 Risk Management

64. During 2018 and 2019, the Project experienced some small risks including:

- financial risks which were related to electricity tariff reform where failure to remove subsidies from the tariff would have had profound risks of failing to achieve Project targets. Electricity tariffs were increased in July 2019 and again in July 2020 under a net-metering regime, serving as a catalyst for initial solar-PV market investments. However, there was also the risk of a lack of "easy" financing to cover initial investment costs. As an adaptive management measure, the Project conducted several meetings and workshop training with the bankers to raise their awareness of financing solar-PV, mitigating the risks of lack of available financing and not achieving Project targets;
- a loss in consumer confidence due to a lack of technical guidelines to regulate solar-PV technology. This was overcome by technical guidelines which were developed with Project assistance and approved by NREA in 2019, to regulate the technology and quality of the solar-PV systems. The Project also developed a quality checklist which led to assurances on solar-PV quality and mitigation of the risk of technical failures and loss of consumer confidence in solar-PV.

65. Otherwise, the Project did not have major significant risks other than the slowdown in work during the COVID-19 pandemic. The risk mitigation measures seemed to have worked well to mitigate the aforementioned risk and no new social and environmental risks have been identified.

3.3 Project Results and Impacts

66. This section provides an overview of the overall results of the Egypt-PV Project and an assessment of the relevance, effectiveness and efficiency, country ownership, mainstreaming, sustainability, and

impact of the Egypt-PV Project. For Table 7, the "status of target achieved" is color-coded according to the following color-coding scheme:

Green: Completed, indicator shows successful achievements	Yellow: Indicator shows expected completion by the EOP	Red: Indicator shows poor achievement – unlikely to be completed by Project closure

3.3.1 Progress towards objective

67. With the overall goal of this Project being to reduce GHG emissions, work with Project beneficiaries, and mobilize additional public and private funds, a summary of achievements of the Egypt-PV Project at the objective level is provided with evaluation ratings on Table 7. The GEF Tracking Tool for the Egypt-PV Project is contained in Appendix E.

68. With respect to the target of "*66,000 tCO_{2eq} over the 20-year default lifetime of the investments*", a total of 296,200 tCO_{2eq} over the 20-year default lifetime of the investments, exceeding the Project targets made during Project implementation by a factor of 4.5. This was calculated using a total of 225 solar PV plants (with a total of 89 co-financing agreements) with a total capacity of 18.3 MWp and a grid emissions factor of 0.45 tonnes/MWh.

69. On many GEF projects, indirect impacts are difficult to monitor. However, the Egypt-PV Project has significant data for indirect lifetime GHG emissions totalling 2.6 million tCO_{2eq} from 200 MW of small scale PV systems connected to the grid over 20 years. This is quite remarkable given the enthusiasm for solar PV by all stakeholders.

70. Egypt-PV supported investments across Egypt covered more than 50% of the Egyptian governorates including 19 governorates. This required the Project to communicate with many facility owners to introduce the Project and raise their awareness on investments in solar-PV plants to generate electricity using solar energy and reduce GHG emissions. Some solar-PV projects received technical support while others have received both technical and financial support to conduct the pilot projects. An interactive map for supported solar PV projects was developed and available on "Egypt-PV Pilot Projects Google Maps uploaded on the Project's website for awareness raising[18]. The Egypt-PV Project successfully facilitated and accelerated the energy transition in Egypt to solar PV systems providing technical and green co-financing for installed capacity of:

- 3.943 MW in public buildings including Cairo International Airport, Ramsees Railway Station, museums, hospitals, libraries, and other government buildings;
- 7.742 MW of industrial facilities including Nissan Motors, MCV, Pharco factory, Hero Factory and other industries;
- 1.734 MW of commercial buildings including Carrefour, Sodic Real Estate, OMMAT Farm, and other commercial establishments;
- 1.060 MW of educational buildings including the Hayah Academy, the British School and the El Qawmya School;

[18] https://egypt-pv.org/interactive-map/?lang=en

Table 7: Project-level achievements against Egypt-PV Objectives and Outcomes

Project Strategy	Performance Indicator	Baseline	Target	Status of Target Achieved	Evaluation Comments	Rating[19]
Project objective: *To reduce greenhouse gas emissions by the removal of barriers to widespread application of decentralized PV-based power generation*	Amount of reduced CO_2 emissions by the investments facilitated by the Project	0	Direct: 66 kilotonnes of CO_{2eq} over the 20-year default lifetime of the investments made during project implementation. Indirect: At least 0.6 million tonnes of CO_{2eq} over the 20-year default lifetime of the investments made within 10 years after the Project end	296.2 $ktCO_{2eq}$ of CO_2 emission reductions over the 20-year default lifetime of the investments An estimated 2.6 million $ktCO_{2eq}$ of indirect lifetimeCO_2 emission reductions over 20 years	See Para **Error! Reference source not found.**	6
Outcome 1: A total of 4 MWp of small PV systems (of a few kW each) installed based on easily replicable and scalable system design	Total capacity of installed rooftop PV systems by the private sector and electricity generated by them	Negligible (significantly less than 100 kW_p per year)	At least 4 MW_p of installed rooftop PV capacity, producing 6,000 MWh of electricity per year. More than 1,000 households and SMEs together benefitting from PV-generated electricity.	18.32 MW of installed rooftop PV capacity leading to over 30,000 MWh of annual energy production, serving more than 18,000 beneficiaries	See Paras 76-77	6
Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralised RE (in particular PV) power generation market together with related market monitoring mechanisms	Extent to which policies and regulations for decentralised RE and PV in particular are adopted and enforced.	Draft Electricity Law and draft implementation degrees for GoO and net-metering scheme prepared. Draft grid code finalised, but final approval pending.	The required financial and fiscal incentives and enabling technical requirements for grid connection effectively implemented and supported by the required laws and regulations, providing a basis for continuing market growth after the Project with a growth rate of at least 20% per year observed at the end of the Project.	The required financial and fiscal incentives and enabling technical requirements for grid connection have been effectively implemented and supported. Training sessions were held for NREA employees and engineers on how to use the PV hub, a website and associated regulations and database for small and medium scaled decentralized grid-connected PV systems.	See Para 86-90	6
Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels.	Level of customer satisfaction on the quality, pricing and ease of purchasing a PV system, having it installed and obtaining the required after-sales services.	No well-established PV supply-side and quality control mechanism to facilitate easy purchasing of a PV system and	Customers able to purchase a PV system and have it installed through a 'one stop shop' model at competitive prices and the established quality control system, ensuring adequate quality and customer satisfaction for both the hardware and the	Customers were able to purchase a PV system and have it installed through a "one stop shop" at competitive prices and the established quality control system. The Project delivered professional training to 530 trainees of various backgrounds from government to the private sector to make this system functional. This included a	See Paras 96-97	6

[19] Ibid 17

Project Strategy	Performance Indicator	Baseline	Target	Status of Target Achieved	Evaluation Comments	Rating[19]
		guaranteeing its quality.	installation (including required after-sales services).	developed comprehensive database for local manufacturers, suppliers and installers.		
Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralised PV systems for a broad range of consumers.	Volume of financing leveraged for small, decentralised PV investments from financing entities active in Egypt.	Practically 0 aside from some demo projects.	At least US$ 10 million by the end of the Project.	US$31.0 million		6

Table 8: Solar-PV investments by sector

Sector	Installed Capacity (MW)	Number of plants	Energy savings (MWh/yr)	Lifetime CO_{2eq} reduction (assumes 20 years)
Industrial	7.743	24	12,519	129,944
Commercial	1.734	9	2,852	30,936
Education	1.060	11	1,790	17,369
Public	3.943	26	6,675	56,065
Tourism	3.050	15	5,414	48,323
Residential	0.799	140	1,292	13,563
Totals:	***18.319***	***225***	***30,542***	***296,200***

- 3.050 MW of tourism projects including the JW Marriott (Mirage City, Cairo), the Tropital (Sahl Hashish Red Sea), the Renaissance Hotel (Mirage City, Cairo) and the Sharm Bride Hotel (Sharm El Sheikh); and
- 0.799 MW of residential projects including the Palm Hills compound and the El Nada Compound. Pilot projects in the residential sector, however, revealed the challenges of implementing the 5-10 kWp on roof-top of individual homes. While the Project technically supported and co-financed the implementation of 45 PV plants in El Nada residential compound in the new City of Zayed, challenges to residential sector pilot projects can be attributed to the limitation of space on the roof of the house that places constraints on the orientation of the system as well as to the limited knowledge of the households about the new technology. As well, there is the inconsistent and seasonal electricity consumption patterns in houses posing another challenge in estimating solar-PV savings from the household systems.

Capacities installed by year include 2.123 MW in 2018, 5.476 MW in 2019, 2.182 MW in 2020, 1.079 MW in 2021, 2.333 MW in 2022, and 5.134 MW in 2022-23. This includes 3.6 MW of solar-PV projects in Sharm El Sheikh, mainly in hotels. The Project had remarkably affected the solar-PV price in the Egyptian market as the average price of submitted projects in 2019 was reduced by 18% below the 2018 prices; the devaluation of the Egyptian pound in early 2022 made these prices rise again. Table 8 provides a listing of solar-PV installations by sector. A listing of solar-PV installations supported by the Project and replicated is provided in Appendix F. Figures F-5 to F-8 provide GEF grant amounts to each pilot project.

71. The investments that the Project has facilitated has achieved international recognition:

- the Project won the 21st British Energy Institute Award (EI Award) in the “Low Carbon” category of the 21st British Energy Institute’s “EI Awards” in November 2020. The Project beat out 3 other nominees and won on the basis of enhancing the supply chain for the solar-PV market across the public, industrial, commercial, educational, tourism and residential sectors;
- the Project was also recognized by the "International Finance" magazine for Egypt-PV with an award for "the best provider of the most sustainable solutions in green energy for the year 2022”.

72. The Project has moved to other initiatives to promote solar-PV installations in Egypt including:

- support for the New Administrative Capital in designing its PV interventions in the city as a model and based on the design and management of the Administrative Capital. The Capital is implementing its first phase that includes 15 MW of rooftop PV systems on government buildings in 2019;
- production and dissemination of a manual in 2022 on “Water desalination: Promoting Water Desalination using Solar Energy Technologies in Egypt”;
- production and dissemination of a manual in 2019 on solar pumping which is mainly used by agricultural sector.

73. Another interesting initiative was the Project using Egypt’s status as a host of COP27 at Sharm El-Sheikh, Egypt in 2022 to organize a high-level promotional event in Sharm on 12 February 2022 to encourage installation of rooftop solar-PV systems in hotels ahead of the COP27. The event was inaugurated by the Minister of Environment, Minister of Tourism and Antiquities, Governor of South Sinai, the UNDP Resident Representative, Executive Director of IMC and the Minister of MoERE. The

event was organized in collaboration with Egyptian Federation of Tourism and was attended by a large number of the hotel owners in Sharm as well as PV private sector suppliers. After hearing Egypt PV presentation, Governor of South Sinai asked all hotels in Sharm to install solar-PV systems. On 31 March 2022, another high-level promotional event was organized in the presence of Minister of Environment, Minister of Trade and Industry, Minister of Civil Aviation, Deputy Minister of Tourism and Antiquities and UNDP Resident Representative where 9 hotels in Sharm signed contracts for installation of solar-PV systems as well as Sharm Airport ahead of COP27. The two events significantly promoted solar-PV installations in hotel sector, catalyzed interest in solar-PV to the extent that more than 40 MW of PV systems were installed in the city including 3.6 MW of solar-PV supported by the Project that included:

- 935 kWp at the Sharm International Convention Center;
- 280 kWp at the Sharm El Sheikh Airport;
- 682 kWp at the Sharm Bride hotel;
- 300 kWp at the Monte Carlo hotel;
- 280 kWp at the Sharm El Sheikh Museum; and
- 50 kWp at Sharm El Sheikh schools.

This only served to encourage replication to other hotels and buildings in Sharm El Sheikh and other parts of Egypt.

74. Overall, the work by the Project to assist Egypt in supporting design and implementation of solar PV projects is rated as **highly satisfactory**.

3.3.2 Progress towards Outcome 1: A total of 4 MWp of small PV systems installed based on easily replicable and scalable system design

75. To achieve Outcome 1, 4 MWp of small PV systems were to be installed based on easily replicable and scalable system design. This was to be achieved through 6 outputs:

- *Output 1.1: Finalized design of the support scheme to facilitate market takeoff for the first 4 MWp of small decentralized privately-owned PV power generation (rooftop) systems, including finalization of procedures and required templates to apply for this support*;
- *Output 1.2: Manual and template for PV system design and installation (with a link to Output 3.1), including sizing, orientation, technical requirements and economics to be released as a hard copy, internet-based and/or eventual smartphone application*;
- *Output 1.3: An established PV project support centre (including dedicated website + hotline) to share and manage information on the 4 MWp programme and advise and guide potential clients through the different steps of applying for the available support and the design, purchase and installation of a PV system*;
- *Output 1.4: Public awareness-raising and marketing campaigns to promote the 4 MWp programme and support the implementation of the planned GoO and net-metering schemes;*
- *Output 1.5: Two in-depth reviews and evaluations of the progress of the 4 MWp programme and issues faced (prior to the standard mid-term and final evaluations), including customer satisfaction surveys, technical and supply-side analysis, lessons learned and recommendations for further development of the scheme;*

- *Output 1.6: A project mid-term and final workshop to present and discuss the results and potential next steps.*

76. With regards to the target of *Output 1.1: Finalized design of the support scheme to facilitate market take-off for the first 4 MWp*, the Project developed project design documents in 2018 as detailed in Para 47. More importantly, the focus of the installations shifted to strategic partnerships with investors who can promote large-scale PV installations in specific regions or sectors in Egypt that aims to induce larger replication impact. This included an increased focus on industrial, commercial, hotel, educational and iconic public building establishments instead of the residential and SME sectors as originally envisaged. This was a significant adaptive management measure as outlined in Paras 48 and 49.

77. In announcing Egypt-PV Grant, the Project started to publish advertisements on the opening of the grant in one of the main newspapers in Egypt to kick-start the first 4 MWp solar PV market in Egypt. The advertisement was written in Arabic and was also published on the Egypt-PV Facebook page. The method of applying for the grant was online applications available for each sector on the Egypt-PV website. All applications were filtered and classified according to Egypt-PV eligibility criteria for each sector, published on Egypt-PV website, and were presented at Advisory Board meetings to determine the accepted pilot projects.

78. For *Output 1.2: A manual and template for PV system design and installation,* a "Minimum Technical Requirements" document was developed and approved by NREA as a guideline for solar-PV systems design and installation that included sizing, orientation, technical requirements and economics. This document was developed by a technical team with the co-operation of specialized consultants and was made available on the Egypt-PV website as technical support for the Egyptian PV market. Throughout implementation of the Project, the document was updated, used in Egypt-PV RFPs, and uploaded on the Egypt-PV website. All the data regarding the solar-PV installations were uploaded onto the Egypt-PV map through Google maps.

79. For *Output 1.3: An established PV project support centre,* the Project developed the "PV Hub", a website housing all Egypt-PV Project contents complete with a hotline to share and manage information on the Egypt-PV programme. This service provided advice and guidance to potential clients through different steps of the application in the design, purchase and installation of a solar PV system including:

- description of the Egypt-PV project, objectives, outcomes, activities and Egypt-PV family including; steering committee, advisory board, and technical team;
- posting of the Minimum Technical Requirements documents as well as a list of recommended suppliers, and other technical documents;
- frequently asked questions;
- a simple online financial calculator with changes updated including changes in the electricity tariff;
- a separate application for each sector available online to apply for Egypt-PV assistance with detailed descriptions of available Egypt-PV grants;
- all applications filtered and presented at PAB meetings to determine approved projects;

- sharing information about the implemented PV pilot projects on the website and FaceBook page using a project album and printed materials in brochures and flyers, to disseminate and publish Egypt-PV success stories for all supported sectors.

80. For "*Output 1.4: Raising public awareness….*", the Project had two public awareness initiatives: events and media & publications. For events, the Project conducted more than 39 events to spread awareness of the PV system benefits to encourage the transformation to green energy entities. These events included announcers, photographers and magazine representatives for media coverage, and covered promotion of the 4 MWp programme and support for implementation of the planned Guarantee of Origin (GoO) and net-metering schemes. Egypt-PV shares the success stories about the implemented pilot projects through these events that includes announcers, photographers and magazine representatives for the media coverage. Main objectives of organizing these events are:

- spreading public awareness in workshops, round tables, awareness-raising sessions of the PV system benefits and encouraging the transformation to green energy entities;
- disseminating Egypt-PV pilot projects results and their impact on the environment, especially to the industrial sector in collaboration with IMC;
- exchanging experiences of solar PV market leaders in Egypt;
- marketing the use of solar-PV systems and renewable energy in the 5 different sectors in Egypt especially to journalists, investors, local manufacturers and companies.

81. For media and publications, the communication strategy was to publish and disseminate Egypt-PV success stories for the five sectors. Media and publications initiatives include the Egypt-PV website, the UNDP Egypt website, the IMC website, FaceBook page, LinkedIn, call centre, and various printed materials.

82. For *Output 1.5: Two in-depth reviews and evaluations of the progress of the 4 MWp programme*, a an MTR Report was produced for the Egypt-PV Project in September 2019 that reviewed and evaluated progress of installed PV plants. This included Project efforts to technically support Administrative Capital for Urban Development (ACUD), the management company for the New Capital of Egypt to install 16 MWp of rooftop PV plants for the governmental buildings in the city starting in September 2020. A Final Report and video documentary are under preparation presenting Project progress of the past 6 years of implementation. The Egypt-PV PMU also prepared progress reports, PIRs that highlighted issues faced, customer satisfaction surveys, technical and supply analyses, lessons learned and recommendations to enhance further progress of the Project.

83. For *Output 1.6: A project midterm and final workshop*, a detailed study was conducted for the MTR in July 2019. Final Workshop preparations are ongoing to present and discuss the results and potential next steps.

84. Overall, the work by the Project to achieve Outcome 1 is rated as **highly satisfactory**. This is primarily due to the Project developing a "Minimum Technical Requirements" document, establishing an Egypt-PV website and hotline to share information on Egypt-PV, raising public awareness of the Egypt-PV programme, and installing 18.3 MW of rooftop solar-PV projects.

Figure 4: Rooftop solar PV on multi-story car park at Cairo International Airport

Figure 5: Inverter boxes at Cairo International Airport (left) and rooftop at Palm Hills Residential compound

Figure 6: Car shed with solar-PV at main administration building for Sodic Real Estate

Figure 7: Rooftop Solar-PV and solar water heaters at El-Hayat International School

3.3.3 Progress towards Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralised RE (in particular PV) power generation market together with related market monitoring mechanisms

85. To achieve Outcome 2, Project resources would be used to generate 7 outputs:

- *Output 2.1: Finalized implementation decrees and other required documents for ensuring fully operationalized guarantee of origin and net-metering schemes for selected tariff categories are in place to support small decentralized PV installations*;
- *Output 2.2: Completed analysis of eventual technical constraints in connecting small, decentralized PV systems to the grid and updating the related technical guidelines (or grid code), as needed, to overcome those constraints and to scrutinize the connections with support of the local electricity distribution companies*;
- *Output 2.3: As applicable, for eventual grid strengthening needs and/or new guidelines for grid and load management for integrating small, decentralized PV systems into the power system on a larger scale*;
- *Output 2.4: Completed analysis of the current building regulations for both construction and management of the buildings to identify any barriers to widespread implementation of rooftop PV systems in residential buildings and proposed amendments and measures to remove or overcome those barriers;*
- *Output 2.5: Drafted amendments to the existing laws and regulations and eventual new regulations to ensure adequate quality control of the PV systems offered in the market and their installations;*
- *Output 2.6: Finalized proposal (together with drafted legal and regulatory provisions) for the eventually required complementary financial and fiscal incentives and other measures (such as RE purchase obligations of national electric utilities, mechanisms for administering and setting national feed-in tariffs, etc.) to support sustainable growth of the small, decentralized PV market after reaching the initial 4 MWp target;*
- *Output 2.7: An assessment and recommendations for waste management and recycling options for the PV systems and their components upon reaching the end of their lifetimes (including, as needed, related drafting of new regulations/amendments to the existing legislation addressing the issue).*

A summary of actual achievements of Outcome 2 with evaluation ratings are provided on Table 7.

86. For "*Output 2.1: Finalized implementation decrees and other required documents….",* the Project placed significant efforts to populate the PV Hub with information concerning all aspects in the process of setting up and implementing solar-PV. This included a "one stop shop" (with a database for small and medium scale of decentralized grid-connected PV systems) that connects the 9 electricity distribution companies, NREA, EgyptERA, PV companies, clients and the Project. The PV Hub also provided useful information (such as national grid code for its use as Egypt-PV minimum technical requirements to support implementation of PV projects) and allowing NREA-certified solar-PV installer companies to electronically submit installation requests to distribution companies. Several meetings took place between 2019 and 2022[32] with MoERE, EgyptERA, NREA, EEHC and distribution companies to understand and coordinate the policies and regulations for the solar-PV market in Egypt; this enabled the PMU to digest the technical and financial impact of the framework.
87. The PMU supported the implemented solar-PV projects through a number of procedures including site inspections at the beginning and end of implementation with an acceptance technical checklist, that is provided to the installer prior to and after inspection of the installed solar-PV systems. In addition, the EEHC conducted acceptance tests of the installed solar-PV systems for connection to the grid and installing the net meters.

88. For "*Output 2.2: Completed analysis of eventual technical constraints…."*, the Project supported 225 solar-PV plants implemented and connected to the grid. The PMU documented the technical constraints of the implemented projects and interviewed a sample of solar-PV plants installation companies to find out their obstacles and challenges faced through grid connection of the plant. The result was a report produced in 2023 that includes recommendations to resolve these obstacles after the EOP to ensure sustainability and updating of the grid code to overcome these constraints with support of the local electricity distribution companies. One common opinion amongst solar-PV plants installation companies was the quick and efficient responsiveness of the PMU to technical concerns over certain types of solar-PV equipment and their installation procedures.

89. For "*Output 2.3: …..eventual grid strengthening needs and/or new guidelines for grid and load management….*", the Project has supported a grid impact study for one of the critical pilot projects "Nissan" which faced a challenge with grid connection in connecting the solar-PV plant, viewed as one of the critical steps to obtain a grid connection license.

90. For "*Output 2.4, Completed analysis of the current building regulations for both construction and management of the buildings ……"*, the Project submitted a guideline report that was posted on the PV Hub for the installation of building-integrated PV (BIPV) systems to remove barriers for the limited spaces on rooftops of buildings:

    - the Project supported implementation (both technically and financially) 45 PV plants in the El Nada residential compound, where the Project faced a lot of challenges and difficulties. With several site visits and inspections with consultants, the Project held meetings with the owners of the solar-PV plants to discuss problems and constraints of the solar-PV plants and their production, and the required maintenance procedures. With a number of monitoring reports prepared as a follow-up to the solar-PV plants, the Project prepared a "Best Practices Installation Guideline" to assist EPC-PV installers to improve their practices in installing and commissioning

[32] Meetings took place on 29 May 2019, 1 November 2020, 7 November 2021, 22 November 2022, and 22 August 2022.

rooftop solar-PV systems. The Guideline posted on the PV Hub also provided beneficiaries and other stakeholders with simple means to assess the quality of rooftop solar-PV installations;

- the Project developed a "Client Guideline" as a small-scale PV projects user manual for the purpose of raising public awareness of grid-tied solar-PV systems;
- a result of these Guidelines was another residential compound applying to install 30 PV plants;
- the Project conducted public hearings in the residential sector through communications with individuals who wanted to install solar-PV plants. This included answering their inquiries through responding to their phone calls on daily basis on the hotline, and on Facebook social media page.

91. For "*Output 2.5: Drafted amendments to the existing laws and regulations…."*, the drafted amendments are facilitated by system integrators who along with consumers are able to submit grid-connected projects applications online that instantly reach corresponding distribution companies, where they can comment and decide on the approval; this allowed the approvals to be issued online and in much less time. Since August 2017, EgyptERA has switched from the feed-in tariff for smaller capacities to net metering. Furthermore, it extends the applicability of the net metering to capacities up to 20 MW. Egypt-PV has coordinated with EgyptERA to issue a guideline for the net metering procedures and its applications This is all posted on the PV Hub to facilitate data analysis, new procedures, and eventual new regulations to ensure adequate quality control of installed solar-PV systems.

92. For "*Output 2.6, Finalised proposal (together with drafted legal and regulatory provisions) for the eventually-required complementary financial and fiscal incentives and other measures….. "*, an "Exit Strategy" was prepared for the next stage to maintain the financial success and sustainability of solar-PV market through establishing a "suitability unit" or a "facilitation center" in the IMC (see Paras 141, 144 and 145). This was to be done at the EOP with transfers of the technical experience from the Project to support the industrial sector in solar-PV projects and to cooperate with the international and funding organizations to replicate the success.

93. For "*Output 2.7: An assessment and recommendations for waste management and recycling options for the PV systems and their components ……*", the PMU has held meetings within a cooperative framework between the National Waste Authority, the Ministry of Environment, MoERE and the UNDP on what actions need to be taken to manage electronic waste generated by solar-PV power plants. The meetings had discussions on proposals for the management of these wastes. The Project also supported an initiative for the collection and safe disposal of the e-Waste through a mobile application developed by a startup, E-Tadweer that was launched in April 2021 in the presence of the Minister of Environment, UNDP Resident Representative, the Federation of Egyptian Industries, and private sector companies including Vodafone Foundation and Raya Holding who are offering collection points for E-Waste and discount vouchers. The Ministry of Environment has supported this initiative by adding it to its Presidential environment awareness televised campaign. Nevertheless, UNDP Egypt is mobilizing additional resources to continue support to the E-Tadweer to increase number of partner companies and scope of electronic and electric devices covered by the initiative.

94. In conclusion, the work by the Project to assist in achieving Outcome 2 of a supportive policy, institutional and regulatory framework for small, decentralized RE (in particular PV) is rated as **highly satisfactory**. This is based on the institutional framework for the operation of the PV-Hub across all the distribution companies, EgyptERA, NREA and others with information posted on the PV Hub including the "one stop shop" for private or public sector stakeholders that allows NREA-certified solar-PV installer companies to electronically submit installation requests to distribution companies.

The Project also supported regular updating of the grid code and grid impact studies, an "Exit Strategy" prepared for financial sustainability of solar-PV market through establishing a "facilitation center" in the IMC, and meetings to manage electronic waste generated by solar-PV power plants, all posted on the PV Hub.

3.3.4 Progress towards Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels.

95. To achieve Outcome 3, Project resources would be used to generate 7 outputs:

- *Output 3.1: Finalized technical and other quality criteria for the PV systems (including inverter and grid connection), installations and PV system suppliers and installers to benefit from the UNDP-implemented, GEF-financed project and related Government support;*
- *Output 3.2: Finalized training programme and training materials to train the key stakeholders (including system suppliers and installers) on the adopted technical and other quality criteria as a prerequisite for offering their products and services for the implementation of the 4 MWp programme and benefit from other financial and fiscal incentives;*
- *Output 3.3: A quality-controlled PV suppliers and installers' database (as applicable, including also pre-tendered prices to be updated at regular intervals) with at least 5 pre-screened and trained system suppliers and 20 installers that have obtained a quality certificate (or recognition) to offer their services to the PV projects supported by the UNDP-implemented, GEF-financed project (with an emphasis on a 'one stop shop' approach);*
- *Output 3.4: Finalized design of a permanent quality control and certification scheme for both the hardware and installations, with related market surveillance and enforcement mechanisms and institutional arrangements to facilitate their effective implementation after the project;*
- *Output 3.5: Agreed methodology, institutional arrangements, procedures and mechanisms for effective market monitoring, producing regular annual market monitoring reports and able to continue such monitoring after the end of the UNDP-implemented, GEF-financed project;*
- *Output 3.6: Complementary training and other capacity development programmes for different professional groups, such as architects, building engineers and construction companies, to promote decentralized PV power generation in new buildings through integrated building and PV system design; and*
- *Output 3.7: Public awareness-raising and marketing support, including, as applicable, support for the establishment of a local Solar Energy Industry Association, which can continue the policy dialogue and operate as a knowledge management hub and training center for further promotion of both the solar power generation and solar thermal markets.*

A summary of actual achievements of Outcome 3 with evaluation ratings is provided on Table 7.

96. For "*Output 3.1: Finalized technical and other quality criteria for the PV systems……*", the Project developed the following documents to ensure quality criteria of PV projects:

- "Minimum Technical Requirements", a quality-control technical document that provides installers and clients with the minimal technically and financially accepted requirements to guarantee optimum performance for on-grid solar-PV projects (see Output 1.2 or Para 78);

- "Technical and Financial Offer Template" that provides essential data that should be available to have professional technical and financial offers submitted to clients or to the Project at the evaluation stage;
- "Projects Acceptance Checklist" that is provided to installers prior to installation to fill in for inspection and evaluation of installed solar-PV systems;
- Follow-up monitoring reports for installed PV plants;
- "Best Practices Installation Guideline" with a focus on Egypt rooftop solar-PV sector with the objectives to assist EPC-PV installation firms to improve their operating practices in the installation and commissioning of rooftop solar-PV systems; and providing a simple means to assess the quality of installation of roof top PV systems for stakeholders;
- Client guideline that serves as a small-scale PV projects user manual to raise public and awareness on grid-tied PV systems (i.e. how it works, capacity sizing, regulations, selecting a company, profitability) that is published on the Project's website and disseminated to the public to guide the public towards the right steps for installing a solar-PV system;
- "Quick Guide for Effective Cleaning of PV Modules" for procedures for cleaning solar-PV modules;
- "BIPV guideline" to provide a guideline for BIPV and Building Attached Photovoltaic (BAPV) installations in Egypt;
- "Water Desalination" report to assess the financial and technical feasibility of utilizing abundant solar energy, mature and existing solar-PV market and the progress and efforts achieved by the private sector and the GoE in the last decade to supply electricity for water desalination plants in Egypt.

All these reports have been posted on the PV Hub.

97. For "*Output 3.2: Finalized training programme and training materials……*", the Project delivered training materials professional for the purposes of training to a wide range of stakeholders of various backgrounds (i.e. students, engineers, bankers and journalists from the Egyptian Engineering Syndicate, the Egyptian Engineering Association, technician's high schools students).

98. With regards to "*Output 3.3: A quality-controlled PV suppliers and installers' database……*", a list of recommended system integrators (suppliers and installers) was prepared who complied with the minimum requirements of both NREA and the Project. As a first stage to support local manufacturing, the Project team developed a comprehensive database of the Egyptian solar-PV components manufacturers such as panels, mounting structures and cables. The list that includes 53 recommended suppliers has been updated and is posted on the PV Hub.

99. With regards to "*Output 3.4: Finalized design of a permanent quality control and certification scheme for both the hardware and installations…….*", the Project designed a database posted on the PV Hub for small and medium scale of decentralized grid-connected PV systems that provides useful information for clients to support solar-PV project implementation. The platform also allows NREA-certified solar-PV installation companies to submit installation requests to distribution companies and electronically follow-up requests. The impact of this output has been a market surveillance and enforcement mechanism and institutional arrangements that maintain and update installation standards with solar-PV installations reflecting improved quality and reduced negative impacts.

100. With regards to "*Output 3.5: Agreed methodology, institutional arrangements, procedures and mechanisms for effective market monitoring……",* the Project developed a concept note and initial plan to transfer experiences and knowledge gained from the Project duration in collaboration with IMC. IMC is currently in discussions for arrangements to establish a unit to use capacities built in the Project to provide same services.

101. With regards to "*Output 3.6: Complementary training and other capacity development programmes for different professional groups….*", the Project conducted professional training to 530 stakeholders of various backgrounds (i.e. architects, building engineers, personnel at construction companies students, bankers and journalists from the Egyptian Engineering Syndicate, the Egyptian Engineering Association, technician's high schools students). Training was also extended to cover professional best practices for system integrators at the hotel sector, journalists, the Federation of Egyptian Banks, Ramsees Railway Station employees, Ministry of Environment, and the Electric Energy Efficiency Unit at the Ministry of Education to promote decentralized PV power generation in new buildings through integrated building and PV system design:

- "Capacity Building for Undergraduate Interns" where the aim was to transfer knowledge on technical aspects of the solar-PV projects including PV system design, selection and installation, implementation of the quality control and certification scheme, product maintenance during operation, and product performance monitoring and testing;
- "System Integrators Training", a course for the design and installation of solar-PV systems;
- "Basics of PVs training at El Wadi El Gadied", a 5-day training course on the basics of solar-PV systems for 96 trainees at the Engineers Syndicate;
- "Design and Installation of PV systems at El Wadi El Gadied", a training session for 22 trainees at the Engineers Syndicate about the design and installation of solar-PV systems, where a Project supported installation of a 10 kWp PV system was used as a demonstration for practical training. The impact of this capacity building has been more decentralized job creation for solar-PV professionals Upper Egypt markets;
- "Basics of PVs training to Egyptian Society of Engineers (ESE)", a course for 22 trainees in cooperation with ESE for the capacity building of their engineers, creating jobs and raising awareness to solar-PV basics;
- "Basics of PVs training to the Ministry of Environment", a course for 26 trainees in cooperation with the MoEF to build capacity of their engineers, creating jobs and raising awareness to solar-PV basics;
- "Banks PV Trainings", a course for 11 trainees from 7 different banks that focused on the feasibility and profitability of solar-PV systems (see Output 4.3, Para 109)
- "Technological Industrial Education School, Cairo" and "High Technician School in Alexandria", a training course on the basics of solar energy to build the capacity of technical school students in cooperation with the Ministry of Education and Technical Education and the IMC Training for technician's school;
- "Training for Ministry of Education's Sustainable Electrical Energy Efficiency Unit personnel" for personnel responsible for energy efficiency and transitioning to greener energy resources for all facilities owned by the Ministry of Education;
- Provision of technical support in screening project proposals in the GEF Small Grants Project (SGP) CCM Sub-Committee, recommending modifications to the design of projects including field visits, and providing technical assistance during implementation of solar-PV projects. Technical support was provided to one of the NGOs funded by SGP to install PV plants in El-Azhar University

where the Project conducted site inspections for the selected sites, followed by a technical and economic feasibility study.

102. With regards to "*Output 3.7: Public awareness-raising and marketing support…….*", the Project developed a concept note to the Sustainability Division of the IMC and initial plan to transfer experiences and knowledge gained from the Project duration for the purpose of building the capacity of the IMC's Sustainability Division to deliver consultation and advisory services in environment, energy efficiency, renewable energy, and sustainable manufacturing. There has also been the establishment of a local Solar Energy Industry Association, which is positioned to have strong links with IMC's Sustainability Division.

103. With regards to the outcome of "strengthened domestic supply chains and quality control system", the delivery of outputs has placed the solar-PV industry in a position to succeed. This included Project technical assistance to all system integrators to resolve issues regarding installation procedures and equipment used, reinforcing the standards and regulations for proper installations. The presence of the Egypt-PV PMU provided suppliers a supportive legalized umbrella organization that provides regulatory oversight to all NREA-certified installations. With project proponents realizing this quality assurance by the suppliers, many of them made commitments to replicate the solar-PV installations using their own resources.

104. The devaluation of the Egyptian pound, however, slowed down solar-PV activities in late 2016 and again in early-2022, placing some suppliers in a difficult position given that they have not diversified their businesses beyond solar-PV and solar thermal equipment. The solar-PV market has slowed down but will show resilience provided there is a hike in electricity tariffs and if there is an available subsidy for solar-PV installations as was the case with the Egypt-PV Project. The EBRD-financed Green Economy Financing Facility (GEFF) project provides 5-10% grants to their investment loans to catalyze the market while the loans for roof top PV systems, promoted by the Project, have reached US$31 million, and GIZ has developed a US$10 million NAMA Facility funded project to provide a similar financial mechanism for rooftop solar-PV systems in the SME industrial sector.

105. In conclusion, the work by the Project to assist in achieving Outcome 3, a strengthened domestic supply chain and quality control system is rated as **highly satisfactory**. This is based on a number of documents prepared to ensure quality criteria of solar-PV projects, capacity building to a wide range of stakeholders on these quality documents for decentralized PV power generation in new buildings, and concept notes and initial plan to transfer experiences and knowledge gained from the Project duration in collaboration with IMC, and establishment of a local Solar Energy Industry Association.

3.3.5 Progress towards Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralized PV systems for a broad range of consumers

106. To achieve Outcome 4, Project resources would be used to generate 5 outputs:

- *Output 4.1: Required background studies, analysis and initial drafting of the proposed financing scheme(s) and support for required follow-up consultations with the financing entities interested in developing the scheme further;*
- *Output 4.2: Involvement of local community associations to act as intermediaries, helping to promote the lending mechanism and support the projects;*

- *Output 4.3: Technical due diligence of projects proposed for financing, and training of the staff of the participating banks on technical aspects of the projects;*
- *Output 4.4: Monitoring the impact and performance of the financing schemes introduced;*
- *Output 4.5: Final report on the results, experiences and lessons learned and recommendations for further work as it concerns the project as a whole.*

A summary of actual achievements of Outcome 4 with evaluation ratings are provided on Table 7.

107. For "*Output 4.1: Required background studies, analysis and initial drafting of the proposed financing schemes…..*", the Project developed a report for business models as a first step for monitoring the impact and performance of financing schemes. The objective of this report was to explore the existing different types of business models of on-grid solar systems in Egypt on the basis of Project-implemented solar-PV projects by within the different sectors (industrial, commercial, tourism, residential and public buildings) revisiting their feasibility and business model used on each investment. This generated follow-up consultations with the financing entities interested in developing the scheme further. The Project has managed to collaborate with 3 major banks for technical support and study of their financial mechanism with the Project's financial grant mechanisms.

108. For "*Output 4.2: Involvement of local community associations to act as intermediaries……*", the Project cooperated with the following local community associations to help to promote the lending mechanism and support the investments:

- El Nada residential compound owner's union that acted as an intermediary between the Project and the district residents where 45 residential units were supported technically and financially with total capacity of 335 kWp;
- Palm Hills residential compound owner's union that acted as an intermediary between the Project and the district residents where 30 residential units were supported technically and financially with total capacity of 220 kWp.

109. For "*Output 4.3: Technical due diligence of projects proposed for financing, and training of the staff of the participating banks …..*", the Project delivered "Banks PV Trainings" in July 2018 to 11 different banks (1 trainee from each bank) in Cairo, on financial feasibility of solar-PV investments to raise the awareness of the bankers to facilitate solar loans. The 3-day training course covered the basics of solar-PV systems and the methodology of plant calculation, enabling bank personnel to conduct full feasibility studies for solar-PV plants and understand the energy produced from the plant and convert it to money. This also enabled bank personnel to integrate this training along their financial mechanisms and open the market and offer non-conventional financial support mechanisms.

110. For "*Output 4.4: Monitoring the impact and performance of the financing schemes introduced*", the Project monitored and evaluated Project progress periodically through the timesheets, PIRs, MTR, and a final report. While there are no financial schemes dedicated for rooftop PV systems, solar-PV technology is included amongst other technologies in credit lines at the Bank Misr, National Bank of Egypt and GEEF supported banks.

111. For "*Output 4.5: Final report on the results, experiences and lessons learned and recommendations …….*" , a final Project report is being prepared.

112. In the context of setting up financing frameworks and a network of local financial institutions, the Project has been coordinating with EBRD-financed GEFF credit line for energy efficiency and renewable energy projects. Thus far, GEFF has supported 33 projects with a total capacity of 44.8 MW with total investments of US$ 31 million and has recently reported that the pipeline is currently biased towards rooftop PV systems in particular for the industrial sector. Meanwhile, GIZ has developed a US$10 million NAMA Facility funded project to provide a financial mechanism, based on Egypt PV model, for rooftop solar-PV systems in the SME industrial sector. GIZ contracted another member of Egypt PV technical team to support the development and later on implementation of the project. The GIZ project may have challenges in getting SME investments financed due to liquidity and collateral issues with most SMEs.

113. The Project has been working on securing financial support for pilot projects for on-grid pumping as well as off-grid (diesel) pumping projects. A financial tool has been created to calculate the financial feasibility of solar pumping projects versus diesel pumping projects demonstrating the need for supporting these projects.

114. In conclusion, the work by the Project to assist in achieving Outcome 4, a financing framework and a network of local financial institutions, is rated as **satisfactory**. This is based on a Project cooperation with local community associations to help to promote the lending mechanism and support the investments, training to 11 banks on financial feasibility of solar-PV investments to raise the awareness of the bankers to facilitate solar loans, and the engagement of 3 banks to give support for financial mechanisms for solar loans.

3.3.6 Relevance

115. The Egypt-PV Project is relevant to the development priorities of Egypt related to a number of national strategies and plans including:

- Law 102 adopted in 1986 establishing NREA;
- the Supreme Energy Council of Egypt in 2007, adopted an ambitious plan to increase the share of electricity produced by renewable energy sources up to 20% of total electricity generation by 2020 (Para 17);
- the Integrated Sustainable Energy Strategy (ISES) to 2035, October 2016 to ensure the continuous security and stability of the country's energy supply (Para 18);
- the 7th Five Year Plan (2012-2017) that included the development of renewable energy and energy efficiency (Para 18);
- Strat_EGY FY14/15 – FY18/19 (Egypt's 5-Year Macro-Economic Framework and Strategy) where electricity grid is to being upgraded to be compatible with the use of renewable energy; and a medium-term plan to fully introduce smart meters is currently being studied;
- the Electricity Law promulgated in July 2015 to include how subsequent phases of renewable development should proceed in Egypt (Para 19);
- the Government's commitment to enhance its NDCs by quadrupling its installed renewables capacity share to 42% by 2030;
- Updated Nationally Determined Contribution Report issued June 2022.

116. Moreover, the Egypt-PV Project is also relevant to:

- the UNDP CPD 2018-2022, "Output 2.1: Expanded use of energy efficiency and renewable energy solutions in key sectors" where "in line with goals 7, 11 and 13, UNDP will continue to help Egypt tackle climate change mitigation, in tandem with pollution abatement, by promoting ….. small-scale renewable energy technologies with poverty reduction dividends, encouraging a shift to low-emission technologies in industry. Enabling activities will continue, including capacity-building for the Government on reporting and compliance with international environment conventions such as the Paris Agreement", and "creating effective linkages to the private sector, innovation, job creation and livelihood improvement, with a focus on women's economic empowerment, community-based development and increased access to renewable energy sources (goals 8 and 9)";
- SDGs in particular No. 5 - Gender Equality: there are gender targets for every indicator involving project beneficiaries or stakeholders; No. 7 – Affordable and clean energy: Ensuring affordable, reliable, sustainable and modern energy for all; No. 11 – Sustainable cities and communities: make cities and human settlements inclusive, safe resilient and sustainable; and No. 13 – Climate action: take urgent action to combat climate change and its impacts;
- GEF-5 focal areas of Outcome 3.1: Favourable policy and regulatory environment created for renewable energy investments, and Outcome 3.2: Investment in Renewable Energy Technologies increased.

117. The ToC applied to the Project is relevant to promoting investment in renewable energy, in particular solar-PV and expanding access to environmental and energy services for the industrial, commercial, education, hospitality, residential and public sectors. It is within the framework of "leave no one behind agenda". The Project objective, outcomes and outputs are clear, practical and feasible within its framework, clearly addressing the need to involve and build capacity for government personnel as well as private sector EPC-PV companies, and to a certain extent, beneficiaries of solar-PV investments. There were lessons from the PWMSP project incorporated into the Egypt-PV Project design (Para 36).

118. The Project does not seem to be designed as rights-based and gender sensitive project. However, the Project did make substantial efforts to include gender dimensions on the design and implementation of solar-PV investments (Para). There were linkages to other Project interventions in Egypt to create synergies (Para 38).

119. Thus, it can be concluded that the Egypt-PV Project is **relevant** to the development priorities in Egypt.

3.3.7 Effectiveness

120. The effectiveness of the Egypt-PV Project has been ***highly satisfactory***, in consideration of the highly successful technical assistance provided, additional resources leveraged by the Project to develop solar-PV investments, and all stakeholders (national and local government, private sector developers, academic, and energy professionals) supporting development of solar-PV measures that contributed to delivering the objective and outcomes of the Project's PRF by the EOP.

121. The partnership and collaboration between the Project and PMU and the IMC, NREA, EgyptERA and others has been extremely appropriate and effective. This has led to solar-PV investments being implemented to an extent that all the objective-level targets (i.e. the GHG emission reductions,

energy saved, volume of public and private investment mobilized) and all outcome-level targets[33] have been exceeded. This was achieved through participatory project management and implementation with all relevant stakeholders contributing towards achievement of the Egypt-PV Project objectives to the extent that stakeholders (Government, private sector and beneficiaries) can build on and expand Project solar-PV installations to other entities of these sectors and other economic sectors.

122. The success of the Project had much to do with the Project's excellent responsiveness to the needs of all relevant stakeholders. The grant blended Egypt-PV pilot programme been effective in creating awareness amongst all stakeholders for solar PV deployment and in demonstrating a functioning and viable financing model. The COVID-19 pandemic delayed all Project activities and solar-PV investments for at least 9 months. However, the Project was able to mitigate the delays with a Project extension of 9 months and the resumption of promotional activities by December 2020.
123. Special mention should be made towards the role of the PAB in monthly Project meetings in providing strong support to the Project meeting its objectives and outcomes, and advising the PMU on ensuring all stakeholder needs were anticipated and met (Para 43). The added layer of expertise of the PAB proved to be crucial to the effectiveness of the PMU and the Project activities in general.

124. The Project has also attempted to contribute to the well-being and human rights of vulnerable groups, including women and youth, effectively contributing to "leave no one behind agenda" and successfully integrating a human rights-based approach.

3.3.8 Efficiency

125. The efficiency of the Egypt-PV Project has been rated as ***highly satisfactory*** in consideration of the cost efficiencies of the technical assistance financed by the GEF funds, followed by co-financing from the private developers and the GoE. This Project delivered its objective and outcomes within a 6.5 year span, 18 months over the 5-year design period of the Egypt-PV Project. The usage of funds allocated to each stakeholder was determined by the GoE, specifically the IMC. The fact that GEF funds allocated to meet all objective targets and outcomes with US$960,865 remaining unused in the GEF budget, contributes to the high efficiency for which GEF funds were utilized, notwithstanding delays caused by the COVID-19 pandemic and changes in government, ***not*** inefficiencies in Project management.

126. The Project started in December 2016 for a design period of 5 years and lost one year due to delay in the Inception Phase. The Project did not have major significant risks up to 2019; political instability and financial issues which were predominant in 2017 and early 2018 were less relevant in 2019. This translated into economical use of financial and human resources (funds, staff, time, expertise) that have been allocated strategically and cost-effectively to achieve outcomes. The COVID-19 pandemic in 2020 and early 2021 coincided during peak demand for solar-PV. During the pandemic, there was no implementation of any pilot projects for about one year, while technical assistance and meetings with the beneficiaries during that period were delivered online. Monitoring and evaluation systems used by UNDP ensured effective and efficient Project management. The added layer of expertise of the PAB also proved to be crucial to the reasonably timely achievement of Project objectives and

[33] Namely i) replicable and scalable system installations of small PV systems; ii) effectively implemented and supported financial and fiscal incentives and enabling technical requirements for solar-PV grid connections; iii) strengthened domestic supply chain and quality control system; and iv) a supportive financing framework and network of local financial institutions to facilitate the financing of small, decentralized PV systems.

outcomes. Though the Project needed an additional 18 months to complete its activities, the Project was still efficient in its implementation.

3.3.9 Mainstreaming

127. The Egypt-PV Project has managed to mainstream *solar-PV renewable energy*. Most notable Project activities to mainstream solar-PV opportunities were:

- all stakeholders (national and local government, private sector, academic, community and developers) supporting development of rooftop solar-PV;
- the GoE becoming more solid in providing the policy and secondary legislation;
- the Strat_EGY FY14/15 – FY18/19, Egypt's 5-Year Macro-Economic Framework and Strategy, where the electricity grid was to be upgraded to be compatible with the use of renewable energy (Para 115);
- the Electricity Law promulgated in July 2015 to include how subsequent phases of renewable development should proceed in Egypt (Para 19);
- GoE establishing a new administrative capital presenting the opportunity to mainstream solar-PV systems in the buildings;
- the use of Egypt's status as a host of COP27 at Sharm El-Sheikh, Egypt in 2022 to organize a high-level promotional event in Sharm on to encourage installation of roof top PV systems in hotels in advance of COP27, resulting in 9 hotels signing contracts for installation of PV systems as well as Sharm Airport in advance of COP27 (Para 73).

3.3.10 Overall Project Outcome

128. The intended Project outcomes have been ***highly satisfactory***:

- the Project has been successful in exceeding GHG emission reduction and energy saving targets from rooftop solar-PV investments (Paras 68-70);
- the Project has been successful in the installation of more than 18.3 MWp of small rooftop solar-PV systems based on easily replicable and scalable system designs that were developed into guidelines and other Project technical reports with an established solar-PV support website and hotline that raised public awareness (Paras 75-80);
- the Project has been successful in developing a supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of small, decentralised renewable energy power generation market, in particular solar-PV. This was done in tandem with the PV Hub, a website that established a "one-stop-shop" for private or public sector stakeholders (Paras 86-87); updating technical guidelines to overcome all constraints connecting small decentralized PV systems to the grid in industrial, commercial, hospitality, public and residential buildings (Paras 88-89); existing and amended laws and regulations posted on-line to ensure adequate quality control of solar-PV systems (Paras 90-91); an "Exit Strategy" prepared to maintain the financial success and sustainability of solar-PV market through establishing a "suitability unit" in the IMC (Para 92); and meetings within a cooperative framework to manage electronic waste generated by solar-PV power plants (Para 93);
- the Project successfully strengthened the domestic supply chain and quality control system, increasing the capacities of domestic manufacturing and assembly of PV panels. This was done in tandem with a "Minimum Technical Requirements" quality-control technical document that provides installers and clients with the minimal technically and financially accepted requirements

to guarantee optimum performance for on-grid solar-PV projects (Para 96), training and listing of qualified system integrators (Paras 97, 98, 101 and 102); and the PV Hub that provides NREA-certified solar-PV installation companies on a market surveillance and enforcement mechanism and institutional arrangements that maintain and update installation standards with solar-PV installations (Paras 99-100);

- the Project has been successful at developing a financing framework and a network of local financial institutions to facilitate financing of small, decentralized PV systems for a broad range of consumers. This includes collaboration with 3 major banks for study of their financial mechanism with the Project's financial grant mechanisms (Para 107); obtaining the help of 2 local community associations to promote the lending mechanism and support the investments (Para 108); and enabling bank personnel to integrate "Banks PV Trainings" along with their financial mechanisms to open non-conventional financial support mechanisms (Para 109).

3.3.11 Sustainability of Project Outcomes

129. In assessing sustainability of the Egypt-PV Project, the Evaluators asked "how likely will the Project outcomes be sustained beyond Project termination?" Sustainability of Egypt-PV's outcomes was evaluated in the dimensions of financial resources, socio-political risks, institutional framework and governance, and environmental factors, using a simple ranking scheme:

- *4 = Likely (L):* negligible risks to sustainability;
- *3 = Moderately Likely (ML):* moderate risks to sustainability;
- *2 = Moderately Unlikely (MU):* significant risks to sustainability; and
- *1 = Unlikely (U):* severe risks to sustainability; and
- *U/A = unable to assess*.

Overall rating is equivalent to the lowest sustainability ranking score of the 4 dimensions. Details of sustainability ratings for the Egypt-PV Project are provided on Table 9.

130. *The overall Egypt-PV Project sustainability rating is moderately likely (ML).* This is primarily due to:

- the current 10% devaluation of the Egyptian pound at the beginning of 2022, the consequences of war in Ukraine affecting supply chains, and the COVID-19 lockdown in China. This raises the cost of solar-PV equipment, negatively affecting the solar-PV market that has shown resilience in past to the shocks;
- there is a proposal to raise electricity tariffs which would catalyze solar-PV deployment. However, the date of raising electricity tariffs is yet to be determined.

3.3.12 Country Ownership

131. Ownership of the Egypt-PV Project is amply displayed in:

- new Electricity Law, which was promulgated in July 2015, does include several provisions on how subsequent phases of renewable development should proceed in Egypt;
- the PB is chaired by the IMC and includes representatives for government officials from relevant institutions, all of whom provided significant contribution to the PB meetings;
- the PAB includes high level consultants and high officials from key line ministries involved with electricity and renewable energy, all of whom provided significant contributions at PAB

meetings, to keep the Project in line with achievement of the objective and the Project outcomes.

3.3.13 Gender equality and women's empowerment

132. Gender actions on the Egypt-PV Project is rated as **satisfactory**. The Project has done many positive actions to promote gender equality in solar-PV including:

- staffing the PMU with 4 women and 3 men at the commencement of the Project in 2018, adhering to the gender equality goal as one of the SDGs. By 2021, the PMU grew to 6 women and 3 men. The Project has had a female NPM since 2018;

Table 9: Assessment of Sustainability of Outcomes

Actual Outcomes (as of April 2023)	Assessment of Sustainability	Dimensions of Sustainability
Actual Outcome 1: A total of 18.3 MWp was installed leading to over 30,000 MWh of annual energy production, serving more than 18,000 beneficiaries, based on easily replicable and scalable system design.	• *Financial Resources:* Funding is available provided the cost of solar-PV equipment is reasonable. Unfortunately, the Egyptian pound was devalued by 10% in early 2022 along with the consequences of Ukraine war including impacts on supply chain due to the war, and the lockdown in many parts of China due to COVID-19. This affected the solar-PV market in Egypt which has shown resilience to the shocks and did not collapse (Para 104); • *Socio-Political Risks*: There are risks related to rising costs of solar-PV equipment, making some solar-PV investments not feasible; • *Institutional Framework and Governance:* Currently, there is a proposal to raise electricity tariffs which would catalyze solar-PV deployment. However, the date for the rise in these tariffs is yet to be determined; • *Environmental Factors:* There are ongoing discussions to manage electronic waste generated by solar-PV power plants (Para 93). ***Overall Rating***	3 3 3 4 **3**
Actual Outcome 2: A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralised RE financial has been effectively implemented and supported with capacities built for NREA employees and engineers on how to use the PV hub, a website with regulations and a database for small and medium scaled decentralized grid-connected PV systems.	• *Financial Resources:* There are NREA and IMC funds to continue hosting the PV-hub; • *Socio-Political Risks*: Capacities of NREA, IMC and energy professionals are built to effectively use the PV hub; • *Institutional Framework and Governance:* Full institutional support for the PV hub; • *Environmental Factors:* No risk. ***Overall Rating***	4 4 4 4 **4**
Actual Outcome 3: The domestic supply chain has been strengthened with project investors being able utilize a "one stop shop" with competitive prices, an established quality control system, and capacities built for 530 trainees of various backgrounds from government to the private sector to make this system functional.	• *Financial Resources:* There is a small risk in funds not being available for hosting the one-stop shop due to the devaluation of the Egyptian pound and rising solar-PV equipment costs; • *Socio-Political Risks:* There is a small socio-political risk in the solar-PV market slowing down due to the devaluation of the Egyptian pound and rising solar-PV equipment costs; • *Institutional Framework and Governance*: Full institutional support for the one-stop shop • *Environmental Factors: No risk*. ***Overall Rating***	3 3 4 4 **4**

Table 9: Assessment of Sustainability of Outcomes

Actual Outcomes (as of April 2023)	Assessment of Sustainability	Dimensions of Sustainability
Actual Outcome 4: A small network of local financial institutions has raised US$27.8 million within a financing framework and is prepared to facilitate the financing of small, decentralized PV systems for a broad range of consumers.	• *Financial Resources:* There are 3 major banks with finances to support their financial mechanism with the Project's financial grant mechanisms. There are, however, external factors that disrupt the sustained financing of rooftop solar-PV in Egypt (Para 104); • *Socio-Political Risks:* With "Banks PV Trainings" delivered to 11 banks out of which 3 banks were still involved with integrating this training along their financial mechanisms, there is still some risk that there are no financing schemes available from these banks. This would leave GEFF and other donor projects as available financing for solar-PV installations; • *Institutional Framework and Governance*: Full institutional support for facilitating solar-PV financing based on a Project and IMC report on financial feasibility of solar-PV investments to raise the awareness of the bankers to facilitate solar loans; • *Environmental Factors: No risk*. ***Overall Rating***	3 3 4 4 **4**
	Overall Rating of Project Sustainability:	**3**

- the communication strategy that was developed in 2018 in collaboration with the PAB to include a policy banning any form of gender discrimination and tools for gender equality and women's empowerment;
- technical training that was conducted in 2019 at the New Valley Governorate for more than 50 women with different technical backgrounds to open future opportunities and create jobs in the field of solar energy;
- awareness activities organized in 2020 with the National Council of Women to support an emerging solar-PV market and the development of knowledge and skills for work continuity and increasing competitiveness. This resulted in the participation of over 60 women out of 100 trainees in 2020 and 2021 in all theoretical and practical workshops to assure improvement, development and sustainability;
- provision of a gender action plan in 2020 to effectively monitor gender actions by the Project. Actions considered the different attitudes between men and women towards energy consumption and energy saving. Considering these differences, the Project sought to mainstream gender in data collection, capacity development, policy dialogue and communication and information dissemination activities;
- support from the Tawasol NGO where one of their main goals is developing the talents and providing income and job opportunities for unemployed women. The Project and Tawasol are currently supporting the installation of a solar-PV plant at the Ezbet Khairallah school in Istabl Antar;
- support for manufacturers who are employing a significant number of females in their work force through site visits, surveys, and meetings. For example, in its development of a comprehensive database of Egyptian solar PV components manufacturers, the Project has found that a solar-PV factory in the Suez governorate is employing 70% female workers;
- provision of an inclusive atmosphere starting in 2020 to ensure equal opportunities in training sessions and workshops for fresh graduates and senior engineering students in the Engineering Syndicate. As a result, the Project has witnessed an increasing interest among women applicants in which more than 60% of the trainees were women coming from different backgrounds;
- a workshop in 2021 where several representatives of the Project's stakeholders (EgyptERA, NREA, EEHC and the electricity distribution companies from different governorates) participated in the collaboration in the decision making of the design of the PV hub, and where 62% of the participants were women from different governorates across the country representing their entities;
- employment of one of the Project's leading national consultants who is female and has provided most of the training sessions in different governorates across Egypt (Cairo, New Valley and South Sinai Governorate). She is also supported the Project in many strategic initiatives and publications given her expertise in the solar energy field.

3.3.14 Cross cutting issues

133. Aside from gender issues which were covered under Section **Error! Reference source not found.**, t here were no cross-cutting issues on the Egypt-PV Project with the exception of pollution. There were no issues with biodiversity and natural resources, climate change, social equality, demographics, culture, health and safety, and socioeconomics. With the Project supporting small scale rooftop solar-PV systems that reduce GHG emissions and reduce the impact of climate change, these installations do not require an environmental impact assessment (EIA) as per Egyptian laws.

134. One potential impact that is being managed by the Project is the future waste that will be generated by solar-PV panels that have reached the end of their service life in 20 to 30 years. The PMU has held meetings within a cooperative framework on what actions need to be taken to manage electronic waste generated by solar-PV power plants (Para 93).

3.3.15 GEF Additionality

135. The issue of GEF additionality is quite clear on the Egypt-PV Project. Without the Project, there would be no catalytic activity to move the solar-PV market towards replicable and scalable systems, no setup of a PV hub that provides the regulatory framework that provides oversight to the solar-PV industry, no efforts to setup the "one-stop-shop" for customers at competitive prices and the an established quality control system, no capacity building amongst all stakeholders concerned with implementing solar-PV installations, and no efforts to involve the financial sector in facilitating the financing of small, decentralized solar-PV systems. Hence, there is substantial GEF additionality for the Egypt-PV Project.

3.3.16 Catalytic/Replication Effect

136. Some of the catalytic and replication effects of the Egypt-PV Project are as follows:

- The Project catalyzed implementation of net metering solar-PV projects in Egypt. As a follow-up to a recommendation from the Project, NREA started monitoring and reporting on the rooftop solar-PV net metering installed capacities in their 2020/2021 annual report. By reporting the total installed small scale PV plants with net-metering scheme all over Egypt had reached 121 MWp, the report generated catalytic interest in net metering solar-PV applications;
- A conceptual master plan of 15 MWp of solar energy applications in the New Capital City has provided a catalytic and replication effect and contributed to SDG-11 (Sustainable Cities and Communities);
- A manual on "Water desalination: Promoting Water Desalination using Solar Energy Technologies in Egypt" has been produced in 2022 and disseminated with the intention of encouraging its deployment to deal with looming water shortages for the country;
- A manual on solar pumping has been produced and disseminated mainly for the agricultural sector to reduce pumping costs from electricity and diesel fuel (Para 72);
- Several industrial, commercial, tourism and educational sector entities are intending to expand their solar-PV installations to become carbon-free. Examples include Nissan Motors, Carrefour chain of grocery stores and the JW Marriott chain of hotels.

137. Challenges to replication effects of the Project include:

- the devaluation of the Egyptian pound. There was a devaluation in late 2016 and again in early 2022, increasing local costs for solar-PV equipment. While the solar-PV market showed some resilience in 2017-18, there is market stagnation from the 2022 devaluation. The GoE has announced that there will be new rise in electricity tariffs in July 2023;
- COVID-19-related issues in Egypt in 2020 and 2021 that included travel restrictions and disruptions in supply chains, and consultants not being recruited. This resulted in several pilot projects to be canceled or postponed. These challenges appear to be gone;
- post-COVID externalities that deal with disrupted supply chains due to lockdowns in some regions of China and the war in Ukraine.

3.3.17 Progress to impact

138. In progress to impact, the Egypt-PV Project has provided an enabling environment and basis for deployment of solar-PV installations in the public, industrial, commercial, hospitality and educational sectors. It has done so through:

- solar-PV installations totalling 18.3 MW which were used to demonstrate that solar-PV technologies can substantially reduce electricity bills;
- the setup of a PV hub that posts published on-line solar-PV laws and regulations that NREA personnel enforce;
- a functional one-stop-shop for customers to purchase a rooftop solar-PV system that has an established quality control system;
- capacity building of all stakeholders who are familiar with the contents of the PV hub and the one-stop-shop; and
- establishing a financing network of 3 banks with green credit lines who will finance small, decentralized solar-PV systems for a broad range of consumers.

All these achievements lead to good progress to the impact of “renewable energy in several sectors has increased and GHG emissions are reduced” and “positive economic and social impacts achieved through increased employment opportunities”.

4. MAIN FINDINGS, CONCLUSIONS, RECOMMENDATIONS AND LESSONS

4.1 Main Findings

139. The Egypt-PV Project has managed to exceed the Project GHG emissions reduction targets by a factor of 90. This has led to other targets being achieved:

- 18.3 MW of rooftop solar-PV capacity was installed leading to over 30,000 MWh of annual energy production (target of 6,000 MWh), serving more than 18,000 beneficiaries (target of 1,000)[22];
- a PV hub website has been setup to disseminate fiscal incentives and enabling technical requirements for grid connection. Training sessions were held for NREA employees and engineers on effectively implementing and supporting the usage of the PV hub that is a website with relevant solar-PV regulations and a database for small and medium scaled decentralized grid-connected PV systems;
- a one-stop-shop website has been setup for solar-PV customers to purchase a solar-PV system at competitive prices and with an established quality control system;
- a financing network of local financial institutions has been setup to facilitate the financing of small, decentralized PV systems for a broad range of consumers.

140. There were a few issues with the Egypt-PV Project to sustain its scale-up of solar-PV installations:

- the devaluation of the Egyptian pound in late 2016 and again in early 2022, increasing local costs for solar-PV equipment, contributing to market stagnation. The solar-PV market showed some resilience shown in 2017-18 and again in 2022;
- COVID-19-related issues in Egypt in 2020 and 2021 that included travel restrictions and disruptions in supply chains, and consultants not being recruited. These challenges appear to be gone;
- post-COVID externalities that deal with disrupted supply chains due to lockdowns in some regions of China and the war in Ukraine.

4.2 Conclusions

141. The Egypt-PV Project has transformed the market for solar-PV by provided significant support to the design and implementation of solar-PV installations to further climate change mitigation actions in renewable energy generation. The Project has leveraged the GEF investment by a factor of more than 18 to implement rooftop solar-PV investments. Project implementation was timely with a few delays notwithstanding the COVID-19 pandemic which stopped pilot project activities for at least 9 months, and the devaluation of the Egyptian pound which has temporarily cooled the solar-PV market. The Evaluator surmises that more than 90% of all solar-PV installations in Egypt have fallen under the Egypt-PV regulatory regime. The IMC is now in a position to scale up the results of the Egypt-PV Project by:

[22] All data monitored by PMU.

- establishing a solar-PV or an RE/EE facilitation center that takes the place of technical services provided by the Egypt-PV Project. Without such a center, progress on further penetration of the solar-PV market would slow down;
- considering measures to reduce the RoI period down to acceptable levels. This could be done if the GoE was intent on setting up strong MRV systems and protocols in place for carbon trading;
- liaising with the GEFF credit line and GIZ's NAMA Facility funded project to assist and facilitate solar-PV investments through grants. The GIZ project, however, will have challenges in getting SME investments financed due to the historical lack of liquidity of SME industries.

142. The frequent devaluation of the Egyptian pound from late 2016 and to early 2022 has contributed to frequent market stagnation, notwithstanding the resilience shown by the solar-PV market in 2017-18 and again in 2022. Another hike in electricity tariffs (such the one proposed for July 2023) as the GoE's actions to remove electricity subsidies, should provide another possible revival to the solar-PV market.

4.3 Recommendations

143. The recommendations made in this Evaluation are made in the spirit of improving ongoing future delivery of projects similar to the Egypt-PV Project, and on the basis of the lessons learned during implementation of the Egypt-PV Project.

144. *Recommendation 1 (to the Government of Egypt): Setup a semi-autonomous RE investment facilitation center dedicated to supporting private and public sector development efforts for commercial RE projects*. A semi-autonomous organization is required to represent solar PV system integrators, technical advisors, engineers and regulators, an organization that is connected to government with private sector staffing to provide the necessary independence for such an organization. This Egypt-PV Project PMU can be replaced with a similar but supportive legalized umbrella organization that provides regulatory oversight to all NREA-certified installations (Para 103) but also lobby for favorable legislation and tariffs, bring all system integrators under one regulatory framework, facilitate the closure of solar PV projects with PPAs, EPCs and ESCOs, and assist in financing solutions. Donor agency guidance is recommended to accelerate the pace of RE (particularly solar-PV) and EE implementation by:

- providing technical assistance to develop this center including the development of promotional materials, strategically located offices to interface with investors, civil society and financers, and the launching and sustained updating of the PV Hub's one-stop-shop;
- strengthening of the PV Hub's one-stop-shop into an RE investment facilitation center for private and public sector investors and project developers getting into the Egyptian RE market. The website should contain all information necessary for potential RE and EE investors and developers. This would include:
  - GoE's RE priority projects;
  - RE resource datasets;
  - financial incentives for RE development offered by the GoE (if any);
  - listing of participating financial institutions and funds for developing RE projects in Egypt;
  - rules and regulations for receiving RE concessions in Egypt, rules and regulations for RE development;

- roster of accredited locally available technical assistance, manufacturers and installers for RE; and
- a list of ongoing RE developments.

These actions should result in (a) the evolution of IMC PV Hub website into a one-stop-shop and strong project facilitation center to support private and public sector development efforts for commercial RE projects; (b) increased understanding of the RE and EE markets that will enable regulators to determine fair but flexible tariff structures; (c) increased confidence of private investors in developing RE and EE projects due to GoE clarity on policy and tariffs; and (d) an increased number of RE and EE project approvals utilizing a tariff structure and financial mechanisms that are more supportive of RE and EE development.

145. There is a precedence of these semi-autonomous organizations within IMC with donor assistance (SIDA and USAID). An opportunity exists for the setup and involvement of this semi-autonomous RE and EE investment facilitation center on the UNDP-GEF project "Green Sharma El Sheikh" on:

- *Output 1.2.1 where preliminary feasibility and feasibility studies are to be conducted addressing public infrastructure services, to determine whether investments in low-carbon, greener product design are sound enough to be technically implemented and financed*. If this project is to provide technical assistance to the city of Sharm El Sheikh and low carbon stakeholders through elaboration of relevant technical-economical solutions covered within feasibility studies, business plans and specifications for design and tender, the semi-autonomous RE/EE investment facilitation center formed under project assistance can undertake these feasibility studies, business plans and specifications for design and tender for RE/EE works. The works can include public infrastructure as well as hotels and other private sector buildings and facilities;
- *Output 2.1.1 can include training of staff in governorate, municipality and hotels on design and implementation of solar-PV and other relevant low-carbon measures with the involvement of the semi-autonomous RE/EE investment facilitation center*;
- *Output 2.2.1 will pilot solar-PV as well as other low carbon technology solutions for public infrastructure of Sharm El Sheikh*, using GEF financing as complementary financial contributions to leverage other municipal and national sources of financing and other funding sources (private sector) to implement best practice RE and EE measures in new and existing public buildings;
- *Output 2.2.3 will support pilot projects to mainstream distributed renewable energy generation (mainly solar-PV) in hotels* by providing technical assistance to hotels looking for the installation into technically and economically feasible solutions, involving the semi-autonomous RE/EE investment facilitation center and similar to what the Egypt-PV Project did;
- *assistance with ESCOs with whom the semi-autonomous RE/EE investment facilitation center can liaise with as well as other private investors*. The ESCOs and other private investors have been approaching many hotels in Sharm El-Sheikh interested in installing solar-PV systems via IPP models on their premises. While the net-metering scheme is limited in power plant capacity (20 MW), independent power production through third party access scheme allows IPPs to construct a plant of any size and enter bilateral electricity purchase contracts with eligible consumers and sell them produced electricity directly on the site or through wheeling. This modality has the potential for solar-PV replication on a large scale.

146. *Recommendation 2 (to the Government of Egypt): Build capacities to implement an MRV system with the certification of GHG auditors and award of Certificates of Emission Reduction (CERs)*. The value

of carbon credits needs to be considered to add value to solar-PV installations and other RE developments that improves the RoI on these investments. GoE needs to conduct capacity building courses for project developers, owners, government officials and third party GHG Auditors on the MRV and to design GHG audit standards and procedures for RE (using selected pilot solar-PV projects) and EE[23]. However, there are currently no quotas for reducing GHG emissions in industry, commercial, or other establishments. There are voluntary carbon credits being sold by some commercial establishments. There are also ENDC carbon credits that can be sold to another country. There needs to be a solid basis to initiate carbon trading with actions to include:

- development of monitoring and evaluation of MRV system implementation for RE/EE (in particular solar PV) pilot projects, including data analysis, stakeholder discussions and dissemination of an updated MRV system. The establishment of coordination platform between MRV system owners (EEAA as the MRV National Agency, NREA and IMC) should be facilitated to strengthen existing coordination arrangements. In line with technology development and measurement system installation for RE (solar-PV) and EE projects, this activity should ensure quality testing and a certification process that is constantly monitored and evaluated, as well as ensuring that the institutions are obliged to continuously improve capability based on the evaluation results and recommendations;
- capacity building involving the transfer of knowledge in the areas of measurement system design, development of equipment installation, testing, operation and maintenance. It may involve in-country and if necessary, international training to enable local key stakeholders to meet the international standards on the design of GHG Project Monitoring Report by implementing the MRV system procedures. Competency standards need to be developed for independent third party GHG emission reduction verifiers;
- setup of a system where end users or companies receive a Certificate of Emission Reduction (CER) at the end of the MRV process, to which the EEAA with the assistance of a donor agency, facilitates training for RE and EE users on how to develop a mitigation action plan (MAP). Examples of some steps in the business process for end-users to obtain CERs can include:
    - the user should provide information for the MAP document;
    - submission of the MAP document for EEAA review where the methodology is part of the MAP;
    - the user must submit the last report of “Implementation of the Mitigation Action” to be validated by an independent third party GHG verifier. The result of the validation process will be issuance of the CER by EEAA.

No CERs can be issued without the EEAA reviewing the MAPs and with no available independent third party GHG emission reduction verifiers available.

147. The Green Sharm project is supposed to contribute to a framework that will pilot a solar-PV or another low-carbon initiative at city level using innovative mechanisms. The work done in Outcome 4 of the Egypt-PV Project should assist putting in place a sound MRV system to track all GHG and other emission reductions as well as environmental benefits achieved through the Green Sharm project. A system to set up the issuance of CERs can also be piloted.

[23] For example, JW Marriott are selling voluntary carbon credits despite the fact they are using solar-PV to save on their own electricity consumption. Meanwhile, the Nissan factory are not using solar-PV energy on weekends leading to the question as to whether or not they can sell the weekend power generation as carbon credits.

148. *Recommendation 3 (to the Government of Egypt): Provide follow-up projects where there have been high successes.* The value of donor-assisted projects in bringing down the cost of solar-PV and reducing the RoI of investments is extremely valuable. The successes of providing of this complimentary financing to RE and EE investments needs to be repeated if there is an urgency to meeting renewable energy targets of Egypt as well as global carbon neutrality goals. As such, the GoE should seek the assistance of bilateral or multi-lateral donors to provide this complimentary financing.

4.4 Lessons Learned

149. *Lesson #1: As a best practice, the Egypt-PV Project had an increased focus on strategic partnerships with stakeholders who can induce a larger replication impact*. Many UNDP projects focus on one sector or group to promote and advance project objectives. Many of these projects do not reach their intended objectives and targets. The Egypt-PV Project took a slightly different approach. While the original Project design focused households and small businesses, the improved approach for the Project was to aim for strategic partnerships with larger-scale PV installations in specific regions or sectors in Egypt. While the residential sector provided numerous opportunities for small-scale decentralized solar PV installations, opportunities for scaling up the industrial, commercial, hospitality, educational and the public sectors alongside residential sector installations became much more attractive. Furthermore, most of these sectoral entities did not have good knowledge of solar-PV but had the wherewithal and resources to pilot solar PV investments. Hence, the Project raised awareness and gave solar-PV implementation experiences to higher profile stakeholders, inducing a much larger replication impact than just the residential and small business sectors alone. For almost all stakeholders, the pilot investments catalyzed strong interest in replication investments into decentralized small-scale solar PV investments to offset electricity costs.

150. The Project also took advantage of the selection of the City of Sharm El-Sheikh to host UNFCCC COP27 to advocate support for the greening of Sharm ahead of COP 27 through the promotion of rooftop solar-PV systems. The result has been the signing of contracts and installing rooftop solar-PV systems at Sharm El-Sheikh Airport as well as nine hotels and many other buildings in 2022 with many other contracts signed after COP27 (Para 73). Recommendation 1 has been made to carry on solar PV in Sharm El Sheikh (Paras 144-145).

151. *Lesson learned #2: As a best practice, pilot solar PV implementation provided a good basis for co-financed solar PV implementation*. Pilot solar PV installations provided valuable experience to regulators, engineers, project owners, and solar PV installers on how to efficiently implement and manage solar PV installations. Pilot solar PV installations also provided valuable experience to IMC, EgyptERA and EEHC on managing applications for solar PV and financing net metered solar PV installations. The lessons applied to all regions of Egypt.

152. *Lesson learned #3: Direct interaction is the preferred means of communication amongst all stakeholders rather than online web-tools or educational modules*. The COVID-19 pandemic placed restrictions on the movement of personnel forcing the Project to adapt to on-line web tools and virtual meetings. While this delayed rooftop solar PV pilots, face-to-face meetings were quickly restored as the primary means of communication.

153. *Lesson learned #4: The Egypt-PV's successes come from the Project's excellent responsiveness to the needs of all relevant stakeholders.* With the Project providing pilot investments in solar-PV to higher

profile stakeholders and experienced solar integrators, it raised awareness of solar-PV installations to the extent that there was high demand for solar-PV installations amongst all stakeholders. This high demand was met by a highly responsive group of technical officers and advisors within the PMU who had strong backgrounds in solar-PV in Egypt, with some advisors having more than 30 years experience in solar-PV in Egypt. The responsiveness of the Team helped proponents navigate the regulatory and technical (and in some cases financial) requirements of solar-PV installations to reach the impacts of solar-PV installations more quickly, catalysing a larger replication impact in industrial, commercial, hospitality, and educational sectors as well as residential and small business sectors.

APPENDIX A - MISSION TERMS OF REFERENCE FOR THE EGYPT-PV PROJECT TERMINAL EVALUATION

Location: Egypt
Application Deadline: 28th of December, 2022
Category:
Type of Contract: Terminal Evaluation (TE) International Consultant (Individual Consultant)
Assignment Type: Short-Term
Languages Required: English
Starting Date: 1 January 2023
Duration of Initial Contract: 30 working days
Expected Duration of Assignment: 1 January 2023 – 31 March 2023

BACKGROUND

1. Introduction

In accordance with UNDP and GEF M&E policies and procedures, all full- and medium-sized UNDP-supported GEF-financed projects are required to undergo a Terminal Evaluation (TE) at the end of the project. This Terms of Reference (ToR) sets out the expectations for the TE of the full-sized project titled Grid-Connected Small Scale Photovoltaic Systems (Egypt PV) (PIMS 4998) implemented through the Industrial Modernization Center (IMC) of the Ministry of Trade and Industry. The project started on the 6 December 2012 and is in its 6th year of implementation. The TE process must follow the guidance outlined in the document 'Guidance For Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects' (link).

2. Project Description

Egypt has set a national target to reach 42% of generated electricity from renewable energy by 2035 and has already embarked on large scale wind and solar energy power stations including the 1.6 GW solar park in Benban, South of Egypt. However, the small scale decentralized renewable energy systems were not receiving a similar attention for several reasons although it should contribute to the national target.

The project aims to catalyze the development of decentralized, grid-connected small-scale renewable energy (RE) power generation market in Egypt and the solar PV in particular. The target is to facilitate the installation of at least 4 MW_p of new decentralized private PV capacity during the lifetime of the project, resulting in direct GHG reduction benefits of 66 kilo-tones of CO_{2eq}. Complementary indirect mitigation benefits are expected from the sustained market growth of the PV market after the project with estimated GHG reduction of about 0.6-0.7 million tons of CO_{2eq}. Additionally, this project is expected to help Egypt in achieving its national strategy to increase the share of electricity produced by renewable energy sources up to 20% of total electricity generation by 2020.

The expected key Outcomes of the project are i) A total of 4 MWp of small PV systems (of a few kW each) installed based on easily replicable and scalable system design; ii) A supportive policy, institutional and regulatory framework for providing a basis for sustainable growth of the small, decentralized RE (in particular PV) power generation market; iii) Strengthened domestic supply chain and quality control system, including, as applicable, increasing domestic manufacturing/assembly of PV panels; and iv) A

financing framework and a network of local financial institutions to facilitate the financing of small, decentralized PV systems for a broad range of consumers.

The total budget of the project implemented through UNDP under National Implementation Modality (NIM) by Industrial Modernization Center (IMC) is USD 33,796,364, including a GEF contribution of USD 3.6 million and co-financing from UNDP, Egypt Electric Utility and Consumer protection Regulatory Agency (EGYPTERA), Ministry of Electricity and Renewable Energy, Energy Efficiency Unit, Industrial Modernization Center (IMC), and Regional Centre for Renewable Energy and Energy Efficiency (RCREEE). The project received a rating of HS in the Mid Term Review and the Evaluator expected that the project will meet its outcomes and outputs by its end.

The project implementation was severely affected by COVID-19 pandemic. The official records show a total of 514,133 citizens who tested positive in government owned healthcare facilities as well as a total 24,725 coronavirus-related deaths between February 2020 and July 2022. The government declared a public health emergency followed by a nationwide lockdown aiming to contain the spread of the virus on 24 March 2020 and entered a cycle of tightening and loosening the restrictions (depending on COVID-19 cases) till June 2021 until all signs of precautionary measures were lifted in July 2022.

As soon as the Government has announced the lockdown, contracts for pilot projects were cancelled in particular for government buildings and hotels. Owners of all type of facilities stopped investments in solar power plants for one and half years. Meanwhile the supply chain and availability of panels in the markets was also severely affected during the same period. Moreover, a mission of an international consultants supporting BIPV systems had to be postponed.

3. TE Purpose

The TE report will assess the achievement of project results against what was expected to be achieved, and draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming. The TE report promotes accountability and transparency and assesses the extent of project accomplishments.

UNDP Egypt will continue to invest in the promotion of small-scale renewable energy technologies. The evaluation will demonstrate to the Government and UNDP Egypt, if Egypt PV and similar UNDP proposed initiatives can contribute to energy transition in Egypt. The lessons learnt from assessing Egypt PV approach in promoting roof top PV systems will be feed into the design of new projects for the promotion of small-scale renewable energy technologies. Additionally, the evaluation will contribute to the following:

- Assess the achievement of project results supported by evidence
- Assess the contribution of the project results towards the relevant outcome and output of the Country Programme Document for Egypt (2018-2022) and recommendations on the way forwards
- Assess any cross cutting and gender issues
- Assess impact of the project in terms of its contribution to, or enabled progress toward reduced environmental stress

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects.

DUTIES AND RESPONSIBILITIES

4. TE Approach & Methodology

The TE must provide evidence-based information that is credible, reliable and useful.

The TE Consultant will review all relevant sources of information including documents prepared during the preparation phase (i.e. PIF, UNDP Initiation Plan, UNDP Social and Environmental Screening Procedure/SESP) the Project Document, project reports including annual PIRs, project budget revisions, Mid Term Review, lesson learned reports, national strategic and legal documents, and any other materials that the Consultant considers useful for this evidence-based evaluation. The TE Consultant will review the baseline and midterm GEF focal area Core Indicators/Tracking Tools submitted to the GEF at the CEO endorsement and midterm stages and the terminal Core Indicators/Tracking Tools that must be completed before the TE field mission begins.

The TE Consultant is expected to follow a participatory and consultative approach ensuring close engagement with the Project Management Unit, government counterparts (the GEF Operational Focal Point), Implementing Partners, the UNDP Country Office, the Regional Technical Advisor, direct beneficiaries and other stakeholders.

Engagement of stakeholders is vital to a successful TE[24]. Stakeholder involvement should include interviews with stakeholders who have project responsibilities, including but not limited to the stakeholder list below; executing agencies, senior officials and task team/component leaders, key experts and consultants in the subject area, Project Board, Project Advisory Committee, project beneficiaries, academia, local government and CSOs, etc. Additionally, the TE Consultant is expected to conduct field missions to Egypt, including sample of project sites.

Stakeholder list:

- Industrial Modernization Center (IMC), Implementing Partner
- The Ministry of Electricity and Renewable Energy (MoERE)
- The New and Renewable Energy Authority (NREA)
- The Egyptian Electric Utility and Consumer Protection Agency (EEUCPRA) or “EgyptERA”
- The Regional Centre for Renewable Energy and Energy Efficiency (RCREEE)
- Local electricity distribution companies
- Egypt Environment Affairs Agency (Host of GEF and UNFCCC Focal Points)
- Egyptian Federation of Tourism
- Public and private facilities using PV systems
- Solar energy private sector service providers
- Academica

Locations:

- The TE Consultant is expected to visit Egypt for one week to meet with the above stakeholders and visit sample of PV projects in Cairo and Giza Governorates and may choose to visit projects outside Cairo for one day trip

[24] (link to stakeholder engagement in UNDP Eval Guidelines?)

The specific design and methodology for the TE should emerge from consultations between the TE Consultant and the above-mentioned parties regarding what is appropriate and feasible for meeting the TE purpose and objectives and answering the evaluation questions, given limitations of budget, time and data. The TE Consultant must, however, use gender-responsive methodologies and tools and ensure that gender equality and women's empowerment, as well as other cross-cutting issues and SDGs are incorporated into the TE report.

The final methodological approach including interview schedule, field visits and data to be used in the evaluation should be clearly outlined in the inception report and be fully discussed and agreed between UNDP, stakeholders, and the TE Consultant.
The final TE report should describe the full TE approach taken and the rationale for the approach making explicit the underlying assumptions, challenges, strengths and weaknesses about the methods and approach of the evaluation.

5. Detailed Scope of the TE

The TE will assess project performance against expectations set out in the project's Logical Framework/Results Framework (see TOR Annex A). The TE will assess results according to the criteria outlined in the Guidance for TEs of UNDP-supported GEF-financed Projects *(*link*)*.
The Findings section of the TE report will cover the topics listed below.
A full outline of the TE report's content is provided in ToR Annex C.

The asterisk "(*)" indicates criteria for which a rating is required.

Findings

i. Project Design/Formulation

- National priorities and country driven-ness
- Theory of Change
- Gender equality and women's empowerment
- Social and Environmental Safeguards
- Analysis of Results Framework: project logic and strategy, indicators
- Assumptions and Risks
- Lessons from other relevant projects (e.g. same focal area) incorporated into project design
- Planned stakeholder participation
- Linkages between project and other interventions within the sector
- Management arrangements

ii. Project Implementation

- Adaptive management (changes to the project design and project outputs during implementation)
- Actual stakeholder participation and partnership arrangements
- Project Finance and Co-finance
- Monitoring & Evaluation: design at entry (*), implementation (*), and overall assessment of M&E (*)

- Implementing Agency (UNDP) (*) and Executing Agency (*), overall project oversight/implementation and execution (*)
- Risk Management, including Social and Environmental Standards

iii. Project Results

- Assess the achievement of outcomes against indicators by reporting on the level of progress for each objective and outcome indicator at the time of the TE and noting final achievements
- Relevance (*), Effectiveness (*), Efficiency (*) and overall project outcome (*)
- Sustainability: financial (*) , socio-political (*), institutional framework and governance (*), environmental (*), overall likelihood of sustainability (*)
- Country ownership
- Gender equality and women's empowerment
- Cross-cutting issues (poverty alleviation, improved governance, climate change mitigation and adaptation, disaster prevention and recovery, human rights, capacity development, South-South cooperation, knowledge management, volunteerism, etc., as relevant)
- GEF Additionality
- Catalytic Role / Replication Effect
- Progress to impact

iv. Main Findings, Conclusions, Recommendations and Lessons Learned

- The TE Consultant will include a summary of the main findings of the TE report. Findings should be presented as statements of fact that are based on analysis of the data.
- The section on conclusions will be written in light of the findings. Conclusions should be comprehensive and balanced statements that are well substantiated by evidence and logically connected to the TE findings. They should highlight the strengths, weaknesses and results of the project, respond to key evaluation questions and provide insights into the identification of and/or solutions to important problems or issues pertinent to project beneficiaries, UNDP and the GEF, including issues in relation to gender equality and women's empowerment.
- Recommendations should provide concrete, practical, feasible and targeted recommendations directed to the intended users of the evaluation about what actions to take and decisions to make. The recommendations should be specifically supported by the evidence and linked to the findings and conclusions around key questions addressed by the evaluation.
- The TE report should also include lessons that can be taken from the evaluation, including best and worst practices in addressing issues relating to relevance, performance and success that can provide knowledge gained from the particular circumstance (programmatic and evaluation methods used, partnerships, financial leveraging, etc.) that are applicable to other GEF and UNDP interventions. When possible, the TE team should include examples of good practices in project design and implementation.
- It is important for the conclusions, recommendations and lessons learned of the TE report to include results related to gender equality and empowerment of women.

The TE report will include an Evaluation Ratings Table, as shown in the ToR Annex.

6. Expected Outputs and Deliverables

The TE Consultant shall prepare and submit:

- TE Inception Report: TE team clarifies objectives and methods of the TE no later than *2 weeks* before the TE mission. TE team submits the Inception Report to the Commissioning Unit and project management. Approximate due date: (21 January 2023)
- Presentation: TE team presents initial findings to project management and the Commissioning Unit at the end of the TE mission. Approximate due date: 21 January 2023)
- Draft TE Report: TE team submits full draft report with annexes within 3 weeks of the end of the TE mission. Approximate due date: 28 February 2023)
- Final TE Report* and Audit Trail: TE team submits revised report, with Audit Trail detailing how all received comments have (and have not) been addressed in the final TE report, to the Commissioning Unit within 1 week of receiving UNDP comments on draft. Approximate due date: (31 March, 2023)

*The final TE report must be in English. If applicable, the Commissioning Unit may choose to arrange for a translation of the report into a language more widely shared by national stakeholders.

All final TE reports will be quality assessed by the UNDP Independent Evaluation Office (IEO). Details of the IEO's quality assessment of decentralized evaluations can be found in Section 6 of the UNDP Evaluation Guidelines.[25]

7. TE Arrangements

The principal responsibility for managing the TE resides with the Commissioning Unit. The Commissioning Unit for this project's TE is UNDP Egypt country office.

The Commissioning Unit will contract the consultants and ensure the timely provision of per diems and travel arrangements within the country for the TE team. The Project Team will be responsible for liaising with the TE team to provide all relevant documents, set up stakeholder interviews, and arrange field visits.

8. Duration of the Work

The total duration of the TE will be approximately (*30 working days)* over a time period of *(12 weeks)* starting *1 January 2023)* and shall not exceed five months from when the TE team is hired. The tentative TE timeframe is as follows:

- *(28 December 2022:* Application closes
- *(29 December 2022):* Selection of TE Consultant
- *(1 January 2023):* Prep the TE Consultant (handover of project documents)
- *(21 January 2023): 4* days: Document review and preparing TE Inception Report
- *(31 January 2021): 10* days: Finalization and Validation of TE Inception Report- latest start of TE mission
- *(1 February 2023): 7* days: TE mission: stakeholder meetings, interviews, field visits

[25] Access at: http://web.undp.org/evaluation/guideline/section-6.shtml

- *(7 February 2023):* Mission wrap-up meeting & presentation of initial findings- earliest end of TE mission
- *(28 February 2023): 10* days: Preparation of draft TE report
- *(15 March 2023):* Circulation of draft TE report for comments
- *(21 March 2023): 5* days: Incorporation of comments on draft TE report into Audit Trail & finalization of TE report
- *(31 March 2023):* Preparation & Issue of Management Response
- *(31 March 2023):* Expected date of full TE completion

The expected date start date of contract is *(1 January 2023).*

9. Duty Station

This is a home-based consultancy with a mission to Egypt for one week (1-7 February 2021) to hold interviews and project site visits. Most meetings will be around Greater Cairo with an expected one day travel to visit a project outside Cairo

Travel:

- International travel will be required to Egypt during the TE mission
- The BSAFE course must be successfully completed prior to commencement of travel;
- Individual Consultants are responsible for ensuring they have vaccinations/inoculations when travelling to certain countries, as designated by the UN Medical Director.
- Consultants are required to comply with the UN security directives set forth under: https://dss.un.org/dssweb/
- All related travel expenses will be covered and will be reimbursed as per UNDP rules and regulations upon submission of an F-10 claim form and supporting documents.

REQUIRED SKILLS AND EXPERIENCE

10. TE Team Composition and Required Qualifications

An independent evaluator will conduct the Terminal Evaluation (TE). The TE Consultant – (with experience and exposure to projects and evaluations in other regions). The Consultant will assess emerging trends with respect to regulatory frameworks, budget allocations, capacity building, work with the Project Team in developing the TE itinerary, etc.

The TE Consultant cannot has participated in the project preparation, formulation and/or implementation (including the writing of the project document), must not have conducted this project's Mid-Term Review and should not have a conflict of interest with the project's related activities.
The TE Consultant should have the following:

Education

- At least Master's degree in urban planning, energy, engineering, environmental studies, or other closely related field.

Experience

- At least 7 years of work experience in climate change mitigation projects including renewable energy and energy efficiency
- Familiar with UNFCCC climate change mitigation targets;
- Relevant experience with results-based management evaluation methodologies;
- Experience applying SMART indicators and reconstructing or validating baseline scenarios;
- Competence in adaptive management, as applied to *(climate change mitigation);*
- Experience in evaluating projects is a must; in particular GEF climate change mitigation projects
- Experience working in Arab States is desired,
- Demonstrated understanding of issues related to gender and climate change mitigation; experience in gender responsive evaluation and analysis;
- Excellent communication skills;
- Demonstrable analytical skills;
- Project evaluation/review experience within United Nations system will be considered an asset;
- Previous work experience with solar energy projects is an asset

Language

- Fluency in written and spoken English.

11. Evaluator Ethics

The TE Consultant will be held to the highest ethical standards and is required to sign a code of conduct upon acceptance of the assignment. This evaluation will be conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluation'. The evaluator must safeguard the rights and confidentiality of information providers, interviewees and stakeholders through measures to ensure compliance with legal and other relevant codes governing collection of data and reporting on data. The evaluator must also ensure security of collected information before and after the evaluation and protocols to ensure anonymity and confidentiality of sources of information where that is expected. The information knowledge and data gathered in the evaluation process must also be solely used for the evaluation and not for other uses without the express authorization of UNDP and partners.

12. Payment Schedule

- 20% payment upon approval of the final TE Inception Report
- 40% payment upon satisfactory delivery of the draft TE report to the Commissioning Unit
- 40% payment upon satisfactory delivery of the final TE report and approval by the Commissioning Unit and RTA (via signatures on the TE Report Clearance Form) and delivery of completed TE Audit Trail

Criteria for issuing the final payment of 40%

- The final TE report includes all requirements outlined in the TE TOR and is in accordance with the TE guidance.
- The final TE report is clearly written, logically organized, and is specific for this project (i.e. text has not been cut & pasted from other MTR reports).
- The Audit Trail includes responses to and justification for each comment listed.

APPLICATION PROCESS

13. Scope of Price Proposal and Schedule of Payments

Financial Proposal:

- Financial proposals must be "all inclusive" and expressed in a lump-sum for the total duration of the contract. The term "all inclusive" implies all cost (professional fees, travel costs, living allowances etc.);
- For duty travels, the UN's Daily Subsistence Allowance (DSA) rates are (Cairo), which should provide indication of the cost of living in a duty station/destination *(Note: Individuals on this contract are not UN staff and are therefore not entitled to DSAs. All living allowances required to perform the demands of the ToR must be incorporated in the financial proposal, whether the fees are expressed as daily fees or lump sum amount.)*
- The lump sum is fixed regardless of changes in the cost components.

APPENDIX B - MISSION ITINERARY (FOR APRIL 2023)

#	Activity	Stakeholder involved	Place
31st March 2023 (Friday)			
	Arrival of Mr. Roland Wong in Cairo		
1st April 2023 (Saturday)			
1	Call with Ms. Amira Abdel Latif	UNDP	Zoom
2	Meeting with Mohamed Bayoumi	UNDP	Marriot Hotel
2nd April 2023 (Sunday)			
3	Meeting with PMU	Egypt-PV PMU	Project Office
4	Meeting with Dr. Amr Sobhy	GIZ	GIZ project office
5	Meeting with Dr. Eng. Mohamed Mostafa El-Khayat, Chairman, NREA, MoERE	MoERE	NREA Chairman's office
3rd April 2023 (Monday)			
6	Site visit to Nissan factory (roof top PV system on the factory)	Industrial stakeholder	6th of October City, Giza Governorate
7	Site visit to Sodic real estate developer (Car Shed in the main admin building)	Commercial stakeholder	3 Beverly Hills, Sheikh Zayed City, Giza Governorate
8	Palm Hills Residential compound (Roof Top PV on residential houses)	Residential stakeholder	Palm Hills
9	Meeting selected members of the Advisory board and Steering Committee including the following: • Deputy Executive Director for RECREE • Director for EBRD GEEF Credit line • Executive Director the Electricity Regulator • First Undersecretary Ministry of Electricity • Former Director of Energy Efficiency Unit at Cabinet of Ministers • National Energy Experts	Project Advisory Board	Hotel
4th April 2023 (Tuesday)			
10	Visiting El-Hayat International School (Roof Top PV system in the school)	Educational stakeholder	
11	Meeting with the Chairman of the Public Authority for Industrial Development Authority (IDA), *Eng. Mohamed Abdelkreem*	IDA	New Cairo 1, Cairo Governorate
12	Carrefour Madinty site visit (roof Top PV system)	Commercial stakeholder	Second New Cairo, Cairo Governorate
13	JW Marriott hotel site visit (Roof Top PV System)	Tourism stakeholder	Second New Cairo, Cairo Governorate
14	Renaissance hotel site visit (Car Shed Next Door to J W Marriott)	Tourism stakeholder	Second New Cairo, Cairo Governorate

#	Activity	Stakeholder involved	Place
15	Cairo International Airport (Roof Top on Multi-Story Car Park)	Public sector stakeholder	Cairo International Airport
5th April 2023 (Wednesday)			
16	Meeting with Ms. Hoda Elsahwadfy	Ministry of Environment for Ecosystem Affairs and GEF OFP	MoE office
17	Meeting with the Service Providers	Service Providers	IMC offices
18	Debriefing meeting with the Executive Director of IMC*, Eng. Doaa Selema*	IMC	IMC office
19	Debriefing meeting with Deputy Resident Representative, UNDP, *Mr Sylvain Merlen*	UNDP	UNDP office
6th April 2023 (Thursday)			
	Departure of Mr. Roland Wong from Cairo		
10th April 2023 (Monday)			
20	Meeting with Dr. Maged Mahmoud	Project Advisory Board	Zoom

Total number of meetings conducted: 20

APPENDIX C - LIST OF PERSONS INTERVIEWED

This is a listing of persons contacted in the Egypt-PV (unless otherwise noted) during the Terminal Evaluation Period only. The Evaluators regrets any omissions to this list.

1. Mr. Sylvan Merlen, Deputy Resident Representative, UNDP;
2. Mr. Mohamed Bayoumi, Programme Analyst, Project Advisory Board member, UNDP;
3. Dr. Hend Farouh, Project Manager, Egypt-PV Project;
4. Dr. Kameila Youssef, Project Consultant, Egypt-PV Project;
5. Dr. Ayman Zaki, Project Executive Coordination, Egypt-PV Project;
6. Ms. Sara Arafa , Communications Officer, Egypt-PV Project;
7. Eng. Ragad Kheireldin, Egypt-PV Project;
8. Eng. Mostafa Nasr, Egypt-PV Project;
9. Eng. Wagdy Wageh, Egypt-PV Project;
10. Ms. Sondos Abdelwahab, Egypt-PV Project;
11. Eng. Seif Yasser, Egypt-PV Project;
12. Eng, Karim Ashour, Egypt-PV Project;
13. Dr. Anhar Hegazy, Project Advisory Board member;
14. Dr. Ayman Zaki, Project Advisory Board member;
15. Eng. Emad Hassan, Project Advisory Board member;
16. Dr. Mohamed Elkhayat, Chairman NREA and Project Advisory Board member;
17. Dr. Maged Mahmoud, Project Advisory Board member;
18. Dr. Mohamed El Sobki, Project Advisory Board member
19. Dr. Hafez Salmawy, Project Advisory Board member;
20. Mr. Sahid Junaidi (General Manager of Egypt Power Systems);
21. Mr. Mohamed Kadri (SES Co.);
22. Mr. Mohamed El Sheikh (EME Co);

23. Mrs. Aya Zanaty, Chairman ATCO and supplier of solar PV equipment;

24. Mr. Mohamed Sahoee, BIPV Consultant;

25. Dr. Samir Ayad, small solar business owner since 1989;

26. Mr. Abdel Rahman Anwar, Owner, Sharm Brid Hotel, Sharm El Sheikh 650 kW installed hoping to reach 1.0 MW

APPENDIX D - LIST OF DOCUMENTS REVIEWED

1. UNDP-GEF Project Document for "Grid-Connected Small-Scale Photovoltaic Systems";
2. UNDP-GEF Request for CEO Endorsement for "Grid-connected Small Scale Photovoltaic Systems";
3. UNDP-GEF Project Implementation Report (PIR) 2018 to 2022;
4. Mid Term Review for Grid-Connected Small-Scale Photovoltaic Systems, Egypt (PIMS#4998), October 2019;
5. UNDP-GEF-IMC Egypt-PV Success Stories, 2020;
6. UNDP – GEF. Guidance for Conducting Terminal Evaluation of UNDP – Supported, GEF-Financed Project. 2020;
7. NREA Annual Report, 2021;
8. Strat_EGY, Egypt's Five-Year Macroeconomic Framework and Strategy, FY14/15 – FY18/19;
9. United Nations Country programme document for Egypt (2018-2022).

APPENDIX E - EVALUATION QUESTION MATRIX

Evaluative Criteria Questions	Indicators	Sources	Methodology
Relevance: How does the project relate to the main objectives of the GEF Focal area, and to the environment and development priorities a the local, regional and national level?			
To what extent was the project in line with GEF focal area, UNDP CPD, UNSDCF, Egypt's Intended Nationally Determined Contribution (INDC), Egypt's National Climate Change Strategy and Action Plan, along with relevant SDGs?	Number of national priorities aligned with Project strategy	ProDoc PIRs Project designers	Desk review of PIRs and interviews PMU, stakeholders
To what extent was the theory of change applied in the project relevant to promoting investment in renewable energy technologies and expanding access to environmental and energy services within the framework of "leave no one behind agenda"?	Quality of outcomes and indicators on log frame	ProDoc PIRs Project designers	Desk review of PIRs and interviews with project designers, PMU, stakeholders
Are the project objectives and outputs clear, practical and feasible within its frame? Do they clearly address target groups?	Quality of outcomes and indicators on log frame	ProDoc PIRs Project designers PMU	Desk review of PIRs and interviews with project designers, PMU, stakeholders
To what extent were lessons learned from other relevant projects considered in the design?	Related projects aligned with Project strategy	ProDoc PIRs Project designers PMU	Desk review of PIRs and interviews with project designers, PMU, stakeholders
To what extent were perspectives of men and women who could affect the outcomes, and those who could contribute information or other resources to the attainment of stated results, taken into account during project design processes?	Number of national priorities aligned with Project strategy	ProDoc PIRs Project designers PMU	Desk review of PIRs and interviews with project designers, PMU, stakeholders
To what extent was this Project designed as rights based and gender sensitive?	Effectiveness and efficiency ratings of the project by the evaluation	ProDoc PIRs Project designers PMU	Desk review of PIRs and interviews with Project designers, PMU, stakeholders
To what extent does the Project create synergy/linkages with other projects and interventions in the country?	Effectiveness and efficiency ratings of the project by the evaluation	ProDoc PIRs PMU	Desk review of PIRs and interviews with PMU, stakeholders
Effectiveness: To what extent have the expected outcomes and objectives of the project been achieved?			
To what extent has the UNDP partnership strategy been appropriate and effective?	Stakeholder engagement ratings of the project by the evaluation	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
In which areas does the project have the greatest achievements? Why and what have been the supporting	Effectiveness ratings of the project by the evaluation	PIRs and information from PMU, stakeholders and IMC personnel	Desk review, interviews with PMU, stakeholders and IMC personnel

Evaluative Criteria Questions	Indicators	Sources	Methodology
factors? How can the project build on or expand these achievements?			
In which areas does the project have the fewest achievements? What have been the constraining factors and why? How can or could they be overcome?	Effectiveness ratings of the project by the evaluation	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
What, if any, alternative strategies would have been more effective in achieving the project objectives?	Effectiveness ratings of the project by the evaluation	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent are project management and implementation participatory, and is this participation of target groups/ stakeholders contributing towards achievement of the project objectives?	Quality of adaptive management	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent has the project been appropriately responsive to the needs of the target groups and changing partner priorities?	Stakeholder engagement ratings of the project by the evaluation	PIRs and information from PMU, stakeholders and IMC personnel	Desk review, interviews with PMU, stakeholders and IMC personnel
To what extent has the Project contributed to the well-being and human rights of vulnerable groups, including, women? Did the Project effectively contribute to "leave no one behind agenda" and successfully integrate human rights-based approach (HRBA)?	Stakeholder engagement ratings of the project by the evaluation	PIRs and information from PMU, stakeholders and IMC personnel	Desk review, interviews with PMU, stakeholders and IMC personnel
Did Covid-19 measures have a positive or negative effect on the achievement of Project results?	Quality of strategy to intended results	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
Efficiency: Was the project implemented efficiently, in line with international and national norms and standards?			
How well did Project Management work for achievement of results?	Institutional and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent has there been an economical use of financial and human resources? Have resources (funds, staff, time, expertise, etc.) been allocated strategically and cost- effectively to achieve outcomes?	Institutional, financing and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent have project funds and activities been delivered in a timely manner?	Institutional, financing and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent do the M&E systems utilized by UNDP ensure effective and efficient project management?	Institutional and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent was there any identified synergy between UNDP initiatives/ projects that contributed to reducing costs while supporting results?	Institutional and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
Sustainability: To what extent are there financial, institutional, socio-political, and/or environmental risks to sustaining long-term project results?			
To what extent will targeted people benefit from the project interventions in the long-term?	Number of stakeholders with issues concerning sustainable livelihoods	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel

Evaluative Criteria Questions	Indicators	Sources	Methodology
Are there any political or financial risks that may jeopardize sustainability of project results?	Number of government and financial stakeholders with issues concerning RE	PIRs and information from PMU, financial stakeholders and IMC personnel	Desk review, interviews with PMU, financial stakeholders and IMC personnel
Are the legal frameworks, policies and governance structures and processes in place for sustaining Project benefits?	IMC governance and administrative processes	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent have development partners committed to providing continuing support? What is the risk that the level of stakeholder ownership will be insufficient to allow for the Project outcomes/benefits to be sustained?	Number of funds set up for post-GEF assistance	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
To what extent does this UNDP intervention have a well-designed and well-planned exit strategy?	Institutional and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
What could be done to strengthen exit strategies and sustainability in order to support stakeholders?	Institutional and management arrangements of the Project	PIRs and information from PMU and IMC personnel	Desk review, interviews with PMU and IMC personnel
Gender equality and women's empowerment: How did the project contribute to gender equality and women's empowerment?			
To what extent has the Project contributed to "leave no one behind agenda" (including disabled, elderly, youth, refugees etc.)?	Number of stakeholders who are able to comment on gender aspects	Stakeholders	Stakeholder interviews
To what extent have gender equality and the empowerment of women been addressed in the design, implementation and monitoring of the project?	Quality of design to intended results	ProDoc and PIRs	Desk review
Is the gender marker assigned to this project representative of reality?	Number of stakeholders who are able to comment on gender aspects	Stakeholders	Stakeholder interviews
To what extent has the project promoted positive changes in gender equality and the empowerment of women? Did any unintended effects emerge for women, men or vulnerable groups?	Number of stakeholders who are able to comment on gender aspects	Stakeholders	Stakeholder interviews
Impact: Are there indications that the project has contributed to, or enabled progress toward reduced environmental stress and/or improved ecological status?			
To what extent has the project provided an enabling environment and basis for deployment of solar PV installations in rural and urban areas?	Effectiveness and efficiency ratings of the project by the evaluation	PIRs Stakeholders (mainly government personnel)	Desk review, interviews with PMU and stakeholders
To what extent has the project established a sustainable financing mechanism for renewable? To what extent is the financing model piloted by the project replicable and up-scalable for other settings and target groups?	Barriers to objectives Opportunities to leverage	PIRs Stakeholders (mainly government personnel)	Desk review, interviews with PMU and stakeholders

APPENDIX F - QUESTIONNAIRE

These questions are designed for Implementing and Project partners:

1. In addressing legal and regulatory barriers prior to the Project, there were 2 renewable energy laws in Egypt, Law 102 which was adopted in 1986 established the New and Renewable Energy Authority (NREA), and the Electricity Law, which was promulgated in July 2015, does include several provisions on how subsequent phases of renewable development should proceed in Egypt. How effective has the Project been at the policy level in catalyzing and influencing the market for small-scale solar PV in various facilities?

2. Was there secondary legislation, for instance, a requirement that obligates distribution companies to install meters for consumers with PV systems and giving distribution companies the authority to charge customers based on net-metering? Was there a modification of standard contracts and the charters of distribution companies, since distribution companies were originally established to strictly sell electricity to consumers and not to purchase electricity?

3. In 2017 at the start of the Project, there was little awareness on renewable energy amongst the public and in the private sector. Though many citizens and institutions support the idea of renewable energy in general, many of these stakeholders do not have adequate awareness and education about renewable energy and the possibility of renewable energy as a preferred consumer choice. What was done to overcome this barrier? Have newsletters and other media informed the general public and potential owners of solar PV systems of the Project?

4. The strategy to approach large industry to finance and implement solar PV installations appears to be brilliant, and in line with the mandate of the Industrial Modernization Center (IMC) under MoIT. This strategy has overcome a barrier of no attractive financing mechanisms available for industries and other stakeholders to obtain financing for small-scale renewable energy projects. With interest rates for commercial borrowing in Egypt in the area of 13-15% per year, financing RE projects would be unattractive. How did you overcome the financing barrier?

5. There was a well-developed PV market in 2017 for large solar PV farms but not small scale solar PV. This meant that the capacity for building, installing and maintaining small-scale solar PV systems in Egypt was low. As a consequence, there was a lack of suppliers, competition and marketing and no adequate maintenance or repair services, making potential owners wary of long-term ownership of solar PV systems. How did you and the Project overcome this capacity barrier?

6. Equipment suppliers import products of varying quality levels. Prior to the Project in 2015 and 2016, there was likely no systematic quality control mechanism and all kinds of products and systems were brought into the market with an objective of making short-term profits without considering market sustainability. As a consequence, consumers faced a high risk that acquired systems do not meet the expected performance. Energy standards for different type of products were adopted, but the controls on domestic production and imports were not yet adequately organised. But you appear to have overcome this barrier. Is that correct? How was the quality of solar PV systems maintained? This would have resulted in secondary legislation for solar PV standards for materials types and specifications, methods of installation, operation and maintenance requirements, etc…?

7. What were some of the changes that enhanced or impeded Project performance? Were there delays in the delivery of some solar PV systems? Were alternative approaches considered in overcoming these challenges? Were the issues procurement related, COVID-related, on-the-ground related?

8. With the PMU in charge of M&E systems, what was the role of IMC, the Advisory Committee, and others to help ensure activities and outputs were managed efficiently and effectively?

9. Focusing on what impact the Project had on all stakeholders and solar PV installations, what has been the impact of solar PV installations on Project beneficiaries, namely industrial establishments as well as commercial establishments, residences and the public sector?

10. After the Project ends, what should be the next steps to providing continued support to all industrial, commercial, public and residential stakeholders in their transition to RE? Does this include other solar PV applications such as solar water pumping, solar desalination plants and building integrated solar PV?

11. Do you see any barriers and risks that may prevent further progress to the long-term impact of market transformation of solar PV and renewables in general?

12. Do you see any real change in gender equality in the governance of solar PV and operations of the solar PV industry in the context of decision-making power, and division of labor?

13. What are the most urgent actions to be taken in view that the Project is ending?

These questions are designed for beneficiary stakeholders:

1. How did you hear about the Egypt-PV Project? Did you have media to informed you of the Project?

2. What were some of the changes brought about during the switch to RE? Were there any positive or negative changes, intended or unintended, and were there delays in the delivery of some of the materials?

3. What were the challenges during the installation of the RE system? Were there delays in the installation of the solar PV system, and were alternative approaches considered in overcoming these challenges? Were the issues procurement related, COVID-related, on-the-ground related?

4. With the installation of the solar PV in your facility, how has the technology benefitted you? What impact has the new RE technology had on you?

APPENDIX G - COMPLETED TRACKING TOOL

Annexed as a separate file

APPENDIX F – SOLAR-PV INVESTMENTS SUPPORTED BY THE EGYPT-PV PROJECT

Figure F-1: Energy generated by industrial investments

			Annual Energy Production (kWh)													
Industrial																
	Facility	**Installed Capacity (kWp)**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**Expected 20-year production (kWh)**	**Expected 20-year CO2 emission reductions (tonnes)**
1	Rosen Berg	56	81,761	81,188	80,620	80,056	79,495	78,939	78,386	77,838	77,293	76,752	76,214	75,681	1,619,782	1,009
2	Art Ceramic	151	212,260	210,774	209,298	207,833	206,378	204,934	203,499	202,075	200,660	199,256	197,861	196,476	4,205,129	2,620
3	Cairo Petrol- Petrol Sector	70	98,149	97,462	96,780	96,102	95,429	94,761	94,098	93,439	92,785	92,136	91,491	90,850	1,944,453	1,211
4	Pharco	150	242,911	241,211	239,523	237,846	236,181	234,528	232,886	231,256	229,637	228,030	226,433	224,848	4,812,378	2,998
5	SITTIN Group	150	235,652	234,002	232,364	230,738	229,123	227,519	225,926	224,345	222,774	221,215	219,666	218,129	4,668,561	2,909
6	Fahim Ragab	25	35,146	34,900	34,656	34,413	34,172	33,933	33,695	33,460	33,225	32,993	32,762	32,533	696,288	434
7	Hero factory	150	219,013	217,480	215,958	214,446	212,945	211,454	209,974	208,504	207,045	205,596	204,156	202,727	4,338,928	2,703
8	El Gawhara	110.4	164,186	163,037	161,896	160,762	159,637	158,520	157,410	156,308	155,214	154,127	153,049	151,977	3,252,736	2,026
9	LEONI Nasr City	904	1,237,684	1,229,020	1,220,417	1,211,874	1,203,391	1,194,967	1,186,603	1,178,296	1,170,048	1,161,858	1,153,725	1,145,649	24,538,493	15,287
10	LEONI Badr City	496	702,103	697,188	692,308	687,462	682,650	677,871	673,126	668,414	663,735	659,089	654,475	649,894	13,919,991	8,672
11	Rockal (1)	662	1,136,787	1,128,829	1,120,928	1,113,081	1,105,290	1,097,553	1,089,870	1,082,241	1,074,665	1,067,142	1,059,672	1,052,255	22,538,092	14,041
12	MCV	993	1,376,542	1,366,907	1,357,338	1,347,837	1,338,402	1,329,033	1,319,730	1,310,492	1,301,318	1,292,209	1,283,164	1,274,182	27,291,517	17,003
13	Pure Life	301	447,029	443,900	440,793	437,707	434,643	431,601	428,579	425,579	422,600	419,642	416,705	413,788	8,862,860	5,522
14	Nissan (1)	500	735,612	730,462	725,349	720,272	715,230	710,223	705,252	700,315	695,413	690,545	685,711	680,911	14,584,337	9,086
15	Tiger Plast	51	88,766	88,145	87,528	86,915	86,306	85,702	85,102	84,507	83,915	83,328	82,744	82,165	1,759,886	1,096
16	Al Amir Ilalaf	156	232,841	231,211	229,593	227,986	226,390	224,805	223,232	221,669	220,117	218,576	217,046	215,527	4,616,343	2,876
17	Tiba	114	169,201	168,016	166,840	165,672	164,513	163,361	162,218	161,082	159,955	158,835	157,723	156,619	3,354,600	2,090
18	Seven K (Technical Support)	150	224,025	222,457	220,900	219,353	217,818	216,293	214,779	213,276	211,783	210,300	208,828	207,366	4,441,552	2,767
19	Nissan (2)	500	735,612	730,462	725,349	720,272	715,230	710,223	705,252	700,315	695,413	690,545	685,711	680,911	14,584,337	6,563
20	SC Johnson	305	438,248	435,180	432,134	429,109	426,106	423,123	420,161	417,220	414,299	411,399	408,519	405,660	8,688,769	3,910
21	Mirsan Factory	104	150,015	148,965	147,922	146,886	145,858	144,837	143,823	142,817	141,817	140,824	139,838	138,859	2,974,211	1,338
22	Jade Textile	1,600	2,600,492	2,582,288	2,564,212	2,546,263	2,528,439	2,510,740	2,493,165	2,475,713	2,458,383	2,441,174	2,424,086	2,407,117	51,557,703	23,201
23	Innovate	44	65,101	64,646	64,193	63,744	63,298	62,855	62,415	61,978	61,544	61,113	60,685	60,260	1,290,709	581
	Sub total	**7,742**	**11,629,136**	**11,547,732**	**11,466,898**	**11,386,630**	**11,306,924**	**11,227,775**	**11,149,181**	**11,071,136**	**10,993,639**	**10,916,683**	**10,840,266**	**10,764,384**	**230,541,656**	**129,944**

Figure F-2: Energy generated by commercial and educational investments

	Facility	Installed Capacity (kWp)	Annual Energy Production (kWh)												Expected 20-year production (kWh)	Expected 20-year CO2 emission reductions (tonnes)
			9	10	11	12	13	14	15	16	17	18	19	20		
	Commercial															
1	Carrefour Madinty	180	272,070	270,166	268,275	266,397	264,532	262,680	260,841	259,016	257,202	255,402	253,614	251,839	5,390,052	3,358
2	Nada Mall	20	28,322	28,124	27,927	27,732	27,538	27,345	27,153	26,963	26,775	26,587	26,401	26,216	561,101	350
3	Sodic	330	490,098	486,668	483,261	479,878	476,519	473,183	469,871	466,582	463,316	460,073	456,852	453,654	9,716,757	6,054
4	Carrefour Ismalia (technical support)	495	725,958	720,877	715,830	710,820	705,844	700,903	695,997	691,125	686,287	681,483	676,712	671,975	14,392,947	8,967
5	QNB El Mansoura	14	22,572	22,414	22,257	22,102	21,947	21,793	21,641	21,489	21,339	21,189	21,041	20,894	447,523	279
6	QNB 6th October	50	75,371	74,844	74,320	73,799	73,283	72,770	72,260	71,755	71,252	70,754	70,258	69,767	1,494,320	931
7	Lasheen Farm	35	53,929	53,552	53,177	52,805	52,435	52,068	51,704	51,342	50,982	50,625	50,271	49,919	1,069,211	666
8	OMMAT	300	459,467	456,251	453,057	449,886	446,737	443,609	440,504	437,421	434,359	431,318	428,299	425,301	9,109,460	5,675
9	Marsa Aswan	150	276,933	274,995	273,070	271,158	269,260	267,376	265,504	263,645	261,800	259,967	258,147	256,340	5,490,520	2,471
10	Aramex	160	245,049	243,334	241,631	239,939	238,260	236,592	234,936	233,291	231,658	230,036	228,426	226,827	4,858,379	2,186
	Sub total	**1,734**	**2,649,772**	**2,631,224**	**2,612,805**	**2,594,515**	**2,576,354**	**2,558,319**	**2,540,411**	**2,522,628**	**2,504,970**	**2,487,435**	**2,470,023**	**2,452,733**	**52,530,270**	**30,936**
	Educational															
1	Al Hayah International School	368	566,209	562,246	558,310	554,402	550,521	546,668	542,841	539,041	535,268	531,521	527,800	524,106	11,217,312	6,988
2	The British School of Egypt	100	164,517	163,365	162,222	161,086	159,958	158,839	157,727	156,623	155,526	154,438	153,357	152,283	3,259,284	2,031
3	Tawasol School	51	75,148	74,622	74,100	73,581	73,066	72,555	72,047	71,543	71,042	70,544	70,051	69,560	1,489,903	670
4	Zagazig University	105	166,661	165,495	164,336	163,186	162,044	160,909	159,783	158,664	157,554	156,451	155,356	154,268	3,304,250	1,487
5	Al Qawmia School	150	231,126	229,508	227,902	226,306	224,722	223,149	221,587	220,036	218,496	216,966	215,447	213,939	4,582,334	2,062
6	The main center for student and educational activities	40	61,634	61,202	60,774	60,348	59,926	59,506	59,090	58,676	58,265	57,858	57,453	57,050	1,221,956	550
7	Shobra School	16	23,762	23,596	23,431	23,267	23,104	22,942	22,782	22,622	22,464	22,307	22,150	21,995	471,116	212
8	Galala University	100	149,907	148,858	147,816	146,781	145,753	144,733	143,720	142,714	141,715	140,723	139,738	138,760	2,972,076	1,337
9	King Salman University	80	136,485	135,530	134,581	133,639	132,703	131,774	130,852	129,936	129,026	128,123	127,226	126,336	2,705,970	1,218
10	Sharm Schools	50	91,197	90,559	89,925	89,296	88,670	88,050	87,433	86,821	86,214	85,610	85,011	84,416	1,808,090	814
	Sub total	**1,060**	**1,666,647**	**1,654,980**	**1,643,396**	**1,631,892**	**1,620,469**	**1,609,125**	**1,597,861**	**1,586,676**	**1,575,570**	**1,564,541**	**1,553,589**	**1,542,714**	**33,032,290**	**17,369**

Figure F-3: Energy generated by public building investments

	Facility	Installed Capacity (kWp)	Annual Energy Production (kWh)												Expected 20-year production (kWh)	Expected 20-year CO2 emission reductions (tonnes)
			9	10	11	12	13	14	15	16	17	18	19	20		
	Public Buildings															
1	HBRC	92.9	133,992	133,054	132,123	131,198	130,279	129,367	128,462	127,563	126,670	125,783	124,903	124,028	2,654,549	1,654
2	General Authority for Educational Buildings	15	22,433	22,276	22,120	21,965	21,812	21,659	21,507	21,357	21,207	21,059	20,912	20,765	444,433	277
3	Engineering Syndicate	10	16,318	16,204	16,090	15,978	15,866	15,755	15,645	15,535	15,426	15,318	15,211	15,105	323,524	202
4	UNICEF	35	53,605	53,229	52,857	52,487	52,119	51,754	51,392	51,032	50,675	50,320	49,968	49,618	1,062,770	662
5	Egyptian Society of Engineers	35	51,980	51,616	51,255	50,896	50,540	50,186	49,835	49,486	49,140	48,796	48,454	48,115	1,030,565	464
6	Misr Library	40	74,035	73,516	73,002	72,491	71,983	71,479	70,979	70,482	69,989	69,499	69,012	68,529	1,467,819	661
7	Minya Engineering Club	20	37,036	36,777	36,519	36,264	36,010	35,758	35,507	35,259	35,012	34,767	34,523	34,282	734,278	330
8	Ramsees Station	310	441,692	438,600	435,530	432,481	429,454	426,448	423,462	420,498	417,555	414,632	411,729	408,847	8,757,044	3,941
9	Cairo International Airport	300	470,606	467,312	464,040	460,792	457,567	454,364	451,183	448,025	444,889	441,774	438,682	435,611	9,330,295	4,199
10	Cairo Economic Court	50	75,186	74,659	74,137	73,618	73,102	72,591	72,083	71,578	71,077	70,579	70,085	69,595	1,490,639	671
11	Shefa El Orman	450	737,236	732,075	726,951	721,862	716,809	711,792	706,809	701,861	696,948	692,070	687,225	682,415	14,616,543	6,577
12	57357	98	148,728	147,687	146,653	145,627	144,607	143,595	142,590	141,592	140,601	139,616	138,639	137,669	2,948,705	1,327
13	General Organization for Standardization and Quality	95	147,526	146,493	145,468	144,450	143,439	142,434	141,437	140,447	139,464	138,488	137,519	136,556	2,924,873	1,316
14	Sharm El Sheikh International Convention Center	935	1,475,400	1,465,073	1,454,817	1,444,633	1,434,521	1,424,479	1,414,508	1,404,606	1,394,774	1,385,011	1,375,316	1,365,688	29,251,488	13,163
15	Sharm El Sheikh Airport	280	437,933	434,867	431,823	428,800	425,799	422,818	419,858	416,919	414,001	411,103	408,225	405,368	8,682,512	3,907
16	Ahram Newspaper	37	53,851	53,474	53,100	52,728	52,359	51,993	51,629	51,267	50,909	50,552	50,198	49,847	1,067,666	480
17	Grand Egyptain Museum	270	400,990	398,183	395,395	392,628	389,879	387,150	384,440	381,749	379,077	376,423	373,788	371,172	7,950,074	3,578
18	Alex Sewage Company	100	167,079	165,909	164,748	163,595	162,450	161,313	160,183	159,062	157,949	156,843	155,745	154,655	3,312,531	1,491
19	Sharm Museum	280	500,309	496,807	493,329	489,876	486,447	483,041	479,660	476,302	472,968	469,658	466,370	463,105	9,919,190	4,464
20	Sharm Punlic Locations	80	141,089	140,101	139,121	138,147	137,180	136,219	135,266	134,319	133,379	132,445	131,518	130,597	2,797,248	1,259
21	Egyptian Atomic Energy Authority	150	222,772	221,213	219,664	218,126	216,600	215,083	213,578	212,083	210,598	209,124	207,660	206,206	4,416,708	1,988
22	Mesmeda	20	30,947	30,730	30,515	30,301	30,089	29,879	29,670	29,462	29,256	29,051	28,847	28,646	613,554	276
23	Egyptian World Heritage Sites and Museums-95 kWp	95	141,089	140,101	139,121	138,147	137,180	136,219	135,266	134,319	133,379	132,445	131,518	130,597	2,797,248	1,259
24	Hayah Karima (Japanese grant)	145	215,346	213,839	212,342	210,856	209,380	207,914	206,459	205,013	203,578	202,153	200,738	199,333	4,269,484	1,921
	Sub total	**3,943**	**6,197,177**	**6,153,796**	**6,110,720**	**6,067,945**	**6,025,469**	**5,983,291**	**5,941,408**	**5,899,818**	**5,858,519**	**5,817,510**	**5,776,787**	**5,736,350**	**122,863,740**	**56,065**

Figure F-4: Energy generated by hospitality and residential investments and totals

			Annual Energy Production (kWh)														
	Tourim																
1	JW Marriot	150	228,969	227,366	225,774	224,194	222,624	221,066	219,519	217,982	216,456	214,941	213,436	211,942		4,536,152	2,826
2	Tropital	301	503,467	499,942	496,443	492,968	489,517	486,090	482,688	479,309	475,954	472,622	469,314	466,028		9,981,797	6,219
3	Beit Yakan	15	25,243	25,066	24,891	24,716	24,543	24,372	24,201	24,032	23,863	23,696	23,530	23,366		500,468	312
4	Steigenberger	150	255,909	254,118	252,339	250,573	248,819	247,077	245,347	243,630	241,925	240,231	238,550	236,880		5,073,693	3,161
5	Sharm Bride Resort	682	1,076,174	1,068,641	1,061,161	1,053,733	1,046,356	1,039,032	1,031,759	1,024,536	1,017,365	1,010,243	1,003,171	996,149		21,336,380	9,601
6	Renaissance	189	266,658	264,791	262,938	261,097	259,270	257,455	255,653	253,863	252,086	250,321	248,569	246,829		5,286,799	2,379
		125	176,361	175,127	173,901	172,683	171,475	170,274	169,082	167,899	166,724	165,556	164,398	163,247		3,496,560	1,573
7	Regency Plaza	126	214,847	213,343	211,850	210,367	208,894	207,432	205,980	204,538	203,106	201,684	200,273	198,871		4,259,584	1,917
8	Monte Carlo	374	633,901	629,464	625,058	620,682	616,338	612,023	607,739	603,485	599,261	595,066	590,900	586,764		12,567,816	5,656
9	Novotel Hotel	100	172,091	170,887	169,691	168,503	167,323	166,152	164,989	163,834	162,687	161,548	160,417	159,295		3,411,907	1,535
10	DiveInn	300	529,083	525,380	521,702	518,050	514,424	510,823	507,247	503,697	500,171	496,669	493,193	489,740		10,489,681	4,720
11	Pyramisa	130	216,599	215,083	213,578	212,083	210,598	209,124	207,660	206,206	204,763	203,330	201,906	200,493		4,294,328	1,932
12	Kimpinski	150	273,592	271,677	269,775	267,887	266,011	264,149	262,300	260,464	258,641	256,830	255,033	253,247		5,424,269	2,441
13	Sunrise Palm	108	189,468	188,141	186,824	185,517	184,218	182,928	181,648	180,376	179,114	177,860	176,615	175,379		3,756,410	1,690
14	Sharming Inn Hotel	150	264,542	262,690	260,851	259,025	257,212	255,412	253,624	251,848	250,085	248,335	246,596	244,870		5,244,841	2,360
	Sub total	**3,050**	**5,026,905**	**4,991,716**	**4,956,774**	**4,922,077**	**4,887,622**	**4,853,409**	**4,819,435**	**4,785,699**	**4,752,199**	**4,718,934**	**4,685,901**	**4,653,100**		99,660,686	48,323
	Residential																
1	El Nada Compound	335	501,030	497,523	494,041	490,582	487,148	483,738	480,352	476,989	473,651	470,335	467,043	463,773		9,926,036	6,184
2	Palm Hills	220	326,732	324,445	322,174	319,919	317,679	315,456	313,247	311,055	308,877	306,715	304,568	302,436		6,477,838	4,036
3	Zizinia Compound	35	51,818	51,455	51,095	50,737	50,382	50,029	49,679	49,331	48,986	48,643	48,303	47,964		1,027,345	462
4	Social Housing and Mortgage Finance Fund (42 units with 1008 individual	126	187,128	185,819	184,518	183,226	181,944	180,670	179,405	178,150	176,902	175,664	174,434	173,213		3,710,035	1,670
5	Ganah	83	135,825	134,874	133,930	132,993	132,062	131,137	130,219	129,308	128,403	127,504	126,611	125,725		2,692,885	1,212
	Sub total	**799**	**1,202,534**	**1,194,116**	**1,185,757**	**1,177,457**	**1,169,215**	**1,161,030**	**1,152,903**	**1,144,833**	**1,136,819**	**1,128,861**	**1,120,959**	**1,113,112**		23,834,139	13,563
	Total	**18,327**	**28,372,170**	**28,173,565**	**27,976,350**	**27,780,516**	**27,586,052**	**27,392,950**	**27,201,199**	**27,010,791**	**26,821,715**	**26,633,963**	**26,447,526**	**26,262,393**		562,462,781	296,200

Figure F-5: Pilot and replication investments of industrial sector

Pilot Projects								Replication					
Sector	No.	Facility	Installed Capacity (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Grant (GEF) (USD)	Total Investments / Initial Cost (USD)	Sector	Facility	Installed Capacity/ Ongoing (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Total Investments / Initial Cost (USD)
Industrial	1	Rosen Berg	56	87,463	54	13,875	47,880	Industrial	NA				
	2	Art Ceramic	152	228,278	142	45,000	132,125		NA				
	3	Cairo Petrol- Petrol Sector	70	105,000	65	17,500	62,654		NA				
	4	Pharco	150	259,866	162	37,500	142,737		NA				
	5	SITTIN Group Marotya branch	150	252,100	157	37,500	118,994		Sittin Qatameya branch	133	220,780	99	111,453
									Sittin Borg Al Arab branch	150	270,000	122	125,698
	6	Fahim Ragab	25	37,610	23	7,500	26,137		NA				
	7	Hero factory	150	234,243	146	37,500	134,078		NA				
	8	El Gawhara	110	175,700	109	27,600	98,603		NA				
	10	LEONI - Badr City phase (1)	150	221,250	138	20,000	128,443		LEONI - Badr City phase (2)	346	510,350	230	296,275
									LEONI - Nasr City branch	904	1,428,320	643	774,082
	11	Rockal phase (1)	150	270,000	168	20,000	114,279		Rockal phases (2 and 3)	512	921,600	415	390,073
	12	MCV PPA project phase (1)	150	223,950	140	20,000	117,754		MCV PPA phase (2)	843	1,258,599	566	661,775
				-	-				MCV EPC phase (3)	1000	1,493,000	672	807,711
	13	Tiger Plast	51	95,640	60	10,125	36,816		El Aseel for sugar industry	60	113,351	51	48,482
	14	Amir ll Alaf	156	250,900	156	20,000	147,055		NA				
	15	Pure life phase (1)	150	240,000	150	20,000	98,474		Pure life phase (2)	151	241,600	109	99,131
	16	Nissan phase (1)	150	237,750	148	-	97,498		Nissan phase 2 and 3	850	1,347,250	606	552,490
									Nissan phase 4 and 5	1000	1,585,000	713	649,988
									Chloride neighbor factory to Nissan	499	790,915	356	397,780
	17	Tiba El Manzalawy	114	182,286	114	20,000	105,548		NA				
	18	Seven K (Technical Support)	150	241,350	150	-	125,437		NA				
	20	SC Johnson phase (1)	150	232,200	145	15,000	84,513		SC Johnson phase (2)	155	239,940	108	87,331
	21	Mirsan Factory	104	161,616	73	15,000	72,515		NA				
	22	Jade Textile phase (1)	150	262,650	118	15,000	132,173		Jade Textile phase (2)	1450	2,538,950	1,143	1,277,668
	23	INNOVATE	44	70,136	32	6,600	58,249		NA				
Total Industrial			2,531	4,069,988	2,450	405,700	2,081,964		Total Industrial	8,053	12,959,655	5,832	6,279,935

Figure F-6: Pilot and replication investments of educational and commercial sectors

Pilot Projects								Replication					
Sector	No.	Facility	Installed Capacity (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Grant (GEF) (USD)	Total Investments / Initial Cost (USD)	Sector	Facility	Installed Capacity/ Ongoing (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Total Investments / Initial Cost (USD)
Educational	1	Al Hayah Academy phase (1)	150	246,900	154	45,000	125,228	Educational	Al Hayah Academy phase (2 and 3)	218	358,828	161	181,998
	2	The British School	100	176,000	110	25,000	111,732		NA				
	3	Tawasol School	51	80,960	50	20,258	40,517		NA				
	4	Al Qawmia School	150	249,000	155	50,000	95,426		NA				
	5	Zagazig University	105	179,550	112	37,500	96,380		NA				
	6	The main center for student and educational activities	40	66,400	30	20,573	41,145		NA				
	7	Shobra School	14	22,400	10	6,578	13,156		NA				
	8	Galala University	100	161,500	73	50,000	133,054		NA				
	9	King Salman University (Japanese Fund)	80	147,000	66		76,902		NA				
	10	Sharm El Sheikh Schools	50	98,250	44		49,097		NA				
Total Educational			840	1,427,960	804	254,909	782,637		Total Educational	218	358,828	161	181,998
Commercial	1	Carrefour Madinty branch phase (1)	150	242,550	151	37,500	125,698	Commercial	Carrefour Madinty branch phase (2)	30	48,510	22	25,140
	2	Carrefour Ismalia branch phase (1)	150	237,000	154	-	107,877		Carrefour Ismalia branch phase (2)	345	545,100	245	248,117
									Carrefour branches PPA	2000	3,200,000	1,440	2,000,000
	3	El Nada Mall	20	30,300	19	5,000	20,099		NA				
	4	Sodic phase (1)	150	240,000	150	20,000	161,677		Sodic phase (2)	180	288,000	130	194,012
	5	QNB (6th Obtober Branch)	50	81,200	51	-	41,018		NA				
	6	QNB (Mansoura Branch)	14	24,320	15	-	11,485		NA				
	7	Lasheen Farm	35	58,100	26	5,950	30,028		NA				
	8	OMMAT phase (1)	150	247,500	111	25,500	117,752		OMMAT phase	150	247,500	111	117,752
									OMMAT phase 3	400	660,000	297	314,004
	9	Marsa Aswan	150	298,350	134	25,500	100,216		NA				
	10	Aramex	160	256,000	115	25,500	87,248		NA				
Total Commercial			1,029	1,715,320	926	144,950	803,098			3,105	4,989,110	2,245	2,899,025

Figure F-7: Pilot and replication investments of the public building sector

Pilot Projects								Replication					
Sector	No.	Facility	Installed Capacity (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Grant (GEF) (USD)	Total Investments / Initial Cost (USD)	Sector	Facility	Installed Capacity/ Ongoing (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Total Investments / Initial Cost (USD)
Public	1	General Authority for Educational Buildings	15	23,700	15	8,813	17,627	Public	NA				
	2	HBRC	93	143,390	89	49,953	99,905		NA				
	3	Engineering Syndicate	10	17,580	11	6,523	12,948		NA				
	4	UNICEF (technical support)	35	57,750	36	-	36,173		NA				
	5	Egyptian Society of Engineers	35	56,000	35	15,774	31,549		NA				
	6	Misr Library	40	79,760	50	14,233	30,032		NA				
	7	Minya Engineering Club	20	39,900	25	8,971	17,943		NA				
	8	General Organization for Standardization and Quality	95	158,935	72	48,554	97,108		NA				
	9	Ramsees Station phase (1)	150	230,250	104	80,960	94,733		Ramsees Station phase (2)	160	245,600	111	101,048
	10	Cairo International Airport phase (1)	150	253,500	114	95,523	98,389		Cairo International Airport phase (2)	150	253,500	114	98,389
	11	Cairo Economic Court	50	81,000	36	21,491	42,983		NA				
	12	Sharm El Sheikh International Convention Center phase (1)	150	255,000	115	6,800	119,037		Sharm El Sheikh International Convention Center phase (2)	785	1,334,500	601	622,960
	13	Sharm El Sheikh Airport phase (1)	150	252,750	114	92,016	136,556		Sharm El Sheikh Airport phase (2)	130	219,050	99	118,349
	14	Shefa El Orman phase (1)	150	264,750	119	50,000	154,526		Shefa El Orman phase 2	300	529,500	238	309,052
									Shefa El Orman phase 3	500	882,500	397	515,087
	15	57357 Children Hospital	98	160,230	72	50,000	80,645		NA				
	16	Ahram Newspaper	37	58,016	26	16,529	31,811		NA				
	17	Grand Egyptain Museum phase (1)	150	240,000	108	56,404	105,000		Grand Egyptain Museum phase 2	120	192,000	86	84,000
									Grand Egyptain Museum phase 3	660	1,056,000	475	638,000
	18	Alex Sewage Company	100	180,000	81	50,000	66,829		NA				
	19	Sharm Museum phase (1)	150	288,750	130		200,300		Sharm Museum phase (2)	130	250,250	113	173,810
	20	Sharm Punlic Locations	80	152,000	68		95,379		NA				
	21	Egyptian Atomic Energy Authority	150	240,000	108	50,000	125,706		NA				
	22	Mesmeda	20	33,340	15	8,718	17,333		NA				
	23	Pyramids Visitors Center	40	66,400	30	85,186	85,186		NA				
	24	Royal Jewellery Museum, Alexandria	20	31,100	14				NA				
	25	Alexandria National Museum	10	15,180	7				NA				
	26	Prince Mohamed Ali Palace (Al Manial Palace)	25	41,750	19				NA				
	27	Hayah Karima (Japanese grant)	145	232,000	104	16,300	245,344		NA				
Total Public			2,168	3,653,031	1,716	832,750	2,043,041			2,935	4,962,900	2,233	2,660,695

Figure F-8: Pilot and replication investments of hospitality and residential sectors and totals

Pilot Projects								Replication					
Sector	No.	Facility	Installed Capacity (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Grant (GEF) (USD)	Total Investments / Initial Cost (USD)	Sector	Facility	Installed Capacity/ Ongoing (kWp)	Energy Prodcution (kWh/year)	CO2 Reduction (tons/year)	Total Investments / Initial Cost (USD)
Tourism	1	JW Marriot	150	245,000	153	45,000	135,196	Tourism	NA				
	2	Tropital phase (1)	150	270,300	168	37,500	138,060		Tropital phase (2)	151	272,102	122	138,980
	3	Beit Yakan	15	27,200	17	3,750	10,834		NA				
	4	Steinberger	150	275,700	172	37,500	140,719		NA				
	5	Sharm Bride Resort phase (1)	150	255,000	159	30,000	170,929		Sharm Bride Resort phases (from 2 till 5)	532	904,400	407	606,229
	6	Renaissance hotel phase (1)	150	228,000	142	30,000	156,546		Renaissance hotel phase (2)	164	249,280	112	171,157
	7	Kimpinski	150	294,750	133	30,000	106,890		NA				
	8	Regency Plaza	126	231,462	104	17,500	69,124		NA				
	9	Monte Carlo phase (1)	150	273,900	123	17,500	83,608		Monte Carlo phase (2)	224	409,024	184	124,854
	10	Novotel Hotel	100	185,400	83	17,500	54,861		NA				
	11	DiveInn phase (1)	150	285,000	128	17,500	96,925		DiveInn phase (2)	150	285,000	128	96,925
	12	Pyramisa	130	233,350	105	17,500	80,502		NA				
	13	Sunrise Palm	130	245,700	111	17,500	69,700		Sunrise Diamond	130	234,000	105	69,502
									Sunrise Arabian	130	234,000	105	62,987
	14	Sharming Inn Hotel (EU Fund) 17500	150	285,000	128		130,317		NA				
Total Tourism			1,851	3,335,762	1,726	318,750	1,444,210			1,481	2,587,806	1,165	1,270,635
Residential	1	Nada Compound (45 Units) phase (1)	150	240,000	150	91,250	150,745	Residential	Nada Compound phase (2)	185	296,000	133	185,919
	2	Palm Hills (30 Units) phase (1)	150	240,000	150	33,000	118,812		Palm Hills phase (2)	70	112,000	50	55,446
	3	Zizinia Compound	35	55,825	25	7,000	23,378		NA				
	4	Social Housing and Mortgage Finance Fund (42 units with 1008 individual units)	126	201,600	91	59,977	126,000		NA				
	5	Ganah (Japanese grant)	83	146,329	66	64,700	122,634		NA				
Total Residential			544	883,754	481	255,927	541,569			255	408,000	184	241,365
Total Implemented			**8,963**	**15,085,815**	**8,103**	**2,212,987**	**7,696,519**			**16,047**	**26,266,299**	**11,820**	**13,533,653**

APPENDIX G - PROJECT RESULTS FRAMEWORK FOR EGYPT-PV PROJECT (FROM DECEMBER 2016)

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD: The Government of Egypt, private sector and civil society have complied with Multilateral Environmental Agreements, adopted policies, and implemented operational measures towards a green and sustainable economy and society including, EE, RE, low carbon cleaner technologies, SWM, POPs, ODS, and Carbon Finance Mechanism.
Country Programme Outcome Indicators: NA
Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one): 1. **Mainstreaming environment and energy** OR 2. Catalysing environmental finance OR 3. Promote climate change adaptation OR 4. Expanding access to environmental and energy services for the poor.
Applicable GEF Focal Area Objective: GEF-5 FA Objective # 3 (CCM-3): "Promote Investment in Renewable Energy Technologies"

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective[38] Reducing greenhouse gas emissions by the removal of barriers to widespread application of decentralised PV-based power generation.	Amount of reduced CO_2 emissions by the investments facilitated by the Project.	0	Direct: 66 kilotonnes of CO_{2eq} over the 20-year default lifetime of the investments made during project implementation. Indirect: At least 0.6 million tonnes of CO_{2eq} over the 20-year default lifetime of the investments made within 10 years after the Project end.	Project monitoring reports and final evaluation. As applicable, post-project market monitoring and evaluations.	Adoption of a supportive regulatory framework for the GoO and net-metering schemes and other related financial incentives in order to create a sufficiently attractive revenue stream for targeted PV investments and facilitate the required grid connections.
Outcome 1:[39] A total of 4 MW_p of small PV systems (of a few kW each) installed based on easily replicable and scalable system design.	Total capacity of installed rooftop PV systems by the private sector and electricity generated by them.	Negligible (significantly less than 100 kW_p per year)	At least 4 MW_p of installed rooftop PV capacity, producing 6,000 MWh of electricity per year. More than 1,000 households and SMEs together benefitting from PV-generated electricity.	Project market monitoring reports and final evaluation.	As above.
Outcome 2: A supportive policy, institutional and regulatory framework for	Extent to which policies and regulations for	Draft Electricity Law and draft implementation	The required financial and fiscal incentives and enabling technical requirements for grid connection	Official Gov't publications.	The proposed legal and regulatory improvements

[38] Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR

[39] All outcomes monitored annually in the APR/PIR. It is highly recommended not to have more than 4 outcomes.

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
providing a basis for sustainable growth of the small, decentralised RE (in particular PV) power generation market together with related market monitoring mechanisms.	decentralised RE and PV in particular are adopted and enforced.	degrees for GoO and net-metering scheme prepared. Draft grid code finalised, but final approval pending.	effectively implemented and supported by the required laws and regulations, providing a basis for continuing market growth after the Project with a growth rate of at least 20% per year observed at the end of the Project.	Project final evaluation. Post-project monitoring, as applicable.	passing swiftly through the Government approval process Required sustainability and predictability of the legal and regulatory acts (and the related financial and fiscal incentives) to prevent damaging 'stop and go' dynamics.
Outcome 3: Strengthened domestic supply chain and quality control system and, as applicable, increasing domestic manufacturing and/or assembly of PV panels.	Level of customer satisfaction on the quality, pricing and ease of purchasing a PV system, having it installed and obtaining the required after-sales services.	No well-established PV supply-side and quality control mechanism to facilitate easy purchasing of a PV system and guaranteeing its quality.	Customers able to purchase a PV system and have it installed through a 'one stop shop' model at competitive prices and the established quality control system, ensuring adequate quality and customer satisfaction for both the hardware and the installation (including required after-sales services).	Regular annual consumer surveys. Local and international PV market reviews. On-site inspections of the installations and the system performance.	Adequate market size to support the mobilisation of the supply-side. Adequate number of companies and trained individuals to ensure adequate supply of the required products and services and adequate price competition.
Outcome 4: A financing framework and a network of local financial institutions to facilitate the financing of small, decentralised PV systems for a broad range of consumers.	Volume of financing leveraged for small decentralised PV investments from financing entities active in Egypt.	Practically 0 aside from some demo projects.	At least USD 10 million by the end of the Project.	Annual project implementation reviews and final evaluation.	Adequate demand for, and competitively-priced financing products able to provide, long-term financing. Banks' requirements for securities within clients' limits.

APPENDIX H – TE REPORT CONTENT REVIEW CHECKLIST

#	Item	Included and at satisfactory standards?	Comments
i	Basic Report Information (to be included in title page		
	Title of UNDP-supported GEF-financed project	✓	
	UNDP PIMS ID and GEF ID	✓	
	TE timeframe and date of final TE report	✓	
	Region and countries included in the project	✓	
	GEF Focal Area/Strategic Program	✓	
	Executing Agency, Implementing partner and other project partners	✓	
	TE Team members	✓	
ii	Acknowledgements	✓	
iii	Table of Contents		
	List, with page numbers	✓	
iv	Acronyms and Abbreviations		
	List	✓	
1.	Executive Summary (3-4 pages		
	Project Information Table	✓	
	Project Description (brief)	✓	
	Evaluation Ratings Table	✓	
	Concise summary of findings, conclusions and lessons learned	✓	
	Recommendations summary table	✓	
2.	Introduction (2-3 pages)		
	Purpose and objective of the TE	✓	
	Scope	✓	
	Methodology	✓	
	Data Collection & Analysis	✓	
	Ethics	✓	
	Limitations to the evaluation	✓	
	Structure of the TE report	✓	
3.	Project Description (3-5 pages)		
	Project start and duration, including milestones	✓	
	Development context: environmental, socio-economic, institutional, and policy factors relevant to the project objective and scope	✓	
	Problems that the project sought to address: threats and barriers targeted	✓	
	Immediate and development objectives of the project	✓	
	Expected results	✓	
	Main stakeholders: summary list	✓	
	Theory of Change	✓	
4.	Findings		
4.1	Project Design/Formulation		
	Analysis of Results Framework: project logic and strategy, indicators	✓	

#	Item	Included and at satisfactory standards?	Comments
	Assumptions and Risks	✓	
	Lessons from other relevant projects (e.g. same focal area) incorporated into project design	✓	
	Planned stakeholder participation	✓	
	Linkages between project and other interventions within the sector	✓	
4.2	Project Implementation		
	Adaptive management (changes to the project design and project outputs during implementation)	✓	
	Actual stakeholder participation and partnership arrangements	✓	
	Project Finance and Co-finance	✓	
	Monitoring & Evaluation: design at entry (*), implementation (*), and overall assessment (*)	✓	
	UNDP implementation/oversight (*) and Implementing Partner execution (*), overall project implementation/execution (*), coordination, and operational issues	✓	
	Risk Management, including Social and Environmental Standards (Safeguards)	✓	
4.3	Project Results and Impacts		
	Progress towards objective and expected outcomes	✓	
	Relevance (*)	✓	
	Effectiveness (*)	✓	
	Efficiency (*)	✓	
	Overall outcome (*)	✓	
	Sustainability: financial (*), socio-political (*), institutional framework and governance (*), environmental (*), and overall likelihood (*)	✓	
	Country ownership	✓	
	Gender equality and women's empowerment	✓	
	Cross-cutting Issues	✓	
	GEF Additionality	✓	
	Catalytic/Replication Effect	✓	
	Progress to Impact	✓	
5.	Main Findings, Conclusions, Recommendations and Lessons		
	Main Findings	✓	
	Conclusions	✓	
	Recommendations	✓	
	Lessons Learned	✓	
6.	Annexes		
	TE ToR (excluding ToR annexes)	✓	
	TE Mission itinerary including summary of field visits	✓	
	List of persons interviewed	✓	
	List of documents reviewed	✓	

#	Item	Included and at satisfactory standards?	Comments
	Evaluation Question Matrix (evaluation criteria with key questions, indicators, sources of data, and methodology)	✓	
	Questionnaire used and summary of results	✓	
	Co-financing tables (if not included in body of report)	**N/A**	
	TE Rating scales	✓	
	Signed Evaluation Consultant Agreement form	✓	
	Signed UNEG Code of Conduct form	✓	
	Signed TE Report Clearance form	✓	
	Annexed in a separate file: TE Audit Trail	✓	
	Annexed in a separate file: relevant GEF/LDCF/SCCF Core Indicators or Tracking Tool	✓	

APPENDIX I – TE RATING SCALES

TE Rating Scales	
Ratings for Outcomes, Effectiveness, Efficiency, M&E, Implementation/Oversight, Execution, Relevance	Sustainability ratings:
6 = Highly Satisfactory (HS): exceeds expectations and/or no shortcomings 5 = Satisfactory (S): meets expectations and/or no or minor shortcomings 4 = Moderately Satisfactory (MS): more or less meets expectations and/or some shortcomings 3 = Moderately Unsatisfactory (MU): somewhat below expectations and/or significant shortcomings 2 = Unsatisfactory (U): substantially below expectations and/or major shortcomings 1 = Highly Unsatisfactory (HU): severe shortcomings Unable to Assess (U/A): available information does not allow an assessment	4 = Likely (L): negligible risks to sustainability 3 = Moderately Likely (ML): moderate risks to sustainability 2 = Moderately Unlikely (MU): significant risks to sustainability 1 = Unlikely (U): severe risks to sustainability Unable to Assess (U/A): Unable to assess the expected incidence and magnitude of risks to sustainability

APPENDIX J – RESPONSES TO COMMENTS RECEIVED ON DRAFT TE REPORT

Annexed as a separate file

APPENDIX K - EVALUATION CONSULTANT AGREEMENT FORM

Evaluators:

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study imitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.

Evaluation Consultant Agreement Form[40]

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: __Roland Wong_____

Name of Consultancy Organization (where relevant)**:** _____

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at *Surrey, BC, Canada* on *May 31, 2023*

[40]www.unevaluation.org/unegcodeofconduct

APPENDIX L - TE REPORT CLEARANCE FORM

Terminal Evaluation Report for *(Project Title & UNDP PIMS ID*) **Reviewed and Cleared By:**

Commissioning Unit (M&E Focal Point)

Name: _____

Signature: _____ Date: _____

Regional Technical Advisor (Nature, Climate and Energy)

Name: _____

Signature: _____ Date: _____