



# Pacific SIDS Energy, Ecosystems and Sustainable Livelihoods Initiative: Managing the Ecosystem Implications of Energy Policies in the Pacific Island States

Review Report 2011





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Author: Dr. Atul K. Raturi  
Division of Physics  
School of Engineering and Physics  
The University of the South Pacific  
Private Bag, Laucala campus, Suva  
Fiji Islands

Available from: IUCN Oceania Regional Office  
Private Mail Bag  
5 Ma'afu Street, Suva, Fiji  
Tel +679 3319084  
Fax +679 3100128  
oceania@iucn.org  
www.iucn.org/oceania

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ADMIRE

The Energy, Ecosystem, Sustainable Livelihood Initiative (EESLI) has been operative in the 6 PICs for the last 3 years. This review is a follow-up of a mid-term review of the EESLI projects that was carried out in November- December 2009. The EESLI is part of a larger programme being funded by the Government of Italy (Ministry of Environment, Land and Sea and Ministry of Foreign Affairs), in collaboration with the Government of Austria and the City of Milan. The overarching objective of this programme is the reduction of GHGs through implementation of renewable energy (RE) and energy efficiency (EE) projects in the six participating countries. In addition, there are a number of small-scale activities being undertaken under the Special Initiatives component.

The main findings of this review are:

- All country projects with the exception of Vanuatu have almost reached their end point.
- Vanuatu solar rehabilitation is 90% complete and wind monitoring equipment is being installed at present. The hydropower project is finally taking shape and is expected to be completed in 2012. Landowners' concerns (regarding wind monitoring locations) are still an issue. The refurbished solar PV systems in health centres have made a remarkable impact on provision of basic health services to rural population and also enhanced educational facilities in hitherto un-electrified schools.
- The Palau project has been able to create a multiplier effect with banks/financial institutions from the other PICs planning to start subsidy schemes in their countries. The energy efficiency loan scheme is now being extended to cover loans for renewable energy equipment. This project has also encouraged other agencies (GEF, SPC and ADB) to support similar efforts.
- The Tuvalu GCPV project was completed in 2009 but faces difficulty, as one of the battery banks is not functional at present (November 2011). The solar street lighting component has helped make the school environs much safer especially for the girl boarders and staff.
- RMI project (retrofitting of LED lights) is 90% complete. The project proponents envisage annual savings of USD 300,000 due to reduced diesel consumption. This project itself is straightforward and should not have serious issues. Performance monitoring is critical for making a proper evaluation. The solar lighting component is being supported by additional funding from Taiwan and Canada. Shortage of technically qualified staffTheCanada.



This report presents the findings and recommendations of a review of the programme entitled "IUCN Pacific Energy, Ecosystems and Sustainable Livelihoods Initiative (EESLI): Managing the Ecosystem and Livelihood Implications of Energy Policies in the Pacific Island States". This initiative is coordinated by the Oceania Regional Office (ORO) of IUCN which is located in Suva, Fiji and implemented in six Pacific Island Countries (PICs)<sup>1</sup>. The initiative is funded by the Governments of Italy and Austria.

The review follows the mid-term review undertaken in November-December 2009, and is for the period 2010-2011.

## BACKG D

The EESLI has its origin in the IUCN Energy, Ecosystems and Livelihoods Initiative (EELI). The main aspiration of the EELI is "to support and accelerate the transition to energy systems that are ecologically sustainable, socially equitable, and economically efficient". The Pacific component of this initiative is EESLI which is "aimed at increasing awareness in the six Pacific Island Countries (PICs) of critical linkages between energy systems and the natural ecosystems through sustainable and socially equitable energy projects".

This would be achieved by:

- Supporting beneficiary countries in the development and implementation of environmentally sound, sustainable energy policies; and
- Implementing a number of renewable energy pilot projects focusing on ecosystem conservation and livelihood enhancement.
- It is expected that program will help implement pilot projects in six Pacific SIDS that demonstrate sustainable energy technologies, and management systems for those technologies, that are suitable for wider dissemination in other Pacific SIDS and beyond.
- The main features of this programme are as follows:
- It is governed by a memorandum of understanding (MOU) between the Government of Italy and twelve PICs;
- All activities are aimed at greenhouse gas emission reduction, with projects being implemented in a range of sectors;
- A total of USD 10 million is provided by the Government of Italy;
- Co-funding is made available by the Government of Austria (EUR 1 million) and
- The City of Milan (USD 500,000);
- Six countries (Fiji, Kiribati, Federated States of Micronesia - FSM, Nauru, Papua New Guinea - PNG, and Solomon Islands) are supported through "direct financing", i.e. funding provided by the Italian Ministry of Environment, Land and Sea and channelled through the Permanent Missions of the PICs in New York;
- Six countries (the Republic of the Marshall Island, Palau, Samoa, Tonga, Tuvalu and Vanuatu) are supported through IUCN;
- A Joint Committee (JC) comprising representatives from the Government of Italy and the Heads of Missions of the Permanent Missions of the PICs to the United Nations in New York is responsible for the implementation of the MOU, including the allocation of funds and the selection of projects;
- A Joint Working Group (JWG) of experts designated by the signatories of the MOU was established, under the coordination of the Euro Mediterranean Centre on Climate Change, to conduct the initial feasibility study.

Actual implementation of the IUCN Initiative began in mid-2008, following a period of design and negotiations that included the following steps:

- May 2007: the Government of Italy and the Governments of twelve Pacific Small Island States sign an MOU and issue a Joint Communiqué.
- 30 June – 1 July 2007: a Regional Meeting for the Implementation of the Cooperation programme between the Italian Government and the Governments of the Pacific Small Island States is held in Vanuatu.
- 13 December 2007: the first meeting of the Joint Committee is convened.
- February 2008: IUCN and Italy sign an MOU, and a meeting is held in Rome between the Ministry of Foreign Affairs, the Ministry of Environment, Land and Sea and IUCN.

<sup>1</sup> The six countries are Palau, the Republic of the Marshall Islands (RMI), Samoa, Tonga, Tuvalu and Vanuatu.









A new board has been formed. According to the project coordinator, the top brass of NDBP is very enthusiastic about this project and the committee members were driving the agenda forward. A number of awareness events (energy fair in schools) have been held to promote the energy efficient activities/appliances. The largest hardware retailer has joined the initiative as a partner.

Future plans include subsidies for retrofitting of EE measures in existing homes. Building on the EESP a new subsidy scheme under Renewable Energy Subsidy Programme (RESP) is now providing subsidies for renewable energy equipment. The funding for this component is through the national GPAS programme (GEF Pacific Sustainability Alliance).

## Impacts

The EESP is the first project in the PICs where a commercial institution (NDBP) has played a leading role in sustainable energy awareness and development. It has spurred a similar interest among other institutions across Pacific.

## Issues

- It is important to show how this project has contributed to decrease in GHG emission since its inception. Baseline data would be required to make a comparison and reduction calculations.
- The project had to be extended until 2013 as there is only one company involved in home construction under the EESP.
- Long term sustainability of the subsidy scheme will be a crucial issue.



## Issues

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## Project description

This solar rehabilitation project involves replacement of old non-functioning PV systems installed in the 80s-90s on the islands of Mango

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Project description

## **Battery banks**

TEC has been having issues with charging the batteries via the grid. With the diesel generator- set at Motufoua not operational at the time of visit (awaiting spare parts for repair), the only other option is to charge from the PV system. This at times can be difficult when there are a few not-so-sunny days (rain, heavy cloud cover) in succession.

One of the battery banks (No.3) is not functional and hence the Sunny Island inverters associated with this battery bank were not operational even on a sunny day. According to the logbook, these inverters have been off most of the time since May 2011 and operating on/ off intermittently even earlier. The set up inside the battery banks and inverters shelter is as shown in Figure 7.

## **System Monitoring**

There is currently very limited information noted down in the site logbooks. More detailed information needs to be logged to assess the performance of the installation. There is an existing Sunny Web box installed at the site which will be able to facilitate remote monitoring if there is an internet connection available. This would reduce the need for physically downloading or manual recording of the data.

## **Maintenance**

There were no records of any regular maintenance carried out for the batteries or other equipment. There is an existing Operation & Maintenance (O&M) manual for the Motufoua PV installation and this should be referred to as the basis for maintenance procedures at recommended intervals. Some basic training was provided to the Vaitupu technicians/operators regarding general system operations.

## **System Load**

The original system design was based on the batteries being able to supply 200 kWh per day. After the system installation, new loads have been added and this will affect the performance of the PV system.

## **Warranty/Inspection**

In consultation with TEC, the initial phase of the project was scheduled for its one year warranty inspection in December 2010. This did not take place. The delay seems to be due to the contractor from Australia – Ecokinetics' failure to comply with the warranty arrangement. It demanded an upfront payment opposed



The school's night watchmen admits that the job is made easier after the installation of street lights, as students are often caught going around after lights were turned off in the dormitories. Matrons also witnessed less intrusion of privacy at night near the girls' dorms. Discussions with a few parents at the village and other islands, Nui, Nukufetau and Funafuti reveal that they were thankful for the solar PV streetlight project as they felt their daughters were much more secure. They would like to see the streetlights programme extended to cover the whole school area.

## Impacts

- The project saves about 44,000 litres of diesel and reduces approximately 109 tonnes of GHG annually.
- The PV system has ensured 18-20 hours of electricity are available to the school community. In October, the diesel generator was out of operation and only the PV system supplied electricity to the school.
- The solar streetlights have made the school environment much safer especially for the girl students.
- This system will also be used for training regional solar technicians.

I

**Santo projects:** These PV systems were rehabilitated in 2010. This report describes the status of the systems in mid-October 2011.

#### Natawa School

This is the only English centre school on the eastern part of the largest of Vanuatu's islands, and has 170 students. The solar system supplies power for lighting in eight class rooms and four staff houses. During the rehabilitation in 2010, the original flooded gel-regulated batteries were replaced by Deka dry batteries.

Since the refurbishment of PV system, student numbers have increased from 103 in 2010 to 170 in 2011 as parents like to send their children to a school which has proper lighting facilities and hence a secure environment. The dining hall system is not functional and needs urgent attention. A new library is under construction and a PV lighting system would enable staff and students to use the facility in the evenings

#### Port Olry Dispensary

Port Olry dispensary was formerly a catholic mission station on the north-eastern part of Santo. The centre has one health dispensary with one nurse practitioner and one nurse aide. The dispensary has undergone a few developments over the years resulting in the construction of a new maternity ward which has two beds and a room for women in labour. The centre is connected to the Port Olry bio-fuel power station, which is currently run by UNELCO GDF Suez. However, this supply is available only from 5am to 9am in the morning and 5pm to 11pm in the evening.

The previously installed solar system has undergone full refurbishment under VREP in 2010. Old batteries were replaced by 3 flooded

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Tata School

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Two of the aforementioned solar PV systems have failed due to technical problems since the beginning of 2011. The solar systems supplying power to the library and to one staff house had stopped working only a few weeks after the upgrade due to technical problems. These systems have not been inspected by qualified technicians.

Tasmulum Dispensa

## Issues

- The villagers work with bare hands and primitive tools. Obviously, the progress is very slow and there are OHS concerns. The contractor had promised to bring in a jackhammer to ease the work
- The building materials for the powerhouse will have to be physically carried over a distance of 3 km by community members – a tough ask.

## ISSUES AND IMPACTS

This section discusses the overall impacts of the EESLI projects and some of the challenges associated with their implementation.

### O

The overarching objective of the EESLI is to reduce the impact of climate change through sustainable energy initiatives. This would translate into a net decrease in the GHG emissions after the intervention.

- For four of the countries (Tonga, Vanuatu, RMI and Tuvalu) the reduction is obvious since fossil fuels are being displaced while in the case of Samoa and Palau energy efficiency projects, GHG reduction calculations are not so straightforward.
- In Tonga, before the rehabilitation of the PV systems, the average kerosene consumption for lighting per household was on average 15L per month, and it can therefore be estimated that the project will reduce approximately 30 tonnes of CO<sub>2</sub>e annually in the two islands where it has been implemented<sup>6</sup> ;
- In Tuvalu, the grid-connected 46kW PV system is expected to reduce GHG emission by 109 tonnes annually;
- The country project in Vanuatu envisages an annual GHG reduction of 118 tonnes, when all components are completed;
- Reduction figures for retrofitted light emitting diodes (LED) lamps in RMI are estimated to be 197 tonnes of CO<sub>2</sub>;
- Careful monitoring and validation is required to ascertain the actual GHG reductions. This in many cases (PV systems in Vanuatu for example) would be difficult to achieve due to logistic reasons. It must be noted that PIGGAREP has offered its help in data collection and analysis which should generate the real reduction numbers.

OM / O M

The intention for gender mainstreaming into the country projects is commendable and ties well with IUCN's women and energy vision. Solar PV projects are helping women to increase their income generation activities in Tonga and provide better health services to expectant mothers in Vanuatu. Solar street lighting in Tuvalu and RMI has created safer environs and the Talise hydro project promises to bring all round development in the beneficiary communities.

**OO & O O M**

Solar lighting in rural Vanuatu has tremendously improved health services and learning/living conditions in schools. In Tonga, the islanders have been able to work at night .The largest livelihood impact is expected to come from the Talise hydro project and it would be interesting

## SPECIAL INITIATIVES

Besides the country projects, IUCN is involved in some related activities termed as special initiatives. A sum of Euro 250,000 was made available for small projects which would be aligned with the overall EESLI mission of biodiversity conservation and reducing the impacts of climate change. As mentioned in Section 2, four types of projects are eligible under this initiative: demonstration projects, information projects, Innovative approaches to sustainable energy and environment policy and Evaluation and Impact Assessment.

The following activities have been funded under this initiative:

### Table 2 Special Initiatives under EESLI

OJ	Object	?
<b>Demonstration projects</b>		
Nahu community solar project	Solomon Islands	Completed
Tetepare solar project	Solomon Islands	Completed
Tavua town Solar streetlight	Fiji	Completed
Solar light bulbs (NoKero)	Solomon Islands & regional	Completed
Lifecycle Tonga Initiative	Tonga	Operational
Lifecycle Fiji Initiative	Fiji	Operational
National Trust of Fiji, Sigatoka Sand Dunes renewable energy project	Fiji	Scheduled for 2012
<b>Information projects</b>		
Pacific energy & gender training	Regional	Completed
EESLI Mid-term review	Regional	Completed
Sustainable Energy Resources Workshop	Regional (with USP & DOE)	Completed
International conference on renewable energy and climate change	International and regional (with USP)	Completed
Solar power for Vanuatu (DVD by GreenTV)	Vanuatu	Completed
Regional capacity development workshop on Clean Development Mechanism under the ACP MEA project	Regional	Completed
<b>Innovative approaches to sustainable energy and environment policy</b>		
Palau energy policy support	Palau	Completed
Tuvalu energy policy support	Tuvalu	Completed
Vanuatu energy policy support	Vanuatu	In progress
Tonga energy road map support	Tonga	In progress
Energy policy screening guidelines	Regional	In progress
MSG Environment and Climate Change meeting support	Regional	In progress
<b>Evaluation and impact assessment</b>		
Environmental and social impact assessment (ESIA) training workshop	Regional	Completed
Samoa biofuel invasiveness review	Samoa	Completed
Workshop for replication of the Palau Energy Loan program	Regional	Completed
ESIA factsheets (bioenergy, wind, solar, hydro)	Regional	In progress
Environmental management plan for Talise micro hydro project	Vanuatu	In progress



Through these special initiatives IUCN has been able to support some EE/RE related activities in Pacific Island Countries (even outside the six EESLI project countries). These projects were designed and executed by IUCN ORO. Some of the major impacts of these initiatives are shown below:

- The Tavua Town (Fiji) solar street lighting system proved its effectiveness during January 2012 floods when the electricity supply was interrupted throughout the western division and solar lamps were only source of lighting in the town centre.
- The Tetepare and Nahu solar projects in Solomon Islands have brought solar lighting to remote islands. In Nahu, 39 homes were the recipient of solar lights and would no longer use polluting, expensive and highly inefficient kerosene lamps or traditional lights (dried sap of a tree). This initiative has specially been beneficial to village women who now do not have to walk long distances in search of the sap.
- The NoKero™ light bulbs project has demonstrated the concepts of solar energy to a wider range of audience.
- The cycling initiatives in Tonga and Fiji have created awareness about effect of cycling on health, environment and energy conservation. Life cycle Tonga is collaborating with Ministry of Health and Tonga Health Association to promote cycling as a healthy habit.

Although there is lot of interest<sup>9</sup>, more concerted action by all stakeholders and commitment by city/town authorities to develop cycling infrastructure would be needed to make this initiative effective in the long run. Involvement of school and university students would be highly beneficial.

- The information projects like Pacific Energy & Gender training and CDM capacity building workshops have been very useful in disseminating information on these topics.
- The Palau Development Financing Institution Workshop for the replication of the Palau Energy Loan Program was a very good initiative which hopefully will get other financial institutions follow the example of NDB, Palau.
- The *Jatropha curcas* invasiveness study in Samoa will help the government to make an informed decision regarding the biofuel development in Samoa.
- Environmental Social Impact Assessment (ESIA) Training Workshop and production of ESIA factsheets are very useful to all renewable energy practitioners.



The EESLI has helped establish IUCN Oceania as a major sustainable energy player in the region. The initiative has helped restart stalled projects (Talise hydro), brought lighting to hitherto unserved areas (Tonga, Vanuatu), reduced diesel dependence (Tuvalu and RMI) and

- Tuvalu: The project was completed in 2010. However, since mid-2011, one of the battery banks is dysfunctional. There are issues with the maintenance and system monitoring. It is imperative that the technical issues are sorted out immediately<sup>10</sup>. Monitoring mechanism should be in place. Extra and unaccounted-for electrical loads have been added after the completion of PV system which would adversely affect the system performance – load management is essential.
- RMI: Monitoring and performance evaluation of LED lights should be done on a continuous basis. Remaining retrofitting tasks should be completed. Additional Funds (USD 150,000) allocated for solar lighting have remained unutilized for quite some time which is not an efficient use of resources. There is a good opportunity to collaborate with other projects namely ADMIRE and North REP.

# ANNEXES

## COUNTRY PROJECTS: SUMMARY

O J OJ	OJ	OMM
<b>Tonga: Solar Rehabilitation</b>		
<p>This project involves rehabilitation of solar photovoltaic based electric systems for homes (solar home systems or SHS) in Mo'unga'one and Mango Islands, part of the Ha'apai group of islands. With the demise of previously installed SHS systems, the island had reverted to using kerosene lamps for its lighting needs and was completely dependent on imported and expensive fuels that had to be ferried over long distances.</p> <p>This project is coordinated by the Energy Division (ED) of Ministry of Lands, Survey, Natural Resources, and Environment.</p> <p>Budget: USD 206,000 Status: Installation in Mango and Mou'ngaone islands was completed in 2009. The project has been expanded to include Lofanga, the only island in Haa'pai group without solar electricity. The community is awaiting installation.</p>	<p>The project involved complete replacement of the old SHS systems (64 in all). Each system comprises two Kyocera 85 TS brand, 80Wp solar panels (connected in parallel), one Steca PR 1515 charge controller and one Hoppecke 12V OpzS deep cycle battery with a C10 capacity of 100 AH. The system is coupled to four 13 watt each Compact Fluorescent lamps (CFLs) and one 0.5 watt LED night-light via a 10 A circuit breaker. The total load is about 418 Wh per day. The system has a 5-day autonomy.</p> <p>The recipient households paid 200T\$ installation fee and pay a monthly 13 T\$ fee for O&amp;M expenses. There are two local technicians in each island to troubleshoot systems and collect monthly payments.</p> <p>The householder is responsible for the section after the circuit breaker while the utility looks after the system before the circuit breaker (similar to a grid-connected system).</p> <p>The battery and the controller are housed in the same box and this might lead to some corrosion/malfunction of the charging system. The project manager Ofa Sefana is looking at this issue.</p>	<p>It is imperative that measures be put in place to ensure that the new system does not suffer the same fate as the previous one. Since the solar panels are warranted for at least 20 years, looking after the battery is the critical maintenance activity. With local technicians available and training provided by the Energy Planning Unit (EPU), it is hoped that the systems will be able to provide useful energy during their predicted lifetime.</p> <p>The Lofanga installations should be completed as soon as possible as the community has been waiting for quite some time.</p>
<b>Tuvalu: Grid connected PV system</b>		
<p>The objective of this project is to reduce Tuvalu's dependence on imported fossil fuel by installing a grid-connected Photovoltaic system in Vaitupu island. The project is being coordinated by the Tuvalu Electricity Corporation (TEC) and Tuvalu Department of Energy.</p> <p>A second initiative under this project was</p>		

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## LIST OF PEOPLE INTERVIEWED

Albert Williams, Director, Department of Environment, Vanuatu

Anare Matakiviti, Energy Programme Coordinator, Regional Office for Oceania, IUCN, Suva

Angeline Heine, Energy Planner, Ministry of Resources and Development, Republic of Marshall Islands

Benjamin Jesse, Senior Energy Officer, Energy Unit, Ministry of Mines, Energy & Rural Water Supply

Catherine Malosu, Environment consultant, Environment Frontier Consultancy Services Vanuatu

Clarinda Ziegler, Former Commercial Loan Officer and Project Manager - Energy Efficiency Subsidy Program, Palau

Eddie Winterstein, Manager, Renewable Energy Programme, SROS, Samoa

Flavia Vaai Senior Research Officer – Energy, Ministry of Finance Government of Samoa

Greg Decherong, Director, Palau Energy Office, Ministry of Infrastructure, Industry and Commerce, Palau

Karla T West, Loan Officer / ELP Program manager, National Development Bank of Palau

Kennedy Kaltavara, Project Coordinator, Vanuatu Energy Unit, Ministry of Lands and Natural Resources

Leo Moli – Director, Energy Unit, Vanuatu

Lillian Penaia, Energy Efficiency Project Coordinator, Renewable energy Division Ministry of Natural Resources and Environment, Samoa

Mafalu Lotolua, Tuvalu Project Coordinator & General Manager of Tuvalu Electricity Corporation

Mohite Kalorai, Corporate Services Unit, Ministry of Lands, Vanuatu

’Ofa Sefana, Energy Specialist, Energy Division, Ministry of Lands, Surveys, Natural Resources and Environment

Peter Salemallo, Talise Community Leader, Vanuatu

Siliá Ualesi, Project Manager – PIGGAREP

Thomas Lynge Jensen, Environment and Energy Specialist, UNDP Pacific Centre, Suva, Fiji Islands

Zeigler, C., former Loan Officer / ELP Program Manager, National Development Bank of Palau.

In addition, a large number of stakeholders were interviewed (students, parents, nurses, community members) during the visits to Vanuatu and Tuvalu project sites.

### C

Figures 1, 2, 3,4

Figure 5, 6

Figure 7, 8

Figure 9

Figure 10

Figure 11

Figure 12

IUCN

IUCN and TEC

Leonie Bule

Jesse Benjamin

Kennedy Kaltavara

Peter Salemallo

Clay Engineering



**INTERNATIONAL UNION FOR  
CONSERVATION OF NATURE**

OCEANIA REGIONAL OFFICE  
Private Mail Bag  
5 Ma'afu Street  
Suva, Fiji Islands  
oceania@iucn.org  
Tel: +679 3319084  
Fax: +679 3100128  
[www.iucn.org/oceania](http://www.iucn.org/oceania)

