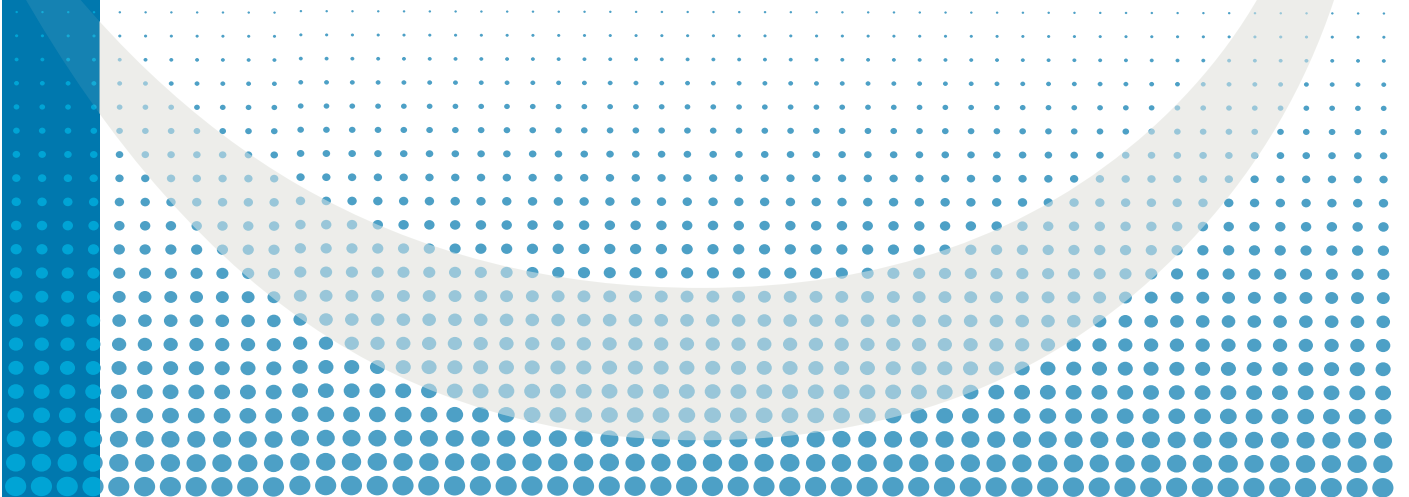


POLICY CHALLENGES FOR RENEWABLE ENERGY DEPLOYMENT IN PACIFIC ISLAND COUNTRIES AND TERRITORIES



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About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation dedicated to renewable energy.

In accordance with its Statute, IRENA's objective is to "promote the widespread and increased adoption and the sustainable use of all forms of renewable energy". This concerns all forms of energy produced from renewable sources in a sustainable manner and includes bioenergy, geothermal energy, hydropower, ocean, solar and wind energy.

As of November 2012, the membership of IRENA comprised 159 States and the European Union (EU), out of which 102 States and the EU have ratified the Statute.

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List of Acronyms

ADB	Asian Development Bank
ASTAE	Asian Sustainable and Alternative Energy Programme
CROP	Council of Regional Organisations in the Pacific
EU	European Union
FAESP	Framework for Action on Energy Security in the Pacific
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIZ	German Agency for International Cooperation
GOT	Government of Tonga
IES	International Energy Agency
IMF	International Monetary Fund
IPESP	Implementation Plan for Energy Security in the Pacific
IPPs	Independent Power Producers
IRENA	International Renewable Energy Agency
IU	Implementation Unit; for Tonga Energy Roadmap
NEP	National Energy Policy
NGO	Non-Governmental Organisation
OI	Outer Islands
PIAC	Pacific Infrastructure Advisory Centre
PICs	Pacific Island Countries
PICTs	Pacific Island Countries and Territories
PIEP	Pacific Islands Energy Policy
PIEPP	Pacific Islands Energy Policy and Plan
PIEPSAP	Pacific Islands Energy Policy and Strategic Action Plan
PIFS	Pacific Islands Forum Secretariat
PILR	Policy, Institutional, Legal and Regulatory
PNG	Papua New Guinea
PPAs	Power Purchase Agreements
PV	Photovoltaic
RE	Renewable Energy
REEEP	Renewable Energy and Energy Efficiency Partnership

REEEP-SEAP	The Renewable Energy and Energy Efficiency Partnership - South East Asia and the Pacific
RET	Renewable Energy Technology
RMI	Republic of the Marshall Islands
SE4ALL	Sustainable Energy for all Initiative
SIDS	Small Island Developing States
SPC	Secretariat of the Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
SWOT	Strengths Weaknesses Opportunities Threats Analysis
TERM	Tonga Energy Roadmap
TERM-C	Tonga Energy Roadmap - Committee
TISREEEP	Tonga-Improving Sustainability Through Reep
TPL	Tonga Power Ltd.
USD	United States Dollars
USP	University of the South Pacific



1. Introduction

The International Renewable Energy Agency (IRENA) is committed to support demand-driven initiatives that create an enabling policy environment to increase the uptake of renewable energy (RE) in the Pacific region. IRENA's commitment in the Pacific has been illustrated by hosting workshops, including the Accelerated RE Deployment in Islands with Emphasis on the Pacific Islands (held in Sydney, October 2011) and the IRENA Pacific Leaders Meeting convened in Abu Dhabi January 2012.

The Pacific Leader's Meeting issued a public communiqué confirming the Agency's proposed work activities to accelerate RE deployment in the region and welcoming IRENA's assistance to help the Pacific Island Countries and Territories (PICTs)¹ realise their full potential as they make the transition to a renewable energy based future. The meeting addressed IRENA's proposed role in accelerating RE deployment, opportunities for collaboration with relevant stakeholders and development partners, and provided guidance on IRENA's new proposals, ensuring that they accord with the Pacific Leaders' policy goals and priorities.

Although the Pacific Region has some hydropower, the predominant share of the energy used for transport and electricity comes from fossil fuels. Increased fuel prices have led the PICTs' fuel imports to represent on average close to 10% of their gross national income. Encouraging the regional development of RE has

been a priority for IRENA since its first Assembly in April 2011.

Political support has been broadly recognised as key to facilitating the implementation of the agenda for transforming energy systems. Many countries have introduced targets and plans to promote RE deployment. However, policy design and implementation often lags behind. This is particularly the case in the Pacific Island Countries and Territories (PICTs).

The purpose of this report is to address the specific conditions of RE policy making in the Pacific SIDS and propose measures that can support the successful deployment of RE policies. In doing so, the report identifies the existing challenges and opportunities, and will offer recommendations to policy makers in designing and implementing RE policies.

The report first provides the energy profile of the region in Section 2. It then describes at the beginning of Section 3 the conditions for an enabling environment for RE deployment, as well as the policy-making cycle. Sub-section 3.2 to 3.5 provides a brief description of regional and national RE policies. It also illustrates a comprehensive approach to deploying RE in Pacific SIDS by analysing the responses to a survey sent to stakeholders in the region and the Tonga Energy Roadmap (TERM). The Report's conclusions are then provided in Section 4.

¹ The PICTs consist of 22 islands, out of which, 11 independent nations (Fiji, Kiribati, Nauru, Palau, Papua New Guinea, Republic of the Marshall Islands, Samoa, The Solomon Islands, Tonga, Tuvalu and Vanuatu) are members or signatories of IRENA as of September 2012



2. Regional Energy Profile in PICTs

The PICTs are sparsely populated with less than 11 million inhabitants, of which Papua New Guinea's (PNG) population alone accounts for an estimated 6.7 million (2010) (Secretariat of the Pacific Regional Environmental Programme (SPREP), 2008; U.S. Department of State, 2012). The PICTs size varies considerably, with Papua New Guinea for example, covering an area of 462 000 km² while Tokelau an area of 12 km². Furthermore, the islands vary in terms of their resource endowments. Fiji, Papua New Guinea and Solomon Islands, for instance, have a wide range of potential RE resources while other islands have both a limited land area and RE resources, such as Kiribati, Marshall Islands and Nauru (SPREP, 2008; IT Power, 2011).

The PICTs share similar sustainable development challenges, these include remoteness, susceptibility to natural disasters, a small population, a small market, and an excessive dependence on international trade. In addition, the unique combination of inaccessibility and relatively small population exposes the region to the enduring challenges that arise from the lack of economies of scale, high transportation and communication costs, expensive public administration and infrastructure, and the lack of skilled human capital.

The slow economic growth of the PICTs can be attributed to a combination of the previously mentioned challenges that increase inefficiencies in the energy supply chain. In 2009, the GDP growth fell sharply as the full impact of the global economic crisis hit the Pacific, with the exception of Papua New Guinea (International Monetary Fund (IMF), 2012). A significant contributor to this fall has been attributed to rising prices of energy and commodities worldwide, predominantly driven by surging oil prices, which more than doubled in five years reaching a peak in 2008 at USD 147 per barrel (International Energy Agency (IEA), 2012).

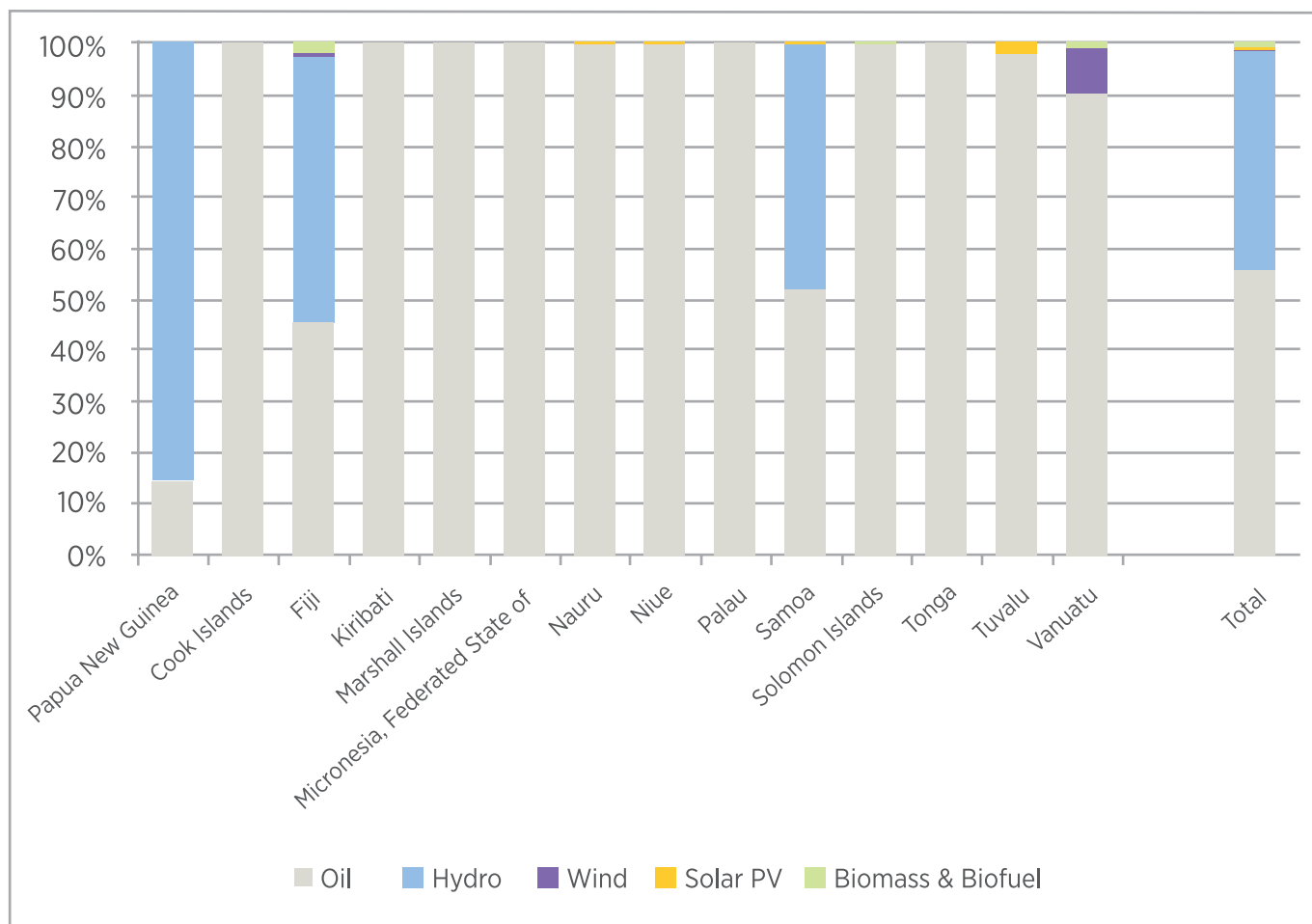
According to the Asian Development Bank (ADB; Rahman, 2009), the Pacific Island Countries (PICs)² are among the countries with the highest vulnerability to the impact of oil price fluctuations. Several PICs - Kiribati, Solomon Islands, and Tonga - rely almost entirely on imported oil for their commercial energy requirements and all others (except oil and gas-producing Papua New Guinea) are heavily reliant on fuel imports (IMF, 2011). Even Papua New Guinea has a significant exposure to market fluctuations due to its high dependency on imported goods, which in turn are affected by increasing oil prices. Fuel imports in the region are worth on average close to 10% of GDP, with Fiji for example, as high as 14% in 2010 (Dornan and Jotzo, 2012). Oil makes up a greater share of the import bill in the Pacific region than even in the low-income Asian countries that face similar challenges (IMF, 2011).

Recent figures show that oil accounts for about 80% of the primary energy consumption in PICTs. On average, transportation accounts for about 75% of oil consumption, while electricity generation accounts for more than 20%. Oil dominates power generation in the region, followed by hydro in a few countries. Consequently, increasing oil prices, oil price volatility and supply disruptions have considerable implications on the economy and energy security (Framework for Action on Energy Security in the Pacific (FAESP), 2010).

Energy security is a compelling reason to pursue RE in the Pacific as recognised in the FAESP document. As a result, PICTs are gradually increasing the contribution of RE resources to their energy mix. In many PICTs, renewable energy applications exist, both in grid-connected and off-grid systems. In particular, solar energy applications are feeding to the grid in various islands such as Nauru, Niue, Samoa and Tuvalu.

² The PICs refer to islands which are members of the Pacific Islands Forum Secretariat, namely: Cook Islands, Federal State of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of the Marshall Islands, Samoa, The Solomon Islands, Tonga, Tuvalu and Vanuatu.

FIGURE 1: GROSS ELECTRICITY GENERATION BY SOURCE FOR MAIN GRIDS IN 2010



Source: IRENA on data from (Pacific Power Association, 2012)

Similarly, hydropower is contributing considerably to the main grid in Fiji, Papua New Guinea and Samoa; wind energy is exploited in Fiji and Vanuatu; and geothermal energy applications can be found in Papua New Guinea. Furthermore, as already mentioned, in many PICTs there is a growing deployment of off-grid systems based on renewable energy.

Access to electricity varies considerably as a result of differences in resources and level of development. In some PICTs, access is limited to well below 20% of the population while others achieved nearly 100% (Pacific Power Association, 2011). Even within a particular country, vast differences can be found between main and remote islands, leaving some of the remote

areas without any electricity. Small and dispersed consumption centres do not provide sufficient basis for grid extension. As such, decentralised renewable energy systems can fill-in or become the catalyst in providing sustainable forms of energy to remote populations.

The transformation of the energy sector in PICTs to an economically viable and environmentally friendly system requires a comprehensive approach in the design of the appropriate policy framework to fully integrate RE technologies. Political support, broadly recognised as key to facilitating the implementation of the agenda for transforming energy systems, will be required.

3. Renewable Energy Policy Making in PICTs

Renewable energy deployment requires an enabling environment with conditions that are conducive to fostering investments. Governments can help shape enabling environments by supporting the adoption of policy and regulatory frameworks, removing administrative barriers to RE investment and use, and raising the attractiveness of such investments.

This section presents a brief description of the policy making process and determining factors specific to the PICTs that influence the policy design and implementation. This is followed by a presentation of the current situation on RE policy at the regional and national level and the findings from the assessment conducted by IRENA. To assess the policy making for the increased deployment of RE in SIDS, two approaches have been used:

- Results drawn from a survey that was circulated through the South East Asia and Pacific Regional Secretariat of the RE and Energy Efficiency Partnership (REEEP-SEAP) network to policy makers and its revision by peer reviewers;
- Lessons learnt from the TERM, which provided a successful and comprehensive framework to understand how other Pacific SIDS may support the deployment of RE.

3.1 THE POLICY MAKING CYCLE AND ITS CONTEXT

Governments around the world, academics and the professional policy organisations that form the peer networks of bureaucrats and politicians have described the policy cycle in many publications, and there seems to be no consensus on the different stages. However, the process is agreed to be cyclical,

a process that starts with a need and ends with an evaluation of the policy impact.

To understand the policy making cycle, it is particularly important to differentiate between two main phases: policy formulation and policy implementation. In addition, it must be considered that the policy cycle does not occur in a vacuum. In reality, it takes place in a broad public, political and institutional context, in which the enabling structures are also a source of barriers to policy making.

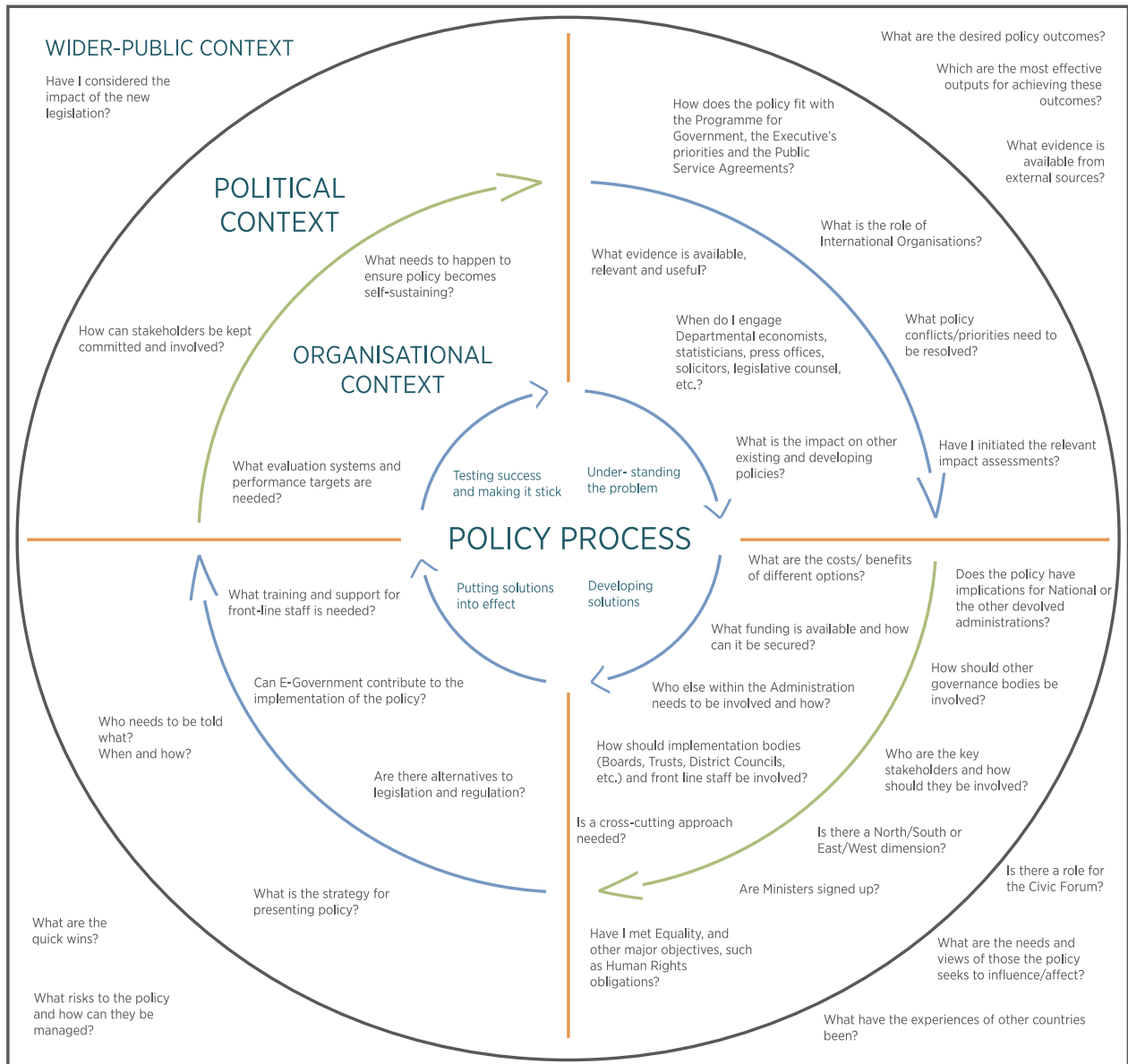
The policy formulation phase demands an initial strategic thinking that includes: understanding the context, options, consensus consultation, outcomes, and policy design and recommendations. Similarly, the implementation phase has two stages: i) implement policy change and ii) monitor and evaluate. Figure 2 provides an overview to the policy making cycle represented by questions that must be considered at each phase and in the appropriate context.

HOW THE CONTEXT OF PICTs IMPACTS POLICY MAKING

It is assumed that SIDS face the same types of challenges to the development and implementation of policy as any other state, advanced or developing. These challenges are exacerbated in the case of PICTs given their small populations, relatively small land areas and their developing economies that are often dependent on external aid.

The resources available in the Pacific to any particular sector of the economy or society are limited. This applies to all resource aspects: institutional, human, fiscal and material. Limited resources are a barrier to policy making and implementation in any context.

FIGURE 2: THE POLICY CONTEXT



Source: Adapted from the Office of the First Minister and Deputy First Minister, Northern Ireland, "A practical guide to policy making in Northern Ireland", 2003.

In the PICTs, the limited resources mean that the capacity to overcome barriers is generally diminished and together with limited opportunities for human resources development, including external competition, it becomes a challenge to retain experienced and trained staff within, among others, the energy and RE sectors of the government.

3.2 COMMITMENTS AND POLICES IN PICTs- REGIONAL ENERGY POLICY INITIATIVES

Regional policy strategies can supplement, enhance, guide and add value to national policies and their

implementation plans. The Pacific Islands Energy Policy and Plan (PIEPP) was endorsed in 2002 and functioned as a guideline for drafting the national policies of the Pacific SIDS in addition to its role in co-ordinating the efforts of the regional agencies working in the energy sector.

Unlike previous initiatives, the PIEPP emphasised the active involvement of national policy makers to avoid previous implementation failures due to the lack of ownership. The plan was revised in 2004 resulting in the adoption of the policy framework (Pacific Islands Energy Policy (PIEP)) and the associated Strategic Action Plan (Pacific Islands Energy Policy

and Strategic Action Plan (PIEPSAP)) (Pacific Island Forum Secretariat (PIFS), 2011). The PIEP and PIEPSAP formulate a critical energy policy and implementation plan for the region. RE is among the ten areas of development addressed in this initiative, with the aim to increase the share of renewable resources in the energy mix in the Pacific Islands.

The latest regional programme towards transforming the energy system in the Pacific region and achieving energy security is the FAESP and its associated Implementation Plan for Energy Security in the Pacific (IPESP 2011-15). The implementation plan was endorsed in April 2011 during the inaugural regional meeting of the Ministers of Energy, Information and Communication Technology, and Transport. The Implementation Plan reflects the regional activities that are to be collectively delivered by the participating members⁴ of the Council of Regional Organisations in the Pacific (CROP), to support, complement and add value to the national efforts on implementing their policies and roadmaps. The desired outcome is a strengthening of both national and regional contributions to improve the region's energy security (FAESP, 2010). Under its "Energy Production and Supply" theme, one of the long-

term objectives is to increase investment in RE technologies that have proved their practicality in the Pacific Islands. Four key priorities were defined, namely, resource assessment; investment in RE; capacity development; and increase in the share of RE in the energy mix (FAESP, 2010).

3.3 NATIONAL ENERGY POLICY INITIATIVES

Many of the PICTs have established national RE targets. Table 1 illustrates the ambitious future aspirations of these countries compared to the share of RE sources in electricity generation in 2009. The percentage of total households, urban and rural, with access to electricity services is also presented.

National energy policies and strategic action plans endorsed by most of the Pacific SIDS address RE, amongst others, on a general level. They include statements promoting the deployment of RE and increasing its share of the energy mix as well as encouraging the reduction of greenhouse gas (GHG) emissions. Table 2 compares the status of energy and RE policies and regulations in a number of PICTs.

TABLE 1: RENEWABLE ENERGY SHARE, TARGETS AND ACCESS TO ELECTRICITY IN SOME PICTS

Island	% Electricity generation from RE (2009) (IRENA, 2012)	Target for renewable energy electricity generation (PPA, 2012)		% of households with electricity access				Source
		% of total	Year	National	Rural	Urban	Year	
Fiji	59	90	2015	-	50	90	2006	(ADB, 2006)
Kiribati	2.6	Reach 70% of population with RE - No date		-	20	90	2009	(SPC, 2009)
Nauru	< 1	50	2015	100	-	-	2007	(Legros et al., 2009)
Palau	<1	20	2020	100	-	-	2006	(Legros et al., 2009)
Papua New Guinea	35	No similar targets set as of date of this brief		10	5	-	2004	(Legros et al., 2009)
Marshall Islands	< 1	20	2020	75	32	92	2007	(Legros et al., 2009)
Samoa	41	20*	2030	98	97	100	2009	(Samoa Ministry of Health, 2009)
Solomon Islands	< 1	20	2018	14	5	70	2007	(Legros et al., 2009)
Tonga	< 1	50**	2012	92	90	100	2006	(Legros et al., 2009)
Tuvalu	3	100	2020	98	95	100	2005	(Legros et al., 2009)
Vanuatu	19	No RE target as of date of this brief		-	7	61	2000	(Legros et al., 2009)

* Additional to the current share.

** For the main grids.

⁴ Pacific Power Association (PPA), Secretariat of the Pacific Community (SPC), SPREP and the University of the South Pacific (USP).

TABLE 2: STATUS OF ENERGY AND RENEWABLE ENERGY POLICY AND REGULATIONS IN SOME PICTs

	Fiji	Kiribati	Nauru	Palau	PNG	RMI	Samoa	Solomon Is.	Tonga	Tuvalu	Vanuatu
Renewable energy target	●	●	●	●	—	●	●	●	●	●	●
Adopted national energy policy	●	●	●	●	●	●	●	●	●	●	●
Specific adopted national renewable energy policy	●	●	●	●	●	●	●	●	●	●	●
Adopted energy roadmap/action plan	●	○	○	●	●	●	●	●	●	●	○
Detailed implementation plan for the roadmap	●	●	●	●	●	●	●	●	●	●	●
Dedicated government arm to oversee effectiveness of renewable energy policy and achievement of target progress	●	●	●	●	●	●	●	●	●	●	●
Contractual framework for power generation (IPPs/PPAs/concessions)	●	—	○	●	—	●	●	●	—	●	●
Support schemes (Feed-in tariff or net metering)	●	—	●	●	—	●	●	●	—	●	—

● Yes or partially
 ○ Under development or discussion stage
 ● No
 — No info

Source: Adapted from SPC and a collection of sources listed under References in this document.

The information presented in Table 1 and 2 implies the following:

- Fiji, Papua New Guinea, Samoa and Vanuatu have a significant share of RE for electricity generation, mostly from hydropower.
- The PICTs are increasingly adopting national energy policies and RE targets, however, there is a need to support these efforts with a clear roadmap and a detailed implementation plan including the allocation of financial resources needed to achieve the RE target.
- There is a considerable progress in allocating a dedicated government arm to oversee the effectiveness of the implementation and monitor the progress towards achieving the RE target.
- The RE targets need to be harmonised between the PICTs own national RE targets and other targets (e.g. Sustainable Energy for All Initiative (SE4All) target is to double the share of RE by 2030; and SIDS Dock⁵ aims at generating a minimum of 50% of electric power from RE sources by 2033 (SE4All, 2012; Fifita, 2011)).

3.4 IRENA SURVEY ON RE POLICY CHALLENGES IN PICTs

Generally, it can be noted that many countries have committed to targets and adopted policies to promote the deployment of RE. Nevertheless, implementation seems to lag behind. As illustrated in the previous section, most PICTs have adopted a NEP as well as a RE target. However, these do not seem to be supported by a clear policy/roadmap and financing plan to reach the RE targets. IRENA has made an attempt to understand the policy-making and implementation process through a regional survey.

The survey was designed and circulated to policy makers in the PICTs through the REEEP-SEAP. The survey attempts to gain insight into the perceptions and experiences surrounding policy making and implementation for RE deployment in the region. This allows for a better understanding of the conditions needed to create an enabling environment that supports the uptake of RE in the context of SIDS.

⁵ An initiative among member countries of the Alliance of Small Island States to provide SIDS with a collective institutional mechanism to assist in transforming the national energy sectors into a catalyst for sustainable economic development and help generate financial resources to address adaptation to climate change.

The scope of the information requested covers the policy environment from the early stages of policy formulation to the point of policy implementation. Questions asked also capture the barriers to the policy-making process for RE in SIDS, as well as solutions identified to address these obstacles.

The survey is divided into three main sections: (A) Energy and RE policy-making; (B) Drivers and barriers to RE policy development; and (C) Energy and RE policy implementation. The following section synthesises the main findings.

A- Energy and renewable energy policy-making

Sources of proposals

Participants identified various ways through which proposals are generated either by the relevant stakeholders or as a result of specific developments related to the sector.

Regarding stakeholders, proposals are often generated at the regional level through ministerial meetings (e.g. Energy Ministers) or Pacific Leaders meetings, which set broad strategies and goals for the region. The development assistance community can be influential in this process and an important source of policy proposals. This is through both the advisory services (carrying out assessments of RE in PICTs and contributions to national energy policy development), as well as the investment projects they fund. In addition, local energy sector stakeholders, in particular private sector companies are often involved with governments in providing advice regarding specific technologies or policy proposals. Other sources of proposals briefly mentioned include Non-Governmental Organisations (NGO), and industry associations. Historically, CROP agencies were instrumental in drafting national energy policies, with local input through the PIFS.

Policy proposals also emerge from mirroring other energy policy developments and experiences from similar regions (e.g. the Caribbean) as well as developments related to the sector such as energy price increases and supply issues.

An interesting observation to note from the surveys is that energy departments until recently were often at the receiving end of policy proposals, not the generators. However, in the past few years, PICTs

witnessed an increase in the involvement of such structures in policy development. In some cases, this was carried out with continued input from the development assistance community while in others national energy committees (public/private) were the main drivers. Furthermore, recent trends show the direct influence of regulators in generating policy proposals.

Evaluation and selection of proposals

In some countries, proposals are **evaluated** based on feedback received in workshops and consultations with regional energy experts. One of the main evaluation criteria is whether the policy aligns to the national strategy.

Several respondents highlighted that the evaluation phase is not very prevalent. While stakeholders are sometimes consulted, they are not necessarily forthcoming, possibly due to cultural reasons and the complexity of the situation. However, in some recent policy formation processes, there has been extensive input from the public, the business community, traditional chiefs, etc. through public fora.

The way preferred proposals are **selected** varies between countries and can be carried out through ministerial decision processes, public meetings (sometimes with SWOT workshops), committees, stakeholder consultations, and workshops at the ministry level, NGOs and island council level. According to one respondent, the proposals are selected based on relevance, cost issues (where funding is available for implementation), externalities, flexibilities, alignment with current government policies or national priorities or national development plans, appropriateness, cost effectiveness, as well as socio-economic benefits.

Requirements for evidence or modelling to support the selection of policies are rare and, when existent, they are limited to cost-benefit analysis with poor statistical data. Generally, the lack of information does not allow for meaningful modelling. In most countries, there is no accurate time-series of energy sector data for either supply or demand. For well-funded policy development in some countries, there has been modelling or analysis of options undertaken. However, in most other cases these are carried out superficially.

Selected proposals are **developed** into policy either by consultants, or a committee overseeing the drafting of the national energy policy, or the economic planning staff. In most cases, this is done in co-operation with external advisors. It is then presented to Cabinet for endorsement.

Some countries have a formal **review process** of the policy choices. The approach selected to review policy choices is usually participatory and involves wide consultation with stakeholders which can include PIFS. Some respondents suggested that this largely eliminates the need for peer-reviews. In most cases, however, it was reported that policies are never reviewed after their formal adoption by governments, mostly due to the lack of capacity to sustainably undertake those tasks.

B- Drivers and barriers for renewable energy policy development

The main **drivers** for RE policy development identified by most respondents include:

- **Energy security:** The risks involved with high dependency on fossil fuels, such as rising fuel costs and supply shortages, are further intensified by the rising energy demand. A transition to a greater share of renewables in the energy mix is part of the solution to establish greater energy security.
- **Energy access:** Higher electrification rates in PICTs with lower energy access would ensure better services related to health, education, communications, etc., contributing to their socio-economic development.
- **Abundance of RE resources:** Most SIDS are relatively well-endowed with some RE resource(s).
- **Readily available financing and technical assistance:** The availability of financing (through loans and grants) and technical assistance for projects from donor agencies and organisations facilitate RE deployment.
- **Accessible donor support:** The RE equipment donated by supporting organisations and developed countries is considered an initiator of RE deployment. In particular, donors and CROP agencies have provided many RE projects for rural stand-alone systems and more recently also for larger grid-connected systems.

- **Vulnerability of islands to climate change:** The region is characterised by a fragile environmental system with vulnerable coastal habitats that needs to be protected against the impacts of carbon-intensive activities.

Participants also pointed to various **barriers** encountered in developing energy and RE policy.

Human resources

- The lack of experience and expertise within the responsible agencies that develop RE policy. This is further exacerbated by the lack of capacity building initiatives to address staffing issues.
- The lack of resources resulting in policy vacuum, for instance, one of the participants noted that some national energy offices consisted of only two professionals, who were more involved in assisting project implementation than policy formulation.
- **Brain drain:** higher paying work in other industries or overseas can result in a significant loss of capacity and corporate knowledge in public institutions. This exacerbates the high turn-over in agency staff in some countries and causes loss of experience and loss of policy/project history.

Financial resources and market barriers

- Budget constraints hamper the development of energy policy and also the possibility of conducting workshops to generate proposals.
- The lack of funds in particular phases of RE deployment hinders undertaking energy resource assessments or feasibility studies for RE projects.
- The limited public funds often create competition for financial resources between different sectors. This may limit the allocation of funds to the energy sector.
- The high upfront cost of RE technologies makes RE investments more difficult.
- Small market sizes are often less attractive to entrepreneurs.

Data and access to information

- Comprehensive data sets for high quality planning are not readily available. Accurate and detailed time-series are lacking for both energy supply and

demand. While collection of data at the project level is common practice, governmental energy entities do not systematically gather and keep track of data.

Regulatory and institutional barriers

- The roles and responsibilities of the specific entities are often poorly defined and are not clearly supported by any specific laws or regulations. This leads to duplication of work and overlapping of responsibilities.
- Lack of regulatory frameworks that would encourage private participation in the energy sector.
- Lack of consultation between relevant stakeholders to benefit from synergies and complementarity in some countries.

Infrastructure barriers in remote areas

- In the absence of sealed roads, RE equipment needs to be carried over long and treacherous distances, which leads to complications in transporting the equipment for repair or replacement in the case of technical failure. This can imply higher costs of RE in the region.
- Also, challenges are faced in the integration into the grid of variable renewable-based power generation. This highlights the importance of the grid stability study.

Social issues

- Social challenges exist in the community, such as the expectation that the electricity grid will come to the village (often perceived as better than RE solutions), the lack of community support and commitment to RE due to misunderstandings and misperceptions regarding the technologies.
- There is a lack of thorough consultation and communication with local communities.
- The issue of property rights and ambiguity regarding land ownership.

In an attempt to provide **potential solutions** to the identified barriers, the respondents suggested the following:

Human resources

- Most respondents suggested that the issue around the lack of human resources could be solved by developing a focused education system and providing training in the operation and maintenance of RE technologies for students, citizens, electricians, engineers, politicians and other decision makers. Accordingly, it was proposed that a special organisation be established to undertake this role and co-ordinate initiatives.

Financial resources

- The issue of competing sectors over limited public funding could be resolved by adopting prioritisation and promoting more collaboration between different stakeholders.
- Increased funding for RE projects or loans provided at concessional interest rates were proposed solutions to overcome the high upfront capital costs and encourage the greater uptake of RE.
- Opting for collective and regional initiatives was suggested as a way to resolve the issues of limited available resources. In fact, regionally executed projects are a cost-effective way to implement homogenous activities across the countries in the region, especially when countries are at identical starting points.
- It was highlighted that an effective instrument to address the lack of capital is the involvement of Independent Power Producers (IPPs) through Power Purchase Agreements (PPAs). This also transfers part of the financial risks from the utility to the developer.

- Respondents suggested that there is a clear business case for moving from grants to sustainable self-financing schemes where savings from the reduced fossil fuel import bill can be used to support RE. Similar to the hydro projects in some countries in the late 1970s and early 1990s, certain current photovoltaic (PV) projects could also be self-financed. In fact, grid-connected PV systems (without storage), can produce electricity cheaper than a diesel generator.

Data and access to information

- Increased financial resources and training national statistical institutions in guidelines for energy can improve the data collection, processing and dissemination.
- To develop an asset register database of renewable energy projects and infrastructure, the database should cover the different project stages: proposal, approval, sanction, completion, and disposal. The database could be used as a “key performance indicator” reporting tool to aid managing units and donors on a regular basis.

Regulatory and institutional aspects

- Realistic planning should be ensured for effective and timely implementation of the energy plan, including a well-thought-out logical framework of objectives, expected outputs and action plans, as well as a strategy for monitoring and evaluating the policy impacts and the energy plan’s budget and timeline.
- It is important to develop a national policy that sets out a comprehensive and balanced plan to administer all energy and energy-related activities. This could be done by providing a predictable and explicit framework within which public and private energy sector participants can make informed planning and investment decisions to manage their operations.
- Wide consultation with a broad range of stakeholders in the policy design phase, with the engagement of all government entities, utilities, renewable energy technology (RET) suppliers, financial intermediaries and, most importantly, the end-users of the RET is important and should

not be limited to a one or two day workshop, as it may take successive rounds of informal and formal meetings with stakeholders.

- A clear direction from governments on how to integrate RE into the energy mix is needed, with supporting laws and regulations to give certainty to the private sector and other stakeholders.
- The strengthening of institutional capacity is essential to avoid duplication of activities and overlapping responsibilities. This would allow stronger co-ordination between relevant entities and harmonisation between stakeholders.
- Prioritisation of activities in order to overcome barriers and issues to policy making is crucial in the context of limited resources.

Social issues

- Social challenges in the community could be solved by creating awareness on the benefits of RE and addressing all concerns regarding the different RETs in order to gain community support and commitment.

C- Energy and renewable energy policy implementation and evaluation

Most respondents did not reply to the questions related to policy implementation, in some cases because common issues are faced at both the policy implementation and the policy development stages of the policy cycle. The following section provides the limited information available.

Regarding the entity responsible for energy policy implementation, it is usually an energy unit or department – though in smaller islands, like Nauru, Tuvalu and Niue, the utility often takes up this role. In some cases respondents mentioned issues faced by the implementing entity, such as the lack of resources (financial and others) at its disposal, as well as the poor definition of roles and missing regulations to support it.

Some of the stakeholders involved in policy implementation noted by the respondents include: the energy planning entity responsible for co-ordinating the implementation of energy policies

and providing necessary advice and assistance on all energy activities and energy-related matters; the public utilities responsible for the provision of power and water as well as the operation and maintenance of all assets associated with service delivery; and the energy ministries responsible for electrification.

Regarding barriers to policy implementation and evaluation, respondents noted the following:

- The cumbersome and lengthy approval processes of the national energy policy that delays its implementation.
- The absence of local technical know-how to implement and evaluate energy policy in general and RE policy in particular.
- The lack of operational or local policies and guidelines to support the NEP.
- The spread of responsibilities across multiple agencies. There is often an ambiguity as to how, when and by whom the energy policy would be implemented and evaluated, resulting in the local power utility setting its own RE targets, for example. In other words, the roles of the specific entities are often poorly defined, overlapping and not clearly supported by any specific laws or regulations.

3.5 CASE STUDY: TONGA ENERGY ROADMAP 2010-2020

In the attempt to better understand the policy-making and implementation process, the second approach used was to draw lessons from the comprehensive energy roadmap designed by the Government of Tonga (GoT), Tonga Power Ltd. (TPL), and development partners, including IRENA. In 2009, the Tongan Government responded to the twin challenges of reducing the Tongan contribution to global GHG emissions and improving national energy security by approving a policy to supply 50% of electricity generation through renewable resources by 2012. In this context, the TERM was designed as a 10 year strategy to reduce Tonga's vulnerability to oil price shocks, as well as achieve and increase quality of access to modern energy services in an environmentally sustainable manner.

Fields of action

In order to achieve these objectives, the TERM suggests the following fields of action:

- Improving energy efficiency (supply and demand);
- Increasing the efficiency of the fuel supply chain;
- Implementing financial risk management by using financial hedges on some of Tonga's fuel imports;
- Diversifying Tonga's supply of energy through RE;
- Ensuring economic, social and environmental sustainability in all energy sector developments.

TERM institutional setup

The process to develop the Tonga Energy Roadmap represents a joint effort among the GoT, TPL - the state-owned electricity provider, and the development partners.

There are currently 20 development partners supporting TERM:

- Asian Development Bank (ADB)
- Australian Aid (AusAID)
- Chatham House: The Royal Institute of International Affairs (Chatham House)
- European Commission (EC)
- European Investment Bank (EIB)
- German Organisation for Technical Cooperation (GTZ)
- International Renewable Energy Agency (IRENA)
- International Union for Conservation of Nature (IUCN)
- Japan International Cooperation Agency (JICA)
- Abu Dhabi Future Energy Company (Masdar)
- New Zealand Aid Programme (NZAID)
- Pacific Islands Applied Geoscience Commission (SOPAC)
- Pacific Islands Forum Secretariat (PIFS)
- Pacific Power Association (PPA)
- Government of the People's Republic of China (PRC)
- Renewable Energy & Energy Efficiency Partnership (REEEP)
- Secretariat of the Pacific Community (SPC)
- South Pacific Regional Environment Programme (SPREP)
- Government of the United Arab Emirates (UAE)
- World Bank Group

TABLE 3: MAIN AREAS OF ASSISTANCE OF SOME OF THE TERM DEVELOPMENT PARTNERS

Partner	Main areas of assistance
ADB	Promoting Energy Efficiency in the Pacific: Phase 2 (PEEP2) (demand side management); Renewable energy in the outer islands
ASTAE	Working with World Bank on demand forecast
GIZ	Coping with Climate Change in the Pacific Island Region (CCCPIR)
IRENA	Off-grid report, policy challenges, hybrid power
JICA	Clean Energy by Solar Home System project; Micro Grid Development
NZAID	Popua Solar Farm project providing 1.32MW of solar power on Tongatapu; Tonga Village Network Upgrade
PIAC	TA support for Institutional Advisor, Operations Officer and Power Sector Tariff Review
REEEP	TISREEEP Report on Institutional, Regulatory and Policy aspects of TERM
SPC	Pacific Appliance Labelling and Standards (PALS) Programme; Framework for Action on Energy Security (FAESP) Security Indicators Report (Pacific Region); Petroleum Pricing Advisory Services to Tonga Competent Authority (monthly)
UAE	Vava'u Solar Park
World Bank	Energising the Pacific project, Petroleum Sector Assessment Report, TERM Institutional and Regulatory Framework Strengthening Project, Natural Gas and Intermittent Energy Inputs Study, Tonga Green Incentive Fund (TGIF), On-grid renewable energy

Regarding the institutional roles and responsibilities at the national level, in April 2002, the Cabinet approved establishing Tonga Energy Roadmap Agency (TERM-A) as a Government Agency accountable directly to Cabinet and responsible for achieving the objectives of the TERM. TERM-A essentially consists of the TERM, TERM Committee (TERM-C) and the TERM Implementation Unit (TERM-IU). The TERM-C is the decision making body and it consists of government and industry representatives. The committee meets monthly and provides regular reports to the GoT, TPL and the development partners. TERM-IU provides TERM-C with the necessary support (secretarial and technical) to assist with the implementation of projects approved by the latter.

Implementation of the TERM

The Implementation Plan is divided into three phases. Phase 0 defines the most urgent steps that should be undertaken without delay, including policy,

institutional, legal, regulatory, capacity building and data gathering actions as well as environmental and social strategic assessments and investments in improved efficiency of electricity supply, improved network safety and end-use efficiency. Phase 1, which can proceed in parallel with Phase 0, includes works designed to implement the first set of Proof-of-Concept RE projects. Finally, at least 12 months of operational data and experience generated from the Proof-of-Concept investments in Phase 1 would be recommended before embarking on Phase 2 for implementation. Phase 2 will involve further efficiency and RE investments and will be initiated when data and experience from the phase 0 and phase 1 activities have been evaluated.

The main milestones of the TERM

The main milestones in the development process of the TERM until now are listed in the following table:

TABLE 4: MILESTONES IN THE TERM PROCESS

April 2009, Tonga	Tonga: Kingdom of Tonga hosted the Pacific Energy Minister’s Meeting; renewable energy and energy efficiency at forefront of regional issues; Tongan Prime Minister set out the Government’s objective of reducing the vulnerability of Tongan electricity consumers and the economy as a whole to oil price shocks.
April 2009-2012	TERM-C (a committee of the Prime Minister’s office) established and TERM drafting undertaken with a range of development partners, technical experts and funders.
June 2010, Abu Dhabi	TERM was tabled and Statement of Declaration was signed by all development partners.
January 2012, Abu Dhabi	Signing ceremony at the World Future Energy Summit to mark the commencement of TISREEP (Tonga – Improving Sustainability through REEEP). This project will map out the necessary policy, institutional, legal and regulatory reform pathways to TERM implementation.
April 2012, Tonga	Renewable Energy Capacity Building workshop and TERM briefing hosted by the USP. The event highlighted the need for improved communications to ensure widespread understanding of the need for energy sector reform, TERM’s strategic scope and secure greater commitment to the approach. Cabinet approval on 20 April 2012 for the establishment of the TERM Agency (TERM-A) as a Government Agency directly accountable to Cabinet and responsible for achieving the objectives of TERM.

Renewable energy in the TERM

As already mentioned, one of the essential fields of action is to diversify Tonga’s supply of energy through RE.

The Off-Grid Component (contributed by IRENA in co-operation with the Government of Tonga)

This section of the TERM while providing almost 100% RE generation will only impact 6% of the total population and will have no impact on reducing diesel use. Projects to provide basic electricity to communities on the Outer Islands (OI)⁶ have been operating since 1988 with varying levels of success. The technical options on the outer islands revolve primarily around solar PV generation which has proven to be the most cost effective option. The overall objective of the Tonga Off-Grid Initiative is to provide Off-Grid communities with access to electricity options from renewable sources that are sustainable and also provide for their varied power needs. Regarding the institutional framework, it was recommended to establish an implementation agency under TPL (e.g. TPL Rural). The implementation agency would be a separate, stand-alone unit with

its own accounts, finances and human resources. GoT establishes clear regulations for the development of fees and tariffs for outer island electricity supplies. The capacity both in manpower and in skill set of the government energy agency, the electricity provider and the private sector must be developed.

Opportunities for Renewable Energy On-grid Development

All potential sources of RE supply in Tonga were considered. The options were considered in two categories: variable sources such as wind and solar PV that fluctuate with the resource availability and firm capacity and energy which is available on a continuous basis. Subject to verification of the resources, the least cost options are landfill gas and wind. The levelised cost estimates for solar PV without storage and substitution of coconut oil for diesel fuel in existing engines were comparable – however, it should be noted that there are uncertainties in the available data. The most expensive option is either solar or wind with storage. All options will benefit from improved data on the resource and on the electric system to which they will be connected.⁷

⁶ The ‘OIs’ of Tonga are a group of 26 islands scattered throughout the three primary island groups of Tonga. The total population of the OI’s is approximately 6,001 people, with 5,300 of these living on islands without reticulated diesel generated electricity.

⁷ The data available for landfill gas and wind will need to be firmed up to determine whether the resources are actually available and viable, before investment in these options is feasible. There is significant uncertainty regarding the coconut price and reliability of supply. Solar resource data are somewhat better, but further measurements would be required as a project proceeds to detailed design stage.

Key challenges of the TERM

During development of the TERM and the initial phases of implementation, a number of key challenges emerged, involving obstacles that would need to be overcome to successfully implement the TERM, these include the following:

- Institutional responsibility for the energy sector is fragmented with responsibility for electricity and petroleum spread across various governmental entities in the country. This creates challenges for strategic planning, risk management and regulation.
- Numerous gaps, overlaps and inconsistencies are present in existing energy sector policy, legislation and regulation.
- Significant data limitations exist and improvement of data generation, analysis and record keeping is essential.
- Greater transparency and simplification of regulatory and oversight processes is required.
- Changes in personnel in government and development agencies result in a loss of knowledge and loss of momentum in its implementation.
- Effective communication is essential to ensure TERM has cross-governmental understanding and implementation can withstand changes in personnel.

These challenges are being addressed in the following ways:

- Donor Co-ordination: TERM is being implemented with the support of various development partners and NGO's. On-going co-ordination of these parties by the World Bank has been a necessary process to avoid duplication of effort and to ensure that agency activities are being implemented at appropriate times within the TERMS schedule.
- Data: A data co-ordinator has been employed as part of the TERM Implementation Unit. This person

is working with the state-owned energy utility - TPL - to gather data on energy consumption around the country.

- The policy, institutional, legal and regulatory (PILR) reform: The project entitled "Tonga-Improving Sustainability through REEEP" (TISREEEP), which was signed during the World Future Energy Summit in Abu Dhabi (January 2012), bridges the gap between TERM and its full-scale implementation. This project audits the current energy sector (electricity and petroleum) policy and recommending policy development, as well as reviewing and recommending institutional frameworks (such as establishment of the TERM's IU, overseen by the Prime Minister's TERM-C), it is developing terms of reference for Energy Sector legislative review and it will recommend a regulatory framework to support a revised legislative framework.
- Communications: with the support of the World Bank, a communications strategy is being developed to identify audiences and appropriate communications tactics across Tonga. This strategy will consider diverse communications needs: inter- and intra-government agencies, outer islands, international donors and the broader energy sector.

In summary, the Government of Tonga is putting in place long-term institutional arrangements that can provide strong leadership, co-ordination and oversight of the energy sector activities. Efficiency improvements are the least cost option for reducing dependence on imported petroleum and should be pursued aggressively. Steps should be taken to collect and interpret the information required, including through proof-of-concept projects, to determine feasibility of potential RE options. The revised sector structure as defined in the policy, legal and regulatory instruments should provide an enabling environment for private participation in the electricity sector.



4. Conclusions

It is now widely recognised that RE represents an important part of the solution to address a more sustainable and secure energy future. The transformation of PICTs' energy sectors, geared towards an economically viable and environmentally friendly system, fully integrating RE technologies, requires a comprehensive approach to the design of appropriate policy frameworks.

RE deployment requires an enabling environment to provide conditions that are conducive to the required investments. Governments can help shape the enabling environment by supporting the adoption of policy and regulatory frameworks, removing administrative barriers to RE investment and use, and raising the attractiveness of such investments.

Many countries have introduced targets and plans to promote RE deployment. However, policy design and implementation often lags behind. Political support has been broadly recognised as the key to facilitating the implementation of RE policies and measures and taking forward the transformation of the energy system.

The policy cycle does not occur in a vacuum, but takes place in a broad public, political and institutional context in which the enabling structures are at the same time a source of barriers to policy making. It is important to differentiate two main phases within the RE policy cycle: policy formulation and policy implementation.

To more comprehensively and thoroughly understand the specific policy environment of PICTs, IRENA has carried out a survey questioning energy professionals in PICTs and looked at lessons learnt from the TERM, which provides a successful and comprehensive framework.

The survey aimed to identify the drivers and barriers in the PICTs' policy formulation and implementation process. The survey assesses three specific aspects, namely, energy and RE policy-making; drivers and

barriers to RE policy development; energy and RE policy implementation.

Lessons learnt from the TERM were considered to understand how the Government of Tonga, Tonga Power Ltd. and TERM development partners addressed challenges to overcome specific barriers. The lessons learnt from the TERM design and implementation may be useful for other PICTs striving for greater deployment of renewable energies.

The main conclusions drawn from the assessment of the PICTs energy profile, existing policies and plans, the TERM and the IRENA survey among PICTs' energy professionals include the following:

Main challenges and drivers

- It is assumed that SIDS face the same types of challenges to the development and implementation of policies as any other country, advanced or developing. The most striking difference is that these challenges are exacerbated in the case of PICTs given their small populations, relatively small and remote land areas, their small markets and their dependence on international trade and oftentimes on external aid.
- The main identified drivers for RE policy development in Pacific SIDS are: Energy security, energy access, abundance of RE resources, readily available financing and technical assistance, accessible donor support, vulnerability of islands to climate change.

Political commitment and adequate institutional architectures

- All PICTs have adopted (some sort of) a NEP as well as a RE target. However, this does not seem to be supported by a clear policy/roadmap and financing plan adopted to reach the set targets. Political support to introduce appropriate policies and measures facilitating implementation would enhance RE deployment.

- There seems to be at least a partial attempt in most countries to have a dedicated government arm to oversee effectiveness of RE policy and achievement of target progress. Empowering such entities is critical to the success of RE deployment. This would allow stronger policy development, management, implementation and co-ordination between relevant entities and harmonisation between stakeholders.
- The active involvement of national policy makers in regional processes is essential to generate new policy proposals and to avoid implementation failures due to the lack of ownership.

Reliable data and information exchange

- To make informed decisions, policy makers need accurate, reliable and the most up-to-date data. In PICTs, comprehensive data sets for high quality planning are not readily available. Accurate and detailed time-series are lacking for both energy supply and demand. There is a need to support improved data collection, analysis and dissemination throughout the region. Increased financial resources and training for national or regional statistical institutions on guidelines for energy data collection, processing and dissemination are necessary to improve the energy data situation.
- Consultations with a wide range of stakeholders through, for example, summits, conferences, workshops, seminars, during all phases of the policy cycle are recommended.

Efficient and effective use of financial resources

- Donor co-ordination is critical, during all stages of the policy cycle to avoid duplication of efforts and to ensure that synergies are used and activities are implemented successfully.
- Competition between sectors for limited public funding could be resolved by adopting prioritisation and promoting regional initiatives. In fact, regionally executed projects are a cost-effective way to implement homogenous activities across PICTs, especially when countries are at identical starting points or face similar challenges.
- High upfront cost of RE technologies hamper RE investments. Designing and implementing

innovative and sustainable load products or other RE oriented financial instruments could encourage investments and stimulate greater uptake of RE. Furthermore, the impact of RE deployment in terms of reducing expenditure for fuel imports needs to be taken into account.

- The increasing energy bill of PICTs and the decreasing costs of RE technology often provide for a business case to move away from grants and promote sustainable self-financing schemes to support the rapid deployment of RE. Financial savings from fossil fuel could be redirected to pay for the loans.

Human skills and capacity building

- There is a lack of experience and expertise within the responsible agencies to develop and implement RE policies. This is exacerbated by the brain drain; often qualified staff seeks employment overseas. In addition there is a high turn-over in agency staff. This results in a constant and significant loss of capacity and corporate knowledge. Concepts to stop or revert the brain drain have to be developed and implemented. The strengthening of the advisory role of existing regional entities, to support initiatives at national level, could be a successful approach for an efficient use of human resources and consolidation of knowledge in the region.
- Awareness raising, networking with internationally available expertise and development and implementation of focused RE trainings for policy and other decision makers at national and regional levels could prove beneficial for both policy design and implementation.

IRENA's Work Plan in the Pacific

IRENA's Work Plan in the Pacific will involve the full co-operation and support of the Pacific region, making IRENA the key inter-governmental agency for RE in assisting PICTs to realise their potential in the transition to a renewables-based energy future. IRENA's activities plan to measure opportunities for implementation and identify pathways to close any knowledge gaps and overcome barriers to RE, it includes:

- Creating a platform to provide easily accessible, up-to-date and accurate information on RE technologies suitable for the conditions of the Pacific;
- Involving utilities in assessing grid stability issues in order to better understand the constraints and identify solutions that can ensure utility system stability in the Pacific environment;
- Fostering a sustainable RE market development in the region through policy advice, technology co-operation, education and training and supporting innovative approaches to mobilising funding for RE investment;
- Undertaking capacity building initiatives, with the particular focus on strengthening public institutions;
- Assessing RE resource potentials and relevant technologies with the view to identifying those suitable for the Pacific environment;
- Assessing the RE, land use and water resources nexus; and
- Integrating IRENA activities into a coherent roadmap for the Pacific Islands.

Successful intervention relies on substantial involvement of governments and other relevant stakeholders. The IRENA Work Plan identifies key areas for collaboration and recognises the diversity of island countries and their needs. These measures will help to accelerate RE deployment, liberating local innovation and industry, while bringing clean energy to the Pacific Island people.



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