The Solarization of Head of State Residences in Pacific Island Development Forum (PIDF) 11 Member Countries

Terminal Evaluation Report








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For any lapses or shortcomings or errors found within this terminal evaluation report, I take full responsibility.

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List of acronyms

BOS	Balance-of-system
DAC	Development Assistance Committee
DoE	Department of Energy
FCCC	Fijian Competition and Consumer Commission
FGD	Focus group discussion
FSM	Federated States of Micronesia
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GESI	Gender equality and social inclusion
GEDSI	Gender equality disability and social inclusion
GHG	Greenhouse gas
GoI	Government of India
HACT	Harmonized approach to cash transfers
HVCA	Hazard vulnerability and capacity assessment
KII	Key Informant Interviews
KOICA	Korea International Cooperation Agency
LTA	Long-term agreement
MCO	Multi-Country Office
MoU	Memorandum of understandings
MPO	Management Program Oversight
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution
O&M	Operation and maintenance
OECD	Organization for Economic Co-operation and Development
PB	Project board
PIC	Pacific Island Country
PIDF	Pacific Island Development Forum
PM	Project-Manager
PNG	Papua New Guinea
PPA	Pacific Power Association
PPE	Personal protective equipment
PRIF	Pacific Regional Infrastructure Facility
ProDoc	Project Document
PV	Photovoltaic
PwD	Persons with disabilities
RE	Renewable energy
RMI	Republic of Marshall Island
TWG	Technical Working Group
SDG	Sustainable development goal
SEIAPI	Sustainable Energy Industry Association of the Pacific Islands
SES	Social and environmental safeguard
SHoS	Solar Head of State
SoHS	Solarization of Head of State Residences in PIDF member countries
SPREP	Secretariat of the Pacific Regional Environment Programme
TE	Terminal evaluation
ToC	Theory of change
UNOSSC	United Nations Office for South-South Cooperation
UXO	Unexploded ordnance

Executive summary

1. The context: Pacific island countries (PICs) rely on various renewable energy (RE) sources, with solar power being the most common due to its abundance and affordability. However, challenges such as limited financial resources, high up-front costs, poor energy data, and shortages of skilled human resources persist. PICs face high electricity unit costs due to their dependence on fossil fuel, a fact limiting their efforts to electrify and exacerbating their energy poverty. Pacific region aims to achieve 100% renewable energy by 2030 and net-zero emissions by 2050. The Solarization of Heads of State Residences in Pacific Island Development Forum (PIDF) Eleven Member Countries, hereafter referred to as "the project", was conceptualized in 2017. The project commenced in June 2020 and underwent two extensions before ended in March 2024. Solaria provided equipment, while the PIDF oversaw project execution with technical support from the Solar Head of State. From July 2023, the UNDP took the lead in project implementation. The project's objective was to promote the adoption of RE and reduce reliance on fossil fuels in the Pacific region (see Table 1 for project and evaluation related information).

Table 1: Synopsis of the project and evaluation information

Project information		
Project title	The Solarization of Head of State Residences in PIDF 11 member countries	
Project ID	113240	
Corporate outcome and output	UNPS Outcome 1: Climate Change, Disaster Resilience, and Environment Protection	
Country	Fiji, Tonga, Kiribati, Nauru, the Solomon Islands, Vanuatu, the RMI, FSM, Palau, Tuvalu, and Timor Leste	
Region	Asia Pacific	
Project document signed (LPAC meeting)	December 2, 2019	
Project dates	Start	Valid period
	June 1, 2020	March 31, 2024
Project budget	Total project's budget: USD 1,310,000 (i. India-UN Development Partnership Fund: USD 400,000 in cash, ii. India-UN DPF Commonwealth Window: USD 700,000 in cash, iii. Solaria's in-kind contribution of goods: USD 90,000, and iv. PIDF and SHoS's in-kind contribution of services: USD 120,000)	
Project expenditure at the time of evaluation	USD 610,000	
Funding source	Government of India through the India-UN Development Partnership Fund	
Implementing party	PIDF, Solar Head of State (SHoS), Solaria, and UNDP	
Evaluation information		
Evaluation type	Terminal evaluation	
Final/midterm review/ other	Final	
Period under evaluation	Start: June 1, 2020	End: March 31, 2024
Evaluator	Dr. Dhruba Gautam, drrgautam@gmail.com	
Evaluation dates	Start: Jan 26, 2024	Completion: March 31, 2024

Source: Project, 2024

2. Purpose and objective of terminal evaluation: The terminal evaluation (TE) was conducted to assess the outcomes of the project, extract valuable lessons, and provide recommendations for future initiatives. It was conducted using the six OECD-DAC criteria: relevance, coherence, efficiency, effectiveness, impact, and sustainability. Specific objectives included identifying project strengths and weaknesses, reviewing progress, evaluating the impact of COVID-19, assessing gender empowerment integration, and recommending design modifications.

3. Evaluation approach and methods: The TE followed the UNDP Evaluation Guideline (revised edition, June 2021) and employed summative, constructive, and formative approaches. In its three phases--inception, data collection and analysis, and report preparation--it aimed to evaluate the project's results, assess design and implementation, and document lessons. An evaluation mission was organized to Fiji, Tonga, and Kiribati, with online interviews conducted with other countries. A mixed-methods approach was used, but qualitative tools were emphasized to fulfil the primary evaluation objectives. Methods included an initial briefing, desk study, key informant interviews (KIIs), focus group discussions (FGDs), direct observation, and the most significant change technique. Two FGDs and 42 KIIs were conducted. The evaluator constructed project's theory of change. Data were disaggregated by gender. Qualitative data were analyzed using the 'content analysis tool.' Project performance was evaluated using OECD-DAC criteria. Data were triangulated to ensure their reliability and validity. Ethical considerations were upheld throughout the process. The methodology did, however, have a few limitations: while the project spans 11 countries, the mission covered only three; and the high turnover of PIDF and UNDP staff resulted in the erosion of institutional memory. However, those limitations were strategically managed, and quality data and evidence were gathered.

4. Relevance: The project aimed to advance RE adoption across the 10 PIDF member countries (Timor Leste was later dropped) by installing 12 solar photovoltaic (PV) systems. It aligned well with the countries' climate change objectives, which emphasize solar energy adoption to reduce emissions and address energy deficits. The project's collaboration with governments and emphasis on energy security further demonstrated the project's relevance. Significant barriers that hindered RE adoption included infrastructural limitations, inadequate policies, high upfront cost, financial constraints, and capacity gaps. The project identified critical gaps, tailored interventions to meet diverse needs, and effectively collaborated with various entities, showcasing a strategic approach towards sustainable energy adoption in the Pacific region.

5. Coherence: The project's coherence was evaluated by considering its alignment with global and local strategies, objectives, and policies. The project's activities, such as feasibility studies and system installations, closely correspond to its outputs. Strategies like bundling equipment and utilizing local capacity effectively supported the project's activities. Despite successes, areas for improvement included assuring insurance coverage and enhancing communication channels. The project effectively engaged with policymakers to advocate for sustainable energy practices, utilizing a multi-stakeholder approach. Its involvement of academia, however, was limited. The project resonates with SDGs, UN strategies, the agendas of bilateral and multilateral donors, and national plans (Nationally Determined Contributions-NDCs and National Adaptation Plan-NAP) emphasizing RE adoption for greenhouse gas (GHG) reduction. The project fills gaps in these plans and fosters synergies with existing initiatives. That said, challenges persist in policy implementation due to resource constraints and inadequate planning.

6. Effectiveness: The project effectively achieved its anticipated outputs: it installed all 12 targeted solar PV systems, organized a total of 12 onsite training sessions with 74 rather than the 12 targeted participants, and developed 12 of the 12 targeted operation and maintenance (O&M) manuals. While it published only 40 news articles about the benefits of solar power in national media, once the all inauguration of the system, the target of 48 is likely to even exceed. The project benefited over 232 individuals directly and 16,228 indirectly. More than 32% of the total beneficiaries were women and many of those employed to install the systems were youths. Factors contributing to the effectiveness of the project included robust logistical strategies, safety measures, and stakeholder collaboration. However, challenges such as pandemic-related disruptions, socio-political changes and staff turnover slowed implementation timelines. Alternative strategies, including enhanced procurement packages and stakeholder engagement, could have bolstered effectiveness. Suggestions for improvement include clarifying resource allocation and stakeholder roles, as well as improving gender monitoring. External factors such as policy mandates and increases in RE investments positively influenced the project. Conversely, pandemic-induced restrictions, natural disasters, changes in government, and limited institutional experience led to delays and operational hurdles. Despite adversities, the project was managed effectively, especially during last six months.

7. Efficiency: The project faced the challenge of high turnover rates among project managers and UNDP officials, a phenomenon which disrupted leadership and decision-making and delayed project timelines. While the project spent almost 98% of its total allocated funds, challenges arose due to inadequate financial planning, unexpected costs such as unexploded ordnance work, and pandemic-induced supply chain disruptions. Travel restrictions during the pandemic significantly interfered with procurement and shipment of solar equipment, increasing costs and delays. Despite challenges, the project's management structure, which involved a project board (PB) and technical working groups (TWGs) helped in decision-making, progress assessment, and risk mitigation. The project effectively implemented monitoring plans, identified and mitigated risks, and maintained accountability and transparency through audits and spot checks. While it did face staffing challenges, the project effectively planned, coordinated, and interacted with stakeholders, overcoming the constraints imposed by the pandemic and socio-political changes in member countries. The project efficiently managed transparent procurement processes, addressing challenges and ensuring cost-effective deals through strategic planning, bulk purchases, and reallocation of resources. It demonstrated value for money through strategic procurement practices, and efficient resource utilization from multiple partners.

8. Sustainability: To promote sustainability, the project strategically managed multiple risks. For instance, financial risks were assessed and mitigated through using standard equipment, allocating budget allocations, and engaging private companies; and social risks were mitigated through adherence to health

and safety measures and stakeholder engagement. Political and legal risks were addressed through protracted memorandum of understanding (MoU) negotiations, and customs clearance facilitation. Rigorous equipment selection, storage protocols, and streamlined logistics were instrumental in managing technological risks. To build resilience, disaster-related risks were considered in design and standard selections, and environmental risks were limited by the small system size, adherence to standards, and environmental impact mitigation measures. At the system level, the project used trained technicians for O&M, involved local companies, and practiced competitive tendering to ensure future support. At the government level, the project verified systems, strengthened TWGs, and mobilized the UNDP's other ongoing RE projects in member countries. It did not, however, develop an adequate sustainability plan or exit strategy. That said, the commitment of governments and stakeholders to maintaining project results and supporting ongoing initiatives bodes well for the long-term sustainability of solar PV systems in the Pacific region.

9. Impact: Twelve solar PV systems, each boasting a capacity of 20 kWp, are projected to reduce 9,600 tons of GHG emissions over the next 25 years. This initiative aims to combat climate change by advocating for the adoption of clean renewable energy technologies and diminishing reliance on fossil fuels. Electricity tariffs declined by 33%, with each system generating an average of 62 units of electricity daily. The visibility of solar technology was increased and South-South cooperation was strengthened through partnerships and high-level engagement. The project also translated RE policy provisions into practice, creating green jobs and supporting the achievement of SDGs and NDC targets. Adopting a whole-society approach, it leveraged multiple stakeholder partnerships with the public, private, and civil society sectors. Overall, the project made significant strides in achieving its outputs and outcomes, a fact attributed to strong partnerships, effective stakeholder engagement, and strategic alignment with key thematic areas. The project's OECD-DAC evaluation criteria was scored/assessed by using 'a five point scale[1]'. The overall performance of the programme rated 'satisfactory' (see Table 2).

10. Cross cutting: The project prioritized mitigating human rights risks within the RE sector, so, unsurprisingly, no instances of human rights violations were reported and strict safety measures were enforced. While recognizing the importance of gender equality and inclusivity, the project faced challenges in achieving the equal participation of women. Efforts were made to incorporate gender considerations into project activities, but improvements are needed to ensure the meaningful engagement of women and marginalized groups. The project aimed to provide services to all demographics through capacity-building initiatives and awareness campaigns on RE. The lack of disaggregated data made it challenging to assess the project's impact on persons with disabilities directly.

Table 2: Evaluation criteria and ranking

Evaluation criteria	Score	Ranking
Relevance	5	Satisfactory
Coherence	5	Satisfactory
Effectiveness	5	Satisfactory
Efficiency	4	Moderately satisfactory
Impact	5	Satisfactory
Sustainability	4	Likely
Overall	5	Satisfactory

11. Best practices and lessons learned: Providing on-the-job training and manuals enhances end-users' skills and confidence. Utilizing existing TWGs aids in securing technical support, planning, and ensuring ownership of initiatives. Procuring equipment in bulk reduces costs and enhances efficiency. In terms of design, among the major lessons learned were that (i) customizing designs based on site-specific needs enhances ownership and cost efficiency, (ii) equity-based resource allocation is more appropriate than equal distribution to address varying country needs, (iii) contingency funds are necessary to address unexpected costs and make technical adjustments. With regard to implementation, it was learned that (i) streamlining procurement processes prevents conflicts and enhances cost-effectiveness, (ii) clustering sites improves efficiency in procurement, storage, and training, and (iii) aligning orders with installation readiness minimizes storage costs and delays. In terms of management, major learnings were that (i) preparing long term agreements (LTAs) with potential vendors accelerates administrative processes and ensures accountability and (ii) involving UNDP staff and appointing focal persons expedite MoU signings and project

[1] Evaluation rating indices for **relevance, coherence, effectiveness, efficiency and impact** are: 6=highly satisfactory, 5=satisfactory, 4=moderately satisfactory, 3=moderately unsatisfactory, 2=unsatisfactory, 1=highly unsatisfactory. Similarly the rating indices for **sustainability** are = 4 (likely-negligible risks to sustainability; 3 (moderately likely-moderate risks to sustainability); 2 (moderately unlikely-significant risks to sustainability); 1 (unlikely-severe risks to sustainability; and U/A-unable to assess the expected incidence and magnitude of risks to sustainability)

proceedings. In terms of project monitoring, regular monitoring based on specific indicators informs stakeholders and enables corrective actions, and effective gender mainstreaming requires training, resources, and commitment from leaders, as well as sex-disaggregated data and thorough gender analysis.

12. Conclusion

i. Relevance: The project advanced the adoption of sustainable energy, especially solar, in10 PIDF member countries, helping them achieve net-zero emissions and address energy deficits. It reduced electricity tariffs, created green jobs, and improved energy access. Various infrastructural, financial, technical, regulatory, and capacity hurdle, however, hindered RE adoption. The project's collaboration with multiple entities enhanced national capacity, but the limited involvement of academia was a missed opportunity.

ii. Coherence: The project's activities and strategies aligned well with its objectives, so actions and outcomes cohered. Close collaboration with stakeholders and key strategies addressed gaps in the RE targets of PIC. The project's focus on mitigating climate change impacts by promoting RE technologies aligned with UNDP's foundational documents and the national priorities of PIDF member countries, but implementation was challenged by the absence of complementary policy measures and limited resources.

iii. Effectiveness: The project successfully installed 12 solar PV systems, reducing 9600 ton GHG emissions (in 25 years) and lowering electricity tariffs by 30%. Training targets were surpassed and participation by women and youths was significant. Capacity was enhanced, awareness increased, and project information disseminated. Fostering ownership, comprehensive procurement packages, and gender mainstreaming all increased effectiveness, as did strong partnerships, clarity regarding stakeholder roles, and leveraging past experiences. The pandemic, natural disasters, and socio-political changes did impact procurement and hiring and disrupted supply chains and limited experience posed challenges, but all these external factors were overcome.

iv. Efficiency: The project nearly utilized all its budget (98%) and completed all activities except for ten inaugurations. It efficiently coordinated operations, with PIDF playing a pivotal role and UNDP assuming overall responsibility. It made needed internal adjustments and collaborated with humanitarian partners to minimize logistics. The management structure and monitoring system, overseen by the Project Board (PB) and using TWGs to ensure equipment safety, streamlined implementation and risk management. Strategic procurement practices and resource reallocation optimized resource utilization, but turnover in leadership and staff posed challenges.

v. Sustainability: The project ensured sustainability through proactive risk management, including financial planning, adherence to SES, and stakeholder engagement. Local technicians were trained to maintain systems, and partnerships with local companies ensured future technical support. Establishment of national TWGs and handover procedures contributed to government-level sustainability. Nation's commitment to zero emission and RE investment reinforced project sustainability efforts. The lack of a dedicated sustainability plan and exit strategy, however, could reduce project longevity. Specific strategies were implemented to address design, logistics, policy, finance, and disaster-related risks as laid out in risk management logs. The project successfully implemented UNDP's social and environmental safeguard (SES) to address programmatic risks and ensure compliance across various phases. Low-category risks related to system design, installation standards, operation, and safe disposal were identified and mitigated.

vi. Impact: The project helped mitigate climate change mitigation by contributing results framework: promoting RE to reduce carbon emissions, and improving power accessibility. It directly benefited over 232 individuals, and an additional 16,228 indirectly. Notably, more than 32% of the total beneficiaries were women, indicating a positive trend in women participation in the RE sector. Member countries replicated best practices, aligned themselves with Paris Agreement goals, strengthened South-South cooperation, and supported NDCs and SDGs, notably SDGs 7 and 13. Green jobs, lower electricity tariffs, and sustainable development showcased a green recovery post-COVID-19. Through a comprehensive "whole-society approach," synergies among stakeholders across sectors were effectively tapped into.

vii. Cross-cutting issues

a. Human rights: The project adopted a human rights-based approach and ensured stakeholder participation and representation in every phase. It mitigated human rights risks and enhance benefits for marginalized

groups through awareness and capacity-building initiatives. Consulted stakeholders reported that there had been no human rights violations and that, on the contrary, by offering equal wages and promoting safety measures, the project had demonstrated a strong commitment to human rights. They also said that the hazard vulnerability and capacity assessment (HVCA) tool could be used better for site identification and risk assessment.

b. Gender equality and leaving no one behind: The project promoted gender equality and women's empowerment by introducing gender equality and social inclusion (GESI) policies to member countries and incorporating gender markers into outputs to enhance women's engagement in the energy sector. Participation is not yet equal, however, and there is a need to conduct "women's safety audits" using tools like the "gender and age marker toolkit" and scenario-based costing studies to deepen understanding of GESI. Advocacy for policy reforms to strengthen GESI in RE projects and development endeavors more broadly is necessary.

c. Disability: The project engaged persons with disabilities (PwDs) throughout its cycle, aiming for positive impacts despite the shortage of disaggregated data. Stakeholders emphasized inclusivity through capacity-building initiatives and accessible venues. The user-friendly solar PV system app was commended for its inclusivity. Areas for improvement include providing training in gender equality and disability and integrating disability-related policy provisions into training curricula, drawing upon the Pacific Framework for the Rights of Persons with Disabilities (2016–2025).

d. Climate change action: The project effectively managed environmental risks. Indeed, stakeholder consultations suggested that there had been no adverse environmental effects. The project helped mitigate climate change and enhanced national and local capacity through review sessions. Environmental sustainability was ensured by employing an 'environmental mainstreaming framework' across solar PV components and providing comprehensive O&M training. Mitigation measures included careful site selection, slope protection, and safe installation practices, such as integrating features like J-hooks into CGI-roofed houses to enhance cyclone resilience.

13. Recommendations for similar projects in the future

Rec. #	TE Recommendations	Agencies responsible	Timeframe *(start data and duration)*
For streamlining current phase			
1	*Prioritize the consolidation of remaining project tasks and the development of a comprehensive handover package before project closure to systematize successful initiatives:* Assign specific staff members of the UNDP MCO to serve as 'focal person' to oversee the consolidation of the remaining tasks and draft 12-week consolidation plans, starting from April 1, 2024. Initiate these plans and mobilize the media to publicize the remaining inaugurations. Ensure that technical issues are addressed through TWGs and Department of Energy (DoE) and are consistently monitored by UNDP staff from other RE projects in the member countries. Develop protocols for transferring equipment and assets to DoE *(Conclusions # 5, 7 and 10).*	UNDP with PIDF, SHoS, Solaria with DoE	April-June, 2024
For future programming of similar projects:			
1	*Enhance the capabilities of project partners, and other stakeholders in both technical and non-technical domains through a comprehensive analysis of capacity gaps:* Conduct a thorough assessment of the institutional capacities of project partners to ensure that they possess relevant experience and technical proficiency; involve stakeholders such as government agencies, suppliers, installers, contractors, technicians, and practitioners in training sessions on decarbonization through energy efficiency; and engage the private sector and academia to foster their involvement in solar PV markets *(Conclusions #1, 2, 5, 7, 10, 15 and 19)*.	UNDP	Within 6 months of project implement ation
2	*Emphasize technological aspects, and develop sustainability plan and exit strategy to ensure the sustainability of solar PV systems:* Strengthen technical aspects of solar PV systems by (i) devising a unified package that encompasses all project phases to streamline processes and mitigate the potential shifting of blame among vendors, (ii) using the 'hazard vulnerability and capacity assessment' tool to pinpoint optimal locations for solar PV installations by evaluating risks	UNDP with partner agencies	Within 6 months of project implement ation

	and identifying vulnerabilities stemming from various hazards, (iii) compiling a roster of potential vendors and suppliers with whom to establish LTAs beforehand to expedite administrative procedures, (iv) crafting a three-year O&M installation and technical support package and budgeting a modest 1% of the total installation cost for O&M, and (v) developing a sustainability plan and an exit strategy to ensure the continuity of successful initiatives beyond the project's lifespan *(Conclusions #5, 6, 8, 11 and 15)*.		
3	*Effectively manage and mobilize both human and financial resources by adhering to the provisions outlined in the ProDoc and by establishing an O&M fund:* Effectively manage and mobilize both human and financial resources by (i) adhering to the provisions outlined in the ProDoc and using training and study visits as incentives, (ii) allocating resources equitably rather than equally as determined by the installation sites, energy demand, and country context, (iii) managing O&M costs to address technical challenges and replace equipment, (iv) promoting insurance schemes to cover damage to equipment in transit, and (v) mobilizing commercial banks and similar institutions to explore financing options for scaling up solar PV systems *(Conclusions # 7, 10, 11, 18 and 19)*.	UNDP, partner agencies, insurance companies, commercial bank	In regular basis
4	*Replicate the best practices of solar PV systems in multi-stakeholder engagement and resource management:* Replicate the best practices of solar PV systems in multi-stakeholder engagement and resource management by (i) facilitating efficient coordination among the Pacific Renewable Energy Investment Facility, the public and private sectors and academic and research institutions, (ii) forming cluster groups of relevant countries to facilitate the shipping and transportation of solar PV equipment and accessories, (iii) collaborating with development partners to consolidate knowledge on the RE sector and to mobilize resources, (iv) enlarging the scope of the PB by involving officials from the Ministry of Finance, Planning Commission, State Utility Offices, Chambers of Commerce and Academia to diversify expertise and influence, (v) adopting the public private partnership model to develop more projects that contribute to climate change goals *(Conclusions # 1, 2, 8, 13 and 14)*.	UNDP, partner agencies, development partners, government agencies, private sectors	In a regular basis
5	*Mainstream gender and disability by developing and operationalizing an inclusive gender action plan and training on a scenario-based gender-responsive costing framework:* Mainstream gender effectively by (i) developing and operationalizing a gender action plan aligned with the project's objectives and outcomes, (ii) building the capacities of relevant stakeholders and staff on the scenario-based gender-responsive costing framework, (iii) involving government stakeholders in GESI-sensitive planning and budgeting processes, and (iv) imparting gender-focused training sessions to stakeholders to deepen their understanding of how gender relates to RE technologies. In the future projects, it is recommended to incorporate 'women's safety audits', utilize the "gender and age marker toolkit", and conduct a 'scenario-based costing study during design phase' to enrich stakeholders' comprehension of various facets of GESI. Take further steps to collect and maintain data disaggregated by sex, age, and disability in collaboration with pertinent government bodies and agencies. Arrange a series of sessions to build capacity in gender equality disability and social inclusion (GEDSI) considerations and integrate disability-related policy provisions into training curricula using a human rights-based approach *(Conclusions # 5, 15, 16, 17 and 18)*.	Project, partner agencies, government agencies	In a regular basis
6	*Contribute to policy advocacy and knowledge management:* Contribute to policy advocacy and knowledge management by (i) developing knowledge products and disseminating them widely, (ii) reviewing and reforming RE-related policies and regulatory frameworks to secure financing, (iii) advocating for making it mandatory to generate at least 30% of total energy through RE in the building code, and (iv) strengthening RE-related data management and organizing quarterly learning-and-review workshops to cross fertilize the knowledge and identify areas for future collaboration *(Conclusions # 4, 6, 11, 17 and 18)*.	Project, partner agencies, government entities	In a regular basis

The Solarization of Head of State Residences in Pacific Island Development Forum (PIDF) 11 Member Countries

Chapter 1: Introduction

1.1 The renewable energy context in PIDF member countries

1. Pacific island countries (PICs) rely on different energy sources, solar, hydroelectricity, wind, marine, biogas and biomass among them. Solar power, including off-grid, is the most common of small-scale renewable energy (RE) applications in these countries, while hydro-electricity is used only in Fiji, French Polynesia, New Caledonia, Papua New Guinea (PNG), Samoa, the Solomon Islands, and Vanuatu. Wind energy is used in Fiji, the Federated States of Micronesia (FSM), New Caledonia, Samoa, Tonga, and Vanuatu for micro- to large-scale applications but most systems are large-scale and grid-connected. Marine energy (tidal, ocean, wave, thermal energy conversion, and salinity gradient) are in the development stage. Biogas does use waste but is not very efficient. Biomass, primarily wood, is used in Fiji, the Solomon Islands, and PNG. Fiji uses waste from its timber mills and, during the crushing season, sugarcane bagasse, while the Solomon Islands and PNG rely on waste from the palm oil industry. The Solomon Islands burn biomass to produce electricity among other uses. Solar energy is most used because it is renewable, cheap and produces no environmental pollution or other harms. It is because most Pacific Island Development Forum (PIDF[2]) member countries (here-in-after called 'member countries') receive an average of 4 - 4.5 kWh/m^2 per day of solar energy, yet the deployment rate in the Pacific region remains low. PICs face multiple energy challenges. Johnston and Peter (2012) categorize these challenges as (i) a limited range of indigenous energy resources (only PNG has proven oil and gas reserves); (ii) the high cost of developing energy resources and extending service to remote populations; (iii) the poor quality of the energy data needed to assess trends; (iv) the paucity of skilled human resources; and, (v) limited ability to bargain with petroleum suppliers. The ADB in 2019 identified other challenges: limited finance and private-sector participation, capacity barriers, poor regulation, and the limited ability of local grids to absorb new sources of renewable power. A thorough analysis is still not in place regarding the ongoing impact on specific social groups, namely women and marginalized communities, in the Pacific region due to the absence of pertinent instruments or policies within the renewable energy (RE) sector concerning gender equality and human rights (see Box-1).

Box-1: Policies related to gender equality and human rights in the Pacific region

In the Pacific region, women have long been central to energy provision and management, particularly within rural areas where they bear primary responsibility for household energy needs. Despite their pivotal role, women encounter numerous obstacles, including restricted access to decision-making forums, financing, and technical training in RE technologies. Initiatives aimed at fostering gender equality in the RE sector could prioritize empowering women through targeted training programs, improved access to financing, and increased leadership opportunities within energy projects. Moreover, marginalized communities, such as indigenous peoples and rural populations, face disproportionate challenges related to energy poverty and environmental degradation. However, existing policies and instruments often fail to adequately address their needs or ensure their inclusion in decision-making processes. Consequently, RE projects may not effectively benefit these communities in terms of job creation, capacity-building, and sustainable development initiatives. To address these issues, the Pacific region could benefit from implementing specific instruments and policies:

- Gender-sensitive energy policies and legal frameworks would help incorporate a gender perspective and address the unique energy requirements of women and marginalized communities during project design.
- Gender mainstreaming in RE plans and projects involves integrating gender considerations across all stages of project development, implementation, and M&E, creating an environment conducive to women's participation and equitable benefits.
- Gender-responsive financing mechanisms, including grants, loans, and venture capital, can support women's participation in the RE sector and facilitate the scaling up of women-led enterprises.
- Capacity-building and training programs tailored to the specific needs of women and marginalized communities not only enhance their participation in the RE sector but also empower them to engage more effectively in decision-making processes.

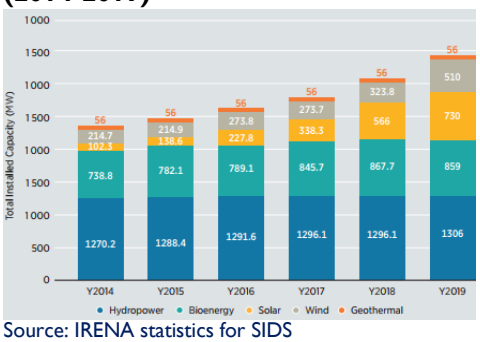
[2]Established in 2013, with its Charter adopted in 2015, this organization aims to advance the green/blue economy, emphasizing leadership, innovation, and partnerships. Its primary goal is to promote sustainable development in Pacific Islands by fostering three key pillars: environmental, social, and economic, thereby integrating continual economic growth with societal needs and environmental resilience.

Furthermore, enacting laws and regulations that promote gender equality and human rights in the energy sector, such as provisions for non-discrimination, equal pay, and protection against gender-based violence and harassment, can bolster women's confidence and foster a culture of inclusivity and empowerment. By prioritizing these initiatives, the Pacific region can create a more equitable and sustainable energy landscape, where women and marginalized communities play active roles in shaping and benefiting from RE initiatives.

2. There is a need to heighten awareness about solar technologies and improve the capacity of local communities to manage and sustain solar photovoltaic (PV) systems. This effort should concentrate on educating women and youth about the benefits of RE. In addition, it is imperative to foster gender equality and uphold human rights principles to ensure that the benefits of RE are accessible to all sectors of society, including women and the marginalized (for more details, please refer to Section 4). Promoting the adoption of RE in the Pacific region is crucial. This can be achieved by facilitating the installation of solar energy infrastructure, aiming to reduce carbon emissions, demonstrate proactive climate action, and reinforce the commitment to bridging energy disparities. This commitment would be upheld through the principles of gender equality and social inclusion (GESI), ensuring that no one is left behind.

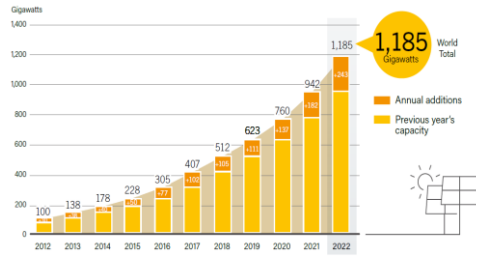
3. Roughly 40% of the petroleum used in PICs produces electricity. Dependence on diesel to generate electricity accounts for the high unit cost of electricity, US$0.20-0.30/kWh. This high cost limits PICs' ability to electrify. Access to electricity varies significantly[3] from PIC to PIC. As electricity is expensive, low-income households often use less electricity than they require. The fact that widely scattered households use limited amounts of electricity means that the cost of transmission and distribution constitutes a disproportionate share of tariffs. RE-based power generation could reduce tariffs and improve the commercial viability of investments. In particular, solar PV systems in PICs and elsewhere could address climate change, energy security, and high electricity costs.[4]

Figure 1: Total installed RE capacity (2014-2019)



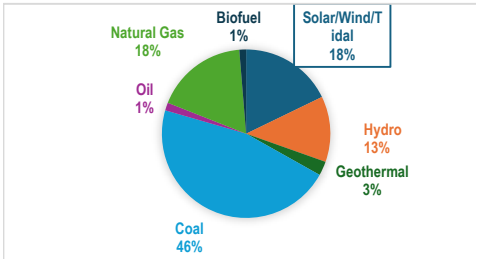
Source: IRENA statistics for SIDS

Figure 2: Solar PV Annual Capacity Worldwide



Source: IRENA, 2022

Figure 3: Power generation mix in the Pacific



Source: Source: International Energy Agency, 2023

4. Figure 1 illustrates the cumulative installed renewable capacity from 2014 to 2019, indicating upward trends in both solar and wind energy. As depicted in Figure 2, the annual capacity of solar PV globally shows a significant upward trajectory, with an addition of 243 GW in 2022 alone, bringing the total global solar PV capacity to 1185 GW. This growth in solar PV capacity is the most substantial among all RE over the past decade, surpassing an 11-fold increase. Figure 3 presents the power generation mix in the Pacific region, indicating that 36% of the energy share comes from renewable sources.

1.2 Project Description

5. To address challenges summarized in section 1.1, "The Solarization of Head of State Residences in Pacific Island Development Forum (PIDF) 11 Member Countries Project[5]," hereafter referred to as "the project," was conceptualized in 2017, developed in 2018, and finally approved at a Project Advisory Committee meeting on December 2, 2019. It commenced on June 1, 2020, and was to run for 24 months.

[3]Nearly every household in Niue, Nauru, Palau, Tokelau, the Cook Islands, Samoa, Tonga and Tuvalu have access to electricity, but in PNG, Vanuatu and Solomon Islands, household electrification rates are 20% or less.
[4]Entura (2016).
[5]Fiji, Tonga, Kiribati, Nauru, the Solomon Islands, Vanuatu, the Republic of the Marshal Islands, the Federated States of Micronesia, Palau and Tuvalu

However, it underwent two extensions: the first for 21 months until December 31, 2023, and the second for three months until March 31, 2024. The Government of India (GoI) funded the project through the India-UN Development Partnership Fund[6] and Solaria[7] provided equipment. The PIDF, as the "responsible party," oversees the project's execution, and the Solar Head of State (SHoS)[8] provided technical advice and backstopping. A synopsis of the project is provided in Table 1.

Table 1: Synopsis of the project

Project ID	113240
Region	Asia and the Pacific
Aim	Support the adoption of RE in the 11 PIDF member countries by elevating the visibility of solar energy installation and utilization in part by the advocacy of heads of state.
Goal/ impact	Promoted the adoption of RE in the Pacific region by facilitating the installation of solar energy infrastructure that aimed to mitigate carbon emissions, showcase proactive climate measures, and affirm commitment to bridging energy disparities.
Project budget	Total project's budget: USD 1,310,000 a. UNDP Target for resources assignment from the core: 00 b. India-UN Development Partnership Fund: USD 400,000 in cash c. India-UN DPF Commonwealth Window : USD 700,000 in cash d. Solaria's in-kind contribution of goods: USD 90,000 e. PIDF and SHoS's in-kind contribution of services: USD 120,000
Timeframe	January to March, 2024

Source: Project, 2024

6. The primary objective of the project was to support UNPS Outcome 1, which focuses on climate change, disaster resilience, and environmental protection. The project was executed in PIDF member countries by the UNDP multi country office (MCO) using a direct implementation modality (DIM). PIDF, responsible for implementation, facilitated the installation of solar energy infrastructure in 10 PIDF member countries[9], in particular targeting the residences of heads of state and buildings of national significance (see Table 2 for a list of project's beneficiaries). The project's objective was to promote the adoption of clean RE technologies in the Pacific region. The project aimed to raise awareness among policymakers and the public regarding the importance of accelerating the adoption of sustainable energy to meet energy sector and climate change mitigation goals in the Pacific region. This initiative aligns with Outcome 1 of the UN Pacific Strategy (2018–2022), which aimed to enhance resilience to climate change, climate variability, and disasters, and strengthen environmental protection. Moreover, the project sought to enhance cooperation with the Government of India (GoI) to support South-South cooperation in advancing sustainable development across the developing world, particularly focusing on least developed countries and small island developing states. As are outlined in Table 3 below, multiple stakeholders played vital roles throughout project (see Annex-11).

Table 2: List of project's beneficiaries

Country	Solar PV system
Fiji	1. Ulunivuaka Community Hall and the Residence of Ratu Epinasa Cakobau Chiefly Island of Bau
	2. Official Residence of the President
	3. Official Residence of Prime Minster
Kiribati	4. State House
Tuvalu	5. Governor General Official Residence
Tonga	6. National Women Council
Solomon Island	7. Governor General Official Residence
Palau	8. Office of the Vice President
Nauru Island	9. Dialysis Center
Federated State of Micronesia	10. State House
Vanuatu	11. Governor General Residence, Torba Province
RMI	12. Office of the President

Table 3: Roles and responsibilities of key stakeholders

Sn	Stakeholders	Roles and responsibilities
1	PIDF	• Facilitate the signing of memorandum of understandings (MoUs) and coordinate site selection in collaboration with foreign missions based in Suva. • Execute project activities in collaboration with SHoS, Solaria, and member countries under the supervision of UNDP MCO.

[6]The India-UN DPF was established by the GoI in June 201, to, in the spirit of South-South cooperation, assist other developing countries in achieving their SDGs. This fund supports Southern-owned and led, demand-driven, and transformational sustainable development projects across the developing world, with a focus on least developed countries and PICs.

[7]Solaria is a private-sector partner based in the U.S. It donates solar panels free of cost.

[8]It is USA based NGO working with governments and install solar PV systems on iconic public buildings as well as support world leaders championing solar, acting as a catalyst for policy advancement and wider adoption of new solutions for RE.

[9] Initially, the project was conceived for 11 countries; however, as Timor Leste lies beyond the purview of the UNDP Fiji MCO, obtaining funds from the UNDP MCO for this nation was not technically viable. While the project proposed site adjustments for Timor Leste contingent upon its ability to procure financial resources, the project board excluded the site at a meeting in 2023 because no funding was to be found. Thus, the project extends its services to 12 sites in 10 PIDF member countries.

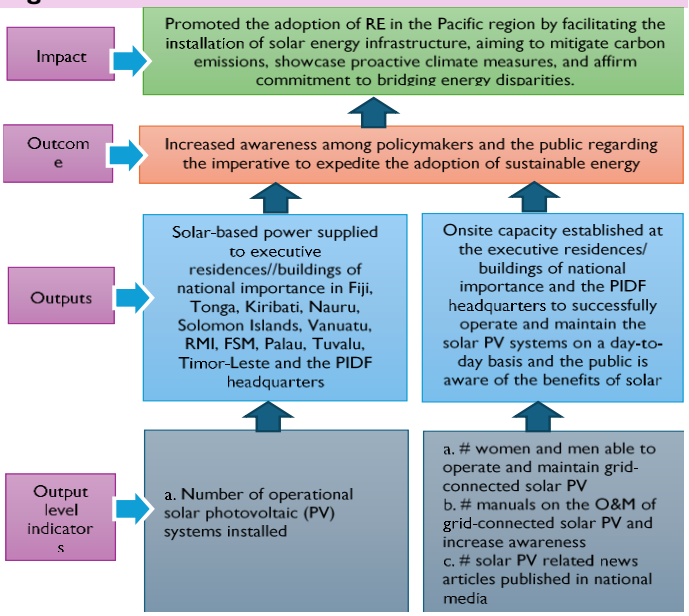
2	Solar Head of State[10]	• Assess sites using indicators agreed upon through stakeholder consultations, provide blueprints, equipment manuals, and detailed operation and maintenance (O&M) guidelines for system designs. • Initiate post-installation media and public engagement campaigns to raise awareness about the benefits of solar energy through demonstration set-ups.
3	Solaria	• Manage solar panel maintenance at no charge and offer technical assistance as needed.
4	Technical working group (TWG)	• Collect data for feasibility studies, Assist in obtaining duty waivers for the importation of solar PV systems, and Coordinate the transportation and storage of equipment. • Assign the nation's department of energy (DoE) to oversee the work of local contractors. • Provide facilities and maintenance personnel for SHoS-run training sessions on system O&M.
5	Project board	• Evaluate progress, address significant issues, and find resolutions. • Review and endorse annual work plans and approve plans for each upcoming quarter. • Offer strategic guidance to entities that implement the project. • Identify risks, develop strategies to mitigate them, and document best practices and lessons.
6	UNDP	• Encourage the PIDF to collaborate with additional partners to accelerate delivery and progress and offer guidance and technical support as required. • Monitor project activities to ensure their quality. • Share information related to the project and lessons learned with relevant agencies to advocate for policy improvements.

Source: Project, 2024

1.2.1 Project's result framework

7. Figure 4 clearly summarizes the project's overall impact (goal), outcome (effect), two outputs and corresponding indicators. The goal, 'promoted the adoption of RE in the Pacific region by facilitating the installation of solar energy infrastructure, aiming to mitigate carbon emissions, showcase proactive climate measures, and affirm commitment to bridging energy disparities' and outcome, 'increased awareness among policymakers and the public regarding the imperative to expedite the adoption of sustainable energy' were slightly modified to harmonize with the two outputs already set (see Figure 4). The indicators of each of the outputs are SMART; in other words, they are clearly quantified and thus easy to measure. The project's result chain looks fine as the outputs, outcome and impact are well correlated (see Annex-17).

Figure 4: Result framework



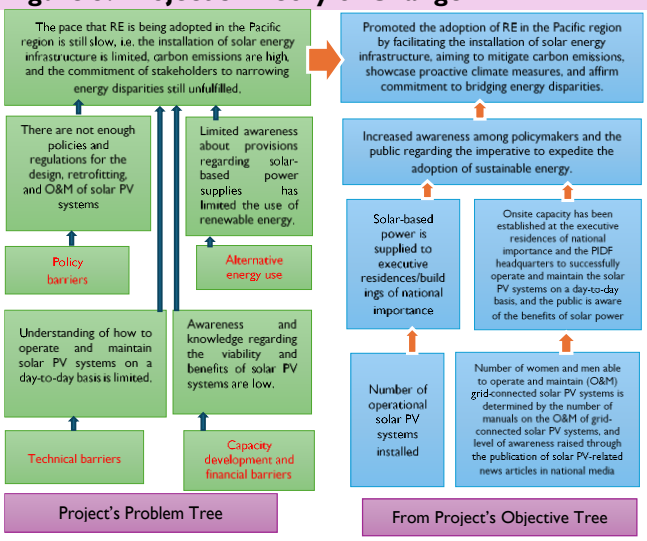
1.2.2 Theory of change

8. Notably, no dedicated theory of change (ToC) was formulated during the project's design. To establish a better connection among the project's impact, outcome, outputs, and activities, the impact and outcome were slightly modified to increase the systematization of the approach and the following connections: Barriers ➔ Outputs ➔ Outcomes ➔ Impact Drivers and Assumptions ➔ Impacts (see

[10] Solar Head of State is a non-profit association formed by a team of solar energy activists around the globe. By installing solar energy systems on government buildings, the country's leadership is given first-hand experience with the proven benefits of renewable technologies.

Figure 5). The assessment also noted that the project strategy outlined in the project document remained largely unchanged throughout the project's duration. Only a few reasonable adjustments, primarily regarding changes solar PV installation sites, were made. The project's financial resources were allocated strategically to address four main types of barriers: (i) policy, regulatory, and institutional barriers; (ii) barriers related to alternative energy use; (iii) technical barriers; and (iv) barriers concerning capacity development and finances. Activities were designed to achieve the expected outputs, which in turn were selected to contribute to the desired outcomes and ultimately to achieve the project's overall impact. The indicators and targets associated with each output played a crucial role in monitoring the project's overall performance. The ToC now presents a clear results pathway, one reflecting the project's impact and the alignment between project outcomes and project outputs.

Figure 5: Project's Theory of Change

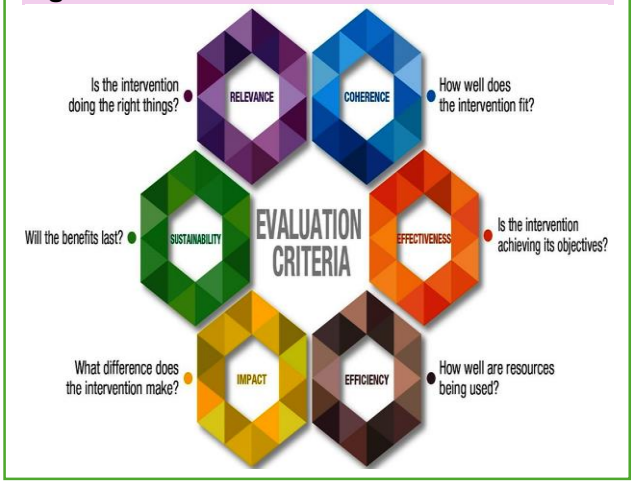


Chapter 2: Terminal evaluation

2.1 Purpose and objective of this terminal evaluation

9. Based on the ToR (see Annex-1), the purpose of this terminal evaluation (TE) was to assess the project's outcomes, extract valuable lessons, and formulate precise recommendations for future endeavors. The evaluation considered each of the six Organization for Economic Co-operation and Development's-Development Assistance Committee (OECD-DAC) criteria: relevance, coherence, efficiency, effectiveness, impact, and sustainability (see Figure-6). Based on the ToR (see Annex-1), its specific objectives were as follows:

Figure 6: OECD-DAC evaluation criteria



- Identify the strengths and weaknesses of the project's design and implementation.
- Review progress made towards achieving objectives and outcomes, specifically outputs.
- Evaluate the impact of COVID-19 on project implementation and the project's contributions to gender equality and women's empowerment.
- Assess how the project integrated gender empowerment and social inclusion, particularly in developing capacity for the operation and maintenance (O&M) of solar equipment and in conducting activities to increase public awareness about the benefits of solar power.
- Recommend design modifications that will enhance the likelihood that this and other, similar projects will succeed.

2.2 Scope of the evaluation

10. This project aimed to enhance climate resilience and improve environmental conservation by mitigating climate change. The scope of evaluation was the total timeframe of the project and its total geographical coverage. Its geographical focus was the PIDF member countries, Fiji, Tonga, Kiribati, Nauru, the Solomon Islands, Vanuatu, the Republic of Marshall Island (RMI), FSM, Palau, and Tuvalu. Its focus was the OECD-DAC criteria: relevance, coherence, efficiency, effectiveness, impact, and sustainability along with the

cross-cutting issues of human rights, gender equality and leaving no one behind, disability, and climate change action (see Table 4).

Table 4: Scope of evaluation

Key elements	Detailed information
Time-frame	• June 2020 to February 2024
Relevance	• Assess the appropriateness of the project design particularly its objectives, ToC, results and resource frameworks as they relate to the achievement of objectives, linkages with governments' strategic policies and plans, and challenges it intends to address.
Coherence	• Assess the project's alignment with UNDP's core documents (UNDP SRPD/CPD), national priorities (national development plans), and related UNDP, UN, and development partner projects.
Effectiveness and efficiency	• Evaluate the project's overall objectives and assess the project's direct and indirect accomplishments (results), including number of solar installations, specific gender results and contributions towards the achievement of the anticipated outcomes, including any constraints on the project's effectiveness and any unintended outcomes.
Impact	• Assess the quality of activities, such as the operational efficiency of the solar systems installed, achievement of energy savings from the installations, training provided to increase O&M capacity, and level of awareness created among policymakers and the public about solar power as a source of renewable clean energy. • Assess indirect results such as the mainstreaming of gender equality and social inclusion (GESI) in policies and strategies, structures, and preparedness activities; capacity enhancements of the target group; enhancements of partnership and engagement, increases in the functional efficiency of target institutions, and specific impacts on gender equality.
Sustainability	• Assess the positive impacts on sustainability and the replication of best practices and lessons learned in countries in other regions.
Cross-cutting issues	• Assess the impact of the project on gender equality and include recommendations on gender equality and women's empowerment.

Chapter 3: Evaluation approach, methodology and process

3.1 Evaluation approach

11. This TE followed the UNDP Evaluation Guideline (revised edition, June 2021[11]) for conducting terminal evaluations of projects supported by the UNDP. It used summative, constructive, and formative approaches to evaluate the extent to which the project has achieved its expected outputs and results; investigate the reasons for the project design and arrangements for implementation; and identified and documented valuable lessons pertinent to the design and implementation of similar project. The TE fulfils a vital function in bolstering accountability and will act as a catalyst. Throughout the assessment, the evaluator maintained autonomy.

3.2 Evaluation methods and process

12. The evaluator employed a mixed methods approach to ensure the evaluation would be comprehensive and well-rounded,[12] but prioritized qualitative tools and techniques to effectively fulfill the primary purpose and objectives of the evaluation. The available data were disaggregated by gender to assess outputs and outcomes thoroughly. At the heart of the TE was an examination of the project's theory of change (ToC). Consultations were conducted to grasp the project's approach and the necessary supporting conditions ("assumptions" and "drivers") to effecting change. The ToC outlined causal pathways, which stakeholders later elaborated during data collection. Quantitative tools were used to gauge progress towards targets. The evaluator used available M&E records and the project's database. By combining qualitative and quantitative data, the evaluator gathered a comprehensive set of a data to address the key evaluation questions using evaluation matrix and key evaluation questions (see Annex-18 and 19). The DAC-OECD's evaluation criteria were used to assess the performance of the project (see Annex 1). The evaluator followed a structured approach with three phases: inception, data collection and analysis, and report preparation. During the inception phase, the evaluator mapped out agencies through stakeholder analysis, reviewed the ToC, established a sampling strategy (see Box 2), and crafted the evaluation framework. The evaluator also crafted a sampling frame to encompass stakeholders from various categories, including (i) project partners, (ii) government agencies, (iii) private institutions and

[11] http://web.undp.org/evaluation/guideline/documents/PDF/UNDP_Evaluation_Guidelines.pdf
[12] The review methodology used is based on the UNDP-GEF Monitoring and Evaluation Policies and includes multiple methods and analysis of both qualitative and quantitative data where possible.

networks, (iv) women's councils, (v) development partners (donors), and (vi) academia. To ensure inclusivity, a minimum of 33% of the total respondents were women. Each data collection tool and approach was meticulously designed to deliberately gather gender-disaggregated data and information. The report lacked gender-disaggregated data due to the absence of a maintained database within the project. Consequently, the data were scattered, making it challenging to tabulate and analyze them effectively. Moreover, since numerous project activities were carried out in the later stages (between October 2023 and March 2024) with a primary focus on meeting the target of installing 12 solar PV systems across 10 countries (which was successfully achieved), non-structural activities such as database management faced obstacles and were not smoothly implemented. From the complete list provided by the project, a minimum of 50% of respondents were randomly selected from each of the six categories discussed above, ensuring proportional representation.

Box-2: Synopsis of the project Sampling Strategy

Given the constraints of time and resources, this evaluation focused on three countries out of the 11 member countries. One of these countries be Fiji, where the UNDP MCO is located, facilitating multiple consultations necessary for this evaluation. To incorporate the nuances of the South Pacific context, Tonga and northern Pacific context, Kiribati were selected. The decision to embrace this approach aimed to address stakeholders' concerns regarding delays in the installation of solar PV systems, the choice between single and three-phase electricity supply, and battery functionality. This strategy also aimed to derive valuable insights for future such projects.

In the three countries sampled, the evaluator engaged directly with a variety of stakeholders crucial to the intervention, including representatives from the private sector, academia, and research institutions with significant practical experience in the renewable energy sector. Additionally, the evaluator sought out input from individuals belonging to the most vulnerable groups, obtaining organic views that complemented those from other formal sources and enhanced the triangulation of responses.

The evaluation has covered seven countries, despite the inability to conduct site visits in these locations. Instead, the TE consultant has (i) meticulously reviewed work progress, (ii) monitored physical work through photographs and videos (whatever available) of the latest physical progress, and (iii) conducted online interviews with pertinent stakeholders in order to fill the data gaps.

13. The data collection and analysis phase included a desk reviews, stakeholder interviews, triangulation, analysis, and interpretation. The report preparation phase involved presenting preliminary findings and drafting the report, soliciting stakeholder comments and factual corrections, and finalizing the TE report. Qualitative information was collected using 42 key informant interviews (KIIs), two focus group discussions (FDGs), most significant change, and observation (see Annex 2). Of the total 42 respondents, 28 were men and 14 were women (33%). Women's participation in the evaluation process was low because the majority of stakeholders in government agencies were men (see Annex-2).

3.3 Selection of countries and relevant stakeholders

14. An evaluation mission (March 8 to March 28, 2024[13]) was organized to visit Suva, Fiji, and to balance the perspectives of the southern and northern Pacific, Tonga and Kiribati respectively (see Annex-3). The constraints of time and resources were considering in making these choices. Four of 12 solar PV systems in three of ten countries were visited. The criteria used to select solar photovoltaic (PV) systems and key informants ensured diverse geographical areas and opinions and experiences would be covered. The evaluation mission provided the evaluator with valuable insight into the respondents' overall perceptions, the hurdles they encountered and the strategies they employed to overcome them, and their assessment of the impacts of the project's intervention. The evaluator also (i) meticulously reviewed work progress, (ii) monitored physical progress through photographs, videos, or whatever else was available, (iii) conducted online interviews with pertinent stakeholders in the other seven countries, and (iv) interacted with TWG members in-person during the policy workshop (March 25-27, 2024) in order to fill in data gaps.

3.4 Methods for data collection and analysis

15. Following methods were used during the data and information collection:

- *Initial briefing meetings with the UNDP MPO team:* At the initial briefing session, representatives from the UNDP Management Program Oversight (MPO) team clarified the primary objectives and areas of focus of the evaluation. The evaluator then reviewed pertinent documents and drafted an inception report overviewing the project's current implementation status and partnership arrangements, notable achievements, and the challenges and obstacles as well as steps to mitigate them currently encountered by the project. The evaluator thus gained a comprehensive understanding of the project's strategy, development process, phase-wise activities, and significant adjustments. The evaluator's method was

[13] The project briefing suggested visiting Vanuatu or Tonga because of the multiple interventions in each.

collaborative and participatory: it ensured active involvement with the project team, as well as all pertinent stakeholders and beneficiaries.

- *Desk study:* The UNDP MPO team furnished the evaluator with a comprehensive set of project-related documents (see Annex-4). In addition, the evaluator examined the RE policies of the member countries found on the websites of the UNDP Multi-Country Office (MCO), Ministry of Environment, Energy Fiji Energy Limited (EFL), and Fijian Competition and Consumer Commission (FCCC) as well as other relevant sources of information.

- *Key informant interviews:* In line with the term of reference (ToR), the evaluator interviewed randomly selected representatives from (i) the UNDP MCO, Fiji, (ii) the Evaluation Reference Group[14], (iii) the project team in Fiji, (iv) representatives of Technical Working Group (TWG) in member countries, and (v) officials from FCCC and private installer groups. The informants were asked about the project's key achievements, priorities, challenges, best practices, and lessons learned. The evaluator interviewed both men and women and used gender-responsive methods and tools that considered gender equality, women's empowerment, and other cross-cutting themes (see Box 3 below). He developed and employed online questionnaires to gather the perspectives of additional stakeholders in the seven countries he was unable to visit. Each interview was conducted in a semi-structured manner that commenced with broad and open-ended questions and got more specific. The KIIs helped identify key lessons learned and validate data.

- *Focus group discussions:* FGDs were conducted with groups of trainees, individuals responsible for the O&M of the solar installations, and a women's group in Tonga. While selecting participants for the FGDs, the consultant employed GESI approach. To mitigate response bias, a few strategically chosen individuals from a comprehensive pool of potential respondents were identified as key informants to be interviewed and participants in FGDs. This strategy ensured representation of the project's entire participant universe. Criteria for selection included (i) expertise in RE-related policy matters at the regional and national levels and an understanding of emerging gaps in the policy sector, (ii) direct involvement in project activities and empirical knowledge about successes and areas needing improvement and the reasons for their relative success, (iii) in-depth familiarity with similar interventions conducted by other agencies and awareness of key learnings from those interventions with applicability to this project, and (iv) representation from diverse backgrounds, genders, and ethnic minorities to capture a comprehensive array of concerns and issues.

- *Direct observation:* The evaluator used participant observation methods to evaluate installation of solar PV systems. He closely observed the results and impacts of the project and interacted with pertinent stakeholders and informants, posing specific questions to each to gain further insight.

- *Competency analysis:* The evaluator employed a competency analysis tool to identify strengths, weaknesses, opportunities, and threats (SWOT) as part of KIIs and FGDs.

- *Most significant change technique:* This technique was used to assess the project's overall accomplishments and gauge the extent of change. It was integrated into both FGDs and KIIs. It helped the evaluator review the project's overall achievements, despite its complex institutional and implementation structure, and the diverse range of stakeholders. Utilizing most significant change, the evaluator addressed concerns regarding the sustainability of the recently installed solar PV systems and significant changes they brought together.

- *Participation in solar energy Policy workshop:* The evaluator participated in a three-day workshop convening all stakeholders associated with the project and other multiple stakeholders from the sector. It focused on four key themes: lessons learned, the policy landscape, capacity-building, and strategy development. Insights gathered from this workshop were also utilized to address any existing gaps.

16. Ethical considerations: The evaluator incorporated the perspectives of both men and women from various agencies. All information was acquired only after securing the informed consent of the respondents. The data generated in the discussions was kept anonymous, and data collection adhered to UNEG guidelines and UN standards of conduct.

[14] Comprising government representatives, at least one donor representative, and UNDP representatives

Box-3: Assurance of cross cutting themes during evaluation data collection and analysis

The TE Consultant has ensured the consideration of gender and human rights aspects throughout the process of data collection, analysis, and reporting by:

- Conducting both combined and separate FGDs with women to thoroughly explore their specific issues and concerns.
- Ensuring that ethical considerations, sensitivity, and tailored data collection methods are integrated.
- Employing gender-inclusive language and maintaining awareness of potential gender biases in evaluation questions and checklists.
- Securing informed consent from all FGD participants, clearly explaining the evaluation's purpose, data usage, and procedures before data collection begins.
- Formulating questions and checklists in a manner that enables participants to openly share their experiences and perspectives regarding gender and human rights.
- Avoiding the framing of questions in a way that assumes the absence of gender or human rights issues or their equal impact on everyone.
- Creating a supportive environment for participants to comfortably share their experiences, especially when collecting sensitive data on topics like gender-based violence or discrimination.
- Ensuring that the data collection approach is culturally sensitive and respects human rights principles.

3.5 Quantitative data collection

17. During the desk review, the evaluator has collected quantitative information and structured it into various tables[15] to validate during KIIs and FGDs. The data and information available in the project's database was also used to gauge output indicators.

3.6 Data analysis

18. The evaluator utilized a mixed-method approach, analyzing both quantitative and qualitative data and triangulating the results obtained from each type. In qualitative analysis, the evaluator used both a thematic approach and a content analysis tool[16] to categorize available information in order to pinpoint key issues and concerns raised by respondents. Quantitative data were analyzed using Excel.

3.7 Performance standards

19. In accordance with the OECD-DAC evaluation criteria, the project's performance was evaluated using following evaluation rating indices as adopted by Global Environmental Facility (GEF) funded project's evaluation:

Relevance, coherence, effectiveness, efficiency and impact

6=highly satisfactory, 5=satisfactory, 4=moderately satisfactory, 3=moderately unsatisfactory, 2=unsatisfactory, 1=highly unsatisfactory

Sustainability

4 (likely-negligible risks to sustainability; 3 (moderately likely-moderate risks to sustainability); 2 (moderately unlikely-significant risks to sustainability); 1 (unlikely-severe risks to sustainability; and U/A-unable to assess the expected incidence and magnitude of risks to sustainability)

3.8 Data triangulation and development of the evaluation report

20. To ensure its quality, the evaluator developed this TE report based on insights gathered from his interviews with key stakeholders. To ensure the reliability and validity of the data and thus contribute to the development of an evidence-based evaluation based credible, reliable, valuable, and useful findings, the evaluator relied on triangulation for validation. More specifically, the evaluator employed a wide variety of data sources and methodologies, meticulously triangulating and validating them to ensure the data and information's inclusivity, accuracy and credibility. Primary information obtained through various tools such as KIIs, FGDs, direct observations, and most significant change technique was compared and cross-checked with documented data and information. The evaluator also tested the consistency of his data and other findings obtained through different instruments to increase the chance he would be able to identify any factors that had distorted those findings. Once the data had been validated, the evaluator tabulated, synthesized, and analyzed them before drawing conclusions. The evaluation report followed the evaluation framework delineated in the approved inception report, and a draft TE report was provided to the UNDP MCO by March 28 (three days prior to agreed date). This report will empower not only the 10 member countries but also the entire Pacific region, enabling other PICs to develop their own RE projects of this nature in the future.

[15] The project team was aksed to fill in these tables. Its responses were later varified during the field work.
[16] This is the technique usually used to analyse qualitative data.

3.9 Limitations

21. During this evaluation, the TE consultant faced several challenges and constraints. However, the evaluator strived to comprehend the project thoroughly and provide an equitable and well-rounded assessment. Though the limitation of bias was ever-present, using tailored questions and triangulating data helped to mitigate it. As each limitation was carefully addressed with a mitigation approach, the challenges were all categorized as minimal and unlikely to pose a significant risk either to the quality of the data or the findings. Table 5 summarizes the limitations and the measures applied to ensure that data would sufficient in quality and quantity for the purpose of this evaluation.

Table 5: Key limitations and their mitigation

Limitation and their impacts in project's evaluation	Mitigation measure
1. The field mission covered only three of 10 countries that the project spanned, meaning that there could be significant data gaps that make generalizing findings and formulating conclusions problematic.	The resultant gaps in data were managed using online platforms to question relevant key stakeholders and interacted with key stakeholders during the policy workshop in Fiji. Thus, limited physical evaluation coverage was not a serious issue because data was obtained remotely
2. The high turnover of PIDF and UNDP staff resulted in the erosion of institutional memory.	This risk was mitigated through close collaboration with the UNDP MCO and partner organizations as well as interviews with most relevant staff to avoid such gaps.
3. The progress reports were poor quality and lacked a consistent format. While each report addressed activities within its reporting period, it did not report on cumulative data from day one.	The evaluator devised a format to tabulate relevant data comprehensively.
4. The minutes of the meetings of the project board were excessively prolix, making it challenging to extract pertinent information for evaluation purposes.	The evaluator employed a quick scan method to ensure that crucial information wasn't overlooked.
5. Not all project partners were happy that UNDP became directly involved in implementing activities in the project's later stages. Their dissatisfaction may have undermined the quality of data and information received.	The evaluator maintained balanced and positive relationships with all partners, strategically harvesting all their issues and concerns without discrimination.
6. Gender-disaggregated data is not consistently maintained, except for the training database. This lack of clarity makes it challenging to demonstrate how GESI are integrated into all of the project's activities and interventions.	The evaluator compiled the dispersed data to the best of their ability and utilized it in the evaluation report. However, it's worth noting that there was no gender-disaggregated data available at the project level, indicating a missed opportunity.

Chapter 4. Evaluation findings

4.1 Relevance

The assessment of relevance was conducted using the following key questions:

4.1.1 How relevant are the project's objectives regarding the adoption of sustainable energy in meeting the ambitious energy and climate change goals of member countries?

22. The primary aims of the project were to bolster the adoption of RE across 11 PIDF member countries[17] by promoting the installation and utilization of solar energy. The PIDF and SHoS[18] spearheaded the effort. The project also aimed to install solar PV systems and encourage the adoption of RE across PIDF member countries. This initiative helped mitigate carbon emissions, demonstrate proactive climate action, and tackle energy deficits, thereby aligning with the aspirations of Pacific island countries (PICs) to achieve net-zero emissions (see Annex 9). During their interviews, key informants opined that the project's relevance stemmed from its alignment with the climate change goals of member countries and support for the targets, particularly in advancing the adoption of sustainable energy sources such as solar power. In this context, the project's objectives were deemed relevant to the adoption of sustainable energy, a goal aligned with the ambitious energy and climate change goals of member countries.

23. Project's objectives are relevant because the types and nature of intervention proposed in this project contributed to respond to local and global needs. It is further relevant because it facilitated to address the "development" gaps and climate change goals, as identified by Nationally Determined Contributions

[17] Initially the project took PIDF took 11 member countries but later Timor Leste was dropped.
[18] The SHoS is a non-profit association comprising a team of solar energy activists around the globe.

(NDCs) and National Adaptation Plans (NAPs) of PIDF member countries. There is a good correlation between project's interventions and targets and indicators of NDCs and NAPs.

Finding 1: *The project, led by the PIDF and SHoS, aims to accelerate the adoption of renewable energy, particularly solar power, in 10 member countries. By promoting solar PV systems, it aims to cut carbon emissions, demonstrate proactive climate action, and tackle energy deficits, in line with the goal of member countries to achieve net-zero emissions. Its significance lies in its advancing of the adoption of sustainable energy, particularly solar power, to support ambitious regional energy and climate targets and contribute to global efforts to combat climate change.*

4.1.2 Are there significant gaps or missed opportunities in the adoption of sustainable and RE among member countries?

24. Gaps in the adoption of sustainable RE: Thorough consultations with stakeholders revealed several gaps in the adoption of sustainable energy and RE among member countries. These gaps stem from a complex interplay of infrastructural, financial, technical, regulatory, geographical, and capacity-related obstacles. One major challenge lies in the lack of sufficient infrastructure for generating, distributing, and storing RE. During FGDs, stakeholders highlighted that the substantial upfront costs associated with solar PV systems deter potential users. Moreover, accessing "green financing" for medium- to large-scale initiatives remains difficult as banks and private institutions offer limited financial support. Inconsistent energy policies, bureaucratic hurdles, and inadequate supportive incentives further hinder investment and innovation in the sector. The absence of well-structured action plans will make it hard to achieve the ambitious RE targets set by PICs (see Annex 9). In addition, the fact that are no systematic policies for recycling batteries and accessories poses an environmental risk. The unique geographical characteristics of the states involved and their vulnerability to climate change-related events present additional challenges to expanding RE infrastructure. The shortage of skilled professionals and limited presence of private-sector companies are other significant barriers. These gaps in the adoption of sustainable energy and RE among member countries are briefly discussed in the following paragraphs.

25. The progress of member countries in adopting RE has been impeded by a confluence of infrastructural, financial, technical, regulatory, geographical, and capacity-related hurdles (see Annex-6 for risk log). Studies conducted by SPC (2018) and ECA (2016) point out a lack of a robust institutional framework and effective regulatory structures, policies, and incentives within the energy sector. According to key informants, insufficient infrastructure for generating, distributing, and storing RE further compounds the problem. Indeed, many countries have inadequate grid connections, energy storage facilities, and efficient transmission systems. Also complicating matters is that some member countries are in Stage 1 of development, while others are poised to transition to Stage 2. Only a few are in Stage 3.[19] The SWOT analysis revealed that the considerable upfront costs of a solar system are a key barrier. Member countries often struggle to secure "green financing", especially for medium to large-scale initiatives, as banks and private institutions do not provide adequate financing. Despite the potential of tapping into renewable sources such as solar, wind, and hydroelectric power, many member countries heavily rely on imported fossil fuels. In addition, in the view of key informants, the shortage of skilled professionals and limited presence of private-sector companies impedes the implementation and maintenance of RE systems. Efforts to escalate capacity-building are also inadequate.

26. In 2023, IRENA found that the commitment of PICs made at COP-28 to triple the use of RE necessitated achieving a total of 11,000 gigawatts (GW) of RE capacity worldwide. To meet this goal approximately 7,800 GW need to be added by 2030 and average annual growth in renewables deployment needs to increase by 17%. To incentivize the uptake of green energy, regulatory measures are crucial, as are efforts to build resilient supply chains for equipment and increase the skill of the workforce. Solar and wind power are projected to contribute the most to this additional capacity, with estimates of over 4,000 GW and 2,600 GW in total production respectively, marking a significant increase from 2022 levels. During interviews, key informants opined that inconsistent energy policies, bureaucratic hurdles, and inadequate supportive incentives pose significant barriers to investment and innovation. Agencies that install solar PV systems often neglect O&M, and there's a glaring absence of policies regarding the systematic recycling of batteries and other accessories to mitigate environmental risks (see Annex13).

[19] Stage 1 is installing a few large widely dispersed to solar farms that minimize overall variation, Stage 2 adds the establishment of several dispersed, rooftop installations on government-owned buildings, and Stage 3 allows customers to install privately owned roof-top grid-connected solar systems whose size is tailored to the building's load and will not require increasing feeder capacity. Stage 3 systems will be widely dispersed and meet utility standards for equipment and installation).

27. Missed opportunities to adopt sustainable RE: During the SWOT analysis, respondents highlighted missed opportunities in the adoption of sustainable energy and RE by member countries. There is potential for PICs to further exploit a variety of RE sources by crafting policies, enhancing local capabilities, exploring financing options, and promoting technological innovation. Optimizing site assessments requires a more robust approach, one tailored to meet the specific needs of each member country rather than relying on a one-size-fits-all approach. Implementing "engineering procurement and contracting" methods could expedite the search for suitable vendors, reduce administrative delays, and enable qualified vendors to offer bundled services. Another missed opportunity is offering long term agreements (LTAs) to potential companies to install solar PV systems.

28. Key informants opined that, at the broad scale, PICs could do more to utilize a variety of RE sources (geothermal, solar, hydropower, and wind energy) and establish supportive policies and local capabilities for their adoption. Given that many PICs are situated along the Ring of Fire, they possess significant potential for tapping geothermal energy resources. In addition, having abundant sunlight throughout the year makes them favorable sites for solar power generation, and the many rivers and streams that flow offer opportunities for hydropower generation. Coastal regions hold promise for wind energy production, and biomass resources could be harnessed to generate bioenergy. Key informants further emphasized that realizing the full potential of these resources has been hampered by high initial costs, limited financing options, and technological obstacles.

29. The project could have refined the quality of its site assessments by involving experienced technicians. Interviews revealed that while the project did distribute a checklist to the members of the TWG to assist them in selecting feasible sites, some had limited technical expertise and other had no free time to do so effectively. In addition, the designs of solar PV systems should be tailored to local needs and contexts; a one-size-fits-all approach is inadequate. For instance, in Kiribati, frequent power outages necessitate that there be a robust battery bank to ensure a continuous supply of energy. In the State House of Fiji, in contrast, mechanisms have been established to minimize power outages, making low-capacity battery banks adequate for its needs. Despite these differences, the project provided both countries with the same types of batteries and inverters.

30. The process of engineering procurement and contracting (EPC) would benefit from a more comprehensive approach as the current piecemeal manner resulted in prolonged searches for suitable vendors and administrative delays. Stakeholders said that to streamline operations and prevent disputes, the project should hire qualified vendors offering bundled services, including site assessment, system design, supply, transportation, installation, testing, commissioning, and O&M training. Furthermore, memoranda of understandings (MoUs) were not signed within the specified timeframes because the project carried out only limited monitoring.

31. The UNDP conducted compliance checks before initiating the project and, based on the findings, leveraged its partnerships with the PIDF and the SHoS. During interviews, stakeholders said that the project should have evaluated the performances of these partners, identified gaps in their capacity, and devised robust action plans to yield better outcomes. The UNDP also struggled to allocate the human resources called for in the project document (ProDoc) to timely fulfill hardware and software tasks.

32. In a move which streamlined logistics, the UNDP established a long-term agreements (LTA) with DHL regarding equipment transportation and engaged other vendors to organize various events. If it had established similar LTAs for solar PV installation, it could have significantly reduced the time needed. There is considerable potential for scaling up roof-top solar PV systems, particularly as land is limited and the PICs aspire to achieve net-zero emissions. FGD respondents opined that member countries could consider implementing policies mandating that homeowners and businesses include plans for solar PV systems that generate at least 30% of the total predicted energy consumption of a building before granting them permission to build.

33. Some respondents still believe, wrongly, that solar PV systems may not withstand cyclone, leading to scepticism about the value of investing in this technology. The project could have conducted awareness-raising events and developed radio jingles and public service announcements to dispel misconceptions about the resilience of solar PV systems in cyclone-prone regions (see Annex 7). In the other hand, in 2018, the Pacific Power Association (PPA) and Pacific Regional Infrastructure Facility (PRIF) reported that

there had been a significant increase in the adoption of solar PV as a primary power solution after the price of panels decreased by a remarkable 80% in the previous decade. They also found that over 50 MW of grid-connected solar capacity had been installed in the PICs, positioning the Pacific region as having one of the world's highest per-capita use of grid-connected solar energy.

Finding 2: *Numerous obstacles impede the uptake of sustainable RE within PIDF member countries. These include infrastructural, financial, technical, regulatory, geographical, and capacity-related challenges such as insufficient infrastructure, high initial expenses, limited financing avenues, inconsistent energy policies, bureaucratic complexities, and inadequate incentives. Moreover, opportunities to harness various RE sources have been overlooked and gaps in policy frameworks and capacity-building initiatives. Key stakeholders acknowledge the need to enhance collaboration among governments, development partners, and the private sector to surmount these hurdles and unlock the Pacific region's full potential to harness sustainable energy and RE.*

4.1.3 Were the interventions aligned with the needs and priorities of the target groups and beneficiaries?

34. The project had three main components: (i) the installation of solar PV systems to power executive residences, (ii) capacity-building in the O&M of solar PV systems, and (iii) raising public awareness about the benefits of solar power through the development of manuals, training programs, and media advocacy efforts (see Annex-7). Evaluation of the project's key components uncovered a strong alignment between the interventions and both local and global needs. The project effectively addressed the RE gaps in PICs by installing solar PV systems and raising awareness through capacity-building measures. Furthermore, the project contributed to the climate change goals of PICs by meeting various targets through its interventions. Overall, the project's objectives were pertinent to the issues it aimed to address. While the needs and priorities of the target groups and beneficiaries were generally considered in terms of resource allocation, there were exceptions, such as in Kiribati and the state house of Fiji. The allocation of resources was nearly identical although needs vary slightly among member countries (see Annex16). The project discovered that an equitable approach in resource allocation was more effective than a strictly equal approach. One key objective was addressing acute needs and priorities, such as reducing electricity tariffs by installing solar PV systems, increasing green job opportunities, and enhancing access to affordable energy sources through awareness campaigns and training sessions. Scaling up RE infrastructure was recognized as a means to significantly decrease reliance on expensive diesel fuel and provide both on- and off-grid ways to enhance power access and thereby reduce electricity tariffs.

Finding 3: *The project's interventions, such as installing solar PV systems, capacity-building for O&M, and awareness campaigns, were tailored to meet the needs and priorities of target groups and beneficiaries. They effectively addressed gaps in RE adoption and contributed to both local and global climate change goals. While generally attentive to stakeholder needs, some instances of uneven resource allocation underscored the importance of adopting an equitable approach. Key objectives included lowering electricity tariffs, generating green job opportunities, and improving access to affordable energy sources. Recognizing the significance of scaling up RE infrastructure, the project aimed to decrease reliance on costly diesel fuel and enhance accessibility of power.*

4.1.4 To what extent did the project collaborate with various entities and still maintain a strategically coherent approach?

35. The project collaborated with relevant entities to share its experiences and ideas regarding its activities. The project partnered various stakeholders and preserved the strategic coherence of its approach. While most PICs rely on state-owned power utilities and official development assistance to establish large solar farm projects that feed electricity into their main-island grids, some farms are run by private-sector independent power producers.[20] Stakeholders added, however, that the level of collaboration between these IPPs and state-owned power producers is minimal. But, the inclusion of a senior member from the department of Energy (DoE) in the TWG bolstered cooperation between the project and the government, and, in Fiji, the project coordinated with Fiji Energy Limited and FCCC. The project installed solar PV systems in collaboration with heads of state, Prime Minister and governors, the Tonga National Women's Council, and Nauru Dialysis Center. This cooperative endeavor was possible because of the good collaboration between the relevant stakeholders.

36. Awareness-building campaigns involved networks of NGOs and CSOs (see Annex 7). Leveraging the networks and forums it had established in PICs, the PIDF signed a host-country agreement with the Government of Fiji on June 20, 2014, and a charter on September 4, 2015. As the PIDF has not signed a standard basic executing entity agreement with the UNDP, a mechanism was devised whereby the PIDF Team Leader/Program Manager acted as Project Manager to implement project activities. In terms of

[20] Refer to PPA & PRIF (2018), pp. 16-32 for a recent overview of the status of IPP involvement in the Cook Islands, Fiji, PNG, Samoa, the Solomon Islands, and Tonga.

private-sector involvement, Solaria[21] was mobilized, and the project collaborated with four private solar companies, thereby enhancing national capacity. While the UNDP has implemented RE projects (see Annex-8) with partners such as the GEF, the Japanese government, and the India-UN Development Partnership Fund, it did not collaborate much with academia or research institutions until now through formal partnership.

Finding 4: *The project collaborated effectively with diverse entities, ensuring a cohesive overall strategy. While partnerships with stakeholders like state-owned utilities and independent power producers were established, collaboration between these entities remained limited. Involving government officials and coordinating with organizations such as the Tonga National Women's Council facilitated successful installations. Awareness campaigns engaged NGOs and CSOs, utilizing existing networks in PICs as a foundation for furthering energy partnerships. Although private-sector involvement bolstered national capacity, formal collaboration with academia and research institutions was limited.*

The evaluation of relevance was determined by: (i) assessing the correlation between the project's objectives and the advancement of sustainable energy adoption in achieving the ambitious energy and climate change objectives of PIDF member countries, (ii) identifying any notable gaps impeding the adoption of RE within PIDF member countries, as well as missed opportunities, (iii) gauging the extent to which interventions align with the needs and priorities of target stakeholders, groups, and beneficiaries, (iv) evaluating the integration level of gender, human rights, and other cross-cutting aspects into project design and implementation, and (v) assessing the project's collaboration with relevant entities and its maintenance of a strategically coherent approach. The overall relevance rating is ***5*** *(Satisfactory).*

4.2 Coherence

4.2.1 Do the project's activities and strategies align with its objectives, ensuring internal coherence between the program's actions and its intended outcomes?

37. Activities and strategies correlate and align with project objectives: Overall, the project's activities and strategies are well-aligned with its objectives, and there is high internal coherence between the program's actions and its intended outcomes. The project has two outputs. Key activities under Output 1 include assessing feasibility, preparing a system design and component specification, conducting tender processes; procuring, transporting, and installing solar PV systems; inspecting and monitoring those systems; organizing official inauguration ceremonies; and transferring asset ownership to national governments. To accomplish Output 2, the project planned to develop O&M training manuals, deliver O&M training sessions to relevant stakeholders, and disseminate the project's best practices and lessons learned through the media. Stakeholders involved in project formulation emphasized that each of the project's activities was developed through (i) thorough consultations with relevant stakeholders, (ii) identification of gaps in the RE targets of PICs, and (iii), through a sustainability lens, the likelihood of collaboration with other relevant agencies. This process ensured that there was a strong correlation between the project's outputs and planned activities and that the expected results were achieved. In particular, as illustrated in Figure 4, the achievements of both project outputs led to the realization of the project outcome: "*increased awareness among policymakers and the public regarding the imperative to expedite the adoption of sustainable energy.*" This outcome also contributes to the overall impact of the project, namely, "*promoted the adoption of RE in the Pacific region by facilitating the installation of solar energy infrastructure, aiming to mitigate carbon emissions, showcase proactive climate measures, and affirm commitment to bridging energy disparities.*"

38. The project's key strategies to execute these activities included (i) bundling equipment to be transported, (ii) remote assessment, (iii) donations, (iv) use of project data, (v) purchasing the same system for all countries, (vi) a tax exemption on equipment and (vii) utilization of in-country capacity. The project's stakeholders noted that these strategies were effective because they were developed through a comprehensive assessment of the project's interventions. In addition, since the project's output-level indicators were SMART (specific, measurable, achievable, relevant, and time-bound), measuring each output based on these quantifiable indicators was straightforward. The SWOT analysis revealed that these areas need improvement: (i) enhancing insurance coverage for equipment, (ii) ensuring venders are paid promptly so they stay motivated, (iii) nurturing communication and establishing a clear chain of command so that high staff turnover does not attenuate these ends, and (iv) expanding in-country storage facilities to ensure the safekeeping of equipment.

[21] It is a leading company in the development and generation of solar PV energy with the aim of actively contributing to decarbonisation and basing the global energy model on clean energy. IT adopts a sustainable approach in its strategy and business management.

39. The project connected with local and global policy makers through public outreach and dialogue: The project facilitated discussions and dialogue with policymakers at the regional and PIC level to impress upon them the need to expedite the adoption of RE practices to address the ambitious climate change mitigation goals of member countries. Some of the key informants emphasized that the project's success in building connections was attributed to its commitment to a 'whole society approach' involving multiple partnerships with stakeholders from the public and private sectors as well as civil society. Academics, however, despite their importance, were not formally involved in the project's initiatives. The project's approach also brought together local and global policymakers, thereby making it easier to enforce RE-related policies.

Finding 5: *The project's activities and strategies are closely aligned with its objectives, ensuring coherence between actions and outcomes. Through extensive consultations and collaboration with stakeholders, activities were tailored to fill gaps in the RE targets of PICs. Key strategies, like bundling equipment and remote assessment, streamlined implementation. Public outreach efforts engaged policymakers at the regional and local levels, stressing the significance of adopting RE for climate change goals. Despite successful connections with academics, their formal involvement in the project's initiatives was notably absent.*

4.2.2 Are the project's core issues consistent with UNDP's foundational documents (UNDP's SRPD/Country Program Document), national priorities (such as the national development plans of PIDF countries), and other relevant projects of the UNDP, UN, and development partners?

40. The project's core issues correlate with the policies, plans and strategies of agencies working in the sector: A thorough desk review reveals that the project's core issues align with the UNDP's foundational documents, national priorities, and other pertinent projects of UNDP, UN agencies, and development partners. The primary focus of the project was to mitigate climate change impacts by promoting the adoption of RE technologies such as solar PV systems, a focus shared by the existing policies and commitments of member countries and UN agencies. For instance, Outcome 1 of the UN Pacific Strategy (2018–2022) aims to enhance resilience to the impacts of climate change, climate variability, and disasters by strengthening environmental protection. Similarly, sustainable development goal (SDG)-7 emphasizes the importance of ensuring that all have access to affordable, reliable, sustainable, and modern energy. The UNDAF (2018-2022) underscores the critical importance of maintaining healthy, resilient marine and terrestrial ecosystems while maximizing climate change mitigation and the need to increase energy usage efficiency and transition to predominantly or entirely RE sources. Sub-outcome 1 of the UNDAF calls for expanding low-carbon development solutions, while Sub-outcome 4 emphasizes scaling up climate change mitigation efforts. The project also aligns with SDG target 7.2.1 (share of RE in total energy consumption) and SDG-13 (climate action) by reducing greenhouse gas (GHG) emissions. Table 6 demonstrates how SDG 7 interacts with other SDGs to achieve synergistic impacts. In addition, the project will help member countries achieve their commitment to achieve universal access to clean, reliable, and affordable RE solutions by 2030. Foundational documents of the UNDP, such as Output 1.1 of the sub-regional program document for the PICs and territories (2018-2022), specifically prioritize the scaling up of action on climate change adaptation. Furthermore, numerous bilateral and multilateral donors including the World and Asian Development Banks as well as vertical donors like the GEF and Green Climate Fund (GCF), contribute to the climate change mitigation agenda of member countries by investing resources in RE technologies. These policy provisions indicate that the project's core issues are in line with the policies, plans, and strategies of agencies operating in the RE sector.

Table 6: SDG 7 along with other SDGs and likely impacts

SDG 7 Interaction	Impacts
SDG 7+ SDG 1	Basic service for poor and reduce energy poverty
SDG 7+ SDG 3	Less pollutants and preservation of vaccines and medicines
SDG 7+ SDG 6	Energy water nexus and water pumping and desalination
SDG 7+ SDG 8	RE industry jobs and employment creation
SDG 7+ SDG 13	Decarbonising energy systems

41. The project aligns with the national plans, policies, and priorities of PIDF member countries: The national plans, policies, and priorities of member countries have been bolstered by the submission of NDCs by all PICs. The RMI,[22] for example, submitted its second iteration in November 2018. The energy-sector targets outlined in these NDCs closely mirror the RE and energy efficiency objectives articulated in the energy sector policy and/or action plans of member countries (see Annex 9). All the NDCs include GHG

[22] RMI is the first country in the world to have submitted its second NDC.

emission reduction targets pertaining to the energy sector. In terms of conditional mitigation measures, common requirements include financial assistance, technology support, and/or capacity development. The primary focus of these targets is RE power generation, particularly the percentage of electricity generated. Notably, some NDCs, including those of Fiji, Tuvalu, and Vanuatu, aspire to achieve 100% penetration of RE. A common NDC target among PICs is to achieve 100% RE power generation, along with carbon neutrality by 2050, and ensuring 100% access to electricity (see Annex-9). During the evaluation consultations, key respondents emphasized the project's relevance as it addresses gaps in NDCs, National Adaptation Plan (NAPs), and other national plans of each member country. Moreover, the project fosters synergies with governments and other stakeholders by leveraging their expertise and experience in expanding access to affordable, reliable, and sustainable energy services, increasing the share of RE, and incentivizing public and private investments in energy efficiency. A thorough desk review confirmed that most member countries have developed long-term visions for low-emission development, typically broken up into five-to-ten-year implementation periods. Tonga uses 2015 as its NDCs baseline year, while other countries have adopted 2020 as their starting point. National climate change mitigation pledges predominantly target the energy sector,[23] with a concentration on power generation. Several member countries, including the Republic of Marshall Island (RMI) and Fiji, have started to prepare long-term strategy documents for decarbonization. This project has contributed to their realization of these as well other NDC targets.[24]

42. Stakeholders were adamant that while member countries have made progress in achieving the various short-, medium-, and long-term targets outlined in policies and strategies, their implementation was compromised by the absence of complementary policy measures (supporting policy arms) and the limited resources relative to the pace of progress. Although many countries have set ambitious RE production targets, these are often not costed or linked to deployment capacities. For instance, a significant portion of the populations in countries like the Solomon Islands and Vanuatu still inadequate access to modern energy services for cooking and lighting. Because policies are crafted without thorough consideration of their backward and forward linkages and gaps, it difficult to translate them into practice in the fullest scale due to ignorance and technical and financial resource gaps.

Finding 6: *The project's core issues are in synchronicity with UNDP's foundational documents, the national priorities of PIDF member countries, and related projects. The project's concerns echo existing policies and commitments aimed at mitigating climate change impacts by promoting renewable energy technologies. Furthermore, the project document aligns with member countries' national plans, policies, and priorities, as reflected in their NDCs, which closely resemble the project's objectives. Translating these plans into practice has, however, been hindered by inadequate complementary policy measures and limited resources, which have not kept the same pace of progress, slowing their effective implementation.*

Coherence was rigorously evaluated by considering: (i) the degree of alignment between activities and strategies with the objectives, and the level of internal coherence among the program's actions and intended outcomes, and (ii) establishing connections between the project's core issues and UNDP's foundational policies and documents, national priorities, and other pertinent projects and programs. Following this assessment, the overall rating is ***5*** *(satisfactory).*

4.3 Effectiveness

43. The project's effectiveness was measured by assessing the following evaluation questions. Overall, the project achieved its expected outputs and corresponding indicators (see Annex10).

4.3.1 How successfully were the project outputs attained or not attained, and what factors influenced the effectiveness or ineffectiveness of the project activities?

44. *Attainment of project's results:* The project achieved its anticipated results to a significant extent. The project successfully achieved its target of installing 12 solar PV systems (see Table 3, Annex-5, Annex-15 and Annex-16) with 20 kWp capacities in the 10 member countries. In their estimated 25-year lifespans, these 12 solar PV systems will eliminate 9,600 tons of GHG emissions, making a substantial contribution to climate change mitigation efforts. Analysis of over three months of data gathered from the fully operational solar PV systems suggest electricity tariffs declined by 33%. On average, each solar PV system generates 62 units of electricity daily, or over 22,000 units annually. The accomplishment of nearly all output-level indicators demonstrates that the outputs have been successfully achieved, thereby

[23] Jensen, Thomas Lynge (2016) Submitted (I) NDCs from the Pacific Island Region, Regional Dialogue on (Intended) NDCs for the Pacific Islands, 6-7 December.

[24] Reaching close to 100% RE power generation (grid-connected) by 2030 and a reduction of 20% of CO_2 emissions from the energy sector under a 'business as usual' scenario.

contributing to the outcome and overall impact of the project (its objectives). Also refer to Figure 4 in Section 1.2.1.

45. *Participation of women and youths in energy-related planning and policymaking:* Seventy-four individuals, 24% of whom were women, were trained in the O&M of grid-connected solar PV systems (see Table 7). The original target of 12 was surpassed by a factor of eight. In addition, a total of 12 manuals regarding O&M procedures for grid-connected solar PV systems were developed and distributed to TWGs and recipients in each country to promote the sustainability of these systems. Project data shows that it directly benefited over 232 individuals, and an additional 16,228 indirectly. Notably, more than 32% of the total beneficiaries were women, indicating a positive trend in women participation in the RE sector. A high proportion of labor engaged in the installation of solar PV system are youths. While the target for the number of news articles in national media was 48, thus far only 40 have been published (all these data were also validated during the consultation meetings). It is anticipated, however, that this target will be exceeded once the remaining solar PV systems have been inaugurated. Table 8 summarizes the execution of activities by output, along with their respective timeframes and approaches for implementation across various stakeholders.

Table 7: Output-wise indicators (target vs. achievements)

Output and output indicators	Baseline	Target	Achievement
Output 1 *– Solar-based power supplied to executive residences/buildings of national importance in 11 PIDF member countries*			
1.1 # of solar PV systems at operational	0	12	12
Output 2 *- Onsite capacity established at the executive residences/buildings of national importance and the PIDF headquarters to successfully O&M their solar PV systems on a day-to-day basis and the public made aware of the benefits of solar power*			
2.1 # of women and men that have built capacity in the O&M of grid-connected solar PV	0	12	74 (men- 56, women-18)
2.2 # of manuals on the O&M of grid-connected solar PV systems	0	12	12
2.3 # of news articles in national media	0	48	40*

Source: Project's final report, Desk review and Consultation with stakeholders
*This number will be increased significantly once the remaining 12 systems hold their inaugural events.

Table 8: Key timeframes and methods of output for various activities

Output wise activities	When	How and by whom	Status
Output 1: *Solar-based power supplied to executive residences/buildings of national importance in 11 PIDF member countries*			
1. Study feasibility	2020-2022	This study was conducted under the leadership of PIDF in partnership with SHoS, Solaria, and UNDP. Survey forms and consultations with stakeholders formed the basis of this study.	Completed
2. Prepare a system design and component specification	2020-2022	This study was spearheaded by PIDF in cooperation with SHoS, Solaria, and UNDP. In addition, private companies, along with members of the TWG, provided technical insights.	Completed
3. Conduct tender processes	2020-2022	Following the UNDP's standard tender guidelines, PIDF and UNDP commenced the tendering process in consultation with members of the TWG.	Completed
4. Procure, transport, and installation of solar PV systems	2020-2022	PIDF and SHoS took the lead under the guidance of UNDP, but the involvement of member countries, particularly TWG members, was crucial in managing the process.	Completed
5. Inspect and monitor solar PV system	2020-2023	Staff from PIDF, SHoS, and UNDP conducted regular inspections and monitoring to ensure technical integrity.	Completed
6. Organize official inauguration ceremonies and transfer asset ownership to national governments	2023-2024	UNDP, in coordination with PIDF and SHoS, took the lead role by inviting all relevant stakeholders, primarily government agencies. That said, only two sites had been inaugurated by the end of March.	Inaugurations in the remaining sites are in process.
Output 2: *Onsite capacity established at the executive residences/buildings of national importance and the PIDF headquarters to successfully O&M their solar PV systems on a day-to-day basis and the public made aware of the benefits of solar power*			
1. Develop O&M training manuals	2023-2024	UNDP, in coordination with PIDF and SHoS, developed this training manual based on user needs and after reviewing similar manuals created by other agencies.	Completed
2. Deliver O&M training sessions to relevant stakeholders	2023-2024	UNDP, working alongside PIDF and SHoS, coordinated on-the-job training sessions involving all pertinent stakeholders and staff responsible for system O&M.	Completed
3. Disseminate the project's best practices and lessons learned through the media	2020-2024	UNDP, in collaboration with PIDF and SHoS, utilized national, regional, and international media channels.	Regular process

Source: Desk study and consultations with stakeholders, 2024

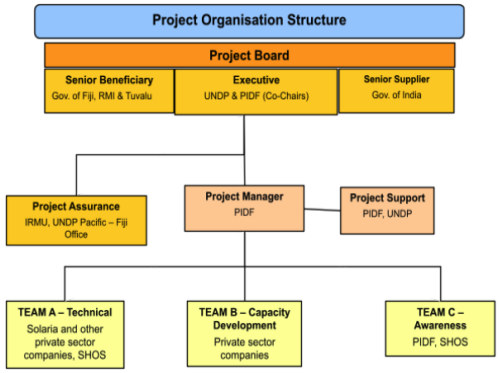
46. The project achieved its outputs in part due to the following three key factors:

a. Solid partnerships: The PIDF's strategic approach to partnership was guided by three key elements: (i) fostering multi-stakeholder engagement, (ii) focusing on the comparative advantages of South-South cooperation, and (iii) developing inter-and-intra-regional member countries partnerships. Together, they contributed to the mitigation of climate change. The high degree of partnership with the public and private sectors and civil society helped the project achieve its defined outputs. The project also mobilized the SHoS, the GoI, and the United Nations Office for South-South Cooperation (UNOSSC) and used their areas of expertise.

b. Defined stakeholder roles clearly: From the onset, the project made roles and responsibilities of relevant stakeholders clear (see Annex11). The PIDF Secretariat was to promote the signing of MoUs and site selection in coordination with Suva-based foreign missions, which then conveyed relevant information to their respective member countries via their ministries of foreign affairs. The UNDP, for its part, encouraged the PIDF to reach out to other partners to expedite delivery and progress. It also provided guidance and technical support as needed. The SHoS provided regular technical advice and backstopping.

c. Used learning from earlier projects: The project did not come up with its designs from scratch; instead, they were grounded in past projects and learning from those projects. For instance, the project drew on the learning of a PIDF project currently being implemented in the Solomon Islands, the Korea International Cooperation Agency (KOICA)-funded RE project. The PIDF also leveraged some UNDP-run energy projects currently operational in the member countries (see Figure 7). The learning acquired by the SHoS from the similar work in Saint Lucia, Jamaica and Maldives also helped to streamline the project's activities.

Figure 7: Project Organization structure



Source: ProDoc, 2019

47. *Non-attainment of project outputs:* Consultations with the project's stakeholders revealed that the project faced several challenges, including the pandemic, disasters, and socio-political changes. The prolonged pandemic-induced travel restrictions significantly disrupted the procurement and shipment of solar equipment and reduced opportunities to learn through multi-stakeholder monitoring visits. Natural disasters such as cyclones, earthquakes, volcanoes, tsunamis, and storm surges also resulted in delays in implementation, while socio-political changes delayed MoU signing. The project also found it hard to hire and mobilize relevant human resources, further slowing the project's progress. (See also Section 4.3.4 below for details on these externalities).

Finding 7: *The project successfully installed 12 solar PV systems across 10 member countries, reducing 9600 ton GHG emissions (in 25 years) and electricity tariffs by 30%. Training initiatives surpassed targets, notably involving women and youths, but media targets fell slightly short. The participation of women and youths in O&M training exceeded targets. Manuals were developed and distributed, benefiting over 232 individuals directly and 16,228 indirectly. Success was attributed to strong partnerships, the clarity of stakeholder roles, and the leveraging of the experiences of past projects. However, challenges stemming from the pandemic, natural disasters, and socio-political changes led to delays in procurement, shipment, and hiring. Despite these obstacles, effective collaboration and stakeholder engagement enabled the project to achieve its outputs, an achievement underscoring the necessity for adaptive strategies in complex environments.*

4.3.2 To what extent has the project enhanced capacities and awareness regarding the adoption of sustainable energy among member countries?

48. The project boosted the capacity and awareness of all ten member countries regarding the adoption of sustainable energy practices. The project enhanced the capacities of member countries to adopt sustainable energy through review-and-reflection meetings, workshops, media advocacy, and 12 onsite training sessions. These needs-based training events helped trainees build their skills in and knowledge of the O&M of solar PV systems, particularly preventive and corrective maintenance. Training was made effective in part by the availability of robust step-wise training manuals. The project also helped to enhance awareness among member countries about adopting sustainable energy by preparing and disseminating project-related information through print, electronic and social media (see Annex 7).

Finding 8: *The project boosted the capacity of member countries in adopting sustainable energy through diverse activities like review meetings, workshops, media advocacy, and onsite training. Tailored training sessions focused on solar PV system's O&M and emphasized preventive and corrective maintenance; trainers were aided by comprehensive manuals. Extensive dissemination of project information across print, electronic, and social media channels heightened awareness among member countries regarding the adoption of sustainable energy.*

4.3.3 Are there alternative strategies that could have been more effective in achieving the project's objectives?

49. The desk study, consultations and interviews with multiple stakeholders in the member countries, suggested that some alternative strategies may have been helpful. For instance, during the design phase, the project could select designs that foster ownership, allocate resources equitably rather than equally, and allocate buffer resources to cover minor O&M technical adjustments. During the implementation phase, the project could implement comprehensive procurement packages to mitigate potential conflicts among stakeholders, optimize implementation efficiency through site clustering, prioritizing procurement orders based on readiness for installation, and enhance training effectiveness through short courses followed up with refresher courses. Similarly, the project could establish LTAs with potential installer and facilitate timely MoUs with the help of UNDP project staff and DoE focal people during the management phase. Moreover, the project could monitor progress through indicator-based oversight, and manage the training, data, resources, and leadership commitment needed to ensure effective gender mainstreaming (see Section 5.2 for details).

Finding 9: *Stakeholder consultations identified alternative strategies to enhance project effectiveness. These include promoting ownership through design selection, allocating resources equitably, and providing buffer resources for minor O&M adjustments. Strategies like comprehensive procurement packages, site clustering, and prioritizing orders based on readiness could improve the efficiency of implementation. Offering short courses and following them up with refresher training could enhance effectiveness. Establishing LTAs with installers, facilitating timely MoUs, implementing indicator-based oversight, and integrating gender mainstreaming could further improve project management and outcomes.*

4.3.4 What external factors, beyond the project's control, have influenced its successes and failures?

The following external factors beyond the project's control were identified as influencing success and promptness as well as failure and delays.

50. External factors of success: Some external success factors included enabling policy mandates, the acute need for RE, and the recent increase in investments in the RE sector. Along with the Paris Agreement, national policies and mandates such as the NDCs and NAPs of member countries highlighted that RE is a key priority. According to ESCAP (2023), PIC economies depend heavily on fossil fuel imports; indeed, imports may constitute up to 80% of a country's total energy consumption. Investment in the RE sector has also been increasing. The World Bank significantly increased its support to PICs by substantially boosting financing and the Asian Development Bank's lending within the energy sector accounted for 20% of its total portfolio in 2011–2021. Regarding its total climate mitigation financing, the ADB allocated 60% to RE, 39% to energy efficiency, and 1% to fuel switching and cleaner fuel initiatives. In addition, bilateral and vertical donors such as the GEF and the GCF actively invested in RE projects in the PICs.

External factors that promote failure and delays in implementation: Some external factors that delayed the project were the pandemic, nature disasters, changes in the structures and institutional arrangements of member countries, and the limited experience of the PIDF in operating solar projects. Taking on 11 countries at once was also a challenge.

- *Pandemic:* A series of consultations with stakeholders revealed that the pandemic seriously impacted the project. The very first case in Australia was confirmed on 25 January, 2020. In response, on 29 March of the same year, Fiji imposed restrictions on shipping. It did not remove its border health measures until 14 February, 2023. The 35 months of restriction in Fiji seriously affected the project. Complicating matters was the fact that countries in the Pacific imposed lockdowns at different times, making it difficult to transport equipment smoothly. The pandemic reduced access to solar PV in the short term as raw materials became unavailable. In particular, the disruption to Chinese manufacturing impacted the global solar supply chain and caused a shortage of PV components in 2021. At the same time, logistical costs increased drastically. The resultant gap in the global supply chain was managed by reducing monitoring and save costs. Even so, shortages of parts forced the project to make minor but sometimes time-consuming changes. For example, when it turned out that CEC-certified 20kW SMA PV inverters were unavailable, the project had to purchase 2x10kW PV inverters. The pandemic also made it impossible for the project team to convene in person to coordinate effectively. Site assessments were not carried out in person either; the project team had to rely instead on

TWGs despite the fact that some initially have inadequate capacity to conduct technical assessments. The pandemic meant that equipment had to be stored for long periods, adding to costs and, at the same time, reducing the efficiency of the equipment. Since the project plan required quite a bit of travel for logistics management and wide consultations, the fact that the pandemic made that plan impossible undermined goals related to time, cost and quality. That said, there was no other option; the project had to rely heavily on in-country capacities and partnership to deliver. The pandemic also impacted the selection of test sites. The project had planned to have solar technicians and experts from project member states physically in-country to oversee the installation of the solar panels and provide support, guidance and training, but travel bans forced it to hold meetings and trainings online. The pandemic also delayed the supply of hardware such as inverters and trackers manufactured in China as well as other equipment produced in South-East Asia, Australia, and the US. In Australia, short-term price increases were also a concern. As a result, shipping was delayed and its cost surpassed that budgeted for. Exercising due diligence through in-country procedures and processes took more time than anticipated since the process was detailed and rigorous.

- *Recurrent disasters:* Disaster events also affected the implementation of the project. For example, in April 2020, a significant cyclone wreaked havoc in the Solomon Islands, Vanuatu, Fiji, and Tonga. In Tonga, the eruption of a volcano of 15 January, 2022, also had a serious impact, said stakeholders during consultations.

- *Changes in the governments of the project countries:* The key informant interviews reflected that the new nature, structure and institutional arrangements of the project also resulted in delays. For instance, after the cabinet of RMI changed, the project had to request the RMI to continue providing effective and efficient coordination. The project liaised with Suva-based foreign missions to coordinate with various countries, but such coordination was often not fruitful.

- *PIDF's inadequate experience in operationalizing such a project:* Because the PIDF had limited experience in managing a solar project of this size and geographical coverage, it found it difficult to work on time and systematically.

- *Other risks:* During SWOT analysis, stakeholders identified several risks that had hindered the smooth operationalization of the project. Shifts in administrations, regulatory challenges, and governmental policies were among the significant political risks. Inflation and fluctuating currency exchange rates increased the cost of equipment. Insufficient awareness and education resulted in limited stakeholder buy-in and acceptance of the project, minimal community engagement and skepticism towards technology. In addition, managing the disposal of damaged and end-of-life goods posed a notable risk.

Finding 10: *Enabling policy mandates, the urgency of RE needs, and substantial investment in the RE sector were key factors contributing to project success. Mandates such as NDCs and NAPs prioritize RE and are supported by significant financing from institutions like the World Bank and ADB. However, external factors such as the pandemic, natural disasters, changes in government structures, and PIDF's limited experience presented challenges. The pandemic disrupted supply chains, delayed logistics, and highlighted reliance on in-country capacities. Natural disasters like cyclones and volcanic eruptions further hindered project implementation. Changes in government structures resulted in delays, while PIDF's limited experience in managing large solar projects affected execution timelines. Political shifts, regulatory hurdles, inflation, and currency fluctuations posed additional risks. Limited stakeholder buy-in, minimal community engagement, and skepticism towards technology also impacted project acceptance. Managing the disposal of damaged goods posed logistical challenges.*

Following a thorough assessment and analysis, the TE consultant evaluates the overall effectiveness of the project based on: (i) identifying the success factors contributing to project achievements and obstacles hindering the attainment of intended outcomes, (ii) assessing the level of capacity enhancement and awareness fostering the adoption of sustainable energy among member countries, (iii) evaluating the utilization of alternative strategies to achieve the project's objectives, (iv) examining the degree of integration of gender equality, women's empowerment, and addressing the needs of youth and vulnerable groups at outcome and output levels, (v) deriving best practices and lessons from various components of the project, (vi) analyzing the influence of external factors on the project's successes and failures, and (vii) assessing the overall project management and implementation arrangements. The evaluator rates the overall effectiveness of the project as 5 (Satisfactory).

4.4 Efficiency

The project's efficiency level was assessed using the following questions:

4.4.1 How effectively have financial and human resources been utilized? Were resources strategically allocated to achieve the desired outcomes?

Despite facing both internal and external challenges, the project adeptly leveraged its financial and human resources, effectively allocating them to achieve the desired project outcomes.

51. Utilization of human resources: Project's key informants opined that from June 2020 to September 2023, Project Manager (PM) of the PIDF effectively coordinated and executed project operations. Technical guidance was provided by the UNDP multi country office (MCO) in Fiji. The stringent travel restrictions

imposed during the COVID-19 pandemic made it, project staff deemed, necessary for the UNDP to deploy its own unexploded ordnance (UXO) expert and staff from other UNDP projects. However, the mobilization of UNDP in-country staff from other projects did not materialize as planned, and the resultant high turnover of staff posed significant challenges. The PIDF PM, for example, changed four times in those three-plus years (see Annex12). Official during the interviews said that since these PMs were considered part of the PIDF's in-kind contribution and not directly remunerated by the project, securing their commitment to project tasks was not easy. Similarly, three different UNDP officials were assigned to be the designated focal persons for this project, causing the loss of institutional memory of the project. Stakeholders expressed their concern that the frequent changing of PMs had disrupted project leadership and impeded decision-making processes (see Annex-12). The changes incurred delays as each successive PMs had to familiarize himself/herself with project strategies and plans before s/he could serve effectively.

52. Needless to say, the frequent turnover did nothing to inspire stability and security among team members; on the contrary, it dampened motivation and undermined team spirit. Moreover, having to employ new staff resulted in the loss of valuable relationships and pertinent information, complicating efforts to sustain partnerships and capitalize on external resources. Hiring new PMs required recruitment and mentoring periods, further dragging out project timelines and impeding the achievement of key deliverables. Both the internal restructuring of the PIDF and the above-described leadership issues adversely impacted the overall performance and delivery of the project. The absence of effective leadership undermined communication and decision-making, and the fact that communication did occur was not well documented made it challenging to track discussions and decisions over time. The absence of a proper handover system for PMs led to confusion regarding the project's status. Some stakeholders felt that sites were selected without adequate consultation or technical assessment. PM turnovers also delayed the timely release of funds, disappointing stakeholders who relied on the PIDF's funding and hindering the contractor approval process. In late September 2023, UNDP appointed a PM to accelerate and ensure the smooth execution of project activities in collaboration with stakeholders. New PM focused on quality assurance, cost management, and adherence to timelines.

53. Financial resource allocation: The project was allocated a total of USD 1.3 million. As per the project's records, as of March 31, the project had spent around 98% of the total. Utilizing 98% of its allocated resources, the project successfully completed all anticipated activities except for one: the official inauguration ceremonies and the transfer of asset ownership to national governments. By the end of March, two sites in Fiji had been inaugurated and plans were underway to inaugurate the remaining sites within the next few months. According to project's officials, since funding from the India-UN Development Partnership Fund is categorized as a South-South contribution, the UNDP's general management support services are subject to a government cost-sharing rate significantly lower than the standard third-party contributions (3% instead of 8%). However, the project faced challenges because it did not have an adequate financial plan, one that could have addressed unforeseen costs such as UXO work of the Solomon Islands and equipment consolidation.

54. Impact of pandemic-induced travel restrictions on project operations: Stakeholders believe that the prolonged pandemic-induced travel restrictions significantly disrupted the procurement and shipment of solar equipment. The project's planned procurement costs had to be adjusted as the restrictions increased costs over time. Pandemic-related supply chain disruptions also considerably delayed the project's implementation schedule.

55. In July 2023, the UNDP took overall responsibility of the project after a spot check revealed that the PIDF was not fully complying with the requirements for procurement and record management. This decision was intended to ensure that the project would meet the standards for performance. The findings of spot checks conducted and completed in February 2024 enhanced the transparency of project operations and yielded recommendations for the PIDF for improvements. The project board (PB) also made internal adjustments to address resource gaps. For example, SHoS, the US-based NGO originally responsible for installation supervision, transferred this role to the UNDP by mobilizing trained and experienced technicians, resulting in a USD 60,000 savings that, was used to fill resource gaps. To manage the increased cost of logistics, the PIDF collaborated with partners in the humanitarian sector. Although the PIDF did not directly charge the project, minimal costs, no more than 1% of operational expenses, were incurred for day-to-day project management. Member countries utilized their resources to

supplement project funding. Adhering to the UNDP protocol for concluding projects, the Project Board (PB) prioritized activities that had secured full financial commitment by the end of December 2023. The UNDP MCO played a crucial role by contributing additional resources to bridge the funding gap and thereby manage the equipment and enhance the quality of installations.

56. Responding to a change in government and its change in prioritizes, the PB, and later the donor, approved a change in an installation site: instead of the PIDF head office in Suva, the community hall and the Chief's residence on Bau Island, Fiji, got solar PV system. However, the remoteness of Bau Island made visiting it a challenge; besides, in order to reach there, the Chief's permission was necessary and various protocols had to be followed. The project's initial plans for operational closure by June 30, 2023, financial closure by November 30, 2023, and full project closure by December 29, 2023, was abandoned as it was deemed, reasonably and justifiably, that an extension until March 31 was needed to ensure activities were completed and of high quality.

57. Timeliness: The project experienced significant delays, stretching its duration from 24 to 46 months. Multiple factors contributed to these delays. Considerable time was spent establishing MoUs with member countries because, it was reported, the project's relatively small scale failed to capture attention and internal governmental procedures and protocols also impeded MoU enactment. Despite concerted efforts by the PIDF and the SHoS to expedite communications, internal bureaucratic procedures proved to be sluggish and the TWG delayed its responses. To overcome these challenges, the PIDF engaged directly with country representatives, conducted on-site visits to locations such as FSM and Timor Leste in September 2022, and sought assistance from other governments and UN officials to finalize MoUs. These delays were attributed to factors beyond the PIDF's control, including, in addition to the factors identified above, the busy schedules of TWG members and limited monitoring visits from the UNDP.

58. Considerable time was also spent obtaining approval for the designs of the solar PV system. Since the information requested from officials at the State House was not received promptly, the documents needed for processing and validating the commissioning were only belatedly submitted to EFL. Stakeholders also stated that the UNDP sometimes also delayed. For instance, when the PIDF had managed equipment and was ready to install it in RMI, the UNDP asked for more time to validate the documentation and finalize the specifications. Another reason behind some delays was the relocation of some sites for solar PV systems. For example, when the PIDF proposed that the official residence of the PM of Fiji be selected after Timor Leste was dropped from consideration, the PB agreed as long as it could secure funding commitment by December 31. The High Commission of India then stipulated that the Permanent Mission of India in New York had to approve the site change. Although approval was eventually granted and it was also approved by the 7th PB meeting, the process was time-consuming. The available data, evidence, and stakeholder interviews suggested that the project maximized its human and financial resources to achieve optimal results. Stakeholders, however, criticized it for focusing more on an equal than an equitable approach in terms of resource allocation as the needs and contexts of different countries vary and a one-size-fits-all approach may not be suitable.

Finding 11: *Despite challenges, the project effectively coordinated operations. The PIDF project manager, in particular, played a pivotal role. However, frequent turnover in leadership and staff posed significant challenges, impacting decision-making and project delivery. Approximately 98% of the allocated budget was utilized. All except for 10 official inauguration ceremonies were completed. Challenges included inadequate financial planning and unforeseen costs, such as the UXO work in the Solomon Islands. Prolonged pandemic-induced travel restrictions disrupted the procurement and shipment of solar equipment, delaying implementation. Adjusting procurement costs and managing supply chain disruptions were additional challenges. To address resource gaps and operational issues, UNDP assumed overall project responsibility and made internal adjustments. Collaboration with humanitarian partners helped to manage the increase in the cost of logistics. The project experienced significant delays, extending its duration from 24 to 46 months. These delays were attributed to challenges in establishing MoUs, obtaining design approvals, and site relocations. Stakeholders criticized the project for prioritizing equality over equity in resource allocation and suggested that it adopt a tailored approach that considered the diverse needs and contexts of different countries.*

4.4.2 To what extent did the project management structure and M&E system outlined in the project document contribute to generating the expected results?

59. The project management structure and M&E system outlined in the project document were instrumental in achieving the expected results. This was facilitated by (i) the involvement of the project board, (ii) activation of TWGs, (iii) implementation of the monitoring plan, and (iv) adherence to the grievance redress mechanism.

60. a. Project board: To realize the anticipated outcomes, foster ownership, and ensure sustainability, the project established a PB and mobilized TWGs. The PB, which was chaired by Tuvalu, was the highest decision-making body. Representatives from the Indian High Commission in Fiji regularly participated in PB meetings, thereby facilitating communication regarding project implementation. Over the project's duration, seven board meetings were convened to assess progress, address key issues and their resolutions, review annual work plan and endorse, document lessons learned, identify risks and strategies to mitigate them, approve the next quarter's plan, and provide strategic direction to project implementation entities. At the sixth board meeting, for instance, PB members decided to extend the project at no cost until March 31, 2024, adjust installation timelines, identify deficits in funding sources, and designate the PM's official residence in Fiji as a site of installation. Stakeholders also expressed their views that the workings of the PB could have been improved by implementing a rotational chairing system among the member countries. In addition, ensuring the consistent participation of the same members in all PB meetings would enhance ownership and institutional memory.

61. Activation of TWGs: The initiative to activate TWGs deserves commendation as it facilitated project implementation, enhanced ownership, and aided in the addressing of problems. Typically comprised of government representatives, such as staff from the DoE, as well as the PIDF and the SHoS, along with other relevant government entities, the TWGs supported various tasks, including gathering data for feasibility studies, facilitating duty waivers for importing and installing solar PV systems, coordinating equipment transportation and storage, appointing the DoE to monitor local contractor work, circulating requests for proposals to potential bidders, training O&M staff, and assisting with post-installation system maintenance. However, the ability of TWGs to execute these tasks varied due to limitations in their capacity. To enhance the effectiveness of TWGs, the project could also include experts from the private sector, civil society, and academia.

62. TWGs played a significant role in ensuring the safety of equipment once it arrived in ports. When equipment remained at the port in Fiji for an extended period, for example, monitoring and controlling its storage was challenging. The timing between receipt and installation also presented difficulties as no contingency funds were allocated for purchasing replacement equipment. To overcome potential risks, thorough risk assessments and mitigation measures were implemented before and after shipment, and proper equipment storage protocols were adhered to. Special attention was given to storing batteries; wet areas were avoided and suitable temperature maintained. The batteries were not stored in containers because exceeding the recommended storage temperatures would void warranties and lead to damages. Despite these precautions, many countries, including Fiji, have inadequate storage facilities, and, in numerous instances, equipment was indeed stored inside containers. In Kiribati, the project was trying for the warranty claim from supplier for the replacement of a damaged battery. In fact, the battery was delivered to Tarawa, Kiribati in August 2023 by One-stop Shipping Agency. It had been received by Kiribati DoE on September 9, 2022. When the battery was unpacked from its box and inspected on February 21, 2024, a rusted nut was observed. Testing with a multi-meter revealed that the battery was dead.

63. Stakeholders appreciated that TWG meetings were instrumental in expediting project progress. Two each were held in RMI, Kiribati, Tonga, Tuvalu, and the Solomon Islands and in Fiji, three were convened. All were used to streamline project implementation. In FSM, an online TWG meeting was organized to initiate a site selection. All member countries except the Solomon Islands opted for roof-top installations because they have limited landmass and issue of security. In addition, the cost of the O&M of this model is low. TWGs oversaw installation work. The Solomon Islands TWG also incorporated UXOs into its risk register. Leveraging lessons learned from Norwegian People's Aid and JICA, which possess extensive experience in UXO management in the Pacific, the project consulted with these agencies and effectively mitigated risks during the installation process and ensured compliance with social and environmental safeguard (SES). As the above discussion shows, TWGs played a pivotal role in every stage of the project cycle.

64. Operationalizing the monitoring plan: The successful attainment of anticipated outcomes was facilitated by systematically crafting the project's monitoring plan though actionable steps. The project's monitoring mechanism was a robust one, as exemplified by its quarterly tracking of results using the indicators of its result-and-resource framework. Programmatic risks were effectively managed by implementing the UNDP's SES and financial audits, as called for in the UNDP's audit policy. To comply with SES, the project

implemented various measures concerning logistics, design, procurement, installation, operation, and recycling and reuse (see Annex 13). Furthermore, risks were identified through project management monitoring and then measures to address them were devised and documented in a "risk log (see Annex 14)." Stakeholders categorized risks were of two main types: operational and environmental. Operational risks included delays in the shipment of equipment to member countries, equipment rendered non-functional due to prolonged storage, delays in clearing customs, and, delays in signing MoUs. Environmental risks included the environmental impacts of damage to solar PV systems. To mitigate these risks, the project proactively communicated with TWGs to facilitate on-site equipment clearance, share delivery addresses, designate responsible individuals, and underscore the tax-free clearance policy stipulated in MOUs. These mechanisms helped the project successfully mitigated risks.

65. Participants in the evaluation consultations claimed that the risks the project encountered during implementation were effectively mitigated by apt management strategies and monitoring mechanisms. To exemplify, the project addressed risks stemming from delays in signing MoUs through continuous communication with TWGs, while minimizing risks associated with site confirmation by providing a robust rationale. Furthermore, storage risks were mitigated by sharing shipping dimensions and weights with TWGs and guiding them in allocating storage space allocation before delivering equipment. Issues regarding UXOs in the Solomon Islands were managed by allocating contingency funds for UXO clearance. The project alleviated design risks by making it mandatory to submit a design before commencing installation and avoided delays in payment by ensuring the timely allocation of funds. Stakeholders further emphasized that the formulation and dissemination of a communication chart helped manage risks related to the chain of command and upholding financial rules and exercising financial oversight reduced risks associated with financial management. Other efforts included mitigating insurance risks by purchasing coverage prior to equipment procurement and transport, addressing logistical risks by communicating clearly with stakeholders and securing approval from higher management, and using no-cost extensions to accommodate pandemic-induced delays and ensure that work was complete and good quality. As a result of such proactive action, the project felt justified in categorizing the above risks as "low" as these risks pose little risk to the successful implementation of the project.

66. The project utilized the UNDP's quality standards to assess its own strengths and weaknesses and inform management decisions aimed at enhancing better performance. Written in narrative form, it was found that, quarterly and annual reports provided details on results achieved in comparison with targets set. They also included a summary of activities, an annual project quality rating, and an updated risk log with mitigation measures. That said, the annual project quality rating lacked adequate detail. According to India-UN Fund guidelines, reports for projects exceeding USD 1 million must be submitted to the UNOSSC and encompass both financial and narrative components; these requirements were met. A multi-year work plan was developed to ensure budgeting would be realistic over the project's entire lifespan. Pandemic-related constraints rendered multi-stakeholder monitoring visits involving the Indian High Commission in Fiji, the UNOSSC, and the PB Secretariat impossible, but stakeholders were kept well-informed about ground realities and overall project performance through periodic updates and PB meetings. Most site visits by donors were planned around inauguration ceremonies and awareness events. For instance, donors attended the inauguration of the solar PV installations at the state house and Bau Island, both in Fiji.

67. The desk study revealed that the project conducted annual audits and spot checks to maintain accountability and transparency.[25] It adhered to UNDP mandates by conducting "harmonized approach to cash transfers" (HACT) reporting using funding authorization and certificate of expenditure forms and UNEX reporting using project delivery reports and attaching a consolidated delivery report. These reports were instrumental in assessing expenditure and identifying areas for improvement. In terms of its procurement processes, the project typically solicited three quotations from third-party entities such as suppliers, procurement and logistics companies, and design and installation contractors. The lowest technically competent bid was generally approved. Transparency and accountability were paramount throughout.

[25] As per UNDP's mandates, spot checks are required in case of more than USD 50,000 expenditure and audit in case of annual budget more than USD 450,000 threshold.

68. Grievance redress mechanism: During interviews, key informants shared that using a grievance redress mechanism had enabled the project to effectively address the minor mistrust that arose among beneficiaries and stakeholders. The UNDP and the PIDF collaborated with TWGs to establish a robust connection between beneficiaries and stakeholders. TWGs directed complaints and grievances from beneficiaries to the UNDP and the PIDF by email. In addition, to ensure compliance with SES during installation, TWG members were invited to the installation sites. When beneficiaries expressed concerns to dignitaries, cultural sensitivities were observed and when dignitaries were absent installations were rescheduled if that is what beneficiaries wanted. There is still room for improvement, however. In particular, the project could enhance its grievance-handling mechanisms by adopting international standards. It could (i) install complaint/feedback boxes at installation sites and display the contact information of a designated focal point, (ii) maintain a register to collect visitors' feedback and suggestions, (iii) conduct public hearings at is start and end and invite stakeholders to attend, and (iv) establish a dedicated complaints-handling-and-response committee, comprising members independent of project staff, to address the issues and concerns of beneficiaries and stakeholders effectively.

Finding 12: *The project management structure and M&E system outlined in the project document were instrumental in achieving expected results. The project board, chaired by Tuvalu, served as the highest decision-making body, ensuring ownership and sustainability. TWGs supported various functions, though their effectiveness varied due to capacity limitations. TWGs facilitated equipment safety, streamlined implementation, and addressed risks, including environmental and operational challenges. Monitoring involved robust quarterly tracking and proactive risk management, an approach which contributed to outcomes. Stakeholders praised the project's proactive risk mitigation strategies, including addressing delays and design issues, managing financial risks, and ensuring compliance with quality standards. Grievance redress mechanisms addressed beneficiary concerns and could be improved by adopting international standards. Despite pandemic-related constraints, the project maintained transparency through audits and spot checks, ensuring accountability in procurement processes and financial reporting.*

4.4.3 How efficient was the staffing, planning, and coordination within the project, including interactions with responsible parties and stakeholders? Were project funds and activities delivered in a timely manner?

69. Staffing, planning, and coordination within the project, along with interactions with responsible parties and stakeholders, were all efficient, albeit to, different extents. Although project funds were received on time, project activities were delayed due to the pandemic and other external factors discussed in Section 4.3.4. The project initially mobilized PIDF and project staff. Project stakeholders expressed that due to the high turnover rate among PIDF and UNDP support staff, maintaining institutional memory became challenging and the project's overall performance suffered, at this junction, the UNDP assumed overall responsibility of the project's implementation. The UNDP was also not able to mobilize the numbers and types of staff called for in the ProDoc. Nonetheless, the project planned, coordinated and interact effectively with relevant stakeholders from the outset, overcoming the challenges posed by the pandemic, multiple disasters, and socio-political changes in member countries. The need for two no-cost extensions meant that project activities did not reach the originally envisioned timeline.

4.4.4 How effective and efficient was the project's implementation approach, including procurement and other activities?

The project's implementation approach enabled it to work effectively and efficiently, speeding procurement to the degree possible and ensuring good deals.

70. Improvement initiatives based on the UNDP's spot checks: In April 2023, a spot check conducted by the UNDP identified a number of ways the PIDF's existing procurement and financial processes could be improved. In response, the UNDP decided to directly undertake these processes itself. While this decision positively impacted the project's progress in its later stages, some stakeholders deemed it too late. The project, some said, had missed an opportunity to institutionalize post-installation activities more effectively and, in consequence, to foster ownership and increase the sustainability of the system.

71. Procurement efficiency of the UNDP and the PIDF: The UNDP assisted the PIDF in procuring goods and services based on the findings and recommendations of a micro HACT assessment conducted in 2019 and examining seven criteria, including program management, finances, and procurement themes. As per the HACT assessment, PIDF's overall rating was moderate. In addition, the UNDP identified necessary international expertise, conducted tenders for procuring services and goods, managed contracts, and facilitated associated payments in accordance with UNDP rules and regulations. The PIDF Secretariat, for its part, developed robust procurement plans in consultation with stakeholders, and the supplier of panels endorsed a remarkable pro bono agreement by which it provided goods and services for free.

72. Cost efficiency and effectiveness in procurement: Since many materials had to be procured, the project executed and managed the associated transactions and contracts very carefully. Broadly, it procured two things: goods and services. In terms of goods, the project acquired and transported 12 sets of solar PV balance-of-system (BOS)[26] components, which included wiring, switches, mounting systems, and all related accessories. Regarding services, the project signed 12 contracts with private companies to install complete solar PV systems and provide on-site user training for day-to-day O&M. Project stakeholders recalled that procurement was executed in phases. Initially, solar equipment such as batteries and inverters were procured for Fiji, Kiribati, Tuvalu, Tonga, and the Solomon Islands taking into account shipping routes. During the second phase, solar panels for all sites were sourced from South Korea and shipped to Fiji, where they were repacked for shipping to other member countries. In the third phase, batteries and inverters were shipped from Sydney to the remaining sites on FSM, Palau, RMI, Timor Leste, Nauru, and Vanuatu. Procuring equipment in various batches for different member countries, taking into account shipping routes, contributed to the cost efficiency and effectiveness of procurement, ensuring value for money. It was shared that minor solar equipment was sourced through Sunny Home Manager, a private company, for six sites, including the Fijian State House. The equipment came from Australia to Fiji and was then shipped to Kiribati, the Solomon Islands, Tuvalu, and Tonga. Equipment for Palau, RMI, and FSM, was procured from the US so it would meet their standards. Solar PV modules were shipped from South Korea to Fiji for storage and subsequent distribution to individual projects. It was also found that buying South Korean solar panels was cost-effective due to the proximity of that nation and the shipping cost involved. In addition, buying in bulk reduced prices and logistical costs. These practices demonstrate the project's commitment to cost efficient and effective procurement. Even so, procurement was delayed because LTAs were not agreed upon in advance.

Finding 13: *The project's implementation approach proved effective and efficient, particularly in procurement activities, ensuring timely acquisition of goods and services while minimizing costs. Improvement initiatives based on UNDP spot checks enhanced procurement and financial processes. Collaboration between UNDP and PIDF effectively managed procurement, as PIDF developed robust plans and secured pro bono agreements. Procurement was phased carefully; it considered sourcing materials from various countries using different shipping routes to meet standards and reduce costs. The adoption of cost-effective practices such as bulk purchasing and sourcing from nearby nations reflected the project's commitment to efficiency. However, delays occurred since LTAs had not been agreed in advance and implementation timelines were impacted.*

4.4.5 Did the project deliver value for money? Were resources utilized efficiently?

The evidence, examples, and data collected during the evaluation fieldwork support the conclusion that the project effectively delivered value for money through its efficient utilization of the resources available.

73. Mechanism to demonstrate value for money: Project stakeholders shared that the project implemented several changes in procurement practices which underscore its commitment to achieving value for money. Among them were acquiring solar panels from South Korea instead of the USA. The project also adeptly reallocated available resources and addressed unforeseen expenses. For instance, Solomon Islands regulations mandated that UXO presence or absence be established at sites earmarked for earthwork and excavation, a requirement that, naturally, increased costs. The need for additional civil infrastructure for battery and solar equipment in Solomon Island also further inflated the total cost. Historical data suggests that ground-mounted systems is typically 20% more expensive than roof-top systems of equivalent capacity. The increase is attributable to greater costs for materials including racks, and foundations. In Solomon Island, where a ground-mounted system was installed, the project covered the additional costs by strategically redistributing resources saved from various other budget headings.

74. Efficiency in resource utilization: Strategically, the project bought in bulk to ensure cost efficiency. The majority of the key informants agreed that by utilizing a 'bundling approach' to making purchases, the project was able to negotiate lower prices and thereby enhance efficiency and reduce costs. This approach sometimes involved assuming risks, even in instances where MoUs were not yet in place, as, for example, was the case with FSM and Nauru. The project was designed to leverage financial resources from multiple partners, another efficient strategy. The GoI provided USD 400,000 via the India-UN Development Partnership Fund and USD 700,000 via the India-UN Development Partnership Fund Commonwealth Window. The PIDF and the SHoS committed in-kind contributions totaling an estimated

[26] Balance of system (BOS) refers to all components of a PV system other than the photovoltaic panels. BOS includes wiring, switches, a mounting system, one or more solar inverters, a battery bank, and a battery charger.

USD 120,000 towards public awareness campaigns (USD 10,000 for each of the 12 installments). In addition, the private-sector company Solaria generously contributed solar PV panel's worth about USD 90,000. Although the project has limited robust data on co-financing, the involvement of multiple stakeholders suggests that it effectively and efficiently utilized available resources.

Finding 14: *The project delivered value for money by efficiently utilizing available resources. Changes in its procurement practices, such as sourcing solar panels from South Korea instead of the USA, showcased its commitment to cost effectiveness. The strategic reallocation of resources and the addressing of unforeseen expenses, such as complying with Solomon Islands regulations on UXO presence, further enhanced efficiency. Bulk purchasing and bundling approaches enabled the project to negotiate lower prices and thereby reduce its costs, while leveraging financial resources from multiple partners ensured the efficient utilization of resources. Although data on co-financing is limited, the project's engagement of various stakeholders suggests it managed resources effectively.*

Considering the comprehensive evaluation of four key parameters, namely: (i) the extent to which project resources, both financial and human, are allocated and utilized strategically to achieve desired outcomes, (ii) the contribution of project management and existing M&E systems in producing expected results, (iii) the timeliness of mobilizing human and financial resources for planning and coordination with key stakeholders, and (iv) the effectiveness and efficiency of the project's implementation approach and procurement mechanisms, with a focus on maintaining 'value for money', the project's performance in terms of efficiency is assessed as ***4*** *(moderately satisfactory, with identified some areas for improvement).*

4.5 Sustainability

Sustainability was evaluated based on the assessment of the following questions.

4.5.1 Are there potential financial, social, political, or legal risks that could pose threats to the sustainability of project outputs?

75. Since its inception, the project has faced various financial, social, political, and legal risks that have threatened the sustainability of its outcomes. Using a strategic approach, however, the project successfully managed these risks, avoiding any detrimental impacts that could seriously compromise its sustainability. Project stakeholders opined that the project managed to avoid risks because it conducted a thorough assessment of various potential financial, social, political, legal, technological, disaster-related, and environmental risks which the project could have faced at each stage of the project lifecycle. It diligently established a mitigation strategy for each risk to ensure that it would not jeopardize the sustainability of solar PV systems. During interviews, key informants shared that the project had encountered several overarching challenges. Economic constraints and governmental budget limitations in member countries hindered the timely adoption of RE technologies despite the clear long-term advantages of those technologies. Logistical obstacles impeded the transportation of equipment to certain countries, necessitating the use of sea containers due to restrictions on air shipments, particularly of hazardous equipment such as batteries. A succinct overview of each risk and its management is provided below.

76. Potential financial risks and mitigation approach: Project stakeholders claimed that because the project used standard, certified, and proven equipment and tools, it was able to reduce the likelihood of having to carry out maintenance immediately. As detailed above, the project did not allocate funds specifically for future O&M as it the savings accrued from the reduced electricity tariffs at each installation was calculated to cover these costs. In addition, it was envisaged that the savings arising from decreased electricity bills could be channeled towards regular on-site maintenance, inspections, servicing, and component replacements. Unless mandatorily provisions and strong monitoring system are in place, however, it is doubtful that these savings will be invested as envisioned. The project put in place the following mitigation approach to minimize possible financial risks.

Mitigation approach

- The majority of TWG members said they would allocate money for O&M from their fiscal budgets. They estimate that annual expenditure on O&M, including refresher trainings for new staff, amount to approximately USD500.
- TWG members have established mechanisms engage private companies or the national power utility to conduct periodic external on-site maintenance inspections and servicing as necessary.

77. Potential social risks and mitigation approach: No stakeholder expressed any concerns regarding adverse social impacts resulting from the installation of solar PV systems on heritage sites such as state houses. Stakeholders who did not benefit from a project's services often express concerns regarding how beneficiaries are selected. In this case however, none of the stakeholders interviewed raised a single concern about the transparency of this project's selection process. The project implemented the following mitigation approach to minimize potential social risks.

Mitigation approach

- The project diligently considered SES in every phase, design, installation, O&M, and recycling/reuse.

- The design and installation processes adhere fully to the standards set forth by the Sustainable Energy Industry Association of the Pacific Islands (SEIAPI), which are widely recognized as the best practices in the Pacific region.
- Health and safety risks were effectively managed through comprehensive orientation sessions, provision and mandatory utilization of PPEs and other safety gear.
- Mechanisms were established to hold installer companies accountable for capacity-building related to O&M.

78. Potential political and legal risks and mitigation approach: Respondents to various evaluation tools said that, at the outset, the project had had several political and legal risks to contend with. Despite the diligent efforts of the project team to follow ups, the process of signing MoUs was protracted. For FSM, Nauru, and Timor Leste, for example, signing MoUs involved negotiations among the respective governments, the PIDF, and Solaria. The UNDP was not directly involved in the beginning. In consequence, considerable time and frequent communication was allocated toward finalizing MoUs. According to project officials, the involvement of multiple stakeholders made coordinating effectively a recurrent challenge, one which often delayed implementation. Moreover, the slow clearance of customs by various government further impeded progress until the UNDP wrote to the TWGs and tax exemptions were facilitated. The project implemented the following mitigation approach to minimize the possible political and legal risks.

Mitigation approach
- Because TWG members have an in-depth understanding of political and legal risks, they can promptly address potential challenges through engagement and consultation with pertinent stakeholders.
- During monitoring visits, in addition to providing technical support, UNDP staff and collaborating partners disseminated policy and legal guidelines at meetings and interactive sessions.
- Staff members from other UNDP RE projects consistently foster communication to mitigate potential risks at their origin.

79. Potential technological risks and mitigation approach: With its typical meticulousness, the project effectively addressed various technological risks, however, prolonged storage of goods in diverse locations heightened the likelihood that they would be torn, bent or otherwise damaged and thereby malfunction, as in Kiribati. Project stakeholders confirmed that the project encountered administrative risks pertaining to the management of equipment and tools. The project used the following mitigation approach to minimize the possible technological risks.

Mitigation approach
- The project ensured all equipment was top quality through rigorous assessments as well as by sourcing it from Australia and the US, where standards are high.
- The project ventilated storage rooms well to mitigate the corrosion risks associated with highly saline environments, to the extent possible.
- DHL was engaged to transport goods from Fiji and the US to member countries.
- To mitigate the risks associated with equipment malfunctions, mechanisms were established to expedite equipment orders from primary suppliers through air freight. Delays in shipments impeded project delivery and the project included a one-month cushion in the proposed timeline and adopted UNDP LTAs for freight forwarding.
- O&M practices were also streamlined through fully automated systems, a practice which minimized the need for the extensive training of end-users.

80. Potential disaster-led risks and mitigation approach: In addition to the pandemic, natural disasters such as cyclones, earthquakes, volcanoes, tsunamis, and storm surges delayed the installation of solar PV systems to various extents. There are inherent risks in neglecting to incorporate potential disaster risks into system design, component specifications, and installation processes. The extent of loss and damage to a solar PV system will depend on the severity of the disaster that hits it. The project followed the mitigation approach below to minimize the risks associated with potential disasters.

Mitigation approach
- The potential risks of natural disasters were considered in system design, component specifications, and installation processes; indeed, each set-up could withstand disaster events, even those as powerful as a category 5 cyclone.[27]
- The solar panels selected were certified to be able to endure such external adversities.
- The project upheld national standards whenever possible recognizing the potential impacts of future disasters. When such standards were not available, the project followed guidelines established by the PPA and the SEIAPI for the design and installation of grid-connected solar PV systems.
- The project embraced regional standards, which are endorsed by the World Bank and were developed in collaboration with the PPA, further bolstered the solar PV system's resilience against natural disasters.

[27] A Category 5 severe tropical cyclone is a tropical cyclone that has 10-minute maximum sustained wind speeds over 107 knots (198 km/h; 123 mph) or greater on the Australian tropical cyclone intensity scale.

81. Potential environmental risks and mitigation approach: Site inspections and discussion with project stakeholders suggested that the environmental impacts of roof-top solar PV systems are limited due to their relatively small size. Such systems generate minimal hazardous waste and are generally unobtrusive. A ground-mounted set-up was installed only at the Solomon Islands Governor General's residence. Here, throughout the installation of solar PV system, activities such as transportation and excavation for laying cables were carried out with minimal disruption to the landscape. Measures were taken to minimize disturbances to local people. These included controlling dust and particulate matter emissions, thus mitigating potential health hazards for residents. Residents were informed about work schedules and briefed on the natures of and rationales behind activities. Moreover, precautions were taken to address the presence of UXOs by obtaining clearance from the Solomon Island Safe Search Clearance before excavation commenced, and selecting only unused and infertile land for installation. Project officials reassured that TWG members are committed to recycling lithium-ion batteries using national practices consistent with those for other battery types. However, it is important to note that Pacific countries do not currently have adequate regulations and mechanisms for managing and recycling any type of battery. The project employed the following mitigation approach to minimize potential environmental risks.

Mitigation approach

- To avoid unsafe and environmentally risky system designs and component specifications, the project complied with standards set by the SEIAPI. Similarly, adherence to installation standards established by the SEIAPI and AS/NZ and oversight by the TWG helped mitigate any unsafe practices.
- Potential risks associated with O&M were addressed by installing fully automated systems.
- Plans were developed for recycling and reusing solar equipment at the end of its service life with a focus on minimizing waste generation.

Finding 15: *Since its inception, the project has faced financial, social, political, legal, technological, disaster-related, and environmental risks that could jeopardize its sustainability. It conducted comprehensive risk assessments throughout the project lifecycle and implemented mitigation strategies. These included financial planning for O&M costs, social and environmental safeguards (SES), and stakeholder engagement to address political and legal hurdles. The project utilized certified equipment to reduce maintenance costs and savings from lower electricity tariffs to cover O&M expenses. SES considerations were integrated into the design and installation processes to meet industry standards and minimize social impacts. Challenges such as slow customs clearance were managed through continuous communication and coordination. Quality assurance and strategic procurement mitigated the risks of equipment malfunctions, while resilience against natural disasters was ensured through compliant design and installation practices. Without a standardized contract package encompassing potential vendors and suppliers and lacking coordination with private entities to establish LTAs, persistent challenges endure.*

To enhance project performance and mitigate various risks, a 'risk log' has been maintained, detailing potential impacts and corresponding mitigation measures (refer to Box-4).

Box-4: Log of different risks, likely impacts and mitigation measures

Throughout the period of project implementation, potential risks were assessed, logs of risks prepared, and mitigation measures developed to minimize the impact of risk on the project's overall performance and achievements. A total of 12 risks were identified. They fell into five key categories: design, logistics, policy/protocol, finance, and disaster. Since any delay in the signing of MOUs posed a design risk, PIDF maintained constant communication with TWGs to expedite MOU finalization. Stakeholder engagement also facilitated the prompt signing of MOUs. To address site confirmation issues, decisions about sites the project aimed to finalize such decisions during MOU signing. PIDF ensured that all sites met contract requirements in order to reduce the likelihood of future changes. A list of approved logistics companies was shared with stakeholders and endorsed by higher management to mitigate transportation delays and logistical issues. Shipping dimensions and weights were shared with TWGs so that in-country storage risks could be addressed and to enable advance planning. Delays in shipments to member countries were minimized by engaging DHL to transport goods from Fiji and the USA. To prevent equipment malfunction due to prolonged storage, TWGs coordinated the local management of boost chargers to revive batteries. Customs clearance delays were addressed by including provisions regarding customs clearance in contractors' scope of duty, replacing faulty equipment, and sharing UNDP letters with TWGs to facilitate exemption from government fees and to expedite clearance.

Contingency funds were allocated for unforeseen UXO clearance costs, an example of budget flexibility. Contingency funds were also allocated so that the project could adapt to changes in international standards like CEC and AS/NZ, ensuring continued compliance with evolving regulations. A comprehensive communication chart was created for future projects and circulated among stakeholders to enhance clarity and streamline approval processes. Integration of this chart into contracts formalized communication protocols. Project forecasting was conducted to anticipate cash flow needs, thereby mitigating payment delays and ensuring timely allocation of funds for expenses and contractor payments. To enhance oversight and accountability, all expenses requiring approval. Insurance coverage for items damaged before equipment was procured mitigated the risk of financial losses during transportation. In acknowledgement of the negative impacts of the unprecedented COVID-19 pandemic, the project provided ample time extensions to accommodate the related delays, an illustration of its resilience and continuity despite unforeseen challenges. Environmental risks were mitigated by adhering to SEIAPI guidelines (see Annex-6).

The project additionally evaluated potential social and environmental risks, implementing a safeguard approach to address constraints, bottlenecks, and challenges, while also maximizing positive project outcomes (refer to Box-5).

Box-5: Assurance of social and environmental safeguards

The project effectively addressed programmatic risks through the mandatory implementation of UNDP's SES and financial audits. Various SES measures were implemented across every phase and dimension of the project, including logistics, design, procurement, installation, operation, and recycling/reuse to ensure compliance. Stakeholders did not express any concerns regarding the adverse social impacts of installing solar PV systems on heritage sites such as state houses.

Within the SES framework, the project identified four low-category risks and developed corresponding mitigation measures. First, ensuring that system designs complied with SEIAPI mitigated the potential impacts of unsafe and environmentally risky designs and component specifications. Second, adhering to the installation standards laid out in SEIAPI & AS/NZ and assigning TWGs to supervise construction managed risks associated with unsafe installation practices. Third, establishing fully automated systems and providing end-user training in O&M mitigated risks related to unsafe O&M practices. Last, collaboration with large-scale solar systems facilitated the safe disposal of PV components after their service life. In addition, site evaluation forms, logistics inspections, quality control forms, commissioning forms, equipment parameters, test results, switching on and serial details documentation were utilized to prevent social and environmental risks (see Annex-14).

4.5.2 What initial signs suggest the potential for sustainability of project results beyond the project's duration, both at the community and government levels?

The evaluator gathered substantial evidence, data, and feedback from stakeholders. All that material collectively demonstrate that the project's outcomes contribute to sustainability at both the systemic and the governmental levels and that the project's benefits are likely to extend beyond the project's conclusion.

82. At the system level: At the systemic level, using local technicians for O&M, as well as engaging local companies to offer both current and future technical assistance, bolstered the project's sustainability.

- *Use of local technician for O&M:* The project leveraged local technicians within the member countries to conduct O&M trainings. Pandemic-related travel restrictions and associated resource constraints made relying solely on external experts impractical. Instead, the project opted to train and deploy local technicians as "local resource persons" to facilitate various O&M trainings. It strongly emphasized involving local companies in design and installation. Interviews with officials working at the Department of Energy (DoE) confirmed that efforts were made to enhance the capacities of the government ground staff responsible for the O&M of the solar PV systems at each site through hands-on, practical trainings.
- *Mobilization of local private companies to provide present and future technical supports:* The project installed test projects in collaboration with local companies, ensuring that there would be technical support in the event of future issues. Project's officials said that this approach aligns with its competitive tendering processes to involve other private-sector entities from the Pacific region in supplying and transporting the remaining balance of payment (BOS) components.

83. At the government level: The government's commitment to sustainability was secured through rigorous system verification and commissioning, bolstering the institutional mechanisms of the TWG, leveraging established relationships, and coordinating with other UNDP projects in other countries.

- *Adherence to system verification and commissioning:* In accordance with their mandates, the national power utilities in the member countries are responsible for conducting commissioning inspections to verify that they meet standards. While the project's original design did not specify a clear mechanism for handing over equipment to governments upon project completion, the UNDP, in coordination with the PB, started to develop procedures for transferring equipment and assets to the government through the appropriate ministry, department, or executing agency.

- *Strengthening of the institutional mechanism of TWG:* One essential sustainability indicator for the project was the "institutional strengthening of the TWG." Project stakeholders averred that the project had successfully mobilized national TWGs in each member country and actively involved them in steering key project initiatives. With the DoE serving as an ex-officio member, TWGs played a pivotal role in coordinating with relevant entities, managing resources for future O&M activities, and facilitating the replication of best practices. The DoE assumed the responsibility for oversight to ensure the continuous operational functionality of solar PV systems once they were handed over.

- *Use of previously built rapport:* The collaboration mechanism involving Solaria, the PIDF, and the Secretariat of the Pacific Regional Environment Program (SPREP) ensured there would be post-project support beyond

the project's conclusion. Key informant said that by leveraging existing relationships, the PIDF and SPREP drew upon their rapport with the member countries to mobilize those countries to sustain and potentially expand the project's positive initiatives. Notably, through MoUs, the PIDF and SPREP had prior engagements with the governments of Tonga and Palau. Furthermore, letters of support from the governments of Kiribati, Nauru, and the RMI during the projects' pre-installation and construction phases in 2017 expedited project processes. In addition, the SHoS, in collaboration with the PIDF, provided crucial technical insights[28] to support project objectives.

- *Mobilization of the UNDP's other projects in project countries:* Discussions with UNDP officials revealed that UNDP runs sustainable energy projects in Tuvalu, Nauru, and Vanuatu, and additional projects are being developed in Kiribati, the FSM, and Nauru (see Annex 8). These projects oversaw the initiatives of this project, as they operate under the purview of the DoE and maintain positive relationships with that department. Furthermore, the PIDF and the Global Green Growth Institute, both funded by the KOICA, are executing a multi-country project called Capacity-Building to Strengthen Sustainable Implementation of Renewable Energy Technologies for Rural Energy Access Project in Fiji, Solomon Islands, and Vanuatu. The PIDF played a leading role in implementing the KOICA-funded project in the Solomon Islands. These collective initiatives contributed to the sustainability of the project by enhancing the capacities of end-users to address any technical challenges that may arise as well as to replicate the project's best practices.

Finding 16: *The assessment found promising signs of sustainability beyond the project's duration at both the system and the government levels. At the system level, the project utilized local technicians for O&M training, circumventing travel restrictions and ensuring that maintenance could be ongoing. Contract with local companies using competitive processed ensures that there will be future technical supports from them. At the government level, national power utilities conduct inspections to verify standards, and procedures for equipment handover are being developed. National TWGs played a key role in coordinating initiatives and managing resources for future O&M. Leveraging relationships with stakeholders ensures that there will be post-project support and that positive initiatives may be expanded. UNDP's projects in various countries enhance the capacities of end-users and replicate best practices, contributing to project sustainability. In the absence of O&M funds facilitated through public-private partnerships, challenges persist. There's no roster of trained local electricians available for immediate maintenance, and insurance schemes to adequately cover damages are also lacking.*

4.5.3 Was there an adequate sustainability and exit strategy incorporated into the intervention design?

84. While sustainability aspects were addressed in various sections of the intervention design, there was a notable absence of a dedicated section focusing on a sustainability plan and an exit strategy.
The sustainability of any project heavily relies on the existence of a sustainability plan and an exit strategy, but, in this case, the evaluator found that neither was adequately developed. This gap represents a significant oversight although sustainability considerations were, it must be said, mentioned in the project proposal.

Finding 17: *The intervention design lacked a dedicated section on sustainability and an exit strategy although it had mentioned aspects of sustainability throughout. This omission represents a significant oversight as sustainability plans are crucial for project longevity.*

4.5.4 How committed are the government and other stakeholders to maintaining the results of project support and ongoing initiatives?

86. The existing evidence and data support the assertion that governments and other stakeholders are firmly committed to maintaining and replicating the initiatives of the project. This commitment is reinforced by the inclusion of zero emissions in the NDCs of member countries. According to the Asia-Pacific Energy Portal (2021), the region allocates approximately USD 6 billion annually towards fuel imports, with individual country expenditures ranging from 5% to 15% of their gross domestic product (GDPs). Average expenditure is 10% of GDPs. Fiji's proportional expenditure, 14% of GDP, is the highest. In the Cook Islands, Fiji, and Vanuatu, RE initiatives contribute 20%–40% of the energy supply, and endeavors to achieve 100% contribution are ongoing. Despite these efforts, however, RE currently constitutes only 17% of the total energy supply in PICs. These figures underscore the commitment of governments and other stakeholders to sustain the outcomes of solar PV systems and support similar initiatives in the future.

[28] Assess feasibility, prepare system design, specify components, provide input to preparation of technical requirements as part of solicitation documentation, assess technical aspects of submitted bids and provide additional technical advice to the Tender Evaluation Team, oversee the installation of the complete systems and the training of on-site users technically, and, provide input to the design of public awareness campaigns.

Finding 18: *Evidence suggests that governments and stakeholders are committed to maintaining and replicating the project's initiatives. This commitment is reinforced by national commitments to zero emissions and significant investments in RE initiatives across the region, both measures indicating serious dedication to sustaining the outcomes of solar PV systems and supporting similar projects in the future.*

*The evaluation of sustainability considered four factors: (i) the degree of potential financial, social, political, or legal risks posing various threats to the sustainability of project outputs, (ii) the initial indicators and evidence supporting the likelihood of sustaining project results, (iii) the availability and sufficiency of sustainability and exit strategies integrated into the intervention design and application, and (iv) the level of commitment from member countries and other stakeholders to uphold the project's results and support future initiatives. After taking these aspects into account, the overall sustainability rating is **4** (Likely).*

4.6 Impact

The assessment of the project's impacts was judged by considering the following questions:

4.6.1 How much progress was made in achieving the project outputs and how did this contribute to outcome-level results?

87. The overall achievements of the project were evaluated using the result framework, which comprised assessments of each output and its indicators, outcome and impacts (see Table 9 below). For a detailed analysis of outputs and output-level indicators, please see Annex-10. Careful assessment of the result framework revealed that the project nicely achieved its output-level indicators and thereby its outputs. The fact that the project crafted intelligent SMART indicators that were easy to measure was helpful. By achieving its targets, the project met its outcome and impacts, as stipulated in result framework.

Table 9: Assessment of the project's result

Assessment of result framework	Baseline	Target	Achievement
Impact: Promoted the adoption of renewable energy in the Pacific region by facilitating the installation of solar energy infrastructure, aiming to mitigate carbon emissions, showcase proactive climate measures, and affirm commitment to bridging energy disparities.	0	0	0
Assessment of Impact: The project will reduce 9,600 tons of GHG emissions in the 25-year lifespans of 12 solar PV systems, thereby helping climate change mitigation efforts. Analysis of over three months of data gathered from the fully operational solar PV systems, each of which generated 62 units of electricity per day, suggests that electricity tariffs declined by 33%. The effectiveness of solar PV systems, combined with heightened awareness among policymakers and the public about the advantages of solar energy, catalyzed the adoption of this sustainable energy option, and, through its use, decreased carbon emissions and energy disparities, thereby contributing to the project's impact.			
Outcome: Increased awareness among policymakers and the public regarding the imperative to expedite the adoption of sustainable energy.	0	0	0
Assessment of Outcome: Seventy-four individuals, 24% of whom were women, were trained in the O&M of grid-connected solar PV systems, and a total of 12 manuals regarding O&M procedures for grid-connected solar PV systems were developed and distributed. The project directly benefited over 232 individuals, and an additional 16,228 indirectly. Notably, more than 32% of the total beneficiaries were women, reflecting a positive trend in women's participation in the RE sector. A high proportion of the workers engaged to install solar PV system were youths. While the target for the number of news articles in national media was 48, thus far only 40 have been published. It is anticipated, however, that this target will be exceeded once the remaining solar PV systems are inaugurated. Ensuring that all sites have solar-based power and enhancing users' capacity to operate and maintain solar PV systems guarantees the functionality of the systems. Enhanced knowledge and understanding of the benefits of solar power among policymakers and the public accelerated the adoption of sustainable energy, thereby contributing to the project's outcome.			
Output 1 – *Solar-based power supplied to executive residences/buildings of national importance in 11 PIDF member countries*			
Assessment of output 1: Solar PV systems were successfully installed in all 12 sites. Each met the specified technical criteria and appropriateness standards. All systems were designed with on-grid configurations. Several safety measures were introduced to mitigate risks, including employing licensed electricians, implementing standard color codes for phase identification, utilizing large batteries, and providing step-by-step instructions for correct procedures. With these advancements, solar-based power supplies can be guaranteed across all sites, thereby achieving Output 1.			
1.1 # of solar PV systems at operational	0	12	12
Assessment of indicator 1.1: Solar PV systems were installed in all 12 sites, but the project has not finished the testing and commissioning processes in Nauru, FSM, Vanuatu, and Palau. All sites met the criteria and were technically appropriate. The project used good strategies to manage the logistical challenge of transporting goods. The designs of all systems were on-grid with small battery sizes, as is compatible for grid interconnection. To avoid likely risks, the project introduced several safety measures. Licensed electricians were employed. Standard color codes for phase identification were used in all electrical connections, and standard power tools used. To reduce risks, the project used large batteries in every site except that on Bau Island of Fiji. All users were given step-by-step instructions so that they would be able to follow procedures correctly. They were also given the forms and serial and contact details needed to pursue warranty claims in the case of any future equipment fault as well as the single line diagram (SLD) and commissioning forms needed to cross-check the systems. They were informed about what to inspect after a cyclone to ensure that no damage had been incurred.			

Output 2 *- Onsite capacity established at the executive residences/buildings of national importance and the PIDF headquarters to successfully O&M their solar PV systems on a day-to-day basis and the public made aware of the benefits of solar power*			
A total of 74 individuals, 24% of them women, benefited from 12 onsite training sessions that equipped them with the skills they need to carry out solar PV system O&M. The project developed and distributed 12 O&M manuals tailored to two specific on-grid systems, SMA and Schneider Electric. Information was disseminated through various media channels, including print, electronic, and social media. Over 40 news articles were published and online engagement was significant. This included 3,980 comments on event posts and 162 clicks on news articles, indicating a growing understanding of solar PV systems and their benefits. The project is expected to exceed its target of 48 news articles once all the installations are inaugurated, thereby achieving Output 2.			
2.1 # of women and men that have built capacity in the O&M of grid-connected solar PV	0	12	74 (men- 56, women-18)
Assessment of indicator 2.1: A total of 12 onsite training sessions were organized for 74 individuals from the relevant agencies, about six times the target. Eighteen trainees (24%) were women. Trainees were equipped with the skills and knowledge they needed to O&M the solar PV systems. The training focused on preventive maintenance as well as corrective maintenance. The training manuals were good: their rich content was carefully calculated to sharpen the knowledge and understanding of users.			
2.2 # of manuals on the O&M of grid-connected solar PV systems	0	12	12
Assessment of indicator 2.2: The project developed and distributed 12 O&M manuals, one for each installation site, tailored to address the specific features of two types of on-grid systems: SMA and Schneider Electric. These manuals were designed to be user-friendly, incorporating informative infographics and step-by-step guidelines for easy implementation.			
2.3 # of news articles in national media	0	48	40*
Assessment of indicator 2.3: The project utilized various media channels, including print, electronic, and social media, to disseminate information widely. By March 25, 40 news articles highlighting major project events were published in national media outlets, while the project was featured in reputable publications. Project achievements were showcased at COP 27 and presented to a high-level committee on South-South Cooperation in the UN General Assembly, with further dissemination through Twitter and Facebook posts. By March 2024, the project's online engagement indicated significant interest, with 3,980 comments on event posts and 162 clicks on news articles, indicating a growing understanding of solar PV systems and their benefits. The project is expected to exceed its target of 48 news articles once all installations are inaugurated.			

Contributions to achieving outcome and impact-level results:

88. Contributed to climate change mitigation: The project effectively underscored the significance of clean RE technologies in addressing challenges within the energy sector while mitigating the impacts of climate change. During interviews, key informants said that the project played a pivotal role in steering the member countries toward a sustainable and resilient future in the RE sector, catalyzing a shift toward a low-carbon trajectory and advancing progress toward the 2030 Agenda by curbing carbon emissions and exemplifying climate action. Project stakeholders also emphasized that the project had contribute to alleviate pressure on fossil fuels by offering alternative means of power generation, thereby paving the way for sustainable green energy solutions. Although installing solar PV systems requires a high initial investment that could serve as a barrier, the money is well spent as the energy sector alone accounts for 40%–80% of the estimated national carbon emissions of the member countries.

89. Replicated the project's best practices: Drawing inspiration from the project's initial outcomes, member countries are now focusing on expanding RE initiatives to counteract elevated electricity prices and exploring both on- and off-grid solutions to enhance power accessibility, quality, and efficiency. Government officials affirmed that the project successfully raised awareness about the significance of RE in the public and private sectors across member countries through various structural and non-structural activities. These efforts facilitated the widespread adoption of solar PV systems, suggesting that the project was a model project whose ripple effects encouraged other countries. During key informant interviews, respondents revealed that several national governments, such as those of PNG, the Cook Islands, Samoa and Tokelau, had expressed interest in replicating the project's successful models in their public buildings, a fact that was verified through a review of secondary information. The project's successful practices could also be replicated in island countries in the Caribbean and Indian and Atlantic oceans. It is likely that private buildings will replicate this technology for two key reasons: electricity tariffs are increasing and the cost of installing solar PV systems is decreasing. Several studies shows that over the last 12 years (2010-2022), the cost of solar PV and wind energy has decreased significantly by 89% and 59% respectively, while hydropower costs have increased by 47%. To spread the project's benefits, the PB also entertained suggestions to replicate solar PV systems in additional government offices, private buildings, hospitals, schools, and the like. Moreover, the project made policymakers aware

of the need to accelerate the adoption of RE to meet the energy-sector goals and climate change mitigation targets of member countries.

90. Increased the visibility of solar technologies: The key role played by this project in engaging in local and global public outreach and facilitating dialogue with policymakers was commendable, as highlighted by key informants during interviews. It underscored the need to expedite the adoption of RE practices, thereby contributing significantly to achieving ambitious energy targets and enhancing the visibility of renewable technologies. In the views of project stakeholders, embracing the installation of solar PV system as a standard programmatic approach in alignment with the Paris Agreement, high-ranking officials from member countries also demonstrated their commitment to mitigating the adverse impacts of climate change by promoting RE. In its various publications, reports, and informational materials, the project consistently displayed the logos of all stakeholders, thereby further amplifying their and its own visibility. The deliberate inclusion of plaques, flags, logos, and relevant partnership signage on project materials and their prominent display during public and media engagements further bolstered the effort to augment the visibility of solar technologies.

91. Strengthened south-south cooperation: The presence of His Excellency, the President of Fiji, and the Minister of External Affairs of the GoI during the project's launch significantly elevated its visibility and facilitated cooperation. The involvement of these notable figures is expected to lead to an expansion of the portfolio in the RE sector. Collaboration with the GoI bolstered South-South cooperation aimed at catalyzing transformative sustainable development across the developing world. FGD participants affirmed that the project strengthened relationships among member countries by encouraging them to collectively pursue initiatives aimed at adopting climate-smart technologies.

Finding 19: *The project's assessment via the result framework revealed that it had successfully attained its output-level indicators, thereby contributing significantly to its outcomes, notably with respect to climate change mitigation. Emphasizing the importance of RE technologies, the project reduced carbon emissions and promoted a low-carbon trajectory. Member countries replicated the project's best practices, enhancing focus on expanding RE initiatives and improving accessibility to power. Furthermore, the project bolstered the visibility of solar technologies, aligning with Paris Agreement goals, and strengthened South-South cooperation, as was evidenced by the involvement of notable stakeholders and collaborative efforts for sustainable development in the RE sector.*

4.6.2 How closely does the project align with the key thematic area it aims to address?

The project's activities were effectively aligned with its targeted thematic areas through the meticulous implementation of its strategies. The project was strategically aligned to address a pivotal thematic area: climate change mitigation.

92. Translated policy provisions into practice: The project played a significant role in assisting member countries in achieving their NDC targets and SDGs. It particularly fostered the attainment of SDG 7 by ensuring universal access to affordable, reliable, sustainable, and modern energy. Stakeholders emphasized that the project also addressed the challenge of climate change while enhancing energy security and easing the financial burden of high electricity costs, thereby aligning with SDG 13 targets. Key informants further noted that the project enhanced global awareness of the potential of solar energy by fostering collaboration among green leaders in the Pacific. It also played a crucial role in helping member countries achieve their ambitious goals of reducing GHG emissions by 2030 and transitioning to nearly 100% RE sources. Furthermore, the project highlighted the attractiveness of solar energy, particularly its cost-effectiveness now that technology expenses are down 80% since a decade ago and require less investment into O&M. This evidence demonstrates that the project helped to put policy provisions into practice.

93. Created green jobs through climate action: Embracing accessible RE sources such as solar power reduced electricity tariffs and facilitated the provision of energy to local communities. Moreover, this transition, claimed key informants during their interviews, has created green jobs, promoted sustainable development, and bolstered efforts to combat climate change. For instance, in Tonga, the recent installation of a solar PV system is poised to support the expansion of women's enterprises once it is fully integrated into the grid, as power outages are currently quite frequent and electricity tariffs quite high. The latest data shows that the representation of women in various sectors of the wind-related economy is as follows: 21% in overall coverage, 22% in oil and gas, 32% in all RE, and notably, 40% in solar energy alone. In this endeavor, the project is playing a pivotal role converting single- to three-phase

power through the leadership of the DoE. Stakeholders confirmed that despite the challenges posed by the COVID-19 pandemic, the project showcased a green recovery, thereby signaling the potential for sustainable development even during difficult times. This initiative reflects a commitment to 'building back better' and underscores the importance of transitioning to RE sources for long-term resilience and prosperity.

Finding 20: *The project closely aligned itself with its thematic focus on climate change mitigation through strategic implementation. By translating policy provisions into practice, it supported member countries in achieving their NDC targets and their SDGs, particularly SDGs 7 and 13. The project also created green jobs and promoted sustainable development, as was demonstrated by the reduction in electricity tariffs and the emergence of solar energy-related employment opportunities. Despite the challenges posed by the COVID-19 pandemic, the project PICs showcased a green recovery.*

4.6.3 To what extent did the intervention address synergies and inter-linkages with other stakeholders and agencies?

94. For the most part, the project's intervention logically addressed synergies and inter-linkages with other stakeholders and agencies. To accomplish this end, the project adopted a "whole-society approach," specifically leveraging multi-stakeholder partnerships involving collaborators from both the public and private sectors, as well as CSOs. In the opinion of key stakeholders, this approach magnified the project's impact, as interventions were executed in coordination with multiple stakeholders. For instance, the SHoS provided system design blueprints, equipment manuals, and detailed O&M instructions, while Solaria, a private sector entity based in the USA, generously donated solar panels. In addition, the PIDF, the SHoS, and the UNDP, in collaboration with private-sector partners/installer companies, facilitated the procurement, and installation of solar PV systems. Each member country played a role in the installation process, specifically in offering O&M training. Senior officials in Fiji government state that a Global-South development partner, specifically the GoI, had provided high-level coordinated support. Meanwhile, the UNDP, as the executing agency, offered technical support and overall oversight from the project's outset. It supervised installation and O&M training and offered post-commissioning support.

Finding 21: *The project effectively addressed synergies and inter-linkages with various stakeholders and agencies by adopting a comprehensive "whole-society approach." This approach involved creating multi-stakeholder partnerships across the public, private, and civil society sectors, thereby enhancing the project's impact through coordinated interventions. Stakeholders such as the SHoS, Solaria, PIDF, and UNDP collaborated closely, with contributions ranging from system design to equipment provision and installation facilitation. Member countries, supported by coordinated assistance from development partners like the GoI and technical oversight from the UNDP as the executing agency, actively participated in the process.*

The preliminary impacts of the project were assessed using three primary parameters: (i) the overall advancement towards achieving project outputs and outcome-level results, (ii) the degree of alignment of the project with the key thematic areas of member countries, and (iii) the extent to which interventions address synergies and inter-linkages with other stakeholders and agencies. The overall impact rating is ***5*** *(satisfactory).*

4.7 Cross-cutting issues

4.7.1 Human right

95. The project integrated a human rights-based approach from its inception, spanning from conceptualization to design and subsequent stages. Stakeholders affirmed that, in the planning phase, there was a significant focus on ensuring diverse stakeholder representation and active participation, facilitating the inclusion of their concerns and challenges. The project's design drew insights from a needs assessment involving consultations with various stakeholders, albeit with some limitations in robustness. During interviews, key informants opined that the project also aimed to mitigate potential human rights risks within the RE sector through a number of measures. Although its primary objective was to install a solar PV system in the residences of heads of state for demonstration purposes and not to carry out any community-level activities, the project did exhibit concern for disadvantaged and marginalized groups, such as the poor, indigenous peoples, persons with disabilities (PwDs), women, and youth and attempted to maximize the benefits for them. The project sought to enhance the knowledge, skills, and understanding of these groups awareness-raising and capacity-building initiatives in the RE sector. It also integrated human rights considerations into its activities. No one consulted reported any instance of any human rights violation; in other words, there were no reported cases of abuse, threats, intimidation, land grabs, dangerous working conditions, non-payment, or child labor. Participants in FGDs revealed that the project had paid equal wages to men and women laborers and made strict safety measures, including the use of PPE, mandatory. The project did not, however, adequately use the hazard vulnerability and

capacity assessment (HVCA) tool to identify suitable locations for solar PV installations, assess potential risks, and determine vulnerabilities induced by various hazards (see Box-4).

Finding 22: *The project practiced a human rights-based approach, prioritizing stakeholder participation and representation from the planning to the execution phases. Although its main focus was installing solar PV systems in the residences of heads of state, the project did mitigate human rights risks and enhanced benefits for marginalized groups through awareness and capacity-building initiatives. While no one consulted reported any human rights violations and, in fact, many pointed out that the project paid equal wages and implemented safety measures, limitations were noted in utilizing the HVCA tool to identify suitable locations and assess risks and vulnerabilities.*

4.7.2 Gender equality and leaving no one behind

96. The project fostered gender equality and women's empowerment. Its action had both intended and unintended impacts on women, men, youth, and vulnerable groups. The UNDP Fiji MCO was honored with the "Gold Certified Gender Equality Seal 2023"[29] for its steadfast dedication, expertise, and effectiveness in safeguarding and promoting women's rights and gender equality. Consequently, it maintains a rigorous commitment to integrating GESI concerns into every phase of its project cycles. Project officials said that along with project based GESI policy, several member countries have initiated the development of dedicated GESI policies to bolster governance. For instance, the Solomon Islands Electoral Commission introduced the GESI Policy 2022-2024 and its accompanying Action Plan to uphold the government's pledge to enhance GESI in electoral processes. GESI frameworks are currently being formulated and implemented. Notably, GESI was identified as a pervasive outcome across all six Indo-Pacific Initiatives and Program Focus Areas in 2020.

97. The project has played a pivotal role in catalyzing positive transformations in critical domains such as women's leadership and empowerment by adhering to the provisions of GESI policies. All stakeholders unanimously recognize the need to transition to a global renewable, decarbonized, and decentralized energy system that offers sustainable solutions for reaching the last-mile population, including women, youth, PwDs, and other marginalized groups. During FGDs, women said that though the project acknowledges that women are both energy consumers and managers and are vital in fulfilling global commitments to climate action, gender equality, and sustainable energy, women did not participate equally, including in terms of staff and TWG numbers. The rationale for adopting inclusive energy policies stems from the recognition that men and women have different levels of understanding, access to, and needs

Box-6: Unanticipated effects of the intervention on gender equality and human rights

The project's intervention has yielded both unforeseen positive and negative effects on gender equality and human rights, as revealed through a series of stakeholder interviews conducted during the field mission. Generally, the implementation of RE projects in the Pacific region has led to unanticipated positive outcomes for gender equality and human rights. While the project primarily aimed to promote energy access through solar PV systems, its impact on various genders and marginalized groups was not fully anticipated. Solar PV systems have played a significant role in generating green jobs across multiple sectors. The installation, maintenance, and operation of these systems necessitate a skilled workforce, contributing to employment opportunities within the RE sector, including manufacturing, installation companies, and maintenance services. Furthermore, the expansion of solar PV systems has spurred demand in related industries such as solar panel manufacturing and distribution networks, resulting in job creation throughout the supply chain, including raw material extraction, transportation, and logistics. The transition to solar energy has also fostered innovation and research in RE technologies, leading to job growth in research and development institutions, with educational institutions offering training programs in solar energy. Additionally, solar PV projects often involve community-based initiatives targeting underserved areas, thereby facilitating local employment and skills development. This underscores how the adoption of solar PV systems not only mitigates carbon emissions and promotes environmental sustainability but also contributes to job creation and economic growth within the green energy sector.

However, anticipated negative effects include potential shifts in employment patterns within the RE sector that may reinforce existing gender disparities, with women encountering barriers to entry or receiving lower wages. Moreover, the distribution of benefits and decision-making power within RE projects may not always be equitable, potentially marginalizing certain social groups. Additionally, the environmental and social changes accompanying RE projects can impact local communities, particularly indigenous peoples, affecting their land rights, access to resources, and cultural practices. Notably, stakeholders did not raise concerns regarding these negative impacts. Nonetheless, addressing these unforeseen negative consequences is imperative to ensure that RE interventions effectively contribute to gender equality and human rights in the Pacific region.

[29] The UNDP Gender Equality Seal is a corporate quality assurance mechanism that measures and certifies achievements and competence of UNDP Country Offices in advancing gender equality and women's empowerment.

for energy. Stakeholders advocate that gender being considered in policies and strategies related to SDG 5, gender equality, SDG 7, clean and affordable energy, and SDG 13, climate action, to foster more effective energy initiatives and drive policy reform. Recognizing the enabling role that RE plays in women's economic empowerment, the project explored how energy could support women's income-generating activities and savings, address gender disparities in access to household energy, and set targets for women's participation in achieving energy sector goals. Interviewed women stated that tackling the multifaceted challenges faced not just by women but also by PwDs necessitates raising awareness about gender and inclusion so that the specific needs of those requiring additional support are not neglected. Systems were devised to generate green jobs capable of engaging women from marginalized backgrounds. The project painstakingly addressed gender and marginalized issues during its design phase. To alleviate the burdens of last-mile populations, each solar PV system incorporated a user-friendly app compatible with both laptops and smartphones. No respondent expressed that some unintended consequence had affected any woman, man, youths, or vulnerable group to (see Box 6 above).

Box-7: Stakeholders' voice

"..To be candid, not every community in the Pacific region is reaping the benefits of renewable energy (RE). Ensuring widespread access to RE requires addressing and resolving potential challenges to sustain the anticipated benefits. In my opinion, the time has come to transition towards a global energy system that is renewable, decarbonized, and decentralized, thereby providing advantages to women, youth, persons with disabilities (PwDs), and other marginalized groups. To sustain these benefits, it's essential to connect them with RE-based green enterprises. This linkage is crucial as heightened economic empowerment aids in narrowing gender disparities and addressing social issues within society.." **states a stakeholder in Fiji**.

"..It's good that the project recognizes the dual role of women as energy consumers and managers, highlighting their importance in meeting global commitments to climate action, gender equality, and sustainable energy. However, women's participation remains low among project staff and the institutions established to execute key project activities. In my opinion, ensuring women's participation within these structures should take precedence before engaging with project communities and stakeholders for gender-focused activities. Achieving a balance between commitment and action is essential.." **says a stakeholder in Fiji**.

"..Only formulating policies isn't sufficient; it's crucial to translate policy provisions into tangible action. Issues and concerns related to RE affecting women and marginalized segments of society must be integrated into mainstream initiatives and put into practice to effect meaningful change. Recognizing the differing levels of understanding, access to, and needs for energy between men and women, inclusive energy-related policies should accommodate their respective concerns and issues. Additionally, educating stakeholders on policy provisions through a series of capacity-building initiatives is equally vital, as it paves the way for policy advocacy and effective implementation.." **opines a stakeholder in Kiribati.**

98. The project placed significant emphasis on gender equality in the energy sector, striving to ensure meaningful participation and benefits for both women and men in the transition to RE. Project stakeholders assured the evaluator that gender markers had been incorporated into the project's outputs to facilitate women's meaningful engagement. Incorporating GESI into data collection, program design, implementation, and monitoring using smart indicators could help enhance women's involvement. In particular, it was noted that integrating gender mainstreaming into project planning from the outset creates numerous opportunities for women to increase their engagement (see Box 7). While acknowledging these commendable initiatives, project stakeholders nonetheless also identified areas for improvement in future projects of a similar nature. For instance, conducting 'women's safety audits'[30] could serve as a platform for stakeholders to assess the safety and security of their living environments critically, promote increased representation of women in leadership roles to drive transformative changes, and facilitate robust coordination among stakeholders to raise awareness about gender-related dimensions.

99. In the views of project officials, utilizing the "gender and age marker toolkit"[31] can sensitize the project team to gender- and age-related concerns by acknowledging steps to progressively address gender equality issues and protection, emphasizing the significance of age-related considerations in project design and subsequent implementation. Additionally, the project could undertake a 'scenario-based costing study' to enhance stakeholders' understanding of GESI and enable decision-makers to estimate costs

[30] It is a participatory tool that is used for collecting and assessing information about perceptions of safety in public spaces. It is a process that brings people together to walk through a physical environment, evaluate how safe it feels, and identify ways to make it safer. It is also a participatory research approach to assess the safety & security concerns of women in public spaces and the practice of safety measures to protect them.

[31] The toolkit introduces the European Commission's new Gender-Age Marker for humanitarian action. It provides an overview of the tool and its application, as well as guidance on how to integrate gender and age concerns in humanitarian action and on how to apply the marker to humanitarian projects. It can be used on the development projects and programs with slight modification.

associated with gender-responsive services and interventions in solar PV systems, thereby supporting policy advocacy efforts to sensitize policymakers.

Finding 23: *The project made significant strides in advancing gender equality and women's empowerment, an achievement exemplified by the UNDP Fiji MCO's receiving the Gold-Certified Gender-Equality Seal 2023 and the initiation of GESI policies in member countries like the Solomon Islands. Despite such progress, challenges remain in ensuring the equal participation of women. Efforts to promote gender equality in the energy sector included incorporating gender markers into outputs to increase women's engagement. Recommendations for improvement include conducting "women's safety audits" and utilizing tools like the "gender and age marker toolkit", both measures that address gender-related concerns thoroughly. Scenario-based costing studies are required to deepen understanding of GESI and advocacy for policy reforms to strengthen gender equality and inclusion in both RE projects and broader development endeavors.*

4.7.3 Disability

100. Project officials verified that PwDs were consulted and actively involved in every phase of the project: planning, implementation, and follow-up. Consequently, the project generated positive impacts for, and even transformative changes among, PwDs. The primary aim of the project was to install 12 solar PV systems and enhance the capacity of end-users for the future O&M of these systems. Since there was no disaggregated data related to disabilities, evaluating whether or not the project had a positive impact on or had brought about any transformative changes in PwDs was challenging.

101. However, during consultations, stakeholders did express a commitment to providing project services to all demographics, including women, men, youths, and vulnerable groups such as PwDs, through capacity-building initiatives like O&M trainings and awareness campaigns on RE. For instance, one of the stakeholders in Tonga said *"…the project's commitment to ensuring the equitable distribution of benefits across all segments of society, including persons with disabilities (PwDs), is commendable. However, implementing this approach at the practical level often presents challenges. For instance, one pressing task is to build the confidence of PwDs through a series of capacity-building activities, including technical training and green job-related programs tailored to address their specific needs. Ensuring their full participation in these trainings necessitates the development of training venues that are sensitive to the nature of disabilities. For example, to accommodate wheelchair users, training venues should be located on the ground floor of buildings with ramp facilities. A noteworthy initiative established by the project is the development of a user-friendly app for solar PV systems that is compatible with both laptops and smartphones. This innovation serves to alleviate the challenges faced women and PwDs, in monitoring the functionality and effectiveness of solar PV systems…"*

102. For future projects of a similar nature, project stakeholders suggested that the project arrange a series of capacity-building trainings aimed at enhancing the sensitivity of program, administrative, and finance staff to Gender Equality and Disability and Social Inclusion (GEDSI) considerations. These workshops would also facilitate the collection of GEDSI-sensitive data through an online data platform. Furthermore, the project could compile a list of clause related to disability and protection found within policy documents, including the Pacific Framework for the Rights of Persons with Disabilities (2016–2025) so that the key policy provisions related to disabilities could be disseminated on a wide scale. These clauses could also be integrated into the training curricula. Developed as a regional framework, the Pacific Framework aims to support national government initiatives in promoting inclusive development for PwDs, drawing upon insights gleaned from the Pacific Regional Strategy on Disability (2010–2015).

Finding 24: *Project officials actively engaged PwDs throughout project cycle, aiming for positive impacts despite the challenge of not having disaggregated data. Stakeholders emphasized the need for inclusive service provision through capacity-building initiatives, and practical challenges underscored the need for tailoring activities and increasing accessibility to venues. The project's user-friendly app for solar PV systems was praised for its inclusivity. Recommendations for future projects include providing capacity-building trainings on GEDSI considerations and integrating disability-related policy provisions into training curricula, drawing upon frameworks like the Pacific Framework for the Rights of Persons with Disabilities (2016–2025).*

4.7.4. Climate change action

103. The evaluator's analysis of available data and consultations with stakeholder found no evidence of any environmental risks that jeopardize the sustainability of the project's outputs. In the contrary, the project contributed to country program outputs and outcomes regarding climate change mitigation. In addition, it enhanced national and local capacity through a series of review-and-reflection sessions. These results were possible because the project employed an 'environmental mainstreaming framework' across all component of the solar PV system, and the O&M training it offered to end-users integrated key elements of this framework. No adverse environmental effects resulting from the project were reported. In any

case, potential risks were mitigated through SES. Sites were selected carefully and slope protection measures implemented as needed. In addition, installation practices were safe. Features such as J-hooks were incorporated into corrugated galvanized iron (CGI)-roofed houses to mitigate the impacts of cyclones.

Finding 25: *The project successfully mitigated environmental risks. No adverse effects emerged either during stakeholder consultations or during data analysis. The project made significant contributions to climate change mitigation outcomes and bolstered national and local capacity through review sessions. The project's environmental sustainability was attributed to its employing an environmental mainstreaming framework across solar PV components and it's offering comprehensive O&M training. Mitigation measures included careful site selection, slope protection, and safe installation practices, such as integrating features like J-hooks into CGI-roofed houses to ensure solar installations would withstand cyclones.*

Chapter 5. Best practices and lesson learned

5.1 Best practices

104. Based on observations and consultations with stakeholders, several best practices are outlined below:

- *Designating TWG as nodal agency:* Utilizing an existing in-country TWG as the primary technical agency instead of creating additional institutional layers has shown advantages. This approach aids in developing robust plans, offering technical support, addressing administrative and technical challenges, and ensuring ownership of initiatives, thereby avoiding redundancy.
- *Compliance with SEIAPI standards:* The design and installation processes play a crucial role in ensuring the resilience of solar PV systems to disasters. Acknowledging the potential impacts of future disasters, adhering to national standards, and following the guidelines of PPA and SEIAPI for the design and installation of grid-connected solar PV systems were commendable approaches. It was learned that compliance with SEIAPI standards contributed to preventing unsafe and environmentally hazardous system designs and component specifications.
- *Bulk procurement:* Procuring equipment and tools in bulk quantities has been advantageous. This strategy has reduced unit costs, ultimately maximizing 'value for money' by enhancing time and cost efficiency.
- *Conducting on-the-job training with manuals:* Providing on-the-job and onsite training sessions alongside O&M training manuals for solar PV systems has proven beneficial. This approach enables end-users to acquire necessary skills and knowledge, fostering confidence and a sense of capability.

Finding 26: *Leveraging in-country TWGs rather than creating additional institutions aided in ensuring planning was robust, provided a source of technical support, and ensured ownership of initiatives. This initiative also avoided redundancy as a single institution was responsible for multiple jobs. Adhering to national standards and SEIAPI guidelines for grid-connected solar PV systems built disaster resilience and prevented the adoption of unsafe designs and component specifications. Bulk procurement reduced unit costs, maximized value for money and enhanced efficiency. Providing on-the-job training alongside O&M manuals empowered end-users, fostering their confidence and capability.*

5.2 Lesson learned

Lessons learned were summarized under the following headings.

105. Project design

- *Tailoring system design to needs enhances ownership:* Recognizing that a one-size-fits-all approach does not apply in all contexts and given the varying needs of member countries, the project adopted designs that consider factors such as energy demand, power supply reliability, and battery storage capacity. It also took into consideration site features and specific requirements. Furthermore, adopting a need-based system design fosters ownership, optimizes resource utilization, and facilitates the replication of best practices in new areas. The integration of both hardware and software components heightened people's interest.
- *Resource allocation emphasizing equity over equality:* While project resource allocation among member countries tends to be uniform, in point of fact, adopting an 'equitable distribution approach' helps mitigate potential conflicts. Making this approach a possibility, however, requires more thorough assessments. It was learned that allocating resources based on 'equity' rather than equality is more appropriate. For instance, countries like Fiji and RMI, which require larger systems than other countries, need more resources.
- *Managing buffer resources for minor technical adjustments:* The absence of a contingency fund poses challenges, especially as the rising rate of inflation has increased project costs. Indeed, freight price hikes alone have inflated project costs by an estimated 15%. The absence of buffer resources often makes it hard to rectify even the most minor of technical adjustments, as observed in Kiribati and Tuvalu. It was learned that incorporating provisions for contingency funds and O&M costs is necessary to solidify project best practices.

Finding 27: *Tailoring system designs enhanced ownership and fostered the replication of best practices. The equitable, rather than equal, allocation of resources mitigated conflicts. Managing buffer resources in the form of contingency funds and allocations for O&M was crucial.*

106. Project implementation

- *Implement comprehensive procurement packages to mitigate conflicts:* Embracing comprehensive procurement procedures streamlines the procurement process by ensuring that site assessments are completed before procurement and detailed designs are based on robust assessments. It was learned that adopting a piecemeal procurement approach unnecessarily increases administrative burdens and diminishes cost-effectiveness. To deal with coordination and administrative challenges, the project learned, it needed to develop a single package encompassing site assessment, design, supply, and transportation, installation, testing, and commissioning. This package was found to prevent unwarranted blame among different vendors if plans fail to materialize.
- *Optimize implementation efficiency through site clustering:* Managing all 12 sites simultaneously was a challenge. This approach exacerbating the administrative burden of the implementation team and limited learning opportunities. It was learned that by clustering sites, rather than tackling them all at once, the project could increase the efficiency of procurement, storage, installation, and training as well as mainstream corrective learning for subsequent clusters.
- *Prioritize procurement orders based on installation readiness:* Difficulties arose regarding the arrival of equipment at ports as the project's original timeline was repeatedly amended. Managing the timing between equipment receipt and installation proved challenging. It was learned that to enhance equipment safety and reduce storage costs, procurement orders should be sanctioned based on the readiness level for system installation.
- *Enhance training effectiveness through short sessions and refresher courses:* Short training sessions followed by refresher courses and drills were found to effectively address technical errors and boost confidence in operationalizing procedures. Learning is also optimized when capacity-building initiatives are viewed as ongoing processes tailored to participants' requirements and needs. Before introducing new technology, it is imperative to sensitize and empower stakeholders through review sessions, reflection, and drills/simulations.

Finding 28: *Developing thorough procurement packages minimized the inclination of vendors to shift blame onto each other for malfunctioning components. Site clustering boosted efficiency in procurement, installation, and training. Prioritizing procurement orders based on readiness enhanced safety and reduced storage costs. Short training sessions followed up by refresher training helped address human error effectively and before it became a serious issue.*

107. Project management

- *Establish LTAs with potential vendors for system installation:* A significant portion of the project's critical time was spent searching for suitable vendors/suppliers, necessitating several steps to ensure accountability and transparency. It was learned that, akin to LTAs established with entities such as DHL and event organizers, preparing an inventory of potential vendors and suppliers and establishing LTAs with them in advance accelerates administrative processes and enhances cost-effectiveness.
- *Facilitate timely MoUs in facilitation with UNDP Project staff and DoE as focal person:* Securing MoU signing proved challenging as member countries clung to certain obstructive administrative and legal procedures. It was learned that the involvement of UNDP's staff from other projects and the appointment of a DoE as focal person of TWG would expedite the process of MoU signing. Additionally, it was learned that promptly recruiting and mobilizing the human resources outlined in the ProDoc could overcome bottlenecks and accelerate proceedings.

Finding 29: *Establishing LTAs accelerated administrative processes and boosted cost-effectiveness. Timely MoUs with UNDP involvement expedited proceedings. Prompt recruitment sped up activities.*

108. Project monitoring

- *Monitoring progress through indicator-based oversight:* Regular monitoring and oversight based on specific indicators are essential for assessing project results and informing relevant stakeholders for necessary corrective actions. It was learned that not all project progress reports adhered to a consistent structure and that the indicator-based reporting system lacked robustness. It was further learned that periodic monitoring and reporting, if it aligned with previous assessments, focused on indicators, and outlined strategies for the subsequent quarter while maintaining disaggregated data, would maximize the attainment of results.

Finding 30: *Indicator-based oversight assessed results accurately and was used to inform corrective actions. Structured reporting maximized the attainment of results.*

109. Gender mainstreaming

- *Gender mainstreaming requires training, data, resources, and commitment of leadership:* Effective gender mainstreaming necessitates incorporating a "gender marker" within project document and ensuring that leadership, staff, and stakeholders are equally informed about the rationale and benefits of gender mainstreaming. It was learned that training, along with access to resources, plays a crucial role in enhancing the capacity of relevant stakeholders to implement gender mainstreaming effectively. This involves maintaining Sex, age, and disability disaggregated data and conducting gender analysis to comprehend the diverse impacts of project components on different genders.

Finding 31*: Effective gender mainstreaming required training, resources, and commitment by leaders. Incorporating gender markers and maintaining disaggregated data were crucial. Gender analysis helped project staff to understand the diverse impacts of RE on various population segments.*

Chapter 6. Conclusions

Conclusions were categorized based on the OECD-DAC evaluation criteria and were arrived at after careful analysis of the key findings in chapter 4.

6.1 Relevance

Conclusion 1: The project played a crucial role in advancing the adoption of sustainable energy, particularly solar energy, across 10 PIDF member countries. Its efforts aligned with the aspirations of the member countries to achieve net-zero emissions and to address energy deficits. The project was relevant in its success in promoting the adoption of solar energy and its alignment with the climate change goals of the member countries. It also aligned its interventions with the needs of target groups, focusing, in particular, on installing solar PV system, building capacity, and running awareness campaigns. Despite a few challenges along the way, the outcomes were a reduction in electricity tariffs, the creation of green jobs, and enhancements in energy access *(Based on findings #1, 2 and 3)*.

Conclusion 2: Significant infrastructural, financial, technical, regulatory, geographical, and capacity hurdles hindered progress in the adoption of RE. In particular, challenges such as insufficient infrastructure, high upfront costs, limited financing, inconsistent policies, bureaucratic hurdles, and inadequate incentives impeded the expansion of RE infrastructure. Collaboration with various entities made for a coherent approach, yet limited involvement from academia was a missed opportunity. By leveraging partnerships and networks, the project enhanced national capacity *(Based on findings #2 and 4)*.

6.2 Coherence

Conclusion 3: The project's activities and strategies align well with its objectives, ensuring coherence between its actions and outcomes. Close collaboration with stakeholders led to the development of activities which addressed gaps in the RE targets of PICs. Key strategies facilitated effective implementation, and public outreach efforts enabled the project to connect with policymakers to emphasize the importance of RE adoption *(Based on finding # 5)*.

Conclusion 4: The project's core issues align closely with UNDP's foundational documents, the national priorities of PIDF member countries, and other relevant projects. The project's goal mirrors the goals of many existing policies and commitments, all of which focus on mitigating climate change impacts through promoting RE technologies. However, implementation was challenged due to the absence of complementary policy measures and to the fact that resources were limited in comparison to the pace of progress. As a result, translating policy into practice was somewhat challenging *(Based on finding # 6)*.

6.3 Effectiveness

Conclusion 5: The project successfully installed 12 solar PV systems in 10 member countries, reducing 9600 ton GHG (in 25 years) and lowering electricity tariffs by 30%. Training initiatives surpassed the targets, and significant numbers of women and youths were involved. The project enhanced the capacity of member countries to adopt sustainable energy through various activities and the robust dissemination of project-

related information, a measure that increased awareness. The wide number of other strategies for improving effectiveness, including fostering ownership, comprehensive procurement packages, and effective gender mainstreaming, suggest that, as much as possible, strategies should be multiple and flexible *(Based on findings #7, 8 and 9)*.

Conclusion 6: The project's success was attributed to strong partnerships and clarity in stakeholder roles, as well as to the ability to draw from previous project experiences, leveraging expertise from SHoS and UNDP. The project faced challenges due to the pandemic, natural disasters, and socio-political changes, all of which, at various times, delayed procurement, shipment, and hiring. Despite the challenges, the project achieved its outputs through effective engagement and collaboration with stakeholders. External factors such as policy mandates, the need for RE, and investments helped the project succeed, but they were offset by challenges such as disruptions in supply chains, political shifts, and limited experience *(Based on findings #7 and 10)*.

6.4 Efficiency

Conclusion 7: The project spent around 98% of its allocated budget, completing all activities except for ten official inauguration ceremonies of completed sites. The project also effectively coordinated operations, assigning PIDF a pivotal role. The UNDP took overall responsibility for the project and made internal adjustments. Collaboration with partners in the humanitarian sector helped keep increases in the cost of logistics at a minimum. The project's management structure and M&E system played crucial roles in the project's achieving the expected results. The PB and TWGs oversaw equipment safety, streamlined implementation, and addressed risks effectively. The project delivered value for money, efficiently utilizing the resources available by adopting strategic procurement practices, reallocating resources, and addressing unforeseen expenses *(Based on findings # 7, 8 and 9)*.

Conclusion 8: Frequent turnover in leadership and staff posed significant challenges, even impacting decision-making and project delivery. Other challenges included inadequate financial planning and unforeseen costs, such as UXO work in the Solomon Islands. Prolonged pandemic-induced travel restrictions disrupted the procurement and shipment of solar equipment and thereby delayed implementation. The project also faced challenges in adjusting procurement costs and managing supply chain disruptions. Mobilizing the media is essential to disseminate the project's best practices on a broader scale *(Based on findings # 7 and 10)*.

6.5 Sustainability

Conclusion 9: The project encountered various financial, social, political, legal, technological, disaster-related, and environmental risks right form inception, but by implementing proactive risk management strategies, including financial planning, adherence to social and environmental safeguards, and stakeholder engagement, it was able to ensure the sustainability of its outputs *(Based on finding # 12)*.

Conclusion 10: Promising signs of sustainability beyond the project's duration were observed at both the system and government levels. Local technicians were trained to perform regular maintenance, and partnering local companies ensured that the project would have technical support in the future. The establishment of national TWGs and procedures for handling equipment over to them contributed to government-level sustainability. Governments and stakeholders demonstrated commitment to maintaining and replicating the project's initiatives. This commitment is reinforced by national commitments to zero emissions and significant investments in RE initiatives across the region. Although aspects of sustainability are mentioned throughout the intervention design, there was no dedicated section on a sustainability plan and exit strategy, an oversight that could affect project longevity. Coordinate with the DoE to prepare a comprehensive handover package aimed at ensuring the sustainability of solar PV sites. Establishing O&M funds through partnerships between public and private sectors, as well as training local electricians, could significantly enhance the sustainability of the solar PV system *(Based on finding #12)*.

Conclusion 11: Throughout the period of project implementation, potential risks were meticulously assessed and documented in a comprehensive risk log. Then corresponding mitigation measures developed to safeguard the project's overall performance and achievements. A total of 12 risks were identified. They were categorized into design, logistics, policy/protocol, finance, and disaster-related risks. Specific strategies

were implemented to address specific risks. Finding 1The submission and approval of designs were made compulsory, and logistics were streamlined by relying on approved companies and planning in advance for storage and shipments. Contingency funds were allocated for unforeseen costs, including UXO clearance and adaptation to evolving international standards. Clear communication protocols were established, and financial oversight was enhanced through project forecasting and third-party managerial authority. The project also accommodated pandemic-related delays and ensured environmental compliance, emphasizing through its action the need for resilience to address challenges. Creating a unified package within the contract roster of potential vendors and suppliers, in coordination with private entities, and establishing LTAs alongside sustainability measures and an exit strategy could help mitigate potential challenges. However, it's worth noting that insurance schemes currently aren't in place to adequately cover damages *(Based on findings #11, 12 and 14)*.

Conclusion 12: The project successfully implemented UNDP's SES to address programmatic risks and ensure compliance across various phases, including logistics, design, procurement, installation, operation, and recycling/reuse. Stakeholders did not express any concern about the adverse social impacts of solar PV system installations. Within the SES framework, five low-category risks were identified and mitigated. System designs, the project made sure, complied with SEIAPI, installation standards were adhered to, automated systems were established, and end-users were trained in O&M. In addition, safe disposal was collaboratively embraced. Additional documentation and inspection protocols were employed to prevent social and environmental risks *(Based on findings # 12 and 13)*.

6.6 Impact

Conclusion 13: The project's achievement of its output-level indicators contributed significantly to climate change mitigation. The project successfully achieved its target of installing 12 solar PV systems and plan to eliminate 9,600 tons of GHG emissions in 25 years, making a substantial contribution to climate change mitigation efforts and electricity tariffs declined by 33%. It directly benefited over 232 individuals, and an additional 16,228 indirectly. Notably, more than 32% of the total beneficiaries were women, indicating a positive trend in women participation in the RE sector. Emphasizing RE technologies, the project reduced carbon emissions, promoted a low-carbon trajectory, and improved power accessibility. Member countries replicated best practices and expanded RE initiatives. The project aligned with Paris Agreement goals, strengthened South-South cooperation, and supported member countries in achieving their NDCs and SDGs, notably SDG 7 and SDG 13 *(Based on finding #19)*.

Conclusion 14: The project created green jobs, reduced electricity tariffs, and promoted sustainable development, demonstrating a green recovery following the COVID-19 pandemic. Through a comprehensive "whole-society approach," it effectively addressed synergies and inter-linkages among stakeholders across sectors *(Based on findings #20 and 21)*.

6.7 Cross cutting issues

Conclusion 15 (human tights): The project prioritized a human rights-based approach which emphasized stakeholder participation and representation in every stage of planning and execution. Despite focusing on installing solar PV systems in the residence of heads of state, the project tried to mitigate human rights risks and enhance benefits for marginalized groups through awareness and capacity-building initiatives, too. Those who were consulted did not report that there had been any human rights violations. On the contrary, they mentioned that the project paid equal wages and implemented safety, thereby demonstrating a strong commitment to human rights considerations. However, limitations were noted in using the HVCA tool to identify sites and assess risks. The project has room to improve its risk assessment methodologies *(Based on finding #22)*.

Conclusion 16 (Gender equality and leaving no one behind): The project advanced gender equality and women's empowerment. In particular, it initiated GESI policies in member countries and incorporated gender markers into outputs to enhance women's engagement in the energy sector. Challenges persist in ensuring the equal participation of women, however, making continued efforts essential *(Based on finding #23)*.

Conclusion 17: Areas of improvement include conducting "women's safety audits" utilizing tools like the "gender and age marker toolkit" and conducting scenario-based costing studies to deepen understanding of GESI. In addition, there is a need to advocate for policy reforms that aim to strengthen GESI in RE projects and development endeavors more broadly *(Based on finding #23)*.

Conclusion 18 (Disability): The project actively engaged PwDs throughout the project cycle, aiming for positive impacts despite the challenge posed by the lack of disaggregated data. Stakeholders emphasized providing inclusive services through capacity-building initiatives as well as tailoring activities and working from accessible venues. The project's user-friendly solar PV system app was praised for its inclusivity. Areas of improvement include offering capacity-building trainings in GEDSI considerations, as well as integrating disability-related policy provisions into training curricula, drawing upon frameworks like the Pacific Framework for the Rights of Persons with Disabilities (2016–2025) to do so *(Based on finding #24)*.

Conclusion 19 (Climate change action): The project mitigated environmental risks. No data analysis of stakeholder consultation rose any intimation that there had been any adverse environmental effects. The project made significant contributions to climate change mitigation outcomes and bolstered national and local capacity through review sessions. The project's environmental sustainability was attributed to its having employed an 'environmental mainstreaming framework' across solar PV components and provided comprehensive O&M training. Mitigation measures included careful site selection, slope protection, and safe installation practices, such as integrating features like I-hooks into CGI-roofed houses so they would be more likely to withstand cyclones *(Based on finding #25)*.

Chapter 7. Recommendations

Below are some recommendations for (i) streamlining current phase and (ii) future programming of similar projects.

7.1 To streamline the remaining work of current phase

a. Prioritize the consolidation of remaining project tasks and the development of a comprehensive handover package before project closure to systematize successful initiatives (in coordination with UNDP with PIDF, SHoS, Solaria with DoE): Assign specific staff members of the UNDP MCO to serve as 'focal person' to oversee the consolidation of the remaining tasks and draft 12-week consolidation plans, starting from April 1, 2024. Initiate these plans and mobilize the media to publicize the remaining inaugurations under the leadership of the communication section of UNDP. Ensure that technical issues are addressed through TWGs and DoEs and are consistently monitored by UNDP staff from other RE projects in the member countries. Develop protocols for transferring equipment and assets to DoEs. Hold weekly meetings at the UNDP MCO to track progress under the leadership of the designated 'focal person' until all systems have been inaugurated. Along with helping to install solar PV system, prepare a comprehensive handover package comprising all relevant knowledge resources and outreach materials, such as reports, studies, policy briefs, plans, assessments, and other pertinent documents to be delivered in both print and digital formats to the DoEs of all member countries. Ensure that digital copies are properly archived within government systems and websites for future access and reference *(Conclusions # 5, 7 and 10)*.

7.2 Future programming of similar nature of project

b. Enhance the capabilities of project partners, and other stakeholders in both technical and non-technical domains through a comprehensive analysis of capacity gaps (in the lead role of UNDP): Before initiating a project, UNDP should conduct a thorough assessment of the institutional capacity of 'implementing partners' to identify and address gaps in both their technical and non-technical skill sets. Ensure that project partners possess relevant experience and technical proficiency. Engage the UNDP and other relevant stakeholders to provide timely and sufficient support, including technical expertise and resources. Emphasize that capacity-building serves as a 'means' and is not an 'end' in itself. In collaboration with the communication section and relevant media house, organize awareness-raising events and campaigns and develop radio jingles and public service announcements to dispel misconceptions about the resilience of solar PV systems in cyclone-prone regions. Focus on building the capacity of a wide range of stakeholders, including government agencies, suppliers, installers, contractors, technicians, and practitioners. Conduct short training courses and follow them up with refresher courses and drills designed to address technical errors and bolster confidence. At the conclusion of the project, arrange a policy workshop, similar to what this project has

done, to disseminate the project's overall accomplishments and exchange experiences in capacity-building, strategy development, and policy work among relevant stakeholders. Allocate resources for O&M funds (USD 2500 at each installation site), utilizing remaining budget and activate this fund through a jointly managed bank account between the DoE and the UNDP. Under the leadership of the DoE, arrange training sessions on decarbonization through energy efficiency for relevant public- and private-sector entities. Provide specialized training for local electricians (including women electricians), focusing on system installation and maintenance in collaboration with private entities. Ensure that rosters of such electricians are maintained to facilitate prompt mobilization for O&M whenever needed. Engage the private sector and academia in training programs, workshops, and meetings to foster their involvement in solar PV markets *(Conclusions #1, 2, 5, 7, 10, 15 and 19)*.

c. Emphasize technological aspects, and develop sustainability plan and exit strategy to ensure the sustainability of solar PV systems (in coordination with UNDP with partner agencies): To streamline processes and mitigate the potential shifting of blame among vendors if a plan fails to materialize, devise a unified package in the contract itself that encompasses all project phases. Utilize the HVCA tool to pinpoint optimal locations for solar PV installations, evaluate risks, and identify vulnerabilities stemming from various hazards. Compile a roster of potential vendors and suppliers in coordination with private entities and establish LTAs with them beforehand to expedite administrative procedures and improve time- and cost-efficiency. Offer comprehensive bundled services to vendors under LTAs, covering site assessment, system design, procurement, logistics, installation, testing, commissioning, and O&M training. Facilitate collaboration between installer and local companies (or technicians if no local companies are available) in member countries through MoUs. Implement an O&M installation and technical support package for a minimum of three years and monitor them from UNDP. Such a package will cost a modest 1% of the total installation cost but will yield significant long-term benefits. Collaborate with government stakeholders to refine a sustainability plan and exit strategy at the first quarter of the project's implementation and operationalize it to ensure the continuity of successful initiatives beyond the project lifespan *(Conclusions #5, 6, 8, 11 and 15)*.

d. Effectively manage and mobilize both human and financial resources by adhering to the provisions outlined in the ProDoc and by establishing an O&M fund (in coordination with UNDP, partner agencies, insurance companies, commercial bank): Minimize changes in the staff of implementing agencies to prevent disruptions in project management. Specifically, allocate human resources as outlined in the ProDoc based on cost rather than in-kind contributions. Also enhance staff capacity through overseas training and study visits that increase motivation and advance careers by allocating resources in the ProDoc itself. When allocating resources to each site, adopt an equity- instead of equality-based approach, keeping in mind the characteristics of installation sites, energy demand, and country context, to tailor-make a suitable design. Allocate O&M costs to address technical challenges, replace equipment, and reinforce best practices. Promote insurance schemes to cover damage in collaboration with insurance companies, such as damage incurred during transit, which manufacturers do not cover. Communicate with commercial banks and similar institutions to explore financing options for scaling up solar PV systems *(Conclusions # 7, 10, 11, 18 and 19)*.

e. *Replicate the best practices of solar PV systems in multi-stakeholder engagement and resource management (in coordination with UNDP, partner agencies, development partners, government agencies, private sectors):* To replicate the successful solar PV systems in government service buildings on a large scale in the future, facilitate the expansion of project investments by leveraging the Pacific Renewable Energy Investment Facility and other relevant entities. Address the lessons learned and develop strategies tailored to align with the specific requirements of local contexts. Foster greater collaboration with the public and private sectors as well as academic and research institutions to encourage the replication of best practices. Incorporate innovative approaches and showcase examples of private industry adoption of clean energy technologies to generate economic growth and create green jobs. Form cluster groups of relevant countries to facilitate the shipping and transportation of solar PV equipment and accessories. Collaborate with development partners such as the World Bank, Asian Development Bank, European Union, Japan International Cooperation Agency, and international agencies like the Secretariat of Pacific Community to consolidate knowledge on the RE sector and to mobilize resources. Expand the scope of the PB by involving officials from the Ministry of Finance, Planning Commission, State Utility Offices, Chamber of Commerce and Academia to diversify expertise and influence. Secure green financing by adopting a public private partnership (PPP) model that aligns with RE sector policies and addresses policy-related obstacles. In particular, use PPP to develop more projects in coordination with Solaria, which has already initiated

projects that contribute to climate change goals and engage multiple stakeholders *(Conclusions # 1, 2, 8, 13 and 14)*.

f. Mainstream gender and disability by developing and operationalizing an inclusive gender action plan and training on a scenario-based gender-responsive costing framework (in coordination with Project, partner agencies, government agencies): To integrate gender considerations effectively into the project's framework, develop and implement a gender action plan aligned with the project's objectives and outcomes. Operationalize this plan by assessing scheduled activities related to gender on a quarterly basis and integrating the findings and associated insights into the project's work plans. Conduct workshops to share the scenario-based gender-responsive costing framework with relevant stakeholders from both the public and the private sectors, as well as project staff and members of the PB. Encourage the diligent application of this framework during project development. Involve government stakeholders in GESI-sensitive planning and budgeting processes, encouraging them to reference the framework for guidance. Provide gender-focused training sessions to stakeholders to deepen their understanding of how women and men interact with their local environment, particularly concerning RE technologies. In the future projects, it is recommended to incorporate 'women's safety audits', utilize the "gender and age marker toolkit", and conduct a 'scenario-based costing study during design phase' to enrich stakeholders' comprehension of various facets of GESI. Take further steps to collect and maintain data disaggregated by sex, age, and disability in collaboration with pertinent government bodies and agencies. Arrange a series of sessions to build capacity in GEDSI considerations and integrate disability-related policy provisions into training curricula using a human rights-based approach *(Conclusions # 5, 15, 16, 17 and 18)*.

g. Contribute to policy advocacy and knowledge management (in coordination with project, partner agencies, and government entities): Develop knowledge products such as concise two-page policy briefs and learning documentation and disseminate them widely to stakeholders to widen the scope of the RE sector under the leadership of UNDP. Review and reform existing policies and regulatory frameworks in the RE sector using backward and forward linkages to facilitate their advancement and adoption and increase the likelihood of securing financing for projects and programs. Make it mandatory for individuals and institutions to generate at least 30% of energy through RE in order to get permission to construct a building. Organize learning-and-review workshops on a quarterly basis, inviting relevant stakeholders to share their experiences and best practices and identify areas for future collaboration, thereby synergizing human and financial resources. Provide technical training and support to strengthen RE-related data management and advocate that national governments establish robust energy management information systems in partnership with private-sector organizations and universities. Compile and share international best practices for managing solar technologies and establish connections so that the PB can access this knowledge. In collaboration with universities, mobilize small grants to university students to conduct research-based case studies and consolidate scattered data on RE and compile policy briefs using data collected before and after solar PV installation. Utilize various media and communication channels, including project websites, Facebook, and TikTok, to disseminate knowledge about solar PV systems through engaging daily posts. Share information about the project's solar PV systems and their potential to reduce electricity tariff through national government display monitors and radio and TV channels *(Conclusions # 4, 6, 11, 17 and 18)*.

Annex-1: Terms of Reference (TOR)

Terminal Evaluation of Solarization of Head of State Residences in Pacific Island Development Forum (PIDF) countries

Duty station: Home based with travel to 2 PIDF member countries (Fiji, Tonga and Kiribati)
Type and duration: International Consultant (30 working days)

1. Background and context

PROJECT INFORMATION		
Project/outcome title	Solarization of Head of State Residences in PIDF member countries	
Project ID	00113240	
Corporate outcome and output	UNPS Outcome 1: Climate Change, Disaster Resilience, and Environment Protection	
Country	Fiji, Tonga, Kiribati, Nauru, Solomon Islands, Vanuatu, Republic of Marshal Islands, Federated States of Micronesia, Palau and Tuvalu	
Region	Asia and the Pacific	
Date project document signed	01st June 2020	
Project dates	Start	Planned end
	01/06/2020	31/03/2024
Project budget	USD 1,310,000 (USD 1,100,000 Cash form Government of India and USD 90,000 In kind from Solaria and USD 120,000 In kind from PIDF and Solar Head of State)	
Project expenditure at the time of evaluation	USD 610,000	
Funding source	Government of India through the India-UN Development Partnership Fund	
Implementing party[32]	UNDP (Direct Implementation Modality) with PIDF as Responsible Party	

The Solarization of Head of State Residences in Pacific Island Development Forum (PIDF) member countries (SoHS project) was launched in June 2020, for an initial period of 24 months funded by the Government of India through the India -UN Development Partnership Fund and extended for 18 months with a completion date of 31 December 2023. It was again extended until 31 March 2024. The multi-country project is implemented by UNDP Pacific Office through Direct Implementation Modality (DIM) with PIDF as the Responsible Party.

The project seeks to facilitate the installation of solar energy infrastructure to power residences of heads of state or buildings of national importance in 11 PIDF member countries (Fiji, Tonga, Kiribati, Solomon Islands, Vanuatu, Republic of Marshall Islands, Nauru, Federated States of Micronesia, Palau and Tuvalu) with an aim to promote clean renewable energy technologies in the Pacific region. The project also seeks to create awareness among policy makers and the public on the need to accelerate the uptake of sustainable energy as part of meeting the energy sector and climate change mitigation targets for the Pacific Region. The project will respond to Outcome 1 of the UN Pacific Strategy 2018 – 2022: By 2022, people and ecosystems in the Pacific, will be more resilient to the impacts of climate change, climate variability, and disasters, and environmental protection is strengthened. The cooperation with the Government of India will contribute to strengthening of South-South Cooperation towards achieving transformational sustainable development across the developing world, with a focus on least developed countries and small Island Developing States.

[32] This is the entity that has overall responsibility for implementation of the project (award), effective use of resources and delivery of outputs in the signed project document and work plan.

The overall project goal is to effectively install solar energy infrastructure to power residences of heads of state or buildings of national importance in 11 PIDF member countries with an aim to promote clean renewable energy technologies in the Pacific region, and awareness among policy makers and the public on the uptake of sustainable energy as part of meeting the energy sector and climate change mitigation targets for the Pacific Region. The outcome will be achieved through 2 expected outputs:

Output 1: Solar based power supplied to executive residences or other publicly-owned buildings of national importance in Fiji, Tonga, Kiribati, Solomon Islands, Vanuatu, Republic of Marshall Islands, Nauru, Federated States of Micronesia, Palau and Tuvalu.

Output 2: Onsite capacity established at the executive residence/buildings of national importance and the PIDF headquarter to successfully operate and maintain (O&M) the solar PV systems on a day-to-day basis and the public is aware of the benefits of solar power.

Key achievements of the project (as of August 2023):

- Completion of installation, commissioning and training at the Bau Chiefly Island in Fiji
- Completion of installation and commissioning at the Fiji State House in Fiji
- Finalization of installation at Solomon, Tuvalu, Kiribati, Tonga, Palau, RMI and Vanuatu
- Delivery of equipment to Fiji, Solomon, Tuvalu, Kiribati, Tonga, Vanuatu, Nauru

Impact of Covid-19 in project implementation:

COVID-19 impacted the project implementation since the governments in PIDF member countries banned entry into the countries mostly from January 2020. Prolonged travel restriction significantly affected the procurement and shipping of the solar equipment to the countries. The cost of planned procurement also needed to be adjusted due to the increase of cost and supply chain disruption which resulted in significant delays in the implementation schedule.

2. Evaluation purpose, scope, and objectives

As this project will be closing by 31st March 2024, the proposed evaluation will assess the relevance and effectiveness of the UNDP's implementation obligation and engagement of PIDF as the responsible party in the implementation process during the project's life and provide specific recommendations for the future course of actions. The terminal evaluation is scheduled in 1st quarter of 2024 as planned in the UNDP 2024 Evaluation Plan. The overall purpose of this terminal evaluation is to assess the project results achieved and lessons learned from the project and provide specific recommendations for future course of action, and will be conducted with great emphasis on: accounting for results (i.e., to what extent have the intended results been achieved); impact and sustainability; review progress towards the project's objectives and outcomes; assess the efficiency and cost-effectiveness of how the project has moved towards its objectives and outcomes; identify strengths and weaknesses in project design and implementation; and provide recommendations on design modifications that could have increased the likelihood of success, and on specific actions that might be taken into consideration in designing future projects of a related nature. The evaluation would also assess: the project's sustainability, impact of COVID-19 on project's implementation, and project's contribution to gender equality and women's empowerment. The evaluation will be used for learning and accountability, and to contribute to the UNDP and Government of India decision-making regarding further engagement for future initiatives.

Scope of the Evaluation:

Unit of analysis (full project/programme/ parts of the project/programme; etc.)	Solarization of Head of State Residences in PIDF member countries project)
Time period of the project/programme covered by the evaluation	June 2020 to February 2024
Geographical coverage of the evaluation	Fiji, Tonga, Kiribati, Solomon Islands, Vanuatu, Republic of Marshall Islands, Nauru, Federated States of Micronesia, Palau and Tuvalu

The terminal evaluation will cover the full scope of the project and its geographical coverage in Fiji, Tonga, Kiribati, Solomon Islands, Vanuatu, Republic of Marshall Islands, Nauru, Federated States of Micronesia, Palau and Tuvalu. The evaluation will focus on OECD-DAC criteria viz. relevance/coherence, efficiency, effectiveness, impact, and sustainability of the intervention. In addition, the evaluation will assess how the intervention sought to mainstream gender and social inclusion issues, particularly in the capacity development for O&M of installed solar equipment and public awareness related activities on benefit of solar power as a renewable source of energy. Mainly, the evaluation should at least cover the following areas:

- ***Relevance of the project***: Assess the appropriateness of the project *design* particularly project's objectives, Theory of Change, Results and Resource Frameworks as it relates to the achievement of project objectives, its linkages with the government's national strategic policies, plans, and challenges it intends to address.
- ***Effectiveness and efficiency in project implementation***: Evaluate the project's overall objectives, and assess the project's direct and indirect accomplishments (results) including no. of solar installations successfully completed, number of people trained, level of awareness raised among public and policy makers, any specific gender results and its contributions towards the achievement of the anticipated outcomes, including any constraints on its *effectiveness*, and any unintended outcomes.
- ***Impact of the project***: Assess the quality of direct such as operational efficiency of the solar systems installed, achievement of energy savings from installations, capacity training provided to O&M the solar installation and level of awareness created among policy makers and the public on solar power as a source of renewable clean energy. The evaluation will also assess indirect results such as mainstreaming of gender equality and social inclusion aspects in policies and strategies, structures, preparedness activities, capacity enhanced to the target group, enhancement of partnership and engagement, increment of functional efficiency of the target institutions, and assess the specific impact of the project on gender equality both direct and indirect results.
- ***Coherence of the project***: alignment with UNDP's core documents (e.g., UNDP SRPD/CPD), national priorities (e.g national development plans), and other related UNDP, UN, and Development Partner projects.
- ***Sustainability of the project interventions***: assess the positive impacts for sustainability and replication of best practices and lessons learned to other regions in the countries.
- ***Project management and implementation arrangement:*** Assess the management and implementation arrangement of the project and distribution of responsibilities within the given structure, including financial and human resource management, monitoring and oversight as well as the *risks* and risk management strategies in terms of their contribution to the delivery of project results in accordance with the project's log-frame and Results and Resources Framework (RRF);
- Identify and examine ***key external factors*** beyond the project's control that have contributed to the program's successes and failures.
- Document ***specific lessons learnt*** in the design, implementation, management and monitoring of the project, gender mainstreaming that will add value to similar projects in the future.
- Assesses the impact of the project on ***gender equality*** and include recommendations on gender equality and women's empowerment cutting across effectiveness, efficiency, sustainability and lessons learnt on gender equality and women's empowerment.

3. Evaluation criteria and key guiding questions

As discussed in section 2, the terminal evaluation will adopt the six revised evaluation criteria by the Development Assistance Committee (DAC) of the Organization for Economic Cooperation and Development (OECD) – Relevance/Coherence, Effectiveness, Efficiency, Impact and Sustainability. Moreover, additional cross-cutting criteria such as Human Rights, Gender Equality and leaving no one behind, and climate change action will also be included.

The evaluation will address the following main evaluation questions:

- To what extent has the project achieved (or is likely to achieve) its intended objectives? What factors contributed to or hindered the project's performance and sustainability of the results?
- To what extent was the project relevant and effective in relation to the contribution of foreseen strategies and theories of change to achieve accelerated uptake of sustainable energy as part of meeting the Pacific Island Countries' ambitious energy sectors and climate change mitigation targets?
- To what extent the project contributed in mainstreaming gender in capacity development on O&M of solar installations, and increased public awareness on the benefits of solar power as a source of clean renewable energy?

The guiding questions outlined below should be further refined by the evaluation consultant and agreed with UNDP and stakeholders prior to commencing the evaluation.

4. Approach and methodology

The suggested evaluation approach and methods are indicative only. The specific design, methods and tools for the evaluation should be finalized and proposed by the evaluation consultant in the inception report, following consultations with the programme unit and review of the project related documents and reports. The method and tools should be appropriate and feasible to meet the evaluation purpose and objectives and answer the evaluation questions, given limitations of budget, time and data. The method and tools should be context-

sensitive and adequately address any issues of human rights, gender equality and climate change action. The terminal evaluation should build upon review of the available project documents, field visits, interviews and meetings, questionnaires surveys and like if deemed appropriate which would provide an opportunity for more in-depth analysis and understanding of the project. The evaluation consultant is expected to frame the evaluation using relevance/coherence, effectiveness, efficiency, impact, and sustainability criteria.

The evaluation should employ a mix-method: a combination of qualitative and quantitative evaluation methods and instruments, and the evaluator is expected to follow a *participatory and consultative* approach that ensures close engagement with the evaluation managers, implementing partners and direct beneficiaries (both men and women). The evaluation consultant must provide evidence-based information that is credible, reliable, and useful.

Thus, the evaluation consultant is expected to work closely with the UNDP Country Office during evaluation process. The following data collection methods, but not limited to, could be used, or the evaluator may propose other suitable data collection methods in the inception report.

- **Document review -** a review of all relevant documentation, inter alia
    - Project document (contribution agreement).
    - Theory of change and results framework.
    - Programme and project quality assurance reports.
    - Annual workplans.
    - Activity designs.
    - Consolidated quarterly and annual reports.
    - Results-oriented monitoring report.
    - Highlights of project board meetings.
    - Technical/financial monitoring reports.
    - Knowledge management products (case studies, success stroes, etc)
- **Interviews and meetings** with key stakeholders (men and women) such as key government counterparts in the beneficiary countries, donor community members, representatives of key civil society organizations, United Nations country team (UNCT) members and implementing partners:
    - **Semi-structured interviews,** based on questions designed for different stakeholders based on evaluation questions around relevance/coherence, effectiveness, efficiency, and sustainability.
    - Key informant and **focus group discussions** with men and women, beneficiaries and stakeholders as appropriate in the beneficiary countries.
    - All interviews with men and women should be undertaken in full confidence and anonymity (with their prior consent). The terminal evaluation report should not assign specific comments to individuals.
- **Questionnaires** survey including men and women participants in development programmes, UNCT members and/or questionnaires surveys and to other stakeholders at strategic and programmatic levels. Online questionnaires can be developed and used in order to help collect the views of additional stakeholders (e.g. trainees, counterparts, partners, etc.), if deemed appropriate for the beneficiary countries.
- **Field visits** and on-site validation of key tangible outputs and interventions in selected sample of beneficiary countries (at least two beneficiary countries).
- **Other methods** such as outcome mapping, and observational visits, etc.
- **Data review and analysis** of monitoring and other data sources and methods. To ensure maximum validity, reliability of data (quality) and promote use, the evaluation consultant will ensure triangulation of the various data sources.
- **Gender and human rights lens**. All evaluation products need to consider any gender, disability, and human right issues that emerged during project implementation.

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 fully discussed and agreed between UNDP, key stakeholders, and the consultant.

5. Evaluation products (deliverables)

The outputs expected from the evaluation consultant is in the following detailed timeline and schedule for completion of the evaluation products, with detail of the length of specific products (number of pages). These products could include:

- **Evaluation inception report–** A brief narrative of the evaluation methods used and the limitations. Describe the different data collection methods used. A detailed evaluation/matrix or framework (Matrix

representation of evaluation criteria, question types and sources of data, data collection technique, including data limitations). The evaluation matrix could be annexed or included under the methodology section. This will also be carried out following and based on preliminary discussions with UNDP after the desk review and should be produced before the evaluation starts (before any formal evaluation interviews, survey distribution or field visits) and prior to the country visits in the case of international consultant.

- **Evaluation debriefings.** Immediately following an evaluation, UNDP may ask for a preliminary debriefing and findings.
- **Draft evaluation report**.
- **Evaluation report audit trail.** The programme unit and key stakeholders in the evaluation should review the draft evaluation report and provide an amalgamated set of comments to the evaluator within an agreed period, as outlined in these guidelines. Comments and changes by the evaluator in response to the draft report should be retained by the evaluator to show how they have addressed comments.
- **Final evaluation report.**
- **Presentations to stakeholders and/ or evaluation reference group** (if required).
- **Evaluation brief and other knowledge products** or participation in knowledge-sharing events, if relevant to maximise use.

Final payment is based on the approval of the terminal evaluation report by the UNDP. It is understood that if needed multiple drafts may be required until the final approval.

The Evaluator/individual consultant should provide clear methodology, updated resumes, work samples, references shared to support claims of knowledge, skills, and experience. Evaluator' independence is compulsory. Individual consultant involved in designing, executing, or advising any aspect of the intervention that is the subject of the evaluation will not be qualified.[33]

6. Evaluation ethics

This evaluation will be conducted in accordance with the principles outlined in the UNEG 'Ethical Guidelines for Evaluation'. The consultant 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 consultant 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 with the express authorization of UNDP and partners. Consultants will be held to the highest ethical standards and must sign a Code of Conduct upon acceptance of the assignment.

7. Implementation arrangements

The principal responsibility for managing this terminal evaluation resides with the UNDP Pacific Office, Fiji. This Office will contract the consultants and ensure the logistic arrangements within the selected countries for the evaluation consultant. The selected consultant will report to the MPO and Evaluation Reference Group (ERG) which will comprise of government representatives, at least one donor representative and UNDP representatives. The Evaluation Manager will provide technical guidance on evaluation and ensure an independent evaluation process, and that the policy is followed. The project manager will provide required information, furnish documents for review to the evaluation consultant and provide logistical support. They will also be responsible for the terminal evaluation's logistic arrangements, setting up stakeholder interviews, arranging consultations, coordination with the Government, etc.

After signing the contract, UNDP will brief the evaluation consultant upon commencing the assignment on the terminal evaluation's objectives, purpose, and expected outputs. Key project documents will be shared with the evaluation consultant. The evaluation consultant should review the relevant documents and share the draft inception report before the commencement of the field mission or data collection. S/he should revise the methodology, data collection tools and review questions. The final methodology and instruments should be proposed in the inception report, including the evaluation schedule and evaluation matrix that guides the terminal evaluation's overall implementation. The inception report submitted by the evaluation consultant should be approved by ERG prior to the commencement of the evaluation process. The terminal evaluation will remain fully independent. A mission wrap-up meeting will be organized during which comments from ERG members, participants and stakeholders will be noted for incorporation in the final report. The draft report will be reviewed by the ERG, concerned stakeholders and provide their comments.

[33] For this reason, UNDP staff members based in other country offices, regional centres and headquarters units should not be part of the evaluation consultant.

The international consultant will maintain all communication through the Evaluation Manager/ERG. The Evaluation Manager/ERG should clear each step of the evaluation. The consultant will be responsible for updating the ERG team on the progress of the evaluation on a fortnightly basis and deliverables must be approved as satisfactory by the ERG.

8. Duration for the evaluation process

The envisaged duration of the consultancy is a total of **30 persons days for international consultant** spread over February-March 2024. This includes desk reviews, primary data collection, field work, and report writing.

Use of terminal evaluation results

The findings of this terminal evaluation will be used to analyze the lessons learned and the way forward for the future design of the next phase of this project (if need be) and similar projects. Therefore, the terminal evaluation report is expected to provide critical and constructive findings and recommendations for future interventions.

9. Application / submission process and criteria for selection

It will be mentioned in advertisement with selection criteria.

10. Annexes

The following ToR Annexes will be provided to the selected evaluation team upon signing the contract.

- **Relevant Documents**: Relevant national strategy documents, Project Document, multi-year and annual work plan, Annual Work, Project Progress Reports, Financial Reports, Organizational Structure, knowledge products, baseline reports, monitoring reports, partnership arrangement, previous evaluations and assessments, UNEG norms and standards and other policy documents etc.
- **Key stakeholders and partners** to be engaged during evaluation process: A list of key stakeholders and other individuals who should be consulted, together with an indication of their affiliation and relevance for the evaluation and their contact information.
- Inception Report content/outline template including evaluation matrix
- Evaluation audit trail form
- UNEG Code of Conduct to be signed by the evaluation team
- Evaluation report quality assessment check list

Annex-2: List of people interviewed

During the field mission, TE Consultant met and interviewed the following individuals to gather primary information. The list comprises their names, positions, and genders, denoted by "M" for men and "W" for women.

Solar Head of State (SHoS)

1. James Ellsmoor, Director and Co-Founder (M)
2. Dustin Jolley, Member of Board of Directors (M)
3. Raizal Rizwaan Ali, Project Manager (Based in Fiji) (M)

Head of State, Fiji

4. Kiti Temo, Official secretary (W)
5. Warrisea Kirwsaravi, Properties Officer (M)
6. Makelosi Nagali, Properties Clerk (W)

Women Council of Tonga

7. Ubaina, Administrative Officer (W)
8. Faludino Vaga, Handicraft In charge (W)
9. Pasimati Vaga, Handicraft facilitator (W)

Department of Energy, Tonga

10. Ofa Sefauna, A/Director of Energy (M)
11. Emeline Laumanu, Energy Efficiency Specialist (W)
12. Samiuela Matakaiongo, Principal Secretary Renewable Energy (M)
13. Filimone Fifita, Energy Officer (M)

Tonga Power Limited (TPL)

14. Viliami Palaki, Manager (M)

FCCC

15. Shalvin S. Chand, T.R Inspector (M)

16. Avneet Singh, Sr. Market Analyst (Energy) (M)

CBS Power Solution
17. Amit Singh, Director (M)

UNDP MCO
18. Yemesrach Workie, DRR (W)
19. Merewalisi Laveti, Program Management Oversight, MPO (W)
20. Emmilia Tuiwawa, Program Management Oversight, MPO (W)
21. Dr. Mohseen Dean, Program Analyst (M)
22. Kiye Mwakawago, Program Advisor (M)
23. Rusiate Ratuniata, Program Analyst (M)
24. Marlyn Omondi, Program Analyst (W)

India High Commission in Fiji
25. Neerupama S. Karaha, Second Secretary (W)
26. Bibhash Lalri, Second Secretary (M)
27. Guriya Kumari, Attache (W)

Nauru High Commission in Fiji
28. Michael Aroi, High Commissioner (M)

PIDF
29. Marilyn Tagicakibau, Director Climate Advisor (W)
30. Peni Torowale, Administration Officer (M)
31. Viliame Kasanawaqa, Director Island Resiliance (Ex PIDF Employee was Project Coordinator) (M)

PM Office
32. William Pawa, PCO/OPM (M)

Department of Energy
33. Joeli Valemei, PSO-DoE (M)

DoE, Kiribati
34. Miriam Iakobwa, Electrical Planner (W)
35. Teweiariki Tebuka, Electrical Planner (M)
36. Thompson Burentarawa, RE Engineer (M)
37. Buremanata temamufuna, Energy technician (M)

International Solar Alliance (ISA)
38. Sandeep, Program Head (W)
39. Shalvin, Senior Program Implementation Specialist (M)

FSM
40. Faustino Yarofaisug, Assistant Secretary, Depart of Energy (M)

Tuvalu
41. Simona Kilei, Director Department of Energy (M)

Private Financing Advisory Network (PFAN)
42. David Eyre, Regional Coordinator Pacific (M)

Annex-3: Mission itinerary

Date (March)	Day	Mission Countries	Activities	Details on mission agenda
08	Fri	Travel to Fiji from Kathmandu	Travel	• Desk review
09	Sat	Travel to Fiji from Singapore	Travel	• Desk review
09	Sat	Travel to Fiji from Nadi	Travel	• Desk review
10	Sun	Reached Fiji	Travel	• Desk review
11	Mon	Fiji	Interviews/ Meeting	• UNDP MCO

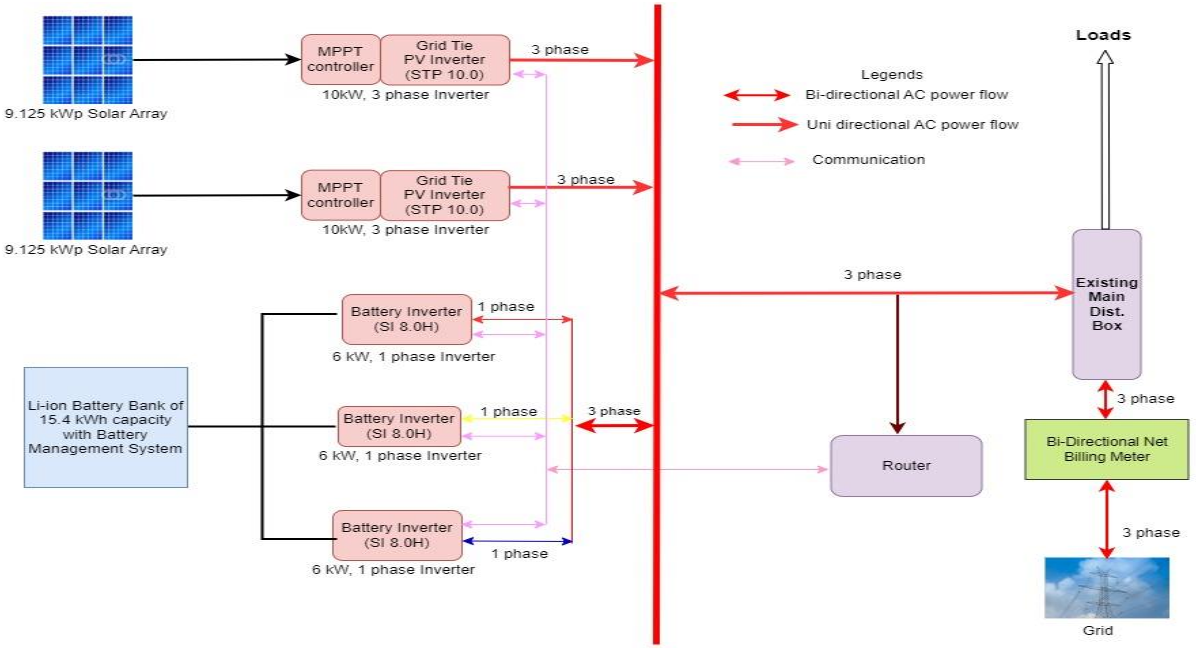
				• Head of State (meeting and system observation)
12	Tues	Travel to Fiji	Interviews/ meeting	• PM Office • DoE office • PM residence installation site
13	Wed	Fiji	Interviews/ meeting	• FCCC • PIDF
14	Thu	Fiji	Interviews/ meeting	• High Commission of Government of India • High Commission of Government of Nauru
15	Fri	Fiji	Interviews/ meeting	• Board Member • TWG members
16	Sat	Tonga	Evaluation mission at Tonga	• Reached Tonga
17	Sun	Tonga	Evaluation mission	• Carry out capacity need assessment of private sector • Assess the scaling-up opportunity • Observation of solar PV installation site at National Women Council (beneficiary)
18	Mon	Tonga	Interviews/ meeting	• KIIs with Officials of DoE • KIIs with Tonga Power Limited • Travel back to Nadi in the evening
19	Tues	Nadi, Fiji	Interviews/ meeting	• Meeting with Women Council of Tonga
20	Wed	Nadi, Fiji	Data synthesis and analysis	• Work on the report
21	Thur	Kiribati	Travel	• Meeting with DoE officials
22	Fri	Kiribati	Site observation	• Solar V installation site at Head of State's residence
23	Sat	Kiribati/ Nadi,Fiji	Work in Fiji	• Work to fulfil the data/evidence gaps
24	Sun	Reached Fiji	Work in Fiji	• Work to fulfil the data/evidence gaps
25	Mon	Fiji	Meeting/workshop	• Participate in policy workshop
26	Tues	Fiji	Meeting/workshop	• Participate in policy workshop
27	Wed	Fiji	Travel back to Nepal	• Travel, write up the report
28	Thurs	Nepal	Reached Nepal	• Travel, write up the report

Annex-4: List of reports reviewed

- Project document (contribution agreement).
- Theory of change and results framework.
- Programme and project quality assurance reports.
- Annual work plans.
- Activity designs.
- Consolidated quarterly and annual reports.
- Results-oriented monitoring report.
- Highlights of project board meetings.
- Technical/financial monitoring reports.
- Knowledge management products (case studies, success stories, etc.)

Annex-5: Architecture of grid-connected solar PV system

The architecture of implemented system is Grid-connected solar systems, also known as grid-tied or grid-interconnected systems, are photovoltaic (PV) systems that are linked to the utility grid. This type of solar system architecture allows for the seamless integration of solar energy generation with the existing electrical grid infrastructure. The system architecture is given below.



a) The key components of a grid-connected solar system implemented are detailed below:

Solar panels (PV Modules): Solaria make 365Wp of solar panels has been provided to each of installations. These are the primary components that capture sunlight and convert it into electricity through the photovoltaic effect. Solar panels are mounted on rooftops except ground-mounted arrays in Solomon Island.

Inverter: The inverter is a crucial component that converts the direct current (DC) electricity generated by the solar panels into alternating current (AC) electricity, which is compatible with the electrical grid and can be used to power household appliances and feed excess electricity back into the grid. Two no 10kW of grid tied inverter (SMA Sunny Tripower) and three no of 8kW of battery inverter (SMA Sunny Island) are installed in the countries which follows AS/NZ standard. Likewise three no of 6.8kW grid interactive inverter (Schneider Electric XW Pro) with 100 Ampere MPPT controller has been installed in the countries which follows US standard namely Palau, FSM and RMI.

Battery bank: The battery bank stores the excess electricity generated by the solar panels for later use when sunlight is insufficient. BYD make 15.4kWh of lithium-ion battery has been installed to provide the lighting services for emergency lights for limited time. It has been considered that the most of the designated sites have reliable power supply as these buildings are of national importance.

Mounting structures: These structures provide support for the solar panels and ensure proper orientation and tilt angle for optimal sunlight exposure. Rail mounting has been installed on the rooftop expect ground mount in Solomon. Solomon installation also include the fencing around the system.

Grid connection: Grid-connected solar systems are connected to the utility grid through a bi-directional meter, which allows for the flow of electricity between the solar system and the grid. When the solar system generates excess electricity, it can be exported to the grid, and when additional power is needed, electricity can be imported from the grid.

Monitoring and control systems: Monitoring systems track the performance of the solar system in real-time, providing valuable data on energy production, system efficiency, and maintenance needs. Control systems enable remote monitoring and management of the solar system, allowing for optimization of energy production and grid integration. The online monitoring is also installed in the VIP's mobile.

b) Benefits of solar system provided to beneficiaries

Cost savings: By offsetting electricity consumption with solar energy generation, grid-connected systems can significantly reduce electricity bills over time.

Renewable energy integration: Grid-connected solar systems contribute to the adoption of renewable energy sources and help reduce reliance on fossil fuels, thereby mitigating environmental impact and combating climate change.

Grid stability and resilience: Distributed generation from grid-connected solar systems enhances grid stability and resilience by diversifying energy sources and reducing transmission losses.

Overall, grid-connected solar system architecture plays a pivotal role in enabling the widespread adoption of solar energy and transitioning towards a more sustainable and resilient energy future.

Annex-6: Risk log of different risks, likely impacts of those risks and mitigation measures

Risk log of different risks, likely impacts of those risks and mitigation measures

- **MOU Signature Risk:** Delays in signing MOUs were identified as a risk, and constant communication was maintained with Technical Working Groups (TWGs) to push for successful finalisation. PIDF actively engaged with stakeholders to expedite the MOU signing process.
- **Site Confirmation Risk:** To mitigate the risk associated with site confirmation, the project aimed to finalize site decisions during the MOU signature stage. PIDF ensured that project sites were in line with contract requirements, minimising the potential for future changes.
- **Storage Risk:** Risks related to storage in-country were addressed by communicating shipping dimensions and weights to TWGs, facilitating advance planning for storage space allocation prior to equipment delivery.
- **UXO Risk:** Contingency funds were allocated to accommodate unforeseen costs associated with unexploded ordnance (UXO) clearance, ensuring that the project budget could absorb additional expenses if required.
- **Design Risk:** The risk of inadequate design was mitigated by making design a compulsory requirement for the project. PIDF advocated for proper design execution before construction commenced, with UNDP ensuring adherence to quality standards.
- **Payment Delay Risks:** Project forecasting was conducted to anticipate cash flow needs and mitigate the risk of payment delays, ensuring timely allocation of funds for project expenses and contractor payments.
- **Change in Standards Risk:** Contingency sums were allocated to accommodate changes in international standards, such as CEC requirements and AS/NZ standards, ensuring that the project remained compliant with evolving regulations.
- **Chain of Command Risk:** A detailed communication chart for future projects to be clearly outlined for stakeholders and circulated, ensuring clarity in communication channels and approval processes. This chart should be incorporated into the contract document to formalize communication protocols.
- **Finance Management Risk:** Project managers if third party should be granted authority to make financial decisions, and all expenses required approval from the project manager to ensure all expenses are documented, enhancing financial oversight and accountability.
- **Insurance Risk:** Insurance coverage for damaged items should be ensured prior to equipment procurement, mitigating the risk of financial loss due to equipment damage or loss during transportation.
- **Logistics Risk:** Approved logistics companies were communicated to stakeholders and approved by higher management, reducing the risk of transportation delays and cost or logistical complications.
- **Pandemic Risk:** Given the unprecedented nature of the COVID-19 pandemic, the project allowed for sufficient time extensions to accommodate delays caused by pandemic-related restrictions and disruptions, ensuring project continuity and resilience in the face of unforeseen challenges

Annex-7: Process involved in developing and maintaining this public awareness program

- **Phase 1: Announcing MOU signing at key international events**

✓ The first phase of the project awareness occured 2017-2020 with the various announcements of individual countries signing MOUs to be part of the initiative with the PIDF. Each MOU was accompanied by a press release and/or event, particularly leveraging COP23 in 2017 (Fiji's COP) to kickstart the process signing MOUs with Tonga. Subsequently, events were held at COP24 and COP26, and COP27 leveraging the Moana Pacific Pavilion at these events.

✓ e.g. https://www.pcreee.org/article/solar-head-state-initiative-tonga

✓ e.g. https://solarheadofstate.org/press-releases/2017/11/19/cop23-palau-joins-solar-head-of-state

✓ e.g. https://www.pacificclimatechange.net/news/pacific-region-takes-spotlight-cop23

- **Phase 2: Virtual sessions such as the Virtual Island Summit by Island Innovation**

✓ During the pandemic, the project was on hold and there was limited opportunities to promote due to a lack of new developments. During this time, virtual events were held in collaboration with Island Innovation, to organise a number of online sessions at the Virtual Island Summit to discuss renewable energy in the Pacific Region and give a spotlight to the project, inviting key stakeholders.

✓ e.g. https://www.pidf.int/virtual-island-summit/

✓ e.g. https://islandinnovation.co/videos/towards-a-low-carbon-and-resilient-development-in-the-pacific-countries/

- **Phase 3: Announcing projects in coordination with UNDP (Ongoing)**

✓ Final phase individual announcements. Using the launch and completion of each specific project to deliver a press announcement and put a spotlight on renewable energy transition activities in that country.

✓ e.g. https://www.undp.org/pacific/news/launch-solarization-head-state-residences-pacific-islands-development-forum-member-countries

Annex-8: Internal coherence

Countries	Name of projects	UNDP /Donor (tenure)
Fiji	FREF (Mini Hydro) – project is closed under Governance	
Kiribati	Promoting Outer Island Development through the Integrated Energy Roadmap (POIDIER) project	UNDP/GEF
Nauru	Supporting Mainstreamed Achievement of Roadmap Targets on Energy (SMARTEN) project	UNDP/GEF
Solomon Islands	Stimulating Progress towards Improved Rural Electrification in Solomon Islands (SPIRES) project	UNDP/GEF
Vanuatu	BRANTV	GEF
	Vanuatu Energy Transformation (VGET)	Japan
RMI		
FSM	Public-Sector Buildings Energy Efficiency Project	UNDP/GEF (Concluded in Nov 23)
Palau		
Tuvalu	Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu (FASNETT) project	UNDP/GEF
	Solar Home Systems for Funaota project	India-UN Development Partnership Fund (UNDPF)

NB: With assistance from India-UNDPF, the UNDP is currently overseeing a project to solarize the residences of the heads of state of 10 member countries of the Pacific Island Development Forum (PIDF).

Annex-9: RE and NDC targets

Sn	Country	Electricity access, 2017 [access target] (% of population)	RE target (% of total electricity production)	Share of renewables in total electricity generation, 2018	Share of renewables in electricity capacity, 2019	NDC targets
1	Fiji	96% [100% by 2020]	100% by 2036	60%	59%	30% reduction in GHG emissions (20% from RE in electricity conditional and 10% EE)
2	Kiribati	98.6%	45% reduction of fossil-fuel energy generation by 2025	17%	30%	Reduce emissions by 35,880tCO2e annually by 2025 and by 38,420tCO2e annually by 2030 (conditional)
3	Marshall Islands	94.8% [95% by 2020]	20% by 2020, 100% by 2050	~2% from government owned RE; a project underway to reach 9%	5%	Reduce GHG emissions to at least 32% below 2010 levels by 2025 and further to at least 45% below 2010 levels by 2030 (conditional)
4	FSM	80.8% access varies significantly among the 4 states: (Kosrae 98%, Pohnpei 87%, Yap 67%, Chuuk 26%)	30% by 2020	5%	9%	35% reduction in GHG (conditional, 28% reduction by 2025, baseline 2006)
5	Nauru	99.6%	50% by 2020	2%	5%	100% RE on grid by 2050 (61% conditional)
6	Palau	00%	45% by 2025	2%	4%	45% renewable energy (35% EE by 2025, 22% energy sector emissions reductions below 2005 levels by 2025, and 95% conditional)
7	Solomon Islands	62.9% (100% urban and 35% rural by 2020]	20% by 2020	6%	5%	27% reduction in GHG emissions by 2025 and 45% reduction in GHG emissions by 2030 (conditional)

8	Tonga	98% [100% by 2020]	50% by 2020 (70% by 2030)	10%	30%	13% reduction in GHG emission by 2030 compared to 2006 through a transition to 70% RE electricity as well as EE measures (100% conditional)
9	Tuvalu	100%	100% by 2020	23%	42%	NA
10	Vanuatu	62.8% [100% by 2030]	100% by 2030	22%	30%	100% RE in the electricity sector by 2030 (Conditional)

Sources: Access, 2018 generation, and 2019 capacity from International Renewable Energy Agency (IRENA) Statistical Profiles, September 2020, NDC targets [Note: EE-energy efficient]

Annex-10: Evaluation of Project's outputs

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

OUTPUT AND OUTPUT INDICATORS	Baseline value	Target	Achievement
Output 1 – *Solar-based power supplied to executive residences/buildings of national importance in Fiji, Tonga, Kiribati, Nauru, Solomon Islands, Vanuatu, RMI, FSM, Palau, Tuvalu, Timor-Leste and the PIDF headquarters*			
1.1 No. of operational PV systems	0	12	12
Assessment of Indicator 1.1 • Solar PV systems were installed in all 12 sites, but the project has not finished the testing and commissioning processes in Nauru, FSM, Vanuatu, and Palau. It plans to finish by April 15, 2024. Out of total 12 systems, 10 sites were official residences; the other two were the Dialysis Centre in Nauru and the National Council for Women in Tonga. All sites met the criteria and were technically appropriate. The pine trees around the installation at the Fijian prime minister's residence need to be trimmed so that a windstorm does not cause branches to fall on and damage the solar panel. • The project used good strategies to manage the logistical challenge of transporting goods from the US to Fiji and then to the other member countries. Four companies were hired to install solar PV systems: Sunray Electrical & Solar, Dawn Renewables, and CBS Power Solutions Pvt. Ltd., all based in Fiji and Superfly Limited, based in the Solomon Islands. These companies collaborated with local solar companies as much as possible. Seven of the ten member countries adopted Australian standards of installation, but Palau, RMI and FSM followed US standards. The designs of all systems were on-grid with small battery sizes, as is compatible for grid interconnection, either 400/230V or 208/120V to meet the Australian and US standards respectively. While Vanuatu and Tonga had planned to upgrade single-phase supply to three phase supply, the project collaborated with TWGs. In Tonga, the expansion is well under way. • To avoid risks, the project introduced several safety measures. Licensed electricians were employed to do the wiring, and all live electrical components were deactivated during the installation process. In addition, standard color codes for phase identification were used in all electrical connections, and power tools were either double insulated or equipped with grounding systems and polarized cord connectors. Electrical cables placed on floors or the ground were inspected, secured, and shielded from potential damage, and, as a general rule, extension cords were not used in working areas or walkways. Solar panels were switched off, and precautions were taken to ensure that battery banks with 15.4 kWh power would not pose a risk of electrical fire. To reduce risks, the project used large batteries (almost four times the battery management system) in every site except that on Bau Island of Fiji. All users were given step-by-step instructions so that they would be able to follow procedures correctly. They were also given the forms and serial and contact details needed to pursue warranty claims in the case of any future equipment fault as well as the single line diagram (SLD) and commissioning forms needed to cross-check the systems. They were informed about what to inspect after a cyclone to ensure that no damage had been incurred. When lifting solar panels onto sloped tin roof, installers used safety procedures to minimize the chance of a spinal or back injury. Wearing personal protective equipment (PPE), such as electrician's clothing, gloves, helmets, and insulated safety shoes, was mandatory.			
Output 2 *- Onsite capacity established at the executive residences/buildings of national importance and the PIDF headquarters to successfully O&M their solar PV systems on a day-to-day basis and the public made aware of the benefits of solar power*			
2.1 No. of women and men that have built capacity in the O&M of grid-connected solar PV	0	12	74 Men- 56 Women-18
Assessment of Indicator 2.1 • A total of 12 onsite training sessions were organized for 74 individuals, about six times the target. Eighteen trainees (24%) were women. Trainees were equipped with the skills and knowledge they needed to O&M the solar PV systems. The participants were well selected: they represented TWGs, the Ministry of Energy and Mines, the DoE, and other relevant government officials. The training focused on preventive maintenance such as regular site inspection, functionality checks, error messages in inverter and other controllers as well as corrective maintenance such as DC and AC multi circuit breakers, fuses, and other spare part management. The training manuals were good: their rich content was carefully calculated to sharpen the knowledge and			

understanding of users. In Tonga, the solar PV system was installed in National Council for Women, where 20 women generate an income, mostly through weaving and crafting.			
2.2 No. of manuals on the O&M of grid-connected solar PV systems	0	12	12
Assessment of Indicator 2.2 • The project facilitated the development of 12 O&M manuals (a separate one for each installation site) and distributed them to all relevant beneficiaries. These manuals addressed two distinct on-grid systems, namely the SMA and Schneider electric systems, each of which has unique operational features. As these manuals incorporated informative info-graphics and step-wise guideline, they are user-friendly and easy to implement. With their use, the project ensured that beneficiaries possessed the requisite resources and skills to optimize performance and prolong the lifespan of the solar PV systems.			
2.3 No. of news articles in national media	0	48	40[34]
Assessment of Indicator 2.3 • The project used print, electronic, and social media to disseminate its information to a large audience. As of March 25, 40 news articles about the project's major events had been published in national media, including newspapers and home pages. A synopsis of the project is featured under "good practices" in volume one of *Sustainable Development in Small Island Development Status* (2021) and in the "Advancing South-South Cooperation: India's Development Partnerships with Pacific Island Countries" event. In addition, project partners and the governments of Fiji and Palau displayed their achievements at the Moana Pacific Pavilion in COP 27 in 2022. The project's key achievements events were presented to a high-level committee on South-South Cooperation in the UN General Assembly and were published in Twitter and Facebook posts. • By March 2024, 3,980 people had commented on its event post and 162 clicks on its news article, meaning that quite a number of viewers had learned how a solar PV system works and what its overall benefits are. Media advocacy was part of the project's public awareness campaign. Such advocacy facilitated local, national, regional and global outreach efforts, fostered public awareness and the transition towards sustainable energy practices, and enhanced dialogue with policymakers to accelerate progress towards adopting ambitious energy sector and climate mitigation targets. The media helped to champion national leaders who adopted solar energy as well as to encourage the mass adoption of solar and other RE technologies. The project will have published more than the targeted 48 news articles once its remaining installations have been inaugurated.			
Output 3: *Effective and efficient project management*			
Assessment of Output 3 • The UNDP assumed overall responsibility for expediting the procurement and installation of solar PV systems from July 2023. This strategic shift entailed developing a collaborative partnership with the PIDF and placed the UNDP MCO Fiji at the forefront of implementation. Accordingly, the UNDP has been actively coordinating solar PV installation services in collaboration with the PIDF and member countries. It has also met its revised deadlines. • The UNDP appointed a dedicated Project Manager (PM), who then played an instrumental role in ensuring the seamless execution of project activities, providing quality assurance, managing costs, and collaborating and coordinating with relevant agencies for synergy. The project conducted spot checks to ensure the transparency and accountability of its activities. These were completed in February 2024 and the key findings and recommendations communicated to the PIDF for the effective management and optimization of project resources. • In general, the project's arrangements for management and overall implementation were good. Because of several adversities and external factors such as the pandemic and nature disasters and internal factors such as high staff turnover, however, there were several delays. Thus, while the PIDF was to lead implementation according to the plan, the UNDP took over the overall implementation from July 2023 to expedite the procurement and installation of solar PV systems. The numerous institutional changes and high staff turnover rate within the PIDF, too, slowed progress. The project is now progressing well and meeting most of its targets, a fact appreciated by stakeholders.			

Annex-11: Roles and responsibilities of different stakeholders

Solar Head of State (SHoS[35])

- Participate in site assessments according to the established indicators through stakeholder consultation.
- Furnish the system design blueprints, equipment manuals, and comprehensive maintenance and operation instructions.

[34] This will be increased significantly by the end of April. 2024.

[35] Solar Head of State is a non-profit association formed by a team of solar energy activists around the globe. By installing solar energy systems on government buildings, the country's leadership is given first-hand experience with the proven benefits of renewable technologies.

- Conduct a post-installation media and public engagement initiative aimed at enlightening the populace about the advantages of solar energy through demonstration setups.
- Educate local personnel, workers, and volunteers who will aid in the construction, operation, and maintenance of the system.

PIDF and SHoS, with private sector partners

- Procure, construct, and provide project management for the System.

Each of the national government of member countries

- Assist with the ongoing maintenance of the system following its construction.
- Provide facilities and maintenance personnel for training conducted by SHoS on operating and maintaining the System.
- Ensure that their own staff and local laborers are insured by a company subcontracted by SHoS for installation tasks.
- Guarantee the continued maintenance of the System after construction.

Annex-12: Project's impacts due to the leadership vacuum within the PIDF

- **Decision-Making Delays:** Prior to the leadership vacuum, PIDF facilitated communication between UNDP and stakeholders. This streamlined communication reduced confusion and ensured clarity for all parties involved. However, with the leadership vacuum, there was a gap in liaison and decision-making with stakeholders, leading to delays in project progress.

- **Uncertainty and Instability:** While some communication with PIDF was verbal and undocumented, the absence of clear documentation during site visits and meetings with PIDF member states created uncertainty about the discussions and decisions made. This lack of clarity contributed to instability, particularly regarding the progress and direction of the project.

- **Lack of Handover and Confusion:** The replacement of the previous coordinator without a proper handover resulted in confusion about the project's status and progress. Changes to project plans, such as site selections, were made without proper consultation with stakeholders, leading to discrepancies with the project contract and undermining project integrity.

- **Trust Issues and Blame-Shifting:** New representatives from UNDP and PIDF blamed the lack of detailed design on the stakeholders, despite prior efforts by stakeholders to complete designs before procurement. This blame-shifting raised concerns and eroded trust between stakeholders and project coordinators.

- **Lack of Direction and Financial Constraints:** PIDF previously guided the project based on financial constraints and decisions regarding additional costs for unforeseen scope changes. However, without clear leadership, there was a lack of direction on how to address additional costs, such as unexploded ordnance (UXO) works or equipment consolidation, leading to project stagnation.

- **Freeze of Fund Allocation:** With the resignation of PIDF representatives, the release of funds came to a halt, disappointing stakeholders who relied on PIDF's distribution of funds. This freeze in fund allocation further exacerbated project delays and frustrations.

- **Stakeholder Engagement Challenges:** The absence of project coordination at PIDF disrupted the decision-making process for contractor approvals, impacting stakeholder confidence. Communication breakdowns with UNDP also contributed to uncertainty and insecurity among stakeholders regarding project decisions.

Annex-13: The process of reuse/recycle of batteries, assurance of SES and mitigation measures

The process of reuse/recycle of batteries

- Regulations – Finding out from appropriate local authorities on the correct way of disposal of the damaged or end of life equipment e.g. landfilling and hazardous waste management
- Disassembly – using the proper switching to shut down and decommission the system e.g., as per operation and maintenance manuals provided
- Transportation – using the right safety equipment for lifting and vehicle for transporting the equipment to it disposal site e.g., proper lifting methods
- Reuse – using the equipment that is still in good condition which can be used elsewhere such as cables and

breakers and rails.
- Documentation – maintaining proper documentation of the materials replace and when, change of equipment and serials details, drawing to be revised as per change of system wiring

Assurance of SES

1) Site Evaluation Forms: These are documents used to gather data during the assessment of potential sites for installing solar equipment. The forms likely include information such as site characteristics, geographical factors, solar exposure, accessibility, and any environmental or social considerations.
2) Logistics Inspections: Inspections conducted before and after the shipment of the solar equipment. These inspections ensure that the equipment is properly packaged, transported, and delivered to avoid damage. Any discrepancies or damages are documented and addressed to ensure the equipment's integrity.
3) Quality Control (QC) Forms:

- During Installation: QA forms are developed to ensure that installation processes meet specified quality standards. These forms may include checkpoints for verifying proper assembly, wiring, mounting, and safety measures during installation.
- After Installation: Post-installation QC forms are used to identify any defects or issues that may have arisen during or after installation. These forms help in detecting and rectifying any problems to ensure the system functions optimally.

4) Commissioning Forms: These forms are prepared for the final commissioning stage, just before the solar equipment is put into operation:
5) Equipment Parameters and Test Results: Commissioning forms document detailed specifications and performance test results of the installed equipment. This includes parameters such as voltage, current, power output, and efficiency.
6) Switching On: The forms note the condition of the equipment before it's activated or switched on for operation. This step ensures that all necessary checks have been completed, and the equipment is ready for use.
7) Serial Details Documentation:
8) Before shipping out the equipment, all serial numbers and relevant details are meticulously noted. This documentation is crucial for warranty purposes, as it enables thorough checks and verification during the commissioning process and throughout the equipment's operational lifespan.
9) Contractors are required to fill in the final commissioning sheets, where they will refer to these documented serial details. This ensures that all equipment is properly accounted for and validated during the commissioning phase.
10) Additionally, these serial details are intended to be recorded in the operation and maintenance manuals. By including this information in the manuals, future maintenance personnel can easily reference the serial numbers for warranty claims and troubleshooting purposes, thus streamlining the warranty process and ensuring timely resolution of any issues.

Annex-14: Social and environmental risks and measures to mitigate these risks

Social and environmental risks and measures to mitigate these risks

Logistics

- Combining shipping to reduce carbon footprint

Design and Procurement

- Choosing high quality equipment to ensure longevity e.g. SMA, Solaria and BYD are all highly recognised brands
- Compliance with clean energy council regulations
-

Installation

- Compliance with local and internationally recognised standards e.g. AS/NZS, SEIPI
- Prevent overdesigning e.g., adoption of grid supply so that extra energy can be utilised by the surrounding communities. With use of minimum batteries
- Installing system on location and angle where it would receive maximum sunlight

Operation

- Teaching locals on the proper operation and maintenance of the system to keep up with the system to keep system operating at it optimal
- Ensure proper protection in place to ensure safety of the equipment and the operation personnel on site

- Provide paper copies of all operation and maintenance manuals to prevent wastage of paper.

Recycle/Reuse

- Develop strategies to ensure that the system is disposed of as per the local rules and regulation at certified disposal locations
- Ensure proper handling and disposing of all equipment with proper PPE.

Annex-15: Project's key tasks by date/year

Table 1: Project's MoU, feasibility and shipping

Countries	MoU date (following the endorsement from the Cabinet)	Date of "Site feasibility assessments and progress to system design, detail specification for procurement and implementation"	Date of "Shipping of materials"
Fiji	12/12/2022	Not done due to sudden change of site	AUD to FJD 05/07/2022/AUD to FJD (PIDF) 17/03/2023/ETA - 18/05/2023
Tonga	02/12/2020	10/03/2021	Australia to Tonga (Inverters, Battery) 10/10/2022 FJD to Tonga (panels) 15/01/2023/ETA - 04/01/2023
Kiribati	06/11/2017	21/03/2022	AUD to FJD 05/07/2022 FJD to Kiribati 05/01/2023/ETA - 31/03/2023
Nauru	By UNDP	Not Done	AUD to Nauru 03/12/2022 FJD to Nauru 16/02/2022/ETA - 18/01/2023
Solomon Islands	22/07/2020	03/03/2021	FJD to SI (Solar Panels) 20/03/2023 AUD to SI 26/07/2022/ETA - 26/04/2023
Vanuatu	24/10/2022	19/09/2022	AUD to VTU 29/11/2022 FJD to VTU 09/01/2023/ETA - 05/05/2023
Marshall Islands	30/07/2019	08/12/2021	FJD to MI 05/02/2023 AUD to MI 22/11/2022/ETA - 25/01/2023
FSM	By UNDP	5/09/2022	
Palau	14/11/2017	07/09/2021	
Tuvalu	19/05/2021	06/08/2021	AUD to FJD 05/07/2022 ETA - 05/12/2022

Table 2: Mode of meeting of project board and participated countries

Meeting	Date	Mode of meeting	Participants
1	12 August 2020	Face-to-face	Republic of Fiji, Republic of Marshall Islands, Tuvalu, India, UNDP, PIDF, DOE, SHoS
2	2 December 2020	Face-to-face	Republic of Fiji, Republic of Marshall Islands, Tuvalu, India, UNDP, PIDF, SHoS
3	27 August 2021	Face-to-face	Republic of Fiji, Republic of Marshall Islands, Tuvalu, India, UNDP, PIDF
4	16 March 2022	Face-to-Face	Republic of Fiji, RMI, Tuvalu, Govt of India, UNDP, SHoS, PIDF
5	7 December 2022	Hybrid (Physical and online)	India, UNDP, PIDF, Republic of Fiji, Tuvalu, SHoS
6	11 May 2023	Face-to-face	India, UNDP, SHoS, PIDF, Republic of Fiji, Tuvalu
7	30 Nov 2023	Face-to-face	Tuvalu, India High Commission, PIDF, UNDP, SHoS

Sources: Access, 2018 generation, and 2019 capacity from International Renewable Energy Agency (IRENA) Statistical Profiles, September 2020, NDC targets [Note: EE-energy efficient]

Annex-16: Individual project's detail

Country	Bau Island Fiji	Fiji Statehouse	Fiji PM Residence	Kiribati	Tuvalu	Tonga	Solomon Islands	Palau	RMI	Nauru	FSM	Vanuatu
Site Name	*Ulunivuaka Community Hall and the Residence of Ratu Epinasa Cakobau Chiefly Island of Bau*	*Official Residence of the President*	*Official Residence of Prime Minster*	*State House Kiribati*	*Govenor General Official Resident*	*National Women Council, Tonga*	*Govenor General Official Residence*	*Office of the Vice President*	*Office of the President*	*Dialysis Center, Nauru Island*	*President Simina's residence*	*Governor General Residence, Torba Province*
Address	*56 Domain Road, Nasese Suva*	*Queen Elizabeth Drive*	Ratu Sukuna Road, Suva Fiji	Bairiki, Tarwa, Kiribati	*Vaiaku, Funafuti, Tuvalu*	*Nuku'alofa Tonga*	East Kolaridge, Honiara	Madalaii, Koror	*Delap, Majuro Marshall Islands*	Meneng Hotel	Palikir, Pohnpei State, FM	Torba Province
Installer Company	*Sunray Electrical & Solar Address: Rewa SUVA P.O BOX 244 FIJI sunrayelectricalsolar@gmail.com Mr. Sudesh Manohar (+679 8365593)*	*Dawn Renewables Nadi, Fiji paul@dawnfiji.com Mr. Paul +679 2031287*	CBS Power Solutions (Fiji) Pte Ltd Address: Lot 17 Dabea Lane, Valelevu, Nasinu SUVA SUVA 15941 SUVA FIJI amit@cbspowersolutions.com +679 9904480	*Sunray Electrical & Solar Address: Rewa SUVA P.O BOX 244 FIJI sunrayelectricalsolar@gmail.com Mr. Sudesh Manohar (+679 8365593)*	CBS Power Solutions (Fiji) Pte Ltd Address: Lot 17 Dabea Lane, Valelevu, Nasinu SUVA SUVA 15941 SUVA FIJI amit@cbspowersolutions.com +679 9904480	*Sunray Electrical & Solar Address: Rewa SUVA P.O BOX 244 FIJI sunrayelectricalsolar@gmail.com Mr. Sudesh Manohar (+679 8365593)*	Superfly Limited Address: SST Building, Ranadi, Honiara, Solomon Islands HONIARA SOLOMON ISLANDS Mr.Gavin Pereira gavin@climatecatalysts.com.au +61403617934	*Sunray Electrical & Solar Address: Rewa SUVA P.O BOX 244 FIJI sunrayelectricalsolar@gmail.com Mr. Sudesh Manohar (+679 8365593)*	*Sunray Electrical & Solar Address: Rewa SUVA P.O BOX 244 FIJI sunrayelectricalsolar@gmail.com Mr. Sudesh Manohar (+679 8365593)*	CBS Power Solutions (Fiji) Pte Ltd Address: Lot 17 Dabea Lane, Valelevu, Nasinu SUVA SUVA 15941 SUVA FIJI amit@cbspowersolutions.com +679 9904480	CBS Power Solutions (Fiji) Pte Ltd Address: Lot 17 Dabea Lane, Valelevu, Nasinu SUVA SUVA 15941 SUVA FIJI amit@cbspowersolutions.com +679 9904480	*Sunray Electrical & Solar Address: Rewa SUVA P.O BOX 244 FIJI sunrayelectricalsolar@gmail.com Mr. Sudesh Manohar (+679 8365593)*
Technical Working Group (TWG)	*PIDF, Ms. Director Climate Action Email: marilyn.tagicakiba u@pidf.int*	*Office of President, Fiji* *Kiti M. Temo Official secretary & Head of Corporate Services - Office of the President kiti.temo@govnet.gov.fj 9921584* *PA - Makalesi - 9904355*	*Viliame Pawa Senior Officer, Office of Prime Minister, Fiji viliame.pawa@pmoffice.gov.fj +6799908839*	*Mr. Tiaon Aukitino, Energy Planning Unit, Ministry of Infrastructure and Sustainable Energy, Betio, Kiribati. t.aukitino@mise.gov.ki* *Tavita Airam Project Demo Technical Officer POIDIER Project, Ministry of Infrastructure and Sustainable Energy, tavita.airam@mise.gov.ki* *Simon Reiher Reiher - Energy Planning Unit, Ministry of Infrastructure and Sustainable Energy - simon.reiher@mise.gov.ki*	Mr. Simona Kilei, Department for Energy, Tuvalu simonakilei@gmail.com Mr. Avafoa Irata CEO, Department for Energy, Tuvalu avafoa@gmail.com Pisi Public Works department afaaso80@gmail.com	*Dr. Tevita Tukunga Director for Energy Department Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDECC) Tel : +676 28 170 | Mob: +676 777 4312 ttukunga@gmail.com* *Mr. Samiuela Matakaiongo sam.matakai@gmail.com Department of Energy Ministry of MEIDECC, Tonga* *Mr. Nikolasi Fonua nfonua@tongapower.to Tonga Power Limited* *Mr. 'Ofa Sefana ofasefana@yahoo.com MEIDECC* *Mr. Filimone Fifita monefifita@gmail.com*	Gabriel Aimaea, DIrector Ministry of Mines, Energy and Rural Electrification, Honiara, Solomon Islands. GAimaea@mmere.gov.sb | +677 7776-217 Andrew Sukaa - Solomon Islands Electricity Authority Andrew.Sukaa@solomonpower.com.sb John Korinihona' - JKorinihona@mmere.gov.sb; - Director Energy 'Chris Vehe' - CVehe@mmere.gov.sb ; 'Margaret Limairadi' - MLimairadi@mmere.gov.sb; 'Maxwell Banyo' <MBanyo@govthouse.gov.sb	*Shelley deBlair Remengesau Office of the President sremengesau@gmail.com* *(New ED) Mr. Tutii Chilton left Executive Director, Palau Energy Administration Ministry of Public Infrastructure, Industries & Commerce Office: (680) 767-5313 Mobile: (680) 775-5433 Fax: (680) 767-6714 Email: energy@palaunet.com*	*Benjamin S. Wakefield Deputy Director National Energy Office Ministry of Environment deputydirector@neormi.com* *Ms. Angeline C. Heine-Reimers Director, National Energy Office, Majuro, MH 96960 Tel: (692) 625 4020/3206 gelheine@gmail.com* *James Myazoe II - vinnymyazoe@gmail.com James F. Myazoe II PMU Manager Project Management Unit Ministry of Works, Infrastructures, and Utilities Majuro MH 96960 Tel: +692 625-8911/ 8931* *Rason Morris- morrisrason@gmail.com* *Jefferson Barton - secwiubarton.rmi@gmail.com* *Dante Dela Vega-Dante M. Dela Vega Compact Delivery Manager Project Management Unit*	Duchene Itaia, Director, Department of Foreign Affairs & Trade Government of the Republic of Nauru, duchene.itaia22@gmail.com Yuri B. Eobob (Mrs) Acting Director - Administration/Finance Department of Foreign Affairs & Trade Government of the Republic of Nauru E: yuriburaman@gmail.com, yuri.eobob@hotmail.com Mrs. Krista Cain Foreign Service Officer Department of Foreign Affairs and Trade Government of the Republic of Nauru Email : kristacain6@gmail.com Nauru MOFA - Director Pacific Division - Josie - Ann Jacob josieannjacob@gmail.com +674 557 3133 udowiyogo@gmail.com - Assistant Director	Faustino Yarofaisug Assistant Secretary Energy Division FSM Department of Resources & Development P.O. Box PS 12 Palikir, Pohnpei FSM 96941 Tel: (691) 320-5133 Website: www.fsmrd.fm fyarofaisug@gmail.com	*Anthony L. Garae Director of Department of Energy gantony@vanuatu.gov.vu* *Julius Mala jmala@vanuatu.gov.vu Department of Energy, (678)25201 (678) 7712471* *doe@vanuatu.gov.vu (678)25201*

									Ministry of Works, Infrastructure & Utilities e-mail: dantedelavegamwiu@gmail.com Tel No 692-6257407, 625-8911/8931			
GPS Coordinate	17° 58' 19.68"S 178° 36' 57.72"E	18° 9'6.11"S, 178°25'34.02"E	18.15350S, 178.4389E	1°19'47.38"N 172°58'56.08"E	-8.528006, 179.19205	21° 8'2.16"S, 175°11'59.48"W	-9.440665, 159.983249	7.34134, 134.475	7° 5'25.17"N, 171°22'49.53"E	0°32'35.16"S, 166°57'3.18"E	6.924552, 158.159806	13°52'38.95"S 167°33'13.05"E
Type of Mount	Rooftop	Rooftop	Rooftop	Rooftop	Rooftop	Rooftop	Ground Mount	Rooftop	Rooftop	Rooftop	Rooftop	Rooftop
Standard of installation	AS/NZS	AS/NZS	AS/NZS	AS/NZS	AS/NZS	AS/NZS	AS/NZS	US	US	AS/NZS	US	AS/NZS
Three Phase Voltage	415V	415V	415V	230V	415V	415V	415V	208V	240V	415V	240V	415V
Single Phase Voltage	230V	230V	230V	415V	230V	230V	230V	120V	120V	230V	120V	230V
Type of supply to site	3P	3P	3P	3P	3P	3P	3P	3P	3P	3P	3P	3P
Frequency	50Hz	50Hz	50Hz	50Hz	50Hz	50Hz	50Hz	60Hz	60Hz	50Hz	60Hz	50Hz
Buiding Incommer Type	3 Phase	3 Phase	3 Phase	3 Phase	3 Phase	1 Phase	3 Phase	3 Phase	3 Phase	3 Phase	3 Phase	3 Phase
	Growatt Inverters	2 x SMA STP 10.0 - 3AV - 40 3 x SMA Sunny Island SI 8.0H-13	2 x SMA STP 10.0 - 3AV - 40 3 x SMA Sunny Island SI 8.0H-13	2 x SMA STP 10.0 - 3AV - 3 x SMA Sunny Island SI 8.0H-13	2 x SMA STP 10.0 - 3 x SMA Sunny Island SI 8.0H-13	2 x SMA STP 10.0 - 3 x SMA Sunny Island SI 8.0H-13	2 x SMA STP 10.0 - 3AV - 3 x SMA Sunny Island SI 8.0H-13	3 x Schneider XW Pro 6.8kW 120-240V 48V Schneider Conect MPPT 100-600	4 x Schneider XW Pro 6.8kW 120-240V, 48V Charger Schneider Conect MPPT 100-600	2 x SMA STP 10.0 - 3 x SMA Sunny Island SI 8.0H-13	4 x Schneider XW Pro 6.8kW 120-240V 48V Charger Schneider Conect MPPT 100-600	2 x SMA STP 3 x SMA Sunny Island SI 8.0H-

Source: Project, 2024

Annex-17: Result framework

Intended Outcome as stated in the United Nations Development Assistance Framework (UNDAF) Regional Programme Results and Resource Framework: By 2022, people and ecosystems in the Pacific are more resilient to the impacts of climate change, climate variability and disasters; and environmental protection is strengthened								
Outcome indicators as stated in the Country Programme Results and Resources Framework, including baseline and targets: Number of countries with policy instruments for renewable energy, energy efficiency, or energy access introduced as a result of UNDP interventions. Baseline (2017) = 0 & Target = 8								
Applicable Output(s) from the UNDP Strategic Plan: Solutions adopted to achieve universal access to clean, affordable and sustainable energy								
Project title and Atlas Project Number: Solarization of Head of State Residences in the Pacific, 115827/113240								
Expected outputs	Output indicators	Data source	Baseline		Targets (year-wise)			Data collection methods & risks
			Value	Year	Y-1	Y-2	Final	
Output 1 - Solar based power supplied to executive residences//buildings of national importance in Fiji, Tonga, Kiribati, Nauru, Solomon Islands, Vanuatu, RMI, FSM, Palau,	1.1 No. of operational PV systems	Commissioning documents	0	2019	6	6	12	Observations, documents/records

Tuvalu, Timor-Leste and the PIDF headquarters								
Output 2 - Onsite capacity established at the executive residences//buildings of national importance and the PIDF headquarter to successfully operate and maintain the solar PV systems on a day-to-day basis and the public is aware of the benefits of solar power	2.1 No. of women and men that have built capacity on the operation and maintenance of grid-connected solar PV	Training workshop reports, project evaluation report	0	2019	6	6	12	Documents/records (attendance and evaluation forms)
	2.2 No. of manuals on the operation and maintenance of grid-connected solar PV	O&M manual, project evaluation report	0	2019	6	6	12	Documents/records
	2.3 No. of news articles in national media	Newspapers, homepages, etc.	0	2019	24	24	48[36]	Documents/records

Source: Project, 2024

Annex-18: Evaluation matrix

Evaluative criteria	Indicators/success standard	Data sources	Data collection tools and analysis
1. Relevance			
1.1 How relevant are the objectives in light of the increased adoption of sustainable energy to meet the ambitious energy and climate change goals of Pacific Island Countries?	• Degree of sustainable energy uptake required to fulfill the ambitious energy and climate objectives of Pacific Island Countries.	• Key government counterparts • Implementing partners (IPs) • Relevant policies and project document • Media reports, case studies • Quarterly and annual progress and monitoring reports	• Interviews • Desk review
1.2 Are there significant gaps in the adoption of sustainable and renewable energy among PIDF member countries, or are there missed opportunities?	• Categories of gaps in the uptake of sustainable and renewable energy within PIDF member nations.	• Key government counterparts, IPs • Relevant policies and project document • Media reports, case studies • Quarterly and annual progress and monitoring reports	• Desk review • Interviews with key government counterparts
1.3 Were the interventions aligned with the needs and priorities of the target groups and beneficiaries?	• Degree of alignment between the requirements and preferences of target groups, beneficiaries, and stakeholders.	• Capacity gap analysis • National stakeholders • Relevant policies and project document • Media reports, case studies • Quarterly and annual progress and monitoring reports	• KIIs • Desk review
1.4 How effectively were gender, human rights, and other cross-cutting issues integrated into the project design and implementation?	• Number of substantiating evidence indicating seamless integration of cross-cutting concerns into project design and subsequent execution.	• IPs, representatives of key civil society organizations • Relevant policies and project document • Media reports, case studies, MIS and GESI data • Quarterly and annual progress and monitoring reports	• Desk review
1.5 To what extent did the project collaborate with various entities and maintain a strategically coherent approach?	• Number of project partnerships with diverse entities following a strategically coherent strategy.	• UNDP strategic priority documents • Relevant policies and project document • Media reports, case studies	• Desk review • KIIs

[36] Four new articles per each solar PV installation.

		• Quarterly and annual progress and monitoring reports	
2. Coherence			
2.1 Do the activities and strategies align with the objectives, ensuring internal coherence between the program's actions and its intended outcomes?	• Degree of alignment between activities and strategies with the objectives, facilitating the program's actions to attain desired outcomes.	• Key government counterparts, IPs • Relevant policies and project document • Media reports, case studies • Quarterly and annual progress and monitoring reports	• Desk review • KIIs
2.2 Are the project's core issues consistent with UNDP's foundational documents (e.g., UNDP SRPD/Country Program Document), national priorities (such as the national development plans of PIDF countries), and other relevant projects of UNDP, the UN, and Development Partners project?	• Extent to which the project's core concerns are integrated with UNDP's foundational documents, national priorities, and other pertinent projects of UNDP, the UN, and Development Partners.	• Action plans, policies and project document • Project board members • UNDP Project staff/ United Nations country team (UNCT) members • Media reports, case studies, website • Quarterly and annual progress and monitoring reports	• Desk review • KIIs
3. Effectiveness			
3.1 How successfully were the project outputs attained or not attained, and what factors influenced the effectiveness or ineffectiveness of the project activities?	• Quantity of project outputs achieved or not, and the factors influencing the efficacy or inefficacy of project activities.	• Project documents • Project staff and Project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports	• KIIs, FGDs • Desk review
3.2 To what extent has the project enhanced capacities and awareness regarding the adoption of sustainable energy among Pacific Island Countries?	• Degree of enhanced capacities and awareness regarding the adoption of sustainable energy among Pacific Island Countries.	• Review of training curricula, and assessment of training (pre and post ranking) • Local resource person and relevant project stakeholders • Media reports, case studies, website and MIS data • Quarterly and annual progress and monitoring reports	• KIIs, FGDs • Desk review • Observation
3.3 Are there alternative strategies that could have been more effective in achieving the project's objectives?	• Number of effective alternative strategies employed to accomplish the project's objectives.	• Review of alternative strategies • Project staff and project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports	• KIIs, FGDs • Desk review, • Observation
3.4 How much impact has the project had on promoting gender equality, empowering women, and addressing the needs of youth and vulnerable groups at the outcome and output levels?	• Level of impact engendered by the project in advancing gender equality, fostering women's empowerment, and addressing the needs of youth and vulnerable groups at both output and outcome levels.	• IPs, representatives of key civil society organizations • Project staff • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and Gender Equality and Social Inclusion (GESI) data	• KIIs, FGDs • Desk review, • Most significant change
3.5 In your opinion, what are the good practices observed?	• Number of good practices being expanded and replicated by UNDP and other agencies.	• Key government counterparts, IPs, civil society organizations (CSOs) and UNDP Project staff • Media reports, case studies • Quarterly and annual progress and monitoring reports	• KIIs, FGDs • Desk review, • Most significant change
3.6 What valuable lessons have been learned regarding project design,	• Varieties of lessons learned concerning project design,	• Key government counterparts, IPs, CSOs and UNDP Project staff	• KIIs, FGDs • Desk review,

implementation, management, monitoring, and gender mainstreaming that could benefit similar projects in the future?	implementation, management, monitoring, and gender mainstreaming for future project development.	• Media reports, case studies, MIS and GESI data • Quarterly and annual progress and monitoring reports	• Most significant change
3.7 What external factors, beyond the project's control, have influenced its successes and failures?	• Categories of external factors impacting the successes and failures of the project.	• Key government counterparts, IPs, CSOs and UNDP Project staff • Media reports, case studies • Quarterly and annual progress and monitoring reports	• KIIs, FGDs • Desk review, observation • Most significant change
3.8 What were the project's management and overall implementation arrangements?	• Degree of robustness in the project's management and implementation arrangements/mechanisms.	• Key government counterparts, IPs, CSOs and UNDP Project staff • Media reports, case studies • Quarterly and annual progress and monitoring reports	• KIIs, FGDs • Desk review • Most significant change
4. Efficiency			
4.1 How effectively have financial and human resources been utilized? Were resources strategically allocated to achieve desired outcomes?	• Number of human resources and financial resources expended to achieve desired outcomes.	• Key government counterparts, IPs, CSOs and UNDP Project staff • Media reports, case studies, MIS and GESI data • Quarterly, annual progress and monitoring reports • Review of fund flow and management cost	• KIIs, FGDs • Desk review • Most significant change
4.2 To what extent did the project management structure and monitoring and evaluation system outlined in the project document contribute to generating the expected results?	• Structure of management and the extent of M&E systems in place to produce anticipated results.	• Project documents, Project staff • Media reports, case studies • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs
4.3 How efficient was the staffing, planning, and coordination within the project, including interactions with responsible parties and stakeholders? Were project funds and activities delivered in a timely manner?	• Number of staff, planning processes, coordination mechanisms, and interactions aiding in timely fund allocation.	• Project documents, Project staff • Media reports, case studies • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs
4.4 How effective and efficient was the project's implementation approach, including procurement and other activities?	• Degree of the project's implementation approach and procurement mechanism.	• Project documents • National and local stakeholders, Project staff • Media reports, case studies • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs
4.5 Did the project deliver value for money? Were resources utilized efficiently?	• Instances exemplifying value for money to ensure the efficient utilization of the project's financial resources.	• Project documents, Project staff • Media reports, case studies, MIS and GESI data • Quarterly and annual progress and monitoring reports • Review of fund flow and management cost	• Desk review • KIIs and FGDs
5. Sustainability			

5.1 Are there potential financial, social, political, or legal risks that could pose threats to the sustainability of project outputs?	• Categories and extent of potential financial, social, political, or legal risks posing a threat to the sustainability of project outcomes.	• Project documents • Project staff and Project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports • Review of fund flow and management cost	• Desk review • KIIs and FGDs • Desk review • KIIs and FGDs
5.2 What initial signs suggest the potential for sustainability of project results beyond the project's duration, both at the community and government levels?	• Number of structures established or reinforced to guarantee the continuity of project outcomes.	• Project documents • Project staff and Project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports	• Desk review • KIIs and FGDs
5.3 Was there an adequate sustainability and exit strategy incorporated into the intervention design?	• Varieties of sustainability issues and exit strategies integrated into the intervention design.	• Project documents • Project staff and Project stakeholders • Media reports, case studies and Action plans • Quarterly and annual progress and monitoring reports • Review of fund flow and management cost	• Desk review • KIIs and FGDs
5.4 How committed are the government and other stakeholders to maintaining the results of project support and ongoing initiatives?	• Number of dedicated government and other stakeholders committed to upholding results in ongoing project initiatives	• Project documents • Project staff and Project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports	• Desk review • KIIs and FGDs
6. Impact			
6.1 How much progress was made in achieving the project outputs and how did this contribute to outcome-level results?	• Degree of progress in attaining project outputs that contribute to outcome-level results.	• Project staff and Project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports	• Desk review • KIIs and FGDs • Most significant change
6.2 How closely does the project align with the key thematic area it aims to address?	• Degree of alignment of the project with the key thematic area.	• Project staff and Project stakeholders • Media reports, case studies, Action plans • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
6.3 To what extent did the intervention address synergies and inter-linkages with other stakeholders and agencies?	• Varieties and extent of interventions and interconnections with other stakeholders that foster synergies.	• Project staff and Project stakeholders • Media reports, case studies • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
7. Cross cutting theme			
Human right			
7.1 To what degree have disadvantaged and marginalized groups, including the poor, indigenous peoples, persons with disabilities, women, men, and youth, benefited from UNDP's efforts in the project countries?	• Degree and types of advantages that disadvantaged and marginalized groups obtain from UNDP's endeavors in the project countries.	• Project documents • Project staff and Project stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
Gender equality and no one left behind			

7.2 How thoroughly has the project considered and integrated gender equality and women's empowerment throughout its design, implementation, and monitoring phases?	• Extent of integration of gender equality and women's empowerment throughout the project's design, implementation, and monitoring stages.	• Project staff and stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
7.3 To what extent has the project facilitated advancements in gender equality and the empowerment of women? Were there any unintended consequences affecting women, men, youth, or vulnerable groups?	• Level of project contribution to the advancement of gender equality and women's empowerment.	• Project staff and stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
7.4 What lessons have been learned concerning gender equality throughout the project's duration?	• Categories of lessons learned concerning gender equality throughout the project's duration.	• Project staff and stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
Disability			
7.5 Were persons with disabilities consulted and actively engaged in program planning and implementation?	• Number of consultations and involvement with persons with disabilities in program planning and execution.	• Project staff and stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs
7.6 What positive impact or transformative changes has the project brought about for persons with disabilities?	• Degree of positive impact or transformative changes experienced by persons with disabilities due to the project.	• Project staff and stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
Climate change action			
7.7 Were there any environmental risks that could threaten the sustainability of project outputs and the project's contributions to country program outputs and outcomes?	• Types of environmental risks jeopardizing the sustainability of project outputs and outcomes.	• Project staff and stakeholders • Media reports, case studies, website • Quarterly and annual progress and monitoring reports • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
7.8 In what ways has the project improved and bolstered national and/or local capacity development?	• Number of methods or approaches to enhance national and/or local capacity development.	• Project staff and stakeholders • Media reports, case studies, policies • MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change
7.9 To what extent were national partners and stakeholders involved, and how well did the project align with existing priorities of local government in targeted areas?	• Degree of engagement of national partners and stakeholders in the project, along with the alignment of the project with the existing priorities of local government.	• Project staff and stakeholders • Media reports, case studies, policies • Quarterly and annual progress and monitoring reports • MIS and GESI data MIS and GESI data	• Desk review • KIIs and FGDs • Most significant change

Annex-19: Checklist and guide questions[37]

KIIs

Introduction and Consent

Hello, my name is Dhruba Gautam. I am employed by UNDP as an independent consultant tasked with evaluating the performance of the "Solarization Project." The aim of this evaluation is to assess the project's success in meeting its objectives and its efficiency and effectiveness in resource mobilization. I am keen to hear your insights and experiences regarding this project to enable me to make more accurate evaluative judgments. I anticipate taking approximately 40 minutes of your time. Please rest assured that all information you share will be kept confidential and used solely for the

Introductory questions

1. What role do you play primarily in this project?

Evaluation related specific questions (with additional questions for probing)[38]

2. *What are the climate change goals of Pacific Island Countries[39],* and how do they align with the increasing adoption of sustainable energy to achieve their ambitious energy and climate change targets (R)?
3. *From your perspective,* do PIDF member countries exhibit significant gaps in the uptake of sustainable and renewable energy, or are there notable missed opportunities (R)? *Can you provide a few examples?*
4. *What are the primary activities undertaken by the project you are acquainted with? What are the requirements and main priorities of the target demographics?* Did the interventions align effectively with the needs and priorities of these groups and beneficiaries (R)?
5. *Throughout the project's lifecycle, has there been consideration for gender, human rights, and other intersecting issues?* How well were these aspects integrated into the project's design and implementation (R)?
6. *Who were the project's collaborators for synergy purposes?* To what extent did the project engage with various stakeholders and maintain a strategically cohesive approach (R)?
7. *What are the primary activities and strategies employed by the project?* Do these align with the objectives, ensuring consistency between the program's actions and its intended outcomes (C)?
8. *From your perspective, what are the core issues facing the project?* Do these align with UNDP's foundational documents (e.g., UNDP SRPD/CPD), national priorities (such as the national development plans of PIDF countries), and other relevant UNDP, UN, and Development Partner initiatives (C)?
9. Are there alternative strategies that might have been more effective in achieving the project's goals? *Would these alternatives bring additional benefits (E)?*
10. What external factors, beyond the project's control, have impacted its successes and failures (E)? *Could you provide some examples?*
11. How were the project's management and overall implementation structured? *Has this structure proven effective* (E)?
12. How efficiently have financial and human resources been utilized? Were resources allocated strategically to achieve desired outcomes (FF)? *Can you provide evidence to support this?*
13. To what extent did the project management structure and the monitoring and evaluation system outlined in the project document contribute to achieving the anticipated results (FF)? *At what level?*
14. How effective was the staffing, planning, and coordination within the project, including interactions with relevant parties and stakeholders? Were project funds and activities delivered in a timely manner (FF)?
15. *Are you familiar with the project's implementation and procurement approach?* How effective and efficient was the project's approach to implementation, including procurement and other activities (FF)?
16. Was the project able to provide value for the investment made? Were resources utilized efficiently? *Could you provide some concrete evidence to support this (FF)?*
17. *What potential risks were encountered during the project's implementation?* Are there financial, social, political, or legal risks that could jeopardize the sustainability of project outcomes (S)?
18. *Does the project have a sustainability plan and exit strategy?* Was there sufficient consideration given to sustainability and exit strategies in the intervention design (S)?
19. *What are the main thematic focuses of the project?* How closely does the project align with the key thematic areas it aims to address (I)?
20. *Has the project succeeded in establishing connections with other stakeholders and agencies to create synergy?* To what degree did the intervention address synergies and connections with other stakeholders and agencies (I)?
21. How much progress has the project made in promoting gender equality and empowering women? Were there any unintended consequences affecting women, men, youth, or vulnerable groups (G)?
22. What insights have been gained regarding gender equality over the course of the project? *Can you provide any solid evidence for this (G)?*
23. *What are the primary environmental risks in the project countries that could undermine overall project performance?* Were there any environmental risks that could threaten the sustainability of project outcomes and its contributions to country program outputs and outcomes (CC)?

[37] Considering the nature of the key informants, a few questions may be adjusted to facilitate smoother discussions.

[38] The letters in the brackets refer to: **R**-relevance, **C**-coherence, **E**-effectiveness, **FF**-efficiency, **S**-sustainability, **I**-Impact, **HR**-human rights, **G**-gender, **D**-disability and **CC**-climate change action for the coding purpose.

[39] Questions in italics are additional questions for the probing.

24. In what ways has the project enhanced national and/or local capacity development? *Could you provide some examples (CC)?*
25. *Which national partners and stakeholders were engaged in the project?* To what extent were national partners and stakeholders involved, and how effectively did the project align with the existing priorities of local governments in targeted areas (CC)?

Thank you.

FGDs

Introduction and Consent

Hello, my name is Dhruba Gautam. I am employed by UNDP as an independent consultant tasked with evaluating the performance of the "Solarization Project." The aim of this evaluation is to assess the project's success in meeting its objectives and its efficiency and effectiveness in resource mobilization. I am keen to hear your insights and experiences regarding this project to enable me to make more accurate evaluative judgments. I anticipate taking approximately 40 minutes of your time. Please rest assured that all information you share will be kept confidential and used solely for the purposes of this evaluation.

Introductory questions

1. How many individuals are on your committee, categorized by gender and any other special designations (persons with disabilities)? How many female members hold significant or leadership positions?
2. What are the primary objectives of this committee? Additionally, could you elaborate on the roles and activities you have undertaken as part of this project?

Evaluation specific questions (with additional questions for probing)

3. *What are the primary activities of the project, and what kind of outcomes have they produced?* How successful were these outcomes, and what factors influenced their effectiveness (E)? Please provide examples.
4. *Were you acquainted with the adoption of sustainable energy prior to this project?* To what extent has the project contributed to enhancing capacities and raising awareness regarding sustainable energy adoption among Pacific Island Countries (E)?
5. *From your perspective, what are the significant advantages of promoting gender equality and empowering women?* How much progress has the project made in these areas, particularly in addressing the needs of youth and vulnerable groups, at both the outcome and output levels (E)?
6. In your view, what are some noteworthy best practices observed as a result of this evaluation (E)?
7. What valuable insights have been gained regarding project design, implementation, management, monitoring, and gender mainstreaming, which could be beneficial for similar projects in the future (E)? *Please provide evidence and examples.*
8. What early indicators suggest the potential sustainability of project outcomes beyond the project's timeframe, at both the community and governmental levels (S)? *What factors contribute to ensuring the continuation of the project's successful practices?*
9. *Have government and project stakeholders allocated their resources to ensure the success of the project?* How dedicated are they to sustaining the outcomes of project support and ongoing initiatives (S)?
10. What level of advancement was achieved in attaining the project outputs, and how did this contribute to results at the outcome level (I)? *Can you provide some examples?*
11. To what extent have disadvantaged and marginalized groups, including the impoverished, indigenous peoples, persons with disabilities, women, men, and youth, benefited from UNDP's efforts in the project countries (HR)? *Please present evidence and examples.*
12. How comprehensively has the project integrated gender equality and women's empowerment throughout its design, implementation, and monitoring phases (G)? *Could you offer evidence and examples?*
13. Were persons with disabilities consulted and actively involved in program planning and implementation (D)? *If so, what processes and approaches were used for their participation?*
14. What positive effects or transformative changes has the project brought about for persons with disabilities (D)? *Can you provide evidence and examples?*

Thank you.

Annex-20: Audit trail

Refer to separate sheet

Annex-21: Signed UNEG Code of Conduct for TE consultant

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.
8. Must ensure that independence of judgement is maintained, and that evaluation findings and recommendations are independently presented.
9. Must confirm that they have not been involved in designing, executing, or advising on the project being evaluated and did not carry out the project's Mid-Term Review.

Evaluation Consultant Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN system: The Solarization of Head of State Residences in PIDF 11 member countries

Name of Evaluator: Dr. Dhruba Gautam
Name of Consultancy/organization: N/A

I confirm that I have received and understood and will abide by the United national Code of Conduct for Evaluators:

Signed at: Kathmandu on Jan 26, 2024

Signature:

Annex-22: Signed report clearance form

Terminal Evaluation Report for The Solarization of Head of State Residences in PIDF 11 member countries
Reviewed and Cleared By:
Commissioning Unit (M&E Focal Point)
Name:
Signature: Date: