



# Global Applications Program

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## *Vanuatu: An Annotated Bibliography*

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### Primary Print Resources

- [1] Asian Development Bank (2013). "Key Indicators for Asia and the Pacific 2013 - Vanuatu." Retrieved from <http://www.adb.org/sites/default/files/ki/2013/pdf/VAN.pdf>.

A summary of key indicators for years 2005 -2012. Includes primarily economic and finance indicators, but also other key indicators such as population and energy.

- [2] Ásmundsson, R. K. (2008). "South Pacific Islands: Geothermal energy for electricity production." B. Steingrímsson, Icelandic International Development Agency. Retrieved from [http://www.edinenergy.org/pdfs/pacific\\_islands\\_geothermal.pdf](http://www.edinenergy.org/pdfs/pacific_islands_geothermal.pdf).

The Icelandic International Development Agency (IIDA) commissioned a summary report on the potential for developing geothermal energy for electricity production in the Southwest Pacific (with which, IIDA would assist). Vanuatu is one of several countries that is highlighted by this report. SOPAC (see organization reference below) is highlighted as a key regional technical resource for further collaboration.

- [3] Barstow, S. F. and J. Falnes (1996). "Ocean Wave Energy in the South Pacific: the resource and its utilization." Retrieved from <http://ict.sopac.org/VirLib/MR0234.pdf>.

An overview report of ocean wave energy in the pacific based on limited historic (1985 to 1995) surveys. Several countries, including Vanuatu, are discussed, with general wave energy potential information provided. It is unclear whether the information remains accurate given modern wave energy technology, and how accurate the estimations are given survey methodology and limited financial resources. Useful as a background document to understanding historic wave energy estimation methods and efforts in the region, an indicator

of data sets available, and to highlight organizations (in particular SOPAC) and individuals involved in these efforts.

- [4] Castlerock Consulting (2012). "Vanuatu: Efate Geothermal Power and Island-Ring Grid Development Framework." The World Bank. Retrieved from [http://www.kuthenergy.com/index.php?item=file&target=world\\_bank\\_report\\_exec\\_summary](http://www.kuthenergy.com/index.php?item=file&target=world_bank_report_exec_summary)

This is an independent report conducted by a consultant to the World Bank, by request of the Vanuatu Government, concerning a significant geothermal project proposal by KUTH Energy (see below) per initial exploratory findings. The report contains a review of the resource, KUTH's findings, and context regarding Efate energy infrastructure. Also provided is an overview of Vanuatu's geothermal policy and regulation framework, and recommendations.

- [5] European Commission (2006). "Renewable Energy Potential - Country Report Pacific Islands: Fiji Islands, Vanuatu, Kiribati." RECIPES. Amsterdam. Retrieved from <http://www.energyrecipes.org/reports/reports/061127%20Recipes%20-%20Pacific%20Islands%20RE%20potential%20report.pdf>.

This report describes the renewable energy market potential for the Pacific Islands and is a deliverable of the RECIPES project (a study into the implementation of renewable energy sources in emerging and developing countries, funded by the European Commission). Three countries (Fiji, Kiribati, and Vanuatu) were selected as representative countries in the region, and were combined together to form one country for RECIPES reporting and analysis purposes. Beyond simple country energy data, the report provides an analysis of the market potential for renewables in Vanuatu (including opportunities, barriers, and scenarios), which may be useful for comparative purposes to other similar and/or more recent reports.

- [6] Fischer, B. and A. Pigneri (2011). "Potential for electrification from biomass gasification in Vanuatu." *Energy* 36(3): 1640-1651. Retrieved from <http://www.sciencedirect.com/science/article/pii/S0360544210007723>.

"Informed by an interdisciplinary data synthesis and an extensive series of field interviews in Vanuatu, this paper analyzes the potential for converting reportedly obsolete timber plantation land into a dedicated feedstock supply system for new small-scale biomass gasifiers. The analysis draws upon geographic mapping of electricity demand and feedstock supply, a historical assessment of Vanuatu's forest plantations, a techno-economic evaluation of investment in 10 kW and 30 kW gasifiers, and a discussion of important social-institutional factors."

This report provides a rare, detailed analysis of potential energy projects in rural and remote communities in Vanuatu. It uses new diesel generators as a point of comparison, and targets basic electricity needs (e.g. personal lighting) as a primary end use.

- [7] Isaka, M., et al. (2013). "Pacific Lighthouses: Renewable energy opportunities and challenges in the Pacific Islands region, Vanuatu." International Renewable Energy Agency. Retrieved from <http://www.irena.org/DocumentDownloads/Publications/Vanuatu.pdf>.

A comprehensive yet concise report detailing renewable energy opportunities and challenges in Vanuatu. The report provides context (including population and economic context), an outline of institutional and regulatory arrangements for energy, and an overview of energy supply and demand. Discussion of renewables includes opportunities (primarily resource potential), experiences (primarily an overview of previous/current/proposed projects), and a concise list of identified challenges.

- [8] Johnston, P. and J. Vos (2004). "Pacific Regional Energy Assessment 2004: Vanuatu National Report." Pacific Islands Renewable Energy Project, South Pacific Regional Environment Programme. Retrieved from [http://www.sprep.org/att/publication/000427\\_Vanuatu\\_PIREP\\_final.pdf](http://www.sprep.org/att/publication/000427_Vanuatu_PIREP_final.pdf).

A comprehensive report detailing renewable energy opportunities and challenges in Vanuatu. The report provides detailed contextual information (including politics, economics, and energy), a summary of resource potential and renewable energy technology experience, and a detailed discussion of opportunities and challenges (including finance and political experiences and barriers, which are often lacking in other similar reports).

- [9] McCoy-West, A. J., et al. (2011). "Geothermal Resources in the Pacific Islands: the potential of power generation to benefit indigenous communities." Thirty-Sixth Workshop on Geothermal Reservoir Engineering, Stanford University, Stanford, California, Stanford Geothermal Program. Retrieved from <http://www.geothermal-energy.org/pdf/IGAstandard/SGW/2011/mccoy.pdf?>

"As part of the international Energy Development in Island Nations (EDIN) programme, the New Zealand Ministry of Research, Science and Technology commissioned GNS Science in 2009 to review the geothermal activity, socio-economic climate and energy demand profile of 20 selected Pacific Island nations and territories... [the] findings [are] detailed in this paper."

The driver for this review was noted to be the significant dependence of nations and territories in the region on imported fossil fuel, and the growing interest in utilizing local renewable energy resources. Although several countries were identified as having "high" or "moderate-high" geothermal potential, only a select few (including Vanuatu) were investigated in detail. A summary of Vanuatu's geothermal resource potential and previous and current development efforts is provided.

- [10] Millennium Challenge Corporation (2011). "Vanuatu: Roads to prosperity." Country Brief. Retrieved from <http://www.mcc.gov/documents/reports/countrybrief-2011002062802-vanuatu.pdf>.

The Millennium Challenge Corporation (MCC) is a bilateral United States foreign aid agency established by Congress in 2004 which conducts foreign aid and international development

with a unique approach. Vanuatu was one of the first countries to be assisted by the program. This report is a summary of development activities (primarily road rehabilitation) completed in Vanuatu, which have some impact on overall energy development policy considerations.

- [11] Polack, A. R. (2010). "Drivers and Barriers of Renewable Energy in the Electrification of Vanuatu." School of Engineering and Energy, Murdoch University. Master of Science in Renewable Energy. Retrieved from [http://researchrepository.murdoch.edu.au/3230/1/Polack\\_2010online.pdf](http://researchrepository.murdoch.edu.au/3230/1/Polack_2010online.pdf).

"This dissertation outlines the drivers and barriers of renewable energy in the electrification of Vanuatu and provides recommendations as to how the drivers can be harnessed and barriers overcome. It is based on a review of academic and other literature, observations during work undertaken by the author in Vanuatu, and a survey of renewable energy professionals in the Pacific region."

Much of the context and energy information is redundant to other (more recent) reports. However, the report contains detailed and lengthy recommendations and conclusions which are useful for comparative purposes to other reports and the Vanuatu National Energy Roadmap.

- [12] Secretariat of the Pacific Regional Environment Programme (2007?). "DRAFT Vanuatu National Energy Policy Framework." Retrieved from <http://www.sids2014.org/content/documents/167Energy%20Strategy.pdf>.

As *Isaka* notes: "In 2006, the South Pacific Applied Geoscience Commission (SOPAC) helped the Government of Vanuatu develop a National Energy Policy Framework (NEPF), which was endorsed by the Council of Ministers in August 2007. This has since been superseded by the Vanuatu National Energy Roadmap."

- [13] South Pacific Applied Geosciences Commission (2011). "SOPAC Country Report, Vanuatu." Retrieved from <http://ict.sopac.org/VirLib/CP0014.pdf>.

A broad natural resource overview of Vanuatu with a focus on SOPAC's various programs, policies, and actions regarding the various resources.

- [14] South Pacific Applied Geosciences Commission (2012). "Catalogue of River for Pacific Islands: Vanuatu: 139-150." Retrieved from [http://www.pacificwater.org/\\_resources/article/files/Vanuatu.pdf](http://www.pacificwater.org/_resources/article/files/Vanuatu.pdf).

An overview of Vanuatu's river resources, with some pertinent hydrological information and current river use for energy generation. Although no comprehensive data is included, the report can be used to identify data sets and resources available through SOPAC.

- [15] Utilities Regulatory Authority of Vanuatu (2010). "Audit Report: Sarakata Hydroelectric Scheme - Luganville Santo." Retrieved from [http://www.ura.gov.vu/attachments/article/103/Audit\\_Report-Sarakata\\_Hydroelectric\\_Scheme-May2010.pdf](http://www.ura.gov.vu/attachments/article/103/Audit_Report-Sarakata_Hydroelectric_Scheme-May2010.pdf).

This report is an audit of the Sarakata Hydroelectric Scheme, which includes the Sarakata Special Reserve Fund and the Saarakata Renewable Fund. The Sarakata program is a critical policy instrument in Vanuatu for energy infrastructure funding. The program has been subject to misappropriations, and this audit was conducted in response. In addition to detailed financial information, the report provides detailed information on the program, its history, and current status.

- [16] Utilities Regulatory Authority of Vanuatu (2012). "Annual Report 2011." Retrieved from <http://ura.gov.vu/attachments/article/14/URA%20Annual%20Report%202011%20Final.pdf>.

As noted by *Isaka*: "The Utilities Regulation Authority (URA) was established in 2008 as a semi-autonomous body to mediate between the Government and electricity and water utilities. The URA also acts as an economic regulator for pricing, energy access, standards and monitoring of concession agreements." This was the most recent and only annual report available online during this research and contains some useful policy and regulatory information, but lacks detailed data.

- [17] Vanuatu Department of Meteorology and Climate Change (2012). "Overview of Potential CDM Project Opportunities in Vanuatu." ACP MEAs. European Union, Vanuatu Ministry of Infrastructure and Public Utilities. Retrieved from [http://www.nab.vu/sites/all/files/documents/11/03/2013%20-%2012%3A10/cdm\\_project\\_opportunities\\_vanuatu1.pdf](http://www.nab.vu/sites/all/files/documents/11/03/2013%20-%2012%3A10/cdm_project_opportunities_vanuatu1.pdf).

A brief overview of energy in Vanuatu from a climate change and greenhouse perspective, highlighting several clean energy development (CDM) opportunities in the country.

- [18] Vanuatu Government (2013). "Vanuatu National Energy Roadmap 2013-2020." Retrieved from <http://www.kuthenergy.com/index.php?item=file&target=nerm>.

The Vanuatu National Energy Roadmap is the comprehensive resource for energy in Vanuatu. It is the product of a collaborative effort between the government of Vanuatu and many of the international and government donor organizations working in Vanuatu. It has the overall vision to "energise Vanuatu's growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an Educated, Healthy, and Wealthy nation". It includes detailed energy information including context, technology, historical/current/future projects, policy and regulatory frameworks, and provides a roadmap for meeting policy goals and targets.

- [19] World Bank (2013). "Vanuatu - Energy Sector Development Project." Washington DC, World Bank. Retrieved from <http://documents.worldbank.org/curated/en/2013/05/17965921/vanuatu-energy-sector-development-project>.

An overview of a WB project which aims to support energy policy and regulatory bodies of the Vanuatu government. The overview also provides excellent and concise context for the energy regulatory and policy scenarios in Vanuatu.

### Primary Online Resources

- [20] Asian Development Bank (ADB): <http://www.adb.org/countries/vanuatu/main>

The Asian Development Bank is a regional development bank. ADB, in partnership with member governments, independent specialists and other financial institutions is focused on delivering projects that create economic and development impact.

ADB has been active in funding various development initiatives in Vanuatu, including a current award supporting technical assistance for energy development. In addition to project information, the ADB website includes comprehensive and detailed country, financial, and economic information for Vanuatu.

- [21] Australian Agency for International Development (AusAID): <http://aid.dfat.gov.au/countries/pacific/vanuatu/Pages/default.aspx>

AusAID (the Australian Agency for International Development) was the Australian Government agency responsible for managing Australia's overseas aid program until 31 October 2013, when it ceased to be an executive agency and was integrated into the Department of Foreign Affairs and Trade. The objective of the aid program is to assist developing countries to reduce poverty and achieve sustainable development, in line with Australia's national interest.

AusAID was (and still is under the new agency structure) highly active in Vanuatu, supporting and funding many programs and projects in support of development in Vanuatu. In addition to information regarding the AusAID-Vanuatu partnership, there is a lengthy database of related publications.

- [22] International Renewable Energy Agency (IRENA): <http://www.irena.org>

The International Renewable Energy Agency (IRENA) was founded in 2009 to promote widespread and increased adoption and sustainable use of all forms of renewable energy. IRENA facilitates access to all relevant renewable energy information, including technical data.

IRENA has several good resources and publications regarding renewable energy in Vanuatu and the region. IRENA has established the [Global Renewable Energy Island Network \(GREIN\)](#),

through which a recent relevant conference was held (see *Conference and Workshop Resources*, below)

- [23] KUTh Energy: <http://www.kuthenergy.com/vanuatu/>

KUTh Energy is a geothermal energy development company based in Australia. KUTh has been investigating an 8 MW geothermal project on the island of Efate, and holds a prospecting license for the Takara site, which provides exclusive rights to exploration. KUTh's website includes many press releases, annual reports, and specific project and resource information for the Efate project, as well as information regarding their other projects in the region (Fiji, PNG).

KUTh has been developing a potential merger with Geodynamics (<http://www.geodynamics.com.au/home.aspx>), a geothermal company based in Australia. The merger would combine KUTh's project development expertise and presence in Southwest Pacific countries, and Geodynamics' drilling expertise and balance sheet.

- [24] Millennium Challenge Corporation: <http://www.mcc.gov/pages/countries/program/vanuatu-compact>

The Millennium Challenge Corporation (MCC) is a bilateral United States foreign aid agency established by Congress in 2004 which conducts foreign aid and international development with a unique approach. Vanuatu was one of the first countries to be assisted by the program; the website contains summary country information and a summary of development activities (primarily road rehabilitation) completed in Vanuatu, which have some impact on overall energy development policy considerations.

- [25] New Zealand Aid Programme: <http://www.aid.govt.nz/where-we-work/pacific/vanuatu>

The New Zealand Aid Programme is the New Zealand Government's international aid and development programme. Its mission is to support sustainable development in developing countries in order to reduce poverty and contribute to a more secure, equitable and prosperous world. It is managed by development specialists in the Ministry of Foreign Affairs and Trade. To deliver its mission, the aid programme focuses on stimulating sustainable economic development. It has a geographic focus on the Pacific.

- [26] Promoting Energy Efficiency in the Pacific (PEEP): <http://www.ee-pacific.net/index.php/database/country-information/vanuatu>

PEEP is a regional effort for implementing energy efficiency, and is supported financially by the ADB. The PEEP website has regional and country energy information, and a building database.

- [27] Secretariat of the Pacific Community (SPC): <http://www.spc.int/>

The Secretariat of the Pacific Community (SPC, sometimes called the Pacific Community) is a regional intergovernmental organization whose membership includes both nations and territories in the Pacific Ocean and their metropolitan powers. It aims to "develop the technical, professional, scientific, research, planning and management capability of Pacific Island people and directly provide information and advice, to enable them to make informed decisions about their future development and well-being." The SPC headquarters is in Nouméa, New Caledonia.

The following are relevant SPC partner organizations or division:

[28] SPC Applied Geoscience and Technology Division (SOPAC): <http://www.sopac.org/>

The Pacific Islands Applied Geoscience Commission (SOPAC) was an inter-governmental regional organization dedicated to providing services to promote sustainable development in the countries it serves. In 2010, its functions had been transferred to the Secretariat of the Pacific Community (SPC) and the Pacific Regional Environment Programme (SPREP), thus ending SOPAC as a separate entity. Today, SOPAC is a division of the SPC with its main office in Suva, Fiji.

SOPAC is a key resource for regional and country energy resource information, in particular geothermal, river, and ocean. Many of the above references directly or indirectly utilize SOPAC information.

- SOPAC's virtual library: <http://www.sopac.org/index.php/virtual-library>
- PacificWater SOPAC: <http://www.pacificwater.org/>

[29] SPC Regional Environmental Programme (SPREP): <http://www.sprep.org/>

The Secretariat of the Pacific Regional Environment Programme (SPREP) is an intergovernmental organization charged with promoting cooperation, supporting protection and improvement of the Pacific islands environment, and ensuring its sustainable development.

The SPREP website has links to several relevant regional and country energy reports, as well as information on two key projects, Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project (PIGGAREP) and the Pacific Islands Renewable Energy Project (PIREP).

[30] Pacific Power Association (PPA): <http://www.ppa.org.fj/>

The PPA (based in Suva, Fiji) is an inter-governmental agency to promote the direct cooperation of the Pacific island power utilities in technical training, exchange of information, sharing of senior management and engineering

expertise and other activities of benefit to the members. The PPA website contains some useful information, in particular links to relevant workshops, projects, and reports. Vanuatu (UNELCO) is represented on the board.

[31] The Renewable Energy and Energy Efficiency Partnership (REEEP): <http://www.reeep.org/>

A Vienna-based non-profit organisation that aims to accelerate the marketplace for renewable energy and energy efficiency with a particular emphasis on the emerging markets and developing countries. Its primary focus is the scaling up of clean energy business models.

The is information on the REEEP website regarding a number of REEEP projects in the Pacific region impacting Vanuatu, including the following:

- Sustainable Energy Industry Association of the Pacific Islands (SEIAPI)
- Energy efficiency policy instruments in Pacific Island countries
- Establish Pacific Micro Energy Service Companies (PMESCOs)

REEEP Clean Energy Portal - reeegle: <http://www.reeegle.info/countries/vanuatu-energy-profile/VU>

[32] U.S. Embassy PNG: <http://portmoresby.usembassy.gov/>

Vanuatu is accredited to the US embassy located in Port Moresby, Papua New Guinea. The website contains some country information, and links to US State Department country information, such as <http://www.state.gov/r/pa/ei/bgn/2815.htm>. The embassy is available to advise organizations seeking to conduct business in the region.

[33] Vanuatu Ministry of Lands and National Resources, Energy: <http://www.mol.gov.vu/energy-home.php>

The Energy Unit is tasked with managing and reforming Vanuatu's energy sector with the aim of promoting the use of local energy resources, ensuring that adequate, reliable and affordable energy supplies are available at reasonable costs and that the supply of electrification into rural areas through funded projects is enhanced. Some program and project information is available on this website, as well as links to other resources, including a database of Vanuatu laws.

A key project of the ministry is the Energy Ecosystems and Sustainable Livelihood Initiative (EESLI): <http://www.mol.gov.vu/mol-projects-eesli.php>

- A project funded by the Italian and Austrian Governments and, is implemented regionally through the International Union for the Conservation of Nature (IUCN) regional office in Suva, Fiji. Nationally known as the Vanuatu Renewable Energy Projects (VREP).

- [34] Vanuatu Renewable Energy and Power Association (VANREPA): <http://energymap-scu.org/vanrepa-green-power/>

From *Isaka*: “A non-governmental organisation (NGO), Vanuatu Renewable Energy and Power Association (VANREPA), has been active since 2003 in bringing wind power to rural areas, managing renewable energy projects for donors and selling solar lighting kits and energy efficient stoves through Green Power, a retail spinoff.

It is unclear during the course of this research if VANREPA is still an active organization.

- [35] Vanuatu Utilities Regulatory Authority: <http://www.ura.gov.vu/>

As noted by *Isaka*: “The Utilities Regulation Authority (URA) was established in 2008 as a semi-autonomous body to mediate between the Government and electricity and water utilities. The URA also acts as an economic regulator for pricing, energy access, standards and monitoring of concession agreements.”

URA’s website contains overview information on the electricity market, concessions, and providing utilities, as well as annual reports and information regarding the Sarakata scheme.

- [36] World Bank: <http://www.worldbank.org/en/country/pacificislands>

The World Bank actively supports many projects and programs in 10 countries in the Pacific, including Vanuatu. As of October 2013, Bank cumulative lending (IBRD and IDA) to the Pacific Island countries was \$200.86 million for 34 active projects. The portfolio is concentrated in transportation, communications, and climate change resilience. The website contains detailed program and project information, and regional contextual information.

## Conference and Workshop Resources

- [37] Efficient Renewable Energy Integration in the Pacific Islands Region (4/4 – 4/12 2013): <http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=30&CatID=79&SubcatID=325>

IRENA conducted workshops on harmonised technical guidelines and grid stability assessment from 8-12 April in the Republic of Palau, to promote efficient renewable energy integration in the Pacific islands. Workshops provided hands-on training and practical knowledge to policy makers, grid operators and utility experts on technical guidelines for solar photovoltaic (PV) installation, and the use of modeling tools to assess and ensure power grid stability with higher shares of renewable energy integration.

- [38] UN Conference on Small Island Developing States (8/28 – 9/4 2014): <http://www.sids2014.org/>

The Third International Conference on Small Island Developing States will be held from 1 to 4 September 2014 in Apia, Samoa, to be preceded by activities related to the conference from 28 to 30 August 2014, also in Apia, Samoa. It will focus the world's attention on a group of

countries that remain a special case for sustainable development in view of their unique and particular vulnerabilities. The conference website has significant resources and pertinent information.

<sup>[39]</sup> Pacific Energy Summit (3/24 – 3/26 2013): <http://www.pacificenergysummit2013.com/>

The Pacific Energy Summit, co-hosted by New Zealand and the European Union (EU), was held in Auckland, New Zealand, 24-26 March 2013 following on from the Pacific Leaders' Energy Summit in Tonga. The website has links to very relevant conference presentations and materials.