End-of-term Evaluation of UNICEF’s Solomon Islands Solar Power Pilot Project

30 September 2015
Cover photograph: Primary school children from Aruligo school in Guadalcanal province study comfortably under the fans and lights powered by solar power systems provided by the Solar Power Pilot Project.

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### Acronyms

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<th>Description</th>
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<tbody>
<tr>
<td>AH</td>
<td>amp-hours</td>
</tr>
<tr>
<td>AMU</td>
<td>Assets Management Unit (MERHD)</td>
</tr>
<tr>
<td>CFL</td>
<td>compact fluorescent lamp</td>
</tr>
<tr>
<td>CRC</td>
<td>Convention on the Rights of the Child</td>
</tr>
<tr>
<td>ICT</td>
<td>information and communications technology</td>
</tr>
<tr>
<td>ICU</td>
<td>Infrastructure Coordination Unit (MEHRD)</td>
</tr>
<tr>
<td>LED</td>
<td>light-emitting diode</td>
</tr>
<tr>
<td>LIC</td>
<td>Leeming International Consulting</td>
</tr>
<tr>
<td>MDG</td>
<td>Millennium Development Goal</td>
</tr>
<tr>
<td>MEHRD</td>
<td>Ministry of Education and Human Resources</td>
</tr>
<tr>
<td>MMERE</td>
<td>Ministry of Mines, Energy and Rural Electrification</td>
</tr>
<tr>
<td>MOA</td>
<td>Memorandum of Agreement</td>
</tr>
<tr>
<td>NEAP</td>
<td>National Education Action Plan</td>
</tr>
<tr>
<td>NESU</td>
<td>National Examination System Unit (MEHRD)</td>
</tr>
<tr>
<td>NER</td>
<td>net enrolment rate</td>
</tr>
<tr>
<td>NGO</td>
<td>non-governmental organization</td>
</tr>
<tr>
<td>PEA</td>
<td>Provincial Education Officer</td>
</tr>
<tr>
<td>PEDF</td>
<td>Pacific Education Development Framework</td>
</tr>
<tr>
<td>PTA</td>
<td>parent teacher association</td>
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<tr>
<td>RAMSI</td>
<td>Regional Assistance Mission to Solomon Islands</td>
</tr>
<tr>
<td>SIEMIS</td>
<td>Solomon Islands Education Management Information System</td>
</tr>
<tr>
<td>SINEAP</td>
<td>Solomon Islands National Education Action Plan</td>
</tr>
<tr>
<td>SISTA</td>
<td>Solomon Islands Standardized Tests of Achievement</td>
</tr>
<tr>
<td>SPP</td>
<td>Solomon Islands Solar Power Project</td>
</tr>
<tr>
<td>TVET</td>
<td>technical and vocational education and training</td>
</tr>
<tr>
<td>WE</td>
<td>Willies Solar and Electrical Company</td>
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1. Executive summary

1.1 Background
This report presents the findings of an end-of-term evaluation of UNICEF’s Solar Power Pilot Project: Improving education outcomes by using solar-powered lighting and fans in primary schools in Solomon Islands (SPP project). The pilot project was implemented from September 2012 to March 2015 with funding from the New Zealand Ministry of Foreign Affairs and Trade, the New Zealand National Committee for UNICEF and UNICEF Pacific. According to the project document, the aim was to “improve education outcomes by installing solar-powered lighting and fans in ten primary schools in Guadalcanal and Choiseul provinces”. The evaluation was mandated by UNICEF and conducted by a private consultant who visited Solomon Islands for 20 days in December 2014. UNICEF directed the evaluator to focus on the five schools in Guadalcanal province because the solar systems there had been in operation for two years by the time of the evaluation.

The evaluation aimed to establish the extent to which the project achieved the outcomes and outputs outlined on page 3 of the project design document and was organized around eight areas: relevance, effectiveness, efficiency, sustainability, equity, quality of project design, quality of implementation and cross-cutting issues (gender responsiveness and environmental sustainability).

The evaluation report will be used by UNICEF Pacific to understand what worked and what did not work and to document lessons learned that could be applied to similar projects. Other audiences include project partners and other agencies seeking to improve education in developing countries.

1.2 Methodology
The evaluation used a non-experimental design (i.e. no comparison or control group) due to the lack of baseline information. As the evaluation focused on the changes catalysed by the project within the same population, qualitative methods were used to gather an in-depth understanding of the perspectives of various primary and secondary stakeholders. The consultant conducted a series of 55 key informant interviews, which used a conversational approach to identify the ‘most significant changes’ achieved by the project. Maximum variation purposive sampling was used to select interviewees, enabling the evaluation to capture a wide dataset. The evaluator also used observation, informal discussions and a document/literature review to collect data.
1.3 Findings

Relevance
The project was found to be relevant and appropriate for the target beneficiaries in the context of the infrastructural and educational needs of Solomon Islands. In addition, the project was aligned with national, regional and global policies.

Effectiveness
The evaluation concluded that the project reached most of its expected outcomes, including more study time for students, increased teacher preparation time and improved exam results. Furthermore, the project had some important unexpected impacts on those living nearby, such as improving their ability to charge laptops and phones.

Efficiency
The project was found to have been efficiently implemented, economically turning project inputs into outputs and outcomes. UNICEF’s decision to partner with the Ministry of Education and Human Resource (MEHRD) and technical service providers significantly contributed to this efficiency.

Sustainability
While the project has a good chance of attaining long-term sustainability, the evaluation concluded that without a range of continuing support from UNICEF, government agencies and other partners, there is a high risk that many of the benefits of the project will not be sustainable. Capacity, systems and funding for the maintenance of the solar systems will be especially important in this regard.

Equity
The evaluation concluded that the project promoted equitable access to education for the targeted beneficiaries and that it did not encourage inequality. The results of the project equally benefited the targeted groups (students and teachers in ten primary schools in Guadalcanal and Choiseul province), regardless of gender or socio-economic status.

Quality of project design
The project design was found to be of good quality, with a coherent, clear and realistic intervention logic. The overall project objective was clearly and logically linked with project activities and the needs of the beneficiaries. The main weakness of the project design was the non-consideration of variables other than classroom lighting and temperature as determinants of educational performance.

Quality of project implementation
Project implementation was also found to be successful. UNICEF’s decision to partner with MEHRD and technical agencies significantly contributed to this success by ensuring that the required technical expertise was available. Less positively, project implementation was slow in the initial stages due to the top-down approach used in the selection of target schools.

Cross-cutting issues
The project demonstrated exceptional commitment to gender promotion and equality in terms of student access to the project benefits. The project also helped ensure the sustainability of the environment and reduced air pollution and greenhouse gases.

1.4 The way forward
UNICEF’s SPP project yielded positive results for the target beneficiaries, proving that solar power is one of the cheapest and most reliable energy sources available in Solomon Islands, especially in communities and schools in remote areas, where the cost of fuel for electricity generation is very high (and its supply inconsistent). Therefore, the Government of Solomon Islands should consider scaling up solar power to other schools in Solomon Islands. A separate cost-benefit analysis would help provide the evidence necessary for decision-making.
2. Project background and rationale

2.1 Geography and demography
Solomon Islands is an archipelagic country consisting of 922 islands, 347 of which are inhabited. The capital city, Honiara, is situated within the main province of Guadalcanal. There are eight other provinces: Central, Choiseul, Isabel, Makara-Ulawa, Malaita, Rennell Bellona, Temotu and Western. On average, Solomon Islanders live 200 kilometres from the capital, considerably farther than in most small island states (Asian Development Bank, 2010).

While the country’s land area is relatively small, at just 28,370 square kilometres, its exclusive economic zone is 1.35 million square kilometres. However, Solomon Islands relies more on its land-based resources than its sea-based ones.

Solomon Islands has a population of approximately 517,455, with an annual growth rate of approximately 2.6 per cent. Nearly half of the population is 14 years of age or under. Approximately 16 per cent of the population live in urban areas, with 30,000 people living in Honiara (Asian Development Bank, 2010). The majority of Solomon Islanders live in rural communities that are based on traditional village social structures and are dependent on subsistence agriculture, supplemented by cash cropping, fishing and forestry.

The population of Solomon Islands is predominantly Melanesian (approximately 95 per cent), with smaller Polynesian, Micronesian, Chinese and European communities. Most communities recognize strong kinship links and obligations. Most major Christian denominations, including Anglican, Roman Catholic, Baptist, Methodist and Presbyterian, are represented in the country. In many cases these beliefs are held alongside traditional beliefs. Urban migration in the past decade has contributed to substantial urban unemployment and accompanying social problems.

2.2 Education system
The education system in Solomon Islands faces continued challenges in terms of access, equity and quality. While there has been considerable progress over the past 10 years in increasing children’s access to basic education (the net enrolment rate (NER) for primary education was 99 per cent in 2009), it is recognized that educational data needs to be treated cautiously and it has been suggested that approximately 6 per cent of primary school-aged children are not attending school. Further, while primary enrolment appears to be quite high, the NER for junior secondary schooling is significantly lower, at 38 per cent.
Only 17 per cent of the population of Solomon Islands is fully literate (able to read and write), one of the lowest rates in the Pacific (Asian South Pacific Bureau of Adult Education, 2007). A challenge to ensuring learning outcomes is the high rate of unqualified teachers, which stands at 40 per cent. Also, girls in Solomon Islands are disadvantaged in gaining access to senior secondary education and technical and vocational education and training (TVET) (ASPBAE, 2007).

The physical condition of primary school buildings in Solomon Islands is generally poor, with many lacking electricity to operate lights and fans. Studies have shown that classroom lighting plays a particularly critical role in learning outcomes and educational performance (Cheryan et al 2014; Warren 2010; Cheng 1994). High temperature and humidity in the classroom have also been shown to adversely affect student performance. Teachers who work in power-free environments have less time to prepare lessons and carry out extra-curricular activities (Amanchukwu and Obijuru, 2013).

2.3 Project design and implementation
The focus of the government’s National Education Action Plan (NEAP) 2013-2015 is on improved effectiveness of teachers and improved quality of learning. The plan’s three long-term strategic goals are:

- To achieve equitable access to education for all people in Solomon Islands;
- To improve the quality of education in Solomon Islands; and
- To manage and monitor resources efficiently and cost-effectively.

The Solomon Islands Solar Power Pilot Project (SPP) was designed to contribute to the realization of these strategic goals. The SPP project was a US$729,148 project funded by the New Zealand Ministry of Foreign Affairs and Trade, the New Zealand National Committee for UNICEF and UNICEF Pacific. The original project period was September 2012 to September 2014. However, due to a number of issues, the project was extended by six months and ended in March 2015. The main aim of the project was to improve education outcomes by installing solar-powered lighting and fans in ten primary schools in Guadalcanal and Choiseul provinces. The planned outputs included:

- Solar systems installed in 10 primary schools and 20 staff houses;
- School committees, teachers and Provincial Education Authority (PEA) staff from 10 primary school communities trained in the operation and maintenance of solar systems; and
- A fully operational backup, maintenance and monitoring system established for the solar systems.

The installation of solar systems in the five schools in Guadalcanal province was completed in September 2013. The majority of the installation work in the five schools in
Choiseul was conducted in October 2014, with modifications requested by MEHRD and UNICEF carried out in January 2015.

UNICEF Pacific was the project facilitator, through the UNICEF Solomon Islands Field Office, with technical support from Leeming International Consulting (LIC), the company that was contracted by UNICEF to procure and install solar systems. During the project, UNICEF partnered with relevant government departments including MEHRD, the Ministry of Mines, Energy and Rural Electrification (MMERE) and the Guadalcanal and Choiseul Provincial Education Offices.
3. Evaluation scope and objective

3.1 Scope
In November 2014 UNICEF contracted a private consultant to undertake an independent external evaluation. While solar systems were installed in five schools in Guadalcanal and five schools in Choiseul province, UNICEF directed the evaluator to focus on the five schools in Guadalcanal province because the solar systems there had been in operation for two years by the time of the evaluation. Approximately 700 children 5 to 15 years of age attend the five target schools in Guadalcanal province. The students reside in approximately 50 villages and more than a dozen smaller settlements (see Appendix A for a list of the schools and villages).

The main purpose of the evaluation was to measure the extent to which the project achieved its aims and objectives. The results from the evaluation will be used by UNICEF Pacific, project partners and other agencies seeking to improve education in developing countries to better understand what worked and what did not work and to document lessons learned that could be applied to similar projects.

3.2 Objectives
According to the UNICEF terms of reference, the main objective of the evaluation was to assess the project around the following parameters:

- Effectiveness: Establish whether the project interventions achieved the desired outputs and outcomes.
- Efficiency: Determine how economically resources, including time, funds and expertise, were converted into project outputs and outcomes.
- Equity: Establish to what extent the project promoted equitable access to education and learning.
- Sustainability: Determine to what extent project interventions can be maintained after the completion of the project.

In addition to the areas outlined in the terms of reference, the consultant added other relevant parameters to the evaluation, including:

- Relevance: Assess the appropriateness of the project to the needs and priorities of the target beneficiaries and its alignment with national, regional and international policies.
- Quality of project design: How was the project designed to attain the project objectives? Discuss the overall quality of the design in terms of stakeholder participation, monitoring of progress towards result/outcomes, etc.
- Quality of project implementation: Examine the implementation processes and interactions between partners.
• Cross-cutting issues: How did the project affect other issues such as the environment and gender?

3.3 Oversight
The Chief of UNICEF’s Solomon Islands Field Office provided overall operational and administrative supervision. In addition, the consultant received guidance from the UNICEF Pacific Chief of Education and Education Specialist, in close consultation with the SPP project officer.
4. Evaluation methodology

4.1 Logic model
A logic model for the project was developed by the evaluator based on project documents provided by UNICEF (see Appendix B for the logic model). The model adopts the logic used by the University of Wisconsin’s United Way Programme and depicts the theory of change in a series of ‘if-then’ relationships. The model includes the following components:

- Inputs: Resources that are needed by the project, including financial and human resources.
- Outputs: Facilities, equipment and relationships that are generated by the project.
- Outcomes: Results or changes catalysed by outputs of the project (including short- and medium-term outcomes as well as long-term impacts).
- Assumptions: The beliefs that surround the project in terms of what factors need to be present and the context in which the project works.
- Risks: Factors that potentially limit project effectiveness.
- External factors: The environment in which the project exists and the potential factors that might affect the project.

4.2 Data collection methods
Both primary and secondary data were collected during the evaluation. The consultant collected and triangulated data from four main sources, including a thorough desk review, the extraction of existing secondary data from various sources, site visits to the five schools in Guadalcanal and a series of key informant interviews. The ‘between (or across) methods’ triangulation type was used (Denzin, 1978). Results from a specific data collection method were cross-validated with the results from another method. For instance, results on education performance from key informant interviews were compared and validated using secondary data collected from MEHRD’s National Examination System Unit (NESU). This method of data triangulation of data helps to ensure that the weaknesses in each method are counter-balanced by the strengths of another.

4.2.1 Desk review
The consultant undertook a detailed desk review of relevant literature, including documentation related to the Solomon Islands education system and project documents (see Appendix C for a list of documents reviewed).

4.2.2 Extraction of secondary data
Secondary data were extracted and analysed, including school profile data from the Solomon Islands Education Management Information System (SIEMIS) and exam results from MEHRD’s NESU.

4.2.3 Site visits
From 3 to 16 December 2014, a team comprised of the consultant and an MEHRD project officer visited Guadalcanal to gather primary qualitative and quantitative data from the five schools in Guadalcanal province:

- Titinge Primary School;
- Aruligo Primary School;
- Tenakoqa Primary School;
- Rate Primary School; and
- Betivatu Primary School.

Data was also collected from two secondary schools (Rate Community High School and Betivatu Community High School). These two secondary schools are fully integrated with Rate and Betivatu primary schools and therefore it was agreed to share solar power between these schools. The school visits were organized by the MEHRD project officer. Since the management of the solar system in each school is the responsibility of teachers and nearby communities, these stakeholders were present during the site visits.

4.2.4 Key informant interviews
The consultant conducted a series of 55 key informant interviews that followed a conversational approach (see Appendix D for a list of informants). The ‘most significant change’ technique was used, which is an informal ‘story telling’ evaluation approach that involves asking respondents about their perceptions of the most significant changes resulting from a project.

Purposive sampling, also known as judgmental, selective or subjective sampling, relies on the judgment of the researcher when selecting the respondents, organizations, reports or pieces of data that are to be studied. Unlike probability sampling techniques, the goal of purposive sampling is not to randomly select units from a population to create a sample with the intention of making generalizations from that sample to the population of interest. The main goal of purposive sampling is to focus on particular characteristics of a population that are of interest. Maximum variation sampling, a type of purposive sampling, was used to select the key informants based on a variety of criteria, including knowledge of the project and its benefits. Maximum variation sampling enables the capture of a wide range of perspectives to gain greater insight into a phenomenon.

The key informants selected included teachers (29 per cent), parent members of parent teacher associations (PTA; 18 per cent), students (44 per cent) and government
representatives (9 per cent). When choosing the key informants, the consultant ensured that females were adequately represented. Out of a total of 55 respondents interviewed, 20 were female (36 per cent).

Stakeholder consultations were conducted in Honiara prior to data collection to discuss the evaluation and to identify any resources that partners could provide to assist in the evaluation (such as secondary data or documents related to the project). The stakeholders were identified by UNICEF Solomon Islands on the basis of their knowledge and participation in the SPP project, and included UNICEF, Guadalcanal PEA officers and a number of MEHRD staff. A meeting was also held with LIC, the company that was contracted by UNICEF to procure and install the solar systems.

4.3 Quality control
During the evaluation, the practices and conduct of the evaluation team were in accordance with UNICEF’s standards as outlined in the document UNICEF Procedures for Ethical Standards in Research, Evaluation, Data Collection and Analysis. Detailed below are the four main procedures included in the document and the actions undertaken during the evaluation to ensure adherence to the procedures.

4.3.1 Procedures relating to harms and benefits
Throughout the evaluation, the consultant liaised with the project coordinator at UNICEF Solomon Islands and the project officer at MEHRD regarding the best methodology to be used to minimize any negative impacts on the respondents and their communities. When choosing the key informants in the five schools in Guadalcanal, the consultant was careful to select respondents with a good understanding of the project, regardless of their social status within the community. The consultant also ensured that women, youth and school children were selected.

4.3.2 Procedures relating to informed consent
Before each interview, respondents were asked if they were comfortable participating. All respondents stated that they were comfortable participating in the interview (if a respondent were to have stated that they were uncomfortable, the consultant would have called off the interview). In the case of school children, consent was sought from their parents or guardians before the interview; the consultant also ensured that a parent, guardian or school teacher was present during the interview.

4.3.3 Procedures relating to privacy and confidentiality
Respondent details were kept confidential throughout the evaluation process, from data collection to analysis and reporting.

4.3.4 Procedures relating to payment and compensation
After consulting with the project coordinator and the project officer, the consultant decided that no payment or compensation would be provided to respondents (consistent with local practice in Solomon Islands).
4.4 Limitations
There were a number of challenges faced during data collection. First, the evaluation was conducted during the last week of the school year and the first two weeks of school holidays. Some key MEHRD staff were on annual leave, especially those who manage the education information system. To ensure the collection of all required secondary data, the consultant retrieved hard copies stored at MEHRD and manually entered data. Second, while the majority of teachers were still in the school compounds and available for interviews, it was more difficult to interview the desired number of parents and solar champions as some were busy during the day of the visit. Follow-up visits were conducted to ensure they were interviewed. Because students were on holiday, they were interviewed in their communities. Finally, the remoteness of Tenakoga, Rate and Betivatu, coupled with difficult access due to heavy rain, made a second day of interviews in these areas impossible. Arrangements were therefore made for stakeholders from these areas to be interviewed during one of their trips to Honiara. Even though these challenges affected the timing of data collection, the consultant concluded that they did not impact the effectiveness of the evaluation, as all required data were collected.
5. Findings

For each of the evaluation areas, a summary score from 1 to 9 was assigned.

Table 1: Description of evaluation scores

<table>
<thead>
<tr>
<th>Overall Impact or Criterion Strength</th>
<th>Score</th>
<th>Descriptor</th>
</tr>
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<tbody>
<tr>
<td>Low</td>
<td>1</td>
<td>Poor</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Fair</td>
</tr>
<tr>
<td>Medium</td>
<td>3</td>
<td>Satisfactory</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Good</td>
</tr>
<tr>
<td>High</td>
<td>5</td>
<td>Very good</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Excellent</td>
</tr>
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</table>

The summary score for each evaluation area is included in Table 2. The score for each area was based on the performance of the various variables within the area. Overall, the project scored very positively.

Table 2: Summary score for each area

<table>
<thead>
<tr>
<th>Evaluation area</th>
<th>Score</th>
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<tr>
<td>Relevance</td>
<td>6</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>5</td>
</tr>
<tr>
<td>Efficiency</td>
<td>4</td>
</tr>
<tr>
<td>Sustainability</td>
<td>4</td>
</tr>
<tr>
<td>Equity-focus</td>
<td>4</td>
</tr>
<tr>
<td>Quality of project design</td>
<td>5</td>
</tr>
<tr>
<td>Quality of project implementation</td>
<td>4</td>
</tr>
<tr>
<td>Cross-cutting issues</td>
<td>5</td>
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</tbody>
</table>

5.1 Relevance

Overall, the evaluator concluded that the project was highly relevant to the needs of the target groups and was aligned with national, regional and international policies and UNICEF’s mandate. The relevance component of the evaluation examined the appropriateness of the project’s objectives to the problems, needs and priorities of the targeted schools.

Prior to the project, all target schools lacked a proper and consistent power supply system. The main sources of lighting prior to the project were kerosene lanterns and generators. Respondents were asked whether those sources were sufficient (bright and reliable) in meeting their needs. The majority of the respondents (74 per cent) stated that
these lighting sources were “not sufficient at all”, while 18 per cent indicated that they were “not sufficient”. Only 8 per cent of interviewees stated that the pre-project lighting was “sufficient”.

From a policy perspective, the project was aligned with the Solomon Islands National Education Action Plan (SINEAP). Goal 1 of SINEAP outlines the need for equitable access to education through:

- Infrastructure development and renovation to improve equitable access to safe learning environments for students, including for children with special needs.
- Improved systems and additional well-qualified staff are required to plan, manage and monitor proposed infrastructure development for all levels of education.
- Supply of adequate numbers of teaching and learning materials and equipment to create engaging and demanding learning environments, which foster development and learning.

At the regional level, the project was aligned with the Pacific Education Development Framework (PEDF), a regional framework endorsed by all Pacific Ministers of Education and developed to guide Pacific Island Countries to further develop access to quality education. At the international level, the project supported the achievement of Millennium Development Goal (MDG) 2, the achievement of universal primary education.

5.2 Effectiveness
As described below and shown in Appendix E, the majority of project targets were achieved. In addition to the planned outcomes, the project also had a number of other benefits. The effectiveness component assessed the extent to which the project attained its planned outputs and outcomes.

5.2.1 Outputs
All project outputs were achieved. According to the technical evaluation report, which was supported by interviews with key informants, solar systems have been successfully installed in the five schools in Guadalcanal province.

In September 2013, 18 teachers and community representatives from the five primary schools in Guadalcanal received training on the management and monitoring of solar power systems. Three education officers also attended the training workshop. The training was designed to equip the trainees with the basic knowledge and skills needed to ensure that facilities are used and maintained optimally.

The third planned project output was the establishment of a fully operational backup, maintenance and monitoring system. The original backup/monitoring system designed
by the contractors was found to be ineffective. Therefore, a new system was designed, including the in-depth training of local electricians in each of the target areas.

5.2.2 Short-term outcomes
The majority of the planned short-term outcomes were achieved. All targeted schools have an operational solar system that is meeting the needs of the beneficiaries by powering classroom lights and fans. Two staff houses per target school have also been equipped with solar power.

Staff were trained on basic system maintenance and reporting at all five schools. While 100 per cent of faults in the five schools were reported, maintenance was found to be weak, with none of the reported faults attended to or repaired within a month.

5.2.3 Medium-term outcomes
Respondents from all five schools in Guadalcanal province stated that there was an improvement in school committee meeting attendance and in the sense of ownership and responsibility among members. This outcome is very important as the proper functioning of the schools depends heavily on these committees. However, more analysis is needed to determine whether the improvements can be attributed to the project.

All teacher respondents stated that they now have enough hours of light to prepare teaching material. The availability of solar lighting has enabled teachers to prepare lessons in the evening. On average, each teacher now spends an extra 6.7 hours per week on lesson preparation, an increase of more than 30 per cent from baseline.

After the installation of solar-powered lighting, as part of preparation for the SISTA exams for Year 6 students, teachers organized evening classes and daily study sessions a few weeks before the exam. The teacher respondents from confirmed that most or all of the Year 6 students attended the evening study sessions.

The original backup/monitoring system designed by the contractors was found to be ineffective. For instance minor faults persisted for more than one month in Betivatu, Aruligo and Titige. Therefore, a new system was designed, including the in-depth training of local electricians in each of the target areas.

5.2.4 Long-term outcomes
According to the teacher and student respondents, the project improved the teaching and learning environments by providing good lighting and temperature control in schools. In a recent study by UNICEF Pacific (forthcoming), schools provided with solar power showed a higher incidence of “clearly observed” ratings (statistically significant at .05 level or lower) for a number of questionnaire items, including:
• Teacher clearly states lesson topic/objective;
• Teacher uses visual aids/manipulatives to demonstrate/explain;
• Teacher circulates to support or correct;
• Teacher works with individuals or small groups; and
• Teacher lets girls and boys participate equally.

While a correlation between solar power and a single questionnaire item may be suspected of being coincidental, a positive correlation between solar power and five items, all of which can be seen as fundamental practices, lends more weight to the conclusion that the correlation is authentic. It was beyond the scope of the baseline study to investigate how the schools were selected for solar installation and the circumstances under which solar panels were installed. UNICEF may therefore wish to explore the potential mechanism by which solar power could have had a positive effect on teaching practices, whether via the selection criteria for solar installations, through the availability of electricity, or through the influence of the partnership with the organization(s) providing the solar installations.

Results from SISTA exams after one year of project implementation show an improvement in student performance (see details below). While this is likely the result of many factors, the project allowed teachers to do more lesson preparation and for children to study longer and more effectively and is therefore likely to be at least partly responsible.

![Figure 1: Overall average mark for SISTA exam](chart)

Figure 1 shows the average mark for the five schools in Guadalcanal province in 2011, 2012 and 2013. Betivatu and Titinge show a dramatic increase in 2013, the first year of project implementation, while Rate and Aruligo show slight increases. Only Tenakoga
shows a decrease in the average mark in 2013. The average for the five schools shows a significant increase from 55 per cent in 2012 to 59 per cent in 2013.

In terms of the SISTA pass rate, Figure 2 shows that Betivatu, Titinge and Rate significantly improved in 2013, while Aruligo witnessed a slight improvement. While there was a decrease in Tenakoga, the five-school pass rate increased significantly from 61 per cent in 2012 to 73 per cent in 2013.

Figure 3 shows that the average English mark increased in Betivatu, Tenakoga and Rate in 2013. The average mark decreased in Titinge and remained the same in Aruligo. The five-school average increased from 57 per cent in 2012 to 60 per cent in 2013.
All five schools showed an improvement in the English pass rate in 2013. The five-school pass rate increased from 61 per cent in 2012 to 79 per cent in 2013.

Betivatu and Titige achieved improvements in the average Math score for the SISTA exam in 2013. Average scores decreased in Aruligo and Tenakoga while there was no change at the Rate school. The five-school average increased from 55 per cent in 2012 to 58 per cent in 2013.
Titinge recorded the highest increase in average pass rate for the Math SISTA exam in 2013. Betivatu also achieved a significant improvement between 2012 and 2013. While the pass rate decreased for the other three schools, the five-school pass rate increased from 62 per cent in 2012 to 65 per cent in 2013.

There was an increase in the average mark for the SISTA general paper for all schools, except Tenakoga, which experienced a slight decline. The five-school average increased from 54 per cent in 2012 to 59 per cent in 2013.
All schools except Tenakoga recorded an increase in the pass rate for the SISTA general paper in 2013. The five-school pass rate increased from 59 per cent in 2012 to 73 per cent in 2013.

5.2.5 Other outcomes
In addition to the planned outcomes, the project also had a number of other benefits:

- **More quality teaching time:** All teacher respondents indicated that they now have more quality teaching time with students as a result of the fans installed in each classroom. Prior to the project, children would often spend the first 20 minutes after recess and lunch break to fan and cool themselves using paper and cardboard. Since there are three breaks per day, the fan cooling system has enabled teachers and students to acquire an extra hour of quality teaching time each day.

- **Support for teacher professional development:** According to teacher respondents, most of the teachers in the five schools have been taking distance-learning courses to upgrade their qualifications. The provision of reliable lighting in the evenings has enabled them to do their assignments and study more effectively.

- **New and innovative teaching modes:** According to teacher respondents, the availability of electricity has allowed teachers to innovate with information and communications technology (ICT) in the classroom. In Betivatu, the school bought 10 laptops from its government school grant. In Aruligo, nearly all teachers have bought their own personal laptops that they use in presenting lessons and class preparation. The schools have prioritized the procurement of projectors to assist in classroom teaching.

- **Cost savings:** Prior to the project, generators were used to supply power to three of the five schools in Guadalcanal, while two had no power supply at all.
analysis assumed that the average cost of a school generator is approximately equal to the cost of the installed solar system. The average daily cost of fuel to run the generators was approximately SBD$25 (~USD$3) per school, increasing to around SBD$40 per day when teachers and students prepared for exams. The respondents from the three schools that previously used generators mentioned that they no longer incur these costs and the money saved is now used in other ways.

- **Community benefits:** Nearby communities also benefited from the project. At Titinge, a women’s group that focuses on livelihood and economic development has been using the school for meetings and training sessions. In all communities, church groups in the area have been able to host some of their night programmes at the schools. Youth, a vulnerable group in rural communities in Solomon Islands, benefited through access to electricity to charge phones, laptops and electronic equipment. Youth in Betivatu and Rate use the solar system to power their public address system during their weekly soccer tournament. In Tenakoga, youth are now able to record songs with a computerized recording system.

- **Improved community respect for schools:** The majority of respondents (85 per cent) indicated that the project positively changed the way surrounding communities perceive the primary schools. Prior to the project, the schools were often seen by members of the surrounding communities who are not parents or members of the school committee or PTA as separate institutions that they had no responsibility for or relationship with. In some cases youth would loiter around the school compound, drink liquor within school premises or even break into classrooms and steal valuable property. The evaluation respondents noted that these attitude changed after the implementation of the project, with community members showing more respect for and attaching more value to the school and its property. This was seen as the result of the secondary benefit that the community members received from the project, such as allowing community members to charge their phones and electronic items using the school solar system. Respondents also noted increased support from community members when the school organized a fundraising drive or requested assistance cleaning the school compound.

### 5.3 Efficiency

Overall, the project was found to be efficient. One of the major contributions to this efficiency was UNICEF’s approach to strategically partner with MEHRD and organizations with the required technical expertise to undertake project activities. The efficiency component of the evaluation focused on how economically resources, including time, funds and expertise, were converted into project outputs and outcomes.
After a transparent and comprehensive bidding process, in January 2013 UNICEF awarded contracts for the provision and installation of the solar power systems to LIC and Willies Solar and Electrical Company (WE). LIC has a good track record implementing projects with the World Bank, European Union, the Secretariat of the Pacific Community and other UN agencies, and has experience working with remote communities in Solomon Islands and other Pacific Island Countries. WE has over 13 years of experience in installing off-grid solar power systems in remote areas of Solomon Islands and Papua New Guinea. The contract with LIC included only a construction component. However, from the beginning of the project David Leeming took responsibility for some of the management tasks (such as overseeing project implementation). As a result, UNICEF did not hire an additional project manager as was stipulated in the project design documents. The funds earmarked for the project manager were instead used for in-depth technical training.

Although project implementation was on track throughout, the expenditure of project funds in the first reporting period was lower than expected as a result of an informed decision by UNICEF to strengthen risk management by targeting only the five target schools in Guadalcanal province in the first year of the project. After a technical evaluation confirmed high standards in Guadalcanal, work commenced in the five schools in Choiseul province in early 2014.

The efficiency of the procurement process was aided by LIC’s suggested deviations from the proposed equipment list (made on the basis of availability and reliability of equipment):

- Use of 250-watt solar panels instead of 200-watt panels, while maintaining the planned total wattage.
- Use of Jinko brand panels instead of Astronergy brand.
- Use of light-emitting diode (LED) lights throughout, instead of the partial use of compact fluorescent lamp (CFL) lights.
- Use of wall-mounted oscillating fans with wire safety cages instead of ceiling mounts (the classrooms have low roofs and there was a safety issue with unprotected fans).
- Use of 520 amp-hour (AH) gel batteries instead of 550Ah (due to the unavailability of 550Ah cells).

Savings were realized around the procurement of solar power equipment as a result of the depreciation of the Australian dollar (all solar power equipment were procured from Australia).

One of the major challenges faced by the project, which caused delays in the initial stages, was the assignment of project operation to a staff member at MEHRD’s
Infrastructure Coordination Unit (ICU), who had pre-existing responsibilities within the unit. Recognizing the slow progress, UNICEF and MEHRD recruited a dedicated project officer in early 2014, who was then based within MEHRD’s Assets Management Unit (AMU).

5.4 Sustainability
The sustainability component of the evaluation assessed the likelihood of the continuation of outputs and outcomes after project cessation. Overall, the project has a good chance of attaining long-term sustainability due to the following activities conducted during project implementation:

- **Intensive site selection and community engagement process**: MEHRD, UNICEF and PEA officers collaborated closely in selecting 10 disadvantaged primary schools in Guadalcanal and Choiseul provinces for project support. While the selection process was largely ‘top down’, efforts to generate community support and involvement contributed to a strong sense of ownership, resulting in care and maintenance of the solar powers by community members.

- **Training for solar champions and community solar technicians**: An orientation training was held in July 2013 in Honiara for the community solar champions nominated by each of the five target schools in Guadalcanal. The training was organized to brief them on project objectives and their roles and responsibilities. In September 2013, 18 teachers and community representatives from the five Guadalcanal schools received training in the management and monitoring of the solar power systems. Three PEA officers also attended the training.

- **In-depth technical training**: In March 2015, an electrician from each of the target schools attended an in-depth technical training session on the operation and repair of the solar systems. These electricians will assist the schools to address technical problems that may occur in the future.

- **Development, production and distribution of a maintenance manual**: The project contractors developed a manual that explains the monitoring, maintenance and backup of the solar power systems in detail and is accompanied by forms for capturing data. The manual has been distributed to the five schools in Guadalcanal province.

- **Maintenance allocation from school grant**: All schools have indicated that maintenance costs will be included in their 2015 annual budgets. At the time of the evaluation Aruligo Primary School had finalized its 2015 budget proposal and allocated SBD$15,000 (~USD$1,900) for maintaining their solar power equipment.

- **Maintenance backup plan**: A monitoring, maintenance and backup system was designed by the contractors in close consultation with the project team (see Appendix F). In October 2014, teachers, community champions and the solar management committee from each school were trained to monitor the solar power supplies, conduct periodic inspections and report faults.
While prospects for project sustainability are good, there are minor issues that need to be addressed by the relevant project partners, including:

- **Disconnect between the project and MEHRD’s Assets Management Unit**: The solar equipment installed in the five schools in Guadalcanal province is not yet included in the AMU’s list of assets. Therefore, the evaluator perceived that the unit does not have ownership of the systems and lacks a vision for long-term sustainability.

- **Absence of a Memorandum of Agreement (MOA) between relevant stakeholders**: All beneficiary schools in Choiseul province have signed an MOA with UNICEF and MEHRD, highlighting the roles and responsibilities of the partners in the maintenance and supervision of the project facilities. However, there is no MOA between relevant stakeholders in Guadalcanal province.

- **Unattended maintenance needs**: At the time of the evaluation there was a maintenance need (e.g. either a fan or bulb not operational) unattended for more than a month in each of the five schools in Guadalcanal province. According to the teacher respondents, the faults had been reported to the community/school technicians. However, no action had yet been taken.

- **Unregulated use of the facility**: None of the schools have a usage plan for the solar facilities and it has been noted that members of the community use the facility after gaining permission from any of the teachers within the school compound.

### 5.5 Equity

According to UNICEF, “equity means all children have an opportunity to survive, develop, and reach their full potential, without discrimination, bias or favouritism”. This interpretation is consistent with the Convention on the Rights of the Child (CRC), which guarantees the fundamental rights of every child, regardless of gender, race, religious beliefs, income, physical attributes, geographical location or other status. In this context, the equity component of the evaluation assessed the extent to which the project promoted equitable access to education and learning for the beneficiaries (the approximately 1,200 students 5 to 15 years of age who attend the 10 target schools).

The results of the evaluation show that the project promoted equitable access to education and that it did not encourage inequality. The process through which the beneficiary schools were selected was designed to help ensure equity. After initial discussions with MEHRD, it was decided to target schools in Choiseul and Guadalcanal provinces to ensure an adequate mix of modern (Choiseul) and older (Guadalcanal) school buildings. In addition, Choiseul schools tend to be remote and accessible only by boat, whereas Guadalcanal schools are accessible by road. After the provinces were determined, the 10 beneficiary schools were selected following an application process from short-listed schools, in which the following information was required:
School size and current infrastructure;
School committee makeup, capacity and engagement in the management of the school;
Willingness to contribute financially to the ongoing maintenance of the installed infrastructure;
Suggestions from the schools on how they would fund system maintenance;
Suggestions from the schools on how they would include women in the operation, maintenance and monitoring of the installed systems;
Local capacity around solar power;
How schools would regulate the use of power points for additional appliances;
Whether the school has Internet or mobile phone access (not used as a determinative factor but asked as connectivity would ease project communications); and
Amount of time spent by teachers on educational activities outside school hours (collected to provide baseline information).

With regard to gender equity, the ratio of girls and boys in primary schools in Solomon Islands is 0.96:1, so both girls and boys should have benefited relatively equally from the project. Female teachers, school committee members and community members also benefited from the project.

5.6 Quality of project design
The quality-of-project-design component examined the practicality of the project in terms of implementation on the ground. Overall, the project design was found to be of good quality, with a coherent, clear and realistic intervention logic. The overall project objective (improved educational outcomes for over 1,200 primary school students) was clearly and logically linked with project activities (the installation and maintenance of solar systems to provide lighting and temperature control) and the identified needs of the beneficiaries.

The main weakness of the project design was the non-consideration of variables other than classroom lighting and temperature as determinants of educational performance. A range of studies have concluded that learning is affected by numerous factors, including gender, age, quality of teaching, socio-economic status of parents and tuition rates, among other things (Graetz (1995), Considine and Zappala (2002)). Given the myriad factors that affect educational performance, the evaluation concluded that a cautious approach needs to be taken in linking project activities with changes in test results.

5.7 Quality of project implementation
This component of the evaluation assessed the quality of project implementation and examined the interactions/negotiations between project partners. Overall, project implementation was found to be successful. UNICEF’s decision to partner with MEHRD
and LIC significantly contributed to this success by ensuring that the required technical expertise was available.

Less positively, project implementation was slow in the initial stage due to the top-down approach used in the selection of the target schools. The selection process included extensive consultations between MEHRD, UNICEF and PEA officers in each province. A list of 16 potential schools, eight in each province, was first drawn up by MEHRD and the list was eventually cut down to ten after site visits by UNICEF and MEHRD’s ICU. As a result, it can be concluded that the project was proposed to the schools rather than the other way around. This approach may have resulted in a lack of project ownership among beneficiaries, which may affect project sustainability.

5.8 Cross-cutting issues
In addition to the core project results, the evaluation also considered how the project affected a number of cross-cutting issues. For instance, the project demonstrated exceptional commitment to gender promotion and equality. Each of the five schools in Guadalcanal province ensured that females were included in the school solar committee. Women were also nominated and trained as community-based technicians at each of the schools.

The project also helped ensure the sustainability of the environment and mitigated air pollution and greenhouse gases. Unlike electricity generated through fossil fuel combustion, solar power facilities involve very low emissions of air pollutants such as sulphur dioxide, nitrogen oxide, carbon monoxide, volatile organic compounds and carbon dioxide. Also, solar facilities do not produce noise pollution, emit any form of scent and are made out of commonly available materials (Pfenninger et al, 2014).
6. Conclusions

6.1 Relevance
The evaluation concluded that the project was relevant and appropriate for the target beneficiaries in the context of the infrastructural and educational needs of Solomon Islands. In addition, the project was aligned with national, regional and global policies.

6.2 Effectiveness
The project yielded positive results to the target beneficiaries. The project has also proven that solar power is one of the cheapest and most reliable energy sources available in Solomon Islands, especially in the country’s remote and outer island communities. The evaluation concluded that the project reached most of its expected outcomes, including more study time for students, increased teacher preparation time and improved exam results. Furthermore, the project had some important unexpected impacts on those living nearby, such as improving their ability to charge laptops and phones.

6.3 Efficiency
Overall, the project was found to have been efficiently implemented, economically turning project inputs into results and outputs and outcomes. UNICEF’s decision to partner with MEHRD and technical service providers significantly contributed to this efficiency.

6.4 Sustainability
While the project has a good chance of attaining long-term sustainability, the evaluation concluded that without a range of continuing support from UNICEF, government agencies and other partners, there is a risk that many of the benefits of the project will not be sustainable. Capacity, systems and funding for the maintenance of the solar systems will be especially important in this regard.

6.5 Equity
The evaluation concluded that the project promoted equitable access to education for the targeted beneficiaries and that it did not encourage inequality. The results of the project equally benefited the targeted students and teachers regardless of gender or socio-economic status.

6.6 Quality of project design
The project design was found to be of good quality, with a coherent, clear and realistic intervention logic. The overall project objective was clearly and logically linked with project activities and the identified needs of the beneficiaries. The main weakness of the project design was the non-consideration of variables other than classroom lighting and temperature as determinants of educational performance.

6.7 Quality of project implementation
Project implementation was found to be successful. UNICEF’s decision to partner with MEHRD and LIC significantly contributed to this success by ensuring that the required
technical expertise was available. Less positively, project implementation was slow in the initial stages due to the top-down approach used in the selection of the target schools.

6.8 Cross-cutting issues
The project demonstrated exceptional commitment to gender promotion and equality. The project also helped ensure the sustainability of the environment and mitigated air pollution and greenhouse gases.
7. Lessons learned

- Establishing a framework through which project partners could work together helped ensure the achievement of project outputs and outcomes.
- Each project partner had specific resources and capacities that the others lack. For instance, LIC is very specialized in the technical aspects of solar systems, while MEHRD has the capacity and mandate to improve the education system in Solomon Islands.
- A bottom-up approach should be adopted throughout all phases of grassroots projects. Implementation of the SPP project highlighted the difficulties faced when using a top-down approach in the planning, implementation and monitoring of community-based projects. For instance, system monitoring and reporting protocols were designed by the contractor and given to the schools without their input. As a result, these protocols were largely ignored.
- The roles and responsibilities of all project partners should be clear and understood from the beginning. Since there were many partners involved in the project, the roles and responsibilities of each could have been clearer, helping ensure ownership and facility maintenance.
8. Recommendations

The recommendations are organized into three categories. The order of the category and recommendations within each category reflects the urgency of each recommendation.

8.1 Sustainability

- MOAs should be established between UNICEF, MEHRD and the schools in Guadalcanal province before the end of the project to ensure that the schools have ownership of the solar facilities and that they take an active role in their operation and maintenance. The MOAs should clearly state the roles and responsibilities of each stakeholder.
- The stability and mobility of project stakeholders, especially at the community level, affected knowledge retention and sustainability. For instance, a number of people trained on solar maintenance are no longer available. Additional trainings are needed before the end of the project to capacitate those people who are newly responsible.
- UNICEF and project partners should facilitate further training to empower system users to identify and mitigate problems before the end of the project. This would enhance the overall sustainability of the programme by increasing response times to system outages, increasing ownership of the system within the community and providing contractors with better information should more difficult problems arise.
- MEHRD’s AMU should include project equipment in their list of school assets. UNICEF should assist in the proper commissioning and handing over of the systems to MEHRD.

8.2 Policy

- UNICEF should undertake pro-active advocacy work to ensure that MEHRD and MMERE adopt policies supporting the expansion and replication of project activities in other areas in Solomon Islands.
- UNICEF should maintain the collaborative approach when developing and implementing similar initiatives in the future. Partnerships with government departments, communities, non-governmental organizations (NGOs) and the private sector ensure that different capacities, ideas and perceptions are available.

8.3 Future implementation

- UNICEF should ensure that the roles and responsibilities of all parties in any similar initiative are clear and understood from the initial stage to ensure a strong governing structure and the sustainability of results.
- The project has proven to provide benefits to children of the five schools and also to nearby communities. The expansion of similar initiatives to other parts of
Solomon Islands would help improve children’s educational outcomes. UNICEF should support a separate cost-benefit analysis that will provide the right evidence for scaling up solar power in schools in Solomon Islands.

- During the implementation of the project, the approved solar power design did not match realities on the ground, necessitating the need to increase the equipment budget. Future projects should adopt a bottom-up approach throughout planning and implementation. Community support should first be mobilized, after which the appropriate systems and structures should be determined.

- To maximize the benefits of solar projects to students, small solar systems should be installed at individual homes rather than at schools. The majority of students who attend the beneficiary schools reside far from the school premises and are not able to utilize the facility after hours.

- Other external variables that can determine project performance should be considered when designing future projects. In the SPP project, the main weakness of the project design was the non-consideration of variables other than classroom lighting and temperature as determinants of educational performance.
9. Works cited


## Appendices

### Appendix A: Beneficiary schools and communities in Guadalcanal province

<table>
<thead>
<tr>
<th>School</th>
<th>Ward</th>
<th>Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenakoga Primary School</td>
<td>16- Aolo</td>
<td>● Nunughu</td>
</tr>
</tbody>
</table>
|                     | 17- Paripao | ● Gezar  
                     |               | ● Qoveu  
                     |               | ● Selapari  
                     |               | ● Sovekau  
                     |               | ● Rerede  |
| Aruligo Primary School | 2- Saghalu | ● Doma  
                     |               | ● Tarou  
                     |               | ● Gorabau  
                     |               | ● Settlements along the coast  
                     |               | ● Barevo  
                     |               | ● Vatukulau  
                     |               | ● Taraboru  
                     |               | ● Visale  |
|                     | 3- Savulei | ● Naro  |
|                     | 4- Tangarare | ● Poneqe  
                     |               | ● Vura  
                     |               | ● Taboko  
                     |               | ● Barevo  |
|                     | 6- Duidui | ● Duidui  |
| Titinge Primary School | 1- Tadai | ● Titige  
                     |               | ● Valeato  
                     |               | ● Taba  
                     |               | ● Watadam  
                     |               | ● Tasahe  
                     |               | ● Vereva  
                     |               | ● Kogulai  
                     |               | ● Arahei  
                     |               | ● Bethel  
                     |               | ● Aroputi  |
| Rate Primary School | 20- Malango | ● Tiwa  
                     |               | ● Horotu  
                     |               | ● Uramila  
                     |               | ● Katihana  
                     |               | ● Marava  
                     |               | ● Vatupaua  
                     |               | ● Namanu  |
| Betivatu Primary School | 12- Birau | • Kabikabi  
| | | • Valesala  
| | | • Namopila  
| | | • Manaqi  
| | | • Koqa  
| | | • Grasshill  
| | | • Haimane  
| | | 20- Malango | • Birau | • Chichinge  
| | | | • Namarani  
| | | | • Sugina  
| | | | • Mataruka  
| | | | • Pamphilia  
| | | | • Koleula |
Appendix B: Logic model

Priorities
NEAP 2013-2015
Achieve equitable access to education; improve the quality of education and manage and monitor resources efficiently and cost-effectively in Solomon Islands

Inputs
- Funding
- Project staff
- UNICEF, MEHRD, LIC and WE partnership
- School committees and communities

Activities
1. Solar systems installed in 10 primary schools
2. Community agreements signed and implemented
3. Centralized system for ongoing maintenance established
4. Service agreement signed
5. Training delivered

Target
~ 1,200 school children in 10 schools

Outputs
- Classrooms have lighting and fans
- Staff houses have lighting and fans
- School staff are meeting the basic maintenance and reporting needs of the solar power systems
- Focus on children (and on women and vulnerable groups)

Outcomes-impacts
- Improved teaching and learning environment in schools
- Greater engagement of school committees within school management
- Backup/monitoring system meeting the needs of schools
- Teachers spend more time on school-related activities

Theory of change
(A= assumptions, R=risks)
A: Resources are sufficient to accomplish all activities
- Resources are consistent with needs
- Funding cutbacks
- Changing priorities
- Host community’s buy-in diminishes
R: Lack of interest from stakeholders towards certain activities

Educational outcomes improved

A: The group targeted by the activities is reached/involved/participates

A: The information and learning will transfer into action from targeted group
- Knowledge and resources available are not used to the fullest

A: Programme assumes target population want to participate
- Target population will not necessarily desire change
Appendix C: Project Documents reviewed

7. SPP Project Officer Progress Report, August 2014.
8. SPP Project Officer Progress Report, September 2014.
9. SPP Project Officer Progress Report, October 2014.
## Appendix D: Evaluation respondents

<table>
<thead>
<tr>
<th>School</th>
<th>Respondents</th>
</tr>
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</table>
| Betivatu Primary School and Betivatu Community High School | Head-teacher/Teacher  
Teacher  
Parent 1  
Parent 2  
Parent/Community solar champion  
Student 1  
Student 2  
Student 3  
Student 4  
Student 5 |
| Rate Primary School and Rate Community High School | Head-teacher/ Teacher  
Parent/Community solar champion  
Teacher  
Deputy Principal/ Teacher  
Teacher  
Parent  
Student 1  
Student 2  
Student 3 |
| Titige Primary School | Teacher  
Head-teacher/ Teacher  
Teacher  
Parent/Community solar champion  
Parent 1  
Parent 2  
Student 1  
Student 2  
Student 3  
Student 4  
Student 5 |
| Araligo Primary School | Head-teacher  
Teacher 1  
Teacher 2  
Teacher 3  
Parent/Community solar champion  
Student 1 |
<table>
<thead>
<tr>
<th>Tenakoga Primary School</th>
<th>Parent/community solar champion</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Deputy Principal/ Teacher</td>
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<tr>
<td></td>
<td>Head teacher</td>
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<td>Teacher</td>
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<td>Student 1</td>
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<td>Student 6</td>
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<td>Student 7</td>
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<td>Education Officer, UNICEF</td>
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<td></td>
<td>Project Officer, MEHRD</td>
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<tr>
<td></td>
<td>Chief of Guadalcanal province</td>
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<tr>
<td></td>
<td>MEHRD Solomon Islands Education Management Information System Officer</td>
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<tr>
<td></td>
<td>MEHRD National Examination System Unit Officer</td>
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### Appendix E: Results measurement table

<table>
<thead>
<tr>
<th>Planned Result</th>
<th>Indicator</th>
<th>Target</th>
<th>Baseline</th>
<th>Actual Result</th>
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<tbody>
<tr>
<td><strong>Outputs</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Solar power systems installed in 10 primary schools</td>
<td># of primary schools with fully operational solar power systems</td>
<td>10</td>
<td>0</td>
<td>According to the technical evaluation report, supported by interviews with key informants, solar systems have been successfully installed in the 5 schools in Guadalcanal province. The installation of solar systems in the five schools in Choiseul province have not been assessed as part of this SPP evaluation.</td>
</tr>
<tr>
<td>School committees, teachers and PEA staff trained on the operation, maintenance and monitoring of solar power systems</td>
<td># of school committees and PEA staff with capacity to operate and maintain solar power systems. # of accurate log books kept up-to-date by schools.</td>
<td>10 school committees and 4 PEA staff</td>
<td>Some community members had limited knowledge of operation of solar power systems. 10 up-to-date log books</td>
<td>Eighteen teachers and community representatives from the five Guadalcanal primary schools who are part of the school committees received training on the management and monitoring of solar power systems in September 2013. Three PEA staff also attended this training workshop in September 2013. Quantitative data not available.</td>
</tr>
<tr>
<td>A fully operational backup, maintenance and</td>
<td>An accessible, centralized system for support to school solar power</td>
<td>Centralized backup system operational by July 2013</td>
<td>No backup system in place</td>
<td>The original backup/monitoring system designed by the contractors was found to be ineffective. Therefore, a new system was</td>
</tr>
</tbody>
</table>
monitoring system in place by 2013 systems is operational. # of school log books with system monitoring information. # of faults reported and repaired within 4 weeks 10 90% designed, including the in-depth training of 10 local electricians in the 10 target areas. Quantitative data not available. Qualitative data collected through this evaluation suggest that none of the reported faults are repaired within 4 weeks.

<table>
<thead>
<tr>
<th>Short-term Outcomes</th>
<th># of hours of lighting and fans per day</th>
<th>% of lights or fans used</th>
<th>% of maintenance activities recorded in system log book</th>
<th>% of faults reported</th>
<th>% of maintenance or reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary classrooms have lighting and fans to meet their needs</td>
<td>6</td>
<td>No lights or fans used</td>
<td>No maintenance or reporting</td>
<td>100%</td>
<td>All faults in the five targeted schools were reported.</td>
</tr>
<tr>
<td>School staff are meeting the basic maintenance and reporting needs of the solar power systems</td>
<td></td>
<td></td>
<td>Quantitative data on recording system log book activities is not available.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No lights or fans used. All faults in the five targeted schools were reported.
Staff houses have lighting and fans to meet their needs | Number of hours of lighting and fans per day | 6 hours of lights, 9 hours of fans | No lights or fans used | Qualitative data collected through this evaluation indicate that all 10 staff houses in the 5 targeted schools have operational solar systems installed that are meeting the needs of the beneficiaries.

### Medium-term outcomes

| Greater engagement of school committees within school management | % of school committee members attending meetings | 90% | Various | Qualitative data collected through this evaluation indicate that respondents from all 5 schools stated that there was an improvement in school committee meeting attendance and in the sense of ownership and responsibility from the members. |
| % of school management meetings attended by school committee | 90% | | | |
| Number of school development plans completed on time. | 10 | | | |

Teachers spend more time on school-related activities (e.g. class preparation) | Number of hours teachers spend outside school hours on school-related activities | 30% increase | Various | All teacher respondents stated that they now have enough extra hours to prepare teaching material. The availability of solar lighting has enabled teachers to prepare lessons in the evening. On average, each teacher now spends an extra 6.7 hours in a week on lesson preparation, an increase of more than 30% from baseline. |
The backup/monitoring system is meeting the needs of schools

| % of faults fixed within 4 weeks | 90% | No system in place | Qualitative data collected through this evaluation suggest that none of the reported faults are repaired within 4 weeks. The backup/monitoring system designed by the contractors was found to be ineffective. For instance minor faults persisted for more than one month in Betivatu, Aruligo and Titige schools. Therefore, a new system was designed, including the in-depth training of 10 local electricians in the 10 target areas. |

| Long-term outcomes |

| Students’ educational outcomes are improved | Education indicators (e.g. school enrolment, attendance, test results, % remaining to final year) | 25% improvement | Various (see figures in Effectiveness section) | Quantitative data on education indicators is not available, but SISTA exam results show some improvement in student learning outcomes in 2013, the first year of SPP project implementation. Further monitoring and robust data are needed to be able to attribute the improvements to the project. |

| Improved teaching and learning environment (good lighting and temperature control) | % of teachers and students reporting better temperature control and lighting in school | 80% | No lighting or temperature control | All teacher and student respondents from the five Guadalcanal schools stated that they now have better temperature control and lighting in school as a result of the project. |
Appendix F: Maintenance backup plan

### Appendix G: Questionnaires

<table>
<thead>
<tr>
<th>Project Site (Primary School name)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of interview</td>
<td></td>
</tr>
<tr>
<td>Name of respondent</td>
<td></td>
</tr>
<tr>
<td>Sex: Male (1) Female (2)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>Project/community status</td>
<td></td>
</tr>
</tbody>
</table>

#### General Questions

1. How long have you been living in this community? ________ years

2. What is the main event/change/infrastructural development that has taken place in this area in the year 2014?
   - School solar project
   - WASH project
   - Natural disaster
   - Road improvement
   - Political event
   - Other (please specify)

3. How has the event/change/infrastructural development affected the community?
   - Very positively
   - Positively
   - No change
   - Negatively

4. How do you see the future of this community and its people in relation to the social impacts of the event/change/infrastructural development?
   - Very optimistic
   - Optimistic
   - Has no effect on future
   - Pessimistic

#### Questions to Head teachers

5. Who own this primary school?
   - Single community (Name please)
   - Group of communities (Name please)
   - Church group (Name please):
   - Government
   - Private owned
   - Others (please specify)

6. Who are the members of the School Committee (select one only)?
   - Men and women of the community
   - Men only of the community
   - Church and community including men and women
2. Has there been any committee formed to oversee the operation and management of the SPP solar system? If YES, who are the members?

| 1. No                                      | 2. Men and women of the community | 3. Men only of the community |
| 4. Church and community including men and women | 5. Church and community excluding women | 6. Government, church and community including men and women |

3. What was the primary source of lighting in the primary school before SPP project? (Please circle applicable)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Candle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. Overall, was the source sufficient for the school needs?

<table>
<thead>
<tr>
<th>1. Very sufficient</th>
<th>2. Sufficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Not sufficient</td>
<td>4. Not sufficient at all</td>
</tr>
</tbody>
</table>

5. Have you had problems with that lighting source (broken, supply)?

6. What tasks/jobs/chores/hobbies do the school unable to conduct using the previous lighting source? Please explain:

**Questions to all teachers including the head teacher**

7. Overall, how do you see the overall impact of the SPP project on education as a whole in your school?

<table>
<thead>
<tr>
<th>1. Very positive</th>
<th>2. Positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No change at all</td>
<td>4. Negative</td>
</tr>
<tr>
<td>2. Very negative</td>
<td></td>
</tr>
</tbody>
</table>

8. As a teacher, how has the SPP project affected the availability of hours in preparing teaching materials and class presentations? If answer 1 or 2, proceed to Q. 8 otherwise move to Q. 9.

<table>
<thead>
<tr>
<th>1. More than enough hours</th>
<th>2. Some hours</th>
</tr>
</thead>
</table>
3. No change

4. Less hours

9. How many hours more in a week are you able to conduct preparatory work for teaching materials and class presentations? ____ hours

10. How has the SPP project affected accessibility to educational new teaching materials/tools?
   1. Greatly improved
   2. Improved
   3. No change
   4. Decreased
   5. Decreased a lot

11. How has the SPP project affected the time spent by teachers in the print/photocopy of any documents related to teaching/exams etc.?
   1. Reduced dramatically
   2. Reduced
   3. No change
   4. Increased
   5. Increased a lot

12. How has the SPP project affected the cost incurred by teachers in the print/photocopy of any documents related to teaching/exams etc.?
   1. Reduced dramatically
   2. Reduced
   3. No change
   4. Increased
   5. Increased a lot

13. How has the SPP project affected accessibility to educational new teaching materials/tools?
   1. Very easy to access
   2. Easy access
   3. No change
   4. Difficult
   5. Very difficult

14. How has the SPP project affected the conditions, in terms of temperature control of the teaching environment?
   1. Greatly improve the conditions
   2. Improve the conditions
   3. No change
   4. Decrease the conditions
   5. Worsen the conditions

15. From a scale 1-10, 1 being “Not satisfied at all” and 10 being “Fully satisfied”, what’s your overall level of satisfaction in the SPP project in improving education in this school?
Questions to students

1. How has the SPP project affected your life as a student here?
   1. Very positive
   2. Positive
   3. No change at all
   4. Negative
   4. Very negative

2. What are some of the impacts (positive and negative) of the SPP project in school children?

23. How has the SPP project affected the conditions, in terms of temperature control of the teaching environment?
   1. Greatly improve the conditions
   2. Improve the conditions
   3. No change
   4. Decrease the conditions
   5. Worsen the conditions

24. As a student, how has the SPP project affected the availability of hours for doing homework and studying in the night? If answer 1 or 2, proceed to Q. 25 otherwise move to Q. 26
   1. More than enough hours
   2. Some hours
   3. No change
   4. Less hours

25. How many hours more in a week are you able to conduct preparatory work for teaching materials and class presentations? ____ hours

26. From a scale 1-10, 1 being “Not satisfied at all” and 10 being “Fully satisfied”, what’s your overall level of satisfaction in the SPP project in improving education in this school?

Questions to parents

1. How much do you, as a parent used to spend per month on making sure your kids have enough lighting to attend to schoolwork? (micro-finance/kerosene)

2. Have you had any problems with your lighting source (safety, broken, supply)? Explain:

3. What benefits have you experienced within your household as a result of the SPP project at the school? Have you noticed changes in:
   1) Income? Explain
   2) Education? Explain
   3) Available Time for your kids? Explain
4) Other well-being?

4. Have you noticed any negative effects to your household?

5. Are you seeing changes in your kid’s schoolwork and performance?

6. From a scale 1-10, 1 being “Not satisfied at all” and 10 being “Fully satisfied”, what’s your overall level of satisfaction in the SPP project in improving education in this school?

Questions to village mayor/chiefs

1. What community/social events normally occur after dark in the village? Describe:

2. How has the SPP project affected life in your community as a whole?

3. What benefits have you experienced within your household as a result of the SPP project at the school? Have you noticed changes in:
   1) Income? Explain
   2) Education? Explain
   3) Community structure and coordination? Explain
   4) Social relations? Explain
   5) Other well-being?

4. Is there any local customs or traditions that can be affected by the SPP project both positive and negative? Explain:
   How can any negative effects be minimized?

5. From a scale 1-10, 1 being “Not satisfied at all” and 10 being “Fully satisfied”, what’s your overall level of satisfaction in the SPP project in improving education in this school?
### Appendix H: Monitoring and evaluation work plan

<table>
<thead>
<tr>
<th>M&amp;E Activities</th>
<th>Approach</th>
<th>Timeline</th>
<th>Roles &amp; Responsibilities</th>
<th>Reporting &amp; deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MONITORING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Community Agreements</td>
<td>Ensure agreement documents drawn up and signed</td>
<td>07/2012 – 09/2012</td>
<td>ICU project officer</td>
<td>ICU Monthly report</td>
</tr>
<tr>
<td>Solar Panel System Installations</td>
<td>Collate number of systems installed, active and fully operational</td>
<td>10/2012 – 04/2013</td>
<td>Technical Project Manager</td>
<td>Project technical monthly report</td>
</tr>
<tr>
<td>School Committee / teachers / PEA staff training</td>
<td>Collate number of training course attendees</td>
<td>09/2012 – 04/2013</td>
<td>UNICEF Solomon Islands</td>
<td>ICU monthly report</td>
</tr>
<tr>
<td>Backup system implementation</td>
<td>Check documentation and joint agreements signed</td>
<td>0306/2013 – 06/2013</td>
<td>Technical Project Manager</td>
<td>Project progress report</td>
</tr>
<tr>
<td></td>
<td>Monitor backup processes / callouts</td>
<td>07/2013 – 06/2014</td>
<td>ICU Project Officer</td>
<td>Project monitoring reports</td>
</tr>
<tr>
<td>Solar Power System Use</td>
<td>Battery levels recorded in log book</td>
<td>Ongoing from implementation</td>
<td>Allocated members of teaching staff</td>
<td>Monthly report – school log</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Collated by ICU officer</td>
</tr>
<tr>
<td><strong>EVALUATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix I: UNICEF call for proposals

THE UNITED NATIONS CHILDREN’S FUND (UNICEF)

Invites applications for the following consultancy:

Evaluation of the Solomon Islands Solar power pilot project

UNICEF Pacific is seeking a consultant to evaluate the impact of the solar power pilot (SPP) project to-date in targeted 10 primary schools and 20 staff houses in Guadalcanal and Choiseul provinces in Solomon Islands.

The Chief of Solomon Islands Field Office will provide overall operational and administrative supervision on a day-to-day basis. In addition, the consultant will receive consultancy-related guidance from the UNICEF Pacific Chief of Education and Education Specialist in close consultation with the Education Officer based in Solomon Islands. The consultant will collect data on SPP project outcomes and outputs to evaluate:

- Effectiveness: Establish whether the SPP project interventions achieved the desired outcomes and outputs: To what extent the school performance indicators (attendance rate, repetition rate, learning outcomes) have been enhanced and determining improvements in teaching and learning environment, greater engagement of school committees, increased time spent on school-related activities by teachers, solar power systems meeting the electricity needs of target schools, etc.
- Efficiency: Determine whether the solar power project design is appropriate and cost-effective in achieving the project outcomes and outputs.
- Equity: Establish to what extent the SPP project is addressing equitable access to education and learning.
- Sustainability: Determine to what extent SPP project interventions can be maintained after the completion of the project: The ability of school committees, school staff and MEHRD staff to operate, maintain and monitor school solar power systems, obtaining the necessary financial support etc. Level of MEHRD commitment in monitoring the school solar power systems, replicating project and support to maintenance and repair, in particular financial support. Establish if there are any long term plans/agreements from MEHRD to provide financial support for annual training of teachers and school committees, maintenance and repairs.

A detailed Terms of Reference (TOR) for this consultancy can be obtained via email to pacificvacancies@unicef.org.
QUALIFICATIONS AND SPECIALISED KNOWLEDGE/COMPETENCE REQUIRED

Qualifications, Skills and Experience

- Advanced degree in education and/or social science.
- A minimum of 6 years of demonstrable experience in reviewing, monitoring and evaluating education programmes.
- Knowledge of basic education systems.
- Fluency in English, verbal and written.
- Excellent report writing skills.
- Strong presentation skills.
- Strong analytical skills
- Able to work effectively in a multi-cultural environment and a high sense of integrity.

REMUNERATION AND TYPE OF CONTRACT:
The consultant will be required to work on a Purchase Order (PO) contract with UNICEF Pacific for 25 working days from November 2014. Remuneration and contract period will be agreed based on proposal submitted by successful consultant.

TO APPLY:

If interested please include in your application:

- A covering letter describing how you meet each of the requirements listed above (maxi. 2 pages)
- Updated UN Personal History Form (P11)
- Expression of interest (EOI)
- The names, addresses, emails and phone details of three supervisor referees

Online submissions must be sent no later than 31 October 2014 to pacificvacancies@unicef.org under confidential cover to:

Human Resource Specialist
(Consultancy 2014-030 Evaluation of Solar power pilot project)
UNICEF Pacific, 5th Floor FDB Building
Private Mail Bag,
Suva, FIJI

UNICEF is committed to diversity and inclusion within its workforce, and encourages qualified female and male candidates from all nationals, religious and ethnic backgrounds, including persons living with disabilities, to apply to become a part of our organization.
Appendix J: Results of SISTA exams

<table>
<thead>
<tr>
<th>School</th>
<th>English mean score</th>
<th>English pass rate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Betivatu</td>
<td>53.3   52.3   58.4   51</td>
<td>56   52   68   48</td>
<td></td>
</tr>
<tr>
<td>Rate</td>
<td>47.5   50.4   57.8   51</td>
<td>33   41   71   53</td>
<td></td>
</tr>
<tr>
<td>Aruligo</td>
<td>57.5   64.1   63.9   54</td>
<td>82   85   95   65</td>
<td></td>
</tr>
<tr>
<td>Tenakoga</td>
<td>59.4   57.3   58.7   58</td>
<td>87   42   75   83</td>
<td></td>
</tr>
<tr>
<td>Titige</td>
<td>51.9   60.7   59     56</td>
<td>58   86   88   70</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>53.92  56.96  59.56  54</td>
<td>63.2  61.2  79.4  63.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School</th>
<th>Maths mean score</th>
<th>Maths pass rate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Betivatu</td>
<td>53.5   46.9   55.1   50</td>
<td>60   17   55   45</td>
<td></td>
</tr>
<tr>
<td>Rate</td>
<td>46     50     49.6   49</td>
<td>5     57   29   31</td>
<td></td>
</tr>
<tr>
<td>Aruligo</td>
<td>51     63.6   60.8   48</td>
<td>64   86   79   20</td>
<td></td>
</tr>
<tr>
<td>Tenakoga</td>
<td>55.1   62.1   54.5   64</td>
<td>74   83   62   100</td>
<td></td>
</tr>
<tr>
<td>Titige</td>
<td>50.2   53.7   67.6   55</td>
<td>53   69   100  78</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>51.16  55.26  57.52  53.2</td>
<td>51.2  62.4  65   54.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School</th>
<th>General papers mean score</th>
<th>General papers pass rate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Betivatu</td>
<td>55.2  45.9   56.3   52</td>
<td>63   21   61   45</td>
<td></td>
</tr>
<tr>
<td>Rate</td>
<td>48.3  47     50.8   51</td>
<td>38   21   47   59</td>
<td></td>
</tr>
<tr>
<td>Aruligo</td>
<td>51.6  57.3   66.7   50</td>
<td>64   85   89   40</td>
<td></td>
</tr>
<tr>
<td>Tenakoga</td>
<td>52   60.1   57     69</td>
<td>61   88   75   100</td>
<td></td>
</tr>
<tr>
<td>Titige</td>
<td>55.6  59.3   65.5   55</td>
<td>68   79   94   74</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>52.54 53.92  59.26  55.4</td>
<td>58.8  58.8  73.2  63.6</td>
<td></td>
</tr>
</tbody>
</table>