ENERGY
CATALYST

Country Guide: Pacific Island Nations

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The Pacific Islands, located in the Pacific Ocean, comprise three ethnogeographic groupings: Melanesia, Micronesia, and Polynesia. The region consists of independent states, associated states, and parts of non-Pacific countries. Notably, the Pacific Islands exclude Australia, the Aleutian Chain islands, and the Indonesian, Philippines, and Japanese archipelagoes. There are 15 independent Pacific Island nations in addition to tens of thousands of islands, islets, and atolls. The independent nations are: Northern Mariana Islands, Federate States of Micronesia, Fiji, French Polynesia, Kiribati, Marshall Islands, Nauru, New Caledonia, New Zealand, Palau, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu, Wallis and Futuna.

Covering over 300,000 square miles (800,000 square kilometers), the Pacific Islands create a triangular shape, stretching from New Guinea to Hawaii and then down to New Zealand, with New Zealand and Papua New Guinea comprising roughly 90% of the total area. The region's population is mainly concentrated in Papua New Guinea, Hawaii, Fiji, and the Solomon Islands, and while the island nations vary in size, most people live along the coast. Papua New Guinea is the largest in both land mass and population, while Nauru is the smallest nation.

Figure 1 Map of the Pacific Island Countries. Source: Natural History Museum, Los Angeles County

English or French is widely spoken throughout the region, as one or the other is the official language in nearly all nations. Christianity is the dominant religion, often combined with traditional practices.

Economy

New Zealand is the only Pacific Island nation classified as a developed country, while Kiribati, Samoa, Solomon Islands, Tuvalu, and Vanuatu are considered least-developed countries, and the remaining nations are developing. The economies of these small islands are limited by their size, scarce natural resources, narrow economic bases, distance from major markets, and vulnerability to external shocks. Most Pacific island economies are developing, with imports surpassing exports, and some islands receive aid as overseas territories of larger, developed nations, while others receive help from other countries.

Agriculture, fishing, and services are the three largest economic sectors overall in the region. Many of the Pacific Island nations' economies rely on tourism. Manufacturing is limited in most nations except for New Zealand. Fiji, New Zealand, Papua New Guinea, and some other nations can export timber and other wood products because forested land available for commercial use.

Most of the Pacific Island countries have reopened their borders after over two years of pandemic-related isolation. Pacific Islands have been hit hard by multiple shocks over the past three years. Average real GDP growth in the region was -1.9 percent in 2021, shifting to positive growth of 0.8 percent in 2022, led largely by recoveries in Fiji (where an early reopening in 2021 facilitated tourism recovery) and Papua New Guinea which has benefited from higher liquid natural gas (LNG) prices.

The energy sector in the Pacific Island Nations

The Pacific Island region faces several energy challenges. Its limited supply of fossil fuels has historically led to a dependence on imported diesel for power generation, with imported diesel and liquid fuels accounting for more than 40% of their power generation. This dependence on imported fuels makes the Pacific region vulnerable to fluctuating energy prices, which can have a significant impact on the cost of electricity. Moreover, outdated power infrastructure, geographical dispersion, small economies of scale, and limited generation capacity lead to high costs of power, transmission and distribution losses, and low electrification rates.

These challenges are particularly acute in the Pacific region, where the scattered islands and small populations create unique challenges for energy providers. Several nations, including Papua New Guinea and Solomon Islands, confront significant hurdles in delivering electricity to their rural or outer island populations due to their widely dispersed demographics. In countries with more centralised populations, such as Samoa and Nauru, they grapple with high generation costs stemming from their reliance on diesel and associated import expenses. The enabling environment varies across countries in the Pacific Island region, with some nations lacking the necessary grid capacity to integrate intermittent renewable energy sources, while others encounter financial or public sector barriers that impede private sector involvement in generation.

Table 1: Pacific Island Nations at a glance

Developing Member Countries	Population 2020	Land Area (square km)	% Renewable Energy Installed
Cook Islands	17,564	237	27.7
Fiji	896,445	18,333	59.4
Kiribati	119,449	811	30.4
Marshall Islands	59,190	181	5.3
Federated States of Micronesia	115,023	701	9.5
Nauru	10,824	21	4.7
Niue	1,626	259	31.1
Palau	18,094	444	3.8
Papua New Guinea	8,947,024	462,840	32.2
Samoa	198,414	2,934	47.1

Table 1: Pacific Island Nations at a glance			
Solomon Islands	686,884	28,230	5.4
Tonga	105,695	749	30.5
Tuvalu	11,792	26	41.7
Vanuatu	307,145	12,281	30.2
Total	1,495,169	528,047	25.6

Source: ADB Pacific Energy Update 2021

There is a significant transformation occurring in the Pacific islands as countries are transitioning from using fossil fuels to more environmentally friendly forms of energy. This shift towards renewable energy aligns with the natural advantages of the Pacific islands, which are rich in renewable energy resources.

There is immense potential for hydropower in countries such as Fiji, Papua New Guinea, Solomon Islands. Additionally, solar power is a strong renewable energy possibility throughout the region, and to a lesser extent, wind energy, geothermal and biomass can also be harnessed.

Hydropower

With its abundant rainfall and numerous rivers and streams, the Pacific islands region has several sites with potential for hydropower generation. Many countries in the region have already begun leveraging on this renewable energy source, with several successful hydropower projects in operation.

In Fiji, there are numerous rivers and waterfalls that can be used for hydropower generation. For example, the Monasavu dam was commissioned in 1983 and has a generating capacity of 80MW and an annual energy yield of 400GWh, and the Nadarivatu dam was commissioned in 2012 with a power output of 40 MW and an annual energy yield of 101 GWh. The Wainikasou Hydro Power Plant, a 5 MW run-of-river hydroelectric power plant, was commissioned in 2014 and provides electricity to the country's national grid.

Papua New Guinea has abundant and largely untapped hydropower potential, due to its mountainous terrain and high rainfall, with an estimated technical potential of 15,000 MW. Some of the leading examples of hydropower projects under active development include Naoro- Brown (80 MW), Ramu 2 (240 MW) and Edevu (50 MW). In addition, there are rehabilitation works under the Town Electrification Investment Programme to increase the generation and extend the operating life of Yonki Toe dam (18 MW) and the Warangoi (10 MW) plants by up to 25 years.

Similarly, the Solomon Islands has identified a number of potential hydropower sites that could be developed to provide reliable and sustainable energy. The Tina River Hydropower Project involves the construction of a 15 MW run-of-river hydropower plant on the Tina River in Guadalcanal Province. The project, which is expected to be completed in 2024, will serve as an abundant source of renewable energy for Honiara, the Islands' capital city, generating an estimated 68% of its electricity. The plant is expected to displace 78.35 GWh of diesel generation with clean energy annually.

Samoa has already made significant progress in developing its hydropower potential, with hydropower generation increased from 35 million GWh in 2013 to nearly 50 million GWh in 2020, as damaged hydropower plants were rehabilitated, and new ones installed. Vanuatu has already developed several small-scale hydropower projects, and the Brenwe hydropower plant will deliver up to 90% of the Malekula grid's needs (the second-largest island in Vanuata), saving more than 200,000 litres of diesel per year when fully operational. The Federated States of Micronesia has a number of potential hydropower sites, particularly in the state of Chuuk, which has several rivers with significant water flow rates.

While the Pacific islands region has immense potential for hydropower generation, it is to note that some of the Pacific Island countries are simply too small to accommodate utility-scale hydropower projects, while in others, traditional landownership structures (often held by communities or tribes) can make land acquisition time-consuming and costly.

Solar power

The Pacific islands region has a promising solar energy landscape as a result of its abundance of sunshine. Several countries in the region are capitalizing on this resource by developing solar projects to generate electricity. Solar and other forms of renewable energy are also attractive because the isolation of islands makes transporting fossil fuels to power generators both expensive and carbon intensive.

Tonga, for instance, aims to achieve ambitious renewable energy targets of 70% and 100% renewable electricity by 2025 and 2035, respectively, with solar energy as a key driver. In 2021, solar energy alone makes up 80% of Tonga's renewable capacity. In December 2022, a 6.9 MW solar power plant (the largest in the South Pacific) was launched to contribute to the country's goal to reduce emissions and have a cleaner energy sector.

The Cook Islands' renewable capacity was 99% solar energy in 2021, which also contributed to about a third of electricity generation. Through the Renewable Energy Sector Project financed by ADB, a combined 2.5 MW peak of solar photovoltaic and 7.5 MWh of battery energy storage for mini-grids were built on the 5 small islands of Atiu, Aitutaki, Mangaia, Mauke, and Mitiaro.

Other countries in the region such as Samoa and Vanuatu are also investing in solar energy to reduce their dependence on imported fossil fuels and provide affordable and sustainable energy to their citizens.

Off-grid solar systems are also becoming increasingly popular in the Pacific islands region, as they can provide electricity to remote communities that are not connected to the main power grid. Companies such as Sunergise and Conergy are providing off-grid solar solutions to communities in Fiji, Samoa, and other Pacific islands.

Wind power

The Pacific islands region has a vast potential for wind energy due to its geographical location and the abundance of wind resources in the region. Several countries in the region have already begun developing wind energy projects to take advantage of this potential.

One of the leading countries in wind energy development in the region is Samoa. The country has installed a 550 kW wind turbine that generates electricity for the island of Upolu. Samoa has set a target of generating 100% of its electricity from renewable sources by 2025, with wind energy playing a significant role in achieving this target.

Similarly, Vanuatu has also taken steps towards developing wind energy to reduce its dependence on imported fossil fuels. The country has installed two wind turbines on the island of Espiritu Santo, which generates approximately 500 kW of electricity.

In Fiji, wind energy has been identified as a potential source of renewable energy. The country's national energy policy sets a target of generating 100% of its electricity from renewable sources by 2036, with wind energy playing a significant role.

The Pacific islands region also has the potential for offshore wind energy, with countries like Papua New Guinea and the Solomon Islands having significant offshore wind potential. While offshore wind energy is still in its infancy in the region, it presents an exciting opportunity for countries to diversify their energy mix and reduce their dependence on imported fossil fuels.

Geothermal

Geothermal energy has the potential to transform the Pacific islands region's energy landscape, given the region's location on the Pacific Ring of Fire.

One of the leading countries in geothermal energy development in the region is Papua New Guinea, which has several geothermal sites with significant potential. The country has identified geothermal energy as a key source of renewable energy and has set a target of generating 100% of its electricity from renewable sources by 2050, with geothermal energy playing a vital role in achieving this target.

Similarly, Fiji has identified geothermal energy as a potential source of renewable energy and has several geothermal sites with significant potential. The country's national energy policy sets a target of generating 100% of its electricity from renewable sources by 2036, with geothermal energy playing a significant role in achieving this target.

The Solomon Islands also have significant geothermal potential, with the country's Savo Island having an estimated 20 MW of geothermal potential. The country has already begun exploring the potential of geothermal energy, with the development of the Tina River Hydropower and Geothermal Project.

Other countries in the region, such as Samoa and Vanuatu, are also exploring the potential of geothermal energy to provide clean and sustainable energy to their citizens.

Biomass

Biomass has the potential to be a game-changer for the Pacific islands region's energy landscape, given the region's significant agricultural sector. Several countries in the region are exploring the potential of biomass to generate electricity and provide energy security.

In Fiji, for example, the government has set a target of generating 100% of its electricity from renewable sources by 2036, with biomass being one of the identified sources. In 2019, 65% of the renewable energy consumption was bioenergy. The country's sugar cane industry has significant potential for biomass generation, with bagasse being a readily available feedstock for biomass power generation.

Similarly, Papua New Guinea has significant biomass potential, with the country's forestry sector producing substantial biomass resources. The country has identified biomass as a potential source of renewable energy, and several biomass power projects are in the development stage.

Vanuatu is also exploring the potential of biomass to generate electricity, with coconut husks being the primary feedstock for biomass power generation. The country has identified biomass as a key source of renewable energy and has set a target of generating 100% of its electricity from renewable sources by 2030.

Other countries in the region, such as Samoa and the Solomon Islands, are also exploring the potential of biomass to provide clean and sustainable energy to their citizens.

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