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Final Report (Contract No. 3000067788)

UNIDO–CTCN: Technical Assistance to Solomon Waters for Energy Efficiency and Self Generation Plan

March 2020

Draft

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26th March 2020

To,

Mr. Rajiv Garg
Regional Manager
Climate Technology Centre & Network (CTCN)
UN City, Marmorvej 51,
2100 Copenhagen, Denmark

Dear Sir,

Subject: Final Report (Deliverable 4) for "**Technical Assistance to Solomon Water for Energy Efficiency and Self-Generation Plan**" (Ref - UNIDO Contract No. 3000067788)

We sincerely thank you for giving us an opportunity to undertake the assignment on "Technical Assistance to Solomon Water for Energy Efficiency and Self-Generation Plan".

As per the scope of the assignment outlined in the Terms of Reference, we are pleased to submit the Final Report. The Final Report includes the details of the services undertaken within Section 3 - Deliverable 4 of the Terms of Reference and covers: (a) Training Modules, (b) Operational Manual for energy efficiency and renewable energy for municipal pump stations, Solomon Waters, (c) Monitoring and evaluation of Impacts and Outcomes including a report on gender co-benefits, and (d) Closure and Data Collection report.

We eagerly look forward to your inputs on this. Further, we would be happy to provide any clarifications or additional information necessary. We can be reached on the mentioned contact details or on my email id (amit2.kumar@pwc.com).

Yours sincerely,

PricewaterhouseCoopers Pvt. Ltd. pwc Gurgaon

Amit Kumar, Partner

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Abbreviations

CTCN	Climate Technology Centre & Network
EE	Energy Efficiency
EPC	Energy Performance Contract
ESCO	Energy Service Company
GHG	Green House Gases
JICA	Japan International Cooperation Agency
SBD	Solomon Dollar
SGO	Self-generation options
SIWA	Solomon Islands Water Authority
SPV	Solar Photo Voltaic
SW	Solomon Water
TA	Technical Assistance

1. Introduction and progress status

1.1. Background

Solomon Islands comprise hundreds of islands; of these, the main islands include Honiara (capital of Solomon Islands) and provincial urban centers of Auki, Noro and Tulagi. Solomon Islands Water Authority (SW), a state-owned enterprise, is mandated to operate as the provider of municipal water and wastewater services in Solomon Islands under the SIWA Act and State-Owned Enterprise Act. SW supplies and manages water only in these four main islands. It provides water services to an estimated population of about 100,000 in Honiara and over 8,000 in the provincial centers. The municipal wastewater services are provided to about 30,000 people in Honiara.[1] The Solomon Waters body reports to Minister of Mines, Energy and Rural Electrification and to the Minister of Finance of Solomon Islands.

The water pumping facilities of Solomon Island Water Authority comprise of the following:

- Borehole pumps (Honiara and Auki)
- Raw water supply and pumping stations (in all four islands)
- Wastewater collection facilities (Honiara)

Typical view of pump stations located in Honiara is presented in **Figure 1**.

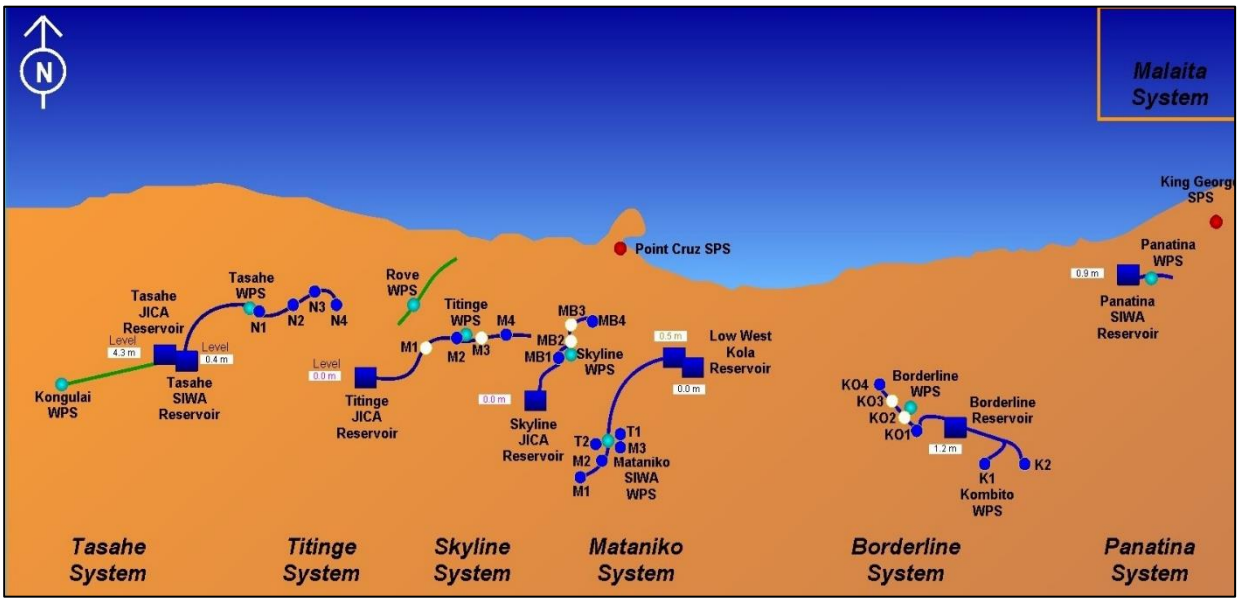

Figure 1 Pump stations in Honiara

About 95% of total installed capacity of electricity generation in Solomon Islands is based on fossil fuels, and the balance 5% is through renewable energy sources. The electricity tariff of Solomon Islands is one of the highest in the Pacific (and the World), since a major share of electricity in the Islands is met through fossil fuels (diesel generators).

Solomon Water is using diesel-based electricity generators to meet its electricity requirements in its various facilities. In addition, most of the equipment and system installed in various facilities of SW have not incorporated energy efficiency options.[1]

[1] *Terms of Reference, CTCN request ref: 2017000039*

1.2. Problem Statement

The expense towards energy consumption were more than 35% in year 2013-14 for Solomon Water. The total energy consumption of Solomon Water is almost 10% of total energy consumption of Solomon Islands. The energy consumption is further expected to increase to cater the projected escalation of demand pertaining to the increasing population and to reach out to un-serviced population. The main source of electricity generation in the island is fossil fuel and the increase in fuel cost would directly affect the operation cost and GHG footprint of Solomon Water. This in turn put upward pressure and wrongly influence the expansion plans of its services. In addition, low importance is provided to efficiency in selection of equipment related to water services. Therefore, it is vital for Solomon Water to explore sustainable energy solutions that would help reducing energy consumption and contribute towards national GHG emission reduction targets.[2]

1.3. Objectives of the Technical Assistance

The objective of the technical assistance is to support the planning and implementation of Energy Efficiency (EE) measures and Self-Generation Options (SGO) through renewable energy to reduce the reliance of Solomon Water on fossil fuel for energy requirements. **Figure 2** presents the objectives of technical assistance:

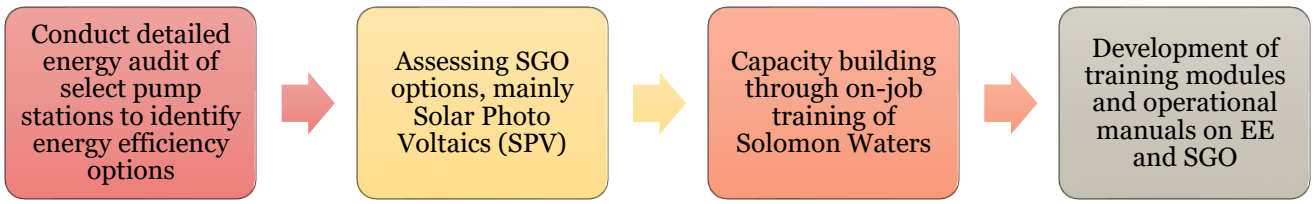

Figure 2 Objectives of the technical assistance

The assistance would lead to preparation of detailed feasibility reports covering technical and economic feasibility for EE and SGO options as well as support for selection of equipment and system by preparing tender specifications for procurement of energy efficient equipment/systems and implementation by Solomon Water.

1.4. Scope of work

The scope of work is divided in four parts:

- Output 1: Implementation plan and communication documents for the projects
- Output 2: Assessment of EE and renewable energy options
- Output 3: Detail assessments of shortlisted EE and SGO options for Solomon Water
- Output 4: Capacity building through on-job training of Solomon Water on EE and RE implementation and monitoring of impacts

Output 1 is the CTCN communication documents such as monitoring & evaluation plan, impact description and closure & data collection reports. **Figure 3** presents the details of output 2 to 4. The study focused on seven pump stations, six in Honiara and one in Auki. The list of pump station is presented in **Table 1**.

Table 1 List of pump stations covered

Borderline pump station – Honiara	Tuvaruhu JICA pump station – Honiara
Skyline pump station – Honiara	Tuvaruhu SIWA pump station – Honiara
Tasahe pump station – Honiara	Kwaibala pump station - Auki
Titinge pump station – Honiara	

[2] *Response Plan, CTCN request ID: 2017000039*

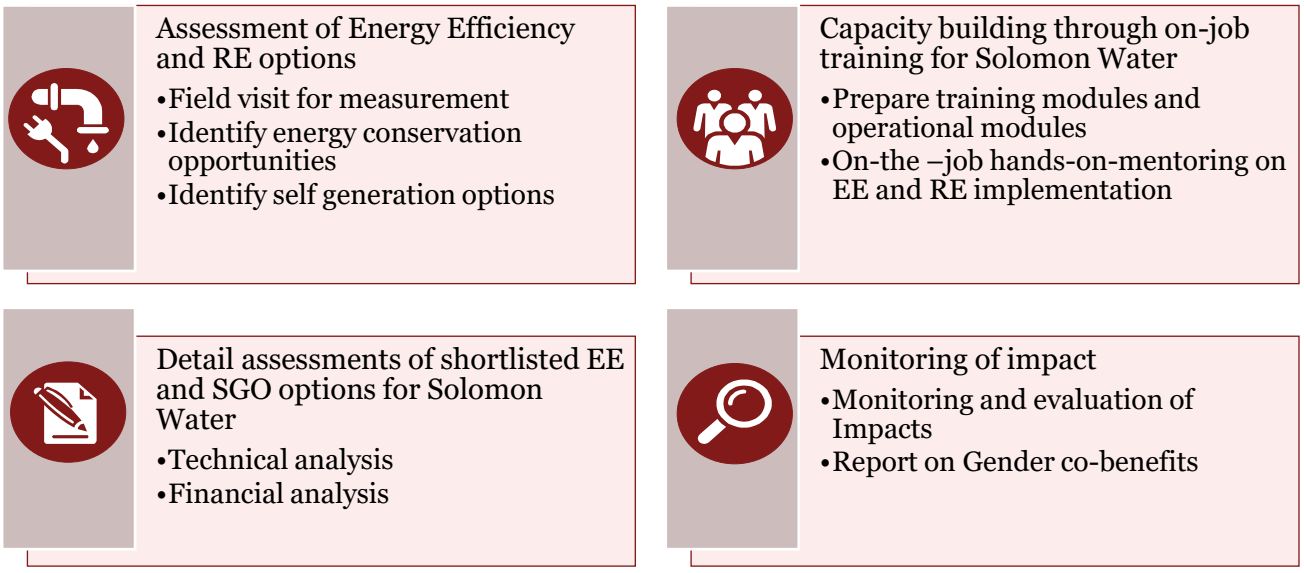

Figure 3 Details of output

1.5. Expected benefits

The proposed technical assistance is expected to expedite the uptake of energy efficiency and renewable energy by Solomon Water in Solomon Islands. **Figure 4** presents some of anticipated environmental, economic and social benefits of technical assistance.

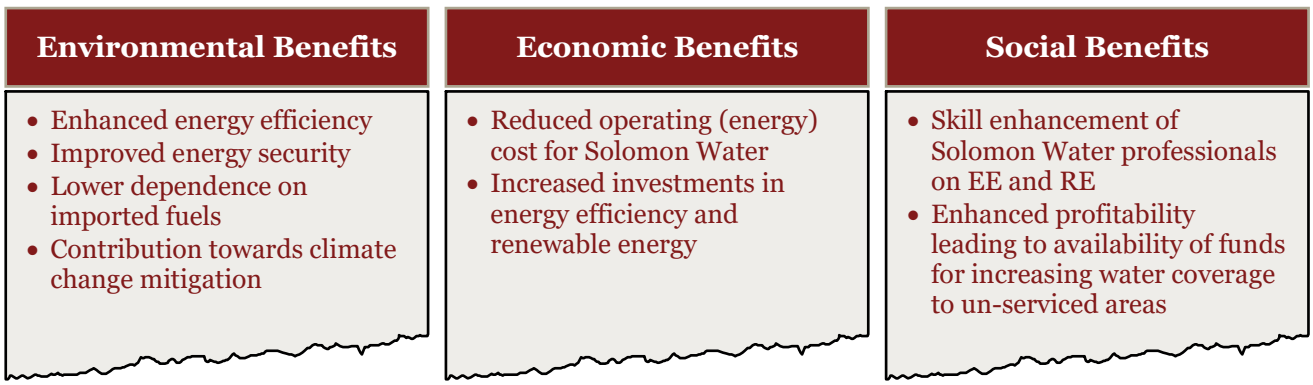

Figure 4 Expected benefits from the assignment

1.6. Progress status

The project is executed in four steps according to the work plan, the steps are defined as ***Outputs*** and each output is linked with a set of project deliverables. The overall outcomes of the TA are to reduce intensity of energy consumption in the 7 pump stations of Solomon Island Water Authority, identification of renewable energy options for self-generation and training of local technical staff to replicate interventions.

The project team has developed and delivered the deliverables in Output 1, 2, 3 and 4. Firstly, the deliverables were submitted to Solomon Water. After incorporating their comments, revised reports are submitted to CTCN / UNIDO for review. Deliverables 1, 2, 3 and 4 were submitted back to CTCN incorporating the suggestions/comments. The same was accepted by CTCN.

The details of completed deliverables are shown in **Table 2**.

Table 2 Completed deliverables

Output 1: Implementation plan and communication documents	1. Detailed work plan 2. Monitoring and evaluation plan 3. CTCN impact description 4. Closure and data collection report
Output 2: Assessment of EE and renewable energy options	1. Presentation to Solomon Water and other stakeholders on the key findings 2. Report on the list of EE and renewable energy (SGO) options identified with potential energy savings and GHG reductions detailing the underlying data collected, energy audit and assessment conducted for EE and RE options.
Output 3: Shortlist and conduct detail assessments of EE and SGO options for SW	1. A detailed feasibility report with technical and financial analysis and funding options of EE and renewable energy options recommended for Solomon Water 2. Tender documents for identified recommendations
Output 4: Capacity building through on-job training of Solomon Waters on the EE and RE measures implemented	1. Training modules 2. Operational manual 3. Monitoring & evaluation of Impacts. Including a report on gender co-benefits 4. TA Closure and Data Collection Report

The training was conducted in January 2020. Training modules, O&M manual, gender report and M&E sheet are prepared and shared with CTCN, UNIDO, NDE and SIWA. Team also prepared TA Closure and Data Collection report and shared with CTCN. Detailed work progress and completion is presented in **Figure 5**.

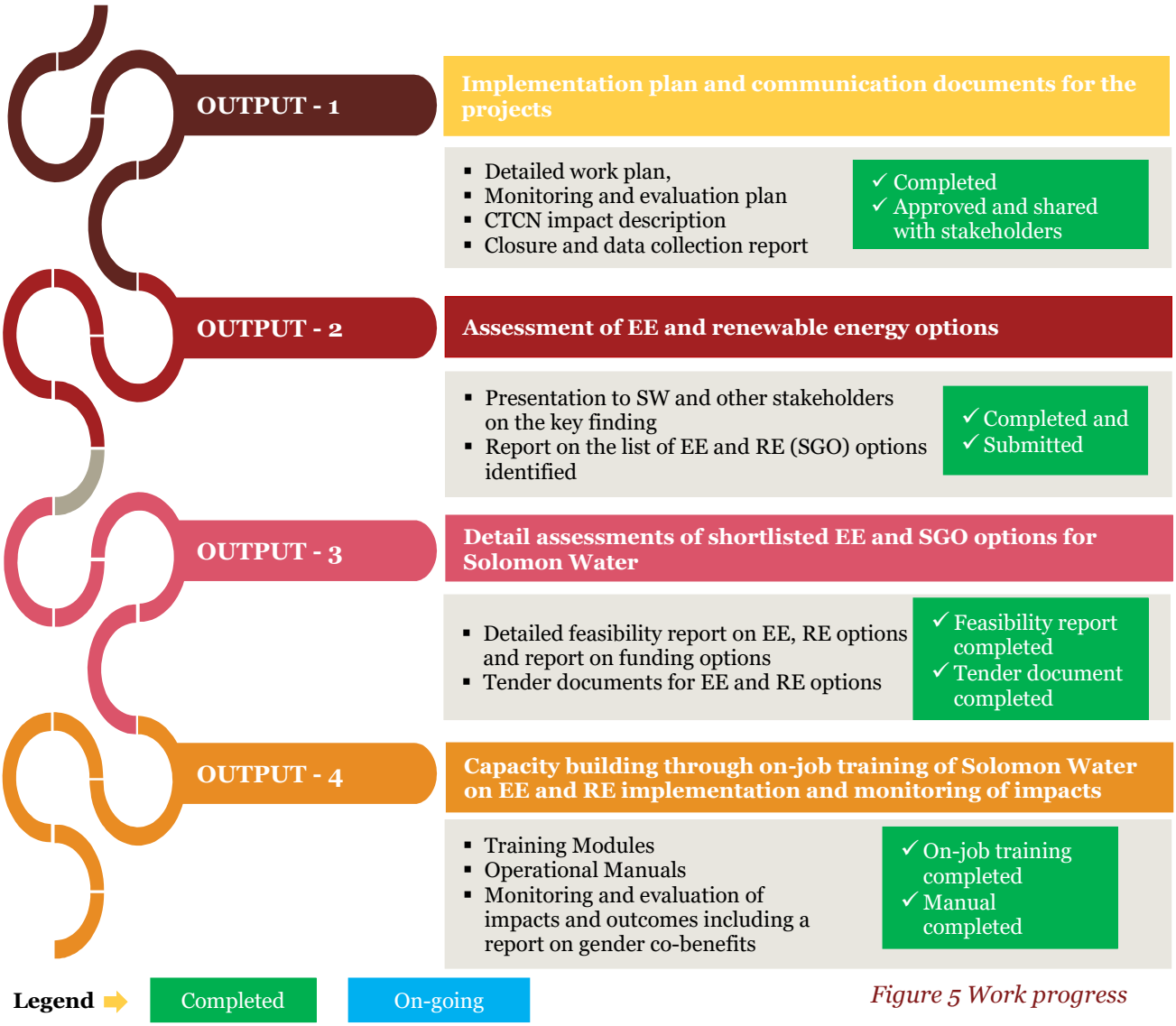

Figure 5 Work progress

2. Deliverable 4

2.1. Training of Solomon Water

PwC prepared and conducted a 2-days classroom training, identifying energy efficiency improvement and self-generation opportunities in selected pumping stations and waste water systems. This training will help all the attendees to build capacities on EE technologies, self-generation opportunities, energy management, O&M, emerging business models and lifecycle costing. It would be beneficial for Solomon Waters to facilitate decision making at local level towards more energy efficient and sustainable water pumping options. It was ensured that the understanding of the findings of this study was disseminated among engineers as well as technical staff at Solomon Water so that best practices be applied to use. The 2-days training consisted of a half day hands-on training in field.

Agenda of the training module and few pictures of the trainings conducted are presented along.

Training programme on

Energy Efficiency and Self-generation options for Municipal Pump Stations

Dates: 21st – 22nd January 2020

Venue: SIWA Office, Honiara

Agenda

Day 1: 21st January 2020, Tuesday		
09:30 – 10:00	**Registration**	
10:00 – 10:05	Welcome address – Setting the context	Mr. Adam Secrancke, SIWA
10:05 – 10:15	Keynote speech	Mr. Hudson, NDE
10:15 – 10:25	Special address	Mr. Ian Gooden, SIWA
10:25 – 10:40	CTCN EE and SGO Technical Assistance update presentation	Mr. E Nand Gopal, PwC
10:40 – 11:15	Energy audit and detailed feasibility assessment methodology	Mr. Pradeep Singhvi, PwC
11:15 – 12:00	Performance assessment of pumping and electrical systems	Mr. E Nand Gopal, PwC
12:00 – 13:00	**Lunch break**	
13:00 – 14:00	Energy Efficiency: Operating practice, retrofit and replacement	Mr. E Nand Gopal, PwC
14:00 – 14:30	Operating and maintenance practices	Mr. Pradeep Singhvi, PwC
14:30 – 15:00	Renewable energy sources and potential assessment	Mr. Pradeep Singhvi, PwC
15:00 – 15:45	Performance monitoring of solar power plant	Mr. E Nand Gopal, PwC
15:45 – 16:00	Open house	PwC Team, Participants
Day 2: 22nd January 2020, Wednesday		
10:00 – 12:00	Site visit and demonstration of detailed energy study	PwC Team, Participants
12:00 – 13:00	**Lunch break**	
13:00 – 13:30	Discussion on field visit	PwC Team, Participants
13:30 – 14:15	Financial feasibility and financing options	Mr. Pradeep Singhvi, PwC
14:15 – 15:15	Measurement and Verification	Mr. E Nand Gopal, PwC
15:15 – 16:00	**Valedictory session – Training feedback, Certificate distribution and Vote of thanks**	

The training modules are separately along with this report. The training was conducted at conference hall of Solomon Water maintenance office. The two-day training programme was conducted at SW for their staff from different departments. **Figure 6** depicts the same. It was attended by 12 staff members of Solomon Water and Mr. Hudson from the NDE.

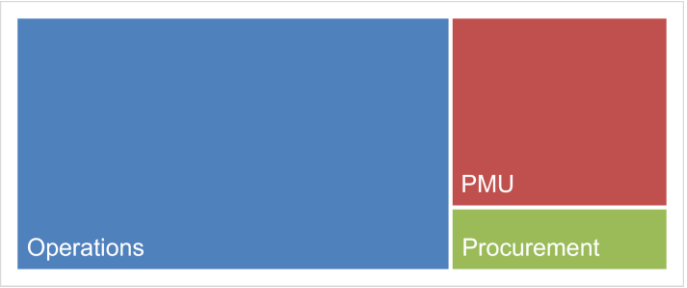

Figure 6 Training staff by departments of SW

Select pictures of the classroom training and hand-on training in field are presented in **Figure 7**.

Figure 7 Training pictures

2.2. Operational manuals

The training materials developed before the training were further refined and made into a brief, user friendly, stepwise operational manual that will facilitate the best practices to operate the EE and RE measures implemented for Solomon Water. The operational manuals are targeted towards the personnel from SW as the key audience and shall serve as a guidance document to ensure sustainability of energy efficiency practices and renewable generation at Solomon Waters.

The operational manual is one of its kind and unique to the present needs of capacity building of the employees of Solomon Water. The purpose of this operational manual is to provide all employees of Solomon Island Water Authority with a reference manual containing of basics of operations & maintenance (O&M) with respect to energy efficiency and self-generation. The prime focus of this manual is on technical staff, O&M/ Energy managers and practitioners. However, an O&M program cannot be competent without everyone at the facility being involved. It is beneficial for everyone to understand the basic principles of O&M in order to support its cause.

The manual is attached separately along with this document. The cover page of the operational manual and table of contents are presented in **Figure 8**.

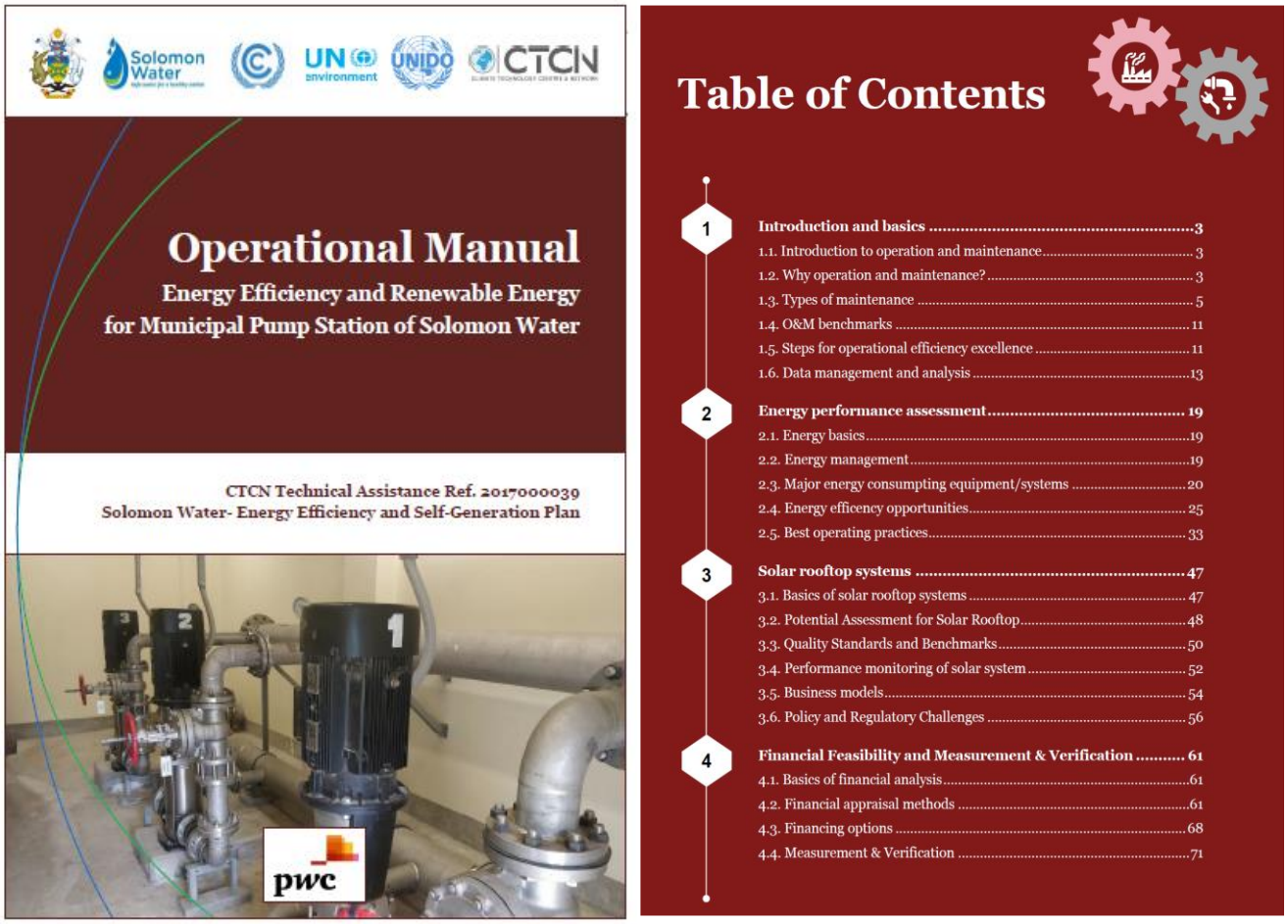

Figure 8 Operational manual – Cover page and table of contents

2.3. Gender co – benefits

During the planning and execution of all activities it was ensured that women will be included in agreement with gender mainstreaming standards**.** Women are significantly impacted by the effects of energy shortages, so it is intended that they will benefit from the efficiency improvement measures in the long term. The direct and equal involvement of women in any awareness raising and capacity building activities is furthermore expected to create opportunities of quality employment.

The assessment process was consultative, participatory, and inclusive. Primary sources of data collection were conducted where the findings were validated with data from interactions with various stakeholders, including Solomon Island Water Authority (SIWA) senior management representatives and members from the regional offices, along with other organizations such as participating NGOs and community-based organizations (CBOs). All the information was synthesized as per the identified probe areas.

The key findings of the detailed report on gender co – benefits are stated along in the table below. The complete detailed report on gender co – benefits will be shared along this document as per the deliverable 4.3 mentioned in Section 3 of ToR.

Table 3 Findings and recommendation of gender co-benefits

Key Findings	Recommendation
Poor access to sanitation aligned with low performing Health and Education indicators among women and girls	Link sanitation with health and education to support improved gender inclusive infrastructure and support.
Low representation of women and individuals with impairment across organization positions and community implementation drives in SW	Promote women leaders in community-based implementation efforts and include individuals with physical impairments in the planning and design of community led efforts for sanitation and water supply.
There is at present limited provision for a gender specific grievance addressal mechanism adopted in SW	Adoption of an innovative and efficient gender focused grievance addressal mechanism to cater to all kinds of concerns both organizational and well as programmatic implementation focused activities
Threats to violence and specifically domestic violence has been high in communities despite a policy against this violence in place	Prioritize role as a facilitator and stakeholder in pushing forth stringent policy focus to advocate for gender equal rights against violence against women.

2.4. Closure and data collection report

The closure and data collection report is completed and attached separately along with this final report.

The **Table 4** shows the tasks covered under deliverable no.3. Appendix gives a snap shot of findings from detailed feasibility.

Table 4 Deliverable 4 coverage

Deliverable 4	Details
1. Training modules	9 training modules were developed and are attached separately
2. Operation manual	Operational manual is attached separately
3. Monitoring and evaluation of impacts and Gender co-benefits report	M&E impact sheet and Gender co-benefits report are attached separately
4. TA Closure and Data Collection report	The TA closure and Data Collection report is attached separately