

## **PACIFIC CENTRE FOR RENEWABLE ENERGY & ENERGY EFFICIENCY**

### **CAPACITY BUILDING FRAMEWORK & STRATEGY: 2019 – 2021**

**unedited draft**

#### **1.0 INTRODUCTION AND BACKGROUND**

This framework intends to put in place recommended capacity building initiatives that will be adopted and carried out by the Centre with respect to its intention to strengthen and augment its roles as per its establishment in the Pacific Island Countries and Territories (PICTs).

The framework is directly related to two outcomes in the PCREEE Results Framework:

Outcome 2 is about “Strengthened capacities of local key institutions and stakeholder groups through the up-scaling and replication of certified training and applied research programs and mechanisms”. Under this Outcome 2, Output 2.1 is a multi-year framework to strengthen the local RE&EE capacities of key institutions and stakeholder groups is developed, adopted and under implementation

At the time when the PCREEE was designed, there was no regional capacity development strategy on RE & EE in place and there was weak implementation of targeted capacity development activities in the region.

PCREEE therefore aims to have this Capacity development strategy validated by key stakeholder groups (incl. women groups) and gender mainstreaming mechanisms are incorporated. It also aims to have at least 30% of the activities of the regional capacity development strategy implemented by end of the first operational phase of PCREEE (2017 – 2021).

Outcome 4, on the other hand, is about “Increased RE&EE business opportunities for local companies and industry through the development and implementation of regional investment promotion programs and tailored financial schemes.” Under this Outcome 4, Output 4.2 is a strengthened local sustainable energy industry.

At the time when the PCREEE was designed, there was low local added value of RE&EE investments due to a lack of PICTs sustainable energy businesses and industry. There was also lack of opportunities for local entrepreneurs due to the absence of tailored support instruments.

PCREEE therefore aims to adopt gender-sensitive PICTs strategy to promote local sustainable energy industry and entrepreneurship. It will work so that at least 150 local sustainable energy hardware and service companies in 22 PICTs receive financial support from the newly created regional facility (at least 30% are in the manufacturing sector, at

least 30% start-up companies). It also aim that at least 20 companies in the sustainable energy sector are awarded through the established clean tech innovation program.

In developing this framework, reference has been made to earlier regional capacity needs assessments that have captured the needs of the governments and local technology industry and businesses. It has also taken account of consultations with NFIs and feedback from participants in earlier PCREEE-related training events. This framework has therefore attempted to capture the needs of local public and private stakeholders and to produce tailored training and certification modules covering various RE & EE issues and tools in coordination with local business and industry groups (and also in local language too).

As part of the framework it identifies key stakeholders for the centre and recommends capacity building strategies that will be enable it to nurture, develop, build and maintain capacities in the area of the Renewable Energy (RE) and Energy Efficiency (EE) in the PICTs that will be able to strengthen and facilitate the delivery of the roles for the Centre in the region.

The essence of the framework is to aggregate the different stakeholders and align specific interventions in terms of capacity building that will bring about region-wide consistency in the mobilization of the private sector on RE & EE in the region.

## **2.0 NEEDS ASSESSMENT**

The PCREEE addresses gaps in the current effort to leverage existing barriers and strengthen drivers for sustainable energy markets, industries through regional methodologies and tools. The Centre focuses on up-scaling and replicating national efforts in the areas of capacity development, knowledge management, innovation and awareness raising, as well as investment and business promotion. The focus of the Centre is on private sector and industry while supporting targeted RE&EE programs to enhance the productivity leverage green jobs in the various sectors of the economy.

### **PCREEE Needs Assessment**

A few capacity building-related needs assessments has been conducted in the region. The needs assessment undertaken for the establishment of the Centre revealed that some PICTs have made considerable progress in the creation of enabling national environments for the promotion of renewable energy (RE) and energy efficiency (EE). However, in some of the areas the developments are still at the early stage and have not been transformed into real investments and the creation of a vibrant market for the sector. The areas of small and medium-sized grid-connected renewable energy plants, decentralised renewable energy solutions for rural areas and households (e.g. sustainable cooking, mini-grids, stand-alone systems, water heating) as well as energy efficiency improvements in different sectors (e.g. buildings, grid losses, appliances, industry) need a further boost.

The needs assessment mentioned above revealed that the CROP agencies are already assisting PICTs in addressing parts of these barriers through various projects and activities (e.g. coordination, policy advisory, (pre-) investment support for projects). However, PICTs have expressed an urgent need for concentrated regional technical capacities to promote local

human resources, awareness and knowledge management, as well as businesses and industry in the sustainable energy sector. The increasing sustainable energy investments and the introduction of appropriate regulations and standards go hand in hand with the need to develop local capacities. Moreover, there is the impression that the local private sector and industry do not take advantage of the growing sustainable energy market and job opportunities. These developments endanger the long-term sustainability of existing investments as they are usually conducted by enterprises from outside without local representatives. The Centre can play a key role in creating economies of scale and a competitive sustainable energy market and business sector in the Pacific.

### PacTVET Training Needs Assessment

The Technical and Vocational Education and Training on Sustainable Energy and Climate Change Adaptation (TVET) project is implemented by the Pacific Community (SPC) in partnership with the University of the South Pacific (USP) over a period of 5 years (2014 – 2018) for a total of 53 months with an overall budget of 6.1 million Euros.

The general objective is to enhance sustainable livelihoods in PACPs. Sustainable livelihoods are a high priority for Pacific Island communities and governments alike. They are central to current development policy including resource management and conservation but also in emerging policy to meet threats such as climate change. The purpose of the project is to enhance and/or create PACPs' regional and national capacity of, and technical expertise to respond to climate change adaptation (CCA) and sustainable energy (SE) challenges.

**Table 1** presents a summary of the priority training needs of the P-ACPs.

Table 1: Summary of Training Requirements Across All Pacific Island Countries and Territories

Training Needs	Cook Islands	FSM	Fiji	Kiribati	Nauru	Niue	Palau	PNG	RMI	Samoa	Solomon Islands	Timor Leste	Tonga	Tuvalu	Vanuatu
Design, Installation and Maintenance of Grid Connect PV systems	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Design, Installation and Maintenance of Grid Connect PV systems with energy storage	Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Operation and Maintenance of Grid Connect PV systems	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Design, Installation and Maintenance of Off-Grid systems	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Operation and Maintenance of Off-Grid PV systems	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Solar Water Pumping	No	No	No	Yes	No	No	No	Yes	No	No	Yes	No	No	No	Yes
Operation and maintenance of wind farms	No	Yes	Yes	No	No	No	No	No	No	Yes	No	No	Yes	No	Yes
Maintenance and Operation of Hydro Power Plants	No	Maybe	Yes	No	No	No	No	Yes	No	Yes	Yes	Yes	No	No	Yes
Design, Installation and Maintenance of Micro-hydro plants	No	Maybe	Yes	No	No	No	No	Yes	No	No	Yes	Yes	No	No	Yes
Operation and Maintenance of biomass/biogas plants	No	No	Yes	No	No	No	No	Yes	No	No	No	Yes	Yes	No	No
Operation and Maintenance of geothermal plants	No	No	Yes	Yes	No	No	No	Yes	No	No	No	Yes	No	No	No
Sizing, Installation and Maintenance of Solar Water Heaters	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Refrigeration	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Air conditioning	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Energy Auditing and Applying Energy Efficiency Solutions	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

## PPA Training Assessment

### 3.0 OBJECTIVE

The ultimate objective of the CBFS 2019 – 2021 is basically to position the Centre through its secretariat and its stakeholders to effectively deliver through improving PICTs economies through fully embracing Renewable Energy & Energy Efficiency and the intricacies inherent with its market and industry.

Strengthened capacities of local key institutions and stakeholder groups through the up-scaling and replication of certified training and applied research programs and mechanisms”.

“Increased RE&EE business opportunities for local companies and industry through the development and implementation of regional investment promotion programs and tailored financial schemes.”

### 4.0 Energy Situation in the Pacific

The PICTs faces interrelated challenges of fossil-fuel dependence, climate change and particular geography, which affect their energy security and contribute to the region’s economic and social challenges. This trio of factors exerts significant impact in terms of the affordability, availability and reliability of energy supplies. Access to reliable and affordable modern energy remains a central challenge to approximately 10 million inhabitants in the PICTs. These unique geographical characteristics, where long distances separate sparsely populated areas or markets are too small to achieve cost savings through economies of scale

in electricity production that result in high costs of supplying electricity, both for urban and rural areas.

**Table 1: PICTs' Population, Land Area and GDP Per Capita<sup>1</sup>**

PICT	Population (2011)	Land area km <sup>2</sup>	GDP per capita (US\$)
Cook Islands	15, 576	237	11, 917
Fiji	851, 745	18, 273	3, 472
Kiribati	102, 697	811	1, 664
RMI	54, 999	181	3, 130
FSM	10, 236	701	2, 889
Nauru	10, 185	21	7, 121
Palau	20, 643	444	10, 692
PNG	6,888, 297	46, 284	2, 700
Samoa	183, 617	2, 785	3, 706
Solomon Islands	553, 254	30, 407	1, 181
Tonga	103, 682	650	4, 394
Tuvalu	11, 206	26	4, 002
Vanuatu	251, 784	12, 281	3, 022
American Samoa	66, 692	199	7, 874
Guam	19, 209	541	23, 134
Niue	1, 446	259	11, 985
Northern Mariana Isl.	63, 517	457	16, 494
New Caledonia	252, 331	18, 576	37, 993
French Polynesia	271, 831	3, 521	21, 071
Wallis & Futuna	13, 193	142	1, 264
<b>Total</b>	<b>9, 746, 140</b>	<b>136, 796</b>	

In addition, on average, 55% of electricity produced in the region is generated from fossil fuels and about 40% from hydropower. As in most small island states, the PICTs are vulnerable to the volatile prices of global oil markets due to their almost exclusively dependence on imported refined oil products to meet their power generation and transportation energy needs. As a result of this dependence, a good proportion of the individual countries foreign exchange reserves are going to fossil-fuels; this is an unsustainable situation in a region where only PNG is an oil producer. Moreover, the reliance on diesel power plants also results in high electricity tariffs for consumers. PPA reported that in 2010 the region's utilities had consumer electricity tariffs that averaged between USD 0.39 and 0.44/kWh, respectively, for household (<200 kWh/month) and commercial (<500 kWh/month) users<sup>2</sup>.

Hydropower is concentrated in Fiji, French Polynesia, New Caledonia, Samoa and PNG and statistically the four countries constitute about 85% of the total population in the region. Notwithstanding the above, electrification rates vary a great deal, PNG for instance with a population of close to seven (7) Million has an electrification rate of only 20%. The Republic of Vanuatu and the Solomon Islands also have electrification rates sitting at around 35% – 40%. With the situation the electrification levels in the region is still standing at around 30%

<sup>1</sup> Benchmarking Report, 2012, PPA

<sup>2</sup> Pacific Power Utilities: Benchmarking report 2012 (PPA, 2013)

with a total of 70% of the population or close to 8 million people that do not have access to electricity in the PICTs<sup>3</sup>. It has been observed that most of the small island nations have done well in this regard and edged close to the 100% electrification rate.

Climate change is another concern on the energy agenda of the PICTs. The region is only responsible for less than the 0.1% of global energy-related GHG emissions. Its impacts such as rising sea levels, changes in rainfall patterns and extreme weather events will further challenge the energy security of PICTs. The Climate change resilience of energy infrastructure becomes an important aspect of energy planning, maintenance, repair and replacement. The switch to renewable energy and increased energy independence, to adapt to and mitigate climate change and also to provide greater economic stability within PICTs is thus important. At the same time, the investments made into various renewable energy technologies should consider the changing environment due to the effects of climate change. In the case of small hydropower, this means the effect on water availability particularly during the dry season is also an issue.

Although efforts are being made, there is still a strong need to scale up the renewable energy and energy development across the region. In this sense the PCREEE will have a pivotal role, as through its activities in the areas of capacity development, knowledge management, awareness raising, as well as business and investment promotion, it will considerably improve the environment to allow the development of further projects.

In contrast to other ongoing initiatives, the Centre will address RE & EE holistically and in a balanced way. Experience in the region has shown that a regional or multi-country approach is generally more cost-effective than national efforts for a wide energy-sector assistance. A common market-place with certain guarantees will help to attract the awareness of potential public and private investors. Regional cooperation can also facilitate the expansion of sustainable energy markets while adding value, businesses and jobs for the region.

## **5.0 Status of RE & EE in the PICTs**

The assessment of the energy sector baseline situation revealed that PICTs have made considerable progress in the creation of enabling national environments for the promotion of RE&EE. Many countries have adopted specific targets which are further outlined on the table below. However, in some PICTs the developments and the implementation of commitments are still in the initial stage and have not transformed into real investments and the creation of a vibrant market and business sector. The areas of small and medium-sized grid-connected RE plants, decentralised renewable energy solutions for rural areas and households (e.g. cooking, mini-grids, stand-alone systems, hot water heating) as well as energy efficiency improvements in different sectors (e.g. buildings, grid losses, appliances, industry) need a further boost.

### **Table 2: Targets for renewable energy and emission reductions in some of the PICTs**

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<sup>3</sup> ADB, Pacific Energy Update 2018, Transport, Energy & Natural Resources Division, Pacific Department, ADB.

No.	Country	Targets for renewable energy and emission reductions
1.	Cook Islands	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b>            50% of inhabited islands electricity needs to be provided by renewable energy in 2015, and 100% by 2020, through implementing the Cook Islands Renewables Energy Chart with key strategies that:</p> <ol style="list-style-type: none"> <li>1. Ensure the use of proven renewable electricity technology options</li> <li>2. Ensure the policy and regulatory environment is aligned with the 50% by 2015 and 100% by 2020 renewable energy goal</li> <li>3. Ensure ongoing education, awareness and advocacy for renewable energy and energy efficiency</li> <li>4. Strengthen the required capacity to implement the Cook Islands renewable energy targets</li> </ol>
2.	Fiji	<p><b>Fiji's NDC and Energy Policy</b></p> <p><b>Target 1:</b> To reduce 30% of BAU CO<sub>2</sub> emissions from the energy sector by 2030.</p> <p><b>Target 2:</b> As a contribution to Target 1, to reach close to 100% renewable energy power generation (grid-connected) by 2030, thus reducing an expected 20% of energy sector CO<sub>2</sub> emissions under a BAU scenario.</p> <p><b>Target 3:</b> As a contribution to Target 1, to reduce energy sector CO<sub>2</sub> emissions by 10% through energy efficiency improvements economy wide, implicitly in the transport, industry, and electricity demand-side sub-sectors.</p> <p><b>Fiji's Energy Policy outlines the following commitments;</b></p> <ol style="list-style-type: none"> <li>1. Percentage of population with electricity access 100% by 2030.</li> <li>2. Energy Intensity (power consumption per unit of GDP in kWh/FJD to improve by 0.077 by 2030.</li> <li>3. Renewable Energy share in electricity generation: 100% by 2030.</li> <li>4. Renewable energy share in Total Energy Consumption to be 23% by 2030</li> </ol>
3.	Federated States of Micronesia	<p><b>FSM Strategic Development Plan (2004-2013)</b>            Decrease the import and use of imported petroleum fuels by 50% by 2020.            10% of electricity in urban centres and 50% in rural areas will be generated using renewable energy sources by 2020.            FSM will have a net gain of area covered by forests between now and 2020.            FSM will have a net gain of area and health status of coral reefs between now and 2020            FSM will remain a net importer of GHG through 2020.</p>
4.	Kiribati	<p>Fuel reduction target for electricity generation in Kiribati by 2025:</p> <ol style="list-style-type: none"> <li>1. South Tarawa: 45%</li> <li>2. Kiritimati: 60%</li> <li>3. Rural public infrastructure: 60%</li> <li>4. Rural public and private institutions: 100%</li> </ol>
5.	Nauru	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b>            50% of electricity generation to be provided by renewable energy by 2020.</p>
6.	Niue	<p>100 % of electricity generation from renewables by 2020.</p>
7.	Palau	<p><b>Palau Strategic Action Plan Energy Sector</b>            20% contribution of renewable energy to the energy mix by 2020.            30% reduction in energy consumption through energy efficiency and conservation</p>
8.	Papua New Guinea	<p><b>UN Document FCCC/AWGLCA/2011/INF.1</b>            Decrease GHG emissions at least 50% before 2030 while becoming carbon neutral before 2050.</p>
9.	RMI	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b>            Pursuant to the Republic of Marshall Islands 2009 National Energy Policy and Energy Action Plan, the 2011 National Climate Change Policy Framework and Joint National Action Plan (for climate change adaptation, energy security and disaster risk reduction), and the Green Energy Micronesia initiative:</p> <ol style="list-style-type: none"> <li>1. A 40% reduction in CO<sub>2</sub> emissions below 2009 levels by 2020;</li> </ol>

No.	Country	Targets for renewable energy and emission reductions
		<p>2. Electrification of 100% of urban households and 95% of rural outer atoll households by 2015;</p> <p>3. The provision of 20% of energy through indigenous renewable resources by 2020;</p> <p>4. Improved efficiency of energy use in 50% of households and businesses, and 75% of government buildings by 2020;</p> <p>5. A 20% efficiency improvement in transportation sector fuel use by 2020;</p> <p>6. Feasibility studies and internationally supported financing plans for innovative 'game-changing' renewable energy and sustainable development opportunities including Majuro atoll waste-to-energy and Kwajalein/Ebeye atoll OTEC plants undertaken by 2015</p> <p>40% reduction of CO2 emissions below 2009 levels by 2020, pursuant to the 2009 National Energy Policy and Energy Action Plan, and with subject to the provision of adequate international support.</p>
10.	Samoa	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b></p> <p>1. To reduce the growth rate in the volume of imported fossil fuels by 10% by 2016. The high level indicators for this overarching goal/objective are:</p> <p>a. Energy Sector Plan launched and implemented with at least 75% of targets achieved by 2016;</p> <p>b. Increase in the contribution of RE to total energy consumption by 10% by 2016;</p> <p>c. Increase in the supply of RE for energy services by 10% by 2016;</p> <p>2. Increase Public and Private investment on Renewable Energy in transport fuels and electricity generation.</p> <p>3. Energy regulatory function established.</p>
11.	Solomon Islands	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b></p> <p>1. Replace current use of imported fossil fuel for electricity generation by 100% by Year 2030</p> <p>2. Increase access to reliable, affordable and stable electricity grid by 50% from the current 12% by Year 2030</p> <p>3. Reduce the price of electricity by half the present tariff rate by 2020</p> <p>4. Increase access to Solar-Home-Systems by remote rural dwellers located far from electricity grid from current 8.7% to 30% by Year 2020.</p>
12.	Tonga	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b></p> <p>1. To reduce Tonga's greenhouse gas emissions and improve energy security through 50% renewable energy mix in the Energy Transformation (TERM) sector by the end of the Tonga Energy Roadmap 2010-2020 implementation period.</p> <p>2. To improve efficiency of electricity supply and demand sides by 18% by the end of the TERM implementation period.</p> <p>3. All Tongans shall access to clean, reliable and affordable energy services by the end of TERM implementation period. Establish phased, comprehensive set of action plans to put in place a long-term institutional arrangement, which provides strong leadership and coordination of energy sector activities.</p>
13.	Tuvalu	<p><b>Barbados Declaration on Achieving Sustainable Energy for All in Small Island Developing States</b></p> <p>1. Power Generation – 100% renewable energy between 2013 and 2020</p> <p>2. Implementation Principles</p> <ul style="list-style-type: none"> <li>- Solar PV 60 – 95% of demand</li> <li>- Wind 0 – 40% of demand (if feasible)</li> <li>- Biodiesel 5% of demand (import)</li> </ul> <p>Energy Efficiency – improvements of 30% of current annual demand of Funafuti.</p>
14.	Vanuatu	<p>100% of energy from renewables with the following milestones:</p> <p>40% of power generation through renewables by 2015</p> <p>65% of power generation through renewables by 2020</p>

Notwithstanding the above commitments, there still exists a broad range of barriers that need to be addressed, in order to take full advantage of RE&EE potentials. While the potential for resources such as wind, solar, hydropower, biomass and geothermal energy is considered high, the PICTs face significant barriers for the development of commercially driven and sustainable energy markets. The lack of appropriate policies, capacities, knowledge, finance



and the respective business environment are constraints that restrict the dissemination of RE&EE technologies and services. Apart from large hydropower, so far only a small fraction of the grid-connected electricity produced is from renewable sources such as PV, wind and biomass/biofuels including hybrid systems. The off-grid and decentralized sector particularly in rural areas (e.g. mini-grids, stand-alone systems) remains underdeveloped in the PICTs with significant rural populations.

In terms of the private sector, PPA, IPPs, etc pls see the attached PRIF report on the 3<sup>rd</sup> Investment Forum

## **6.0 OBJECTIVE, SCOPE OF MANDATE & OUTCOME OF THE CENTRE**

The development objective of the centre; outlines that "Improved access to modern, affordable and reliable energy services, energy security and mitigation of negative externalities of the energy system (e.g. local pollution and GHG emissions) by promoting renewable energy and energy efficiency investments, markets and industries in PICTs.

In terms of its scope and mandate it takes on both a geographic and technical nature. In terms of geographical scope it intends to support the 22 PICTs in the area of RE & EE and projects which cover one or more PICTs. It focuses primarily on activities and projects with regional impact or national projects which demonstrate high potential for scaling-up or regional replication. In addition it focuses as well in urban, peri-urban and rural areas due to the high relevance of decentralized RE&EE technologies and services for rural areas particularly for the agricultural sector.

In terms of technical scope the Centre promotes all appropriate and sustainable renewable and energy efficiency technologies including hybrid systems and mini-grids. With respect to its specific objectives (outcomes), it is embedded in four (4) components of activity that is integrated into the 7 themes of the FAESP and the activities of hub and spokes of regional organisations. The Centre addresses existing barriers and strengthens drivers for sustainable energy markets, industries and innovation through regional methodologies and tools. Its outcomes includes;

**Outcome 1:** Enhanced regional institutional capacities through the creation of efficiently managed and financial sustainable PCREEE.

**Outcome 2:** Strengthened capacities of local institutions and stakeholders through the up-scaling and replication of certified training and applied research programs and mechanisms.

**Outcome 3:** Enhanced awareness of key stakeholder groups or renewable energy and energy efficiency opportunities through the upscaling of regional mechanisms for data and knowledge management and advocacy.

**Outcome 4:** Increased renewable energy and energy efficiency business opportunities for local companies and industries through the execution of regional investment promotion programs and tailored financial schemes.

All activities of the Centre demonstrate a high relevance for the local private sector and industry. Local business and industry promotion will be an important activity component of the centre but also a cross-cutting issue across the other key result areas e.g. (capacity development, knowledge management, awareness raising). Notwithstanding the above there are spill-over effects of the different interventions, for example awareness raising and

capacity building can lead to positive developments in the area of knowledge management and investment and business promotion. To create a regional RE&EE market it is crucial for the Centre to stimulate as much as possible such spill-over effects across the result areas and national borders.

## 7.0 IDENTIFIED KEY STAKEHOLDERS

The different stakeholders and beneficiaries for the Centre consist primarily of entities listed below;

- |      |                        |       |                                |
|------|------------------------|-------|--------------------------------|
| i.   | Energy Planners        | viii. | RE & EE Equipment Suppliers    |
| ii.  | Energy Regulators      | ix.   | Energy Entrepreneurs           |
| iii. | Utility Companies      | x.    | IPPs / Domestic IPPs           |
| iv.  | Electrical Contractors | xi.   | Energy Training Providers      |
| v.   | RE & EE Contractors    | xii.  | Youths / Women in Energy       |
| vi.  | Financing Institutions | xiii. | Consumers (Greater Population) |
| vii. | Development Partners   |       |                                |

The main stakeholders are further regrouped on the table outlined below;

NO.	STAKEHOLDERS	COMMON GROUPING
1.	Energy Regulators (FCCC, URA – Vanuatu, ICCC - PNG etc.)	Regulators
2.	NFIs, Energy Officers, Energy Policy makers & those within the sector and from other sectors within Government (Agriculture, Tourism and Climate Change)	Government
3.	Utilities (Dominant Utility and smaller or utilities operating in rural areas)	Utilities
4.	Electrical Companies, RE & EE Contractors, RE & EE Equipment Suppliers, Energy Entrepreneurs	Private Sector
5.	Independent Power Producers (IPPs) & Domestic IPPs	IPPs
6.	Training Providers Local & Overseas	Training Institutions
7.	Consumers including Gender (Women, Youths & Children)	Consumers
8.	Financing Institutions & Development Partners	Financing Entities

## 8.0 Needs Assessment Conducted in PICTs

To identify the capacity needs of the Centre, a survey was earlier undertaken as part of a needs assessment for its establishment. The survey was undertaken amongst RE&EE stakeholders in PICTs to ascertain, priority activities and issues that should be addressed by

the Centre in the PICTs. The project team consisted of local consultants with an excellent regional understanding of the RE&EE market in the Pacific. The needs assessment has been undertaken in collaboration with government institutions, the private sector, training and research institutions and the donor community.

In terms of the identified barriers it was categorised into 4 main groupings;

- a. Specific Barriers for Renewable Energy,
- b. Specific Barriers for Energy Efficiency;
- c. General Regional Barriers and
- d. Barriers Faced by Local Businesses.

The list of identified barriers is attached as **Annex 1**.

#### **a. Barrier Analysis**

An assessment of the identified barriers was undertaken and the following were identified in terms of categorization through the following table.

NO.	Barrier Classification	IDENTIFIED BARRIERS (REGIONAL)				Total
		Renewable Energy Barriers	Energy Efficiency Barriers	General Regional Barriers	Local Business Barriers	
1.	Capacity, Capabilities & Knowledge	5	5	5	3	18
2.	Investment Issues	6	1	3	1	11
3.	Government Policies & Targets	5	1	Nil	Nil	6
4.	Legislations & Regulations	4	2	Nil	Nil	6

**NB.** Please refer to Annex 1 on the categorisation of each barrier.

In terms of barrier analysis the table tries to capture the most prevalent or common occurring barrier that were affecting or serves as an obstacle in the adoption of RE&EE in the PICTs. The barriers were categorized and listed in terms of prevalence;

- i) Capacity, Capabilities and Knowledge Issues,
- ii) Investment Issues,
- iii) Govt Policy & Targets and
- iv) Legislations & Regulations.

All the four (4) different barriers acknowledged that the lack of "Capacity, Capabilities and Knowledge" was the most prevalent in the region, this was followed by the "Investment related Issues", followed by the "Government Policies and Targets" and the "Legislations & Regulations" that prevailed in the PICTs. The "Capacity, Capabilities and Knowledge" basically refers to the energy institutions in the countries, its ability to respond to the inherent tasks and finally on the familiarity or know how in terms of the skills and tasks and the experience therein. In terms of "Government Policies and Targets" and "Legislations and Regulations", it

was basically the level in terms of the presence of these instruments including those directly related to the technologies and also regarding Independent Power Producers and Feed-in-Tariffs. In addition the biased subsidies on fossil fuels were also identified as a shortcoming in terms of investment in renewable energy and energy efficiency.

Despite the potential contribution of RE&EE technologies and services to resolving some of the energy challenges in the region, markets for these technologies remain largely underdeveloped. Important to note that the CBFS 2019 – 2021 that is being formulated is only for first 3 – 4 years of the Centre (First Operational Phase) at the conclusion of this time period there will perhaps new barriers that will need to also be considered as part of the current matrix.

**b. Categorization of Barriers (Short & Medium Term Interventions)**

In terms of categorization of barriers, the consideration was on the urgency in terms of implementation of actions to address the barriers and also in terms of its impacts or the realization of the benefits as a result of implementing those actions.

Annex 2 outlines specific barriers that have been extracted from the list of barriers and can be implemented in terms of “**Short - Medium**” interventions for the Centre and also has been incorporated as part of Capacity Building Strategy Framework.

**9.0 MATRIX & PLANNED ACTIVITIES OR CAPACITY BUILDING STRATEGIES**

Meanwhile outlined below the initial matrix that provides an outlook on tentative outputs and activities envisaged under the outcomes of the Center. The activities focus primarily on Outcome 2 & 3 that specifically deals with Capacity Building and Awareness for the Centre. The activities are based on the gap analysis made under the abovementioned needs assessment that was undertaken for the establishment of the Centre.

**A. Outcome 2: Strengthened capacities of local key institutions and stakeholder groups through the up-scaling and replication of certified training and applied research programs and mechanisms**

- i. Output 2.1 : A multi-year framework to strengthen the local RE&EE capacities of key institutions and stakeholder groups is developed, adopted and under implementation

<b>Output 2.1</b>	
<b>Activities</b>	<b>Responsibility</b>
2.1.1 Conduct a regional capacity needs assessment particularly reflecting the needs of the governments and local technology industry and business using existing studies and in cooperation with the NFIs.	PCREEE
2.1.2 Develop a regional multi-year capacity development strategy particularly reflecting the needs of local public and private stakeholders (to be done in combination with activity 4.2.1 under output 4.2)	PCREEE
2.1.3 Produce tailored training and certification modules covering various RE&EE issues and tools in coordination with local business and industry groups (also in local language).	PCREEE
2.3.4 Training for Regulators / Government / Utilities / Private Sector / IPPs / Training Institutes / Financing Institutions on PPA’s with the intention for developing a region wide template that can be adopted in each country. The template can be adapted to the different countries if required. However it is to be	PCREEE

pegged on the principle to ensure equitable sharing of costs and gains for the different stakeholders.	
2.3.5 Training for Regulators / Government / Utilities / Private Sector / IPPs / Training Institutes / Financing Institutions on Feed In-tariffs and also on Net Metering with the principle to ensure equitable sharing of cost and gains for the different stakeholders.	PCREEE
2.3.6 Work with Governments in terms of their respective NDC's and develop frameworks that will enable the implementation of activities pertaining to RE & EE. This will also take into account energy efficiency improvements (low hanging fruit) to be considered such as building codes and other energy efficiency activities.	PCREEE
2.3.7 Conduct regional capacity building for smaller island countries to focus on the removal of monopolies in the power sector and also the need to put in place a regulator (looking at multi-sector regulation).	PCREEE

- ii. Output 2.2 : Pacific certification / accreditation scheme for individuals, organisations and products is created (in collaboration with SEIAPI) and operational

<b>Output 2.2</b>	
<b>Activities</b>	<b>Responsibility</b>
2.2.1 Act as the secretariat for developing the training competency standards on RE&EE which was already started by USP/SEIAPI	PCREEE, USP
2.2.2 Act as the body accrediting training Centres and certifying trainers	PCREEE, USP
2.2.3 Act as the secretariat for co-coordinating installation and products standards/guidelines	PCREEE, USP

- iii. Output 2.3 : Key stakeholders are trained by the certified trainers on RE&EE aspects of high relevance for the local business and industry sector

<b>Output 2.3</b>	
<b>Activities</b>	<b>Responsibility</b>
2.3.1 Train key policy makers in sustainable energy policy planning and incentive mechanisms (including sustainable cooking and transport)	PCREEE
2.3.2 Train utilities and regulators regarding RE integration/grid stability and energy efficiency (e.g. demand side management)	PCREEE, PPA
2.3.3 Provide targeted RE&EE business development training for clean-tech SMEs and entrepreneurs (e.g. energy auditors, equipment installers, RE service providers)	PCREEE, SEIAPI
2.3.4 Increase the capacity of stakeholders to mainstream gender and climate resilience into RE&EE policies and projects	PCREEE, SIDS DOCK
2.3.5 Increase the capacity of technical private-sector experts and start-ups to develop, install and maintain RE&EE projects and systems (including training on climate resilient energy infrastructure).	PCREEE, PFAN and others
2.3.6 Train experts on the financial structuring, design and planning of RE&EE projects (e.g. climate finance, RETScreen, HOMER)	PCREEE

- iv. Output 2.4 : Applied science research networks and technology transfer with high relevance for the local business and industry sector are promoted

<b>Output 2.4</b>	
<b>Activities</b>	<b>Responsibility</b>
2.4.1 Conduct a baseline study on the research priority needs of the Pacific RE&EE industry and business sectors	PCREEE, PFAN and others
2.4.2 Create a regional incentive model for the establishment of regional research programmes with high relevance for the local industry (e.g. call for proposals)	PCREEE
2.4.3 Promote south-south and north-south technology transfer programs and projects	PCREEE

**B. Outcome 3: The awareness and knowledge base of local key institutions and stakeholder groups on RE&EE are strengthened**

- i. Output 3.1 An effective online RE&EE information management system addressing the needs of investors, private sector and industry is created and operating

<b>Output 3.1</b>	
<b>Activities</b>	<b>Responsibility</b>
3.1.1 Contribute to the establishment of the interactive PCREEE website (www.pcreee.org) and link it to the Pacific Regional Data Repository for SE4ALL	PCREEE, SPC
3.1.2 Compile an inventory of relevant experiences/projects and papers/study reports/research reports and documents on best practices, skills, know-how, knowledge, technology suppliers in each PICT (disseminated through the information system)	PCREEE
3.1.3 Create a database of RE&EE stakeholders, including governments, training institutes, industry and NGO's (to be disseminated through the information system)	PCREEE
3.1.4 Develop guidelines on energy data verification, quality and harmonisation in cooperation with the NFIs	PCREEE
3.1.5 Create a database of RE&EE standard investment opportunities for the region to facilitate matching available funds to real projects (particularly in alignment with the activities under outcome 4)	PCREEE
3.1.6 Produce and publish and RE&EE resource atlas and facilitate resource mapping in the PICTs (data to be disseminated through the information system)	PCREEE
3.1.7 Map existing sustainable energy projects including their key information (manufacturer, installer, status of operation, generated energy, etc) and disseminate information through the information system	PCREEE

- ii. Output 3.2 Awareness and knowledge base of key stakeholder groups on various RE&EE aspects are strengthened

<b>Output 3.2</b>	
<b>Activities</b>	<b>Responsibility</b>
3.2.1 Organize at least one major annual conference on different RE&EE aspects	PCREEE, SPC, SIDS DOCK, UNIDO
3.2.2 Contribute to the production a RE&EE Industry report in cooperation with REN-21 and link the Pacific to the Asia-Pacific portal as well as the global tracking framework to the SE4ALL initiative	PCREEE, REN-21, SIDS DOCK

3.2.3 Design and implement at least one regional RE&EE awareness campaign targeting the residential, commercial or industrial sectors	PCREEE
3.2.4 Provides energy policy support to CROP agencies, especially to SPC, as well as Member States	PCREEE

## 10.0 CONCLUSION

The outputs and activities that have been listed above portrays most if not all the urgent requirements or needs in terms or capacities enhancement required for the PCREEE and its stakeholders. The success in terms of implementation of the recommendations will also determine the rate in which the changes(adoption of RE & EE) takes place in the local and regional energy sector.

## ANNEX 1

Outlined line below the different barriers that have been identified as part of the inception of the PCREEE. The Project Team had conducted a needs assessment among the RE&EE Stakeholders in the PICTs. The Team consisted of local consultants with understanding of the RE&EE in the region. They had also undertaken needs assessment for government institutions, the private sector, training and research institutions and the donor community.

In terms of the assessment, respondents were sent an email requesting their assistance in the survey along with a questionnaire. Telephone and in-person interviews were then conducted, with the outcome being registered by the project team. However the majority of the respondents had filled in and the sent their questionnaires by email.

The needs assessment conducted as part of the preparatory work for the Centre has identified the following barriers for sustainable energy (RE & EE) in the PICTs.

For information also indicated in blue are the various timelines or the level or urgency that is associated with the barrier. That is either it is **“short”, “Medium” or “Long Term”**. The **“short – medium”** term have been incorporated as part of the CBSF 2019 – 2012.

### 1.0 Specific barriers for Renewable Energies

1. Lack of firm plans and targets on RE&EE: Although 13 PICTs have specific targets for RE adoption and for rural electrification some lack technical studies, infrastructure and allocated budget for achieving the targets. Due to these factors some of the targets are likely not to be achieved. The current FAESP does not include explicit regional renewable energy and energy efficiency targets. That does not reflect the pro-active commitments of countries on national levels - **(Policy / Plans / Targets) & (S/M)**.
2. There is a lack of concrete follow-up measures to implement national policy commitments and targets (e.g. laws, standards, investment plans, incentive schemes, public procurement). This goes hand in hand with existing knowledge and capacity gaps concerning sustainable energy implementation. Regional RE&EE targets in the FAESP and a guided regional implementation process could help to facilitate the implementation of national commitments - **(Policies) & (S/M)**.
3. Existing RE support policies in many cases are considered as insufficient by the private sector. Project developers usually require financial support from bilateral and multilateral institutions, in the form of grants and concessional loans, to pass the different stages of project development. Moreover, often they do not consider energy efficiency improvement as a complementary activity - **(Policies) & (S/M)**.
4. Electricity generation sector is not attractive to Independent Power Producers: Governments have not been able to establish support schemes such as feed-in-tariffs to deem RE projects economically viable. There is also the particular case in Fiji where biomass power plants are not economically sustainable due to low tariffs combined with technical issues - **(Policies / Legislations / Regulations) & (S/M)**.
5. Monopoly by utilities: Utilities in the PICTs are vertically integrated (usual practice in small island states) combining generation, transmission and distribution, and frequently, also regulation. This can be seen as a conflict of interest especially by the utilities in terms of dealing with independent power producers - **(Legislations & Regulations) & (S/M)**.
6. Lack of technical capacity to formulate and enforce policies. Usually, the technical capacity in the Pacific islands is confined to the staff of the utilities. Governments and regulators



often lack the resources to formulate consistent sustainable energy policies and regulations in line with the local environment and social aspects. This is frequently due to the limited number of persons in these institutions but also because of their technical skills – **(Policies & Regulations) & (M/L)**.

7. Low grid stability: The reliability of the PICTs power systems is low due to lack of investments in the generation, transmission and distribution networks. Adding intermittent sources of energy as is the case of the majority of RE sources such as solar and wind could contribute to further interruptions in the grid when the power plants are not able to meet the demand. As in many PICTs only intermittent RE sources are available an efficient interplay with the conventional production units is of high importance. The outdated diesel engines in some PICTs make that difficult - **(Investment) & (S/M)**.
8. Subsidies to fossil fuels: One of the key constraints to investments in renewable energy and energy efficiency is the biased subsidies to fossil fuels – **(Policies & Regulations) & (M/L)**.
9. Lack of trained O&M personnel to operate and maintain the power systems. This has caused that a significant number of RE projects (mostly PV) to stop operating - **(CCK) & (S/M)**.
10. Lack of RE resource assessments and feasibility studies. The potential for hydro, wind, biomass and tidal/wave energies in many PICTs is not entirely understood. Although some studies have already identified potential sites are identified, there was no follow up for conducting feasibility studies. This is the result of the lack of allocation of funds by governments and utilities, and the reduced technical capacity in the region to conduct these technical studies – **(CCK) & (M/L)**.
11. Apprehension in making new investments. The economic slowdown and the increase in frequency of extreme climate events (e.g. cyclones and floods), has led to business owners to hold back on potential RE&EE investments. This is the case in the hospitality industry that prefer not to install solar water heaters, an equipment which has usually very short payback times when electricity tariffs are as high as in the PICTs – **(Investment) & (S/M)**.
12. Land use/availability: Land in small islands is limited as its use is often sensitive. As most RE technologies require significant land usage, investors can be wary of projects that entail land acquisitions/lease – **(Investment) & (M/L)**.
13. Low electrification rates. Efforts to electrify peri-urban and rural areas, especially in PNG and Vanuatu, need to be significantly scaled-up in order to tackle their low electrification rates. Besides availability of finance, the main barrier is the lack of regulatory framework to allow private businesses such as RE services companies to operate in this market. It is also important to link these mechanisms with other access-to-energy programmes (e.g. rural electrification and efficient cooking stoves) – **(Investment & Regulations) (M/L)**.
14. Due to lack of knowledge and awareness, renewable energy technologies are still perceived as expensive although some are already cost-competitive when they compete with conventional alternatives under specific conditions. Moreover, decision makers often do not have the full understanding of the potential benefits of existing technologies - **(CCK) & (S/M / L)**.
15. Equipment not appropriate to local environment. The selection of system components often is based only in the price without taking into consideration the local environment conditions such as high temperatures, salinity and climatic variability found in PICTs. This leads to an increased risk of equipment failure and high maintenance costs – **(CCK) & (M/L)**.
16. Quality standards for renewable energy equipment are not existing or implemented sufficiently. Presence in the market of low quality equipment can lead to a negative uptake of RE technologies, and interviews in some PICTs confirm that this is the case. Consumers need to be educated regarding the options when purchasing equipment. It is also urgent to address waste management issues of the equipment when they reach the end of their

- life. There is a lack of certification of equipment such as the Lighting Africa programme from World Bank which tests and certifies off-grid lighting products. Failed demonstration projects lead to the perception that RE technologies are not reliable - **(CCK) & (S/M/L)**.
17. Stakeholders have also mentioned the lack of reliable and updated energy data. Renewable energy projects will often require information, which may not be readily available, including historic weather-related data such as sun radiation, wind speed, biomass availability and precipitation - **(CCK) & (S/M / L)**.
  18. The up-front costs for RE tend to be high (but operational costs low) and there is a lack of tailored financial schemes for small scale to medium scale projects available. Another challenges is that most ongoing renewable energy investments are fully financed from outside. Systems tend to be fully (or over-) subsidised leading to a lack of ownership, especially in small scale projects. Markets cannot very well develop under these conditions - **(Investment) & (S/M/L)**.

## 2.0 Specific barriers for energy efficiency

19. Although energy efficiency is part of PICTs national energy policies and plans, there is often no clear responsibility within the government for developing and implementing EE efforts, no priorities and little or no budget support - **(Policy & Investment) & (S/M/L)**.
20. There are weak or no minimum energy performance standards for new buildings, building renovations, appliances, lights, air conditioning and refrigeration, vehicles, etc - **(CCK) & (M/L)**.
21. There is limited human and institutional capacity to carry out energy audits, provide energy efficiency training, help arranging the finance, guarantee results, etc - **(CCK) & (M/L)**.
22. Although energy efficiency improvements are often the “low hanging fruit” and cost-competitive they are not considered or there is lack of awareness options. For the business community, there are no guaranteed benefits for the costs incurred and sometimes a lack of trust in energy auditors, who may be linked to equipment suppliers. Renewable energy solutions are implemented without energy efficiency measures what leads to higher costs (e.g. change of light bulbs) - **(CCK) & (S/M/L)**.
23. Decisions (regarding appliance choice, new building design, vehicle purchases, etc.) tend to be made on the basis of initial cost, not operating or life-cycle costs - **(CCK) & (S/M/L)**.
24. There is no incentive or legal requirement for the power utilities to provide energy efficiency services and usually little or no capacity to do so. They tend to concentrate on expanding supply and distribution. The area of commercial losses is not very well managed - **(CCK) & (M/L)**.
25. In much of the Pacific, power tariffs (at least for households) have traditionally been lower than actual costs of supply, encouraging waste in the use of electricity - **(CK & Investment) & (M/L)**.
26. Utility short-to-medium term planning (often donor supported) largely ignores demand-side (end-use) efficiency opportunities and seldom if ever considers end-use efficiency as an alternative to new generation - **(CCK) & (M/L)**.

## 3.0 General Regional Barriers

27. Small market size does not allow economies of scale especially among the smaller PICTs - **(Markets) & (M/L)**
28. Distance between islands and from manufacturers significantly increase the cost of equipment and spare parts. Moreover, this is further exacerbated by the small size of the local markets - **(Markets) & (M/L)**.

29. Staff turnover tend to be high in governments and developing partners. This tends to result in complications in the implementation of projects and programmes. Brain drain in the energy sector is a general challenge - **(CCK) & (M/L)** .
30. The distinct geographical, environmental, cultural and social aspects in the region difficult the creation of one-size fits all approach. This is an issue when developing capacity building activities and selecting appropriate technologies and business models for different islands - **(CCK) & (M/L)**.
31. Lack of continuity and planning of capacity building, awareness raising and investment promotion activities in the sustainable energy sector combined with the fact that most of them are led by external organisations. This leads to the wheel being reinvented several times, efficient use of resources and demotivation by regional institutions and individuals who feel that their views and needs are not addressed - **(CCK) & (M/L)**.
32. Some sustainable energy areas such as transport, cooking, solar thermal heating and cooling or energy storage systems are not very well integrated in regional activities. Particularly transport would be a high impact area as it consumes most of the energy in PICTs. The area of sustainable cooking is a high priority area with high expected impacts for the population in PICTs - **(CCK) & (M/L)**.
33. Gender and climate change resilience of energy infrastructure are not well integrated in the energy sector planning and policy in PICTs. This leads to the situation that the needs of women are not well addressed - **(CCK) & (M/L)**.

#### **4.0 Barriers Faced by Local Businesses**

34. Local businesses, especially suppliers and installers of RE&EE equipment are generally not benefiting from donor funded projects. This is mostly due to the size of the projects which tend to be of a scale not appropriate to the capacity of local companies. Also, external companies tend to be able to offer significantly cheaper prices as they are able to buy bulk quantities - **(CCK) & (M/L)**.
35. Lack of technical capacity of local staff. Local companies tend to be set-up by self-taught individuals who then have to train their own staff as the know-how is not present in the labour market. They also face difficulties when trying to approach new markets/technologies as there is limited experience in the region or the experience/lessons learned have not been disseminated (e.g. setting-up renewable energy service companies). During the needs assessment it was also mentioned that installation manuals and training materials are often not available in local languages - **(CCK) & (M/L)**.
36. Equipment and technologies are not appropriate to the market environment. Due to the small size of the market, there is a lack of options to answer the needs of users, especially for pico and micro applications - **(CCK) & (M/L)**.

## ANNEX 2

### IDENTIFIED BARRIERS REQUIRING SHORT - MEDIUM TERM INTERVENTIONS

NO.	BARRIERS (Short – Medium Term Interventions)	Actual Nos.
1.	Lack of firm plans and targets on RE&EE: Although 13 PICTs have specific targets for RE adoption and for rural electrification some lack technical studies, infrastructure and allocated budget for achieving the targets. Due to these factors some of the targets are likely not to be achieved. The current FAESP does not include explicit regional renewable energy and energy efficiency targets. That does not reflect the pro-active commitments of countries on national levels - <b>(Policy / Plans / Targets) &amp; (S/M)</b> .	1.
2.	There is a lack of concrete follow-up measures to implement national policy commitments and targets (e.g. laws, standards, investment plans, incentive schemes, public procurement). This goes hand in hand with existing knowledge and capacity gaps concerning sustainable energy implementation. Regional RE&EE targets in the FAESP and a guided regional implementation process could help to facilitate the implementation of national commitments - <b>(Policies) &amp; (S/M)</b> .	2.
3.	Existing RE support policies in many cases are considered as insufficient by the private sector. Project developers usually require financial support from bilateral and multilateral institutions, in the form of grants and concessional loans, to pass the different stages of project development. Moreover, often they do not consider energy efficiency improvement as a complementary activity - <b>(Policies) &amp; (S/M)</b> .	3.
4.	Electricity generation sector is not attractive to Independent Power Producers: Governments have not been able to establish support schemes such as feed-in-tariffs to deem RE projects economically viable. There is also the particular case in Fiji where biomass power plants are not economically sustainable due to low tariffs combined with technical issues - <b>(Policies / Legislations / Regulations) &amp; (S/M)</b> .	4.
5.	Monopoly by utilities: Utilities in the PICTs are vertically integrated (usual practice in small island states) combining generation, transmission and distribution, and frequently, also regulation. This can be seen as a conflict of interest especially by the utilities in terms of dealing with independent power producers - <b>(Legislations &amp; Regulations) &amp; (S/M)</b> .	5.
6.	Low grid stability: The reliability of the PICTs power systems is low due to lack of investments in the generation, transmission and distribution networks. Adding intermittent sources of energy as is the case of the majority of RE sources such as solar and wind could contribute to further interruptions in the grid when the power plants are not able to meet the demand. As in many PICTs only intermittent RE sources are available an efficient interplay with the conventional production units is of high	7.

	importance. The outdated diesel engines in some PICTs make that difficult - <b>(Investment) &amp; (S/M)</b> .	
7.	Lack of trained O&M personnel to operate and maintain the power systems. This has caused that a significant number of RE projects (mostly PV) to stop operating - <b>(CCK) &amp; (S/M)</b> .	9.
8.	Apprehension in making new investments. The economic slowdown and the increase in frequency of extreme climate events (e.g. cyclones and floods), has led to business owners to hold back on potential RE&EE investments. This is the case in the hospitality industry that prefer not to install solar water heaters, an equipment which has usually very short payback times when electricity tariffs are as high as in the PICTs - <b>(Investment) &amp; (S/M)</b> .	11.
9.	Due to lack of knowledge and awareness, renewable energy technologies are still perceived as expensive although some are already cost-competitive when they compete with conventional alternatives under specific conditions. Moreover, decision makers often do not have the full understanding of the potential benefits of existing technologies - <b>(CCK) &amp; (S/M / L)</b> .	14.
10.	Quality standards for renewable energy equipment are not existing or implemented sufficiently. Presence in the market of low quality equipment can lead to a negative uptake of RE technologies, and interviews in some PICTs confirm that this is the case. Consumers need to be educated regarding the options when purchasing equipment. It is also urgent to address waste management issues of the equipment when they reach the end of their life. There is a lack of certification of equipment such as the Lighting Africa programme from World Bank which tests and certifies off-grid lighting products. Failed demonstration projects lead to the perception that RE technologies are not reliable - <b>(CCK) &amp; (S/M/L)</b> .	16.
11.	Stakeholders have also mentioned the lack of reliable and updated energy data. Renewable energy projects will often require information, which may not be readily available, including historic weather-related data such as sun radiation, wind speed, biomass availability and precipitation - <b>(CCK) &amp; (S/M / L)</b> .	17.
12.	The up-front costs for RE tend to be high (but operational costs low) and there is a lack of tailored financial schemes for small scale to medium scale projects available. Another challenges is that most ongoing renewable energy investments are fully financed from outside. Systems tend to be fully (or over-) subsidised leading to lack of ownership, especially in small scale projects. Markets cannot very well develop under these conditions.	18.
13.	Although energy efficiency is part of PICTs national energy policies and plans, there is often no clear responsibility within the government for developing and implementing EE efforts, no priorities and little or no budget support - <b>(Policy &amp; Investment) &amp; (S/M/L)</b> .	19.
14.	Although energy efficiency improvements are often the "low hanging fruit" and cost-competitive they are not considered or there is lack of awareness options. For the business community, there are no guaranteed benefits	22.

	for the costs incurred and sometimes a lack of trust in energy auditors, who may be linked to equipment suppliers. Renewable energy solutions are implemented without energy efficiency measures what leads to higher costs (e.g. change of light bulbs) - <b>(CCK) &amp; (S/M/L)</b> .	
15.	Decisions (regarding appliance choice, new building design, vehicle purchases, etc.) tend to be made on the basis of initial cost, not operating or life-cycle costs - <b>(CCK) &amp; (S/M/L)</b> .	23.

**END**