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Terminal Evaluation of UNDP/GEF Project: Pacific Islands Greenhouse Gas Abatement through Renewable Energy Projects (PIGGAREP)

(GEF Project ID: 2699; UNDP PIMS ID: 3462)

Terminal Evaluation Report

Mission Member:

Mr. Roland Wong, International Consultant

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SYNOPSIS

Title of UNDP supported GEF financed project: Pacific Islands Greenhouse Gas Abatement through Renewable Energy Projects (PIGGAREP)

UNDP Project ID: PIMS 3462

GEF Project ID: 2699

Evaluation time frame: January 2007 to August 2016

CEO endorsement date: September 6, 2006

Project implementation start date: January 24, 2007

Project end date: November 30, 2016

Date of evaluation report: August 31, 2016

Region and Countries included in the project: Asia and the Pacific Region; Cook Islands, Fiji, Kiribati, Nauru, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. The Federated States of Micronesia, Republic of Marshall Islands and Palau were added to the project under PIGGAREP+.

GEF Focal Area Objective: SP-4: Productive uses of renewable energy

Implementing partner and other strategic partners:

- Implementing partner: Secretariat of the Pacific Regional Environment Program (SPREP)
- International Union for Conservation of Nature (IUCN);
- International Renewable Energy Agency (IRENA);
- Secretariat for the Pacific Community (SPC);
- Pacific Power Association (PaPA);
- University of the South Pacific (USP); and
- Pacific Islands Forum Secretariat (PIFS).

Evaluation team member: Mr Roland Wong, International Consultant

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allowing me to meet several delegates from several PICs at the Pacific Power Association conference in Nuku'alofa between August 3 and 6. I also wish to extend my regrets to the National Project Coordinators of the other PICs including the Cook Islands, Vanuatu, the Republic of Marshall Islands and the Federated States of Micronesia for not being able to visit your countries, due to the budgetary and time constraints. Thank you again to all those I met during the mission for your hospitality and insights. I sincerely hope that this report contributes to a better understanding of renewable energy and low carbon development in the South Pacific region.

EXECUTIVE SUMMARY

This report summarizes the findings of the Terminal Evaluation Mission conducted during the July 26 - August 12, 2016 period for the UNDP-GEF Project entitled: “*Pacific Islands Greenhouse Gas Abatement through Renewable Energy Projects*” (hereby referred to as the PIGGAREP Project or the Project), that received a USD 5.225 million grant from the Global Environmental Facility (GEF) in June 2007.

Project Summary Table

| Project Title: | Pacific Islands Greenhouse Gas Abatement through Renewable Energy Projects (PIGGAREP) | | | |
|--------------------------|---|--|--|---|
| GEF Project ID: | 2699 | | <i>at endorsement</i> <i>(Million US\$)</i> | <i>at completion</i> <i>(Million US\$)</i> |
| UNDP Project ID: | 3462 | GEF financing: | 5.225 | 5.225 |
| Country: | Cook Islands, Fiji, Kiribati, Nauru, Niue, Papua New Guinea, Samoa, Solomon Island, Tonga, Tuvalu and Vanuatu | IA/EA own: | 0.5 | 0.4 |
| Region: | Pacific Island Countries | Government: | 26.47 | 51.46 |
| Focal Area: | Climate Change | Other: | 1.013 | 10.95 |
| FA Objectives, (OP/SP): | Operational Programme 6: Promoting the adoption of renewable energy by removing barriers and reducing implementation costs | Total co-financing: | 27.983 | 62.81 |
| Executing Agency: | Secretariat of the Pacific Regional Environment Programme (SPREP) | Total Project Cost: | 33.208 | 68.035 |
| Other Partners involved: | Secretariat for the Pacific Community (SPC), Pacific Power Association (PPA), University of the South Pacific (USP), Pacific Islands Forum Secretariat (PIFS) | ProDoc Signature (date project began): | | 24 January 2007 |
| | | (Operational) Closing Date: | Proposed: 30 November 2011 | Actual: 31 December 2015 (for GEF-funded activities), 30 November 2016 (for PIGGAREP+ activities) |

Project Description

The PIGGAREP Project design was approved with:

- a goal to “*reduce the growth rate of GHG emissions from fossil fuel use in PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies*”; and

- an objective of “*promoting the productive use of RE to reduce GHG emissions by removing the major barriers to the widespread and cost effective use of commercially viable RETs.*”

The PIGGAREP Project was to be implemented in 11 Pacific Island countries (PICs) including the Cook Islands, Fiji, Kiribati, Nauru, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu, and Vanuatu.

Overall project targets in the PIGGAREP logical framework analysis (LFA) included:

- An incremental direct target of “*2 million tonnes of CO₂ reduced per year by the end-of-project in 2015 (EOP)*”; and
- An incremental target of “*219,000 MWh of cumulative electricity generation from RE based energy systems by EOP*”;
- 50 MW of additional installed RE based energy systems capacity by 2015; and
- USD 110,000 of income generating opportunities in each PIC gained from RE by the EOP.

This was to be achieved according to actions proposed in the Project Document of November 2006. The PIGGAREP Project commenced on 24 January 2007 with the Inception Phase conducted in November 2007 with a proposed terminal date of 30 November 2011. In 2013 and 2014, the PIGGAREP Project leveraged an additional USD 3 million from the Government of Denmark and SIDS DOCK (referred to as PIGGAREP+) to finance energy efficiency and RE projects that promote productive uses of renewable energy (PURE) that would contribute towards the achievement of PIGGAREP targets. Funds from PIGGAREP+ were also used to implement EE and RE projects in 3 additional PICs, Federated States of Micronesia (FSM), Republic of the Marshall Islands (RMI) and Palau. The completion of PIGGAREP (that includes PIGGAREP+) is scheduled for November 30, 2016. The scope of the PIGGAREP Terminal Evaluation includes activities implemented with GEF resources as well as the resources under PIGGAREP+.

Project Results

Overall results of the PIGGAREP (including PIGGAREP+) can be summarized as follows:

- only generated 11,505 MWh of electricity generation from RE based systems by the EOP against a target of 219,000 MWh within a 5-year period;
- only 6,363 tonnes CO_{2eq} has been reduced in PICs from electricity generation from RE sources by EOP against a target of 2 million tonnes CO_{2eq};
- only 9.15 MW of additional RE based energy systems installed by EOP. However, it is encouraging that the PIGGAREP project, despite not meeting its target of an additional 50 MW of RE-based energy systems capacity by 2015, has been involved with the study and development of 42 MW of RE based energy systems, of which 9.15 MW was installed during PIGGAREP and another 25.6 MW not yet installed but with confirmed financing for implementation;
- USD 5 million of cumulative income generating opportunities for all PICs resulting from the deployment of RE projects by 2014 against a target of USD 110 million.

Table A provides a summary of actual outcomes achieved on PIGGAREP in comparison with intended outcomes.

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

| Intended Outcomes in June 2007 ProDoc | Actual Outcomes as of August 2016 |
|--|---|
| Outcome 1: Improved knowledge about RE resources potential and increase the number of successful commercial RE applications on the ground | Actual Outcome 1: Knowledge about RE in all the PICs under PIGGAREP has improved. Moreover, a number of these PICs have successfully implemented RE installations, although not all of these installations can be classified as commercially viable. |
| Outcome 2: Expansion of the market for RET applications. | Actual Outcome 2: In comparison with the baseline energy scenario of 2007 in PIGGAREP PICs, the market for RET applications has expanded considerably, in large part due to strong government support for renewable energy development and its linkage to climate change mitigation and strong support from the donor community. |
| Outcome 3: Enhancement of institutional capacity to design and implement RE sustainable energy. | Actual Outcome 3: Institutional capacities of all PICs has been enhanced to manage accelerated RE development consistent with national energy policies and climate change mitigation plans. |
| Outcome 4: Improvement of the availability of funding for existing and new RE projects. | Actual Outcome 4: Availability of RE funding has improved, though much of it is from the donor community mainly for new RE projects, and some for existing RE rehabilitation. However, funding for operation and maintenance of existing RE installations has not yet been fully established in all PICs. |
| Outcome 5: Strengthened legal and regulatory structures in the energy and environmental sectors | Actual Outcome 5: All PIGGAREP PICs have improved legal and regulatory frameworks to promote the acceleration of RE development within their energy and environmental sectors. |
| Outcome 6: Increased awareness and knowledge about RE among key stakeholders | Actual Outcome 6: Awareness and knowledge of RE within all PIGGAREP PICs has significantly improved from the baseline scenario of 2007. |

Summary of Conclusions, Recommendations and Lessons

One of the significant PIGGAREP outcomes has been the increased confidence of PIC governments to have meaningful dialogue with potential financiers, mainly donors, to investing in renewable energy projects in various PICs. However, PIGGAREP required 9 years to reach this outcome:

- The early stages of PIGGAREP were highlighted by efforts to promote productive uses of renewable energy (PURE) to satisfy GEF-4 requirements. The predominance of communal subsistence livelihoods in the region resulted in many of these donor projects not being PURE-driven, and higher risks that PIGGAREP targets as set in 2008 would not be achieved by the EOP;
- Implementation of PIGGAREP had to deal with the special circumstances and different RE market conditions of all the 11 PIGGAREP PICs such as institutional capacities, regulatory frameworks, country geography, available RE resources and population size. As a result, the impact of PIGGAREP was varied amongst all the PICs. For the Cook Islands, Kiribati, Samoa, Tonga, Tuvalu, and Vanuatu, the impact of PIGGAREP was positive. For various reasons, PIGGAREP did not make a significant impact on renewable energy development in Fiji, Nauru, Niue, Papua New Guinea and Solomon Islands as well as PIGGAREP+ countries of FSM, RMI and Palau. These reasons range from baseline low levels of electrification (Solomon

Islands) and the challenges in effectively disseminating EE information over a vast region (such as FSM and RMI) to the inclusion of large PICs with their own RE programs in collaboration with UNDP and other donors (such as Fiji and Papua New Guinea).

PIGGAREP did fall short of its GHG emission reduction target of 2 million tonnes CO_{2eq} by 2015. This target was likely unattainable given that initial periods of PIGGAREP were dedicated mainly to capacity building and strengthening RE resource databases prior to RE investments, leaving less time available to generate this level of GHG emission reductions. However, it is encouraging that the PIGGAREP project, despite not meeting its target of an additional 50 MW of RE-based energy systems capacity by 2015, has been involved with the study and development of 42 MW of RE based energy systems, of which 9.2 MW was installed during PIGGAREP and another 25.6 MW not yet installed but with confirmed financing for implementation.

During PIGGAREP, there has been a marked increase in the regional development of renewable energy, notably with solar PV installations. This has resulted in the emergence of 2 excellent RESCOs servicing PIGGAREP PICs that are both based in Fiji. There is also a number of well-trained solar PV technicians residing in Tonga, Kiribati and Tuvalu who could be easily employed by RESCOs with a regional client base. However, the Fiji-based RESCOs are not yet willing to set up local RE shops since many of the PIGGAREP PIC RE markets are small where the ability to pay for operation, maintenance and capital replacements of RE systems remains poor. This is an indicator that future development and financing of RE systems by the private sector will remain a challenge.

PICs currently have more access to RE financing from increased donor interest to finance expansion of low carbon and RE generation systems. Attempts by PIGGAREP to increase the access to finance through an energy loan program (ELP) similar to that established by the National Development Bank of Palau, has not been fully adopted by targeted PICs including Cook Islands, Kiribati, Samoa, Tuvalu, FSM and RMI. This is due in part to difficulties experienced by some of these PICs to raising public awareness of RE and EE opportunities.

Despite robust efforts in Tonga that have improved the local skills to operate and maintain solar PV installations beyond the initial warranty periods, there are still weaknesses throughout the region amongst local communities to sustain RE power generation and reduced GHG emissions throughout the service period of the technologies installed.

Corrective actions for the design, implementation, monitoring and evaluation of the project:

Action 1: Project should carefully schedule its activities in that this schedule will determine to a large extent what targets the project can achieve. PIGGAREP targets for energy savings, GHG emission reductions and RE installed capacity should have been scaled back to account for the initial periods of PIGGAREP being dedicated mainly to capacity building and strengthening RE resource databases. Failure to account for these activities only invites additional risks to the project not achieving its objectives and targets.

Action 2: Targets on GEF Projects should be reviewed and reset to adapt to changing baseline conditions. Although the PIGGAREP targets were revised in late 2008 after the Inception Phase to adapt to changing baseline conditions, another review of these targets (notably during the MTE) should have been made in consideration that the definition of several PIGGAREP project activities was dependent on donor feedback on the RE project installations they had planned to finance.

Actions to follow up or reinforce initial benefits from the project:

Action 3 (to all PIC governments): Make annual budgetary allocations for retaining a pool of key technical personnel for supporting sustained operation and maintenance of existing RE systems, and efforts to fiscally and technically plan for RE capital replacements.

Action 4 (to all PIC governments): PIC governments should focus on creating and sustaining enabling conditions that would encourage regional RESCOs to set up local RE service centres that will strengthen local O&M skill sets and improve local access to standardized RE equipment

Proposals for future directions underlining main objectives of PIGGAREP:

Proposal 1 (to UNDP and SPREP): Continued assistance to PICs is required to guide scaled-up low carbon development (that includes RE and EE) that can be effectively delivered through a regional approach with a grouping of PICs with similar energy market conditions. A regional project could serve as a technical assistance facility to support improvements to the sustainability of low carbon deployments in a number of PICs including:

- scaled-up and regularized training of O&M at the community level including RE systems maintenance in the local education curriculum;
- assistance on measures to stabilize the grid as RE penetration approaches 90 to 100% to PICs where there are no such grid investment plans;
- replication of the development of community-based RESCOs such as the “incorporated societies” demonstrated in Tonga; and
- networking workshops for national low carbon champions and community RE operators to share experiences on O&M and national information dissemination, to keep current with best international practices, and for exposure to the application of new RE technologies; and
- a lower number of PICs than PIGGAREP to increase the attention being given to each PIC, and increase the effectiveness of the aid being provided by a future regional project.

Best and worst practices in addressing issues relating to relevance, performance and success:

Lesson 1: Project implementation teams need to carefully prepare procurement packages for goods or services to ensure that the desired goods or services are procured and that risks of a prolonged tendering process are minimized. In many cases, project teams mistakenly confine their search within their own country (where these goods and services may be of poor quality and even non-existent but at a lesser cost), and not externally (where these goods and services should be available but at a higher cost). Especially where UNDP-managed funds are provided for the procurement of goods and services, an experienced project manager or Chief Technical Advisor (with knowledge of the technical aspects and market conditions of the goods and services to be procured) should have been employed on the project team to provide procurement guidance.

Lesson 2: Regional projects providing soft assistance and technical support require streamlined institutional arrangements for efficient delivery. In the case of PIGGAREP, coordination of country activities was dependent on National Project coordinators or NPCs who considered work to identify opportunities for PIGGAREP assistance, and provide monitoring reports of GEF funded activities as an additional burden to them, all of whom had already high workloads for Government agencies or utilities that they worked for. A means of overcoming this issue would have been stronger support from the PIGGAREP PMO to prepare the project activity summaries required for PIGGAREP support, possibly through an international CTA. This would have had an impact on

streamlining the delivery of identified PIGGAREP activities, opportunities, approvals and monitoring reports, possibly precluding the need for some of the PIGGAREP Project extensions.

Lesson 3: All GEF climate change mitigation projects should employ a part time Chief Technical Advisor (CTA) to provide oversight to project management and technical guidance. GEF projects are an opportunity for developing countries to access international expertise as well as to provide oversight in management and quality control. An International CTA with a background in renewable energy development would have provided the PIGGAREP Project with oversight to the implementation of PIGGAREP with knowledge of best practices globally on GEF projects, advice on approaches to PICs on strategic development of their renewable energy programs, assisting the PIGGAREP Project manager in various reporting functions, and the procurement process of goods and services not typically available locally.

Evaluation Ratings¹

| 1. Monitoring and Evaluation | Rating | 2. IA & EA Execution | Rating |
|-------------------------------------|---------------|---|---------------|
| M&E design at entry | 5 | Quality of Implementation Agency - UNDP | 5 |
| M&E Plan Implementation | 4 | Quality of Execution - Executing Entity (SPREP) | 5 |
| Overall quality of M&E | 4 | Overall quality of Implementation / Execution | 5 |
| 3. Assessment of Outcomes | Rating | 4. Sustainability² | Rating |
| Relevance ³ | 2 | Financial resources | 2 |
| Effectiveness | 5 | Socio-political | 2 |
| Efficiency | 4 | Institutional framework and governance | 3 |
| Overall Project Outcome Rating | 4 | Environmental | 4 |
| | | Overall likelihood of sustainability | 2 |

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

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

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

ABBREVIATIONS

| Acronym | Meaning |
|----------|--|
| ADB | Asian Development Bank |
| ADMIRE | Action for the Development of Marshall Islands Renewable Energies |
| AFO | Administrative financial Officer (in the Cook Islands) |
| APR | Annual Progress Report |
| AWP | Annual Work Plan |
| BAU | business as usual |
| CCM | Climate change mitigation |
| CDM | Clean Development Mechanism |
| CDR | Combined Delivery Report |
| CER | Certified emission reduction |
| CIREC | Cook Islands Renewable Energy Chart |
| CKIG | Cook Islands Government |
| CO | UNDP Country Office |
| CROP-EWG | Regional Organization in the Pacific's Energy Working Group |
| CTA | Chief Technical Advisor |
| CTCN | Climate Technology Centre and Network |
| DBT | Development Bank of Tuvalu |
| EA | Executing Agency |
| EE | Energy efficiency |
| EERF | energy efficiency revolving fund |
| EIB | European investment Bank |
| ELP | Energy loan program |
| EOP | End of project |
| ESCO | Energy service company |
| EU | European Union |
| FASNETT | Facilitation of the Achievement of Sustainable National Energy Targets of Tuvalu |
| FSM | Federated States of Micronesia |
| GDP | Gross domestic product |
| GEF | Global Environment Facility |
| GHG | Greenhouse gas |
| GoD | Government of Denmark |
| GoI | Government of Italy |
| GoJ | Government of Japan |
| IFC | International Finance Corporation |
| IMPRESS | Improving the Performance and Reliability of Renewable Energy Power Systems in Samoa |
| INC | Initial National Communication |
| IRENA | International Renewable Energy Agency |
| IUCN | International Union for Conservation of Nature |
| JICA | Japan International Cooperation Agency |
| kt | Kilotonnes or 1,000 tonnes |
| KUA | Kosrae Utility Authority (in the FSM) |
| LFA | logical framework analysis |
| LPAC | Local Project Advisory Committee |
| M&E | Monitoring and evaluation |

| Acronym | Meaning |
|----------------|--|
| MEIDECC | Tongan Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications |
| MNRE | Ministry of Natural Resources and Energy in Samoa |
| MPR | Multipartite review meeting |
| MRV | Monitoring, reporting and verification |
| MSP | medium-sized project |
| MTE | Mid-term evaluation |
| NES | National Energy Strategy |
| NEX | National execution |
| NGOs | Non-governmental organizations |
| NPC | National Project Coordinator |
| NZMFAT | New Zealand Ministry of Foreign Affairs and Trade |
| OIREP | Outer Islands Rural Electrification Project in Tonga |
| PAC | project advisory committee |
| PAS | Project activities summary |
| PB | Project Board |
| PEC | Pacific Environment Community supported by Japan |
| PIEPSAP | Pacific Island Energy Policies and Strategic Action Planning Project |
| PIREP | Pacific Islands Renewable Energy Project |
| ProDoc | UNDP Project Document for “Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project” |
| PICs | Pacific Island countries |
| PIF-PEC | Pacific Island Forum - Pacific Environment Community |
| PIGGAREP | Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project |
| PIR | Project Implementation Reports |
| PM | Project Manager |
| PMO | Project Management Office |
| PaPA | Pacific Power Association |
| PPA | Power purchase agreement |
| PPG | Project preparation grant |
| PPM | Project Planning Matrix |
| PRF | Project results framework |
| PSC | Project Steering Committee |
| PURE | Productive uses of renewable energy |
| PV | photovoltaic |
| RE | Renewable energy |
| REO | Renewable energy officer |
| RESCO | renewable energy service company |
| RET | Renewable energy technology |
| RMI | Republic of the Marshall Islands |
| RTA | Regional Technical Advisor |
| SIDS DOCK | Small Island Developing States – Island Energy for Island Life |
| SIG | Solomon Islands government |
| SMART | Specific, measurable, attainable, relevant and time-bound |
| SNC | Second National Communication |
| SPC | Secretariat of the Pacific Community |
| SPREP | Secretariat of the Pacific Regional Environment Program |

| Acronym | Meaning |
|----------------|---|
| TE | Terminal Evaluation |
| TEC | Tuvalu Electricity Corporation |
| TERM | Tonga Energy Roadmap |
| ToR | Terms of Reference |
| UAE | United Arab Emirates |
| UNDP | United Nations Development Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USD | United States dollars |
| USP | University of the South Pacific |
| YWAM | Youth with a Mission in Samoa |

1. INTRODUCTION

1. This report summarizes the findings of the Terminal Evaluation Mission conducted during the July 25 - August 12, 2016 period for the UNDP-supported GEF-financed Project entitled: “Pacific Islands Greenhouse Gas Abatement through Renewable Energy Projects” (hereby referred to as the PIGGAREP or the Project), that received a USD 5.225 million grant from the Global Environmental Facility (GEF).
2. The PIGGAREP Project consisted of incremental activities to remove barriers to wider use of renewable energy in the Pacific island countries (PICs). PIGGAREP commenced operations on January 24, 2007. While PIGGAREP was operationally closed by December 31, 2015, the Project managed to leverage from the Government of Denmark (GoD) and the SIDS DOCK program an additional USD 3 million (known as PIGGAREP+) in 2 tranches, mid-2013 and mid-2014. The terminal date for PIGGAREP+ is scheduled for November 30, 2016. The scope of this Terminal Evaluation includes GEF-funded activities as well as those funded under PIGGAREP+.

1.1 Purpose of the Evaluation

3. In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP support GEF financed projects are required to undergo a Terminal Evaluation (TE) upon completion of implementation of a project to provide a comprehensive and systematic account of the performance of the completed project by evaluating its design, process of implementation and achievements vis-à-vis GEF project objectives and any agreed changes during project implementation. As such, the TE for this Project serves to:
 - promote accountability and transparency, and to assess and disclose levels of Project accomplishments;
 - synthesize lessons that may help improve the selection, design and implementation of future GEF activities;
 - provide feedback on recurrent issues across the portfolio, attention needed, and on improvements regarding previously identified issues;
 - contribute to the GEF Evaluation Office databases for aggregation, analysis and reporting on effectiveness of GEF operations in achieving global environmental benefits and on the quality of monitoring and evaluation across the GEF system.
4. This TE was prepared to:
 - be undertaken independent of Project management to ensure independent quality assurance;
 - apply UNDP-GEF norms and standards for evaluations;
 - assess achievements of outputs and outcomes, likelihood of the sustainability of outcomes, and if the Project met the minimum M&E requirements;
 - report basic data of the evaluation and the Project, as well as provide lessons from the Project on broader applicability..

1.2 Scope and Methodology

5. The scope of the TE for the PIGGAREP Project was to include all activities funded by GEF and activities from leveraged funds managed under UNDP, specifically the PIGGAREP+ funds from the GoD and SIDS-DOCK. The TE mission was fielded to Fiji, Tuvalu, Solomon Islands, Tonga and Samoa during the period of July 25 to August 12, 2016. The Terms of Reference (ToRs) for the TE are contained in Appendix A. Key issues addressed on this TE include:
 - Design of PIGGAREP including considerations of the absorptive capacity of PIC personnel and the difficulties of procuring and servicing RE equipment for remote small island markets;
 - Assessment of key financial aspects of the Project, including the extent of co-financing planned and realized;
 - The effectiveness of the PIGGAREP project in the development, management, implementation and maintenance of RE programmes for more than 11 PICs to meet the objectives of reducing GHG emissions. Sustained maintenance of RE projects should be seen as a challenge given the remoteness of these RE projects and the associated challenges of providing technical backup in the event of the breakdown of some of these RE systems;
 - Strengths and weaknesses of the PIGGAREP Project design, implementation, monitoring and adaptive management and sustainability of project outcomes including the Project exit strategy;
 - Results and impacts of the implemented national activities including views from the PIGGAREP country focal points (and other relevant stakeholders) on the impacts of PIGGAREP's regional activities implemented and their recommendations on the future regional activities;
 - PMO response to the challenges of integrating barrier removal activities with increased overreliance of donor capital cost contributions to various RE projects amongst the participating PICs;
 - Recommendations, lessons learned, best practices from implementing this Project that could be used on other similar GEF projects, in particular future multi-country programmes on climate change mitigation in the Pacific.
6. Outputs from this TE will provide an outlook and guidance in charting future directions on sustaining current efforts by UNDP, SPREP, their donor partners, the private sector, and all RE project proponents in participating PICs, to scale up renewable energy development and reduce GHG emissions from power generation facilities in the South Pacific region.
7. The methodology adopted for this evaluation includes:
 - Review of project documentation (i.e. APR/PIRs, meeting minutes of Project Steering Committee or multipartite meetings) and pertinent background information;
 - Interviews with key project personnel including the current and former Project Managers, technical advisors (domestic and international), and Project developers;
 - Interview with relevant stakeholders from various PIC governments and regional partners; and
 - Field visits to selected Project sites and interviews with beneficiaries.

A detailed itinerary of the Mission is shown in Appendix B. A full list of people interviewed and documents reviewed are given in Appendix C and Appendix D respectively. The Evaluation Mission for the UNDP-GEF project was comprised of one international expert.

8. The Project was evaluated for overall results in the context of:
 - *Relevance* – the extent to which the outcome is suited to local and national development priorities and organizational policies, including changes over time;
 - *Effectiveness* – the extent to which an objective was achieved or how likely it is to be achieved;
 - *Efficiency* – the extent to which results were delivered with the least costly resources possible; and
 - *Sustainability* - The likely ability of an intervention to continue to deliver benefits for an extended period of time after completion.

9. Limitations to the quality of this evaluation include the feasibility of only traveling to a limited number of PICs in the PIGGAREP project in consideration of the vast distances between and a given mission duration of 3 weeks; mission travel was only possible to the PICs of Fiji, Tuvalu, Solomon Islands, Tonga and Samoa due to limited availability of flights to various PICs. Moreover, mission travel was limited to visits in and around the capital cities of each PIC to observe PIGGAREP interventions and interview relevant PIC government officials and stakeholders. Travel to the outer islands of these PICs (such as Tuvalu, Tonga and Solomon Islands) to observe PIGGAREP interventions would have been very costly and taken several weeks. As such, assessment of these “remote” interventions was made through discussions with appropriate PIC government officials and triangulated with evidence provided from documentation and videos. For other PICs excluded from the evaluator’s mission travel, the assessment of the PIGGAREP impact was made through phone and Skype interviews, and triangulated wherever possible with evidence from existing project documentation and videos.

1.3 Structure of the Evaluation

10. This evaluation report is presented as follows:
 - An overview of Project activities from commencement of operations in July 2007 to the present activities of PIGGAREP+;
 - An assessment of Project results based on Project objectives and outcomes through relevance, effectiveness and efficiency criteria;
 - Assessment of sustainability of Project outcomes;
 - Assessment of monitoring and evaluation systems;
 - Assessment of progress that affected Project outcomes and sustainability; and
 - Lessons learned and recommendations.

11. This evaluation report is designed to meet GEF’s “Guidelines for GEF Agencies in Conducting Terminal Evaluations, Evaluation Document No. 3” of 2008:
<http://www.thegef.org/gef/sites/thegef.org/files/documents/Policies-TEguidelines7-31.pdf>

12. The Evaluation also meets conditions set by:
 - the UNDP Document entitled “UNDP GEF – Terminal Evaluation Guideline”:
<http://web.undp.org/evaluation/documents/guidance/GEF/UNDP-GEF-TE-Guide.pdf>;
 - the UNDP Document entitled “Handbook on Planning, Monitoring and Evaluating for Development Results”, 2009:
<http://www.undp.org/evaluation/handbook/documents/english/pme-handbook.pdf>; and
 - the “Addendum June 2011 Evaluation”:
<http://www.undp.org/evaluation/documents/HandBook/addendum/Evaluation-Addendum-June-2011.pdf>

2. PROJECT DESCRIPTION AND DEVELOPMENT CONTEXT

2.1 Project Start and Duration

13. The PIGGAREP Project Document (ProDoc) provides details on the baseline energy scenario in the South Pacific from 2000 to 2002, barriers to wider use of renewable energy in the region, incremental activities to remove these barriers spread over 6 components, and implementation arrangements. The Project commenced operations on January 24, 2007 for an intended duration of 5 years. The PIGGAREP Inception Workshop was conducted during November 2007. While PIGGAREP was operationally closed by December 31, 2015 (almost 9 years), disbursements from PIGGAREP were still being made during 2016.
14. Additional resources were provided to PIGGAREP towards achieving its objectives and targets. In early 2011, the SIDS DOCK support program⁴ developed a number of project concepts to support Small Island Developing States (SIDS) to transition to low carbon economies through the development of renewable energy and promotion of improved energy efficiency. Through funds made available from the Government of Denmark (GoD) through SIDS DOCK, 6 of these project concepts were implemented as additional activities to meet targets under PIGGAREP Subcomponent 1.3: RE demonstration schemes, designed to increase the number of successful low carbon applications in PICs. Out of these 9 concepts, 6 were to support RE applications and 3 to support EE applications. Funds for these activities were provided in 2 tranches, collectively referred to as *PIGGAREP+*, with the “+” aspect to distinguish the inclusion of the three non-PIGGAREP countries in Micronesia: Federated States of Micronesia (FSM), Republic of Marshall Islands (RMI) and Palau:
 - Activities of the first tranche were provided in the PIGGAREP+ ProDoc of February 2013 with an additional 3 RE and 3 EE projects;
 - Activities of the second tranche were provided in the PIGGAREP+ ProDoc addendum of February 2014, 3 additional RE projects were recommended for implementation as a part of the SIDS DOCK support program.

PIGGAREP+ has been under implementation since 2014 with an expected terminal date of November 30, 2016. PIGGAREP+ activities are also included in this Terminal Evaluation.

2.2 Problems that PIGGAREP Sought to Address

15. PIGGAREP sought to address the issues related to the heavy dependence on fossil fuels for power generation and other energy uses in Pacific Island countries (PICs). Many of the PICs are comprised of low-lying atolls that are at risk of becoming uninhabitable from rising sea levels with expected increased frequencies of extreme climatic events such as cyclones and intense rainstorms. Given the linkage of fossil fuels to GHG emissions and climate change impacts, vulnerability of these PICs to rising sea levels, and price fluctuations of imported fossil fuels, PICs have a particularly strong interest in renewable energy development for electricity generation and basic energy needs where electricity is not available. In addition, RE development would be a means to mitigate impacts to climate change, attenuate the

⁴ The SIDS DOCK Support Program is a joint initiative of the United Nations Development Programme (UNDP) and the World Bank (WB), developed in close consultation with the Alliance of Small Island States (AOSIS).

impacts of variable costs of imported fossil fuels, and increase access for its residents to renewable energy sources to improve their own economic standing.

16. For most PICs, fossil fuel imports are estimated to be in the range of 10% of the region's GDP with diesel being the most commonly used primary fuel for electricity generation⁵. PICs are over 12 times more exposed to oil-related price shocks⁶ as demonstrated by the volatility of the global price of fossil fuels that peaked in 2008. Notwithstanding the recent and steep decline of oil prices in 2015, PICs still experience higher costs of imported fossil fuels in the order of 20 to 40% to cover transport of these fuels over long distances to these scattered PICs. These only serve as constraints to PIC governments and their ability to deliver public services and development programs, and to reduce the region's growing poverty.
17. Efforts to deploy renewable energy technologies (RETs) in PICs has been underway since the late 1990s. Unfortunately, these efforts were generally developed in an ad hoc fashion and have not led to any sustainable development and growth of RETs in the PICs. A number of PICs had received support from the donor community to develop renewable energy projects during the late 1990s and early 2000s. Many of these RE projects were provided as demonstrations without adequate follow-up support to sustain and increase applications of various renewable energy technologies (RETs). Support for these activities would include improving local knowledge of RET applications and local capacities to implement RE projects. With the increase in the global price of oil from 2005 culminating in the oil price shocks of 2008, the number of donor RE funded projects in PICs had significantly increased with conditions that included shorter time frames for implementation and commissioning.
18. In 2002, UNDP received a GEF grant to identify barriers to the sustainable growth of RETs within PICs and to prepare a project with the objective of developing the renewable energy potential of the region. This project preparation, named the Pacific Islands Renewable Energy Project (PIREP), was approved as a medium-sized project (MSP) and implemented for the purposes of formulating and preparing PIGGAREP as a regional approach for PICs to remove barriers on the development and commercialization of renewable energy systems. PIREP was implemented between May 2003 and August 2006.
19. One of the successful PIREP outcomes was approval of the successor project, PIGGAREP⁷. PIGGAREP was approved by GEF as a 5-year USD 5.25 million grant in 2006 under GEF Strategic Priority 4 (SP-4) for the removal of barriers in 11 PICs to "reducing the growth rate of GHG emissions from fossil fuel use through widespread and cost effective use of RE resources and application of feasible RETs".

2.3 Immediate and Development Objectives of PIGGAREP

20. The goal or the development objectives of the PIGGAREP project was the "reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies". The immediate objective of the PIGGAREP Project was "the promotion of the productive use of

⁵ <https://www.beehive.govt.nz/sites/all/files/MFAT%20Energy%20factsheet.pdf>

⁶ <http://www.asia-pacific.undp.org/content/dam/rbap/docs/programme-documents/WS-SRP-2013-2017.pdf>

⁷ The preparatory activities of PIREP also spun-off efforts by the Marshall Islands and Palau to develop their own medium-sized UNDP-GEF proposals that were approved and implemented, respectively called "Action for the Development of Marshall Islands Renewable Energy" (ADMIRE) and "Sustainable Economic Development through Renewable Energy" (SEDREA).

renewable energy to reduce GHG emissions by removing the major barriers to the widespread and cost effective use of commercially viable renewable energy technologies”. The PIGGAREP LFA from October 2008 is contained in Appendix F.

21. The development objective of PIGGAREP+ was to foster “low carbon development for Pacific SIDS through the deployment of renewable energy (RE) resources and promotion of energy efficiency (EE)”. The PIGGAREP+ LFA from July 2014 is contained in Appendix G. Location of the PICs in PIGGAREP and PIGGAREP+ are provided on Figure 1.

Figure 1: Location of Pacific Island Countries of PIGGAREP and PIGGAREP+



2.4 Baseline Indicators Established

22. Objective-level baseline indicators of the PIGGAREP project includes:

- GHG emission reductions in PICs in tonnes CO_{2eq};
- Cumulative electricity generation from RE-based energy systems in MWh;
- Installed RE based energy systems capacity in MW;
- Value of income generating opportunities in each PIC gained from RE in USD.

The baseline value for all these indicators at the start of PIGGAREP was zero.

23. Objective baseline indicators for the PIGGAREP+ phase includes:
- % share of RE in the energy mix in the PIGGAREP+ countries of which the baseline value in 2013 was 0.04%;
 - Number of RE and EE projects implemented in the Pacific SIDS that replicated, or were designed based on PIGGAREP+ pilot projects of which the baseline value in 2013 was 0 for RE and EE projects;
 - Average fuel consumption of national power utilities in PIGGAREP+ countries in litres diesel/ kWh. Baseline value of this indicator in 2013 was 0.265 L diesel/kWh;
 - Number of implemented residential EE projects that were supported by EE financing schemes in PIGGAREP+ countries.
24. Outcome level baseline indicators for PIGGAREP can be found in Appendix F. Outcome level baseline indicators for PIGGAREP+ can be found in Appendix G.

2.5 Main Stakeholders

25. In addition to the implementing partner of PIGGAREP, namely the Secretariat of the Pacific Regional Environment Programme (SPREP), the main strategic stakeholders of PIGGAREP included:
- International Union for Conservation of Nature (IUCN);
 - International Renewable Energy Agency (IRENA);
 - Secretariat for the Pacific Community (SPC);
 - Pacific Power Association (PaPA);
 - University of the South Pacific (USP); and
 - Pacific Islands Forum Secretariat (PIFS).

A complete listing of PIGGAREP stakeholders is provided in Section 3.2.2 (Paras 69-75).

2.6 Expected Results

26. To achieve the specific PIGGAREP objective of “reducing the growth rate of GHG emissions from fossil fuel use in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies”, the PIGGAREP Project was designed for the removal of barriers with the following expected **Project outcomes** (from the 2008 LFA):
- Outcome 1: Improved knowledge about RE resources potential and increase the number of successful commercial RE applications on the ground;
 - Outcome 2: Expansion of the market for RET applications;
 - Outcome 3: Enhanced institutional capacity to design and implement RE;
 - Outcome 4: Improved availability of funding for existing and new RE projects;
 - Outcome 5: Strengthened legal and regulatory structures in the energy and environment sectors;
 - Outcome 6: Increased awareness and knowledge about RE amongst key stakeholders.
27. The addition of the PIGGAREP+ served to enhance the likelihood of achieving the PIGGAREP Outcome 1 by increasing the number of successful low carbon (RE and EE) commercial applications on the ground as well as promoting energy efficiency. The expected outcomes of PIGGAREP+ included:

- Outcome 1.1: Reduced energy costs for telecommunication systems equipment, and reduced reliance on fossil fuels to operate rural telecommunication systems **in the Solomon Islands**;
- Outcome 1.2: Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas **in Tonga**;
- Outcome 1.3: Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas **in Palau**;
- Outcome 1.4: Reduced reliance on fossil fuels, reduced and operational costs for electricity generation and distribution **in the Cook Islands**;
- Outcome 1.5: Reduced reliance on fossil fuels for the supply of electricity through commercial biofuel power generation **in Kiribati**;
- Outcome 1.6: Reduced reliance on fossil fuels for the supply of electricity through commercial biogas-based power generation **in Samoa**;
- Outcome 2.1: Increased application of EE technologies and energy savings in the residential sector **of Tuvalu**;
- Outcome 2.2.A: Improved energy use performance in power generation and reduced power generation cost in the national power utility **in RMI**;
- Outcome 2.2.B: Improved energy use performance in power generation and reduced power generation cost in the 4 state power utilities **in FSM; and**
- Outcome 2.3: Operational, effective and widely accepted energy efficiency lending schemes **in FSM, RMI and Tuvalu**.

Outcomes 1.1 to 1.3 and Outcomes 2.1 to 2.3 were funded under the first tranche (ProDoc of February 2013), while Outcomes 1.4 to 1.6 were funded under the second tranche (ProDoc of February 2014).

3. FINDINGS

3.1 Project Design and Formulation

28. Design of the PIGGAREP project was conducted during the period of May 2003 and November 2004 under the UNDP-GEF supported PIREP Project. As such, the intention of PIREP was to lay the groundwork for the PIGGAREP design through:
- the production of a set of country reports for each of the 14 participating PICs (including Tokelau) that provided excellent descriptions of the baseline energy situation of these PICs in 2001 and 2002;
 - the formulation of a regional renewable energy project; and
 - the in-country workshops and regional meetings as part of the consultative process (since 1998) to prepare the PIGGAREP concept.
29. Further strengthening the outputs of PIREP were its linkages and collaborations with the various Pacific regional projects and programmes. This included the UNDP/Government of Denmark supported “Pacific Island Energy Policies and Strategic Action Planning Project” (PIEPSAP), and the regional work of the Pacific Power Association (PaPA) on RE development with utilities.
30. The PIGGAREP ProDoc includes information generated from the PIREP PIC reports with 2002 information. Implementing the Project as per the ProDoc (start of implementation was in 2007), however, presented a few challenges due to:
- the need to update energy baseline information from the PIGGAREP ProDoc (which has 2002 baseline information) to 2007. The 2007 baseline information would have included RE projects being implemented and under consideration by several donors (including ADB and the World Bank commencing 2003 and 2004);
 - the PIGGAREP ProDoc being framed within the strategic objectives of GEF-4 that included the promotion of the “productive uses of renewable energy” (PURE). In reality, PURE projects were very difficult to promote in most PICs for a variety of reasons including many of the PICs being very small and remote energy markets, the lack of local capacity to manage such projects, the huge areas covered within the Pacific region, the associated increases in the cost of operation, limited opportunities for economies of scale, and little attraction for the private sector.
31. At the commencement of implementation in July 2007, PIGGAREP was the only *RE barrier removal initiative for PICs amongst* all donor projects (most of the other donor projects were related to the installation and demonstration of RE hardware). As such, the PIGGAREP ProDoc was only able to provide indicative approaches to RE barrier removal specific to each PIC including:
- the provision of technical assistance to implement demonstration projects and showcase RE delivery mechanisms and viable business cases for RE. Specific details were left to the Inception Phase where baseline RE development would need to be re-assessed and provided in Project work plans;
 - embedding project activities that mainstream RE activities into each PIC to provide continuity and sustainability after completion of PIGGAREP. This was to include PIGGAREP assistance to raise awareness of RE issues and provide training to RE equipment technicians in each PIC;
 - anchoring project activities with national climate change and energy programs that would have the effect of strengthening the role of national energy offices to lead in activities related to RE development and GHG emission reductions, and to coordinate RE

- development with other key environmental stakeholders, both public and private. This would ensure RE development is driven from within each PIC resulting in improved local ownership of the projects; and
- entrusting implementation to SPREP, a Samoan-based regional partner involved in the implementation of PIREP as well as a new climate change mitigation program as part of a large umbrella climate change program for the South Pacific. The selection of SPREP would ensure that PIGGAREP stakeholders would have access to SPREP's vast network of regional partners and donors involved with climate change and other regional environmental management challenges.
32. Ironically, the challenges referred to in Para 30, and the indicative approaches as referenced in Para 31 was identified as an issue in the PIREP Terminal Evaluation of October 2006 that states "*the project document format employed by both UNDP and GEF seemed to encourage a certain level of 'vagueness' with respect to presenting a clear structure of objectives, outputs and activities as well as inputs needed to achieve those (both in case of PIREP and PIGGAREP). Instead, the formats used by UNDP and GEF should be such that they promote a more to-the-point style of writing. In the end, prioritization of barriers, issues and activities is always needed (given the limitation of the project budget) and the lack of detail in the project conceptualization phase might lead to long delays in project's initiation phase with long discussions on the work plan of specific activities and the corresponding budget allocation*"⁸.
33. Indeed, this is precisely the issue that unfolded during the Inception Phase of the PIGGAREP project. Modifications to the LFA were deemed necessary and made in October 2008 for the following reasons:
- Significant changes in baseline (from 2003 and 2004) and co-financed projects including some that were in progress, near completion and completed, and some projects that did not materialize due to changes in government priorities;
 - Changes in national activities resulting from delays in the start of PIGGAREP ground activities in early 2008; and
 - The aforementioned and significant changes in the baseline had necessitated changes to the bulk of proposed incremental activities.
34. In conclusion, the approved PIGGAREP ProDoc (with indicative details of activities related to RE barrier removal specific to each PIC) should have triggered an expectation that the Inception phase of the PIGGAREP project would experience delays in finalizing work plans and allocating appropriate budgets for each PIC. Moreover, project time and resources would be required to build local capacity and anchor project activities at the national level prior to development of RE projects by the PICs. This would only serve to delay implementation of RE projects on PIGGAREP and increase the risk of not meeting GHG emission reduction targets. The adaptive management response to this design issue is further discussed in Section 3.2.1.
35. The design of the PIGGAREP+ phases in 2013 and 2014 was intended to enhance the likelihood of the PIGGAREP project achieving its GHG emission reduction targets by providing funds to demonstrate productive uses of renewable energy (PURE), commercially viable renewable energy technologies, EE measures, and the use of revolving funds to increase the adoption of EE measures.

⁸ Pg 5 of PIREP Terminal Evaluation of October 2006.

3.1.1 Analysis of Project Planning Matrix

36. The logical framework analysis (LFA) for PIGGAREP provides 41 indicators and targets to serve as proof of the achievement of the Project objective of “reducing the growth rate of GHG emissions from fossil fuel usage in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies”. The wording of *most of the indicators and targets do meet SMART criteria*⁹; as such, the “intent” of the indicators and targets set in the LFA provides some guidance for the Project team to plan activities.
37. Comments on “Goal and Objective level targets” includes:
- the targets of 50 MW of additional installed RE based energy systems capacity, 219,000 MWh of cumulative electricity generation from RE based systems, and the corresponding 2 million tonnes of CO_{2eq} reduced by the EOP did not appear to be realistic or attainable. This would have required more than 20 MW of RE based systems to be developed and generating electricity during the first 2 years of the Project. Given the expected delays in implementing RE project due to the need to define specific work plans and build local capacity to implement such projects (as mentioned in Para 34), meeting this target would seem unlikely;
 - the target of USD 110 million of cumulative income generating opportunities in each PIC gained from RE development was difficult to attain given that most PICs are remote small markets where the opportunities for income generating activities are very limited. Furthermore, the evaluator also questions the measurability of this indicator given the lack of human capacity to evaluate income generating opportunities in each PIC. Employment generated from RE projects would have served as a more useful and more easily measured development indicator.
38. A comment on an “Outcome 1 target”:
- The attainability of the target of 90% average collection efficiency for each of demonstration project by EOP. The reality of many of the demonstration projects is the lack of a culture for the collection for tariffs given that many of these projects (as set up by many donors) have been located in subsistence areas where the collection of tariffs is not likely¹⁰.
39. A comment on an “Outcome 2 target” includes:
- The attainability of the target of 100 MW of cumulative additional RE-based power generation installed in PICs by 2015. This indicator appears to contradict the 50 MW “objective level” target. Regardless, this target is not attainable for reasons mentioned in Para 36.
40. Comments on an “Outcome 5 indicator” includes:
The lack of a target for the indicator “RE based livelihood and productivity projects by 2012”.

3.1.2 Risks and Assumptions

41. The risks identified in the PIGGAREP ProDoc are related to insufficient local capacities in small markets to manage RE development activities to improve confidence in new RE technologies. This would include ineffective local participation, ineffective participation of the

⁹ Specific, Measurable, Attainable, Relevant and Time-bound

¹⁰ To a large extent prior to PIGGAREP, donor-provided RE systems were viewed as a gift of free electricity with little planning up front for paying for operations and maintenance.

private sector, and the failure of demonstration projects. Given the actual outcomes of the PIGGAREP Project, all risks appear to be properly identified. The effectiveness of local participation in RE development was certainly challenged in PICs with low populations characterized by a number of PICs that relied on one person, thereby reducing the efficiency of RE development in that particular PIC. In addition, private sector regards the development of RE in these small markets as high risk.

42. The PIGGAREP objective was based on assumptions of political stability of the PICs, high price of imported fossil fuels and strong in-country support for RETs with successful demo RE projects. These assumptions have also been properly identified; notwithstanding the 2015 fall in the global price of oil, support for RE development has been very strong in all the PICs at both regional, national and community levels as a concrete means of addressing problems of global warming and rising sea levels.

3.1.3 Lessons from Other Relevant Projects Incorporated into PIGGAREP Design

43. PIGGAREP was the first regional project to comprehensively attempt to address the systematic removal of barriers to the widespread utilization of renewable energy technologies. As such, project preparations for PIGGAREP were supported by PIREP, an MSP supported by GEF in 2003 and 2004 to provide baseline energy information of 11 PICs, and to prepare a regional project that is known as PIGGAREP. Root causes and barriers to wider deployment of RE in many of the PICs were documented in PIREP.
44. To a large extent, the primary lesson from PIREP incorporated into the PIGGAREP design was the lack of success of earlier donor efforts to promote RETs in the PICs. This includes earlier efforts to address barriers to RETs through a number of bilateral donor projects which were done on an ad hoc basis with minimal impact on the sustained development of RET deployment during the 1990s and early 2000s (such as RE development on the Cook Islands, Solomon Islands, Tonga and Tuvalu). PIGGAREP was designed as an integrated and comprehensive initiative to remove policy, institutional, financial, market and technical barriers to improve the effectiveness of future RET efforts of the region.

3.1.4 Planned Stakeholder Participation

45. PIGGAREP as a regional project, was to have a strong mechanism for engaging stakeholders to participate in all phases of barrier removal to RE development in PICs. The PIGGAREP design called for the involvement of an implementing regional partner with appropriate outreach to all PICs. In this case, the PICs involved during PIREP endorsed the role of SPREP to provide the necessary coordination and management of PIGGAREP's activities. The selection of SPREP to manage PIGGAREP was related to their network of stakeholders in each of the PICs, deemed sufficient to engage all important stakeholders in critical RE barrier removal activities.
46. The PIGGAREP ProDoc further defined stakeholder engagement through project implementation arrangements that included the formation of country teams comprised of government, private sector and CSOs to enhance the likelihood of efficiently implementing barrier removal activities of each PIC. Through the contributions from the various members of the country teams, some country teams were to appoint their own experts to address the required activities for the removal of barriers. These experts would be led by a National Project Coordinator (NPC) who would then work full-time on PIGGAREP as well as being paid by the Project. NPCs would also be responsible for the delivery of on-ground activities

recruitment of local experts and serving as a primary liaison with local communities. Moreover, if services needed to be procured, they would be procured through an open international tender as per UNDP Results Management User Guide.

47. Stakeholder participation was to be further strengthened through mechanisms to include regional coordination. Regional coordination was deemed as a means of sharing lessons learned on implementing RE development throughout the South Pacific region, leveraging partnerships, and taking advantage of opportunities to replicate RE achievements that would maximize the impacts on the quality of life in the region. Some of these regional stakeholders would be involved with PIGGAREP through their participation in a PIGGAREP project advisory committee (PAC) that was designed to review annual project progress. The PIGGAREP design also called for a donor roundtable meeting to inform donors of RE developments and opportunities arising from PIGGAREP interventions.
48. Overall, only a few PICs would have the capacity to assemble country teams with government, private sector and CSOs. Many of these country teams had existed prior to the commencement of PIGGAREP through funding under the GEF supported “Pacific Islands Climate Change Program” (PICCAP) that was set up to assist PICs to implement their obligations under the UNFCCC. SPREP undertook coordination of these teams under funding from PICCAP and partly from some of the SNC projects. However, when these funds were exhausted, country teams in many of the PICs had to be reformed. Moreover, many of the PICs had very few personnel to choose from for the coordination and management of RE development activities on behalf of PIGGAREP. As a result, country teams for many of PIGGAREP’s PICs comprised of one person. Moreover, none of the countries had any private sector members to promote PURE on their country teams due to the small size of the markets of all PICs.

3.1.5 Replication Approach

49. The Project design envisaged a replication approach where the lessons learned from building local capacity and fostering an enabling environment (regulatory, institutional and financial) would generate interest in commercial RET demonstrations in each PIC to boost confidence that RET applications in each PIC can be successfully implemented. Concurrently, the Project would also promote PURE projects and develop financing mechanisms to assist potential RE project proponents in designing and implementing replications of these RET demonstrations.
50. The reality, however, is that the availability of financing for RE development in many of the PICs (many of the smaller PICs) is almost wholly dependent on donor financing (to some extent demonstrated by the additional funds from PIGGAREP+), and reflective of the poor market opportunities in the region for development of PURE projects. As such, the feasibility of replicating RE applications in many of the PICs appears questionable. Only in the larger PICs such as Fiji and Samoa, could there be any expectations of replicating RE development.

3.1.6 UNDP Comparative Advantage

51. While there are many donors involved with the deployment of RETs within PIGGAREP PICs, as mentioned before, their assistance has been limited to the provision of hardware with limited training in the installation operation and maintenance of these facilities. Moreover, prior to the operation of PIGGAREP, much of the RE development was done on an ad hoc

basis without any attention to a strategic approach to meeting many of the ambitious RE targets of all PICs that would include improved sustainability of RE power generation.

52. UNDP's comparative advantage to other donor agencies is its focus on policy-based and cross-sectoral approaches as well as building local capacities through effective collaboration with a wide range of local stakeholders. This would include public and private sectors as well as technical experts, civil society and grassroots level organizations. UNDP's approaches to development in most countries is designed to improve the lives of the most vulnerable population sectors including difficult approaches to improving access to clean and modern energy services to households that cannot afford such services or investments. Given UNDP's long track record on such projects, notably in climate change mitigation and adaptation projects, the organization is suited as an implementing agency for such projects.

3.1.7 Linkages between PIGGAREP and Other Interventions within the Sector

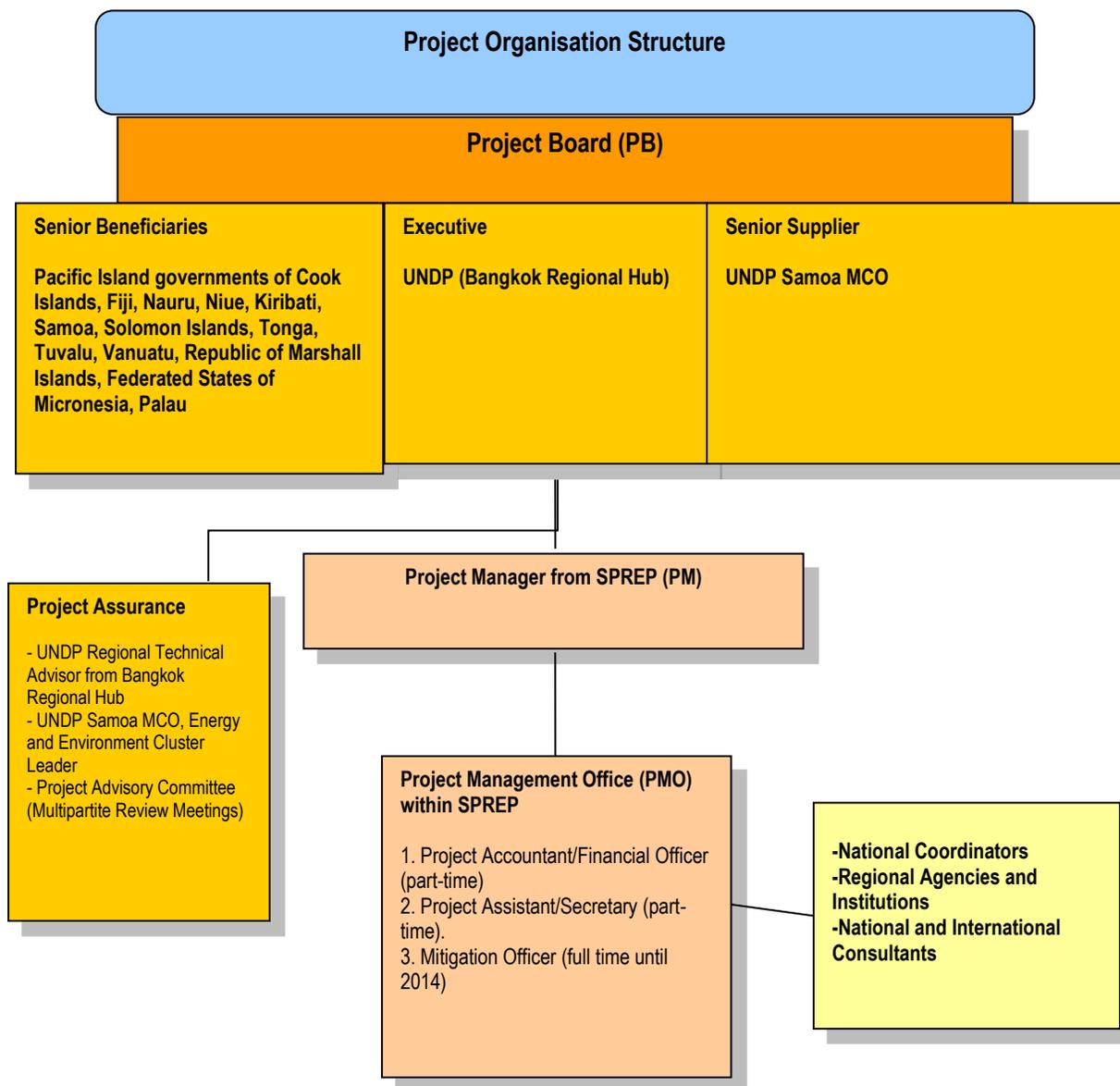
53. The intention of the PIGGAREP Project was to learn from and improve the performance of RE investments made by donors throughout all the PICs, and to create enabling conditions to sustain RE growth that would improve productive uses of RE (through PURE projects) and alleviate poverty in areas without electricity. With the limited funds of the PIGGAREP project, PIGGAREP activities would focus on soft interventions to enable PIC governments to develop their own strategic RE development plans, to collect critical RE resource data that is a prerequisite to formulating an RE investment, and to improve the overall knowledge and awareness of RE development for PIC government personnel as well as the general public. The intended outcome of these activities would be to improve the confidence of PIC governments and their dialogue with potential financiers of RE projects on how to most effectively deploy RE investments consistent with their national strategic vision for RE development.

3.1.8 Management Arrangements

54. The implementing partner of the PIGGAREP Project is the Secretariat of the Pacific Regional Environmental Program (SPREP), an intergovernmental organization based in Apia, Samoa supported by governments and administrations of the Pacific region to ensure regional protection and sustainable development. The PICs that were covered under the PIGGAREP Project endorsed SPREP's role on PIGGAREP in 2007 including overall planning, management, coordination and administration of PIGGAREP. Under SPREP's Pacific Futures Program, PIGGAREP served as one of the cornerstones of the Program's Climate Change component, enabling the utilization of SPREP's multidisciplinary expertise on a wide range of climate change issues including climate change negotiations, waste management and climate monitoring.
55. The original management arrangements of PIGGAREP were to have SPREP as the Implementing Partner to coordinate Project activities through a Project Management Office (PMO) that was set up within the premises of SPREP. The evaluator is mindful that PIGGAREP was a unique regional project that commenced in 2007; as such, these arrangements were designed without precedence in terms of management and implementation arrangements.
56. In the ProDoc, regional coordination was to be used as a means of sharing lessons learned on implementing RE development throughout the Pacific region, leveraging partnerships, and taking advantage of opportunities to replicate RE achievements to maximize the impacts

- on the quality of life in the region. A Project Advisory Committee representing a number of the regional stakeholders would provide oversight and guidance as required by the Project Manager; this was to be done during the Project through Multipartite Review (MPR) meetings chaired by UNDP with committee members consisting of the NPCs from the various PICs and UNDP.
57. Technical assistance to advance renewable energy development throughout the PICs was to be provided from SPREP's network of multidisciplinary expertise, either in-house or external. Success of these management arrangements were based on the assumption that the capacity of SPREP would be sufficient to efficiently implement and coordinate the PIGGAREP Project. Contrary to most project designs, the PIGGAREP ProDoc does not mention the need for a Project Board (PB) or a Project Steering Committee (PSC) but does have a Project Advisory Committee (PAC); a PSC was constituted during the inception workshop in November 2007, and later renamed as a Project Board.
 58. The PIGGAREP PMO was to be staffed by a Project Manager (PM), and an Administrative/Financial Officer (AFO) to undertake specific PIGGAREP project responsibilities including submission of work plans, progress reports, audit and financial reports as well as financial control of the PIGGAREP project using the National Execution (NEX) modality of UNDP. The PM would also be responsible for entering working and partnership arrangements with regional organizations and consultants to maximize the likelihood of achieving the objectives of PIGGAREP. SPREP reports to a responsible Program Officer within UNDP Samoa on the submission of work plans, progress reports audits and financial reports.
 59. Another important implementation arrangement in the PIGGAREP ProDoc includes 14 National Project Coordinators (NPCs) of the 14 PICs under PIGGAREP and PIGGAREP+. PIGGAREP (as well as PIGGAREP+) activities under each PIC were to be managed by the NPC responsible for the day-to-day management and implementation of all PIGGAREP activities, delivering on-the-ground activities, utilizing local expertise, and engagement of local communities notably those that are beneficiaries of RE-based energy projects. NPCs were originally designated as Project paid positions in the ProDoc. However, during the Inception Phase, a decision was made not to pay NPCs from the Project as further detailed in Para 63.
 60. Given the achievements and progress of the Project up to 2016, these management arrangements appear to be appropriate notwithstanding the poor progress during the early stages of the Project (when project resources were being used to provide details to PIGGAREP activities and build capacity of PICs), operational issues related to the remoteness and small sizes of the PICs, and the associated lack of capacity to find qualified RE personnel. However, there were some PICs that only had a minimal number of PIGGAREP activities or none at all such as PNG, Fiji and Nauru. *One could surmise that due to the wide range of market and geophysical conditions of all PIGGAREP PICs, there were probably too many PICs under PIGGAREP. A reduced number of PICs would have only improved the project's effectiveness, preferably PICs with similar RE market characteristics.*
 61. An organogram of the PIGGAREP implementation arrangements is provided on Figure 2.

Figure 2: Current Management Arrangements for the UNDP-GEF “Pacific Islands Greenhouse Gas Abatement through Renewable Energy Projects” (PIGGAREP) Project



3.2 Project Implementation

62. The following is a compilation of key events and issues of PIGGAREP implementation including the 2 additional phases, PIGGAREP+ and PIGGAREP++ in chronological order:

- The PIGGAREP project was approved by the GEF CEO on September 6, 2006;
- The ProDoc was signed on January 24, 2007, marking the official start of the Project;
- PIGGAREP commenced operations in July 2007 with a Project Manager and the establishment of a Project Management Office (PMO) in Apia, Samoa;

- The PIGGAREP Inception workshop was conducted in November 2007 followed by the delivery of the Inception Report in February 2008;
- A review of PIGGAREP targets was conducted by UNDP in October 2008. The review was necessitated by the time elapsed between the time when the original PIGGAREP targets were set (with PIREP information from 2001 and 2002), and the commencement of PIGGAREP ground activities in January 2008;
- The PIGGAREP midterm evaluation (MTE) was conducted in November 2009 with a report issued in July 2010 that made recommendations to extend PIGGAREP for another 2 years until December 2014;
- In 2012, a PIGGAREP report prepared by an international CTA was issued on a “Recommended Proactive Strategic Barrier Removal Approach” providing details to the strategic barrier removal approach recommended in the MTE. Fundamental to this approach was a renewed focus on the sustainable removal of barriers to the uptake of PURE in PICs, and the provision of PIGGAREP resources to PICs demonstrating the potential for “commercial PURE” projects;
- SIDS-DOCK and the Government of Denmark contributed an additional USD 3 million (this is referred to as PIGGAREP+) in 2 tranches:
 - First tranche of USD 2 million in July 2013 to support implementation of RE and EE demonstration projects under Outcome 1 of PIGGAREP. PIGGAREP+ was scheduled to be implemented over an 18- month period commencing April 2013 with completion on September 30, 2014; and
 - Second tranche of USD 1 million was confirmed in February 2014 to be used over a 16-month period commencing March 2014 with completion on July 31, 2015;
- PIGGAREP+ was granted an extension from September 2014 to June 30, 2015;
- PIGGAREP project was operationally closed on December 31, 2015;
- In July 2016, PIGGAREP+ and PIGGAREP++ was extended to November 30, 2016 to complete ongoing activities in Tuvalu, Palau and Samoa.

3.2.1 Adaptive Management

63. During the Inception Phase of PIGGAREP in 2007-8, the Project had to adaptively manage Project activities since the circumstances of the PIGGAREP design in the ProDoc (based on 2002 information) had significantly changed. The November 2007 PIGGAREP Inception Report demonstrates a number of efforts required to adaptively manage project ground activities commencing in January 2008:
- All PICs had to submit Project Activity Summary (PAS) proposals for PURE projects that would be funded by PIGGAREP and implemented in the proponent PICs. In each PAS proposal, the actual baseline activities in the PICs energy sector had to be presented, along with incremental activities that will include those that promote and facilitate PURE activities. The approved PAS would justify the incremental funds from the PIGGAREP’s GEF budget;
 - Details of implementation arrangements of PIGGAREP had to be formulated including:
 - the staffing and budget required for operating the PMO;
 - composition of country teams to coordinate PIGGAREP national activities based on the details provided in their PAS;
 - streamlining coordination of PIGGAREP activities and integrating these activities with regional issues related to climate change and energy by involving the Council of a Regional Organization in the Pacific’s Energy Working Group (CROP EWG), which would have resulted in lower project management costs;

- formation of a Project Steering Committee (PSC made up of representatives from UNDP, SPREP and the PICs) which was not provided in the ProDoc;
 - selection of National Project Coordinators for PIGGAREP that were not to be paid with PIGGAREP resources due to the already high cost of the aforementioned implementation arrangements. The intention of involving NPCs was to absorb them into the region's civil services at the EOP;
 - redefining the roles and responsibilities of the various stakeholders of the Project including PIC governments, NGOs, local communities, private sector, financial institutions, and regional and international organizations working in the region; and
 - adjustments to the M&E framework (but not the LFA for reasons explained in Para 65) due to the lack of timely submission of PASs and national work plans of each PIC. The lack of timely submission of PASs was likely the primary cause of the poor disbursement efficiency of PIGGAREP between 2008 and 2010.
64. Moreover, all PICs possessed unique market traits that impacted the way RE promotion was implemented by PIGGAREP inducing further adaptive management measures after the Inception Phase including:
- adjusting activities to adapt to differing levels of capacity at the national level to coordinate and manage energy issues;
 - different actions to support RE on large islands with large populations to isolated small islands which are not connected to a central power grid;
 - use of local tendering and procurement processes for some PICs while using UNDP and SPREP procurement for smaller PICs which do not have strong public procurement processes;
 - changed approaches for some PICs with changing energy sector priorities due to the years of lapsed time between early 2008 and the time when PASs were submitted to the PMO; and
 - constant adjustments of annual PIGGAREP work plans accounting for the realities of the rate of implementation. Some PICs implemented at a slower rate due to the lack of local capacity and lack of dedicated time from NPCs who were not paid by PIGGAREP funds.
65. Changes to the LFA were not made during the Inception Phase but were deemed necessary by UNDP and made in October 2008 (led by the RTA) for the following reasons:
- significant changes in baseline (from 2002 information) and co-financed projects including some that were in progress, near completion and completed, and some projects that did not materialize due to changes in government priorities;
 - changes in national activities resulting from delays in the start of PIGGAREP ground activities in early 2008; and
 - the aforementioned and significant changes in the baseline had necessitated changes to the bulk of proposed incremental activities.
66. One significant issue with the reset targets of the 2008 LFA for the evaluator was meeting the “attainability” of SMART criteria. The GHG emissions targets would be difficult to attain considering the overreliance of donor assistance to finance RE hardware¹¹ (that would never reach the required levels for installed capacity of 50 MW in 5 years) and the soft nature of PIGGAREP assistance. In the opinion of the evaluator, GHG emission reductions could be causal from PIGGAREP activities:

¹¹ A danger of PIGGAREP taking credit for lifetime GHG reductions from RE projects is that the funders of these project, the donors, may want to also take GHG emission reduction credits, thereby double counting of the GHG emission benefits.

- if RET deployment was accelerated to an earlier date compared with the business-as-usual (BAU) scenario; and
- if improved capacities of local communities to operate and maintain RE installations maximized the service life of RETs deployed.

Unfortunately, estimation of these GHG emission reductions using this logic would be very subjective. This issue is further discussed in Section 3.3.1.

67. After just over 2 years of PIGGAREP implementation that was characterized by inefficient delivery (2008-2009), a midterm evaluation (MTE) was conducted in 2010 to identify further adaptive management to improve the performance of PIGGAREP. The MTE approached this issue by providing a more comprehensive description of actual barriers to sustained RE deployment in PICs including:
- market distortions on electricity tariffs in PICs that are driven by donor or grant funding for both fossil fuel and RE electricity generation equipment, and resulting in electricity tariffs that cannot even cover O&M costs of the systems;
 - understandable reluctance of PICs to turn away donors offering new equipment;
 - general lack of RE knowledge amongst RE advocates, politicians, decision-makers and the general public of the real cost of energy; and
 - the lack of local successful demonstrations on RE installations, resulting tangible and sustained energy savings and GHG emission reductions.
68. The MTE correctly pointed out that the original PIGGAREP design was not going to lead to the development of productive uses of renewable energy (PURE) in PICs as defined under GEF Strategic Priority 4. This was based on the fact that the provision of electricity from RE sources to non-electrified and remote areas was not going to lead to PURE or income generating uses without building local skills in business development, marketing and financing. The activities within the PIGGAREP design simply did not support the building of these specific capacities. This was an important step for PIGGAREP as a means of focusing their post-2011 efforts with ongoing RE projects brought forward by PICs and driven by donors, many of which were not PURE projects.
69. UNDP played a key adaptive management role in 2013 in leveraging the PIGGAREP project for additional resources from SIDS-DOCK referred to as PIGGAREP+. The addition of PIGGAREP+ resources was significant in providing the necessary funds to implement and operate RE applications and EE measures in 9 key PICs. Without these RE and EE projects, PIGGAREP would have little to show for RE development.

3.2.2 Partnership Arrangements

70. PIGGAREP was able to foster a wide range of partnerships that has played an important role in enhancing the Project's ability to deliver barrier removal activities, in leveraging support and financing for scale up of renewable energy development, and sharing EE implementing experiences with other PICs. The effectiveness of the range of partners is demonstrated by 4 categories of stakeholders for which PIGGAREP partnership arrangements were established.
71. PIGGAREP had strategic partnership arrangements with the following regional and international partners:

- Secretariat of the Pacific Community (SPC) in the identification of renewable energy projects throughout the region through NPCs, and opportunities for assistance in developing and strengthening national policy frameworks for RE;
 - International Union for Conservation Nature (IUCN) regional office on joint implementation of renewable energy projects as well as the procurement of solar PV panels for a number of PICs (that received funding through IUCN's Oceania energy programme with €33 million from Italy and €1 million from Austria);
 - Pacific Power Association (PaPA) to assist in building capacity in institutional strengthening of PIC utilities in renewable energy development;
 - University of the South Pacific (USP) to develop and strengthen existing national policy frameworks for RE initiatives in several PICs;
 - Pacific Island Forum - Pacific Environment Community (PIF-PEC) to provide additional support to the PICs including financing of renewable energy hardware funded by Japan;
 - International Renewable Energy Agency (IRENA) on soft costs regarding studies on mini grids and grid stability, updating of the PIREP energy baselines of various PICs, and access to capital cost financing of renewable energy hardware from the UAE; and
 - Climate Technology Centre and Network (CTCN) in the facilitation of building capacities in various PICs at regional workshops.
72. Partnership arrangements were established with PIC governments to advance their RE development agenda with local stakeholders with these efforts led by the NPC. PIC governments with partnership arrangements with PIGGAREP includes:
- The Cook Islands Renewable Energy Development Division;
 - The Fiji Department of Energy;
 - Kiribati Ministry of Public Works and Utilities (not interviewed);
 - Nauru Utility Corporation (not interviewed);
 - Niue Power Corporation (not interviewed);
 - Ministry of Natural Resources and Energy (MNRE) in Samoa;
 - The Energy Division within the Solomon Islands Ministry of Mines, Energy and Rural Electrification;
 - Tonga's Ministry of Meteorology, Energy, Information, Disaster Management, Environment, Climate Change and Communications (MEIDCC); and
 - Tuvalu Electricity Corporation;
 - The Vanuatu Ministry of Climate Change Adaptation, Meteorology, Geohazards, Environment and Energy;
 - Republic of the Marshall Islands; Office of Environmental Planning and Policy Coordination;
 - Federated States of Micronesia FSM Development Bank, Ministry of Resources and Development and Kosrae Utilities Authority; and
 - Palau Public Utilities Corporation (not interviewed).
73. Since PIGGAREP activities were designed to complement ongoing RE development in each PIC which was funded mainly through donors, PIGGAREP did establish partnerships with the following donors:
- Australian AID as one of the funders of the Tonga RE electrification program;
 - New Zealand MFAT notably for solar PV installations in the Cook Islands;
 - the Japanese government for their contribution to the Pacific Environment Community fund (PIF-PEC), to provide additional support to PICs financing of renewable energy hardware;

- JICA notably for a number of solar PV installations in solar water pumping in Nauru, and the rehabilitation of the Sarakata small hydropower project in Vanuatu;
 - the Taiwan government notably for solar PV street lighting installations in Nauru;
 - the Italian government for solar water pumps in Kiribati, solar PV installations on the Solomon Islands;
 - the Austrian government for solar PV installations on the Solomon Islands;
 - Government of Denmark for funding additional RE and EE applications under PIGGAREP+;
 - the UAE Pacific Partnership Fund that provided funding for a number of solar PV installations including Tuvalu;
 - the EU and its Renewable Energy Programme for €13.95 million funded from the 10th EDF National Indicative Programmes (Multi Country RE Programme including Kiribati, Nauru, Niue and Tonga);
 - the Asian Development Bank mainly with the new small hydropower projects and rehabilitated hydropower projects in Samoa;
 - the World Bank and the International Finance Corporation (IFC) in collaboration with the European Investment Bank (EIB) on the financing of the Tina River hydropower project in the Solomon Islands.
74. PIGGAREP also established relationships with service providers to strengthen the quality of RET installations and their maintenance. This included:
- RESCOs that provided technical support mainly for solar PV installations in a number of PICs including Fiji (CBS Power Solutions), Solomon Islands (Willies Electric Power and Solar), Tonga (Kingdom Energy) and Kiribati (Kiribati Solar Energy Company or Terubentau Akura's);
 - NGOs to assist in training of technicians including YWAM in Samoa (training on various biogas generation technologies);
75. Efforts were made by PIGGAREP to partner with national development banks in each PIC to assist in efforts to train their personnel on programs to improve the access of EE financing to PIC residents (in support of Outcome 2.3 in PIGGAREP+). These efforts, however, were not effective since this did not result in national development banks being proactive in the developing these programs.
76. Overall, mechanisms to engage stakeholders on PIGGAREP activities appear effective in complementing and supporting donor-driven RE developments in PIGGAREP PICs. However, communication with some of the PIGGAREP partners would be sporadic for several months due to so many PICs involved in PIGGAREP, the lack of RE capacity in each PIC, and frequent changes of personnel within some of the PIC governments. While many of the PIGGAREP interventions have been quite effective in catalysing RE/EE market development in PICs, *improvements to the effectiveness of the PIGGAREP partnerships could have been realized with a reduced number of PICs involved on the Project.*

3.2.3 Feedback from M&E Activities Used for Adaptive Management

77. Feedback for M&E activities has been provided through:
- *PIRs from 2008 to 2015* that provided details of activities used for adaptively managing the Project;
 - *Quarterly progress reports that were issued from 2007 to 2016*, and used to assist in the preparation of annual PIRs. Information for these QPRs were dependent on feedback

from the National Coordinators in each PIC. A number of the PIRs and QPRs informed the evaluator of the difficulties in timely feedback from the NPCs. One of the issues of timely feedback has been the fact that NPCs were not paid positions within PIGGAREP, thus adding to the already heavy workload of these high-level government employees;

- *Minutes from annual Project Board meetings (2007 to 2013)*. The Project Board consists of UNDP Samoa, UNDP Bangkok, SPREP, and selected representatives from PICs to review on an annual basis, progress on Project implementation and other operational issues, and to take adaptive management actions;
- *Multipartite Review (MPR) meetings minutes up from 2009 to 2014*. MPRs were generally held on an annual basis with the Project Board and representatives from each of the participating PICs and regional partners to review progress and identify future needs of each PIC. MPRs have not been conducted since 2014 due to the exhaustion of the PIGGAREP budget; and
- *The Mid-Term Evaluation (MTE) report from July 2010* which provided recommendations to improve the delivery efficiency of the Project from its first 2 years of operation from July 2007 to late 2009, and to improve its focus on barrier removal to sustained RE development.

78. As mentioned in Para 76, communications with the some PIGGAREP stakeholders would be sporadic (such as Palau, Kiribati, RMI, FSM and Nauru), due to their limited capacities and remote locations; this would cause delays in adaptive management decisions that were noticeable on the implementation of PIGGAREP+ activities. Feedback for M&E activities for the purposes of adaptive management was stronger with PICs such as Cook Islands, Samoa, Solomon Islands, Tuvalu and Solomon Islands due to more proactive NPCs. Similar to the conclusion in Para 76, *improvements to feedback from M&E activities of PIGGAREP PICs could have been realized with a reduced number of PICs involved on the Project*.

3.2.4 Project Finance

79. The PIGGAREP Project had a GEF budget of USD 5.25 million that was disbursed over a 10-year duration, managed by a PMO from July 2008 to August 2016, with an additional budget from the Government of Denmark of USD 3 million that was managed by the same PMO from July 2014 until the proposed termination date of PIGGAREP+ of November 30, 2016. Table 1 provides an overview of expenditures of the PIGGAREP Project budget of USD 5.25 million from July 2008 to August 2016, and the PIGGAREP+ project budget from July 2014 to August 2016. Table 2 breaks down PIGGAREP expenditures by PICs and PMO costs. These tables reveal:

- Low rates of disbursements during the period of 2007 to 2010 that coincide with early PIGGAREP activities to re-define RE activities within all participating PICs and build local capacity;
- An increase in PIGGAREP disbursements between 2011 and 2014 after the MTE and coinciding with increased confidence of PICs in RE planning, and increased levels of RE implementation activities leading to actual RE investments made by donors;
- Deviations of original ProDoc Outcome expenditures including:
 - An estimated 56% of PIGGAREP disbursements were made to support Outcome 1 (RE capacity building and technical support) and Outcome 2 (RE market development) as shown on Table 1;
 - Only 21% was expended on support of Outcome 3 (institutional strengthening) which was USD 576,000 below the original allocation of the ProDoc;
 - Only 53% of the allocation for Outcome 4 (Financial Support) was expended;

- Estimates of project management costs were not made in the ProDoc. Given that these costs were expected to be significant during implementation of PIGGAREP, a decision was made during the Inception Workshop to separately monitor the costs of the project management office (PMO). According to Table 2, monitored PIGGAREP PMO costs were in the order of 35%, which given the expected high costs of managing a regional project that covers vast distances and sparsely populated Pacific Island countries (translating into higher costs for communications, travel and PMO time), does appear reasonable;
 - PICs underserved by PIGGAREP including Fiji, PNG, Kiribati and Palau. For Fiji and PNG, the low disbursements could be attributed to the lack of interest in PIGGAREP and that these PICs have their own donor-supported projects in climate change. For Kiribati, there was less interest in the use of PIGGAREP resources possibly due to the implementation of another ongoing GEF project (PAS: Grid Connected Solar PV Central Station Project, GEF Project ID 4282), precluding the need for PIGGAREP assistance in solar PV installations. Palau was not one of the 11 original PICs in the PIGGAREP ProDoc.
80. Tables 3 and 4 provide overviews of the expenditures for the 1st and 2nd tranches of the PIGGAREP+ funding. These tables reveal:
- A completion of 1st tranche expenditures for Outcomes 1.1 (RE for Solomon Islands), 1.2 (Solar water pumping for Tonga) and 2.2A (EE for power generation for RMI);
 - Completion of 2nd tranche disbursements for Outcomes 1.4 (RE on the Cook Islands) and 1.5 (Kiribati Biofuels mill on Abemama Island). SPREP, however, has reported some of the disbursements of Outcome 1.5 have been diverted to Outcome 1.3 (Palau) and Outcome 1.6 (Samoa) for reasons detailed in Table 15 under Outcome 1.5;
 - Re-allocation of 1st tranche resources from the surplus in Outcome 2.2A (EE power generation in RMI) to Outcomes 1.3 (Solar water pumping in Palau) and 2.1 (EE technologies in residential sector of Tuvalu) where costs have been unexpectedly higher, and delivery of completed RE and EE applications delayed for various reasons¹²;
 - A small surplus on Outcome 1.6 (Biogas power generation in Samoa) of PIGGAREP++ is due to delayed completion of biogas infrastructure work caused by delays in recruitment of biogas consultants and the slow progress during the design phase. Completion of the biogas power generation in Piu Village in Samoa is expected on November 30, 2016.
81. Project co-financing was USD 62.81, more than double the ProDoc estimate of USD 27.47 million (this does not include the USD 3 million financing received for PIGGAREP+). Higher co-financing estimates were a result of the increased interest and investment of other donors to RE/EE development in the PICs, and the ability of PIGGAREP to adaptively improve its integration with these donor projects especially after 2010. Co-financing details can be found on Table 5.
82. The cost effectiveness of the PIGGAREP Project had been satisfactory in consideration of the significant impacts of the PIGGAREP Project found in most of the PICs (including those impacted by the additional SIDS-DOCK funds) as further detailed in Sections 3.3.8 and 3.3.9.

¹² Completion of Outcome 1.3 (Solar water pumping in Palau) was delayed by a severe drought. Completion of Outcome 2.1 (EE in Tuvalu residential sector) was delayed due to Tuvalu customs clearances and slow progress of EE equipment supplier based in Fiji.

Table 1: GEF Project Budget and Expenditures for PIGGAREP Project (in USD as of August 30, 2016)

| PIGGAREP Project component | Budget (from Inception Report) | 2007 ²⁵ | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 ²⁶ | Total Disbursed | Total Remaining |
|---|--------------------------------|--------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------------|------------------|-----------------|
| 1. Technical capacity building/ tech support | 1,650,000 | 29,590 | 283,923 | 318,872 | 212,397 | 66,522 | 564,937 | 415,467 | 269,582 | 146,591 | 21,375 | 2,329,257 | -679,257 |
| 2. Market development | 400,000 | 30,056 | 57,486 | 100,904 | 52,304 | 120,971 | 96,840 | 110,306 | 37,118 | 1,655 | 20,315 | 627,954 | -227,954 |
| 3. Institutional strengthening | 1,675,000 | 30,056 | 112,027 | 109,132 | 177,796 | 255,039 | 135,970 | 103,096 | 153,076 | 1,655 | 20,315 | 1,098,163 | 576,837 |
| 4. Financial support | 400,000 | 7,223 | 9,373 | 21,579 | 12,569 | 95,969 | 35,547 | 22,047 | 3,979 | 398 | 4,882 | 213,566 | 186,434 |
| 5. Policy and regulatory support | 250,000 | 4,427 | 50,658 | 7,060 | 7,704 | 17,817 | 13,317 | 42,546 | 85,360 | 244 | 2,992 | 232,126 | 17,874 |
| 6. Information and awareness enhancement | 850,000 | 15,144 | 19,654 | 127,953 | 39,168 | 237,088 | 77,364 | 153,088 | 43,404 | 834 | 10,236 | 723,935 | 126,065 |
| Total (Actual) | 5,225,000 | 116,495 | 533,121 | 685,501 | 501,939 | 793,406 | 923,975 | 846,550 | 592,519 | 151,378 | 80,116 | 5,225,000 | 0 |
| Total (Cumulative Actual) | 5,225,000 | 116,495 | 649,616 | 1,335,117 | 1,837,056 | 2,630,462 | 3,554,437 | 4,400,986 | 4,993,506 | 5,144,884 | 5,225,000 | | |
| Annual Planned Disbursement (from ProDoc) ²⁷ | | 835,000 | 1,600,000 | 1,308,000 | 860,000 | 622,000 | 0 | 0 | 0 | 0 | 0 | | |
| % Expended of Planned Disbursement | | 14% | 33% | 52% | 58% | 128% | | | | | | | |

²⁵ Commencing June 22, 2007

²⁶ Up to August 30, 2016. Expenditures during 2016 were used to support the PIGGAREP PMO's activities in awareness raising, capacity building, and RE market development at a regional level, and not for specific PICs.

²⁷ From pg 73 in PIGGAREP ProDoc

Table 2: Estimated PIGGAREP expenditures by PIC

| PIC | Budget (from Inception Report) | 2007 ²⁸ | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 ²⁹ | Total Disbursed |
|---------------------------|--------------------------------|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|--------------------|-----------------|
| Project management office | 252,000 | 116,495 | 102,458 | 172,303 | 122,981 | 407,635 | 378,638 | 329,958 | 137,196 | 6,416 | 80,117 | 1,854,198 |
| Cook Islands | n/a | | 49,891 | 75,534 | 13,368 | 23,328 | 82,472 | 128,323 | 40,234 | | | 413,150 |
| Fiji | n/a | | 2,190 | 12,062 | 6,806 | 10,000 | 26,093 | 9,703 | 30,246 | | | 97,099 |
| Kiribati | n/a | | 9,073 | 50,630 | 15,369 | 13,132 | 10,791 | 8,616 | 4,231 | | | 111,841 |
| Nauru | n/a | | 77,696 | 3,633 | 44,168 | 11,247 | 29,882 | 14,796 | 5,620 | | | 187,041 |
| Niue | n/a | | 6,690 | 8,237 | 92,288 | 10,510 | 67,515 | 47,521 | 3,860 | | | 236,622 |
| PNG | n/a | | 8,993 | 17,852 | 2,755 | 10,737 | 7,781 | 3,305 | | | | 51,423 |
| Samoa | n/a | | 163,580 | 14,721 | 7,848 | 39,855 | 89,640 | 130,311 | 8,962 | | | 454,916 |
| Solomon Islands | n/a | | 7,029 | 155,524 | 118,236 | 111,734 | 127,985 | 52,814 | 62,224 | | | 635,545 |
| Tonga | n/a | | 35,601 | 16,825 | 28,027 | 52,252 | 51,051 | 15,080 | 100,885 | | | 299,722 |
| Tuvalu | n/a | | 64,315 | 62,383 | 26,473 | 26,247 | 5,822 | 30,134 | 122,155 | 144,962 | | 482,491 |
| Vanuatu | n/a | | 5,604 | 95,797 | 23,619 | 76,729 | 16,135 | 75,990 | 76,906 | | | 370,781 |
| Palau | n/a | | | | | | 30,171 | | | | | 30,171 |
| Total (Actual) | 252,000 | 116,495 | 533,121 | 685,501 | 501,939 | 793,406 | 923,974 | 846,550 | 592,519 | 151,378 | 80,117 | 5,225,000 |

²⁸ Commencing June 22, 2007²⁹ Up to August 30, 2016

Table 3: Project Budget and Expenditures for PIGGAREP+ (1st tranche) (in USD as of August 30, 2016)

| PIGGAREP+ Project component/ outcome | Budget (from Inception Report) | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 ³⁰ | 2014 | 2015 | 2016 ³¹ | Total Disbursed | Total Remaining |
|---|--------------------------------|------|------|------|------|------|------|--------------------|---------|-----------|--------------------|----------------------|------------------------|
| 1. RE technology application: | | | | | | | | | | | | | |
| Outcome 1.1: RE for rural telecommunications in Solomon Islands | 342,935 | | | | | | | | 31,458 | 217,419 | 94,058 | 342,935 | 0 |
| Outcome 1.2: Solar water pumping in Tonga | 411,682 | | | | | | | | 232,599 | 154,408 | 24,675 | 411,682 | 0 |
| Outcome 1.3: Solar water pumping in Palau | 185,912 | | | | | | | | 8,739 | 112,661 | 253,566 | 374,967 | -189,055 ³² |
| 2. EE technology application | | | | | | | | | | | | | |
| Outcome 2.1: EE technologies in the residential sector of Tuvalu | 218,494 | | | | | | | | 21,050 | 140,113 | 105,266 | 266,428 | -47,934 ³³ |
| Outcome 2.2A: EE in power generation with national utility in RMI | 214,535 | | | | | | | | 181,513 | | 33,022 | 214,535 | 0 |
| Outcome 2.2B: EE in power generation for 4 state power utilities in FSM | 463,781 | | | | | | | | 47,788 | 57,865 | 121,138 | 226,791 | 236,990 ³⁴ |
| Outcome 2.3: EE lending schemes in FSM, RMI and Tuvalu | 99,511 | | | | | | | | 57,105 | 10,295 | 32,111 | 99,511 | 0 |
| Project management | 63,150 | | | | | | | 14,223 | 20,263 | 15,561 | 13,103 | 63,150 ³⁵ | 0 |
| Total (Actual) | 2,000,000 | 0 | 0 | 0 | 0 | 0 | 0 | 14,223 | 600,515 | 708,322 | 676,939 | 2,000,000 | 0 |
| Total (Cumulative Actual) | 2,000,000 | 0 | 0 | 0 | 0 | 0 | 0 | 14,223 | 614,738 | 1,323,061 | 2,000,000 | | |
| Annual Planned Disbursement (from ProDoc)* | | | | | | | | 1,030,954 | 969,046 | 0 | 0 | | |

³⁰ Commenced December 2013³¹ Up to August 30, 2016³² Outstanding amount was re-allocated from surplus in Outcome 2.2B for FMI³³ Ibid 31³⁴ FSM was only able to do EE in one state (Kosrae) and not in all 4 states. In 2015, FSM was notified of PIGGAREP+ fund redistribution, some of which were re allocated to FSM energy audit, with the remainder re-programmed PIGGAREP+ Outcomes 1.3 and 2.1 for Palau and Tuvalu due to their higher costs.³⁵ Utilized by UNDP

Table 4: Project Budget and Expenditures for PIGGAREP+ (2nd Tranche) (in USD as of August 30, 2016)

| PIGGAREP++ Project component/ outcome | Budget (from Inception Report) | 2007* | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016** | Total Disbursed | Total Remaining |
|---|--------------------------------|-------|------|------|------|------|------|------|---------|---------|---------|-----------------|-----------------|
| 1. RE technology application: | | | | | | | | | | | | | |
| Outcome 1.4: RE in the Cook Islands | 410,000 | | | | | | | | 410,000 | | | 410,000 | 0 |
| Outcome 1.5: Biofuel Power Generation in Kiribati | 225,000 | | | | | | | | 9,363 | 5,618 | 210,020 | 225,000 | 0 |
| Outcome 1.6: Biogas-based power generation in Samoa | 265,000 | | | | | | | | 183,254 | 33,686 | 33,686 | 250,626 | 14,374 |
| Project management | 100,000 | | | | | | | | 23,296 | 23,521 | 53,184 | 100,000 | 0 |
| Total (Actual) | 1,000,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 625,912 | 62,824 | 296,890 | 985,627 | 14,374 |
| Total (Cumulative Actual) | 1,000,000 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 625,912 | 688,737 | 985,627 | | |
| Annual Planned Disbursement (from ProDoc)*** | | | | | | | | | 797,530 | 202,470 | 0 | | |
| % Expended of Planned Disbursement | | | | | | | | | 78% | 31% | | | |

Table 5: Co-Financing for PIGGAREP project (as of August 30, 2016)

| Co-financing (type/source) | UNDP own financing (million USD) | | Government (million USD) | | Partner Agency (million USD) | | Private Sector (million USD) | | Total (million USD) | |
|----------------------------|----------------------------------|--------------|--------------------------|----------------------|------------------------------|----------------------|------------------------------|--------------|---------------------|--------------|
| | Planned | Actual | Planned | Actual | Planned | Actual | Planned | Actual | Planned | Actual |
| Grants ³⁶ | 0.500 | 0.000 | 24.504 | 15.420 | 0.463 | 10.200 ³⁷ | | | 25.467 | 25.62 |
| Loans/Concessions | | | | | | | | | 0.000 | 0.00 |
| • In-kind support | | 0.400 | 1.966 | 36.040 ³⁸ | 0.550 | 0.750 | | | 2.516 | 37.19 |
| • Other | | | | | | | | | 0.000 | 0.00 |
| Totals | 0.500 | 0.400 | 26.470 | 51.460 | 1.013 | 10.950 | 0.000 | 0.000 | 27.983 | 62.81 |

³⁶ Includes all cash contributions³⁷ This includes PEC, SIDS DOCK (PIGGAREP+), IUCN, IRENA, the Taiwan Government, GoJ, Gol, Government of Austria and others³⁸ Estimated amount as given by various governments.

3.2.5 M&E Design at Entry and Implementation

83. The Inception Workshop of November 2007 provided an elaboration of the M&E design of the PIGGAREP ProDoc. The elaborated design assigned M&E functions of SPREP and delegation of the M&E functions to NPCs within each PIC. In addition, the targets in the LFA were clarified and reset in late 2008 (as provided in Appendix F) on the basis of available baseline information in 2008 on the various PICs. While most of the indicators of the 2008 LFA meet SMART criteria for the purposes of effective M&E implementation, those that did not meet SMART criteria are discussed in Section 3.1.1 (Analysis of Project Results Framework). *The rating for M&E design is rated as **satisfactory**.*
84. With the predominance of donor-funded RE projects serving as the baseline of planned RE projects for PIGGAREP, finalization of the donor projects commonly did not coincide with PIGGAREP Project reporting cycles. As a result, M&E design had limitations highlighting the constraints of PICs in the timely submission of their national work plans (Project Activity Summaries or PASs) and their monitoring reports. Within PIGGAREP, the Project Manager (PM) had sole responsibility of the M&E functions, a responsibility that consumed a considerable portion of their time. With considerable time required to follow-up on the submission of PASs and monitoring reports, the PM was left with less time to formulate strategic actions towards sustainable development of RE in the region. Exacerbating the situation, NPC personnel were government employees with other duties, further affecting the timeliness of PAS submissions from the PICs.
85. With these difficulties, the quality of M&E reports from the SPREP-managed PMO was moderately satisfactory. The evaluator had access to annual PIRs that included reports on all targets in the PRF as well as quarterly progress reports and mission reports. These reports contain details in conveying the Project achievements and issues that were addressed in minutes to PSC meetings. However, the reports do not directly report progress against the indicators of the 2008 LFA, leaving the evaluator to interpret the actual target achievements. Examples can be found in Section 3.3 where target achievements in each Outcome are assessed. Moreover, there has been no reporting of progress in achieving PIGGAREP+ targets. The PIGGAREP Terminal Report of January 2015 also provides a summary of the Project achievements as separated into each PIC, providing some indications of the impact of PIGGAREP activities for a particular PIC. However, this report could have also provided more detailed activity descriptions within each PIC (especially against the LFA targets) which would have been beneficial in terms of better understanding and monitoring the impact of PIGGAREP within that particular PIC.
86. As such, *the ratings for M&E plan implementation is rated as **moderately satisfactory***. This rating has been given in consideration of the logistical challenges in effectively monitoring and evaluating this project (including the difficulties of communication and capacities of PICs to effectively and efficiently report activities), and considering the actual outcomes and impacts of the PIGGAREP project. Ratings according to the GEF Monitoring and Evaluation system³⁹ are as follows:

³⁹ 6 = HS or Highly Satisfactory: There were no shortcomings;

5 = S or Satisfactory: There were minor shortcomings,

4 = MS or Moderately Satisfactory: There were moderate shortcomings;

3 = MU or Moderately Unsatisfactory: There were significant shortcomings;

- M&E design at entry - 5;
- M&E plan implementation - 4;
- Overall quality of M&E - 4.

3.2.6 Performance of Implementing and Executing Entities

87. The performance of the implementing partner (formerly known as an Executing Agency) of the PIGGAREP Project, SPREP, can be characterized as follows:
- Prior to PIGGAREP, SPREP was mainly an organization with more focus on climate change adaptation. As such, during PIGGAREP's early stages up to 2010, senior management involvement of SPREP was noticeably absent. This did cause issues with the progress of implementation early during PIGGAREP, drawing in UNDP to a large extent to troubleshoot and remedy some of the progress issues;
 - After 2012, senior management involvement of SPREP had improved considerably, especially with the guidance from the MTE which better defined the responsibilities of SPREP to meet the objectives of PIGGAREP;
 - Overall performance of SPREP can be assessed as being **satisfactory** (with early stages being moderately unsatisfactory to highly satisfactory during the latter stages).
88. The performance of UNDP (the Implementing Agency) can be characterized as follows:
- The level of UNDP involvement during the early stages of PIGGAREP was higher than normal considering the implementing partner, SPREP had been hired under contract but required assistance to troubleshoot and remedy implementation issues (mainly related to detailing and updating PIGGAREP activities as required during the Inception Phase) between 2008 and 2010;
 - Turnover rate of the Energy and Environment Officer position in UNDP Samoa was high throughout the duration of PIGGAREP as well as PIGGAREP+. This became problematic given that the guidance provided by UNDP to its implementing partner was subject to different interpretations of policies and procedures that likely caused delays to SPREP in efficiently implementing PIGGAREP⁴⁰;
 - Overall performance of UNDP on PIGGAREP can be assessed as being **satisfactory** (early stages being moderately satisfactory to the latter stages of PIGGAREP being satisfactory).
89. A summary of ratings of the implementing and executing entities of the PIGGAREP Project are as follows:
- Implementing Partner (SPREP) – 5;
 - Implementing Entity (UNDP) – 5;
 - Overall quality of implementation/execution (UNDP/SPREP) - 5

2 = U or Unsatisfactory: There were major shortcomings;

1 = HU or Highly Unsatisfactory

U/A = Unable to assess

N/A = Not applicable.

⁴⁰ During the latter stages of PIGGAREP including PIGGAREP+, there was an absence of a qualified UNDP energy specialist in the Pacific Region, leaving much of the project technical guidance to the RTA in the Bangkok Regional Center.

3.3 Project Results

90. This section provides an overview of the overall project results and assessment of the relevance, effectiveness and efficiency, country ownership, mainstreaming, sustainability, and impact of the PIGGAREP project. In addition, evaluation ratings for overall results, effectiveness, efficiency and sustainability are also provided against the revised October 2008 Project LFA (as provided in Appendix F)⁴¹. For Tables 6, and 8 to 14, the “status of target achieved” is color-coded according to the following color coding scheme:

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

3.3.1 Overall Results

91. A summary of the achievements of the PIGGAREP project at the Project Objective level with evaluation ratings are provided on Table 6.

92. The PIGGAREP target for GHG emission reductions was set at 2 million tonnes CO_{2eq} reductions cumulative by 2015. These direct GHG reductions were to be generated mainly from completed demonstration and commercially viable RE projects, technical assistance to build local capacity to implement RE projects (that includes RE and EE projects under PIGGAREP+), and from improved availability of funding for new and existing RE projects. In the estimation of the evaluator and further to Para 37, however, the Project was in no position to leverage this level of RE investments over a 5-year period due to:

- The lack of readiness of many PICs to undertake their own RE programs in Year 1. Many of the PIC institutions did not have the capacity or confidence to effectively liaise with foreign investors, donor agencies and Project developers, and would have required at least 1 year of capacity building from PIGGAREP to reach this level of readiness;
- Many PICs did not have sufficient RE resource databases on which RE investments could be justified. This also would have required at least one year of PIGGAREP assistance;
- Difficulties in controlling the amount of donor investment and its timing for RE projects. Funding for initial pilot projects would have been donor-funded since private RE investment in PICs has not commenced in most PICs due to their remoteness and the small size of their markets.

93. As summarized in Table 7, direct GHG emission reductions generated by PIGGAREP were counted from soft activities which removed barriers to various investments on RE projects in the PICs and counted over the service life of the technology (contrary to the real GHG impact of PIGGAREP activities as mentioned in Para 66). These soft activities would have included RE resource assessments and feasibility studies in addition to the direct hardware investments (that were made under PIGGAREP+). Indirect GHG emission reductions were counted from training activities provided by PIGGAREP to RE installations; these were justified on the basis that the service life of RE systems where technical and financial training was provided to increase the likelihood of sustainable operations of the RE systems, and to sustain GHG emission reductions over a longer period of the service life of the RE systems and beyond. Different GEF causality factors were applied to each situation in calculating the indirect GHG emission reductions. Details on the GHG emission reductions from this PIGGAREP and PIGGAREP+ are provided in Appendix E.

⁴¹ Evaluation ratings are on a scale of 1 to 6 as defined in Footnote 40.

Table 6: Project-level achievements against Project targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁴² |
|--|---|----------|-----------------------------------|--|---|----------------------|
| Project Objective: <i>Reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies</i> | Cumulative electricity generation from RE based systems | 0 | 219,000 MWh by EOP | <i>Only 11,505 MWh of electricity generation from RE based systems has been achieved by EOP</i> | For reasons provided in Para 37, this target was not realistically attainable within PIGGAREP timeframe | MU |
| | GHG emissions in PICs reduced | 0 | at least 2 million tonnes by 2015 | <i>Only 6,363 tonnes CO_{2eq} has been directly reduced in PICs from electricity generation from RE sources by EOP</i> | For reasons provided in Para 37, this target was not attainable within PIGGAREP timeframe | MU |
| | Additional installed RE-based energy systems capacity | 0 | 50 MW by 2015 | <i>Only 9.2 MW of additional RE based energy systems installed by EOP. PIGGAREP, however, has been involved with study, design and implementation of a total of 41.8 MW of RE projects, out of which 24.7 MW have either been installed or have confirmed finances</i> | For reasons provided in Para 37, this target was difficult to achieve within the timeframe of the Project | MS |
| | Cumulative income generating opportunities in each PIC gained from RE | 0 | USD 110 million by EOP | <i>USD 5 million of cumulative income generating opportunities for all PICs from the deployment of RE projects by 2014 in various PICs</i> | For reasons provided in Para 37, this target was not attainable within the timeframe of the Project | MS |
| Overall Rating – Project-Level Targets | | | | | | MS |

94. These overall results reflect the creation of a more enabling environment by PIGGAREP to reduce the growth rate of GHG emissions from fossil fuel usage in PICs through the widespread adoption and usage of RE as evidenced by the Project's involvement with 41.8 MW of RE projects. For this reason, the evaluation of PIGGAREP Project-Level targets is rated as **moderately satisfactory**. PIGGAREP also made key contributions towards this enabling environment including:

- the provision of RE resource assessments for Fiji, Samoa, Tonga, Tuvalu and Vanuatu that has triggered RE investments, mainly from donors;
- feasibility studies for RE systems projects in the Cook Islands (solar PV), Fiji (net metering policy for solar PV), Tonga (feasibility study of the rehabilitation of solar home

⁴² Ibid 40

systems), and Vanuatu (feasibility study review of the Talise 75kW small hydropower project) that have triggered donor RE investments;

- training for locally-based solar PV technicians including Kiribati, Nauru, Solomon Islands, Tonga, Tuvalu and Vanuatu (only for hydropower technicians) to increase sustainability of RE project operations ;
- financial management training for communities in Tonga to manage operation and maintenance and increase the likelihood of replacement funds for RE equipment;

Table 7: Summary of RE generation and CO₂ reductions from the PIGGAREP Project⁴³

| Pacific Island country | Project Period (2007-2016) | | Lifetime direct emission reductions (tonnes of CO ₂ /yr) ⁴⁴ | Indirect emission reductions (tonnes of CO ₂ /yr) ⁴⁵ |
|----------------------------------|----------------------------|--|---|--|
| | Cumulative MWh generation | Cumulative direct emission reductions (tonnes of CO ₂) | | |
| Cook Islands | 1,762 | 1,260 | 475 | 0 |
| Fiji | 0 | 0 | 0 | 0 |
| Kiribati | 0 | 0 | 0 | 1,077 |
| Nauru | 0 | 0 | 0 | 72 |
| Niue | 465 | 333 | 499 | 0 |
| Papua New Guinea ⁴⁶ | 0 | 0 | 0 | 0 |
| Samoa | 6,086 | 4,351 | 13,566 | 0 |
| Solomon Islands | 417 | 298 | 621 | 175,375 |
| Tonga | 1,857 | 121 | 150 | 498 |
| Tuvalu | 918 | 0 | 0 | 705 |
| Vanuatu | 0 | 0 | 0 | 2,566 |
| Republic of the Marshall Islands | 0 | 0 | 0 | 0 |
| Federated States of Micronesia | 0 | 0 | 0 | 0 |
| Palau | 0 | 0 | 0 | 0 |
| TOTAL | 11,505 | 6,363 | 15,311 | 180,292 |

- capital funds for Solomon Islands PV installations in 9 social buildings (i.e. schools, health clinics and police stations), and solar water pumping sites in Tonga and Palau as a part of the PIGGAREP+; and
- capital funds for RE systems including Cook Islands solar PV on Palmerston Island, Kiribati biofuel mill on Abemama Island, Samoa biogas power generation at Piu Village as a part of PIGGAREP+.

⁴³ Includes RE generation and GHG emission reductions from PIGGAREP+

⁴⁴ Lifetime direct emission reductions are only counted for projects where PIGGAREP provided RE resource assessments for feasibility studies, and not training activities

⁴⁵ These are generated by PIGGAREP training activities which enhance local skills to support sustainable operation of RE systems

⁴⁶ PNG dropped out of PIGGAREP in 2009 without any significant expenditures

3.3.2 Component 1: Technical capacity building/tech support

95. Under this component, PIGGAREP was to improve the knowledge of key stakeholders in all participating PICs to enable them to increase the use of commercial renewable energy applications by using Project resources to:
- prepare RE resources assessments;
 - provide technical training support for local stakeholders to evaluate and manage RE technologies; and
 - provide technical assistance to plan, design and implement demonstration RE projects.

A summary of the actual achievements of the Component 1 with evaluation ratings are provided on Table 8.

96. The evaluation of Component 1 is rated as **satisfactory** since Component 1 activities have had a significant impact on the catalysing current investment levels in renewable energy in the Pacific region. Most importantly, the PIGGAREP Project supported a number of RE training courses followed by RE resource monitoring studies that provided the information necessary for policymakers to formulate RE strategic plans and policies that today are strongly driving RE development in many of the PICs. For example:
- the RE resource monitoring study in Tonga has led to the preparation of the Tonga Energy Roadmap that provides action plans within the Tongan strategic energy planning framework;
 - the RE awareness raising program in Samoa between 2008 and 2013 (that is a part of Component 6) coupled with hydrometric surveys at 6 small hydro sites and wind data collection, catalyzed RE development by the Government of Samoa as a means of reducing fossil fuel imports and power generation-related GHG emissions; and
 - PIGGAREP's partnership with IRENA has resulted in RE data collection and analysis for all PICs that was completed in September 2013. This work was also done to update the 2001 and 2002 baseline energy scenario reports of each PIC under PIREP.
97. Another integral output of this component has been the support for designing and implementing RE demonstration projects as a means to improve confidence that commercially operated RE projects in the Pacific region are feasible. During the initial stages of PIGGAREP (2008 to 2010), there were no clear mechanisms as to how RE projects would spontaneously be implemented to demonstrate PURE or productive uses of RE⁴⁷. Furthermore, meeting the target of 10 demonstration projects for PURE was not realistic in the Pacific region (as emphasized by the MTE) with many PICs known for its customs of communal sharing, and lack of private sector enterprises.
98. By 2011, however, a number of RE projects appeared in the SIDS DOCK pipeline that were proposed for implementation through PIGGAREP and to demonstrate PURE. Six of these RE projects were approved for financing and brought under PIGGAREP management for implementation as PIGGAREP+ approved in 2013 and 2014 in two tranches. At the EOP of PIGGAREP, only 8 demonstrations on commercial PURE projects completed, and has been assessed as satisfactory. A list of RE projects and GHG emission reduction estimates are listed in Appendix E.

⁴⁷ Section 5.4 of PIGGAREP MTE

Table 8: Outcome 1 achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁴⁸ |
|---|--|----------|---|--|---|----------------------|
| Outcome 1: Improved knowledge about RE resource potential and increase the number of successful commercial RE applications on the ground | Average collection efficiency for each of demonstration project | 0 | 90% by EOP | <i>60% collection efficiency rate has been recorded at some demonstration sites including Tonga (outer island solar pumping demo projects).</i> | For reasons provided in Para 38, this target was difficult not attainable. | MS |
| | Annual completed training courses on RE system designs | 0 | 2 RE training courses each year starting 2009 | <i>Total of 20 training courses on RE systems design has been completed although only one training course has been conducted annually since 2011</i> | Target met but not sustained after 2011 | S |
| | Completed RE project feasibility assessments | 0 | 10 by 2010 | <i>10 RE project feasibility assessments completed by EOP</i> | Target met but not efficiently within timeline | S |
| | Commercially sustainable RE projects in PICs | 0 | 10 by 2010 | <i>8 commercially sustainable RE projects exist in the Cook Islands (4), Samoa (2), and Tonga (2)</i> | Some RE installations (such as solar PV installations in Solomon Islands) were deemed not sustainable until there are confirmed costs to maintain these RE projects | S |
| | 10 completed resource monitoring studies by 2010 | 0 | 10 by 2010 | <i>14 resource monitoring studies have been completed by 2015</i> | | HS |
| | Completed training | 0 | 2 by EOP | <i>18 completed training courses by 2015 that were requested by the PICs.</i> | | HS |
| | PICs adopting technical standards for RE systems components and their installations. | 0 | 8 by 2009 | <i>13 PICs have adopted RE technical standards for systems components and their installations by EOP</i> | | S |
| Overall Rating – Component 1 | | | | | | S |

⁴⁸ Ibid 40

3.3.3 Component 2: Market development

99. Under this component, PIGGAREP was to remove barriers to RE market development, both nationally and regionally by using PIGGAREP resources to:
- strengthen local energy professionals in their capacities to prepare bankable RE projects throughout the region;
 - support the strengthening RE equipment supply chains;
 - support and develop the capacities of local RE suppliers and installers; and
 - building the local capacity for operation and maintenance of RE systems.

A summary of the actual achievements of the Component 2 with evaluation ratings are provided on Table 9.

100. The activities of Component 2 has facilitated the expansion of the market for RET applications in the Pacific region, albeit not all to the levels envisaged in the targets. The development of RE supply chain enterprises in many of the PICs for manufacturing, supplying and installing RE systems is simply not realistic due to the lack of profit potential in small remote markets of some of the PICs. Examples of RESCOs includes 2 solar PV installation enterprises based in Fiji who provide regional services to PICs within PIGGAREP. The RE contracts that they are servicing, however, are mainly financed by donors. Fiji appears to be the only PIC where there are private sector opportunities to develop renewable energy installations that are mainly solar PV⁴⁹.
101. PIGGAREP provided resources to strengthen the management capacity of the Kiribati Solar Energy Company in 2009. With an objective of strengthening the capacity of this company to sustainably manage solar PV installations installed in the 1990s, and to ensure best practices for solar PV installations for those under the EU EDF 10 Project, PIGGAREP provided funds to train the company's solar PV technicians on the use an updated version of a web-based software application for solar PV, RESCO Manager III.
102. In the Solomon Islands, Tonga and Tuvalu, PIGGAREP has also provided resources to the training of local community leaders and personnel in the operation and maintenance of solar PV installations provided by the various donors including PIGGAREP++. In the Solomon Islands, solar PV installations installed in primary schools and health clinics have been installed by local solar PV technicians trained by a Fiji-based RESCO. The agreement reached between the Ministry of Education and the RESCO includes a 2-year servicing agreement for the solar PV installations after the completion of PIGGAREP. The evaluator is not aware of any operational support mechanism for the solar PV installations after the 2-year servicing agreement expires. This remains a large gap in the sustainability of these RE systems, in particular solar PV, after the EOP.
103. The evaluation of Component 2 is rated as **moderately satisfactory** since Component 2 activities have contributed to enabling RE market development in the Pacific PICs. However, the development of RE markets for all these PICs as envisaged in the original PIGGAREP design still face key challenges including:

⁴⁹ PIGGAREP funds were used in Fiji to conduct a feasibility study towards developing a net metering policy as the baseline information needed to be assessed. There were funds from a different donor which contributed to the development of the actual net metering policy but not without the PIGGAREP study to confirm the feasibility of a net metering policy.

Table 9: Outcome 2 achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁰ |
|--|---|----------|----------------|---|---|----------------------|
| Outcome 2: Expansion of the market for RET applications | Cumulative additional RE-based power generation installed in PICs in MW | 0 | 100 MW by 2015 | Only 9.1 MW of installed RE capacity installed in 9 PICs by PIGGAREP EOP including 5.74 MW of RE systems under PIGGAREP+. | For reasons provided in Para 37, this target was not attainable. This indicator appears to contradict the 50 MW “objective level” target. | MS |
| | New “bankable RE projects” identified and funded | 0 | 20 by 2015 | 8 bankable RE projects identified and financed by EOP including 3 in Cook Islands, 1 in Kiribati, 1 in Solomon Islands, 2 in Samoa, and 1 in Vanuatu | This target may have been too ambitious and not achievable based on the readiness of some of the PICs | MU |
| | ‘One-stop-shops’ established in the PICs | 0 | 3 by EOP | Only 2 “one-stop shops” established in Tonga (Kingdom Energy for Solar PV and components), and the Solomon Islands (Willies Electrical and Solar Power Company Ltd) | | S |
| | New manufacturers of RE systems in the PICs | 0 | 5 by EOP | Only 1 manufacturer of RE systems setup in Fiji | PIC markets make it difficult to incentivize private sector investment into RE manufacturing | U |
| | New RESCOs established in the PICs | 0 | 3 by 2012 | 4 RESCOs established in Tonga, Fiji (2) and Kiribati | | S |
| | No. of RET companies in each PIC | 0 | 11 by 2010 | 7 RET companies established in the PICs: Tonga – 1, Solomon Is – 2, Kiribati – 1, Fiji – 3 | | S |
| | No. of rural RE suppliers established in the PICs by 2012. | 0 | 8 by 2009 | 2 rural RE suppliers established in Tonga by EOP | The small nature of PIC markets make it difficult to incentivize private sector investment into supplying rural RE markets | U |
| | Rural residents trained on basic O&M | 0 | 300 by EOP | More than 400 rural residents trained in basic O&M of solar PV installations in Tonga, Tuvalu and Solomon Islands | | HS |
| Overall Rating – Component 2 | | | | | | MS |

⁵⁰ Ibid 40

- Limited human resource capacities in the smaller PICs. The remote PICs with small populations such as the Cook Islands, Kiribati, Marshall Islands, Nauru, Solomon Islands and Tuvalu usually only have one person who deals with all energy-related issues at the national level. For these countries to reach their targets of increased usage of RE, finding qualified personnel to assist PIC governments in scaling up RE projects and investments is a major constraint;
- Different RE marketing conditions with all 14 PICs. Given the time and distances required to visit these PICs, PIGGAREP more easily provided assistance to PICs who were able to express their needs for RE market development through PIC-based NPCs to identify opportunities for PIGGAREP assistance. In this manner, it was difficult for PIGGAREP to design activities that would meet its own market development targets. A reduction in the number of PICs under PIGGAREP would have resulted in more focused and effective technical assistance in more effective assistance to all participating PICs;
- The fact that NPCs are government staff and are not to be paid for their work on PIGGAREP resulted in most NPCs not fully dedicated towards PIGGAREP activities. This only encouraged delays to the delivery of identified opportunities for PIGGAREP assistance in RE market development. This was especially an issue during the early stages of PIGGAREP between 2007 and 2011 when few feasibility studies were identified and few demonstration projects were implemented.

3.3.4 Component 3: Institutional strengthening

104. Under Component 3, PIGGAREP was to strengthen host institutions to manage RE development programs by using its resources to:

- train institutional personnel to improve governance and management accountability at the national level;
- facilitate private sector involvement in RE development; and
- establish effective RE programs through appropriate staffing levels and sufficient resources.

A summary of the actual achievements of the Component 3 with evaluation ratings are provided on Table 10.

105. The evaluation of Component 3 is rated as **satisfactory** since most targets in this Component have been met and has resulted in strengthened PIC institutions that have played a catalytic role in renewable energy development. This has been underpinned by opportunistic assistance from PIGGAREP driven by the PIC governments who made specific requests for assistance in energy planning, setup of strategic plans and the setup of RE units in government. All NPCs and government officials interviewed during the evaluation had spoken positively of PIGGAREP's contributions to technical assistance in strengthening their institutions to approach strategic RE development, giving PIC government personnel more confidence to manage and scale up RE development programs, and more effectively liaising with donors with financing.

106. Examples of PIGGAREP institutional strengthening activities includes:

- training for government officers in 2012 for monitoring, surveillance and quality assurance for solar PV installations on the Cook Islands;
- biofuel task forces for the Solomon Islands formed in Fiji in 2009;

Table 10: Outcome 3 achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵¹ |
|--|---|----------|------------|---|---|----------------------|
| Outcome 3: Enhancement of institutional capacity to design and implement RE | No. of Energy Offices in region with clear mandates, equipped with databases for planning and policy works, and have adopted energy plans | 0 | 5 by 2010 | <i>6 energy offices established with databases by EOP</i> | This includes Tonga, Cook Islands, Samoa, Fiji, Kiribati & Vanuatu | S |
| | No. of energy offices with established national energy coordination committees, clear mandates, strategies and action plans | 0 | 10 by 2010 | <i>8 energy offices have established national energy coordination committees with strategies and action plans</i> | This includes Cook Islands, Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu | MS |
| | No. of national energy/climate change mitigation plans incorporating new RE projects adopted in the region by 2010 | 0 | 5 by 2010 | <i>3 PICs have adopted national energy and CCM plans</i> | This includes Fiji, Samoa and Tonga. Other PICs are in the process of completing national energy and CCM plans with donor assistance. | S |
| | No. of PICs with established national coordinating mechanisms that include the private sector | 0 | 5 by 2008 | <i>6 PICs have established national coordinating mechanisms including all within the public sector.</i> | Difficult market to incentivize private sector participation | |
| | No. of RE projects designed and implemented by local experts in each PIC | 0 | 11 by 2010 | <i>10 RE projects designed and implemented by local experts</i> | This includes all PIGGAREP PICs except PNG | S |
| | Overall Rating – Component 3 | | | | | |

- training of technical staff in 2014 from the Nauru Utility Corporation and the Niue Power Corporation on solar PV operation and maintenance;
- assistance to the Government of Niue in the drafting of a climate change policy including mitigation and renewable energy development in 2009

⁵¹ Ibid 40

- training of local experts in 2011 that has led to design and implementation of RE projects by local experts in Tonga (solar PV systems), Kiribati (solar water pumps) and several solar PV projects in Fiji;
- assistance in developing national energy plans through the use of energy databases for planning and policy work, to the governments in the Cook Islands (revised energy policies) and Tonga (Tonga Energy Roadmap and Energy Act in 2010 and 2012 respectively);
- establishment of an RE and EE Unit within the Government of Tuvalu in 2011, and the associated training of those officers to increase their knowledge of RE with a focus on operation and maintenance of grid connected solar PV systems;
- establishment of RE targets for all PICs in PIGGAREP as per their INDCs including 6 PICs in 2012 (Cook Islands, Niue, Tuvalu, Fiji, Vanuatu and Solomon Islands);
- training of all NPCs in managing EPC contracts.

3.3.5 Outcome 4: Financial support

107. Under Component 4, PIGGAREP was to improve the availability of financing to PICs for the development of RE programs by:

- Improving access to financing for small rehabilitation and failing projects; and
- Improved access to and availability of financing for new RE projects.

A summary of the actual achievements of the Component 4 with evaluation ratings are provided on Table 11.

108. The evaluation of Component 4 is rated as **satisfactory** since most targets in this Component have been met or exceeded. Considering the reference to the general lack of opportunity of PURE in many of the PICs (see Para 30 in Section 3.1), there has been increasing interest by donors in financing all renewable energy development to meet the low carbon and renewable energy targets of all PICs. According to all PIC government personnel interviewed, their knowledge of RE prior to PIGGAREP was poor. To a large extent, the soft activities of PIGGAREP's other components has increased the PIC government personnel knowledge of RE issues, and their confidence to liaise and negotiate with donors on the scope and scale of donor investments into renewable energy. This has resulted in an outcome of improved availability of funding for new and existing RE projects at the EOP. These funds are mostly from donors with limited involvement of the private sector.

109. Unfortunately, the activities of this Component did not remove the private financial barriers to RE development. As mentioned several times in this Evaluation (in Paras 30, 50 and 68), reasons for the lack of private sector involvement in RE development in PIGGAREP PICs is due to the small markets, high investment risks and absence of attractive electricity tariffs. While it has been easier for PICs to accept donor-funded RE projects, there has been difficulty in the identification of an RE project that could be implemented and demonstrated as a project for productive purposes that is sustainable and competitive with fossil fuel based alternatives. Funds from PIGGAREP+ for the biofuels mill in Kiribati and biogas generation in Samoa were opportunities to demonstrate viable RE projects. These projects are still under development. Table 15 provides further details on the status of these projects.

Table 11: Outcome 4 achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵² |
|---|--|----------|-------------------------|--|---|----------------------|
| Outcome 4: Improvement of the availability of funding for existing and new RE projects | USD available in capital fund for new RE projects | 0 | USD 10 million by 2010 | <i>More than USD 130 million available from various donors</i> | This includes Tonga, Cook Islands, Samoa, Fiji, Kiribati & Vanuatu. Details can be found on Para 108. | S |
| | No. of completed feasibility studies on a regional/national RE fund | 0 | 1 by 2009 | <i>One RE marketing survey completed for 7 PICs in 2009. This includes Cook Islands, Fiji, Kiribati, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu</i> | There was no follow-up to this marketing survey due to a lack of stakeholder interest | MS |
| | USD of investments on rehabilitating existing RE installations by 2010 | 0 | USD 5 million by 2010 | <i>USD 218,000 invested in rehabilitating existing RE installations. ADB has committed more than USD 5 million to rehabilitate 5.5 MW of small hydro projects in Samoa</i> | This includes: -Tonga: rehabilitation solar home systems funded by IUCN; and -Samoa: hydrometric surveys for 3 small Hydro sites to be rehabilitated (using funding from ADB) | S |
| | USD of new investments in RE | 0 | USD 100 million by 2015 | <i>USD 248 million of new investments by 2015 (of which many were generated from PIGGAREP+ resources)</i> | Investment details are provided in Para 109. | S |
| Overall Rating – Component 4 | | | | | | S |

110. Capital funds that are currently available for RE development in PIGGAREP PICs are mainly from donors including:

- USD 25 million for Cook Islands from NZMFAT as well as the GoCI's own funding;
- USD 28.5 million for Cook Islands "Renewable Energy Sector Project" (USD 4.1 million from GEF ID 9067 and USD 28.3 million from ADB loan);
- USD 5 million for Samoa from ADB for various small hydro schemes;
- USD 4.5 million for Kiribati Outer Island Solar Electrification Program in 2010 from EU EDF-10 fund;
- USD 66 million from the Pacific Environment Community (PEC) funds as approved by the Pacific-Japan Leaders Meeting-5. These funds would be applied to various RE projects under PIGGAREP PICs;
- USD 3 million from UNDP-World Bank administered SIDS DOCK that was given to PIGGAREP to manage under the PIGGAREP+ and PIGGAREP++ phases; and

⁵² Ibid 40

- donor funding for other RE projects in other PICs currently being negotiated in Tuvalu, Tonga, Solomon Islands from the governments of Taiwan, Japan, Italy and Austria

It is probable that the improved knowledge of PIC government personnel has been a factor in facilitating availability of these funds.

111. Examples of new RE investments leveraged by from SIDS-DOCK (under PIGGAREP+) and the aforementioned capital funds in Para 109 includes:

- ⇒ Cook Islands: 2 grid connected solar PV installations (288 kW) and 53 kW on Palmerston Island (USD 1.3 million) from SIDS-DOCK;
- ⇒ Kiribati: biofuel mill fuelled by copra oil on Abemama island (USD 0.3 million + cost of 3-30 kW gensets) from SIDS-DOCK;
- ⇒ Samoa: USD 5 million for 0.55 MW wind project from UAE, 3 new small hydropower sites and 3 small hydro sites for rehabilitation (> USD 5 million from ADB lending), 400 kW grid connected solar PV site (USD 1.0 million), Piu Village biogas power generation (USD 0.25 million)
- ⇒ Solomon Islands 20 MW Tina River hydropower project (USD 124 million);
- ⇒ Tonga: 10 solar water pumps from SIDS-DOCK;
- ⇒ Tuvalu: various solar PV installations including 40 kW at soccer stadium, 500 kW at Power Station (USD 5 million), solar PV systems on small islands of Nukufetau, Nukulaelae and Nui (€2.5 million project) with ongoing negotiations with the World Bank for wind turbines and grid connected solar PV installations;
- ⇒ Vanuatu: Talise hydropower scheme funded by IUCN, Italy and Austria (USD 1.1 million).

112. Examples of PIGGAREP soft assistance to improve the availability of RE finance to various PICs includes:

- Tonga: PIGGAREP funded a national renewable energy survey (under Component 1) that provided policymakers in the Tongan government with the necessary information on renewable energy resources and the information necessary to prepare an energy roadmap that included a conversion to 100% renewable energy by the year 2030. This in turn, has provided donors with increased confidence of the effectiveness and sustainability of donor-financed RE projects in Tonga;
- Tuvalu: PIGGAREP trained personnel (under Component 3) of the Tuvalu government. This included the head of TEC who has been instrumental in the modernization of the diesel power generation facilities, preparation of GEF and Green Climate fund proposals with UNDP, and in negotiating with the World Bank and other donors on their financing of an increasing the share of renewable energy in the electricity grid in Funafuti;
- Samoa: PIGGAREP provided soft assistance for the collection of hydrometric data at 6 small hydropower sites (under Component 1), the data of which was critical in the determination of economic feasibility of all sites. This allowed the Samoa government to close financing with ADB on 3 new small hydropower sites and the rehabilitation of 3 existing small hydropower sites.

113. One of the key outputs of this component was a study to set up a renewable energy fund that would increase the access to financing for RE proponents. To this end, a study was conducted in 2012 with IUCN on setting up an RE and EE loans scheme for 7 PICs that replicates the successful experience with development banks in Palau. Unfortunately, there was little interest in the setup of such a fund in part due to weak financial institutions in the region, and the coincidental and increasing availability of donor financing for RE projects.

Weak interest in the RE fund is also likely related to poor market conditions, and the aforementioned higher risks to private sector power producers and low rates of return on RE power projects in most PICs. Given the high costs of and limited ability of consumers to pay for renewable energy in the South Pacific region, there has been an understandable reluctance of regional financial institutions to fund RE projects.

3.3.6 Outcome 5: Policy and regulatory support

114. Under Component 5, PIGGAREP was to improve the policy and regulatory regimes of PICs that would encourage the development of RE projects by:

- assisting in the assessment and the adoption of national energy and climate change policies and guidelines;
- establishing incentives to encourage RE based livelihood and productivity projects;
- improved understanding of the real economic costs of energy sources, electricity and other forms of energy;
- developing and implementing RE system equipment and components standards; and
- effectively coordinating RE and other national sustainable development efforts.

A summary of the actual achievements of Component 5 with evaluation ratings are provided on Table 12.

Table 12: Outcome 5 achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵³ |
|--|---|----------|--------------------|--|--|----------------------|
| Outcome 5: Strengthened legal and regulatory structures in the energy and environmental sectors | No. of completed energy pricing studies for use in planning and policy formulations | 0 | 11 studies by 2011 | Only 2 energy pricing studies were completed by EOP | Studies completed for Fiji (feasibility of net metering policy) and Tuvalu (study on electricity tariffs in 2014 to develop a net metering policy) | MU |
| | No. of national plans and strategies with RE features | 0 | 11 by 2009 | 8 national plans and strategies for RE have been completed. However, only one national RE plan and strategy was completed in 2009. | Only Tuvalu, Nauru and Niue do not yet have finalized national RE plans and strategies. | S |
| | No. of PICs that have adopted RE/CC policies and guidelines | 0 | 8 PICs by 2012 | Only 5 PICs have adopted RE/CC policies and guidelines by 2012. | | S |
| | No. of PICs that have adopted technical standards for RE systems components and their installations | 0 | 8 PICs by 2009 | Only 6 PICs have adopted technical standards for RE systems components and their installations by EOP. By 2009, only | | MS |

⁵³ Ibid 40

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵³ |
|-------------------------------------|---|----------|----------------------------------|--|---|----------------------|
| | | | | 2 PICs had adopted such standards | | |
| | No. of PICs with relevant act/provisions (energy and environment) in place that supports RE development, utilization and formulation of RE regulations and policies | 0 | 11 by 2010 | Only 4 PICs have relevant acts in place supporting RE development and utilization by EOP. By 2010, only 3 PICs had adopted such relevant acts. | | MS |
| | No. of PICs with specific policies and incentives for RE based livelihood and productivity projects | 0 | 8 by 2012 | Only one PIC has specific policies and incentives for RE-based livelihood and productivity projects by EOP. | This achievement applies to Tonga | MU |
| | RE based livelihood and productivity projects by 2012 | 0 | No target set for this indicator | 5 projects in 2012 | These projects are located in Kiribati, Tonga and Vanuatu | S |
| Overall Rating – Component 5 | | | | | | MS |

115. The evaluation of Component 5 is rated as **moderately satisfactory** since some targets in this Component have not yet been met. Component 5 activities have provided several of the PIC governments with strong support to strengthen their regulatory and legal regimes to promote increases in renewable energy deployment. Despite partial achievement of the targets, the outputs of this Component strengthened the readiness and drivenness of all PICs to develop RE. PIGGAREP assistance through SPREP staff as well as other regional partners such as SPC and IRENA have provided complementary assistance to each PIC towards the development of their policies, standards, acts and provisions related to RE development and the setup of quality RE systems.

116. Examples of PIGGAREP assistance towards meeting the intended outcome of strengthened legal and regulatory structures in the energy and environmental sectors includes:

- Cook Islands: Drafting of the sustainable energy action plan (2009), and adoption of a renewable energy chart (2012);
- Fiji: Review of the Fiji Electricity Authority act, review of energy baseline data and the feasibility study of a net metering policy that could catalyzed the number of solar home systems connected to the grid;
- Kiribati: Drafting and adoption of the National Energy Policy (2009);
- Nauru: Development of an energy roadmap (2012);
- Samoa: Development of the Energy Sector Plan and Program (2012);
- Solomon Islands: Adoption of national standards for solar PV equipment and installation
- Tonga: Preparation of a renewable energy roadmap and developing national standards for solar PV equipment and installation (2010);

- Tuvalu: Adoption of a 7-target plan to reduce diesel dependency for power generation (2010), study on electricity tariffs that will determine the feasibility of developing a net metering policy, and review of Tuvalu’s Environment Protection Bill (2010);
- Vanuatu: Development of an energy roadmap (2012).

3.3.7 Outcome 6: Information and awareness enhancement

117. Under Component 6, PIGGAREP was to improve information dissemination and awareness of RE issues within PICs by:

- raising awareness of best practices of RE projects amongst key stakeholders;
- effectively promoting and recognizing innovative and successful RE initiatives; and
- implementing RE training programs.

A summary of the actual achievements of the Component 6 with evaluation ratings are provided on Table 13.

Table 13: Outcome 6 achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁴ |
|---|--|----------|-----------------------|---|--|----------------------|
| Outcome 6: Increased awareness and knowledge about RE amongst key stakeholders | % of energy sector professionals, politicians, investors, senior government officials and the general public who are aware of the benefits of RE each year starting in Year 1. | 0 | 50% by Year 1 | 30% awareness of RE benefits amongst general public, government, politicians and professionals at EOP. | No survey or documentation is available to confirm this number. | MS |
| | No. of completed training programs and national training workshops each year in each PIC. | 0 | 2 in each PIC by 2009 | By 2009, 6 training programs and workshops had been completed by PIGGAREP. By EOP in 2014, a total of 24 training workshops had been conducted. | All training programs and workshops were singular events and not held annually with the exception of Samoa where RE training workshops were conducted annually between 2011 and 2013 | MS |
| | No. of PICs that have an operational annual RE award program | 0 | 11 PICs by 2010 | 3 PICs have operational annual RE awards. 2 were operational in 2010 plus additional program established in 2014 ⁵⁵ . | Due to capacity constraints in some PICs, it was not realistic for all PIGGAREP PICs to have operational annual awards | MS |
| | No. of PICs with a regular RE public awareness program and a RE website | 0 | 11 PICs by 2010 | 4 PICs were achieved by 2010 with 7 PICs currently with ongoing public | This includes Niue (on TV and radio programs), and Samoa (RE awareness program held from 2011 to 2012) | MS |

⁵⁴ Ibid 40

⁵⁵ Includes award program in Samoa for “Young Environmentalist Stars”.

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁴ |
|-------------------------------------|---|----------|---------------|---|---|----------------------|
| | | | | RE awareness programs | that included RE DVD documentary) | |
| | No. of RE projects whose technical, economic, social and environmental characteristics are comprehensively documented and accessible via Internet based info system | 0 | 10 by 2010 | Only 2 RE projects posted on PIGGAREP website by 2010 but 5 RE projects fully described on the PIGGAREP website by EOP. | Additional RE projects under PIGGAREP+ and PIGGAREP++ to be added under SPREP's Pacific Climate Change Portal ⁵⁶ | MS |
| | No. of trainees trained in the region by 2010 | 0 | 2,000 by 2010 | More than 600 trained by EOP with 474 trainees trained by 2010 | | MS |
| Overall Rating – Component 6 | | | | | | MS |

118. The evaluation of Component 5 is rated as **moderately satisfactory** since there have been results, but not sufficient to meet the targets. Knowledge and awareness of RE has increased amongst all key stakeholders amongst the 11 PIGGAREP PICs. This is reflected in the policies and national programs of all PICs on the importance of developing renewable energy in all PICs to mitigate climate change and to reduce the cost of electricity.

119. Activities implemented under Component 6 have provided a critical foundation towards building awareness and local knowledge of renewable energy within the PICs under PIGGAREP. All PICs interviewed expressed the importance of the being more knowledgeable on RE issues as a prerequisite to being able to access funds and technical assistance to design and implement RE projects, and to replicate important awareness raising and educational programs on renewable energy within their PICs. This has resulted in the increased confidence of responsible government personnel to engage in productive dialogue with donors to develop renewable energy projects. Notable awareness raising efforts included:

- Update of school curriculums in Tonga on RE learning in primary schools;
- Solar PV training in schools in Solomon Islands;
- M&E of solar water pumping at 3 secondary schools in Kiribati enhancing education and awareness;
- DVD documentaries on renewable energy for each of the 10 participating PICs under PIGGAREP in 2011. These documentaries are excellent records of RE development for 10 PICs;
- setup of a renewable energy information centre in Honiara, the Solomon Islands; and
- the launching of the PIGGAREP webpage under the SPREP website containing all information related to the progress and plans of PIGGAREP, as well as PIGGAREP success stories.

⁵⁶ <http://www.sprep.org/Pacific-Islands-Greenhouse-Gas-Abatement-through-Renewable-Energy-Project/about-piggarep>

120. To further engage stakeholders captured by RE awareness raising programs, training courses that provided more detail of various RE technologies such as solar PV and wind energy were strategically offered. With more than 600 people trained in over 10 PICs, PIGGAREP has developed pools of local RE expertise that would contribute to the development of RE in each PIC. For donors, these improvements in local capacity and knowledge on renewable energy were perceived to contribute to lowering the risks of poorly implemented RE installations throughout the PICs.

3.3.8 PIGGAREP+ Results

121. PIGGAREP+ results are reviewed here against the targets in the PIGGAREP+ ProDoc of February 2013 (PIGGAREP+ is found in Appendix G). It should also be noted that the successful deployment of low carbon applications under PIGGAREP+ were also credited to towards PIGGAREP targets under:

- the Objective-Level target of 50 MW of “additional installed RE-based energy systems capacity”; and
- Component 1 target of “10 commercially sustainable RE projects in PICs”.

122. Under PIGGAREP+, resources were provided from SIDS-DOCK to deploy low carbon technologies, both RE and EE, in selected PICs to achieve the following outcomes:

- **Outcome 1.1:** Reduced energy costs for telecommunication systems equipment, and reduced reliance on fossil fuels to operate rural telecommunication systems in **the Solomon Islands**;
- **Outcome 1.2:** Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas **in Tonga**;
- **Outcome 1.3:** Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas in **Palau**;
- **Outcome 1.4:** Reduced reliance on fossil fuels, reduced and operational costs for electricity generation and distribution in the **Cook Islands**;
- **Outcome 1.5:** Reduced reliance on fossil fuels for the supply of electricity through commercial biofuel power generation in **Kiribati**;
- **Outcome 1.6:** reduced reliance on fossil fuels for the supply of electricity through commercial biogas-based power generation in **Samoa**.
- **Outcome 2.1:** Increased application of EE technologies and energy savings in the residential sector of **Tuvalu**;
- **Outcome 2.2.A:** Improved energy use performance in power generation and reduced power generation cost in the national power utility in **RMI**;
- **Outcome 2.2.B:** Improved energy use performance in power generation and reduced power generation cost in the 4 state power utilities in **FSM**; and
- **Outcome 2.3:** Operational, effective and widely accepted energy efficiency lending schemes in **FSM, RMI and Tuvalu**.

123. The results of the PIGGAREP+ interventions have been mixed. Positive results have been experienced in:

- the Solomon Islands (Outcome 1.1 with the installation of solar PV panels and 9 locations all of which have realized benefits from the displacement of diesel fuel for power generation);

- Tonga (Outcome 1.2 with the installation of solar PV for water supply which has substantially reduced the pumping costs which were previously used diesel. The tariffs in Tonga saved from solar PV are being saved by the communities for O&M of the system, and for capital costs for equipment replacements. While this is a very positive development, the amounts required to cover 100% of the replacement costs are substantially more, likely requiring external assistance;
- Cook Islands (Outcome 1.4 to support solar PV power generation for Palmerston Island). An array of solar PV to generate 260 kWh of power was successfully installed in early 2015 with strong support from the Cook Island Government;
- RMI (Outcome 2.2A with EE measures on a diesel power generation unit). These measures have been undertaken with reported improvements in the efficiency of power generation.

124. Some of the PIGGAREP interventions has not yet resulted in reduced energy costs including:

- Palau (Outcome 1.3 with solar PV water pumping at Kayangel). While the system is ready for construction, the project has been delayed pending resolution of the current severe drought being experienced. Completion of this solar PV system is scheduled for November 2016;
- Kiribati (Outcome 1.5 supporting the construction of a commercial biofuels plant for power generation). The project has experienced problems sourcing appropriate biofuels expertise for implementation, and will not be completed by the EOP;
- Samoa (Outcome 1.6 supporting the construction of a biogas power generation system). While the system in Piu village was not completed as of August 2016, the project is a successful example of development of a renewable energy project with an independent power producer (the Village of Piu) that will generate 180 kWh per day of electricity into the Samoan grid. Delays in its completion were related to problems in sourcing appropriate technical expertise to design and implement the project using the public procurement of the Government of Samoa;
- Tuvalu: (Outcome 2.1: Increased application of EE technologies and energy savings in the residential sector). This is primarily due to difficulties in sourcing a contractor to build a demonstration fale that can be used to showcase EE applications and measures and energy savings. The fale is scheduled for completion by November 2016;
- FSM (Outcome 2.2B with improvements in energy efficiency in diesel power generation units for 4 states). Due to cost constraints and logistics of undertaking business over the next a vast region, only one state (Kosrae) is undertaking energy efficiency measures on its diesel generation unit;
- FSM, RMI and Tuvalu (Outcome 2.3 that covers operational EE lending schemes). Seed funding still has not been deposited into the operational schemes in RMI and Tuvalu. For all these EE lending schemes, general public awareness of the availability of these scheme is poor either due to the vastness of these PICs that need to be covered (i.e. FSM and RMI), or the lack of capacity of the PIC Governments to effectively disseminate EE information.

A summary of the actual achievements of PIGGAREP+ with evaluation ratings are provided on Table 14.

Table 14: PIGGAREP+ achievements against targets

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁷ |
|--|--|--------------------|------------------------|--|---|----------------------|
| Objective: Low carbon development for Pacific SIDS through the deployment of renewable energy (RE) resources and promotion of energy efficiency (EE). | % share of RE in the energy mix in the PIGGAREP+ countries by end 2014, % | 0.04 ⁵⁸ | 0.1% share by 2014 | <i>It is not known if a 0.1% share of RE amongst all PIGGAREP+ countries was achieved by the end of 2014 or EOP.</i> | Reporting on the monitoring of the objective targets of PIGGAREP+ was not provided by the Project. | U/A |
| | No. of RE & EE projects implemented in the Pacific SIDS that replicated, or were designed based on, the PIGGAREP+ pilot projects by end 2014 | 0 RE 0 EE | 5 RE & 5 EE projects | <i>There has been no reporting on the replication of RE and EE projects based on PIGGAREP+ pilot projects</i> | Many of the PIGGAREP+ and PIGGAREP++ projects were not yet completed until late 2015, leaving little time for replication of these projects to occur | U |
| | Average specific fuel consumption of the national power utilities in PIGGAREP+ countries by end 2014, lit diesel/kWh | 0.265 | 0.252 liter diesel/kWh | <i>While FSM and RMI national power utilities acknowledge a reduction of average specific fuel consumption, there has been no report calculating the reduction</i> | Reporting on the monitoring of the objective targets of PIGGAREP+ was not provided by the Project | MS |
| | No. of implemented residential EE projects that were supported by EE financing schemes in PIGGAREP+ countries by end 2014 | 0 | 30 | <i>Project has not provided any information on the progress of this indicator</i> | Reporting on the monitoring of the objective targets of PIGGAREP+ was not provided to the Evaluator | U/A |
| Outcome 1.1: Reduced energy costs for telecommunication systems equipment, and reduced | Average monthly energy cost of the operation of telecom systems in the pilot rural health centers and hospitals by mid-2014, US\$ | 9,200 | 0 | <i>0 monthly energy cost of pilot rural health centres and schools by late 2015</i> | <i>Original plans to install solar PV systems on telecommunication systems were changed in mid-2014 due to the upgrading of the telecommunication systems to 3G. Solar PV installations sites were changed to 9</i> | HS |

⁵⁷ Ibid 40⁵⁸ Baseline 2009 figure for the 6 PIGGAREP+ countries (Ref: Regional Indicators 2009 – Economic Development Division, SPC – Suva Regional Office).

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁷ |
|--|---|----------|--------|---|--|----------------------|
| reliance on fossil fuels to operate rural telecommunication systems in the Solomon Islands | | | | | <i>public locations including rural schools, health clinics, pharmacies and police stations.</i> | |
| | Average monthly electricity usage of telecom systems in the pilot rural health centers and hospitals by mid-2014, kWh | 11,400 | 0 | <i>0 kWh of average monthly electricity usage in pilot rural health centres and schools by late 2015</i> | | HS |
| | Average monthly no. of hours of operation of telecom systems in all pilot rural health centers and hospitals by mid-2014, hrs | 0 | 7,200 | <i>Less than 1,000 hrs of operation of RE systems at pilot rural health centres and schools by EOP since most of these installations were completed by mid-2016 (resulting in the displacement of diesel fuel for generation sets).</i> | Achievement is satisfactory since this reflects the normal operating hours of rural health centers and schools | S |
| Outcome 1.2: Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas in Tonga | Average monthly energy cost of the operation of well water pumping systems in the pilot rural villages by mid-2014, USD | 1,220 | 780 | <i>USD 528.61 average monthly energy cost of operating well water pumping systems in the outer islands of Tonga commencing in January 2015</i> | Sustainable, environmentally friendly and energy cost saving operations of solar PV well water pumping systems in outer islands in Tonga | HS |
| | Average monthly energy consumption of well water pumping systems in the pilot rural villages by mid-2014, kWh | 2,175 | 1,080 | <i>111.9 kWh of average monthly energy consumption for 13 solar PV well water pumping systems in pilot rural villages commencing January 2015</i> | | HS |
| | Average monthly no. of hours of operation of RE powered well water pumping systems in pilot rural villages by mid-2014, hrs. | 90 | 150 | <i>1,840 hours of monthly operation of 13 solar PV power well water pumping systems in pilot rural villages commencing January 2015</i> | This reflects high usage of these wells. | HS |
| Outcome 1.3: Sustainable, environment | Average monthly energy cost of the operation of the Kayangel water | 278 | 26 | <i>A sustainable, environmentally friendly and energy cost saving solar PV well water pumping</i> | | U/A |

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁷ |
|--|--|----------|--------|---|--|----------------------|
| friendly and energy cost saving operation of well water pumping systems in rural areas in Palau | supply system by mid-2014, USD | | | system in the Kayangel water supply system has not yet been installed due to severe drought afflicting Palau. Construction drawings for the solar PV system were completed in early 2016 and the subcontractor has assembled all building materials in Palau with construction of the system commencing on October 31, 2016 | | |
| | Average monthly energy consumption of the Kayangel water supply system by mid-2014, kWh | 2,780 | 255 | | | U/A |
| | Average monthly no. of hours of operation of RE powered water supply system in Kayangel by mid-2014, hrs | 0 | 150 | | | U/A |
| Outcome 1.4: Reduced reliance on fossil fuels, reduced and operational costs for electricity generation and distribution in the Cook Islands | Average annual cost of the Palmerston power generation system by mid-2015. USD/kWh | 1.05 | 0.15 | Government utility has not reported the average annual cost for Palmerston island power generation system and the annual number of litres of DFO saved | Reliance on fossil fuels for electricity generation and distribution has been reduced on the Palmerston island power generation system, with the installation of solar PV panels to generate 260 kWh of electricity daily. | S |
| | Average annual DFO savings of the Palmerston island power generation system in liters | 0 | 15,030 | | | S |
| Outcome 1.5: Reduced reliance on fossil fuels for the supply of electricity through commercial biofuel power generation in Kiribati | Average monthly CNO consumption of the power generation facilities in Abemama Island by mid-2015 in litres | 0 | 3,761 | Reliance on fossil fuels for the supply of electricity from commercial biofuel power generation in Kiribati has not been reduced. Consultation started with Kiribati focal person regarding the potential of the project and level of support to be provided by them noting the project has been slow moving and Kiribati's participation has been limited. | The identified company to execute the biofuel project in Kiribati is not an environmental company. As of October 2016, this activity was cancelled due to limited funding and lack of interest. Funds for this outcome have been reallocated to complete Samoa and Palau activities. | U |
| | Maximum % CNO oh content of biofuel blend used in the power generation facilities in Abemama Island by mid-2015, % | 0 | 90 | | | |

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁷ |
|--|---|----------|---------|---|---|--|
| Outcome 1.6: Reduced reliance on fossil fuels for the supply of electricity through commercial biogas-based power generation in Samoa | Average specific biogas consumption of the demo power generation systems by mid-2015, m ³ /kWh | 0 | 0.6 | <i>Construction of this biogas power generation project in Piu village was underway during August 2016 with an expected completion date of October 2016. As such, there has not yet been a reduced reliance on fossil fuels from the supply of electricity from a commercial biogas-based power generation system in Samoa.</i> | This facility was designed to generate 180 kWh per day (over a 12-hour period) of electricity into the Samoan grid using wastewater sludge as the feedstock. Late delivery of this outcome can be attributed to difficulties in procuring services of consultants to remote markets such as Samoa | U/A |
| | Average annual diesel fuel savings from the demonstration power generation systems by mid-2015 | 0 | 70,000 | | | U/A |
| | % of grid power is supplied by biogas fired power generation systems by end of 2015 | 0 | 5 | | | U/A |
| Outcome 2.1: Increased application of EE technologies and energy savings in the residential sector of Tuvalu | No. of planned EE improvement projects based on EE concepts featured in the Demo Fale by end 2013 | 0 | 1 | <i>There has not been an increased application of EE technologies and energy savings in the residential sector of Tuvalu. This is due to delays in contracting the services of a contractor to supply EE equipment and build a demonstration fale. As a result, none of the intended targets have been achieved by the EOP. Results of the fale will be seen after the EOP.</i> | | U/A |
| | No. of implemented EE improvement projects based on EE concepts featured in the Demo Fale by mid-2014. | 0 | 3 | | | U/A |
| | Cumulative energy savings from implemented new EE improvement projects by mid-2014, kWh | 0 | 100,000 | | | U/A |
| | Cumulative energy financing provided by DBT for the Tuvalu Energy Efficient Revolving Fund (EERF) and other commercial banks for EE | 0 | 200,000 | | | EERF has been setup. However, with poor public awareness of the EERF and the lack of a functioning demonstration fale, there has not yet been any energy financing from the EERF |

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating ⁵⁷ |
|---|---|--|--|---|--|----------------------|
| | improvement projects by mid-2014, USD | | | | | |
| Outcome 2.2.A: Improved energy use performance in power generation and reduced power generation cost in the national power utility in RMI | Average specific fuel consumption of the power generation units of MEC by mid-2014, liters diesel oil/kWh | 0.265 | 0.251 | <i>Improved specific fuel consumption of these power generation units has been reported for MEC power generation units through cleaning of equipment and tanks, replacement of cooling radiator coil on a generator and rebuilding of another generator</i> | The Project has not provided any reports of the actual fuel savings of litres of diesel oil per kWh | MS |
| Outcome 2.2.B: Improved energy use performance in power generation and reduced power generation cost in the 4 state power utilities in FSM | Average specific fuel consumption of the power generation units of the state power utilities by mid-2014, liters diesel oil/kWh <ul style="list-style-type: none"> ▪ CPUC ▪ KUA ▪ PUC ▪ YSPSC | <ul style="list-style-type: none"> ▪ 0.263 ▪ 0.270 ▪ 0.268 ▪ 0.274 | <ul style="list-style-type: none"> • 0.250 • 0.253 • 0.252 • 0.255 | <i>Improved energy use performance in power generation is ongoing with the Kosrae Utility Authority (KUA), but not the other 3 state power utilities.</i> | Despite reported efficiency improvements in efficiencies in power generation of 4.74%, actual specific fuel consumption at the KUA units in litres diesel oil per kWh has not yet been reported to PIGGAREP. | MS |
| Outcome 2.3: Operational, effective and widely accepted energy efficiency lending schemes in FSM, RMI and Tuvalu | No. of EE financing schemes established and operational by mid-2014. | 0 | 3 | <i>For FSM, the FSM Development Bank have an operational EE lending scheme since 2015 (mainly for energy audits provided by PIGGAREP+ and EE home improvements),</i> <i>RMI has secured a commitment for USD 4.0 million for an EE lending scheme from the Marshall Islands Development Bank. As of September 2016, funds have not yet been provided for the EE loan scheme;</i> | <i>However, the RMI and FSM schemes have been undersubscribed due to logistical difficulties in disseminating information to remote communities on these schemes;</i> | MU |
| | No. of EE financing applications approved by mid-2014 | 0 | 10 | | | MU |

| Intended Outcome | Performance Indicator | Baseline | Target | Status of Target Achieved | Evaluation Comments | Rating 57 |
|-----------------------------------|-----------------------|----------|--------|--|---------------------|--------------|
| | | | | <p><i>The Tuvalu Energy Efficient Revolving Fund (EERF) is expecting seed funds from IUCN and TEC for operationalization. However, there is still poor awareness of EE amongst Tuvalu residents that can be improved through implementation of the demonstration fale from Outcome 2.1 of PIGGAREP+.</i></p> | | |
| Overall Rating – PIGGAREP+ | | | | | | MS |

3.3.9 Relevance

125. The PIGGAREP is **relevant** to the development priorities of PIC countries given the well-known and often discussed impacts of climate change including extreme weather events and rising sea levels. Since the 1990s, Pacific Island Leaders' Forum meetings have consistently advocated for serious measures to address the problems of global warming and sea level rise that pose a serious threat to the sustainable development and existence of all PICs. These Leaders have continuously called for the increased development and utilization of renewable energy (RE) technologies as one of the effective means of addressing these problems.
126. In 2002, the Council of Regional Organizations in the Pacific - Energy Working Group (CROP EWG) finalized a regional Pacific Islands Energy Policy (PIEP) along with an associated Pacific Island Energy Strategic Action Plan (PIESAP) that prioritizes the region's need for utilizing commercially viable RETs for mitigating GHG emission. The design of PIGGAREP is strongly aligned with PIEP and PIESAP, especially Component 3 (Institutional strengthening) and Component 5 (Strengthening legal and regulatory structures).
127. In addition, leaders of the PICs adopted the Pacific Islands Framework for Action on Climate Change (PIFRAC) in 2005 that was assembled after PIESAP. PIFRAC identified the priorities of the Pacific region for the reduction in GHG emissions and activities for action at the national and regional level during the 2007 to 2015 period. PIFRAC was instrumental in the design of PIGGAREP activities including the need for strengthening legal and regulatory frameworks for RE development and strengthening partnerships at all levels to enable the Pacific region to better understand and respond to climate change and climate variability. PIFRAC is consistent with the timeframes of the Millennium Declaration, the Johannesburg Plan of Implementation (JPol) and the subsequent work of the United Nations Commission on Sustainable Development (CSD).
128. Lastly, PIGGAREP is relevant to the strengthening of the Alliance of Small Islands States' (AOSIS) in demonstrating the strong commitment of the PICs to a number of commitments including those of the Johannesburg Renewable Energy Coalition (JREC), the International Action Programme on RE adopted at the International RE Conference held in Bonn in June 2004, the Johannesburg Plan of Implementation, the Barbados Programme of Action (BPoA) and the Mauritius Strategy.

3.3.10 Effectiveness and Efficiency

129. In general, the effectiveness of PIGGAREP overall has been **satisfactory**, notwithstanding that "unattainable" Project objective-level targets (such as GHG emission reductions and energy saved) were not met. To the extent possible, the PIGGAREP PMO and UNDP despite the constraints presented in implementing this Project over such a vast region, have delivered a number of outputs towards meeting the RE objectives. This included delivery of technical assistance to PICs on national plans and policies towards low carbon future including:
- Cook Islands: Drafting of the sustainable energy action plan (2009), and adoption of a renewable energy chart (2012);
 - Fiji: Review of the Fiji Electricity Authority act in the drafting of a new energy act, the net metering policy study that catalyzed the number of solar home systems connected to the grid;
 - Kiribati: Drafting and adoption of the National Energy Policy (2009);

- Nauru: Development of an energy roadmap (2012);
- Samoa: Development of the Energy Sector Plan and Program (2012);
- Solomon Islands: Adoption of national standards for solar PV equipment and installation
- Tonga: Preparation of a renewable energy roadmap and developing national standards for solar PV equipment and installation (2010);
- Tuvalu: Adoption of a 7-target plan to reduce diesel dependency for power generation (2010), study on electricity tariffs that will determine the feasibility of developing a net metering policy, and review of Tuvalu's Environment Protection Bill (2010);
- Vanuatu: Development of an energy roadmap (2012).

130. PIGGAREP has made significant contributions to assisting all PICs in developing RE projects to reduce their growth rate of GHG emissions from fossil fuel usage in PICs through the widespread adoption and usage of RE including:

- the provision of RE resource assessments for Fiji, Samoa, Tonga, Tuvalu and Vanuatu. In the case of these countries these RE resource assessments have triggered RE investments, mainly from donors;
- feasibility studies for RE systems projects in the Cook Islands (solar PV), Fiji (net metering policy for solar PV), Tonga (feasibility study of the rehabilitation of solar home systems), and Vanuatu (feasibility study review of the Talise 75kW small hydropower project);
- training for locally-based solar PV technicians including Kiribati, Nauru, Solomon Islands, Tonga, Tuvalu and Vanuatu (only for hydropower technicians);
- financial management training for communities in Tonga to manage operation and maintenance and replacement funds;
- capital costs for Solomon Islands PV installations in 9 social buildings (i.e. schools, health clinics and police stations), and solar water pumping sites in Tonga and Palau as a part of the PIGGAREP+;
- capital cost works for RE systems including Cook Islands solar PV on Palmerston Island, Kiribati biofuel mill on Abemama Island, Samoa biogas power generation at Piu Village as a part of PIGGAREP++.

131. However, the presence of a Project indicator in the log-frame for setting up an RE fund (assumed to be with a commercial bank) reflects the lack of compatibility of the PIGGAREP design with market conditions. Prerequisites to set up an EE and RE fund includes building the capacities of regional financial institutions to become familiarized with the business of renewable energy and energy efficiency; to this end, capacity building for financial institutions on the Marshall Islands was conducted in 2014 in support of operationalizing the country's EE loan scheme under PIGGAREP+. Unfortunately, the effectiveness of PIGGAREP activities to improve access to financing RE projects for PICs has been *moderately unsatisfactory*, coupled with the increased availability of donor funding for RE projects after 2010.

132. The efficiency of delivery of PIGGAREP activities was assessed as **moderately satisfactory** in consideration of:

- Poor progress of PIGGAREP between 2008 and 2011. This was attributable to the design issues of PIGGAREP (as described in Section 3.1, Paras 30 to 34) that forced the PMO to focus on providing detailed PIGGAREP activities and building capacity of the PICs before implementing RE projects;
- Involvement of the PIGGAREP Project (with a USD 5.225 million grant) with studies and data collection for 41.8 MW of RE projects out of which 25.6 MW now has confirmed financing for implementation period. This is a satisfactory outcome from an efficiency

perspective considering that in addition to RE data collection and feasibility studies, the Project also contributed to building capacities of key stakeholders (such as institutions, energy professionals, the RE supply chain and local communities) as prerequisites to local stakeholder participation in the implementation of RE projects in PICs. The 41.8 MW was short of the Project-level objective of 50 MW;

- the inherent difficulties of implementing a project over such a vast region that required higher operating and management costs mainly associated with travel;
- the different capacities of each of the PICs to prepare PASs which resulted in delays from some of the PICs in the timely delivery of PAS reports.

3.3.11 Country Ownership

133. As described in Para 126 and 127, the design of PIGGAREP (in particular Component 3 - Institutional strengthening and Component 5 - Strengthening legal and regulatory structures) was strongly aligned with the plans and actions from PICs that are contained in the 2002 CROP-EWG authored PIEP and PIESAP. With PIGGAREP assistance through SPREP staff as well as other regional partners such as SPC and IRENA to each PIC, there have mostly positive outcomes of most of the PICs to develop and adopt policies, standards, acts and provisions related to RE development and the setup of quality RE systems. Some positive examples are provided in the following paragraphs.

134. Cook Islands: Commencing 2011, PIGGAREP provided assistance to the Cook Islands to prepare a Renewable Energy Chart (CIREC) containing a 2020 renewable energy target of 100%. With the adoption of the CIREC in 2012, the GoCI used PIGGAREP resources as seed funding for feasibility studies of potential solar PV installations on its northern islands. Capital funds for the development and implementation of these solar PV projects was provided by NZMFAT and GoCI. Implementation of the CIREC is undertaken by the GoCI's Renewable Energy Development Division.

135. Kiribati: PIGGAREP's main contributions to building capacity of Kiribati was in early 2012 to upgrade the skills of the Government solar PV technicians (under the Kiribati Solar Energy Company or Terubentau Akura's) to use a solar PV software, RESCO Manager III. In addition, PIGGAREP+ provided resources in 2014 for the installation of generation sets to support the Government's Kiribati Copra Mill Company Ltd (KCMCL) on Abemama Island to generate electricity from coconut oils from copra to partially substitute to imported fossil fuels. There has been effective country ownership of PIGGAREP assistance in Kiribati as both KSEC and KCMCL continue to operate to sustain the use of solar PV and biofuels for the country.

136. Nauru: PIGGAREP provided assistance in 2008 to the preparation of the Nauru National Energy Policy and the National Energy Roadmap which has been adopted by the government. PIGGAREP assistance has also been provided to train renewable energy officers (REO) to increase the knowledge of government personnel in the operation and maintenance of public RE assets (such as solar PV street lighting, solar water pumping, and solar PV for public building energy supplies). This has resulted in local government personnel operating and managing RE development.

137. Niue: Country ownership of PIGGAREP assistance (mainly of RE awareness raising) has been effective. PIGGAREP has facilitated the REP-5 project in 2009 of a grid connected 52 kW solar PV system at the hospital, an EU EDF-10 investment in solar PV installations as well as a grid stability study. Moreover, these pilot actions have resulted in Niue developing

and adopting a “Niue Strategic Energy Road Map 2015-25”, similar to those developed (with PIGGAREP assistance) in the Cook Islands, Tonga and Samoa.

138. Samoa: According to the Ministry of Finance in Samoa⁵⁹, the RE awareness raising program funded by PIGGAREP for Samoa in 2008 with a key contribution towards raising awareness and increasing knowledge of RE benefits amongst policymakers and higher government officials. Moreover, it galvanized the Government of Samoa’s commitments vis-à-vis targets of 20% renewable energy by 2030 (that was recently upscaled in May 2015 to 100% renewable energy by 2017), and facilitated their actions towards preparing the Samoa Energy Sector Plan 2012-2016 for which PIGGAREP provided technical assistance. The adoption of the Energy Sector Plan and the overall increased knowledge of RE benefits has enabled the Government of Samoa to staff a well-qualified Renewable Energy Department within MNRE, and to effectively implement a number of renewable energy projects in Samoa including hydropower, solar PV, wind and biogas.
139. Tonga: Early PIGGAREP activities included support for the collection of renewable energy data and information that served as a key contribution towards the Tonga’s Renewable Energy Bill and the Tonga Energy Roadmap (TERM) that were adopted in 2008. With strong participation of officers from the Government of Tonga, Tonga was able to prepare its own feasibility studies towards solar PV rehabilitation and environmental impact assessments for solar water pumping systems, which led to investments in these projects. PIGGAREP also provided targeted training for Government officers in financial management and training on the operation and maintenance of solar PV systems, technical training on solar PV installations, training for the solar home systems inspection and standardization. These actions have demonstrated strong country ownership of the RE programmes ongoing in Tonga.
140. Tuvalu: PIGGAREP has provided assistance to the Government of Tuvalu for the establishment of an RE and EE unit within the Tuvalu Electricity Corporation (TEC) in 2011. Currently, low carbon development work in Tuvalu is one of the Government’s main priorities and is led by an energy champion in Tuvalu and personnel from the RE and EE unit. Their primary roles are to provide strategic advice for low carbon development to the Government of Tuvalu, and to recommend and implement low carbon investments. PIGGAREP’s contribution has been substantial to the strengthening of Tuvalu’s capacity for developing its own low carbon development plans.
141. For the other PICs, country ownership of PIGGAREP was not as positive:
- For Fiji, its renewable energy development was more reliant on its own renewable energy program with assistance from GEF supported projects under UNDP Fiji. PIGGAREP did contribute to feasibility study into the formulation of a net metering policy (involving the analysis of baseline information and the feasibility of setting up individual grid-connected solar home systems). This has led to further assistance from another donor to develop the net metering policy which has not yet been adopted by the Government of Fiji;
 - For PNG, the lack of country ownership was similar to those reasons in Fiji, the reliance of its own donor-assisted programs to support RE development. As a result, PNG was not active with PIGGAREP after 2010;
 - For Solomon Islands, There has been substantial contributions by PIGGAREP to raising the profile of renewable energy as early as 2009, including the setup of a RE Information

⁵⁹ The role of MoF in Samoa is oversight of expenditures in their energy sector and the Ministry of Natural Resources and Energy (MNRE)

Centre / one-stop-shop, the provision of training in the installation, operation and maintenance for solar PV technicians, technical assistance to Tina River hydro project stakeholders, and the solar PV installations on selected public buildings. This has to some extent enabled policy makers and energy professionals to sustain dialogue on influencing policymakers to develop clean energy for sustainable rural development. However, as of 2016, the Government of the Solomon Islands has not yet updated its National Energy Policy of 2007 similar to other PICs (such as Cook Islands, Niue and Tonga), despite RE development and rural electrification being priorities of its Energy Division. As such, Solomon Island ownership of PIGGAREP is not as strong as the aforementioned PIGGAREP PICs;

- For Vanuatu, PIGGAREP's assistance comprised of the production of a wind atlas (through the setup of wind monitoring stations) and the updating of a 2002 feasibility study of the 70kW Talise hydropower project in 2010 as well as support for the development of an enabling investment environment for RE in Vanuatu. While these activities have led to investments in wind energy projects and hydropower rehabilitation, the capacity limitations within the Vanuatu Government has not yet led to any policy framework to guide the development of RE. As such, country ownership of PIGGAREP in Vanuatu cannot be considered as strong as other PIGGAREP PICs.

3.3.12 Mainstreaming

142. PIGGAREP has successfully mainstreamed with the UNDAF for the Pacific Region (2013 to 2017)⁶⁰. The development of renewable energy as promoted under PIGGAREP activities was deemed a top priority for all PICs in so far as addressing the well-being and sustainable development of all PICs. As such, the renewable energy developments of PIGGAREP addresses all the intended results within the UNDAF document including:

- Outcome Area 1: Environmental management climate change and disaster to risk management. The development of renewable energy as a part of an integrated approach to environmental management and climate change mitigation should create more resilient PIC communities to the adverse environmental impacts of climate change;
- Outcome Area 2: Gender equality. The programs to develop renewable energy would provide new opportunities for all PICs citizens regardless of gender (PIGGAREP held a gender mainstreaming workshop in May 2013);
- Outcome Area 3: Poverty reduction and inclusive economic growth. The development of renewable energy through PIGGAREP in communities with marginal incomes would enhance inclusive economic growth, improve food security and livelihood opportunities for women, youth and vulnerable groups and reduce poverty that is becoming increasingly prevalent in the region;
- Outcome Area 4: Basic services for health and education. Through the growth of renewable energy throughout many PIC communities, pilot RET installations would be set up in schools and health clinics, thereby improving the quality of public health and education services provided by these facilities; and
- Outcome Area 5: Governance and human rights. PIGGAREP was designed to strengthen the capacity of local governments to encourage and accelerate the development of renewable energy, and provide the basic energy needs to its citizens at the lowest cost.

⁶⁰ http://www.asia-pacific.undp.org/content/dam/fiji/docs/UNDAF_Summary_Report_Final_LR.pdf

3.3.13 Sustainability of Project Outcomes

143. In assessing sustainability of the PIGGAREP Project (including its extensions PIGGAREP+), the evaluator asked “how likely will the Project outcomes be sustained beyond Project termination?” Sustainability of these objectives was evaluated in the dimensions of financial resources, socio-political risks, institutional framework and governance, and environmental factors, using a simple ranking scheme:

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

Overall rating is equivalent to the lowest sustainability ranking score of the 4 dimensions.

144. The overall PIGGAREP Project sustainability rating is moderately unlikely (MU). This is primarily due to:

- Significant improvements in the awareness and knowledge of RE in all PICs under PIGGAREP amongst key stakeholders such as government personnel, policymakers, community leaders, and the general public;
- All PICs under PIGGAREP having prepared and adopted national energy policies and strategic plans that focus on the development of renewable energy and low carbon technologies as a means to mitigate climate change;
- The increased availability of capital funds from the donor community primarily earmarked for RE installations, and service contracts for the RE installations;
- The uncertainty and current lack of available funds **within the participating PIC governments for sustained** operation and maintenance of power generation from RET applications, notably in remote RE project sites that are located far from technical expertise on solar PV and other RETs, notwithstanding the solar PV training provided to community residents **and the perception of the evaluator of the sincere intentions of most PIC governments to allocate such funds if available, to O&M;**
- The lack of funds to provide regularly scheduled training for technicians or personnel to operate and maintain RET applications after the initial service contracts of the RE installers has expired.

Details of sustainability ratings for the PIGGAREP Project (including individual PIGGAREP+ outcomes) are provided on Table 15.

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|--|---|---|
| <p>Actual Outcome 1: Knowledge about RE in all the PICs under PIGGAREP has improved. Moreover, a number of these PICs have successfully implemented RE installations, although not all of these installations can be classified as commercially viable.</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Financial resources for improving the knowledge of RE in many of the PICs is likely available from donors as well as intergovernmental agencies such as the Pacific Power Association (PaPA), an agency with the interests of promoting an exchange of information related to power generation, renewable energy, and related engineering expertise. With all PIC governments having national energy policies targeting 100% renewable energy, agencies such as PaPA would likely pool their resources for conferences and workshops to promote renewable energy development though this does not appear to be a commitment. Moreover, the cost of renewable energy is still higher than conventional fossil fuel power generation, thus leaving most RE project investments to donors; • <i>Socio-Political Risks:</i> There are no socio-political risks to workshops on RE benefits as well as commercially viable RE installations, wherever such sites do exist in PIGGAREP PICs. All PICs in PIGGAREP support accelerated development of RE within their national energy policies; • <i>Institutional Framework and Governance:</i> For several PICs, there are focal points who can coordinate RE development in compliance with their own policies and standards. However, for some PICs with remote communities, there are still issues of insufficient human capacity to effectively disseminate RE knowledge and implement RE installations that are commercially viable; • <i>Environmental Factors:</i> There are no environmental risk factors that would hinder RE information dissemination and implementing RE demonstration installations. <p style="text-align: right;">Overall Rating</p> | <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">3</p> <p style="text-align: center;">4</p> <p style="text-align: center;">3</p> |
| <p>Actual Outcome 2: In comparison with the baseline energy scenario of 2007 in PIGGAREP PICs, the market for RET applications has expanded considerably, in large part due to strong government support for renewable energy development and its linkage to climate change mitigation and strong support from the donor community.</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Financial resources from the donor community for the preparation of RE projects has been strong. However, financial resources for RESCOs to maintain a presence in many of the PICs are not available since many of the residents of PICs have not demonstrated a willingness to pay for operation and maintenance services, and replacement costs for most of the RE installations. There is currently no commitment from donors for long-term and sustained operation and maintenance of installed on RE systems; • <i>Socio-Political Risks:</i> There are no social political risks to the continued expansion of the RE market by donors. In addition, with the increased public awareness of the benefits of RE (and their associated lack of electrification in some communities), there are no social risks to RE development in many communities; | <p style="text-align: center;">2</p> <p style="text-align: center;">4</p> |

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|---|---|---|
| | <ul style="list-style-type: none"> • <i>Institutional Framework and Governance</i>: Most PICs have RE focal points who are able to manage donor driven RE projects within the framework of their respective national energy policies and action plans; • <i>Environmental Factors</i>: There are no environmental factors that would hinder the support for expanding the market for RET applications. <p style="text-align: right;">Overall Rating</p> | <p style="text-align: center;">3</p> <p style="text-align: center;">4</p> <p style="text-align: center;">2</p> |
| <p>Actual Outcome 3: Institutional capacities of all PICs has been enhanced to manage accelerated RE development consistent with national energy policies and climate change mitigation plans.</p> | <ul style="list-style-type: none"> • <i>Financial Resources</i>: Financial resources are available in all PIC governments for personnel to coordinate and manage RE project development consistent with national energy policies mandating accelerated RE development; • <i>Socio-Political Risks</i>: These risks are low as PICs have strongly embraced RE development within their national energy policies and action plans; • <i>Institutional Framework and Governance</i>: Most PICs in PIGGAREP have RE offices or RE focal points along with clear policies and action plans for the accelerated RE development; • <i>Environmental Factors</i>: There are no environmental risk factors for this outcome. <p style="text-align: right;">Overall Rating</p> | <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> |
| <p>Actual Outcome 4: Availability of RE funding has improved, though much of it is from the donor community mainly for new RE projects, and some for existing RE rehabilitation. However, funding for operation and maintenance of existing RE installations has not yet been fully established in all PICs.</p> | <ul style="list-style-type: none"> • <i>Financial Resources</i>: Financial resources for the development of RE in many of PIGGAREP's PICs has dramatically increased over the levels of 2007. However, these financial resources are still primarily from the donor community, with many of these financial resources already earmarked for new installations, and not for the operation and maintenance of existing facilities which ideally should come from the users. This has not been yet demonstrated for many of the installations with the exception of Tonga; • <i>Socio-Political Risks</i>: For many of the RE installations in PIGGAREP PICs, the beneficiary communities are not able to fully pay for the maintenance and the upkeep of the RE installations. As such, the sustainability of these RE installations (especially in remote communities) is questionable even during the lifetime of the technology (for example, some of the solar PV installations have a 2 to 3-year service contract after which the community will be in charge of maintenance; community-based maintenance without any fiscal resources will may result in higher risks of power disruptions); • <i>Institutional Framework and Governance</i>: Most PIC governments are able to easily process donor funded RE projects efficiently; | <p style="text-align: center;">3</p> <p style="text-align: center;">2</p> <p style="text-align: center;">4</p> |

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|--|--|---------------------------------|
| | <ul style="list-style-type: none"> <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of this actual outcome. <p>Overall Rating</p> | 4 |
| <p>Actual Outcome 5: All PIGGAREP PICs have improved legal and regulatory frameworks to promote the acceleration of RE development within their energy and environmental sectors.</p> | <ul style="list-style-type: none"> <i>Financial Resources:</i> All PIC governments have financial resources for personnel in charge of oversight of RE policy and legal framework and RE product standards, and for promotion of RE development; <i>Socio-Political Risks:</i> No socio-political risks since all PIC governments under PIGGAREP are deeply committed to RE development as a means of mitigating climate change; <i>Institutional Framework and Governance:</i> All PIC governments have dedicated government personnel in charge of oversight of RE policy and legal framework, and RE product standards, and promotion of RE development; <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of this actual outcome. <p>• Overall Rating</p> | 4 4 4 4 4 |
| <p>Actual Outcome 6: Awareness and knowledge of RE within all PIGGAREP PICs has significantly improved from the baseline scenario of 2007.</p> | <ul style="list-style-type: none"> <i>Financial Resources:</i> Financial resources for the continuation of RE awareness raising and RE technical training are possibly available from regional agencies (and such as SPREP or PaPA), donors and from some of the PIC governments. At the time of this evaluation, however, there is no confirmation of any funds being earmarked for these purposes; <i>Socio-Political Risks:</i> Some of the local technicians in some of the remote RE project sites do not have sufficient training nor do they have any regular training scheduled over the years after the EOP. This lack of training may lead to higher risks of disruptions in RE power generation resulting from poor maintenance (such as lack of maintenance on some of the battery packs etc.); <i>Institutional Framework and Governance:</i> Most PIC governments have designated agencies and personnel to promote and raise awareness of the benefits of RE; <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of this actual outcome. <p>• Overall Rating</p> | 3 2 4 4 2 |
| | <ul style="list-style-type: none"> • Overall Rating of PIGGAREP Sustainability: | 2 |

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|--|--|--|
| <p>Outcome 1.1 (PIGGAREP+): Reduced energy costs for 6 schools, 2 health clinics and a police station in the Solomon Islands</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Financial resources for the continuation of the operation and maintenance of solar PV installation at these sites are not available after the installers initial warranty period of 2 years despite the favorable opinions of the beneficiaries. In addition, stakeholders have also suggested that of a funding mechanism be setup to finance sustained operation and maintenance of solar PV systems, notably for the procurement of spare parts; • <i>Socio-Political Risks:</i> Trained local solar PV and RE technicians are located in the main urban centers of the Solomon Islands; • <i>Institutional Framework and Governance:</i> The capacity Government of the Solomon Islands to implement and manage RE development continues to need strengthening; • <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of this actual outcome. <p style="text-align: center;">• Overall Rating</p> | <p>2</p> <p>3</p> <p>2</p> <p>4</p> <p>2</p> |
| <p>Outcome 1.2 (PIGGAREP+): Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas in Tonga</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Financial resources for the continuation of the operation and maintenance of solar PV installation at these sites are not available after the installers initial warranty period of 2 years. However, there are efforts being made by local communities to set aside funds for O&M costs and possibly capital replacement costs (this effort was funded by PIGGAREP); • <i>Socio-Political Risks:</i> Trained local solar PV and RE technicians are located in the local communities; • <i>Institutional Framework and Governance:</i> The Government of Tonga have officers dedicated to sustaining the operation of RET installations; • <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of this actual outcome. <p style="text-align: center;">• Overall Rating</p> | <p>3</p> <p>3</p> <p>4</p> <p>4</p> <p>3</p> |
| <p>Outcome 1.3 (PIGGAREP+): Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas is currently in development in Palau</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Project is still under construction; • <i>Socio-Political Risks:</i> Project is still under construction; • <i>Institutional Framework and Governance:</i> Project is still under construction; • <i>Environmental Factors:</i> Project is still under construction. <p style="text-align: center;">• Overall Rating</p> | <p>U/A</p> <p>U/A</p> <p>U/A</p> <p>U/A</p> <p>U/A</p> |

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|---|---|---|
| <p>Outcome 1.4 (PIGGAREP+): Reduced reliance on fossil fuels, reduced and operational costs for electricity generation and distribution in the Cook Islands</p> | <ul style="list-style-type: none"> • <i>Financial Resources</i>: CoGI have stated their intentions of providing financial resources sustain the operation and continue maintenance of these solar PV installations; • <i>Socio-Political Risks</i>: Trained local solar PV and RE technicians are located in Rarotonga. However, there is a need (as well as for other PICs) for continual training of these technicians; • <i>Institutional Framework and Governance</i>: The capacity of the Cook Islands Renewable Energy Development Division is appears sound to continue managing growth of RE development on the Cook Islands; • <i>Environmental Factors</i>: There are no environmental risk factors that would hinder the continuation of this actual outcome. <p style="text-align: center;">• Overall Rating</p> | <p style="text-align: center;">3</p> <p style="text-align: center;">3</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">3</p> |
| <p>Outcome 1.5 (PIGGAREP+): There has not yet been a reduced reliance on fossil fuels for the supply of electricity through commercial biofuel power generation in Kiribati</p> | <ul style="list-style-type: none"> • <i>Financial Resources</i>: Financial resources for the continuation of the project on Abemama Island were re-allocated to Samoa and Palau due to continuing difficulties to find qualified technical companies to install the gen sets; • <i>Socio-Political Risks</i>: The remoteness of Abemama Island makes the installation of this plant very difficult; • <i>Institutional Framework and Governance</i>: Despite the Government's commitment to developing biofuel as a means of offsetting the use of fossil fuels for power generation, the capacity Government of the Kiribati has been insufficient to overcome the difficulties of implementing this commercial biofuel plant; • <i>Environmental Factors</i>: There are no environmental risk factors that would hinder the continuation of this actual outcome. <p style="text-align: center;">• Overall Rating</p> | <p style="text-align: center;">1</p> <p style="text-align: center;">1</p> <p style="text-align: center;">2</p> <p style="text-align: center;">4</p> <p style="text-align: center;">1</p> |
| <p>Outcome 1.6 (PIGGAREP+): A commercial biogas-based power generation facility for the supply of electricity is being constructed in Samoa to reduce its reliance on fossil fuels.</p> | <ul style="list-style-type: none"> • <i>Financial Resources</i>: Project is still under construction but does have a Power Purchase Agreement from the local utility; • <i>Socio-Political Risks</i>: Community is behind the Project; • <i>Institutional Framework and Governance</i>: Government support has been strong for this Project as it is seen as a pilot for future community-based power generation projects; • <i>Environmental Factors</i>: Though the project is still under construction, there are no environmental risk factors that would hinder the continuation of power generation from biogas. <p style="text-align: center;">• Overall Rating</p> | <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> |

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|---|---|---|
| <p>Outcome 2.1 (PIGGAREP+): Increased application of EE technologies and energy savings in the residential sector of Tuvalu</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Project is still under development and is to be completed before November 30, 2016. Financing for increased uptake of EE technologies is available from the DBT through its EERF; • <i>Socio-Political Risks:</i> The demonstration fale needs to be completed to show tangible savings to the public in Tuvalu. The evaluator cannot assess the response of the public until the demonstration fale is completed; • <i>Institutional Framework and Governance:</i> Government support has been strong for the demonstration fale to support its promotion of energy efficiency; • <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of the promotion of EE. • Overall Rating | <p style="text-align: center;">4</p> <p style="text-align: center;">U/A</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">U/A</p> |
| <p>Outcome 2.2.A (PIGGAREP+): Improved energy use performance in power generation and reduced power generation cost in the national power utility in RMI</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Project is providing a demonstration of energy savings for the utility. Future financial resources will be available to continue with more EE improvements to other power generation units; • <i>Socio-Political Risks:</i> No socio-political risks; • <i>Institutional Framework and Governance:</i> Government support has been strong for this Project as it is seen as a pilot for other EE initiatives for power generation projects; • <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of EE improvements with other power generation facilities. • Overall Rating | <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> |
| <p>Outcome 2.2.B (PIGGAREP+): Improved energy use performance in power generation and reduced power generation cost in the 4 state power utilities in FSM</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Financial resources only available for Kosrae Utility Authority (KUA), but not the other 3 state power utilities. However, if the KUA efforts are successful, the Government will allocate funds to undertake EE improvements with the other utilities; • <i>Socio-Political Risks:</i> No socio-political risks; • <i>Institutional Framework and Governance:</i> Government support has been strong for this Project as it is seen as a pilot for future community-based power generation projects; • <i>Environmental Factors:</i> There are no environmental risk factors that would hinder the continuation of EE improvements with other power generation facilities. • Overall Rating | <p style="text-align: center;">3</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> <p style="text-align: center;">4</p> |
| <p>Outcome 2.3 (PIGGAREP+): Operational, effective and widely</p> | <ul style="list-style-type: none"> • <i>Financial Resources:</i> Financing is available from the development banks of each of these PICs; | <p style="text-align: center;">4</p> |

Table 5: Assessment of Sustainability of Outcomes

| Actual Outcomes (as of August 2016) | Assessment of Sustainability | Dimensions of Sustainability |
|--|---|---|
| accepted energy efficiency lending schemes in FSM, RMI and Tuvalu | <ul style="list-style-type: none"> • <i>Socio-Political Risks</i>: More awareness raising is needed to convince the public of the benefits of EE appliances and measures. However, this will be difficult given the remoteness of many of the communities in each of these PICs; • <i>Institutional Framework and Governance</i>: Government support for additional public awareness raising of EE appliances and measures is needed; • <i>Environmental Factors</i>: There are no environmental risk factors that would hinder the continuation of the promotion of EE. <ul style="list-style-type: none"> • <u>Overall Rating</u> | <p style="text-align: center;">1</p> <p style="text-align: center;">2</p> <p style="text-align: center;">4</p> <p style="text-align: center;">1</p> |

3.3.14 Impacts

145. Although the PIGGAREP Project did not meet its GHG emission reduction targets, the Project did involve itself with implementing RE projects and provided key studies and data collection initiatives, many of which led to RE investments which have generated and will generate more GHG emission reductions that are estimated in Table 7. In summary, PIGGAREP's impact on RE development in the PICs can be rated as **significant**. However, PIGGAREP impacts may be best understood by examining the impacts on renewable energy development in each of the PICs as described in the following paragraphs.
146. *Cook Islands*: Commencing 2011, PIGGAREP provided assistance to the Cook Islands to prepare an energy chart containing a 2020 renewable energy target of 100%. In 2012, the Cook Islands Government (CKIG) used PIGGAREP resources as seed funding for feasibility studies of potential solar PV installations on its northern islands. Capital funds for the development and implementation of these solar PV projects was provided by NZMFAT and CKIG. Notwithstanding the high cost of developing these projects, they provided strong indications to NZMFAT, SIDS DOCK, ADB, EU, Japan of the country's readiness to scale up renewable energy development to undertake solar PV installations for the Southern Islands. The Northern Island PV installations were basically catalyzed by PIGGAREP and the use of its funds for feasibility studies of around USD 180,000 leveraged USD 20 million of investment with donors that includes NZFMAT and CKIG. In addition, another USD 320,000 was invested on the Palmerston island solar systems by SIDS DOCK as PIGGAREP+ in 2014, and more recently, the "*Renewable Energy Sector Project*" is a USD 32.4 million investment for the Cook Islands (comprised of USD 4.1 million from GEF ID 9067 and USD 28.3 million from ADB loan).
147. As such, PIGGAREP has had a **significant** impact on the development of renewable energy in the Cook Islands. The CKIG, however, recommends follow-up donor assistance to assure the sustainability and operation of the RE systems installed including training local community and specialized technicians on the upkeep of the systems, awareness raising and capacity building of local communities. This could serve as one of the components of a follow-up stage of PIGGAREP as a soft technical assistance facility for training, information exchanges and capacity building that other donors do not provide.
148. *Fiji*: The impact of PIGGAREP activities on renewable energy development in Fiji can be rated as **negligible**. This in part is due to Fiji having its own renewable energy program and GEF supported projects under UNDP Fiji. PIGGAREP, however, did contribute to a feasibility study of a possible net metering policy for Fiji which resulted in the development of the policy funded by another donor. However, the impact of PIGGAREP's contribution cannot yet be determined considering there has been no confirmation by the government of Fiji on the adoption of the net metering policy which could lead to the installation of a potential of 5 MW of solar PV.
149. *Kiribati*: Since the 1980s, Kiribati has utilized mainly solar PV for the electrification of its communities including its outer Islands. This included the installation of over 2,200 solar home systems that provided basic electrical services to off-grid homes, financed mainly through donor funding. The large number of solar home systems also created a pool of local technicians with skills in the installation and maintenance of off grid solar power systems who are employed under the government-owned Kiribati Solar Energy Company (Terubentau Akura's). PIGGAREP resources were utilized in early 2012 in Kiribati to upgrade the skills of the Government solar PV technicians to use a solar PV software, RESCO Manager III.

PIGGAREP resources were also provided in 2012 for the feasibility study of the production of biofuels from copra as a partial substitute to imported diesel for transport, and in 2010 to train students at schools to operate and maintain the solar PV water pumping system.

150. While the impact of solar PV training for students can be considered minor, the contribution of the feasibility study for biofuel from copra can be considered more significant given the investments made in 2012 by the Italian government and SIDS DOCK in the Kiribati Copra Mills Limited plant to use biofuel produced to substitute 30% of diesel fuel for transport. In addition, under PIGGAREP+, another USD 300,000 was invested in 3 - 30 kW generation sets fuelled by coconut oil to offset the use of fossil fuels for electricity generation. However, this investment has run into difficulties due to its remote location and difficulties in sourcing qualified vendors to install the generation sets. In summary, PIGGAREP has had a **minimal** impact on renewable energy development in Kiribati.
151. Nauru: Prior to the commencement of PIGGAREP in 2007, Nauru's energy demands were being mainly met through fossil fuel power generation. PIGGAREP interventions after 2008 included assistance in the preparation of the Nauru National energy roadmap, a wind monitoring study, and training of renewable energy officers (REO) that would increase the knowledge of government personnel in the operation and maintenance of public RE assets (such as solar PV street lighting, solar water pumping, and solar PV for public building energy supplies). The impact of PIGGAREP to Nauru from REO training (to increase the likelihood that RE generation from public RE assets can be sustained over the designed service life of the RE technologies) to PIGGAREP's assistance in preparing the energy roadmap has been rated as **minimal** to date.
152. Niue: The energy mix for Niue has been mainly diesel fuel, most of which has been used for electricity generation. Despite several donor driven solar PV installations on the premises of public buildings such as a high school, hospital and other government buildings, renewable energy only made up around 2% of the total energy produced within Niue in 2009. In 2011, the REP-5 project on EU EDF-10 financed a grid connected 52 kW solar PV system at the hospital and Niue Secondary School that caused a grid instability, notably for the 2 largest energy consumers, the quarry (50 kW) and the wharf (11 kW). PIGGAREP interventions include an RE awareness raising program for high schools and the completion of a grid stability study in 2013. The impact of PIGGAREP to date been **minimal** although the PIGGAREP grid stability study has convinced Government in 2014 of setting a target for 100% solar PV.
153. Samoa: PIGGAREP's impact on RE development in Samoa has been **significant**, notably in the development of RE projects that are generating and will generate more GHG emission reductions. In addition to PIGGAREP support for the initial RE awareness programs, and subsequent institutional strengthening and capacity building assistance, the Government of Samoa through its well-qualified Renewable Energy Department within MNRE, were able to effectively implement a number of renewable energy projects in Samoa including hydropower, solar PV, wind and biogas. This included PIGGAREP support in 2012 towards hydrometric monitoring for the development of 3 new small hydro projects sites and the rehabilitation of 3 small hydro projects sites; this has led to the engineering and eventual implementation of these small hydro projects through ADB funding. A PIGGAREP funded feasibility study on a grid connected solar PV farm was completed, also leading to implementation with financing from the Japanese supported PEC. PIGGAREP+ funds are

currently being used to develop a 4 kW biogas power generation facility in the village of Piu on Upolu Island.

154. Solomon Islands: PIGGAREP activities have led to a number of RE installations where energy has been saved and GHG emission reduced. This includes the training of solar PV technicians that fills in a large technical gap in the country for local servicing of standalone solar PV installations, especially the 2,000 systems installed by the PEC fund (Japan) in 2012⁴⁹, and the 9 solar PV systems installed under PIGGAREP+ (Outcome 1.1) in 2015 for schools, health clinics and police stations. The training of these technicians would have the impact of increasing the likelihood of longer service life for the generation of RE and GHG emission reductions. Soft assistance to the Solomon Islands included hydropower feasibility studies, wind resource data collection, building capacity for landowners of the Tina River hydropower project to negotiate effective agreements⁵⁰, and raising awareness of the community of the Tina River hydropower project. Assistance to the Tina River hydropower project is aiding the World Bank IFC group towards approval of the financing of the project. Informal surveys by government with local community attitudes towards RETs indicated that demand for solar PV systems was very high after their installation.

155. In summary, the impacts of PIGGAREP to RE development in the Solomon Islands can be rated as **significant**. However, future impacts of PIGGAREP's renewable energy developments are threatened by challenges as previously mentioned by government personnel including:

- lack of sustained training to renewable energy technicians, especially those located in remote areas outside of Honiara or Noro, of which travel to these areas would be very costly⁵¹;
- lack of sufficient numbers of trained technicians to service all 8,000 solar PV installations throughout the Solomon Islands; and
- lack of sufficient income generation in rural communities to pay for and sustain the operation of renewable energy projects.

156. Tonga: The impact of PIGGAREP interventions in Tonga has been rated as **significant**. In addition to assistance in preparing Tonga's Renewable Energy Bill and its energy roadmap (as described in Para 139), PIGGAREP has supported feasibility studies towards solar PV rehabilitation and environmental impact assessments for solar water pumping systems, which led to investments in these projects. PIGGAREP also supported targeted training towards financial management and training on the operation and maintenance of solar PV systems (also described in Para 139) which would lead to increased likelihood of extended service period of solar PV installations and increased GHG emission reductions. Funds from PIGGAREP+ (Outcome 1.2) have also been used to procure and install 10 solar pump stations on the Outer Islands.

⁴⁹ Some of the problems experienced were related to the 126 W panel, inverter (300 W) and 150 amp batteries, and the use of larger appliances that would damage the inverter and drain the batteries. There were also some solar PV systems that ceased to function due to corrosion from saline environments. There were actually 6,000 applicants for solar PV systems for the PEC project with demand very high amongst villagers. Operation and maintenance costs were short of what was needed but no funds were available for spare parts. Maintenance of these solar PV systems has been difficult considering the travel costs to the remote islands.

⁵⁰ This included the use of PIGGAREP resources to fund a study tour to Fiji for landowners of the Tina River hydropower project to learn of negotiating methods that would result in agreements with other project stakeholders that would be equitable and beneficial for the local community.

⁵¹ This would include the challenge of training teachers to operate solar PV installations installed by PIGGAREP+; these teachers often change positions after every 2 or 3 years thus requiring the retraining of the new teacher.

157. *Tuvalu*: The impact of PIGGAREP for Tuvalu was also rated as **significant** in large part due to the dedicated work of an energy champion in Tuvalu, and several strategic interventions from PIGGAREP including:

- the establishment of an RE and EE unit within the Tuvalu Electricity Corporation (TEC) in 2011;
- training for officers of the RE and EE unit in Australia on the operation and maintenance of solar PV technology;
- training for local technicians as a complement to the EU funded solar PV projects for the outer island communities;
- initial investigations on the available wind resources in Tuvalu that has resulted in Tuvalu currently negotiating renewable energy loans from the World Bank;
- setup of an EERF (PIGGAREP+ Outcome 2.3);
- setup of a demonstration EE home (PIGGAREP+ Outcome 2.1);
- tariff reform study in 2014 and 2015 recommending a number of options including the impact of incremental increases in the tariff, leading to future considerations of the merits of net metering for renewables.

These strategic interventions should result in the increased likelihood of future RE investments in wind energy and solar PV installations and the generation of indirect GHG emission reductions in future.

158. *Vanuatu*: Prior to the 2007 commencement of PIGGAREP, Vanuatu energy mix consisted of less than 10% renewable energies including hydropower, biofuel and a small amount of solar energy. There have been efforts by a number of donors including Aus Aid to assist with development of these renewable energies but with little impact due to the weak institutional arrangements in Vanuatu. The impact of PIGGAREP assistance in Vanuatu has been to produce a wind atlas (through the setup of wind monitoring stations) and the updating of a 2002 feasibility study of the 70kW Talise hydropower project in 2010. Both of these activities have led to investments in wind energy projects and hydropower rehabilitation. However, based on the IRENA renewable's readiness assessment of 2015 for Vanuatu, there are still a number of issues related to the lack of knowledge in Vanuatu on the stability of country's electricity grid if there is a high proportion of renewable energy inputs, and the lack of published standards for grid connected renewable energy technologies. Furthermore, the human resource capacity of Vanuatu to develop and scale up renewable energy systems is limited. Considering the current small scale of renewable energy investments in Vanuatu, the impact of PIGGAREP on Vanuatu has been rated as **minimal**.

159. Some brief notes on the impact on PIGGAREP+ countries:

- *Republic of the Marshall Islands (RMI)*: Since RMI already had a GEF project that focused on the development of renewable energy in RMI (the ADMIRE Project, GEF Project ID 2568), PIGGAREP+ funds focused more on energy efficiency issues. Prior to the infusion of PIGGAREP+ funds, RMI had been struggling to replicate the EE lending scheme of Palau, and to improve the efficiency of the diesel power generation units of the Marshall Islands Electricity Corporation (MEC). The impact of PIGGAREP+ funds on RMI has been rated as **minimal** in the provision of focused technical assistance to:
 - the Marshall Islands Development Bank (MIDB) in designing and implementing an EE lending scheme; the lending scheme currently awaits an infusion of funds to become operational; and

- MEC personnel in identification of other opportunities to increase the efficiency of the power generation units. This has facilitated MEC in utilizing their own funds to implement these EE measures and improving fuel efficiency in their power generation units.
- Federated States of Micronesia (FSM): There already has been substantial solar PV installations in FSM including a number of mini grids on outer islands (with no battery storage systems) as well as mini-hydro and wind projects, all funded by donors (Government of Japan, EU, UAE and the Government of Italy). The impact of PIGGAREP+ funds in FSM has been rated as **minimal**, in part due to the EE loan scheme with the FSM Development Bank that is currently operational but with no subscribers to the EE loan program. This is in part due to the difficulties and expenses of disseminating information of the EE loan program in a country where there is wide geographic dispersion of its population centres. In addition, only one out of 4 generation units are currently being upgraded for more energy efficient power generation (at Kosrae);
- Palau: Similar to RMI, Palau also had its own GEF project focusing on RE development (SEDREA Project, GEF Project ID 2567). As such, the impact of PIGGAREP+ in Palau in the realm of renewable energy was rated as **minimal**. However, one of the recommendations from the terminal evaluation of SEDREA was for the government to explore partnerships with PIGGAREP+ to access funding for solar PV for the desalination plant at Kaynagel. The impact of PIGGAREP in Palau has not yet been felt given that installation of the solar PV at Kaynagel has not been completed. Reasons for this delayed completion are related to diverted government priorities on resolving the severe drought conditions afflicting Palau in 2016.

4. CONCLUSIONS, RECOMMENDATIONS AND LESSONS

160. One of the significant PIGGAREP outcomes has been the increased confidence of PIC governments to have meaningful dialogue with potential financiers, mainly donors, to investing in renewable energy projects in various PICs. However, PIGGAREP required 9 years to reach this outcome:

- The early stages of PIGGAREP were highlighted by efforts to promote productive uses of renewable energy (PURE) to satisfy GEF-4 requirements. The predominance of communal subsistence livelihoods in the region resulted in many of these donor projects not being PURE-driven, and higher risks that PIGGAREP targets as set in 2008 would not be achieved by the EOP;
- Implementation of PIGGAREP had to deal with the special circumstances and different RE market conditions of all the 11 PIGGAREP PICs such as institutional capacities, regulatory frameworks, country geography, available RE resources and population size. As a result, the impact of PIGGAREP was varied amongst all the PICs. For the Cook Islands, Kiribati, Samoa, Tonga, Tuvalu, and Vanuatu, the impact of PIGGAREP was positive. For various reasons, PIGGAREP did not make a significant impact on renewable energy development in Fiji, Nauru, Niue, Papua New Guinea and Solomon Islands as well as PIGGAREP+ countries of FSM, RMI and Palau. These reasons range from baseline low levels of electrification (Solomon Islands) and the challenges in effectively disseminating EE information over a vast region (such as FSM and RMI) to the inclusion of large PICs with their own RE programs in collaboration with UNDP and other donors (such as Fiji and Papua New Guinea).

161. PIGGAREP did fall short of its GHG emission reduction target of 2 million tonnes CO_{2eq} by 2015. This target was likely unattainable given that initial periods of PIGGAREP were dedicated mainly to capacity building and strengthening RE resource databases prior to RE investments, leaving less time available to generate this level of GHG emission reductions. However, it is encouraging that the PIGGAREP project, despite not meeting its target of an additional 50 MW of RE-based energy systems capacity by 2015, has been involved with the study and development of 42 MW of RE based energy systems, of which 9.2 MW was installed during PIGGAREP and another 25.6 MW not yet installed but with confirmed financing for implementation.

162. During PIGGAREP, there has been a marked increase in the regional development of renewable energy, notably with solar PV installations. This has resulted in the emergence of 2 excellent RESCOs servicing PIGGAREP PICs that are both based in Fiji. There is also a number of well-trained solar PV technicians residing in Tonga, Kiribati and Tuvalu who could be easily employed by RESCOs with a regional client base. However, the Fiji-based RESCOs are not yet willing to set up local RE shops since the RE markets for many of the PIGGAREP PICs still remain small where the ability to pay for operation, maintenance and capital replacements of RE systems remains poor. This is an indicator that future development and financing of RE systems by the private sector will remain a challenge.

163. PICs currently have more access to RE financing from the increased interest in donors to finance the expansion of low carbon and RE generation systems. Attempts by PIGGAREP to increase the access to finance through an energy loan program (ELP) similar to that established by the National Development Bank of Palau, has not been fully adopted by a few of the PICs including Cook Islands, Kiribati, Samoa, Tuvalu, FSM and RMI. For example, in Tuvalu, an energy efficiency revolving fund (EERF) has been launched but suffers from a

lack of public awareness of the scheme and low human resources capacity to manage the program resulting in low subscription to the fund. This is a similar situation for the ELPs in FSM and RMI. This is due in part to difficulties experienced by some of these PICs to raising public awareness of RE and EE opportunities.

164. Despite robust efforts in Tonga that have improved the local skills to operate and maintain solar PV installations beyond the initial warranty periods, there are still weaknesses throughout the region amongst local communities to sustain RE power generation and reduced GHG emissions throughout the service period of the technologies installed.

4.1 Corrective actions for the design, implementation, monitoring and evaluation of the project

165. Action 1: Project should carefully schedule its activities in that this schedule will determine to a large extent what targets the project can achieve. It was expected that during the early stages of PIGGAREP that the Project activities would support ongoing baseline activities in RE development. The objective-level targets for energy savings, GHG emission reductions and RE installed capacity developed during PIGGAREP assumed that progress on these targets would be achieved over the entire 5-year period of the project. However, during the early stages of the PIGGAREP Project, many of the PICs were not at an appropriate stage of readiness to implement RE projects. According to the Prodoc, the PIGGAREP project needed to remove barriers to RE development that included raising awareness and knowledge of RE issues amongst government personnel, energy professionals and the general public. In addition, there was a need to strengthen RE resource data and updating of the baseline energy scenarios of many of the PICs before RE investments could be made. All these aforementioned activities would have required intensive support during the initial years of PIGGAREP, thereby providing less project time and resources to implement RE installations. As such, the PIGGAREP targets for energy savings, GHG emission reductions and RE installed capacity should have been scaled back to account for the initial periods of PIGGAREP being dedicated mainly to capacity building and strengthening RE resource databases. Failure to account for these activities only invites additional risks to the project not achieving its objectives and targets.

166. Action 2: Targets on GEF Projects should be reviewed and reset to adapt to changing baseline conditions. Although the PIGGAREP targets were revised in late 2008 after the Inception Phase to adapt to changing baseline conditions, another review of these targets (notably during the MTE) should have been made in consideration that the definition of several PIGGAREP project activities was dependent on donor feedback on the RE project installations they had planned to finance. In several instances during PIGGAREP, the timing of this feedback was difficult to forecast necessitating a periodic review of PIGGAREP targets.

4.2 Actions to follow up or reinforce initial benefits from the project

167. Action 3 (to all PIC governments): Make annual budgetary allocations for retaining a pool of key technical personnel for supporting sustained operation and maintenance of existing RE systems, and efforts to fiscally and technically plan for RE capital replacements. This pool of personnel would:

- be familiar with renewable energy, RE technologies installed in their countries, RE standards for equipment and installations, and RE enforcement tools, who can liaise with donors and potential investors to ensure the compliance of equipment imported and installed meets adopted local standards that are aligned with best practices;
- be familiar with and have experience with the repair, installation and maintenance of RE systems;
- be retained through remuneration packages that are sufficiently attractive that are competitive to the actual market for renewable energy professionals in the region that would encourage them to provide their services over a sustained period of time;
- have skills in liaising with local communities to monitor and evaluate their stewardship of RE assets, and their willingness to set up and manage O&M funds similar to what the outer islands in Tonga have accomplished. If possible, the O&M funds could also contribute to capital replacements of some of the RE systems components such as batteries.

168. Action 4 (to all PIC governments): PIC governments should focus on creating and sustaining enabling conditions that would encourage regional RESCOs to set up local RE service centres that will strengthen local O&M skill sets and improve local access to standardized RE equipment. This would include:

- full adoption of policies and standards that cover RE equipment, RE installation and operation and maintenance;
- strengthening institutional arrangements for the continual review and amendments to RE equipment standards and installation;
- continual support and strengthening of local staff to enforce policies and standards for RE equipment, installation and operation and maintenance;
- support and monitoring of local financing mechanisms that will ensure the availability of funds for the capital replacement of RE systems.

4.3 Proposals for future directions underlining main objectives

169. Proposal 1 (to UNDP and SPREP): Continued assistance to PICs is required to guide scaled-up low carbon development (that includes RE and EE) that can be effectively delivered through a regional approach with a grouping of PICs with similar energy market conditions.

The evaluator also notes that there are a number of country-driven CCM GEF-projects in the region including Cook Islands, Marshall Islands (ADMIRE), Samoa (IMPRESS), Tonga (OIREP), and Tuvalu (FASNETT) that are focusing on the development of low carbon initiatives. A regional project could serve as a technical assistance facility to support improvements to the sustainability of low carbon deployments in a number of PICs including:

- scaled-up and regularized training of O&M at the community level including RE systems maintenance in the local education curriculum. There could be an emphasis on solar PV given the familiarity of the technology throughout the region but also with wind, biomass and hydropower projects as deemed appropriate;
- assistance on measures to stabilize the grid as RE penetration approaches 90 to 100% to PICs where there are no such grid investment plans. The evaluator notes that a number of PICs have either planned or are already receiving this nature of assistance;
- replication of the development of community-based RESCOs such as the “incorporated societies” demonstrated in Tonga. This would include working with communities towards their adoption of a financial mechanism (with monies saved from offsetting fossil fuel

usage) that contributes to a community-based sustainable O&M fund that would also provide funding towards RE systems replacement costs⁵²;

- networking workshops for national low carbon champions and community RE operators to share experiences on O&M and national information dissemination, to keep current with best international practices, and for exposure to the application of new RE technologies (that may include newer and more efficient models of solar PV panels and wind turbines, new battery technology, and EE practices);

a lower number of PICs than PIGGAREP to reduce the administrative and operational costs related to travel, communications, and the additional support required to overcome challenges of the lack of human resource capacity to implement in activities in very small markets. A lower number of PICs than PIGGAREP would increase the attention being given to each PIC, and increase the effectiveness of the aid being provided by a future regional project.

4.4 Best and worst practices in addressing issues relating to relevance, performance and success

170. Lesson 1: Project implementation teams need to carefully prepare procurement packages for goods or services to ensure that the desired goods or services are procured and that risks of a prolonged tendering process are minimized: The evaluator is flagging this lesson based on the Project experience in the procurement of services and equipment to implement the biogas power generation project in Piu village in Samoa (Outcome 1.6 on PIGGAREP+). A sequence of events of this procurement is as follows:

- an agreement was made between UNDP Samoa and the Government of Samoa (GoS) in late 2014 to procure these PIGGAREP+-funded services through the Samoan government procurement system;
- a local implementation team staffed with foreign expertise responded to the GoS's request for tenders and submitted a bid in late 2014;
- after the tender award in mid-2014, involvement of the foreign expertise with the local implementation team failed to materialize resulting in substantial delays in the implementation of contract, from the need to cancel a nationally awarded contract, to the subsequent recruitment of a replacement biogas consultant under UNDP procurement to continue implementation of the biogas project;
- equipment for the biogas plant was already in Samoa in 2015 under the conditions of the contract;
- international consultants were recruited in late 2014 and again in mid-2015 to provide technical assistance to implement the biogas power generation project using the imported equipment;
- construction of the project was delayed until mid-2016, and is expected to be completed by November 2016.

171. With procurement through the Samoan government procurement system using PIGGAREP+ funds that resulted in additional project expenditures (emanating from additional project management time and the cost of implementation delays), there is a lesson provided here in preparing tenders where the services or goods are not commonly available locally. To reduce the risks of implementation delays, the tender for implementing a biogas power generation project in Piu could have been strategically analyzed by:

⁵² Addresses MTE recommendation that Project should try to demonstrate commercial viability of new RE systems, but with a full understanding that this not may be possible for all communities.

- undertaking market research of the goods or services to be acquired;
- undertaking discussions with prospective suppliers or consultants to understand their conditions under which they would submit a bid; and
- preparing terms and conditions of a tender that would solicit a bid from a supplier or consultant.

172. The evaluator has been witness to many instances on GEF projects (including the PIGGAREP Project) where preparations for procurement packages for goods and services have been made by less qualified persons and persons without the full technical understanding of the goods and services to be procured; this often results in a less than satisfactory outcome. In many cases, project teams mistakenly confine their search within their own country (where these goods and services may be of poor quality and even non-existent but at a lesser cost), and not externally (where these goods and services should be available but at a higher cost). Especially where UNDP-managed funds are provided for the procurement of goods and services, an experienced project manager or Chief Technical Advisor (with knowledge of the technical aspects and market conditions of the goods and services to be procured) should have been employed on the project team to provide procurement guidance.

173. Lesson 2: Regional projects providing soft assistance and technical support require streamlined institutional arrangements for efficient delivery. In the case of PIGGAREP, coordination of country activities was dependent on National Project coordinators or NPCs. While the PIGGAREP ProDoc supported the employment of project-supported and paid positions for NPCs, PIGGAREP NPCs were not paid from Project resources to identify opportunities for PIGGAREP assistance, and to provide monitoring reports of GEF funded activities. All NPCs interviewed had stated that these additional and unpaid PIGGAREP obligations became an additional burden to them, all of whom had already high workloads for Government agencies or utilities that they worked for. A means of overcoming this issue would have been stronger support from the PIGGAREP PMO to assist in preparing the project activity summaries required to qualify for PIGGAREP support. Within PIGGAREP, an international CTA employed part or full-time could have provided this assistance for PAS preparation. This would have had an impact on streamlining the delivery of identified PIGGAREP activities, opportunities, approvals and monitoring reports, possibly precluding the need for some of the PIGGAREP Project extensions.

174. Lesson 3: All GEF climate change mitigation projects should employ a part time Chief Technical Advisor (CTA) to provide oversight to project management and technical guidance. This evaluator has said this in several other evaluations that GEF projects are an opportunity for developing countries to access international expertise as well as to provide oversight in management and quality control. Unfortunately for the PIGGAREP project, this was not realized until after the midterm evaluation of 2010. A part time International Chief Technical Advisor with a background in renewable energy development would have provided the PIGGAREP Project with:

- oversight to the implementation of PIGGAREP with knowledge of best practices globally on GEF projects, especially between 2007 and 2010 when PIGGAREP was experiencing slow delivery;
- advice on approaches to PICs on strategic development of their renewable energy programs based on ongoing developments. To some extent, this was achieved by the CTA to provide strategic barrier removal advice in 2012;

- assisting the PIGGAREP Project manager in the preparation and collection of reports from NPCs including PASs and activity monitoring reports (see Lesson 2, Para 168); and
- procurement of goods and services not typically available locally (see Lesson 1, Para 167).

APPENDIX A – MISSION TERMS OF REFERENCE FOR PROJECT FINAL EVALUATION

A. Introduction

In accordance with the United Nations Development Programme (UNDP) and Global Environmental Facility (GEF) monitoring and evaluation (M&E) policies and procedures, all UNDP-GEF financed full and medium-sized projects are required to undergo a terminal evaluation upon completion of project implementation. These terms of reference (TOR) set out the expectations for a Terminal Evaluation (TE) of the Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP) (PIMS 3462.)

B. Project Description or Context and Background

The PIGGAREP is a UNDP-GEF regional climate change mitigation (CCM) project implemented in 14 Pacific Island Countries (PICs). The GEF funding for this project is US\$5.225 million and it is in line with the GEF-4 CCM Strategic Priority 4 (Productive Use of Renewable Energy). While the UNDP is the implementing agency (on behalf of the GEF), the executing agency for PIGGAREP is the Secretariat of the Pacific Regional Environment Program (SPREP). The global environment and development goal of the project is the reduction of the growth rate of greenhouse gas (GHG) emission from fossil fuel use in the PICs through the removal of the barriers to the widespread and cost effective use of feasible renewable energy technologies.

The project is expected to attain the following outcomes in the PICs: i) increased number of successful commercial renewable energy applications; ii) expanded market for renewable energy applications; iii) enhanced institutional capacity to design, implement and monitor renewable energy projects; iv) availability and accessibility of financing to existing and new renewable energy projects; v) strengthened legal and regulatory structures in the energy and environmental sectors; and, vi) increased awareness and knowledge on renewable energy and renewable energy technologies among key stakeholders.

This regional project, while developed and designed in 2005, supports the PICs 2013 - 2017 UNDAF outcome: Improved resilience of PICs, with particular focus on communities, through integrated implementation of sustainable environment management, climate change adaptation/mitigation and disaster risk management.

C. Objective & Scope:

The objective of this consultancy assignment is to conduct the TE of PIGGAREP.

To have clarity in the periods and scope under Evaluation, it is important to point out that the PIGGAREP implementation period was extended by three years. Moreover, the PIGGAREP was expanded in 2014 with a SIDS DOCK support program, which is a joint initiative of the UNDP and the World Bank, developed in close consultation with the Alliance of Small Island States (AOSIS) and funded by the Government of Denmark (through the Danish International Development Agency or DANIDA) with US\$ 3 million. With this additional funding, three new countries (Federated States

of Micronesia, Marshall Islands and Palau) and nine projects were added. The additional project activities are referred to as PIGGAREP “Plus”. The terminal evaluation will focus on all issues related to all activities, including the additional nine projects whose implementation period will end by June 2016.

The Evaluation will review achievements made during the period January 2008 to December 2015. The last project board (Multipartite review meeting) was held in July 2014.

The objectives of the evaluation are to: (1) assess the achievement of the project through the outputs that were deliver; (2) assess the impacts of the project results/outputs; and, (c) draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming.

The Evaluation will also collate and analyze specific lessons and best practices pertaining to the strategies employed, and implementation arrangements, which may be of relevance to other similar projects in the country and elsewhere in the world. The evaluation will also evaluate the strengths and weaknesses of project design, implementation, monitoring and adaptive management and sustainability of project outcomes, including the project exit strategy.

A mid-term review was conducted for the project in November 2009. The report will be made available for evaluator. The program management office has worked to address the main issues and implement the recommendations as indicated in the management response.

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

Evaluation Approach and Method:

An overall approach and method¹ for conducting project terminal evaluations of UNDP supported GEF financed projects has developed over time. The evaluator is expected to frame the evaluation effort using the criteria of **relevance, effectiveness, efficiency, sustainability, and impact**, as defined and explained in the UNDP Guidance for Conducting Terminal Evaluations of UNDP-supported, GEF-financed Projects. A set of questions covering each of these criteria have been drafted and are included with this TOR (see [Annex C](#)) The evaluator is expected to amend, complete and submit this matrix as part of an evaluation inception report, and shall include it as an annex to the final report.

The Evaluation must provide evidence-based information that is credible, reliable and useful. The evaluator is expected to follow a participatory and consultative approach ensuring close engagement with government counterparts, in particular the GEF operational focal point, UNDP Country Office, project team, UNDP GEF Technical Adviser based in the region and key stakeholders. The evaluator is expected to conduct a field mission to Cook Islands, Palau, Samoa, Solomon Islands, Tonga and Tuvalu for stakeholder consultations and evidence- based information gathering, including visits to and evaluation of project sites such as the following:

| Country | Site | RE system installed | No. of days~ |
|---------|------|---------------------|--------------|
|---------|------|---------------------|--------------|

| | | | |
|-----------------|---|--|---|
| Cook Islands | Rakahanga | Wind/solar hybrid power generation | 2 |
| | Pukapuka | Solar PV power systems | 2 |
| Palau* | Kayangel | Solar PV water pumping and supply system | 2 |
| Samoa | Apia | Wind resource monitoring | 2 |
| | Falesaaseela, Tafitoala, Faleata, Fale ole Fe'e, Alaola, Samasoni | Micro-hydropower systems | 2 |
| Solomon Islands | Managikiki Community in Bahomea, Central Guadalcanal | Tina hydropower generation system | 2 |
| Tonga | Ha'apai District, 13 villages | Solar PV water pumping and supply system | 2 |
| Tuvalu | Funafuti | Demonstration Energy Efficient Fale | 1 |

~Please note that the stated number of workdays in each PIC does not take into account the travel time to and from sites nor do they include transit time. The number of days for anticipated site inspections, field data gathering, and discussions with project implementers and stakeholders.

*Please note that the site visit to the project site in Palau is not yet confirmed. Confirmation will be made once the successful bidder has been engaged. As such, all tenders are to clearly reflect separate costing for a field mission including Palau.

The evaluator will review all relevant sources of information, such as the project document, project reports – including Annual monitoring reports (APR/PIR), project budget revisions, midterm review, progress reports, Midterm Review (MTR) project files, national strategic and legal documents, and any other materials that the evaluator considers useful for this evidence-based assessment. A list of documents that the project team will provide to the evaluator for review is included in [Annex B](#) of this Terms of Reference.

The project evaluation shall be carried out in accordance with UN evaluation norms and policies and should embody a strong results-based orientation. It should be made clear that the evaluation team is responsible for revising the approach as necessary and present its methodological proposal as part of the inception report. Evaluation methods should be selected for their rigor in producing empirically based evidence to address the evaluation criteria, to respond to the evaluation questions, and to meet the objectives of the evaluation.

Evaluation Criteria's & Ratings

An assessment of project performance will be carried out, based against expectations set out in the Project Logical Framework/Results Framework (see [Annex A](#)), which provides performance and impact indicators for project implementation along with their corresponding means of verification. The evaluation will at a minimum cover the criteria of: **relevance, effectiveness, efficiency, sustainability and impact**. Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The obligatory rating scales are included in [Annex D](#):

| | | | |
|-------------------------------------|---------------|---------------------------------|---------------|
| Evaluation Ratings: | | | |
| 1. Monitoring and Evaluation | rating | 2. IA & EA Execution | rating |

| | | | |
|----------------------------------|---------------|---|---------------|
| M&E design at entry | | Quality of Implementation – Implementing Agency (IA, UNDP) | |
| M&E Plan Implementation | | Quality of Execution - Executing Agency (EA, Ministry of Natural Resources and Environment) | |
| Overall quality of M&E | | Overall quality of Implementation / Execution | |
| 3. Assessment of Outcomes | rating | 4. Sustainability | rating |
| Relevance | | Financial resources | |
| Effectiveness | | Socio-political | |
| Efficiency | | Institutional framework and governance | |
| Overall Project Outcome Rating | | Environmental | |
| | | Overall likelihood of sustainability | |

The project will use a capacity development monitoring and evaluation scorecard to monitor the project capacity development progress. It will monitor **the all fifteen indicators in the five categories of capacity development** for this project, (see table below). Although this scorecard was used at the time of project inception, it was incomplete.

The TE will rate the capacity development indicators at the end of project implementation.

Project Finance/ Co Finance

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data will be required, including annual expenditures. Variances between planned and actual expenditures will need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator will receive assistance from the Multi-Country Office (MCO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

| Co-financing (type/source) | UNDP own financing (mill. US\$) | | Government & Executing Agency (mill.US\$) | | Partner Agency (mill. US\$) | | Total (mill. US\$) | |
|----------------------------|---------------------------------|---------|---|-----------|-----------------------------|-----------|--------------------|------------|
| | Planned | Actual | Planned | Actual | Planned | Actual | Planned | Actual |
| Grants | 500,000 | 300,000 | 24,004,000 | 8,299,000 | 513,000 | 3,000,000 | 25,017 | 11,599 |
| Loans/Concessions | | | | | | | | |
| • In-kind support | | | 2,966,000 | 1,979,000 | | | 2,966,000 | 1,979,000 |
| • Other | | | | | | | | |
| Totals | | | | | | | 27,983,000 | 13,578,000 |

Mainstreaming:

UNDP supported GEF financed projects are key components in UNDP country programming, as well as regional and global programmes. The evaluation will assess the extent to which the project was successfully mainstreamed with other UNDP priorities, including poverty alleviation, improved governance, the prevention and recovery from natural disasters, and gender.

Impact:

The evaluator will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated: a) verifiable improvements in ecological status, b) verifiable reductions in stress on ecological systems, and/or c) demonstrated progress towards these impact achievements.²

Conclusions, Recommendations & Lessons:

The evaluation report must include a chapter providing a set of **conclusions, recommendations and lessons for future multi-country programmes on mitigation in the Pacific**. To the extent that recommendations and lessons can be applied in other similar political, geographic, socio-economic contexts, these should also be highlighted.

E. Implementation Arrangement

The principal responsibility for managing this evaluation resides with the UNDP MCO in Samoa. The UNDP MCO will contract the evaluator and connect them with the focal point at SPREP. The evaluator is expected to organize their own travel arrangements to the countries they will evaluate, with the support of the UNDP Samoa MCO's operations unit. The SPREP project team will be responsible for liaising between country coordinators and the evaluators team to set up stakeholder interviews, arrange field visits, and coordinate between the government and national coordinators. UNDP-GEF staff will provide support to the Samoa MCO throughout the conduct of the terminal evaluation.

F. Evaluation Timeframe

The consultant should propose a time schedule in line with the suggested timeframe below, where the total working days for the evaluation will be 35 days⁵³, and should be according to the following plan:

| Activity | Timing | Completion Date |
|----------|--------|-----------------|
|----------|--------|-----------------|

⁵³ This does not take travel time into consideration nor does it take into account consultant's initial desk review, quality check of the final report from UNDP MCO, nor potential delays due to unforeseen circumstances, not included as deliverables in the table above.

| | | |
|--|-----------------|--------------------------|
| Preparation and submission of inception report | 5 working days | 4 April 2016 |
| Project country missions | 15 working days | 11 April – 29 April 2016 |
| Debrief after missions | 1 working day | 2 May 2016 |
| 1 st draft evaluation report due | 5 working days | 9 May 2016 |
| Final draft report due, with feedback incorporated | 5 working days | 20 May 2016 |
| Final Report due, with feedback incorporated | 4 working days | 4 June 2016 |
| Total | 35 days | |

G. Evaluation Deliverables

The evaluator is expected to deliver the following:

| Deliverable | Content | Timing | Responsibilities |
|----------------------------------|--|--|--|
| Inception Report | Evaluator provides clarifications on timing and method | No later than 2 weeks before the evaluation mission. | Evaluator submits to UNDP Multi-country office |
| Presentation | Initial Findings | End of evaluation mission | To project management, UNDP Multi-country office |
| Draft Final Report | Full report, (per annexed template) with annexes | Within 3 weeks of the evaluation mission | Sent to UNDP Multi-country office, reviewed by Regional technical advisor, PCU, GEF OFPs |
| Final Report⁵⁴ | Revised report | Within 1 week of receiving UNDP comments on draft | Sent to UNDP multi-country office for uploading to UNDP Evaluation Resource Centre. |

H. Duty Station

Home-based with travel to Cook Islands, Palau, Samoa, Solomon Islands, Tonga and Tuvalu. It is expected that the consultant will spend 15 days on mission. When in Samoa the consultant will be based at the UNDP or SPREP office.

⁵⁴ When submitting the final evaluation report, the evaluator is required also to provide an 'audit trail', detailing how all received comments have (and have not) been addressed in the final evaluation report. See [Annex H](#) for an audit trail template

I. Competencies

Corporate Competencies

- The independent consultant:
 - Demonstrates integrity by complying with the UN's values and ethical standards;
 - Promotes the vision, mission, and strategic goals of UNDP;
 - Displays cultural, gender, religion, race, nationality and age sensitivity and adaptability.

Functional

- The independent consultant should possess proven and strong analytical and communication skills, including the ability to produce high quality reports.

Project & Resource Management

- The independent consultant should have strong organizational skills;
- The independent consultant should be able to work independently and collectively to produce individual high quality inputs and collectively high quality and TOR-compliant outputs;
- The independent consultant should possess sound judgment, strategic thinking and the ability to manage competing priorities.

Team Work

Demonstrated ability of the consultant to work in a multi-cultural environment.

J. Qualifications and Experience of the Successful Contractor

The evaluation team will be composed of 1 international evaluator and the PIGGAREP Country Coordinators. The consultant shall have prior experience in evaluating similar projects. Experience with GEF financed projects is an advantage. The evaluator selected should not have participated in the project preparation and/or implementation and should not have conflict of interest with project related activities.

The consultant must present the following qualifications:

- Post-graduate degree in environmental science or climate change, renewable energy, or other energy related technical field; (20%)
- Minimum 8 years of relevant professional experience in Climate Change Mitigation/Renewable Energy Technologies (RET) development; (25%)
- Must have extensive experience in evaluation of GEF projects and UNDP evaluation procedures; (15%)
- Previous experience with results-based monitoring and evaluation methodologies; (20%)
- Technical knowledge in the targeted focal areas: Climate Change Mitigation/ renewable energy (10%)
- Experience working in the Pacific region (5%)
- Fluency in English (oral and written) is a requirement (5%)

Offers will be evaluated according to the Combined Scoring method – where the technical criteria will be weighted at 70% and the financial offer will be weighted at 30%.

Evaluator Ethics

Evaluation consultants will be held to the highest ethical standards and are required to sign a Code of Conduct ([Annex E](#)) upon acceptance of the assignment. UNDP evaluations are conducted in accordance with the principles outlined in the [UNEG 'Ethical Guidelines for Evaluations'](#).

K. Recommended presentation of proposal

Given below is the recommended format for submitting your proposal. The following headings with the required details are important. Please use the template available (Letter of Offer to complete financial proposal)

CVs with a proposed methodology addressing the elements mentioned under deliverables must be submitted by **Friday, 25 March 2016**, electronically via email: procurement.ws@undp.org or apply online attaching all the required documents on <https://jobs.undp.org/>. Incomplete applications will not be considered and only candidates for whom there is further interest will be contacted.

Proposals must include:

- **P11 form – template attached**
- **3 professional references (most recent)**
- **Brief Methodology** on how you will approach and conduct the work (no more than 1 page)
- **Financial Proposal** – Professional daily fee (inclusive of per diem and travel costs) or alternatively lump sum amount
- **Letter of interest and availability** summarizing all details required – template attached

Queries about the consultancy are to be directed to the UNDP Procurement Unit on procurement.ws@undp.org with the responsible Programme Officer - tessa.tafua@undp.org copied.

UNDP applies a fair and transparent selection process that will take into account the competencies/skills of the applicants as well as their financial proposals. Qualified women and members of social minorities are encouraged to apply.

L. Evaluation Report Outline⁵⁵

-
- i. Opening page:
- Title of UNDP supported GEF financed project
 - UNDP and GEF project ID#s
 - Evaluation time frame and date of evaluation report
 - Region and countries included in the project
 - GEF Operational Program/Strategic Program
 - Implementing Partner and other project partners

⁵⁵ The Report length should not exceed 40 pages in total (not including annexes)

- Evaluation team members
- Acknowledgements
- ii. Executive Summary
 - Project Summary Table
 - Project Description (brief)
 - Evaluation Rating Table
 - Summary of conclusions, recommendations and lessons
- iii. Acronyms and Abbreviations (See: UNDP Editorial Manual⁵⁶)
- 1. Introduction
 - Purpose of the evaluation
 - Scope & Methodology
 - Structure of the evaluation report
- 2. Project description and development context
 - Project start and duration
 - Problems that the project sought to address
 - Immediate and development objectives of the project
 - Baseline Indicators established
 - Main stakeholders
 - Expected Results
- 3. Findings
(In addition to a descriptive assessment, all criteria marked with (*) must be rated⁵⁷)
- 3.1 Project Design / Formulation
 - Analysis of LFA/Results Framework (Project logic /strategy; Indicators)
 - Assumptions and Risks
 - Lessons from other relevant projects (e.g., same focal area) incorporated into project design
 - Planned stakeholder participation
 - Replication approach
 - UNDP comparative advantage
 - Linkages between project and other interventions within the sector
 - Management arrangements
- 3.2 Project Implementation
 - Adaptive management (changes to the project design and project outputs during implementation)
 - Partnership arrangements (with relevant stakeholders involved in the country/region)
 - Feedback from M&E activities used for adaptive management

⁵⁶ UNDP Style Manual, Office of Communications, Partnerships Bureau, updated November 2008

⁵⁷ See Annex D for rating scales

- Project Finance:
 - Monitoring and evaluation: design at entry (*), implementation (*), and overall assessment (*)
 - Implementing Agency (UNDP) execution (*) and Executing Agency execution (*), overall project implementation/ execution (*), coordination, and operational issues
- 3.3 Project Results
- Overall results (attainment of objectives) (*)
 - Relevance(*)
 - Effectiveness (*)
 - Efficiency (*)
 - Country ownership
 - Mainstreaming
 - Sustainability:financial resources (*), socio-economic (*), institutional framework and governance (*), environmental (*), and overall likelihood (*)
 - Impact
4. Conclusions, Recommendations & Lessons
- Corrective actions for the design, implementation, monitoring and evaluation of the project
 - Actions to follow up or reinforce initial benefits from the project
 - Proposals for future directions underlining main objectives
 - Best and worst practices in addressing issues relating to relevance, performance and success
5. Annexes
- ToR
 - Itinerary
 - List of persons interviewed
 - Summary of field visits
 - List of documents reviewed
 - Evaluation Question Matrix
 - Questionnaire used and summary of results
 - Evaluation Consultant Agreement Form
 - *Annexed in a separate file:* TE audit trail

APPENDIX B – MISSION ITINERARY (FOR JULY 23 - AUGUST 12, 2016)

| # | Activity | Stakeholder involved | Place |
|----------------------------------|---|--------------------------------|----------|
| July 25, 2016 (Monday) | | | |
| | Arrival of Mr Roland Wong to Nadi International Airport, Fiji @ 07:50 | | |
| | Travel from Nadi International Airport to Suva | | Suva |
| July 26, 2016 (Tuesday) | | | |
| | Travel from Suva International Airport to Funafuti, Tuvalu dep 09:00, arr 11:35 | | |
| 1 | Meeting with Mr. Mafalu Lotofua, CEO, Tuvalu Electricity Corporation and PIGGAREP Focal person | Tuvalu Electricity Corporation | Funafuti |
| July 27, 2016 (Wednesday) | | | |
| | Site visits to various solar PV installations and demonstration EE house in Funafuti | Tuvalu Electricity Corporation | Funafuti |
| July 28, 2016 (Thursday) | | | |
| 2 | Meeting with CEO, Tuvalu Electricity Corporation | Tuvalu Electricity Corporation | Funafuti |
| | Travel from Funafuti to Suva International Airport dep 12:20, arr 14:50 | | Suva |
| 3 | Skype call with Mr. Manuel Soriano, UNDP-GEF RTA | UNDP-GEF | Suva |
| July 29, 2016 (Friday) | | | |
| 4 | Meeting with Mr. Rapa Young, former PIGGAREP focal person for Samoa, currently with Pacific Power Association | Pacific Power Association | Suva |
| 5 | Meeting with Mr. Thomas Jensen, former UNDP-GEF RTA for the Pacific Region | UNDP Fiji | Suva |
| July 30, 2016 (Saturday) | | | |
| | Travel from Nadi international Airport to Honiara, Solomon Islands dep 13:45 arr 15:45 | | |
| July 31, 2016 (Sunday) | | | |

| # | Activity | Stakeholder involved | Place |
|-----------------------------------|--|------------------------------------|--------------------|
| 6 | Meeting with Mr. Gabriel Aimaea, PIGGAREP focal person, and Director of Energy | Solomon Islands government | Honiara |
| August 1, 2016 (Monday) | | | |
| | Site visits to Tamboko Community High School (northwest of Honiara) and Nguvia School (east of Honiara) where solar PV with battery systems installed accompanied by Mr. Aimaea and a solar PV technician from Climate Catalysts | Solomon Islands project proponents | Guadalcanal Island |
| August 2, 2016 (Tuesday) | | | |
| 7 | Meeting with Mr. Gavin Pereira, Climate Catalysts and subcontractor for PIGGAREP+ solar PV installations | RESCO based in Fiji | Honiara |
| | Travel from Honiara to Nadi international Airport dep 16:00 arr 20:00 | | |
| August 3, 2016 (Wednesday) | | | |
| | Travel from Nadi International Airport to Nuku'alofa, Tonga dep 15:00 arr 18:05 | | |
| August 4, 2016 (Thursday) | | | |
| 8 | Meeting with Dr. Tevita Tukunga, Director of Energy for MEIDECC, Government of Tonga | Government of Tonga | Nuku'alofa |
| 9 | Meeting with Mr. Solomone Fifita, former PIGGAREP Project Manager (2007 to 2010), now with SPC in Fiji | Former PIGGAREP Project Manager | Nuku'alofa |
| August 5, 2016 (Friday) | | | |
| 10 | Mr. Ofa Sefana, the PIGGAREP coordinator, also from MEIDECC | Government of Tonga | Nuku'alofa |
| 11 | Mr. Nixon Kua, former PIGGAREP Project Manager (2011) and PIGGAREP focal point in Solomon Islands | Former PIGGAREP Project Manager | Nuku'alofa |
| | Site visit around Nuku'alofa to view Ma'ama Mai Solar Farm and solar pumping facility | | Nuku'alofa |
| August 6, 2016 (Saturday) | | | |
| 12 | Meeting with Mr. Ajay Prasad, Managing Director of CBS Power Solutions in Fiji, and Mr. Mark Kibby, GM, Yingli Green Energy Australia | RESCO based in Fiji | Nuku'alofa |

| # | Activity | Stakeholder involved | Place |
|------------------------------------|--|---|-------------|
| | Travel from Nuku’Alofa to Nadi International Airport dep 16:50 arr 17:20 | | |
| August 7, 2016 (Sunday) | | | |
| | Travel from Nadi international Airport to Apia, Samoa dep 14: 00 arr 17:50 | | |
| August 8, 2015 (Monday) | | | |
| 13 | Mission briefing with Ms. Liz Cullity, (Resident Representative), Ms. Naoko Takasu (Interim Deputy RR), Ms. Zuzana Tollrianova (Program Associate, Environment and Climate Change) Ms. Evette Kerlake (Program Manager, Environment and Climate Change), of UNDP Samoa and Mr. Kosi Latu (Director General), Dr. Netatua Pelesikoti (Director, Climate Change), Espen Ronnenburg (Climate Change Advisor), Naheed Hussein, Project Manager PIGGAREP, SPREP | UNDP Samoa, SPREP | Apia |
| 14 | Meeting with Ms. Savia, Ms. Faisana, and Ms. Lorraine from the Ministry of Finance | Ministry of Finance, Government of Samoa | Apia |
| 15 | Meeting with Ms. Nuulopa Periera, of EPC | Electricity Power Corporation of Samoa | Apia |
| 16 | Meeting with Ms Vanda Faasoa-Chan Ting, ACEO for RE Division and the MNRE ACEO for GEF | Ministry of Natural Resources and Energy, Government of Samoa | Apia |
| August 9, 2016 (Tuesday) | | | |
| 17 | Meeting with Dr. Netatua Pelesikoti (Director, Climate Change), Espen Ronnenburg (Climate Change Advisor), Naheed Hussein, Project Manager PIGGAREP, SPREP, on PIGGAREP impact on PICs | SPREP | Apia |
| 18 | Phone call with Mr. Tangi Terapii of the Cook Islands Department of Energy | Government of the Cook Islands | Apia |
| August 10, 2016 (Wednesday) | | | |
| 19 | Field visit and meeting with YWAM on biogas power generation and training of local stakeholders | NGO based in Samoa | Apia |
| | Field visit to Piu community and biogas power generation construction site | | Piu village |

| # | Activity | Stakeholder involved | Place |
|------------------------------------|---|--|-------------------|
| 20 | Phone call with Mr. Hubert Yamada of the Federated States of Micronesia | Government of the Federated States of Micronesia | Apia |
| August 11, 2016 (Thursday) | | | |
| 21 | Phone call with Mr. Benjamin of Government of Vanuatu | Government of Vanuatu | Apia |
| 22 | Meeting with Mr. Espen Ronneberg | SPREP | Apia |
| 23 | Meeting with Dr. Netatua Pelesikoti | SPREP | Apia |
| 24 | Phone call with Ms. Dolores deBrum Kattil of Republic of Marshall Islands | Government of the Republic of Marshall Islands | Apia |
| August 12, 2016 (Friday) | | | |
| 25 | Debriefing meeting on preliminary findings of terminal evaluation with SPREP, UNDP and PIGGAREP personnel | UNDP Samoa | Apia |
| 26 | Meeting with UNDP Samoa procurement, Tessa | UNDP Samoa | Apia |
| | Travel from Samoa to Honolulu dep 17:45 arr 00:15 | | |
| August 13, 2016 (Saturday) | | | |
| | Travel from Honolulu to Vancouver dep 22:20 arr 07:15 | | |
| August 17, 2016 (Wednesday) | | | |
| 27 | Skype discussion with former UNDP Samoa DRR, Mr. Jaime de Aguinaga | UNDP Samoa | Vancouver, Canada |
| August 18, 2016 (Thursday) | | | |
| 28 | Skype discussion with former PIGGAREP Project Manager, Ms. Silia Kilepoa Ualesi | SPREP | Vancouver, Canada |
| August 19, 2016 (Friday) | | | |
| 29 | Skype discussion with former UNDP Samoa energy and environment cluster leader, Ms. Mina Weydahl | UNDP Samoa | Vancouver, Canada |

Total number of meetings conducted: 29

APPENDIX C – LIST OF PERSONS INTERVIEWED

This is a listing of persons contacted in various Pacific Island countries (unless otherwise noted) during the Terminal Evaluation Period only. The Evaluator regrets any omissions to this list.

1. Mr. Manuel Soriano, Regional Technical Advisor, Bangkok Regional Hub, UNDP-GEF, Thailand;
2. Mr. Thomas Jensen, Energy Programme Specialist at UNDP Bureau for Policy and Programme Support, UNDP Fiji;
3. Ms. Liz Cullity, Resident Representative, UNDP Samoa MCO;
4. Ms. Naoko Takasu, Interim Deputy RR, UNDP Samoa MCO;
5. Ms. Evette Kerslake, Program Manager, Environment and Climate Change, UNDP Samoa MCO;
6. Ms. Zuzana Tollrianova, Program Associate, Environment and Climate Change, UNDP Samoa MCO;
7. Mr. Jaime de Aguinaga, former UNDP Samoa DRR;
8. Ms. Mina Weydahl, former UNDP Samoa energy and environment cluster leader;
9. Mr. Kosi Latu, Director General, SPREP;
10. Dr. Netatua Pelesikoti, Director, Climate Change, SPREP;
11. Mr. Espen Ronnenburg, Climate Change Advisor, SPREP;
12. Mr. Naheed Hussein, Project Manager PIGGAREP, SPREP;
13. Ms. Silia Kilepoa Ualesi, former PIGGAREP Project Manager;
14. Mr. Mafalu Lotolua, CEO, Tuvalu Electricity Corporation, Funafuti, Tuvalu;
15. Mr. Rapa Young, former PIGGAREP focal person for Samoa, currently with Pacific Power Association;
16. Mr. Gabriel Aimaea, PIGGAREP focal person, and Director of Energy, Government of Solomon Islands;
17. Mr. Gavin Pereira, Climate Catalysts, Suva, Fiji;
18. Dr. Tevita Tukunga, Director of Energy for MEIDECC, Government of Tonga;

19. Mr. Solomon Fifita, former PIGGAREP Project Manager (2007 to 2010), currently with SPC, Suva, Fiji;
20. Mr. Ofa Sefana, MEIDECC, Government of Tonga;
21. Mr. Nixon Kua, former PIGGAREP Project Manager (2011) and Climate Change Mitigation Officer in Solomon Islands;
22. Mr. Ajay Prasad, Managing Director of CBS Power Solutions, Suva, Fiji;
23. Mr. Mark Kibby, GM, Yingli Green Energy, Australia;
24. Ms. Savia, Ministry of Finance, Government of Samoa;
25. Ms. Faisana, Ministry of Finance, Government of Samoa;
26. Ms. Lorraine, Ministry of Finance, Government of Samoa;
27. Ms. Nuulopa Periera, Electricity Power Corporation of Samoa;
28. Ms Vanda Faasoa-Chan Ting, ACEO for RE Division, Ministry of Natural Resources and Energy, Government of Samoa;
29. Mr. Tangi Terapii of the Cook Islands Department of Energy;
30. Mr. Hubert Yamada, Government of the Federated States of Micronesia;
31. Mr. Benjamin, Government of Vanuatu;
32. Ms. Dolores deBrum Kattil, Government of the Republic of Marshall Islands.

APPENDIX D – LIST OF DOCUMENTS REVIEWED

1. UNDP PIF for the “Pacific Island Greenhouse Gas Abatement with Renewable Energy Project” (PIGGAREP Project);
2. UNDP Project Document for the “Pacific Island Greenhouse Gas Abatement with Renewable Energy Project” (PIGGAREP Project), July 2007;
3. Project Brief for the “Pacific Island Greenhouse Gas Abatement with Renewable Energy Project”
4. PIGGAREP Project Inception Report (July 2008);
5. PIGGAREP PIRs from 2008 to 2015;
6. PIGGAREP Progress and Quarterly Report (2008-2016);
7. Combined Delivery Reports for PIGGAREP from 2008 to 2016;
8. Annual Work Plans for PIGGAREP and PIGGAREP+ between 2011 and 2016;
9. PIGGAREP Multi-Partite Reviews, 2011 to 2014;
10. PIGGAREP Project Supervision Reports (2012-2016);
11. UNDP Samoa and MCO: Mid-Term Evaluation Report for PIGGAREP, July 2010;
12. SPREP – UNDP, “PIGGAREP - Recommended Proactive Strategic Barrier Removal Approach”, 2012;
13. Terminal Report of PIGGAREP, January 2015;
14. Workshop Report for “Gender Mainstreaming in PIGGAREP”, May 2013;
15. Project Document of “Pacific Islands Greenhouse Gas Abatement through Renewable Energy “PLUS” Project”, February 2013;
16. Project Document of “Pacific Islands Greenhouse Gas Abatement through Renewable Energy “PLUS” Project” – ADDENDUM, February 2014;
17. Project Activity Summaries for all PICs between 2008 and 2013;
18. PIREP Terminal Evaluation, October 2006;

19. Terminal Evaluation for the Palau Sustainable Economic Development through Renewable Energy Applications (SEDREA) Project, June 2014;
20. Mid-Term Review for the “Action for the Development of Marshall Islands Renewable Energies (ADMIRE), March 2012;
21. Annual SPREP Reports, 2011 to 2015;
22. PIGGAREP Report on “A Technical, Institutional, Environment and Economic Impacts Assessment of the Mango and Mo’unga’one Solar Photovoltaic Rehabilitation Project” March 2009;
23. Government of Tonga report on “Solar Home System Minimum Standards and Installation Guidelines for Ministry of Environment and Climate Change” by Energy Division, Ministry of Environment and Climate Change, January 2012;
24. UNDAF for the Pacific Region (2013-17);
25. IRENA Reports on “Renewable energy opportunities and challenges in the Pacific Islands region” for all PIGGAREP PICs.

APPENDIX E – GHG EMISSION SUMMARY

| PIC and Activity Detail | PIC Expenditure (in USD) | Installed Capacity (kW) | Potential annual MWh generation | Project Period (2007-2016) | | | 10 year post-project (2017-2026) | | Comments |
|--|--------------------------|-------------------------|---------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--|---------------------------------|---|
| | | | | MWh generation during Project Period | Cumulative direct ERs (tonnes of CO2) | Lifetime direct ERs (tonnes of CO2) | Direct post-project ERs (tonnes of CO2/yr) | Indirect ERs (tonnes of CO2/yr) | |
| Cook Islands | | | | | | | | | |
| Rakahanga Wind/Solar Hybrid FS Project | | 8 | 20 | 33 | 23 | 0 | 70 | 0 | Investment confirmed by NZFMAT and CKIG. Confirm installation in 2014 |
| Pukapuka/Nassau/Suwarro w Solar Grid Connect Project | | 207 | 399 | 666 | 476 | 0 | 1,426 | 0 | Investment confirmed by NZFMAT and CKIG. Yes, installation in 2014. In 2013 Assessments/Feasibility Studies conducted |
| Manihiki Grid Connected Solar PV Project | | 281 | 542 | 904 | 647 | 0 | 1,936 | 0 | Investment confirmed by NZFMAT and CKIG. Yes, installation in 2014. In 2013 Assessments/Feasibility Studies |
| Palmerston Island Solar Systems (PIGGAREP+) | | 53 | 95 | 158 | 113 | 475 | 339 | 0 | Installed Dec 2014 with battery storage systems |
| Subtotal: | \$499,179 | | 1,055 | 1,762 | 1,260 | 475 | 3,772 | 0 | |
| Fiji | | | | | | | | | |
| Renewable Energy Resource Assessments for Fiji-WindPro Software | | 2,000 | 5,957 | 0 | 0 | 0 | 0 | 1,487 | No confirmed investments from this work |
| Feasibility study into the formulation of Net-Metering Policy for Grid - Connected Renewable Energy Generation Systems in Fiji | | 5,000 | 9,636 | 0 | 0 | 0 | 0 | 2,405 | No confirmed investments from this work |
| Subtotal: | \$52,360 | | 15,593 | 0 | 0 | 0 | 0 | 3,892 | |
| Kiribati | | | | | | | | | |
| Support to the Italian-funded solar water pumps for the rural schools in Kiribati. | | 10 | 19 | 0 | 0 | 0 | 0 | 23 | Installed in 2010 |
| Bio-fuel feasibility study in Kiritimati Island | | 90 | 670 | 0 | 0 | 0 | 0 | 1,054 | No known investment yet confirmed. As such, a CF of 0.4 has been factored in over an assumed 5.5 yr service life of biofuel plant |
| Construction of biofuel mill in Abemama island (PIGGAREP+) | | 66 | 65 | 0 | 0 | 0 | 1,859 | 0 | 3 - 30 kW gensets to be installed to generate 60 kWh per day over a 4-year period with coconut oil |

| PIC and Activity Detail | PIC Expenditure (in USD) | Installed Capacity (kW) | Potential annual MWh generation | Project Period (2007-2016) | | | 10 year post-project (2017-2026) | | Comments |
|---|--------------------------|-------------------------|---------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--|---------------------------------|--|
| | | | | MWh generation during Project Period | Cumulative direct ERs (tonnes of CO2) | Lifetime direct ERs (tonnes of CO2) | Direct post-project ERs (tonnes of CO2/yr) | Indirect ERs (tonnes of CO2/yr) | |
| <i>Subtotal:</i> | \$357,525 | | 754 | 0 | 0 | 0 | 1,859 | 1,077 | |
| Nauru | | | | | | | | | |
| RE Officer training for Nauru College RE grid connect system | | 40 | 77 | 0 | 0 | 0 | 0 | 66 | Training will contribute to indirect ERs as potential lifetime ERs and a causality factor of 0.2 |
| RE Officer training for Solar PV Street lighting | | 3 | 5 | 0 | 0 | 0 | 0 | 4 | Training will contribute to indirect ERs as potential lifetime ERs and a causality factor of 0.2 |
| RE Officer training for Solar Water Pumping | | 1 | 2 | 0 | 0 | 0 | 0 | 1 | Training will contribute to indirect ERs as potential lifetime ERs and a causality factor of 0.2 |
| <i>Subtotal:</i> | \$65,150 | | 83 | 0 | 0 | 0 | 0 | 72 | |
| Niue | | | | | | | | | |
| Data Analysis on the Impact of Grid Connected Solar Panel Generation (including RE Awareness on TV) | | 52 | 100 | 465 | 333 | 499 | 71 | 0 | Installed in 2011 |
| <i>Subtotal:</i> | \$55,090 | | 100 | 465 | 333 | 499 | 71 | 0 | |
| Samoa | | | | | | | | | |
| Wind Resource Monitoring | | 550 | 1,638 | 3,276 | 2,343 | 8,199 | 5,271 | 0 | Actual installation made in September 2014 with UAE funding |
| 6 hydro monitoring installation sites: | | | | | | | | | |
| New hydropower site A: Faleaseela, Upolu | | 190 | 549 | 0 | 0 | 0 | 3,142 | 0 | Investments made by ADB. Operational startup in January 2019 |
| New hydropower site B: Tafitoala, Upolu | | 460 | 1,330 | 0 | 0 | 0 | 7,606 | 0 | Investments made by ADB. Operational startup in January 2019 |
| New hydropower site C: Faleata, Savaii | | 160 | 463 | 0 | 0 | 0 | 2,646 | 0 | Investments made by ADB. Operational startup in January 2019 |
| Rehabilitation of Fale ole Fe, Upolu | | 1,740 | 5,030 | 0 | 0 | 0 | 28,772 | 0 | Investments made by ADB. Operational startup in January 2019 |
| Rehabilitation of Alaola, Upolu | | 1,050 | 3,035 | 0 | 0 | 0 | 17,362 | 0 | Investments made by ADB. Operational startup in January 2019 |
| Rehabilitation of Samasoni, Upolu | | 1,900 | 5,493 | 0 | 0 | 0 | 31,417 | 0 | Investments made by ADB. Operational startup in January 2019 |

| PIC and Activity Detail | PIC Expenditure (in USD) | Installed Capacity (kW) | Potential annual MWh generation | Project Period (2007-2016) | | | 10 year post-project (2017-2026) | | Comments |
|--|--------------------------|-------------------------|---------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--|---------------------------------|--|
| | | | | MWh generation during Project Period | Cumulative direct ERs (tonnes of CO2) | Lifetime direct ERs (tonnes of CO2) | Direct post-project ERs (tonnes of CO2/yr) | Indirect ERs (tonnes of CO2/yr) | |
| Feasibility study grid connected PV for Tanugamanono (Upolu), Vaitele (Upolu) and Salelologa (Savaii) | | 546 | 1,052 | 2,810 | 2,009 | 5,267 | 3,386 | 0 | Installed December 2013 with JICA funding |
| Biogas production (PIGGAREP+) | | 4 | 28 | 0 | 0 | 100 | 100 | 0 | To be in operation by January 2017 |
| Subtotal: | \$542,500 | | 18,618 | 6,086 | 4,351 | 13,566 | 99,701 | 0 | |
| Solomon Islands | | | | | | | | | |
| Set up of an RE information centre and training on the installation, monitoring and maintenance of solar PV systems | | 10 | 19 | 129 | 92 | 96 | 0 | 0 | Installed in 2009 |
| Solar PV Training for Solar PV users in Community High Schools | | 20 | 39 | 219 | 156 | 193 | 28 | 0 | Installed in 2010 |
| Freighting and Installation of the Santa Ana Solar PV Systems | | 3 | 5 | 23 | 16 | 96 | 28 | 0 | Installed in 2011 |
| Bio-fuel feasibility study at Lata and Nangu | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No known investment yet confirmed |
| Tina Hydropower Landowners Study Tour (to Fiji) | | 20,000 | 122,640 | 0 | 0 | 0 | 0 | 175,375 | Investment with World Bank/IFC confirmed. Counted as indirect ERs with causality factor of 0.2 |
| Solar panels for internet connection (9 sites) on PIGGAREP+ | | 5,600 | 47 | 47 | 34 | 235 | 202 | 0 | Installed September 2015 on PIGGAREP+ |
| Subtotal: | \$658,210 | | 122,750 | 417 | 298 | 621 | 257 | 175,375 | |
| Tonga | | | | | | | | | |
| Feasibility study that lead to the Rehabilitation of Mango and Mounga'one Solar Home Systems | | 10 | 17 | 116 | 89 | 13 | 13 | 0 | Installed in 2009 |
| Solar Home System in Outer Islands - Financial Management Training and Technical Training on Operation and Maintenance | | 181 | 313 | 1,461 | 0 | 0 | 0 | 429 | Installed in 2011. Training provided and counted as indirect ERs with causality factor of 0.3 |
| Technical Training and Awareness on PV Technology Applications for | | 19 | 33 | 155 | 0 | 0 | 0 | 46 | Installed in 2011. Training provided and counted as indirect ERs with causality factor of 0.3 |

| PIC and Activity Detail | PIC Expenditure (in USD) | Installed Capacity (kW) | Potential annual MWh generation | Project Period (2007-2016) | | | 10 year post-project (2017-2026) | | Comments |
|--|--------------------------|-------------------------|---------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--|---------------------------------|---|
| | | | | MWh generation during Project Period | Cumulative direct ERs (tonnes of CO2) | Lifetime direct ERs (tonnes of CO2) | Direct post-project ERs (tonnes of CO2/yr) | Indirect ERs (tonnes of CO2/yr) | |
| solar water pumping and Solar Street lighting in Nakolo Village, Tongatapu. | | | | | | | | | |
| Lofanga Solar Home systems Financial Management Training and Technical Training on Operation and Maintenance | | 10 | 17 | 80 | 0 | 0 | 0 | 23 | Installed in 2011. Training provided and counted as indirect ERs with causality factor of 0.3 |
| Solar water pumps (10) (PIGGAREP+) | | 15 | 27 | 46 | 33 | 137 | 98 | 0 | Installed in December 2014 on PIGGAREP+ |
| Subtotal: | \$433,517 | | 408 | 1,857 | 121 | 150 | 111 | 498 | |
| Tuvalu | | | | | | | | | |
| Training Workshop on the installation and commissioning of a 46 kW photovoltaic network integration project, Funafuti and Motufoua, Tuvalu | | 46 | 80 | 0 | 0 | 0 | 0 | 136 | Installed 2010. Training provided and counted as indirect ERs with causality factor of 0.4 |
| Increasing reliable access to modern energy services through solar PV systems for rural areas (outer Islands in Tuvalu) | | 182 | 315 | 526 | 0 | 0 | 0 | 450 | Installed 2010. Training provided and counted as indirect ERs with causality factor of 0.4 |
| Support to TEC's outer island grid-connected renewable energy project: Tuvalu Photovoltaic Electricity Network Integration Project (TPVENIP) Training - A component that aimed at training users or beneficiaries of the project | | 40 | 69 | 392 | 0 | 0 | 0 | 119 | Installed 2010. Training provided and counted as indirect ERs with causality factor of 0.4 |
| Subtotal: | \$714,570 | | 463 | 918 | 0 | 0 | 0 | 705 | |
| Vanuatu | | | | | | | | | |
| On the job training on the operation and maintenance of the Sarakata Hydropower Project. | | 1,200 | 3,207 | 0 | 0 | 0 | 0 | 2,566 | Installed 2009. Training provided and counted as indirect ERs with causality factor of 0.2 |
| Review of the 2002 Talise Mini Hydropower Scheme Feasibility Study | | 75 | 295 | 0 | 0 | 0 | 2,107 | 0 | 2014 PIGGAREP feasibility study followed by confirmed project funding from Government of Vanuatu (1st |

| PIC and Activity Detail | PIC Expenditure (in USD) | Installed Capacity (kW) | Potential annual MWh generation | Project Period (2007-2016) | | | 10 year post-project (2017-2026) | | Comments |
|--|--------------------------|-------------------------|---------------------------------|--------------------------------------|---------------------------------------|-------------------------------------|--|---------------------------------|--|
| | | | | MWh generation during Project Period | Cumulative direct ERs (tonnes of CO2) | Lifetime direct ERs (tonnes of CO2) | Direct post-project ERs (tonnes of CO2/yr) | Indirect ERs (tonnes of CO2/yr) | |
| | | | | | | | | | stage funding of USD 0.64 million)) followed by Government of Austria and Italy (USD 0.95 million) |
| <i>Subtotal:</i> | \$221,358 | | 3,502 | 0 | 0 | 0 | 2,107 | 2,566 | |
| Totals | \$3,599,459 | | 163,326 | 11,505 | 6,363 | 15,311 | 107,878 | 184,184 | |
| Total GHG Reductions (Direct, Post-Project and Indirect) | | 303,209 | Tonnes CO2 ⁷⁰ | | | | | | |
| Abatement cost | | \$11.87 | per tonne CO2 | | | | | | |
| Total installed capacity during PIGGAREP | | 9,152 | kW | | | | | | |
| Total capacity not yet installed but with confirmed financing during PIGGAREP | | 25,579 | kW | | | | | | |
| Total RE capacity developed or studied during PIGGAREP | | 41,821 | kW | | | | | | |
| Installed during PIGGAREP | | | | | | | | | |
| Confirmed financing during PIGGAREP | | | | | | | | | |
| No confirmed financing yet confirmed | | | | | | | | | |

⁷⁰ This sum less post-project direct ERs from CKI's Palmerston solar PV, Niue's solar panel generation, Samoa's wind resource monitoring and their feasibility study for grid connected PV, and Tonga's feasibility study and solar water pumps.

APPENDIX F – PROJECT LOGFRAME MATRIX FOR PIGGAREP (FROM OCTOBER 2008)

| Project Objective and Outcomes | Indicators | | 2009 | 2010 | 2011 | 2012 | 2013 |
|--|--|---------------------|------|--------|--------|---------|---------|
| | Description | Target | | | | | |
| Goal: Reduction of the growth rate of GHG emissions from fossil fuel use in the PICs through the widespread and cost effective use of RE resources and application of feasible RE technologies | GHG emissions in PICs reduced by 2015, million tons | 2 | 0 | 0 | 49,500 | 95,000 | 172,000 |
| | Cumulative electricity generation from RE-based energy systems by end-of-project (MWh) | 219,000 | 0 | 0 | 80,000 | 120,000 | 219,000 |
| Objective: Promotion of the productive use of RE to reduce GHG emission by removing the major barriers to the widespread and cost-effective use of commercially viable RETs. | Additional installed RE-based energy systems capacity by 2015 (MW cumulative) | 50 | 0 | 0 | 20 | 30 | 50 |
| | Value of income generating opportunities in each PIC gained from RE by end of project, US\$ cumulative | 110,000 | 0 | 10,000 | 25,000 | 50,000 | 110,000 |
| Outcome 1: Improved knowledge about RE resources potential and increase the number of successful commercial RE applications on the ground | No. of completed resource monitoring studies by 2010 | 10 | 0 | 2 | 4 | 7 | 10 |
| | No. of commercially sustainable RE projects in PICs by 2010 | 10 | 1 | 3 | 5 | 7 | 10 |
| | No. of resource monitoring studies completed by 2010 | 10 by 2010 | 5 | 8 | 10 | | |
| | Average collection efficiency for each of demonstration project by end of project | 90% | 0 | 75 | 80 | 85 | 90 |
| | No. of completed RE project feasibility assessments by 2010 | At least 8 | 5 | 7 | 10 | | |
| | No. of completed training courses on RE system designs each year starting 2009 | At least 2 annually | 1 | 2 | | | |
| | No. of PICs adopting technical standards for RE systems components and their installations by 2009. | At least 8 | 5 | 8 | | | |

| Project Objective and Outcomes | Indicators | | 2009 | 2010 | 2011 | 2012 | 2013 |
|--|--|--------|------|------|------|------|------|
| | Description | Target | | | | | |
| Outcome 2: Expansion of the market for RET applications | No. of RET company in each PIC by 2010 | 11 | 2 | 7 | 11 | | |
| | Cumulative additional RE-based power generation installed in PICs by 2015 | 100 | 0 | 0 | 20 | 30 | 50 |
| | Cumulative No of new 'bankable RE projects' identified and funded by 2015 | 20 | 1 | 3 | 6 | 8 | 10 |
| | No. of new manufacturers of RE systems in the PICs by end of project | 5 | 1 | 2 | 3 | 4 | 5 |
| | No. of 'one-stop-shops' established in the PICs by end of project. | 3 | 0 | 1 | 1 | 2 | 3 |
| | No. of new RESCOs established in the PICs by 2012 | 3 | 0 | 0 | 1 | 2 | 3 |
| | No. of rural RE suppliers established in the PICs by 2012 | 3 | 0 | 1 | 2 | 3 | |
| | No. of rural residents trained on basic O&M by end of project | 300 | 0 | 50 | 100 | 200 | 300 |
| Outcome 3: Enhancement of institutional capacity to design and implement RE | No. of RE project designed and implemented by local experts in each PIC by 2010 | 11 | 4 | 8 | 11 | | |
| | No. of energy offices that have established national energy coordination committees, have clear mandates, strategies and action plans by 2010 | 10 | 1 | 5 | 10 | | |
| | No. of national energy/climate change mitigation plans incorporating new RE projects adopted in the region by 2010 | 5 | 1 | 3 | 5 | | |
| | No. of PICs with established national coordinating mechanisms that include the private sector by 2009 | 5 | 2 | 5 | | | |
| | No. of Energy Offices in the region with clear mandates and equipped with databases for planning and policy works and have adopted energy plans by 2010. | 5 | 1 | 3 | 5 | | |
| Outcome 4: Improvement of the availability of funding | Value of new investments in RE by 2015 (US\$ million) | 100 | 10 | 25 | 40 | 60 | 75 |
| | Total investments on rehabilitating existing RE installations by 2010. | 5 | 1 | 3 | 5 | | |

| Project Objective and Outcomes | Indicators | | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|--|--------|------|------|------|------|------|
| | Description | Target | | | | | |
| for existing and new RE projects | Completed feasibility study on a regional/national RE fund by 2009 | 1 | 0 | 1 | | | |
| | Amount of capital fund available for new RE projects by 2010 | 10 | 1 | 5 | 10 | | |
| Outcome 5: Strengthened legal and regulatory structures in the energy and environmental sectors | No. of PICs that have a relevant Act / provisions (Energy and Environment) in place by 2010 that supports RE development and utilization and the formulations of RE regulations and policies | 11 | 1 | 6 | 11 | | |
| | No. of PICs that adopted RE/CC policies and guidelines by 2012 | 8 | 1 | 3 | 5 | 7 | 8 |
| | No. of PICs with specific policies and incentives for RE-based livelihood and productivity projects by 2012 | 8 | 1 | 4 | 6 | 7 | 8 |
| | No. of energy pricing studies completed for use in planning and policy formulations by 2012 | 11 | 1 | 3 | 5 | 6 | 8 |
| | No. of PICs that adopted technical standards for RE systems components and their installations by 2009 | 8 | 4 | 8 | | | |
| | No. of national plans and strategies with RE features by 2009 | 11 | 5 | 11 | | | |
| Outcome 6: Increased awareness and knowledge about RE among key stakeholders | Ave. percentage of energy sector professionals, politicians, investors, senior government officials and the general public who are aware of the benefits of RE each year starting Year 1. | 50 | 50 | 75 | 75 | 80 | 90 |
| | No. of RE projects whose technical, economic, social and environmental characteristic are comprehensively documented and accessible via internet based info system by 2010 | 10 | 2 | 5 | 10 | | |
| | Average percentage approval rating for RE technologies and projects in PICs by 2010 | 75 | 30 | 60 | 75 | | |

| Project Objective and Outcomes | Indicators | | | | | | |
|--------------------------------|---|--------|------|------|------|------|------|
| | Description | Target | 2009 | 2010 | 2011 | 2012 | 2013 |
| | No. of PICs with a regular RE public awareness program and a RE website, by 2010 | 11 | 2 | 8 | 11 | | |
| | No. of PICs that have an operational annual RE award program by 2010 | 11 | 2 | 6 | 11 | | |
| | No. of completed training programs and national training workshops each year in each PICs starting 2009 | 2 | 0 | 2 | | | |
| | Total no. of trainees trained in the region by 2010 | 2,000 | 500 | 1500 | 2000 | | |

APPENDIX G – PROJECT LOGFRAME MATRIX FOR PIGGAREP+ (FROM FEBRUARY 2014)

| Strategy | Objectively Verifiable Indicators | | | Means of Verification | Critical Assumptions |
|---|--|---|--|--|--|
| | Indicator | Baseline | Target | | |
| <p>Objective: Low carbon development for Pacific SIDS through the deployment of renewable energy (RE) resources and promotion of energy efficiency (EE).</p> | <ul style="list-style-type: none"> • % share of RE in the energy mix in the PIGGAREP+ countries by end 2014, % • No. of RE & EE projects implemented in the Pacific SIDS that replicated, or were designed based on, the PIGGAREP+ pilot projects by end 2014 • Average specific fuel consumption of the national power utilities in the PIGGAREP+ countries by end 2014, lit diesel/kWh • No. of implemented residential EE projects that were supported by EE financing schemes in PIGGAREP+ countries by end 2014 | <ul style="list-style-type: none"> • 0.04⁷¹ • 0 EE • 0 RE • 0.265 • 0 | <ul style="list-style-type: none"> • 0.1 • 5 EE • 5 RE • 0.252 • 30 | <ul style="list-style-type: none"> • Project activity and progress reports; Project monitoring reports; • Survey of PIC RE projects; Project M&E reports; North-REP project reports • Power utility performance reports; Project activity and progress reports; PPA reports • Survey of PIC RE projects; Project M&E reports | <ul style="list-style-type: none"> • Current RE policy of PICs improves or at least remain the same • PICs can secure own and supplementary funding for their EE/RE projects • Power plant testing & load dispatch optimization is regularly practiced • Established financing schemes are funded by development banks |
| Component 1: Renewable Energy Technology Applications | | | | | |
| <p>Outcome 1.1: Reduced energy costs for telecommunication systems equipment, and reduced reliance on fossil fuels to operate rural telecommunication systems in the Solomon Islands</p> | <ul style="list-style-type: none"> • Average monthly energy cost of the operation of telecom systems in the pilot rural health centers and hospitals by mid-2014, US\$ • Average monthly electricity usage of telecom systems in the pilot rural health centers and hospitals by mid-2014, kWh • Average monthly no. of hours of operation of telecom systems in all pilot rural health centers and hospitals by mid-2014, hrs. | <ul style="list-style-type: none"> • 9,200 • 11,400 • 0 | <ul style="list-style-type: none"> • 0 • 0 • 7,200 | <ul style="list-style-type: none"> • Project activity and progress reports; Project monitoring reports; PGSP & PACRICS reports • Project activity and progress reports; Project monitoring reports; PGSP & PACRICS reports • Project activity and progress reports; Project monitoring reports; PGSP & PACRICS reports | <ul style="list-style-type: none"> • PACRICS install the required telecom peripheral equipment • Actual daily solar hours = at least equal to the assumed 5 hrs. in the solar PV sizing • Telecom system operation permits are secured |

⁷¹ Baseline 2009 figure for the 6 PIGGAREP+ countries (Ref: Regional Indicators 2009 – Economic Development Division, SPC – Suva Regional Office).

| Strategy | Objectively Verifiable Indicators | | | Means of Verification | Critical Assumptions |
|---|---|--|---|---|--|
| | Indicator | Baseline | Target | | |
| Outcome 1.2: Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas in Tonga | <ul style="list-style-type: none"> • Average monthly energy cost of the operation of well water pumping systems in the pilot rural villages by mid-2014, US\$ • Average monthly energy consumption of well water pumping systems in the pilot rural villages by mid-2014, kWh <ul style="list-style-type: none"> • Average monthly no. of hours of operation of RE powered well water pumping systems in pilot rural villages by mid-2014, hrs. | <ul style="list-style-type: none"> • 1,220 • 2,175 • 90 | <ul style="list-style-type: none"> • 780 • 1,080 • 150 | <ul style="list-style-type: none"> • Project activity and monitoring reports; Water Management Committee reports • Project activity and monitoring reports; Water Management Committee reports • Project activity and monitoring reports; Water Management Committee reports | <ul style="list-style-type: none"> • Water Management Committees charge reasonable water tariffs • Water Management Committees manage the operation of installed systems <ul style="list-style-type: none"> • Actual daily solar hours = at least equal to the assumed 5 hrs. in the solar PV sizing |
| Outcome 1.3: Sustainable, environment friendly and energy cost saving operation of well water pumping systems in rural areas in Palau | <ul style="list-style-type: none"> • Average monthly energy cost of the operation of the Kayangel water supply system by mid-2014. US\$ • Average monthly energy consumption of the Kayangel water supply system by mid-2014. kWh <ul style="list-style-type: none"> • Average monthly no. of hours of operation of RE powered water supply system in Kayangel by mid-2014. hrs | <ul style="list-style-type: none"> • 278 • 2780 • 0 | <ul style="list-style-type: none"> • 26 • 255 • 150 | <ul style="list-style-type: none"> • Project activity and monitoring reports; PWSC water service reports • Project activity and monitoring reports; PWSC water service reports • Project activity and monitoring reports; PWSC water service reports | <ul style="list-style-type: none"> • PWSC charge reasonable water tariffs • PWSC monitors energy consumption <ul style="list-style-type: none"> • Actual daily solar hours = at least equal to the assumed 5 hrs. in the solar PV sizing |
| Outcome 1.4: Reduced reliance on fossil fuels, reduced and operational costs for electricity generation and distribution in the Cook Islands | <ul style="list-style-type: none"> • Average annual cost of the Palmerston power generation system by mid-2015. US\$/kWh • Average annual DFO savings of the Palmerston island power generation system. liters | <ul style="list-style-type: none"> • 1.05 • 0 | <ul style="list-style-type: none"> • 0.15 • 15,030 | <ul style="list-style-type: none"> • Project activity and monitoring reports: PI power supply service reports • Project activity and monitoring reports: PI power supply service reports | <ul style="list-style-type: none"> • PI entity in charge of power supply charge reasonable electricity tariffs; and monitors and records power generation system operating parameters <ul style="list-style-type: none"> • actual daily solar hours are at least equal value used in solar PV sizing |

| Strategy | Objectively Verifiable Indicators | | | Means of Verification | Critical Assumptions |
|--|---|---|--|--|--|
| | Indicator | Baseline | Target | | |
| Outcome 1.5: Reduced reliance on fossil fuels for the supply of electricity through commercial biofuel power generation in Kiribati | <ul style="list-style-type: none"> Average monthly CNO consumption of the power generation facilities in Abemama Island by mid-2015. Litres Maximum % CNO oh content of biofuel blend used in the power generation facilities in Abemama Island by mid-2015.% | <ul style="list-style-type: none"> 0 0 | <ul style="list-style-type: none"> 3.761 90 | <ul style="list-style-type: none"> Project activity reports and Island Council power supply service reports Project activity reports and Island Council power supply service reports | <ul style="list-style-type: none"> Island Council charges reasonable electricity tariffs power generation facilities monitor specific fuel consumption electricity demand will increase |
| Outcome 1.6: reduced reliance on fossil fuels for the supply of electricity through commercial biogas-based power generation in Samoa | <ul style="list-style-type: none"> Average specific biogas consumption of the demonstration power generation systems by mid-2015, m³/kWh average annual diesel fuel savings from the demonstration power generation systems by mid-2015 % of grid power is supplied by biogas fired power generation systems by end of 2015 | <ul style="list-style-type: none"> 0 0 0 | <ul style="list-style-type: none"> 0.6 70,000 5 | <ul style="list-style-type: none"> Project activity and monitoring reports Project activity and monitoring reports Project activity and monitoring reports | <ul style="list-style-type: none"> EPC buys biogas generated electricity and grants favourable PPA price to Piu village Piu village and SLC monitor and record biogas-based power generation system operating parameters <i>Merremia tuberosa</i> fine generates substantial biogas |
| Component 2: Energy Efficiency Technology Applications | | | | | |
| Outcome 2.1: Increased application of EE technologies and energy savings in the residential sector of Tuvalu | <ul style="list-style-type: none"> No. of planned EE improvement projects based on EE concepts featured in the Demo Fale by end 2013 No. of implemented EE improvement projects based on EE concepts featured in the Demo Fale by mid-2014. Cumulative energy savings from implemented new EE improvement projects by mid-2014, kWh | <ul style="list-style-type: none"> 0 0 0 | <ul style="list-style-type: none"> 1 3 100,000 | <ul style="list-style-type: none"> Project activity and progress reports; Project monitoring reports DBT EERF financing reports; Project monitoring reports Project activity and progress reports; Project monitoring reports | <ul style="list-style-type: none"> TEC provide technical assistance to interested clients EERF of the DBT is operational |

| Strategy | Objectively Verifiable Indicators | | | Means of Verification | Critical Assumptions |
|---|--|--|--|---|--|
| | Indicator | Baseline | Target | | |
| | <ul style="list-style-type: none"> Cumulative energy financing provided by DBT EERF and other commercial banks for EE improvement projects by mid-2014, US\$ | <ul style="list-style-type: none"> 0 | <ul style="list-style-type: none"> 200,000 | <ul style="list-style-type: none"> Project activity and progress reports; Project monitoring reports | <ul style="list-style-type: none"> EERF of the DBT is operational |
| Outcome 2.2.A: Improved energy use performance in power generation and reduced power generation cost in the national power utility in RMI | <ul style="list-style-type: none"> Average specific fuel consumption of the power generation units of MEC by mid-2014, liters diesel oil/kWh | <ul style="list-style-type: none"> 0.265 | <ul style="list-style-type: none"> 0.251 | <ul style="list-style-type: none"> Power utility performance reports; Project activity and progress reports; PPA reports | <ul style="list-style-type: none"> MEC approves and implements the plan for EE improvements in their power plants MEC-PRP activities are implemented |
| Outcome 2.2.B: Improved energy use performance in power generation and reduced power generation cost in the 4 state power utilities in FSM | <ul style="list-style-type: none"> Average specific fuel consumption of the power generation units of the state power utilities by mid-2014, liters diesel oil/kWh <ul style="list-style-type: none"> CPUC KUA PUC YSPSC | <ul style="list-style-type: none"> 0.263 0.270 0.268 0.274 | <ul style="list-style-type: none"> 0.250 0.253 0.252 0.255 | <ul style="list-style-type: none"> Project activity and progress reports; Power utility production reports <ul style="list-style-type: none"> CPUC Reports KUA Reports PUC Reports YSPSC Report | <ul style="list-style-type: none"> 4 state power utilities approve and implement the formulated plan for EE improvements in their respective power plants |
| Outcome 2.3: Operational, effective and widely accepted energy efficiency lending schemes in FSM, RMI and Tuvalu | <ul style="list-style-type: none"> No. of EE financing schemes established and operational by mid-2014. No. of EE financing applications approved by mid-2014 | <ul style="list-style-type: none"> 0 0 | <ul style="list-style-type: none"> 3 10 | <ul style="list-style-type: none"> Project activity and progress reports; Project monitoring reports Project activity reports; FSMDB, MIDB and DBT reports | <ul style="list-style-type: none"> IUCN Study endorsed EE financing schemes for FSM, RMI & TUV Funds for the financing schemes are made available by FSMDB, MIDB and DBT |

APPENDIX H – FRAMEWORK OF QUESTIONS TO PIGGAREP STAKEHOLDERS

| Evaluation Criteria Questions | Indicators | Sources | Methodology |
|--|---|--|--|
| Relevance: How does the Project relate to the main objectives of the GEF focal area, and to the environment and development priorities at the local, regional and national levels? | | | |
| To what extent is the principle of the project in line with national priorities? <i>All PICs are concerned with the impacts of climate change. Mitigation of climate change through renewable energy development is a top national priority of most of the PICs.</i> | Level of participation of the concerned agencies in project activities. Consistency with relevant strategies and policies. | Minutes of meetings, Project progress reports, national and regional strategy and policy documents | Desk review, interviews |
| To what extent is the Project aligned to the main objectives of the GEF focal area? <i>In line with GEF-3 operational program for the promotion of renewable energy by removing barriers and reducing implementation costs. The project is also in line with GEF-4 under strategic programmes to promote market approaches for renewable energy.</i> | Consistency with GEF strategic objectives | GEF Strategy documents, PIRs, Tracking Tools | Desk review, interview with UNDP-GEF RTA |
| Do the outcomes developed during the project formulation still represent the best project strategy for achieving the project objectives? <i>Project aligns very well with national priorities to build local capacity and strengthen institutions responsible for the development of renewable energy.</i> | Consistency with relevant strategies and policies | Lessons learned, evaluations, progress reports | Desk review, interviews |
| Effectiveness: To what extent have the expected outcomes and objectives of the Project been achieved? | | | |
| To what extent have the project objectives and outcomes, as set out in the Project Document, project's Logical Framework and other related documents, have been achieved? <i>Most outcomes and objectives have been achieved. However, achievement of project-level targets appears to have fallen short.</i> | Effectiveness | PIRs, evaluation reports, lessons learned | Desk review, interviews |
| Were the project budget and duration planned in a cost-effective way? <i>Costs were based on estimated costs to develop RE from baseline activities.</i> | Cost-effectiveness | Financial expenditure reports, cofinancing records, PIRs | Desk review, interviews |
| How and to what extent have implementing agencies contributed and national counterparts (public, private) assisted the project? <i>Implementing agencies have utilized their network of regional partners to fully engage PIC government counterparts. This appears to be a strong aspect of the project.</i> | Execution of implementing partner and other responsible partners | Progress reports, evaluation reports | Desk review, interviews |
| Efficiency: Was the Project implemented efficiently, in-line with international and national norms and standards? | | | |
| Was the Project efficient with respect to incremental cost criteria? <i>Does appear to be the case since there were a lot of changes in activities during Inception necessitating a review of all incremental activities and their costs.</i> | Activities supported by the Project not commonly included among "business as usual" planning and development priorities | National strategies and plans | Desk review, interviews |

| Evaluation Criteria Questions | Indicators | Sources | Methodology |
|--|---|--|---------------------------------------|
| Were the risks identified in the project document and PIRs the most important and the risk ratings applied appropriately? Yes | Risks mitigated | Risk logs, progress reports, lessons learned | Desk review, interviews |
| The extent of achievement of Project objective and outcomes according to the proposed budget. All funds spent towards achievement of outcomes, and numerous RE projects. | Percentage of expenditures in proportion with the results | Progress reports, Project Implementation Reviews | Desk review, interviews |
| How useful was the logical framework as a management tool during implementation and any changes made to it? Reasonably useful although some indicators were confusing. | Appropriateness of results framework | Progress reports, evaluation reports, Project Implementation Reviews | Desk review, interviews |
| Country Ownership: | | | |
| Are project outcomes contributing to national and regional development plans and priorities? Yes, notably climate change mitigation through RE development. | Plans and policies incorporating initiatives | Government approved plans and policies | Desk review, interviews |
| Have the relevant country representatives from government and civil society been involved in the Project? Yes, personnel from the government departments responsible for RE | Effective stakeholder involvement | Meeting minutes, reports | Desk review, interviews, field visits |
| Have the recipient governments and co-financers maintained their financial commitment to the Project? Yes | Committed co-financing realized | Audit reports, project accounting records, PIRs | Desk review, interviews |
| Have governments approved policies or regulatory frameworks in line with the Project objective? A number of PICs have approved policies and regulatory framework for RE; however, some PICs still do not have this framework in place. | Plans and policies incorporating initiatives | Government approved plans and policies | Desk review, interviews |
| Sustainability: To what extent are there financial, institutional, social-economic, and/or environmental risks to sustaining long-term project results? | | | |
| Was project sustainability strategy developed during the project design? Yes | Sustainability | Sustainability strategy | Desk review, interviews |
| How relevant was the project sustainability strategy? Not particularly relevant due to the lack of PURE projects in the area. | Sustainability | Sustainability strategy | Desk review, interviews |
| Are there any financial risks that may jeopardize sustenance of project outcomes? What is the likelihood of financial and economic resources not being available once the GEF assistance ends (resources can be from multiple sources, such as the public and private sectors, income generating activities, and trends that may indicate that it is likely that in future there will be adequate financial resources for sustaining project's outcomes)? Financing appears to be leaning heavily towards donor-financed projects with few opportunities for private sector RE development. | Financial risks | Progress reports, PIRs, testimonial evidence | Desk review, interviews |

| Evaluation Criteria Questions | Indicators | Sources | Methodology |
|---|---|---|---------------------------------------|
| Has institutional capacity for supporting RE management been strengthened, and are governance structures capacitated and in place? At the commencement of PIGGAREP, strengthening of institutional capacity is required for RE development. | Institutional and individual capacities | Progress reports, PIRs, testimonial evidence, training records | Desk review, interviews |
| Are there any social or political risks that may jeopardize sustenance of project outcomes? What is the risk that the level of stakeholder ownership will be insufficient to allow for the project outcomes/benefits be sustained? Do the various key stakeholders see that it is in their interest that the project benefits continue to flow? Is there a sufficient public/ stakeholder awareness in support of the long term objectives of the project? None on this project. | Socio-economic risks | Socio-economic studies, macroeconomic information | Desk review, interviews |
| Are there ongoing activities that pose an environmental threat to the sustainability of project outcomes? None. | Environmental threats | State of environment reports | Desk review, interviews, field visits |
| Impact: Are there indications that the project has contributed to, or enabled progress toward, reduced environmental stress and/or improved ecological status? | | | |
| Has the project made verifiable environmental improvements? Yes, but below target for some indicators. | Impact | Progress reports, PIRs | Desk review, interviews |
| Has the project made verifiable reductions in stress on environmental systems? Reductions of air pollution from RE have not been verifiable. | Impact | Progress reports, PIRs | Desk review, interviews |
| Has the project demonstrated progress towards these impact achievements? Demonstrated progress has been made towards achieving impacts from PIGGAREP. | Impact | Progress reports, PIRs | Desk review, interviews |
| Are the project outcomes contributing to national development priorities and plans? Yes. | Impact | National development strategies and plans, approved legislation | Desk review, interviews |
| Stakeholder Involvement: | | | |
| Has the Project consulted with and made use of the skills, experience, and knowledge of the appropriate government entities, NGOs, community groups, private sector entities, local governments, and academic institutions? Yes. | Active stakeholder involvement | Meeting minutes, reports, interview records | Desk review, interviews, field visits |
| Have relevant vulnerable groups and powerful supporters and opponents of the processes been properly involved? RE project developments have been focused on marginal communities with little or no government support. | Active stakeholder involvement | Meeting minutes, reports, interview records | Desk review, interviews, field visits |
| Has the Project sought participation from stakeholders in (1) project design, (2) implementation, and (3) monitoring & evaluation? Stakeholders have been participating in project design and implementation. | Records of stakeholder consultations | Plans, reports | Desk review, interviews, field visits |
| Catalytic Role: | | | |

| Evaluation Criteria Questions | Indicators | Sources | Methodology |
|--|---|---|---------------------------------------|
| Explain how the Project has had a catalytic or replication effect in the country and/or region. Through building local capacity on understanding RE development issues, and assisting with RE resource data, the Project has catalysed RE development. | Reference by other projects, programs | Interview records, project fact sheets | Desk review, interviews |
| Synergy with Other Projects/Programs | | | |
| Explain how synergies with other projects/programs have been incorporated in the design and/or implementation of the project. Synergies have been developed as baseline activities through PIGGAREP soft support to implement these projects. | Reference to other projects/programs | Plans, reports, meeting minutes | Desk review, interviews |
| Preparation and Readiness | | | |
| Were project objective and components clear, practicable, and feasible within its time frame? Targets did appear ambitious for a 5-year project that required building of local institutions and capacities. | Project efficiency, stakeholder involvement | Logical results framework | Desk review, interviews |
| Were the capacities of the executing institution(s) and its counterparts properly considered when the Project was designed? Yes due to inclusion of institutional strengthening and capacity building activities. | Project efficiency and effectiveness | Progress reports, audit results | Desk review, interviews |
| Were partnership arrangements properly identified and roles and responsibilities negotiated prior to Project approval? Yes, through SPREP network of regional partners. | Project effectiveness | Memorandums of understanding, agreements | Desk review, interviews |
| Were counterpart resources, enabling legislation, and adequate project management arrangements in place at Project entry? Enabling legislation was weak but in place. Counterpart "in-kind" resources were available for PIGGAREP. | Project efficiency and effectiveness | Interview records, progress reports | Desk review, interviews, field visits |
| Financial Planning | | | |
| Does the project have the appropriate financial controls, including reporting and planning, that allowed management to make informed decisions regarding the budget and allowed for timely flow of funds? Financial controls in place including planning to determine budgets required. | Project efficiency | Audit reports, project accounting records | Desk review, interviews |
| Has there been due diligence in the management of funds and financial audits? Evaluator was not offered any project audits for review. | Project efficiency | Audit reports, project accounting records | Desk review, interviews, field visits |
| Has promised co-financing materialized? Yes. | Project efficiency | Audit reports, project accounting records | Desk review, interviews |
| Supervision and Backstopping | | | |

| Evaluation Criteria Questions | Indicators | Sources | Methodology |
|--|--|--|--|
| Has Implementing Agency staff identified problems in a timely fashion and accurately estimate their seriousness? Needs assessment during evaluation. | Project effectiveness | Progress reports | Desk review, interviews |
| Has Implementing Agency staff provided quality support and advice to the project, approved modifications in time, and restructured the Project when needed? Programme Officers changed frequently during the 9-year duration of PIGGAREP and PIGGAREP+ leading to some issuers with regards to quality advice on project. | Project effectiveness | Progress reports | Desk review, interviews |
| Has the Implementing Agency provided the right staffing levels, continuity, skill mix, and frequency of field visits for the Project? Implementing partner, SPREP could have used staff more improve effectiveness and delivery of activities and more frequent field visits. | Project effectiveness | Progress reports, back-to-office reports, internal appraisals | Desk review, interviews, field visits |
| Delays and Project Outcomes and Sustainability | | | |
| If there have been delays in project implementation and completion, what were the reasons? Numerous reasons including the need to building capacity and RE resource information in the early stages of project, and the difficulties in sourcing vendors, suppliers and engineering consulting for small remote energy markets. | Sustainability of Project outcomes | Progress reports | Desk review, interviews |
| Have the delays affected project outcomes and/or sustainability, and, if so, in what ways and through what causal linkages? Delays did expose vulnerabilities of meeting RE targets and the sustainability of some of the indicators. | Sustainability of Project outcomes | Progress reports | Desk review, interviews |
| Monitoring & Evaluation | | | |
| Has the Project M&E plan been implemented according to plan? Yes. | Project effectiveness | PIRs, M&E reports | Desk review, interviews |
| Has there been sufficient focus on results-based management? Yes. | Project effectiveness | PIRs, M&E reports | Desk review, interviews |
| Mainstreaming | | | |
| Were gender issues had been taken into account in project design and implementation? Not until 2012 when a gender mainstreaming workshop was held by the Project. | Were gender issues had been taken into account in project design and implementation? | Were gender issues had been taken into account in project design and implementation? | Were gender issues had been taken into account in project design and implementation? |
| Were effects on local populations taken into account in project design and implementation? Absolutely. | Were effects on local populations taken into account in project design and implementation? | Were effects on local populations taken into account in project design and implementation? | Were effects on local populations taken into account in project design and implementation? |

APPENDIX I - EVALUATION CONSULTANT AGREEMENT FORM

Evaluators:

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

Evaluation Consultant Agreement Form⁷²

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

Name of Consultant: Roland Wong

Name of Consultancy Organization (where relevant): _____

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

Signed at Surrey, BC, Canada on November 28, 2016

Signature:  _____

⁷²www.unevaluation.org/unegcodeofconduct