KI MUA:

TOWARDS A JUST TRANSITION FOR THE PACIFIC

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Disclaimer and acknowledgements
This paper aims to contribute to an ongoing discussion on the just transition from fossil fuels in the Pacific. Views expressed in this paper are those of the authors.

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FOREWORD

'Low-cost renewable energy provides the most compelling pathway to the decarbonisation of the global future energy system and the achievement of both the 1.5°C target and the goals of the Paris Agreement.

...

Renewables will reduce fossil import bills and average electricity system costs, and lessen the damaging impacts of high electricity prices on consumers and industry. This year's fossil fuel price crisis demands a response; renewables and energy efficiency provide the answer, bringing unprecedented benefits for consumers, the environment and the global economy.'

International Renewable Energy Agency, 2022

[1] *(IRENA, 2022a, 5).*

Talofa and warm Pacific greetings,

It is my pleasure to introduce this comprehensive report, which delves into the pathways for the Just and Equitable Transition in the Pacific region.

While responsible for just a fraction of a percent of annual global emissions, Pacific communities are on the frontline of the climate crisis, feeling its impacts through rising sea levels, more intense extreme weather events, increasing crop failure, diminishing marine ecosystems and both physical and social harms.

For decades, Pacific Island nations, frontline communities and indigenous leaders have been at the forefront of climate action and challenging fossil fuels. However, our reality is that currently we are heavily reliant upon imported fossil fuels for our energy needs, with the lion's share of our electricity coming from diesel generators. These costs are steep, with the Pacific islands collectively spending $6 billion USD on fossil fuel imports annually.

We can tap into the power of wind, sun and water. Our countries have been rapidly moving towards renewable energy sources as evident in our current energy policies and commitments. Tokelau is already 100% powered by solar energy with more Pacific Island Governments investing heavily in hydropower. A renewable energy transition in the Pacific would substantially improve Pacific islands' energy security and result in significant cost savings. At the same time, phasing out these polluting technologies and replacing them with clean, safe alternatives will have greater health benefits to the people of our Blue Pacific. It is clear that we will benefit significantly from the global energy transition, however, any plans for a just transition must be co-created with Pacific peoples.

Decades ago, Pacific Island leaders and communities were the first to raise the alarm about the impacts of climate change. Today, we continue to stand at the forefront of climate leadership - from setting the 1.5 global temperature limit in the Paris Agreement to the landmark passage of the ICJ Advisory Opinion in the UN General Assembly and now, pioneering the Port Vila Call for a Just Transition to a Fossil Fuel Free Pacific and calling for the negotiation of a new international treaty on fossil fuel phase out.

It is high time for wealthy, fossil fuel producing countries that are largely responsible for the climate emergency to take the lead in phasing out fossil fuels, and support our countries in the shift towards renewable energy. Embarking on a global clean energy revolution will require significant international cooperation, in particular addressing the critical need for substantial climate finance, as well as providing technical assistance to our nations.

A just transition plan for the Pacific must be comprehensive and holistic, accounting for all impacts associated with the energy transition, including those flowing from renewable energy uptake.

The world stands at a critical crossroads, where decisions made today will profoundly influence the well-being of our future generations.

This report, which has been meticulously crafted by a team of dedicated researchers, seeks to understand and analyze the advancements in renewable energy, map out pathways for a just transition and pave a way for the future we want to see. May this report ignite conversations, spur deep and critical discussions and actions, and drive us all towards a shared vision of a just, equitable and a sustainable future.

Hon. Seve Paeniu
Minister of Finance and Climate Change
Pacific Treaty Champion
Government of Tuvalu

Science is crystal clear: Fossil Fuels are responsible for the irreversible harm to people and the planet now being suffered by all. New analysis shows that the world's 20 largest economies spent a record-breaking $1.4 trillion on state support for the coal, oil and gas industry in 2022, while all developed countries together have still not yet managed to meet their 2009 commitment that by 2020 they would collectively provide USD 100 billion annually to developing countries towards addressing climate change

How is this possible that the world still has such an addition to fossil fuels, and that today's global leadership accepts horrific climate loss and damage consequences on a daily basis? It is immoral that Pacific islands are right now disappearing beneath the waves, fundamental human rights are being undermined and Pacific lives are being lost.

Hurtling now towards a future global heating of more than double the 1.5°C limit of the Paris Agreement, time for slow and steady action has passed, and the time for ambitious global leadership is upon us. We must see sustained, radical, and socially phase out of fossil fuels now, and not later. There is no other option for Vanuatu. There is no other option for our planet.

That is why the Republic of Vanuatu and the Republic of Tuvalu convened Pacific Ministers in Port Vila in March of 2023, to demonstrate ambition and call for a Just Transition to a Fossil Fuel Free Pacific.

The Port Vila Call has echoed around the world, and is now inspiring States from the global South and North to participate in the Pacific's International Court of Justice case to realise climate justice and accountability, to demand a fossil fuel phase out as an outcome of the United Nations climate negotiations process, and to develop a new Fossil Fuel Non-Proliferation Treaty that will shepherd the world towards abundant, green, and inexpensive energy, that keeps Fossil fuels in the ground and ensures that no State or Peoples are left behind in the urgent transition required.

I warmly welcome the KI MUA:TOWARDS A JUST TRANSITION FOR THE PACIFIC, a report which puts facts above the lies and misinformation of the fossil fuel energy and shows in quantitative detail that a Pacific without fossil fuels is both possible and beneficial to our sustainable development aspirations.

I look forward to working with all those who see, and are committed to realizing, this better way. You have in Vanuatu a staunch ally for present and future generations and an ally for our Planet.

Hon Ralph Regenvanu is the Minister for Climate Change Adaptation, Energy, Environment, Meteorology, Geo-Hazards and Disaster Management in the Government of the Republic of Vanuatu

EXECUTIVE SUMMARY

KEY FINDINGS

The 15 largest greenhouse gas emitting nations are responsible for ***71.88%*** of all annual global emissions.

The 14 Pacific Island Countries (PICs) are responsible for just ***0.23%*** of annual global emissions.

The upfront estimated cost of replacing all existing fossil fuel electricity generation in the eight PICs profiled in this report ranges ***from $691 million USD to just over $1 billion USD*** depending on the specific technology mix.

A full decarbonisation of Pacific economies will lead to benefits quite apart from the obvious climate mitigation gains, including in the areas of ***public health, energy accessibility and economic development, disaster resilience, political independence, and global climate mitigation advocacy.***

A just transition must go beyond replacing one technology with another,

and encompass a holistic approach to economic development in the Pacific, characterised by economic diversification, poverty eradication, decentralised renewable energy systems, and the retraining and redeployment of fossil fuel workers.

A genuine and full energy transition in the Pacific will not be possible without Global North nations providing substantial climate finance and expertise sharing in relevant sectors.

A JUST TRANSITION FOR THE PACIFIC

The world is in the midst of a climate crisis, whose impacts are already being felt by much of humanity. In order to prevent the worst impacts of dangerous global warming and preserve a planet able to sustain human life in close to its current form, the mining and burning of coal, oil and gas must be stopped as soon as possible, and replaced with renewable energy.

This crisis is unequal. It was caused primarily by the developed countries of the Global North, whose nations produced the lion's share of historic emissions, and continue to dominate the highest emitter rankings. The world's top 15 annual greenhouse gas emitters together currently produce 71.88% of all annual global emissions.

Its effects, however, are mainly felt in the Global South. Pacific Island Countries (PICs) are on the frontlines of the climate crisis, with their people already suffering from rising sea levels, more intense extreme weather events, and the crop failures, forced relocations, and harm to human life and culture they cause. This is despite the 14 PICs together producing just 0.23% of current annual global emissions.

As acknowledged by all leading global multilateral fora, the countries of the Global North therefore have a differentiated obligation to frontline communities to take responsibility for their past actions by helping to facilitate the energy transition in the Global South through measures like climate finance and sharing of expertise. Nevertheless, the nations of the Pacific have themselves committed - most recently in the 2023 *Port Vila Call for a Just Transition to a Fossil Fuel Free Pacific* - to do their part by leading the way in decarbonising their economies and transitioning from an energy system largely based on diesel fuel, to one dominated by renewable energy.[2]

If the necessary and urgent economic transformation away from fossil fuels and renewables is to be credible for the Pacific, it must go beyond a simple swap of one technology for another and take the form of a just transition that implements real solutions across sectors to allow economic diversification, sustainable development and poverty eradication; an energy transition with ambitious deployment of people-centred, socially and environmentally appropriate renewable energy systems; and equity and a just transition for workers and communities in both the fossil fuel industry and other sectors affected by fossil fuel production phase out.

The task for the Pacific, while substantial, is achievable. Many PICs are already advanced on their decarbonisation pathways, with Papua New Guinea and Fiji, for example, already at 60% of their annual electricity generation coming from renewable sources. However, for other smaller nations, such as the Federated States of Micronesia, Tuvalu, and the Marshall Islands, whose energy mix remains dominated by fossil fuels, there is more work to do.

This report estimates that the **upfront cost** of replacing all existing fossil fuel electricity generation in the eight PICs profiled in this report ranges **from $691 million USD to just over $1 billion USD**, depending on the specific technology mix.

However, with the Levelised Cost of Electricity generated by onshore wind and utility solar PV now lower than that of coal, oil or gas, these initial investments would result in a **net economic gain** over the lifetime of the generation assets. Although some PICs currently enjoy renewable energy from other sources, such as hydropower and biomass, the cost of wind and solar has gone down so much over the past ten years, that any new renewable generation build would be unlikely to include other technologies in the foreseeable future purely on economic grounds.

[2] *(PICAN, 2023a).*

This programme of renewable energy investment would also reap many substantial co-benefits. All PICs profiled in this report exhibit air particulate pollution well above WHO safe levels. Removing the bulk of diesel generation from urban environments would mean that Pacific people would lead longer, healthier lives. Renewable energy sources, being more resistant to damage from extreme weather events like cyclones, would make PICs more resilient to climate impacts. Cheaper, more accessible energy would also represent a boost to the economies of the Pacific, while the resulting energy independence would empower PICs to more forcefully argue for their interests on the global stage.

The transport sector presents the greatest decarbonisation challenge for the Pacific, due to its unique geography, low baseline of EV uptake, and the high costs of replacing internal combustion engine vehicles with EVs and installing the necessary charging and grid upgrade infrastructure. Further, as developed economies decarbonise their own transport sectors, the dumping of cheap pre-owned ICE vehicles onto the developing world, including the Pacific, will exacerbate the comparative cost challenge of the transition.

However, while the upfront costs of decarbonising transport are significant, the latest research demonstrates that such an investment, over the course of its lifetime, would represent a net financial saving, quite apart from the considerable climate, environmental and public health benefits that would result. This report recommends that, while transport decarbonisation should be a goal for PICs, priority be given to planning and securing investment in a 100% (or close to 100%) renewable electricity system before investing large amounts of public funds into transport decarbonisation.

With regard to just transitions for affected workers, it is important to emphasise that Pacific Island Countries have no domestic fossil fuel extraction sector, with the exception of Papua New Guinea. This means that a transition for their workforce would be relatively painless. In the case of PNG, strong economic diversification initiatives will be required to ensure fossil fuel workers are not left behind.

This report's individual profiles of eight leading PICs reveal the diversity of economic and social experiences in the region. However, they are united by the huge opportunities for sustainable economic growth and development, climate mitigation and adaptation, public health, security, and political advocacy offered by a planned phase out of fossil fuels and their replacement with renewable energy. For such a transformation to become a reality, global North countries responsible for the climate crisis must come to the table with meaningful offers of climate finance, expertise, and international climate action advocacy: measures that would result in a net benefit for all of humanity.

INTRODUCTION

This report forms part of the Fossil Fuel Non-Proliferation Treaty Initiative (Fossil Fuel Treaty Initiative)'s advocacy for a new international treaty that aims to end expansion of fossil fuels and phase down existing coal, oil and gas projects, and enable a global just transition from fossil fuels. It analyses the opportunities and challenges posed for Pacific nations by a global transition to 100% renewable energy, and recommends clear steps for policy makers to understand what they can do to accelerate the transition and manage it in a way that ensures greatest prosperity for Pacific communities.

Chapter 1 provides a situation analysis in the form of a summary of climate and energy policy settings across the Pacific, including emissions profiles of the region's nations, their energy sectors, and their commitments under the Paris Agreement.

Chapter 2 provides an overview of principles on the meaning of 'just transition' for the purposes of the Fossil Fuel Treaty Initiative, as a foundational statement for the analysis that follows.

Chapter 3 analyses what that global just transition away from fossil fuels would look like in the Pacific as a whole, focusing on the opportunities for economic diversification, sustainable development and poverty eradication; equity for workers affected by a fossil fuel phase out, including, but not limited to, the fossil fuel sector; and the role of people-centred, socially and environmentally sustainable renewable energy systems.

Chapters 4-11 form self-contained case studies of how this transition would individually affect eight Pacific Island Countries across the Pacific's three main regions of Melanesia, Micronesia, and Polynesia: Papua New Guinea, Fiji, Solomon Islands, Vanuatu, Samoa, Kiribati, Federated States of Micronesia, and Tuvalu.

Chapter 12 discusses the role of the 'developed' Global North in securing a just transition away from fossil fuels, and how its efforts could complement the long-standing leadership of Pacific Island Countries in this arena.

The report also includes detailed appendices that outline the methodologies used in reaching its conclusions throughout the body of the report.

METHODOLOGICAL OVERVIEW

The methodology and information on which the findings in this work are based are discussed in the appendices at the end of this report, with footnoted cross-references to each chapter text as necessary. It is useful, however, to highlight here some important elements of the report's approach, as well as some of the limitations of the available data

When undertaking an analysis of national data - such as emissions profiles, renewables penetration or finance - it is critical to be able to use consistent data sources across all metrics and geographies as much as possible. This is both to ensure that any calculations use the same baselines and so that it is possible to compare like with like when looking beyond the immediate area of inquiry. Doing so makes it possible, for example, to say that the Pacific's annual greenhouse gas emissions represent 0.23% of the global total and to be sure that the measurements for each nation have been consistently applied in doing so.

The quality of the data available on specific sectors of economic activity in the Pacific as well as individual nations are unfortunately quite varied. In some cases data are not available, while elsewhere they do not correspond with comparable studies from international monitoring bodies and, in some situations, are not internally consistent across different datasets from individual ministries or government agencies.

This is not unexpected when dealing with a region of 14 nation states at different levels of economic development, and with correspondingly different levels of resourcing and is in no sense to be understood as a deficiency on their part. Inevitably, however, this means that some of the findings of this report are made with more confidence than others. Such cases are flagged throughout in footnotes, with more detailed discussion in the methodological appendices as necessary.

As a rule, for emissions levels and breakdowns, we use Climate Watch Data numbers, while for renewable energy we use International Renewable Energy Agency (IRENA) data, down to the most recent years available. Despite their often controversial and rubbery nature, we include Land Use Change and Forestry (LUCF) emissions in our calculations, choosing to follow the UNFCCC and the Paris Agreement on Climate Change practice in this regard.

1. CLIMATE AND ENERGY IN THE PACIFIC

1.1 EMISSIONS PROFILES

1.1.1 The international context

Global emissions in 2019 were 49.8 gigatonnes of carbon dioxide equivalent (49.8 Gt CO2e).[3] The biggest emitter was China, with 24.22% of global emissions, followed by the USA, with 11.58% of global emissions. Taken together, the 14 Pacific Island Countries (PICs) that have ratified the Paris Agreement, on the other hand, comprise just 0.23% of global emissions.

The top 15 greenhouse gas emitting nations or national groupings and those of Pacific Countries are shown in the table below.

Rank	Nation	Gt CO2e	% of global total
1	China	12.06	24.22%
2	USA	5.77	11.58%
3	India	3.36	6.75%
4	EU (27)	3.15	6.33%
5	Indonesia	1.96	3.94%
6	Russia	1.92	3.86%
7	Brazil	1.45	2.91%
8	Japan	1.13	2.27%
9	Iran	0.89378	1.79%
10	Canada	0.77429	1.55%
11	Saudi Arabia	0.72315	1.45%
12	Democratic Republic of the Congo	0.67957	1.36%
13	Mexico	0.67084	1.35%
14	South Korea	0.65266	1.31%
15	Australia	0.60849	1.22%

[3] This figure is inclusive of Land Use Change and Forestry (LUCF). 2019 is the latest year that we have full, globally comprehensive emissions data at time of publication. This report uses Climate Watch Data emissions figures: (Climate Watch 2020a). Emissions graphs are generated using Climate Watch's open source historical emissions tracker. (Climate Watch 2020a). Percentages may not add up to 100% due to rounding.

Rank	Nation	Gt CO2e	% of global total
	Top 15 emitters	35.80	71.88%
	Pacific Island Countries (14)	0.113	0.23%
	World total	49.8	100%

1.1.2 The Pacific

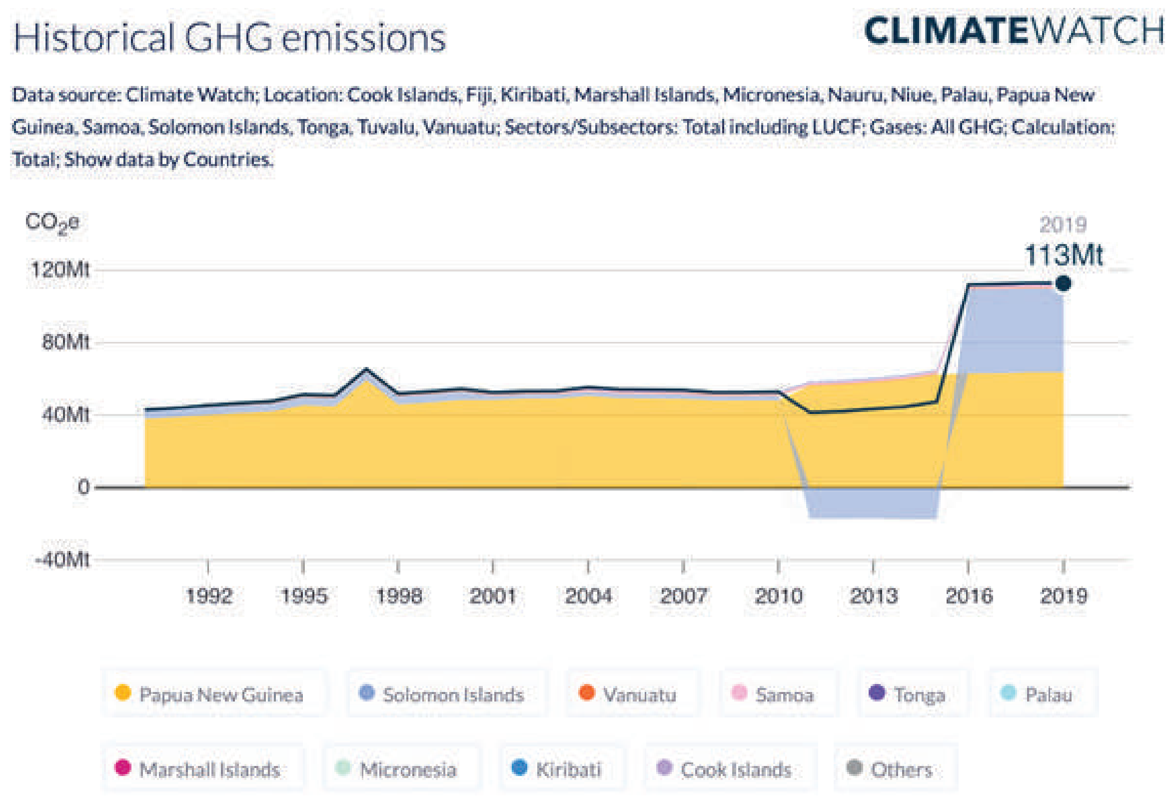
The Pacific is one of the lowest carbon emitting regions in the world.

The 14 Pacific nations that are signatories of the UNFCCC together produce an annual total of 113 Mt of carbon dioxide equivalent emissions. As the largest Pacific country by population and economy, Papua New Guinea produces the majority of these (63.47 Mt), followed by Solomon Islands (46.46 Mt), with Vanuatu a very distant third (0.87 Mt).[4] The table below includes Australia and New Zealand by way of comparison and to put PICs' emissions into their regional context.

Country	Annual emissions (Mt CO2e, 2019)
Australia	608.49
New Zealand	72.59
Papua New Guinea	63.47
Solomon Islands	46.36
Vanuatu	0.87
Samoa	0.79
Tonga	0.31
Palau	0.29
Marshall Islands	0.23
Federated States of Micronesia	0.23
Kiribati	0.12
Cook Islands	0.11
Nauru	0.07
Tuvalu	0.03
Niue	0.01
Fiji	-0.16

[4] Source: (Climate Watch, 2020a).

Figure 1 - **Pacific greenhouse gas emissions as MtCO2e, including LUCF, by nation**

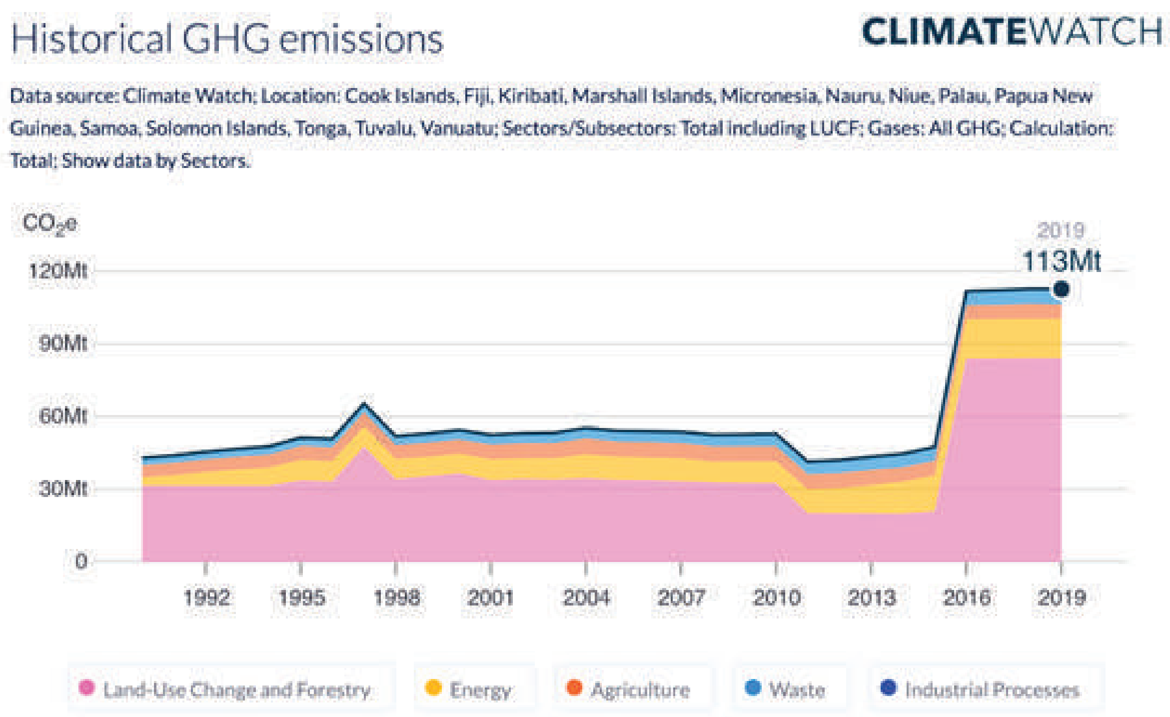


1.1.3 Emissions by sector

Emissions in the Pacific come overwhelmingly from land use change and forestry, followed by energy and agriculture.

Sector	Emissions (Mt CO2e, 2019)
Land-use change and forestry (LUCF)	83.99
Energy	16.28
Agriculture	6.06
Waste	5.69
Industrial processes	0.681

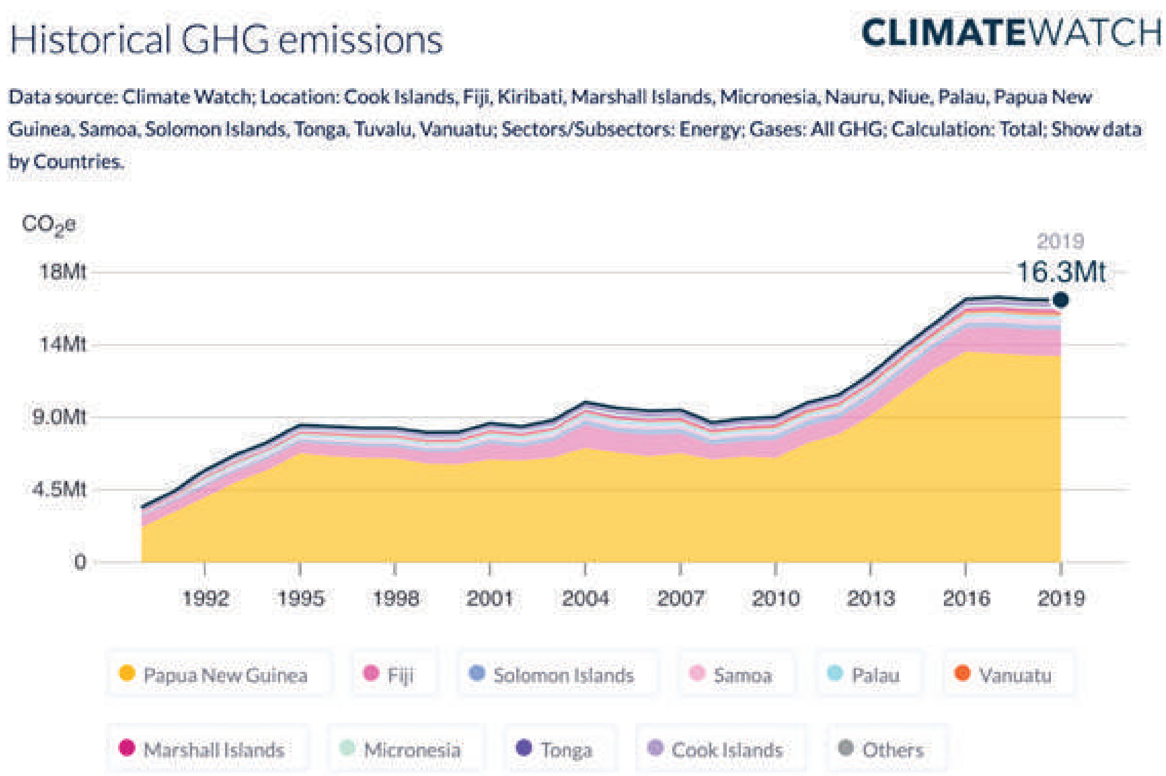
Figure 2 - **Pacific greenhouse gas emissions as MtCO2e, including LUCF, by sector**



1.2 ENERGY SECTOR

Within the energy sector, emissions have remained broadly stable over the last 30 years, reflecting the non-energy intensive character of most PIC's economies. The exception is Papua New Guinea, whose energy sector emissions have risen from 2.17 Mt CO2e in 1990 to 12.80 Mt CO2e in 2019: over 3.5 times that of the other 13 PICs combined.

Figure 3- **Pacific energy sector emissions as MtCO2e, including LUCF, by nation**



1.2.1 Fossil fuels

The fossil fuel mix for the vast majority of the Pacific's energy supply is dominated by diesel fuel, imported by sea for use in diesel generators. While diesel generation has the advantage of being able to operate at a hyper-local scale, it suffers from a variety of disadvantages, including air pollution, cost relating to variable - and currently historically high - oil prices, and issues of supply, reliability and maintenance of equipment.

As discussed further in Chapter 3, a mix of utility-scale and decentralised renewables, dominated by solar PV and wind installations, provides significant opportunities for Pacific Island Countries to reduce pollution and improve public health, grow their economies, and remove their reliance on fossil fuel imports for their energy needs, while retaining the versatility of existing energy systems. With substantial proportions of people in many Pacific countries still lacking equitable access to energy, the ability to leapfrog a coal, oil or gas dominated energy system via a renewable energy transformation also represents a significant poverty reduction measure for the region: a key plank of any just transition policy suite.

1.2.2 Renewable energy

Renewable energy and renewable electricity penetration across the Pacific is varied, from highs of around 60% renewable electricity generation to almost zero renewables: the result of a combination of economic, political and environmental factors.[5]

The table below shows what proportion of each nation's electricity is generated from renewables (Column 2), and how much of its total energy - comprised of energy from all sources including, but not limited to, just electricity - comes from renewable sources (Column 3).

Nation	Renewables as % of total electricity generation	Renewable energy as % of total energy supply	Population with access to electricity as % of total population
Papua New Guinea[6]	60%	45%	60%
Fiji	60%	25%	100%
Solomon Islands	7%	44%	73%
Vanuatu	28%	28%	67%
Samoa	38%	30%	100%
Kiribati	14%	36%	92%
Federated States of Micronesia	7%	2%	83%
Tuvalu	16%	4%	100%
Tonga	13%	2%	100%
Palau	3%	<1%	100%
Marshall Islands	2%	n/a	99%
Cook Islands	35%	4%	100%
Nauru	7%	1%	100%
Niue	14%	16%	100%

[5] *Renewable energy generation and capacity statistics throughout this report are sourced from the latest figures from the International Renewable Energy Agency (IRENA). See the methodology appendices for more details about the quality of these data. Although the terms 'energy' and 'electricity' are sometimes used interchangeably elsewhere, they are not the same thing. Energy comprises all sources of energy: electricity, but also any fuels that are burned for power, cooking, transport, or industrial processes. Electricity, on the other hand, is one subset of the total energy mix in a given geography. They are used with these distinct meanings throughout this report.*

[6] *Individual data as follows: Papua New Guinea, (IRENA, 2022b); Fiji, (IRENA, 2022c); Solomon Islands, (IRENA, 2022d); Vanuatu, (IRENA, 2022i); Samoa, (IRENA, 2022e); Kiribati, (IRENA, 2022f); Federated States of Micronesia, (IRENA, 2022g); Tuvalu, (IRENA, 2022h); Tonga, (IRENA, 2022j); Palau, (IRENA, 2022k); Marshall Islands, (IRENA, 2022l); Cook Islands, (IRENA, 2022m); Nauru, (IRENA, 2022n); Niue, (IRENA, 2022o).*

1.3 NATIONALLY DETERMINED CONTRIBUTIONS

Despite being responsible for a tiny percentage of global emissions, Pacific Island Countries have adopted some of the most ambitious Nationally Determined Contributions (NDCs) for emissions reduction as part of the Paris Agreement on Climate Change. The NDCs for the eight Pacific Island Countries profiled in this report are shown below.

Nation	NDC
Papua New Guinea	**NDC to 2030** • PNG commits to generating 78% of its electricity supply from renewable energy sources by 2030 • Absolute Target: By 2030, annual emission from deforestation and forest degradation due to agriculture expansion and commercial logging is reduced by 10,000 Gg CO2 eq comparing to 2015 level • Relative Target: LULUCF will be converted from net GHG source (1, 716 Gg CO2 eq) in 2015 to net GHG sink (-8,284 Gg CO2 eq) by 2030 to mitigate emissions from other sectors • Non GHG Qualitative Targets: The area of annual deforestation is reduced by 25% of 2015 level by 2030 (Equating to a reduction of 8,300 ha of annual deforestation). The area of forest degradation is reduced by 25% of 2015 level by 2030 (Equating to a reduction of 43,300 ha of annual degradation). The area of planted forest and forest restoration is increased. Non GHG Action Based Targets Enhanced land use planning Promoting climate-friendly agriculture Enhancement of timber legality Promoting REDD+ Promoting downstream processing Promoting the Painim Graun Planim Diwai initiative and planting trees initiative. **NDC to 2050** • Reduce emissions to 50 percent by 2030 - and to be carbon neutral by 2050

Nation	NDC
Fiji	**NDC to 2030** • Target 1: To reduce 30% of BAU CO2 emissions from the energy sector by 2030. • Target 2: As a contribution to Target 1, to reach close to 100% renewable energy power generation (grid-connected) by 2030, thus reducing an expected 20% of energy sector CO2 emissions under a BAU scenario. • Target 3: As a contribution to Target 1, to reduce energy sector CO2 emissions by 10% through energy efficiency improvements economy wide, implicitly in the transport, industry, and electricity demand-side sub-sectors. **NDC to 2050** • Achieve net-zero GHG emissions by 2050 as set out in Low Emission Development Strategy (LEDS)
Solomon Islands	**Conditional** • target is 27% reduction in GHG emissions by **2025** and 45% reduction in GHG emissions by **2030** compared to a Business As Usual (BAU) projection. **Unconditional** • target is 12% reduction below 2015 level by **2025** and a 30% reduction below 2015 levels by **2030** compared to a Business As Usual (BAU) projection.
Vanuatu	**NDC to 2030** • Sector specific target of transitioning to close to 100% renewable energy in the electricity sector by 2030. This target would replace nearly all fossil fuel requirements for electricity generation in the country and be consistent with the National Energy Road Map (NERM) target of 65% renewable energy by 2020. • This contribution would reduce emissions in the energy sector by 72Gg by 2030.
Samoa	**Conditional** • commits to generating 100% of its electricity from renewable energy sources by **2025** • reduce overall GHG emissions by 26 per cent in **2030** compared to 2007 levels

Nation	NDC
Kiribati	***Conditional*** • On receiving external support, Kiribati's conditional contribution will reduce emissions by 35,880tCO2e annually by **2025** and by 38,420tCO2e annually by **2030**. ***Unconditional*** • In the absence of receiving any external support, in addition to the carbon storage in the ocean ecosystem, Kiribati's unconditional contribution will reduce emissions by 10,090tCO2e annually throughout the period 2020 to **2030**.
Federated States of Micronesia	***Conditional*** • Subject to the availability of external additional financing, technical and capacity building support from the international community, by 2025 Micronesia could reduce up to 35% of greenhouse gas emissions compared to a base year of 2000. This is an approximate 94,000tCO2e. ***Unconditional*** • In the absence of external support, Micronesia commits to unconditionally reduce its greenhouse gas emissions by 28% by 2025 compared to a baseline year of 2000. This is an approximate 108,000tCO2e.
Tuvalu	***NDC to 2025*** • Tuvalu commits to a reduction of emissions of green-house gases from the electricity generation (power) sector, by 100% i.e. almost zero emissions by **2025**. Tuvalu's indicative quantified economy-wide target for a reduction in total emissions of GHGs from the entire sector to 60% below 2010 levels by **2025**.


VOTE
YES
FOR
CLIMATE
JUSTICE
Friendly
environment
Rainbow
Help Reduces
change
I don't need money
FOSSIL FUEL
NON-PROLIFERATION
TREATY
Fuel
air
pollution

2. JUST TRANSITIONS: POLICIES AND PRINCIPLES

For the transition to 100% renewables in the energy sector to be credible, it must be a just transition.

The Fossil Fuel Treaty Initiative considers a just transition to be one that addresses:

1. The design and rapid implementation of transformative pathways and real solutions across sectors to allow economic diversification, sustainable development and poverty eradication.
2. An energy transition with ambitious deployment of people-centred, socially and environmentally appropriate renewable energy systems.
3. Equity and a just transition for workers and communities in both the fossil fuel industry and other sectors affected by fossil fuel production phase out.[7]

The Pacific will benefit significantly from the global energy transition and from its own domestic energy transition. Such benefits include improved climate mitigation, climate adaptation, energy security and energy access, and even the very survival and habitability of Pacific countries themselves.

However, the transition brings up complexities for the region given its large marine and terrestrial deposits of Energy Transition Metals, demand for which is projected to substantially increase due to their use in the manufacture of solar panels, batteries and wind turbines. Further, oil and gas workers in Papua New Guinea will need additional protections to ensure they are not left vulnerable to unemployment and poverty. Due to these challenges, Pacific island nations must implement programs and strategies - with international support and cooperation from the actors most responsible for climate change - to ensure that the negative impacts of the transition are mitigated against and that justice is achieved for Pacific communities.

[7] *(Fossil Fuel Non-Proliferation Treaty Initiative, 2022a, 4).*

2.1 DEVELOPING A CREDIBLE, COMPREHENSIVE PLAN

A truly just plan requires deep collaboration and co-creation with affected people and communities in the Pacific. It is essential that such a plan is comprehensive and holistic, paying attention to the full range of social, economic and environmental impacts - both positive and negative - of a global fossil fuel phase out on Pacific governments, workers, and communities.

2.1.1 Co-creation with Pacific peoples

A plan for a just transition must be co-created with Pacific peoples, and must be based on research carried out by, or in genuine partnership with, Pacific research institutions. While substantial research exists on just transitions globally, a detailed plan for or about the Pacific must be additionally informed by context-specific research that addresses Pacific needs, systems and structures. Principles outlined in the UN Declaration on the Rights of Indigenous Peoples (UNDRIP) can also be applied to research and policy co-creation, such as principles of full and effective participation, free prior and informed consent, and respect for and acknowledgement of Indigenous ontologies and knowledge systems.[8] Pacific peoples are the experts on their own local and national communities, and as such must be key participants in the creation of a transition plan that impacts upon them. This chapter, therefore, lays out only in broad terms what the impacts and opportunities of the energy transition are as well as the key issues that a just transition plan for the Pacific may need to address.

2.1.2 Comprehensive and holistic

The core principle of the just transition framework is 'leave no one behind'.[9] This means that the transition from fossil fuels to renewable energy should not cause injustice or inequity. People and communities currently dependent on the fossil fuel economy must be accounted for and protected through the energy transition. Doing so includes upholding human rights and dignity for those affected peoples by 'contributing to the goals of decent work for all, social inclusion, and the eradication of poverty'.[10] A plan for the Pacific must therefore consider and protect all fossil fuel workers including those engaged in extraction, electricity generation, utility construction, pipelines and other related manufacturing.

A just transition plan for the Pacific must also pay attention to existing international power dynamics. We live in an unequal and inequitable world where there are stark differences between wealth and opportunity in developed and developing countries. Developing countries are going into the global energy transition under a very different set of circumstances to developed countries, facing persistent poverty, inequality, and large gaps in energy access.[11] Overcoming these challenges and embarking on a global clean energy revolution will require significant international cooperation, in particular substantial amounts of climate finance to developing nations.[12] 'Small Island Developing States'[13] (SIDS) additionally face unique challenges associated with their size, geography, and their predominantly service-based economies.[14]

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[9] *(Smith, 2017).*

[10] *(International Labour Organization, 2015, 4).*

[11] *(Atteridge et al., 2022, 13-18).*

[12] *(Atteridge et al., 2022, 22).*

[13] *Note, this language is still in common parlance in international political institutions; however, it is noted that the Pacific is made up of 'large ocean states' with some of the largest oceanic territory and resources in the world.*

[14] *(British Academy, 2021, 5).*

Finally, just transition literature often focuses on the transition *away from fossil fuels*, while the transition *to renewable energy* receives far less attention. In the Pacific, a global transition to renewable energy has already seen multinational corporations take an interest in Pacific Island Countries and the deep Pacific Ocean due to vast deposits of Energy Transition Metals (ETMs).[15] A just transition plan for the Pacific must be comprehensive and holistic, accounting for *all* impacts associated with the energy transition, including those flowing from renewable energy uptake.

2.2 **ECONOMIC DIVERSIFICATION AND POVERTY ERADICATION**

A just transition is indivisible from the project of creating conditions that achieve well-being and decent living standards for all. Countries with fossil fuel sectors will require strong diversification initiatives to ensure fossil fuel workers are not left behind in the transition. Papua New Guinea is the only Pacific Island Country with fossil fuel reserves and its own fossil fuel sector.

2.2.1 Case study 1: Papua New Guinea fossil fuel workers

The fossil fuel sector in Papua New Guinea employs 14,700 workers, according to most recent data from the PNG Extractive Industries Transparency Project.[16] The majority of these workers are deployed at PNG LNG and Exxon Mobil, with Total Energies hiring a separate small number of workers.[17] During phases of expansion and construction, PNG LNG purports to hire substantially higher numbers of workers. For example, in 2012, during a peak construction period, PNG LNG purportedly had 21,200 workers on its books.[18] Sustained employment, however, is at much lower levels - typically between 2500-4000 employees depending on the year.[19]

Oil and gas is not a major employer in PNG, with 52% of formal employment opportunities arising from education, agriculture and forestry, real estate and construction.[20] However, the 14,700 oil and gas workers are deserving of a just transition that protects them and their dependents against unemployment and poverty.

Many analyses have found that in most cases disappearing fossil fuel jobs will be replaced with increased jobs in the clean energy sector.[21] Net employment rates at the national level therefore may not change. Papua New Guinea's main LNG plant is located at Caution Bay only 20 kilometres northwest of the nation's capital, and its most populated city, Port Moresby. Many other sectors are large employers in Port Moresby, and so diminished employment at the plant is unlikely to have a significant impact on local economies.

However, the effect of the energy transition can be very different in regional and rural areas, as fossil fuel production sites may not easily be 'swapped' for renewable energy project sites.[22] This can have profound effects on local economies whose populations are employed

[15] *(British Academy, 2022, 6).*
[16] *(PNGEITI, 2022, 55-59)*
[17] *(PNGEITI, 2022, 55-59)*
[18] *(PNGEITI, 2022, 55-59)*
[19] *(PNGEITI, 2022, 55-59)*
[20] *(PNGEITI, 2022, 55-59)*
[21] *(World Resources Institute, 2023,15).*
[22] *(World Resources Institute, 2023,15).*

by fossil fuel projects or by indirect and induced businesses that rely on patronage from fossil fuel workers. While it is difficult to say due to the lack of publicly available workforce statistics for these locations, this could be the case for LNG workers in the Southern and Western Highlands of PNG where several gas facilities operate, such as the Hides, Agogo and Kutubu facilities.[23]

There are several initiatives that the PNG government could initiate, with international support and cooperation, to ensure a just transition. This includes initiating programs to upskill, reskill and adapt transferable skills from oil and gas to new jobs in the renewable energy economy.[24] The International Labour Organisation's guidelines for a just transition put forward a number of recommendations such as reskilling, research and development support, project incubation, improved social safety nets for those seriously impacted by the transition, and changes to education.[25]

2.3 INTERNATIONAL COOPERATION

Pacific Island Countries are at the start line of the global transition in very different circumstances to large and wealthy countries. Pacific countries face unique challenges in securing a just transition due to their size, island geography, and developing economies. With the exception of Papua New Guinea, Pacific Island Countries do not have a fossil fuel sector to transition away from; instead, they rely on imported petrol and diesel. Their contributions to global greenhouse gas emissions are comparatively minimal, and so the need to cease fossil fuel imports into Pacific islands on climate mitigation grounds is not very urgent compared to heavier emitting countries. For these reasons, envisioning a just transition for Small Island Developing States is "anything but straightforward".[26]

The transition to a domestic clean energy sector within Pacific Island Countries will have enormous benefits, such as energy security, increased energy sovereignty, and supporting decarbonisation of export markets. However, it will require large sunk costs to develop a new clean energy industry. Those substantial costs are not a burden that Pacific Island Countries should bear on their own. A just transition for the Pacific will require substantial international cooperation, mostly in terms of financing but also through sharing knowledge and technologies (with patents made freely available[27]).

2.3.1 Financing the Transition

Developing countries will find it difficult to mobilise funds for the renewable energy transition, given limited financial resources and high levels of existing debt to overseas partners. British Academy researchers have put forward three recommendations for creating the conditions in Small Island Developing States wherein a just transition could be possible, and all three of these recommendations relate to the economy and economic relations - that's how big of a barrier money (or lack thereof) is to a just transition for PICs. These recommendations are to:

[23] *(Oil Search Limited, 2012, 3).*

[24] *(World Resources Institute, 2023,15).*

[25] *(International Labour Organization, 2015).*

[26] *(British Academy, 2021, 4).*

[27] *(United Nations, n.d.).*

1. Revisit eligibility criteria for, and improve access to, Overseas Development Assistance,
2. Ensure SIDS receive a fairer share of, and improved access to, climate finance
3. Provide greater debt relief and long term debt restructuring.[28]

The Port Vila Call for a Just Transition to a Fossil Fuel Free Pacific - issued on 17 March 2023 by the Ministers and officials from the Kingdom of Tonga, the Republic of Fiji, Niue, the Solomon Islands, Tuvalu, and the Republic of Vanuatu - also stresses the critical need for climate finance.[29] The statement calls for:

1. Calling on international partners to mobilise billions of USD needed in grant based financing and direct investments into the Pacific Island Countries to ensure that transitioning out of fossil fuel dependent industries can take place in a just, fair and equitable way, resulting in socially and economically empowering paradigm shifts.
2. Reforming existing international financial institutions and climate finance mechanisms to enable scaled up, timely and easily accessible funding for this transition, and shifting to comprehensive country-wide transformational programming approaches. Financial institutions must be able to handle the climate finance needs of the Pacific to enable a just transition from fossil fuels and support adaptation and loss and damage needs in a rapid and timely manner.
3. Implementing and developing national capacity on innovative means of mobilising finance for a just transition, preferring that, where appropriate, any present, new and IRENA, the Pacific Community, the University of the South Pacific, the Pacific Natural Grid Alliance and others such as debt cancellation, debt and energy swaps, green and blue bonds, carbon market credits, marine-based ecosystem positive carbon credits, carbon pricing mechanisms such as carbon taxes, concessional financing, financial transaction taxes, taxes on fossil fuel industry profits and carbon levies including a universal agreement on taxing extractive industries' profits future financing for a just transition be mobilised through multilateral development banks and existing facilities, such as the Pacific Resilience Facility.
4. Ending fossil fuel subsidies and other public finance for fossil fuel production globally, and redirecting this finance towards enabling the just transition away from fossil fuels.

SIDS have had very limited access to the climate finance so far mobilised by developed nations. For example, in 2019, SIDS only had access to 1.5 billion USD of the $100 billion pledged to developing countries.[30] In order to stand a chance at building climate adaptation and mitigation in line with just transition to a low carbon future, Pacific Island Countries must be able to access significantly greater amounts of climate finance.

In addition, the focus of this finance must broaden to include support for managing the socio-economic impacts of transition within Pacific Island Countries. The use of international climate finance has a present focus on the implementation for techno-economic transitions "with little financial support for ensuring the outcomes are socially, economically and environmentally just."[31]

[28] *(British Academy, 2021, 19).*
[29] *(PICAN, 2023a).*
[30] *(Akiwumi, 2022)*
[31] *(Atteridge et al., 2022, 3-4).*

Finance is also required to simultaneously support programs and investments "that help affected regions and communities to manage socio-economic impacts of transition".[32] In Papua New Guinea, this could include programmes for reskilling oil and gas sector workers, or unemployment social safety nets.[33]

Greater transparency about how climate finance is spent will support improved understanding and data on the progress of the transition, the distribution of that progress, and unmet needs related to the transition within Pacific communities.

2.3.2 Knowledge and Technology Transfer

Due to the small populations of Pacific Island Countries, there may be skills and knowledge gaps that will slow the low-carbon transition unless addressed.[34] This includes the supply of technicians to install, repair and monitor renewable energy technologies, such as solar panels and wind turbines as well as access to these technologies at low cost. Global expertise should be provided as a form of in-kind support to Pacific island workers, to transfer knowledge and build expertise within Pacific communities thereby ensuring ongoing independence and energy sovereignty.

Technology transfer will also be required so that Pacific island states can access clean energy technologies. This will be difficult and expensive unless advanced economies are willing to share Intellectual Property (IP) rights or provide freely available patents. Intellectual property is a major barrier to clean energy transition within developing countries, as the "concentration of IP ownership in advanced economies makes it difficult for developing economies to get a foot on the ladder of green technology innovation".[35] This leaves developing countries to face "higher entry costs to establish domestic [renewable energy] capacities".[36] According to UNCTAD, green technology transfer must be led by developed economies based on the principle of common but differentiated responsibilities.[37]

[32] *(Atteridge et al., 2022, 3-4).*
[33] *(Atteridge et al., 2022, 22).*
[34] *(Atteridge et al., 2022, 16).*
[35] *(UNCTAD, 2022, 4).*
[36] *(UNCTAD, 2022, 4).*
[37] *(UNCTAD, 2022, 6).*

3. GLOBAL FOSSIL FUELS PHASE OUT: THE PACIFIC

3.1 OPPORTUNITIES

The urgent need to act on climate change is understood in the Pacific better than perhaps anywhere else. Pacific communities are on the frontline of the climate crisis, and are already feeling its impacts through rising sea levels, more intense extreme weather events, increasing crop failure, and the physical and social harms these impacts cause.[38] The Pacific will therefore stand to greatly benefit from the reduction in greenhouse gas emissions that will result from a global effort to phase out the extraction and use of coal, oil and gas. Moreover, transitioning Pacific country economies to 100% renewables itself offers considerable additional benefits to their citizens separate from any climate mitigation outcomes.

3.1.1 Climate benefits of the global transition

Together the 14 Pacific Island Countries that have ratified the Paris Agreement account for only 0.23% of global greenhouse gas emissions.[39] In terms of climate mitigation, it is the energy transition of heavy emitting countries and corporate actors that will make a real and tangible difference for the Pacific.

The IPCC states that limiting global warming to 1.5-2 degrees would substantially reduce projected losses and damages worldwide.[40] At over 1.5 degrees of warming, there are a range of threats the IPCC has laid out for Small Island Developing States.[41] Sea level rise is the gravest but not the only threat: other threats include increased severity of tropical cyclones, wave surge, ocean acidification, heavy rainfall and drought.[42] These threats elevate a number of key risks, such as increased destruction of settlements and infrastructure, loss of marine and terrestrial biodiversity and ecosystem services (the most immediate of which is coral reefs), risk to water and food security, degradation of human health, loss of cultural heritage, and economic decline.[43] These key risks combine to reduce habitability for all Pacific islands, not only the low lying atoll countries that are particularly vulnerable to sea level rise.[44]

[38] *See (Čašule & Jiva, 2021, 10-13, 26-9 et passim).*
[39] *See above, Chapter 1.1.*
[40] *(IPCC, 2022a,13 - B.3.3).*
[41] *(IPCC, 2022b, 2045-2047).*
[42] *(IPCC, 2022b, 2045-2047)*
[43] *(IPCC, 2022b, 2045-2047)*
[44] *(IPCC, 2022b, 2074).*

For the above reasons the IPCC states that 'in the absence of ambitious human intervention to reduce emissions, climate change impacts are likely to make some small islands uninhabitable in the second part of the 21st century.'[45] The global energy transition, particularly rapid transition away from fossil fuels in the heaviest emitting countries, will be the most impactful human intervention to limit global warming to 1.5 degrees. Reductions made on the basis of 'fair share contribution' (or 'common but differentiated responsibilities') will ensure actors who contribute most to greenhouse gas emissions will be responsible for making the biggest and fastest cuts.[46] This must include industrial actors, many of which produce greenhouse gas emissions larger than whole countries.[47] Fair share greenhouse gas reductions in line with a 1.5 degree warming scenario will give Pacific island settlements, ecosystems, and biodiversity a fighting chance at survival.

3.1.2 Cheap, accessible, resilient electricity

As outlined in Chapter 1, most Pacific countries still have progress to make in decarbonising their economies. Many Pacific communities also do not currently have access to affordable sources of electricity or clean cooking. In decarbonising through a rapid build out of renewable energy generation capacity, led by wind and solar, the Pacific will unlock cheaper, more accessible electricity for its people compared to a fossil fuel-led electrification programme. This is because the cost of renewable generation has fallen precipitously in the past decade: an 88% fall for solar PV and a 68% fall for onshore wind. Indeed, in many cases the Levelised Cost of Electricity (LCOE) for wind and solar is now lower than existing coal generation, and significantly lower than oil or gas fired electricity: a situation that would have been unthinkable a generation ago.[48]

Figure 4 - **Global weighted average total installed cost and LCOE by technology**[49]

	Total installed costs (2021 USD/kW)			Levelised cost of electricity (2021 USD/kWh)		
	2010	2021	Percent change	2010	2021	Percent change
Bioenergy	2 714	2 353	-13%	0.078	0.067	-14%
Geothermal	2 714	3 991	47%	0.050	0.068	34%
Hydropower	1 315	2 135	62%	0.039	0.048	24%
Solar PV	4 808	857	-82%	0.417	0.048	-88%
CSP	9 422	9 091	-4%	0.358	0.114	-68%
Onshore wind	2 042	1 325	-35%	0.102	0.033	-68%
Offshore wind	4 876	2 858	-41%	0.188	0.075	-60%

[45] *(IPCC, 2022b, 2095).*
[46] *(Climate Action Tracker, 2023a); (Civil Society Equity Review, 2023).*
[47] *(Benjamin, 2016, 353-354).*
[48] *LCOE is a widely used metric that allows the true cost of different forms of electricity generation to be compared in a like-for-like way. An LCOE calculation takes into account all input costs for a particular electricity plant - including the cost of construction, financing, ongoing operation and maintenance costs, and the cost of fuel required to produce power - and provides a dollar amount for each unit of electricity that the plant is expected to produce over its lifetime. For a detailed comparison between the LCOE of diesel generation in the Pacific to new build solar and wind, see (Pacific Region Infrastructure Facility, 2019).*
[49] *(IRENA, 2022a, 15).*

A domestic renewable energy sector in Pacific Island Countries would also have substantial co-benefits with climate adaptation. Fossil fuel energy systems are particularly vulnerable to climate change impacts, such as extreme heat, drought, heavy rainfall and tropical cyclones. For example, in 2022, a massive heatwave in Buenos Aires, Argentina, caused massive power outages impacting 700,000 people.[50] In 2020, freezing rains in East Russia coated power lines resulting in hundreds of thousands of homes losing electricity for days.[51] Extreme heat and drought conditions also limit the water supplies available to fossil fuel power plants, which use large volumes of water for cooling.

Renewable energy systems, on the other hand, are far more resilient to hydro-meteorological events. For example, well-secured ground based solar PV systems in Tonga withstood cyclone Gita in 2018, "with power restored in days rather than weeks".[52] Decentralised renewable energy systems can also ensure that the power stays on for crucial services, such as hospitals and emergency services, during disasters.[53] It is for these reasons that renewable energy must also be a focus of climate adaptation strategies for the Pacific islands.

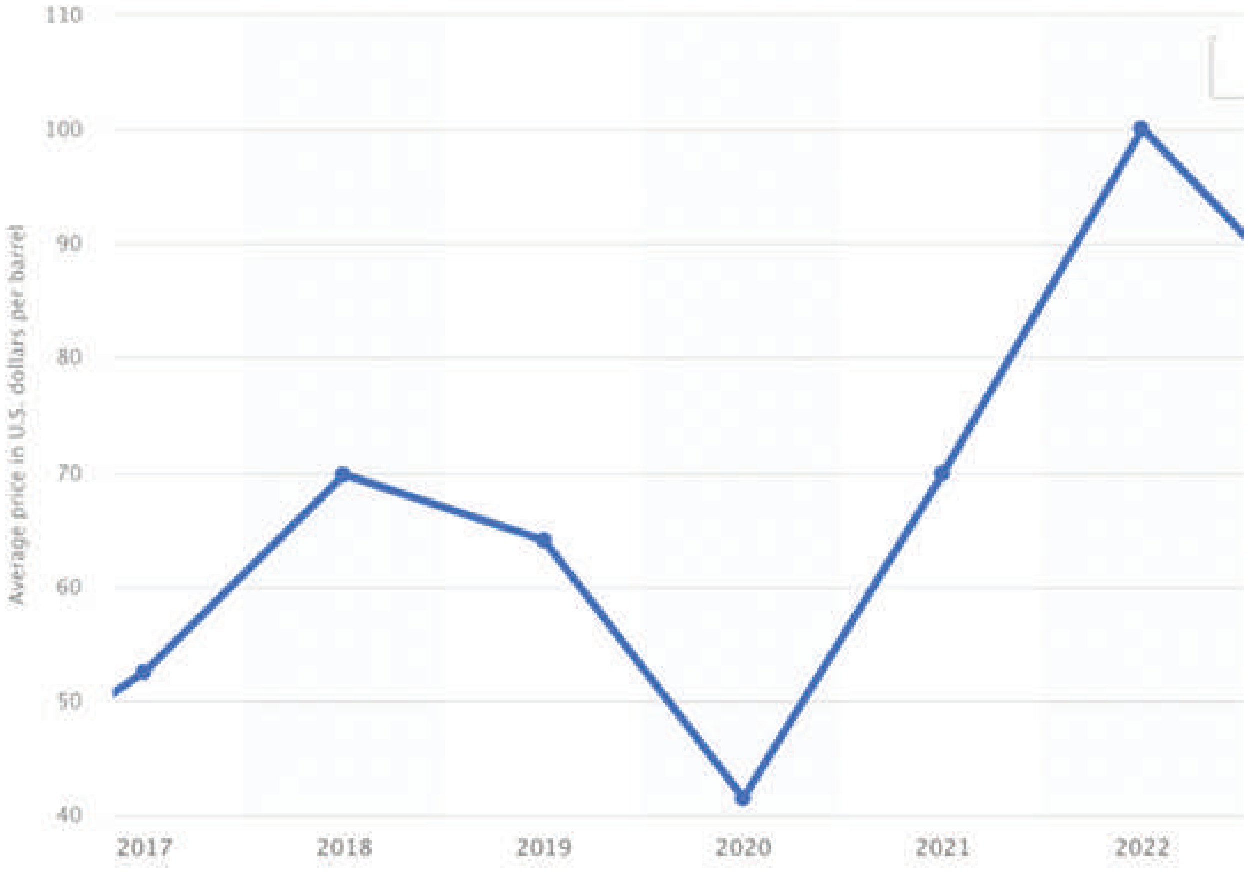
3.1.3 Energy security and independence

Pacific Island Countries are currently heavily reliant upon imported fossil fuels, with the lion's share of their electricity coming from diesel generators: ranging from 35% of total electricity generation (Fiji), to 84% (Tuvalu), 86% (Kiribati), and 93% (Solomon Islands).[54] Diesel generation costs are steep, with Pacific islands collectively spending $6 billion USD on fossil fuel imports annually.[55] This equates to between 5-15% of each Pacific Island Country's GDP.[56]

This also makes the Pacific highly vulnerable to price and supply shocks affecting the trade of fossil fuels.[57] Indeed, as a result of supply squeezes and inflationary pressures, driven in part by a war in Europe in which Pacific states have no involvement, the global oil price has experienced a particularly volatile period over the last two years: the average annual OPEC oil price in 2022 was $100.08 USD per barrel, up from $69.89 per barrel in 2021, and $41.47 in 2020.

[50] *(World Meteorological Association, 2022, 12).*
[51] *(World Meteorological Association, 2022, 12).*
[52] *(IPCC, 2022c, 2681).*
[53] *(IRENA, 2023a).*
[54] *(Sydney Environment Institute, 2021, 5).*
[55] *(UNESCAP, 2023).*
[56] *(UNESCAP, 2023)*
[57] *(Hubacek et al., 2023)*

Figure 5 - **Average annual OPEC crude oil price 2017-2022**[58]



Rising oil prices not only lead to higher retail fuel prices for transport and key economic sectors, they also contribute to rising prices in other imported commodities due to increasing costs of production and shipping, causing economy-wide inflation. Higher oil prices also increase import bills, which in turn leads to a larger trade deficit and reduced government spending capacity.

This position of reliance undermines the Pacific's energy security, as PICs are highly vulnerable to disruptions outside their control. Further, shipping routes to the Pacific are some of the longest and most complex in the world,[59] exacerbating trade costs and increasing the Pacific islands' vulnerability to marine territory conflict such as in the South China Sea.[60]

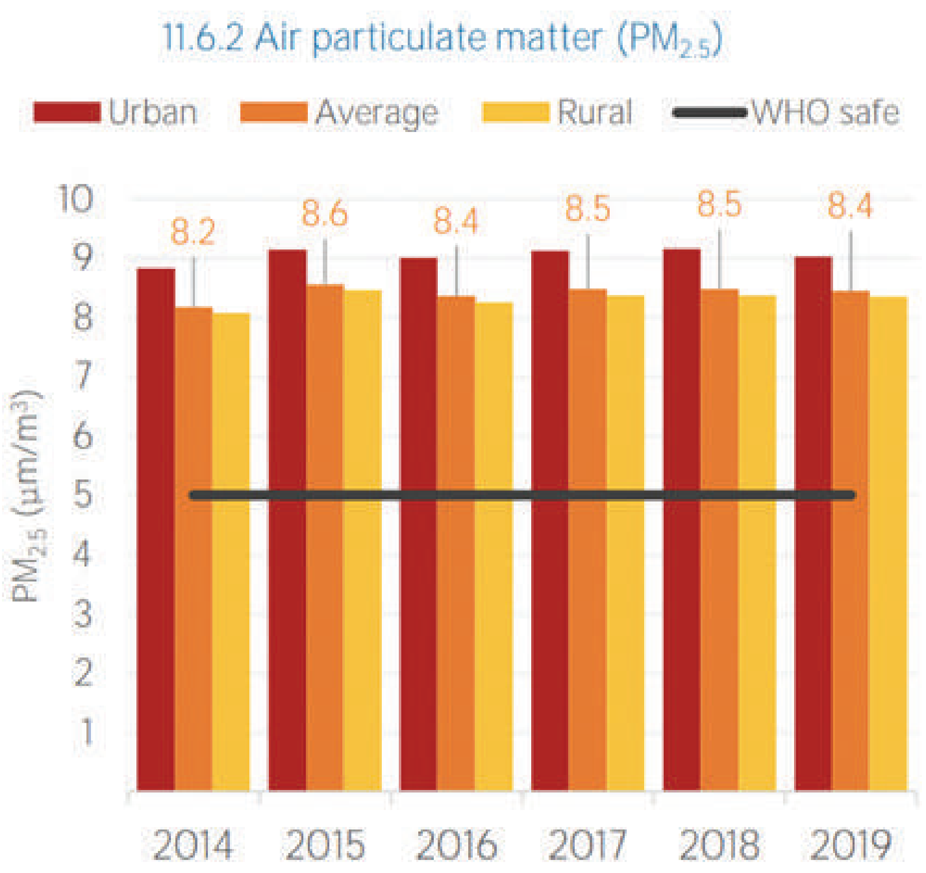
A renewable energy transition in the Pacific would substantially improve Pacific islands' energy security and result in significant cost savings. It will likely also improve energy access rates, with the installation of stand-alone solar home systems providing a simple solution to electrification.[61] The Pacific has strong potential for renewable energy development, with "excellent solar resources", and good hydropower potential.[62] Such energy independence would have the additional benefit of improving PIC's ability to robustly pursue their interests on the global stage, freed from the threat of geopolitically-driven supply restrictions.

[58] *(Statista, 2023a).*
[59] *(The Loadstar, 2013).*
[60] *(Oloruntoba et al., 2022).*
[61] *(UNESCAP, 2022, 40-41).*
[62] *(UNESCAP, 2022, 38).*

3.1.4 Public health benefits

The majority of electricity generation in the Pacific is performed by diesel generators. The burning of biomass for energy is also widespread, and electric vehicle use is low. All three technologies - diesel power, burning of biomass, and internal combustion engine vehicles - are significant sources of harmful air pollution. As a result, levels of particulate air pollution, and especially the tiny PM 2.5 particles that can enter the bloodstream via the lungs, across all Pacific countries profiled in this report are well above World Health Organisation safe levels. Phasing out these polluting technologies and replacing them with clean, safe alternatives will be of great benefit to the health of the people of the Pacific.

Figure 6 - **Average annual PM 2.5 air pollution levels, Papua New Guinea**[63]



3.1.5 Advocacy

Pacific nations have long led the way on the world stage in advocating for ambitious emissions cuts and the decarbonisation of the global economy. Pacific Islands nations were the first to call for a global agreement on fossil fuels, demanding a moratorium on coal in the Suva Declaration 2015. In addition the Pacific has led on initiatives such as the call for an International Court of Justice Advisory Opinion, while many Pacific nations were founding members of the High Ambition Coalition under the UNFCCC.

[63] *(IRENA, 2022b, 1).*

A rapid transition of their own economies to 100% renewables will give the Pacific's international climate diplomacy and lobbying efforts additional weight by demonstrating their own commitment to decarbonisation at home, neutralising any potential public criticism in this regard. This commitment has now been made firmly and publicly through the Port Vila Call for a Just Transition to a Fossil Fuel Free Pacific.[64] That statement includes a commitment to:

'Dramatically scaling up the deployment of renewable energy and energy efficient technologies across all sectors, including by transforming and scaling up our electricity systems, building on the Framework for Energy Security and Resilience in the Pacific, ensuring energy independence and resource resilience, and enabling sustainable air, maritime and land transport.

Urgently decarbonising land transport, including through scaling up the Pacific EMobility Policy and Programme'[65]

3.2 **IMPACTS**

The Pacific stands to make significant gains from a rapid transition away from fossil fuel energy to renewable energy, not least the continued survival of low lying atoll countries that would otherwise face the existential threat of submergence due to rising sea levels. However, the transition will bring up a number of challenges for Pacific islands, which may lead to environmental and social injustice unless proactively addressed. These include a substantial increase in the global demand for Energy Transition Metals (ETMs), and "last grab" attempts by multinational fossil fuel companies to expand oil and gas production in developing countries such as Papua New Guinea. To avoid these injustices, a just transition may require transformative changes to the global economy.[66]

3.2.1 Alternative development pathways

Phasing out fossil fuels and ramping up the use of wind, solar, and other renewable technologies is the core of a just transition for the Pacific. However, for that transition to fully meet the needs of its people as autonomous human communities in charge of their own destiny - that is, for it to be truly just - it must extend beyond a simple substitution of one form of energy for another. The current, dominant extractivist model of economic growth and development is unlikely to be compatible with a Pacific prosperity that respects its people, culture and place.

As outlined in more detail elsewhere in this report, a global transition from fossil fuel energy to renewable energy will cause a substantial increase in demand for Energy Transition Metals such as copper, nickel, cobalt and lithium. Where metals deposits occur in developing countries, those communities will be vulnerable to harmful environmental and social impacts from ETM mining. Researchers in ecological economics have called for an alternative development pathway for a just transition: that of 'degrowth'. Degrowth would require developed economies to 'abandon growth of gross domestic product (GDP) as a goal, scale down destructive and unnecessary forms of production to reduce energy and material use, and focus economic activity around securing human needs and well-being.'[67] Transformative approaches that require an overhaul of the status quo development paradigm have the support of many Indigenous and women's groups, such

[64] *(PICAN, 2023a).*
[65] *(PICAN, 2023a, 2).*
[66] *(Just Transition Research Collaborative, 2018, 14-15).*
[67] *(Hickel et al., 2022, 400-401).*

as the Indigenous Environmental Network, Just Transition Alliance, and the Women's Environment and Development Organisation.[68]

Degrowth proponents argue that government action will be a challenge 'because those in power have ideologies rooted in neoclassical economics, and tend to have limited exposure to researchers who explore economics from other angles.' There is some government interest and investment into exploring transformative approaches, for example the UK's All-Party Parliamentary Group on Limits to Growth, and the European Parliament's 'Beyond Growth' conference series. However, a common critique of transformative approaches - particularly from government actors - is that they lack a clear or coherent vision of the pathways that can be followed to achieve transformation.[70]

The Pacific is not homogenous and government, business and civil society actors across the region are likely to be divided on the merits of alternative development pathways. However, it is clear that the projected environmental and social impacts of increased ETM mining must be proactively addressed through the exploration of alternative development pathways if we are to avoid a new environmental catastrophe for the region.

3.2.2 How much new renewable energy would be needed?

Transitioning the economies of the Pacific from a reliance on fossil fuels for energy to one based on clean, renewable technologies like wind and solar is a significant task, which will require the build out of substantial new solar and wind generation, and the upgrade of electricity transmission networks to transport their power to where it will be used.

The following table shows the estimated **total amount of renewable capacity** that would need to be built, across different technologies, to replace each Pacific nation's **current electricity generation** that is provided by fossil fuels.[71]

Nation	Current RE generation (MWh/year)	Current fossil fuel generation (MWh/year)	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)
Papua New Guinea	1,263,000	827,000	586.36	262.24
Fiji	679,000	459,000	325.45	145.55
Solomon Islands	7,000	98,000	69.49	31.08
Vanuatu	22,000	56,000	39.71	17.76
Samoa	65,000	107,000	75.87	33.93
Kiribati	5,000	31,000	21.98	9.83
FS of Micronesia	4,000	60,000	42.54	19.03
Tuvalu	2,000	8,000	5.67	2.54

[68] *(Just Transition Research Collaborative, 2018, 15).*
[69] *(Hickel et al., 2022, 403).*
[70] *(Scottish Government, 2020); (Just Transition Research Collaborative, 2018, 15).*
[71] *The methodology behind these calculations is provided in Appendix 2.*

It is worth emphasising that these figures likely understate the scale of investment needed. While we have projected out how much more renewable capacity would be required to replace all current fossil fuel power assets, it is likely that, as the benefits of renewables become more a part of the Pacific's lived experience, electrification will be expanded beyond these limits, especially in PICs where current access to electricity and clean cooking is limited. The renewable energy potential of the PICs profiled is more than sufficient to provide for their needs from 100% renewables sources, were such generation assets to be built.

Such expansions would also require an upgrading and expansion of electricity transmission infrastructure and, depending on the specific technology mix, energy storage options. This would increase the capacity required, above, as well as increase the investment needed, as outlined in the next two sections.

3.2.3 How much would it cost: generation assets

The following table shows:

1. The estimated **total amount of solar PV or onshore wind capacity** that would need to be built, across different technologies, to replace each Pacific nation's current electricity generation that is provided by fossil fuels (taken from the previous table, above).
2. The estimated **total average installed cost** of the solar PV or onshore wind capacity that would need to be built to decarbonise each Pacific country's electricity system.
3. The global average Levelised Cost of Electricity for solar PV and wind.[72]

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Papua New Guinea	586.36	$502.5 million	$48	262.24	$347.47 million	$33
Fiji	325.45	$278.91 million	$48	145.55	$192.85 million	$33
Solomon Islands	69.49	$59.55 million	$48	31.08	$41.18 million	$33
Vanuatu	39.71	$34.03 million	$48	17.76	$23.53 million	$33
Samoa	75.87	$65.02 million	$48	33.93	$44.96 million	$33
Kiribati	21.98	$18.84 million	$48	9.83	$13.02 million	$33
FS of Micronesia	42.54	$36.46 million	$48	19.03	$25.21 million	$33
Tuvalu	5.67	$4.86 million	$48	2.54	$3.36 million	$33

[72] *The methodology behind these calculations is provided in Appendix XXXX. LCOE and total installed cost average figures are based on (IRENA, 2022a).*

3.2.4 How much would it cost: transmission assets

As noted above, new wind and solar generation assets would require the upgrading of existing electricity transmissions infrastructure as well as the construction of new infrastructure, depending on the location and size of these generation projects.

While upfront costs and LCOE of these projects is relatively straightforward to estimate, quantifying the generation costs for each is 'difficult, idiosyncratic, and dependent on geographical context'.[73] Relevant factors include:

1. The difficulty in attributing systemic costs to individual wind or solar projects, since transmission infrastructure will, in part at least, service the whole grid and not just the project in question.
2. Geographic variation in individual projects makes it challenging to credibly estimate nation- or region-wide costs as a single sum cost of capital weighting.
3. The need to balance transmission costs with wind or solar resource strength. For example, the best (most windiest) wind resources in a given region may be far away from population centres whose electricity needs it would service, increasing transmission costs in order to secure the highest capacity factor.

Mindful of these issues, recent research at the University of California, Berkeley's Lawrence Berkeley National Laboratory, by using a large dataset and triangulating a variety of observed cost figures and estimates, has been able to quantify average global transmission costs for individual projects as an additional $1-$10 USD per megawatt hour on top of a project's Levelised Cost of Electricity ($1-$10/MWh + LCOE).[74]

This represents a 2%-21% increase of the LCOE of solar PV (based on a baseline LCOE of $48/MWh) and a 3%-30% increase of the LCOE of onshore wind (based on a baseline LCOE of $33/MWh).

These additional figures for each PIC are included in the amended costs table, below. It is worth noting that, while this study represents a best practice approach, its data is US-focused. More detailed modelling is necessary to arrive at specific figures for each PIC, taking into account the Pacific's unique geography and economic profile.

[73] (Gorman et al., 2019, 1).
[74] (Gorman et al., 2019).

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	LCOE including transmission costs (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)	LCOE including transmission costs (USD/ MWh)
Papua New Guinea	586.36	$502.5 million	$48	$49-58	262.24	$347.47 million	$33	$34-44
Fiji	325.45	$278.91 million	$48	$49-58	145.55	$192.85 million	$33	$34-44
Solomon Islands	69.49	$59.55 million	$48	$49-58	31.08	$41.18 million	$33	$34-44
Vanuatu	39.71	$34.03 million	$48	$49-58	17.76	$23.53 million	$33	$34-44
Samoa	75.87	$65.02 million	$48	$49-58	33.93	$44.96 million	$33	$34-44
Kiribati	21.98	$18.84 million	$48	$49-58	9.83	$13.02 million	$33	$34-44
FS of Micronesia	42.54	$36.46 million	$48	$49-58	19.03	$25.21 million	$33	$34-44
Tuvalu	5.67	$4.86 million	$48	$49-58	2.54	$3.36 million	$33	$34-44

3.2.5 Energy transition metals

Energy Transition Metals (ETMs) are metals that are required for renewable energy technologies like solar panels, wind turbines and batteries. Vast amounts of these metals - such as cobalt, copper, bauxite, lithium and nickel - will be required in the global renewable energy transition. According to International Energy Agency (IEA) Paris-aligned modelling, total demand for ETMs will rapidly increase in the next 20 years.[75] If UN Member States enact policies to limit global warming within Paris Agreement levels, then there will be an increased demand of 40% for copper, 60-70% for nickel and cobalt, and 90% for lithium.[76]

The Pacific faces a 'double exposure', according to a recent joint research program on just transitions by the University of St Andrews and the University of Queensland.[77] Pacific islands are exposed to the impacts of climate change and to increased global demand for ETMs. Pacific Island Countries contain enormous deposits of ETMs that will be sought after internationally:

> 'New Caledonia contains 25% of the global supply of nickel, there is more than 44 million tonnes of undeveloped copper between Papua New Guinea and Fiji, and it is estimated that deep sea cobalt reserves in the Pacific are five times larger than global terrestrial reserves.'[78]

[75] *(IEA, 2022a).*
[76] *(IEA, 2022a, 5).*
[77] *(British Academy, 2022, 9).*
[78] *(British Academy, 2022, 9).*

Increased metals mining in the Pacific is likely to undermine environmental and social justice for Pacific peoples. For example, in Pacific countries where metals mining already takes place on a smaller scale than the anticipated growth to come - namely Papua New Guinea and the Solomon Islands - there have been environmental disasters and ongoing mistreatment of Indigenous communities as a result of metals mining. Ok Tedi, Porgera, Tolukuma and Panguna mines in Papua New Guinea have operated without dedicated tailings facilities; instead, these metals mines use 'riverine tailings disposal' wherein all mining waste is released directly into the country's river systems causing grave damage to ecological and human health.[79] In the Solomon Islands, the Gold Ridge mine has also caused water and soil contamination from tailings, with multiple leaks from the mine's tailings dam and damaged tubes into the Metapono River.[80]

The Pacific's deep sea metals reserves remain untouched; however, deep sea mining could begin as early as 2024 without a global moratorium banning it. Pacific island governments such as Nauru, Tonga and Kiribati see deep sea mining as an opportunity for wealth creation, driven by the imperative to enable climate-resilient development for their economies and people. Multinational mining corporations such as The Metals Company have been sponsored by these governments with the plan to begin operations as soon as the International Seabed Authority finalises mining regulations - potentially as early as 2024.[81] According to a review of over 250 academic journal articles, the environmental impacts of deep sea mining in the Pacific Ocean would be significant and include habitat destruction, species loss, toxicity in marine food chains (and bioaccumulation of toxins), noise pollution and light pollution.[82]

A just transition within a capitalist development paradigm therefore must include the minimisation and mitigation of all negative environmental and social impacts that may result from ETM mining, while recognising that Pacific nations need support to find alternative wealth creation and development pathways. Where those impacts cannot be minimised or mitigated, laws and policies must be in place to ensure these are borne in a fair and equitable way across developed and developing countries.

3.2.6 *Final grab of oil and gas resources*

As developed countries begin to be increasingly bound by tighter national climate targets, they are likely to look to developing countries with looser targets in a 'final grab' for oil and gas resources. For example, in September 2022, Japanese companies were granted priority by the Papua New Guinea government for the development of additional gas fields in PNG. As the Japanese government implements a domestic phase out of coal power plants by 2030, it has looked to Papua New Guinea as a remedy to potential energy shortfalls - particularly due to low production costs in PNG.[84] Australian company Santos, American company Exxon-Mobil and Japanese company JX Nippon have likewise signed an agreement with the Papua New Guinea government that will see PNG gas fields expanded to include the P'nyang field near Port Moresby, subject to Final Investment Decision.[85] Previously, the PNG government has claimed enormous economic benefits will flow to the population from gas expansion, based largely on modelling prepared by Australian consultants; however, such benefits have failed to eventuate.[86]

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[79] *(Jubilee Australia, 2020, 47-48).*
[80] *(Weldegiorgis, 2014).*
[81] *(McVeigh, 2023).*
[82] *(Deep Sea Mining Campaign and Mining Watch Canada, 2020, 21, 25-26).*
[83] *(Paul & Klamann, 2022).*
[84] *(Keen, 2022).*
[85] *(Hopstad, 2018).*
[86] *(Iannucci, 2022).*

Multinational fossil fuel companies may increase their fossil fuel operations in the developing world while under legal and/or political pressure to wind down their operations in countries with stronger targets. A just transition will require limits to be placed on fossil fuel multinationals, who can move operations overseas rather than make net reductions to the volume of resources they extract or greenhouse gases they emit.

3.2.7 Transport

If electricity is often rightly described as the 'lowest hanging fruit' of decarbonisation due to the fact that replacement technologies are readily available and relatively cheap, transport may be seen as its 'wicked problem' cousin, not least for developing states that span large geographic regions. Some of the challenges of decarbonising the Pacific's transport sectors include:

1. PICs start from a low baseline when it comes to clean transport, with electric vehicle (EV) penetration very poor across most countries.
2. Replacing internal combustion engine vehicles (ICEs) with EVs requires a high upfront investment. For example, a rough calculation of that task for Papua New Guinea, which has an estimated 100,000-120,000 ICE vehicles currently in use, would require an upfront investment of $4.8 billion at a (low) average price of a new EV of $40,000 USD: or 18% of its annual GDP. By comparison, if such a proportionate investment were to be made by Australia, it would amount to around $280 billion.
3. A fully electric transport system would require the construction of wholly new electric charging infrastructure and significant new electricity generation to be viable.
4. While changes in practices and mindsets around mobility - such as a move away from cars to public transport, '15 minute cities' and shifting freight from sea or road to (electrified) rail - are a key plank of any 100% renewables transport system, many of these are likely to bear less fruit in the Pacific than in other regions due to the Pacific's unique geography and its economic development.

However, while these **upfront costs** are significant, the latest research demonstrates that such an investment, over the course of its lifetime, would be a **net financial saving**, quite apart from the considerable climate, environmental and public health benefits, outlined above, that would result.[87]

It is the recommendation of this report that, while transport decarbonisation should be a goal for PICs, priority be given to planning and securing investment in a 100% (or close to 100%) renewable electricity system before investing large amounts of public funds into transport decarbonisation.

3.2.8 Fossil fuel industry jobs and re-training

Fossil fuels are not a major employer in most Pacific countries. As noted above, the exception is Papua New Guinea, where a more significant number of workers are employed in the extraction and use of fossil fuels for energy. Nevertheless, even here this sector makes up a small minority of all jobs, making a just transition less challenging for local workforces than it has proved in other nations where fossil fuels are a larger part of the domestic economy.

The following table shows:

1. The total number of workers employed in the fossil fuel industry
2. The total number of workers employed in the energy sector as a whole

As can be seen, the data are incomplete for some Pacific countries. The methodology used to arrive at these figures and the limitations of workforce data statistics and breakdowns in these geographies are discussed further in Appendix 2.

[87] *See (Whitehead et al., 2022); (Kodjak, 2021); (US Federal Government, 2023).*

Nation	Total fossil fuel sector employment	Total energy sector employment
Papua New Guinea	14,700	
Fiji		877
Solomon Islands		1098
Vanuatu		265
Samoa		371
Kiribati		260
Federated States of Micronesia		3% of total wage income
Tuvalu		31

CASE STUDIES

PAPUA NEW GUINEA

AT A GLANCE

Flag

9,311,874
Population[88]

452,860
Land area (km²)

2,402,290
Exclusive Economic Zone (km²)

$26.6 billion
GDP (USD)

$2,915
GDP/capita (USD)

2.7%
Unemployment rate %

$13.7 billion
Total national debt (USD)

48,173 billion kina
Total national debt (Local Currency)

51.5%
Debt as % of GDP

Key industries

Agriculture, Livestock, Forestry, Mining, Petroleum, Tourism, Fisheries, Manufacturing, Retailing and Wholesaling, Building and Construction, Transport and Telecommunications, Finance and Business, Trade.

ECONOMIC OVERVIEW

Papua New Guinea is in many ways the outlier of the eight PICs profiled in this report. Its annual GDP is five times larger than the next largest (Fiji) and its population, at 9.3 million people, is an order of magnitude larger than the population of the other thirteen PICs combined. As a result, both the challenges and benefits of decarbonisation are greater.

With a substantial, though still small, proportion of its workforce employed in the fossil fuel sector - both mining and generation - the task of ensuring a just transition for those workers in a decarbonised world will require more substantial government policy planning and investment than for other PICs. The shape of potential policies to take care of the around 14,700 workers in this sector has been discussed in Chapter 2.2.1, above.

[88] At-a-glance statistical data for all profiled PICs is 2022 data sourced from (Pacific Data Hub, 2022).

CLIMATE CHANGE POLICIES AND COMMITMENTS

PNG's Nationally Determined Contribution

2030

- PNG commits to generating 78% of its electricity supply from renewable energy sources by 2030 Absolute Target
- Absolute Target: By 2030, annual emission from deforestation and forest degradation due to agriculture expansion and commercial logging is reduced by 10,000 Gg CO2 eq comparing to 2015 level
- Relative Target: LULUCF will be converted from net GHG source (1, 716 Gg CO2 eq) in 2015 to net GHG sink (-8,284 Gg CO2 eq) by 2030 to mitigate emissions from other sectors
- Non GHG Qualitative Targets:

  The area of annual deforestation is reduced by 25% of 2015 level by 2030 (Equating to a reduction of 8,300 ha of annual deforestation).

  The area of forest degradation is reduced by 25% of 2015 level by 2030 (Equating to a reduction of 43,300 ha of annual degradation).

  The area of planted forest and forest restoration is increased.

  Non GHG Action Based Targets

  Enhanced land use planning

  Promoting climate-friendly agriculture

  Enhancement of timber legality

  Promoting REDD+

  Promoting downstream processing

  Promoting the Painim Graun Planim Diwai initiative and planting trees initiative.

2050

- Reduce emissions to 50 percent by 2030 - and to be carbon neutral by 2050

Papua New Guinea's goal of 78% of its electricity from renewables by 2030 is ambitious, building on a strong foundation of 60% of current electricity generation coming from renewable sources: primarily hydroelectric power and geothermal.

However, as noted by PNG's official NDC communique:

'The target of 100 percent renewable energy by 2030 in the previous NDC was revised due to the influence of liquefied natural gas (LNG) into the energy mix and existing agreements with Independent Power Producers that extend beyond 2030.' [89]

The choice of gas over renewables is inadvisable both due to its emissions and cost which is now regularly more expensive than solar PV and onshore wind. Similarly, relying on a change in LUCF emissions from a net greenhouse gas source to a net sink to offset emissions from other sectors is risky. This report recommends prioritising emissions reductions at the source through a faster transition to 100% renewables and an expansion of grid connections and small scale, rooftop solar systems.

[89] *(Government of PNG, 2020, 10).*

EMISSIONS PROFILE

Figure 7 - **Papua New Guinea emissions profile**

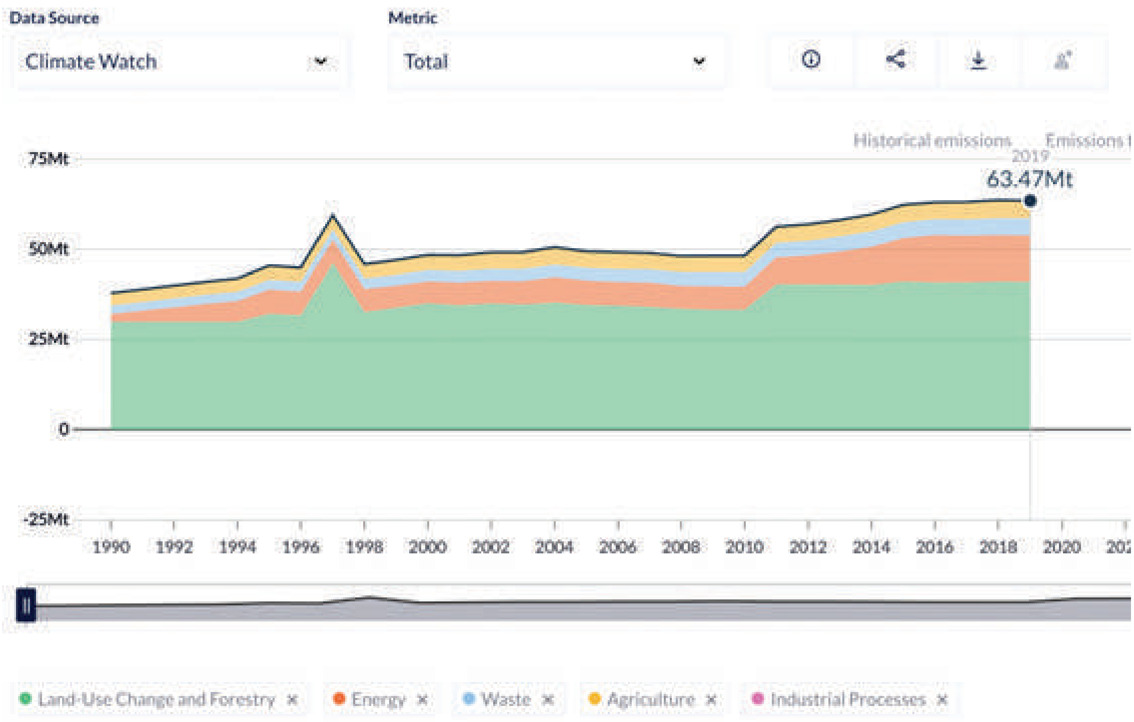
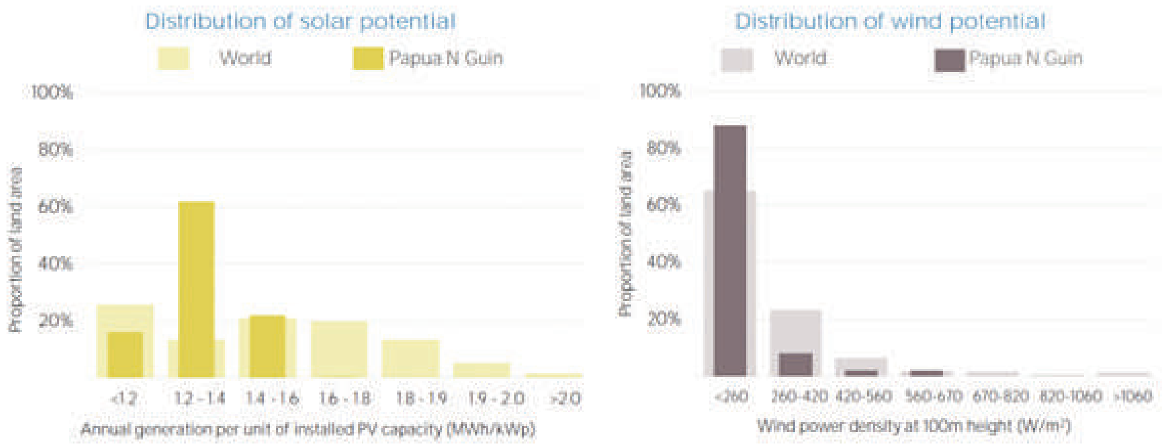


Figure 8 - **Papua New Guinea renewables capacity per capita**

Renewable resource profile

Figure 9 - **Solar and wind potential, Papua New Guinea**[90]



Papua New Guinea has good solar and wind potential, with some sites performing especially well for onshore wind resources. When planning the ideal mix of renewable capacity to be built to decarbonise PNG's energy supply, therefore, it is recommended that wind be given preference to solar PV except for locations where wind resources are low.

FOSSIL FUEL PHASE OUT

Opportunities

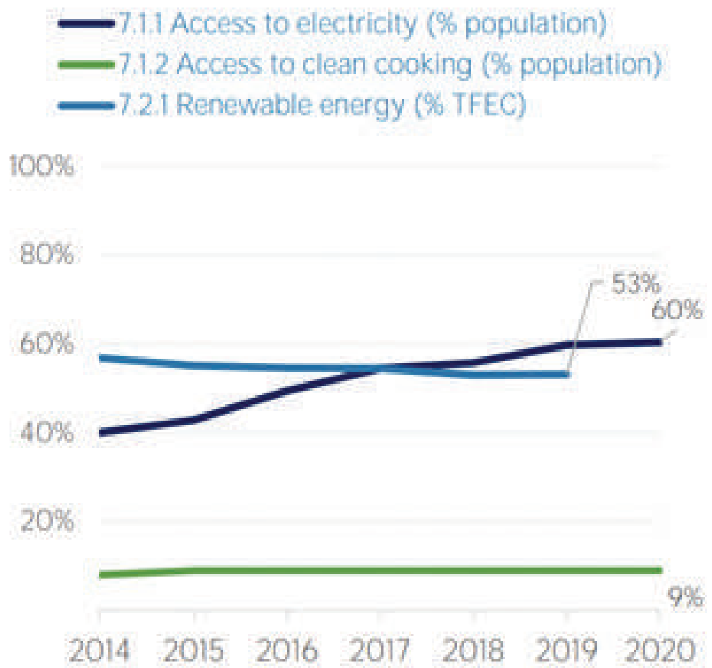
A phase out of fossil fuels presents a variety of advantages and opportunities for Papua New Guinea. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable PNG to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

The second and fourth of these points are particularly salient for PNG, whose population has one of the lowest rates of access to electricity and clean cooking, resulting in worse rates of poverty and poorer public health outcomes.

[90] *(IRENA, 2022b: 4).*

Figure 10 - **Access to electricity and clean cooking, Papua New Guinea**



Costs and challenges

We estimate the cost of transitioning the remainder of PNG's electricity generation from fossil fuels to renewables as approximately $502.5 million for the total installed cost of an entirely solar PV system, and $347.47 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that these figures relate to upfront costs only. Although these are more substantial than upfront costs for diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed in an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	LCOE including transmission costs (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Papua New Guinea	586.36	$502.5 million	$48	262.24	262.24	$347.47 million	$33

While PNG currently enjoys both geothermal and hydro electricity, the large drop in the cost of solar PV and wind generation since those projects were built effectively rules out new hydro and geothermal generation simply from a financial perspective.

FIJI

AT A GLANCE

Flag

901,603
Population[88]

18,270
Land area (km²)

1,282,980
Exclusive Economic Zone (km²)

$4.59 billion
GDP (USD)

$5,111
GDP/capita (USD)

6.5%
Unemployment rate %

$4.01 billion
Total national debt (USD)

9.125 billion Fijian dollars
Total national debt (Local Currency)

88.6%
Debt as % of GDP

Key industries

Agriculture, Fishing, Forestry, Mining, Tourism, Manufacturing.

ECONOMIC OVERVIEW

Fiji is the second largest Pacific Island State both by population and Gross Domestic Product, after PNG. However, unlike PNG, Fiji has no domestic fossil fuel extraction industry, and only a very small proportion of its population employed in fossil fuel-related jobs. Energy sector jobs as a whole employ just 0.01% of Fiji's population. As such, Fiji's transition to a 100% renewable energy system presents fewer challenges for its people. However, its relatively high debt-to-GDP ratio, compared to other Pacific countries, may pose a moderate barrier to public financing of new build renewables in the short to medium term.

Fiji's climate activities currently result in 'negative emissions', due to its LUCF sector acting as more a carbon sink than a carbon source. While this does not obviate the need to decarbonise other sectors of its economy, it places Fiji in an enviable position on the world stage when advocating for emissions reduction by higher emitting nations, especially in the global North.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Fiji's Nationally Determined Contribution

2030

NDC to 2030

- Target 1: To reduce 30% of BAU CO2 emissions from the energy sector by 2030.
- Target 2: As a contribution to Target 1, to reach close to 100% renewable energy power generation (grid-connected) by 2030, thus reducing an expected 20% of energy sector CO2 emissions under a BAU scenario.
- Target 3: As a contribution to Target 1, to reduce energy sector CO2 emissions by 10% through energy efficiency improvements economy wide, implicitly in the transport, industry, and electricity demand-side sub-sectors.

2050

NDC to 2030

- Achieve net-zero GHG emissions by 2050 as set out in Low Emission Development Strategy (LEDS)

EMISSIONS PROFILE

Figure 11 - **Fiji emissions profile**

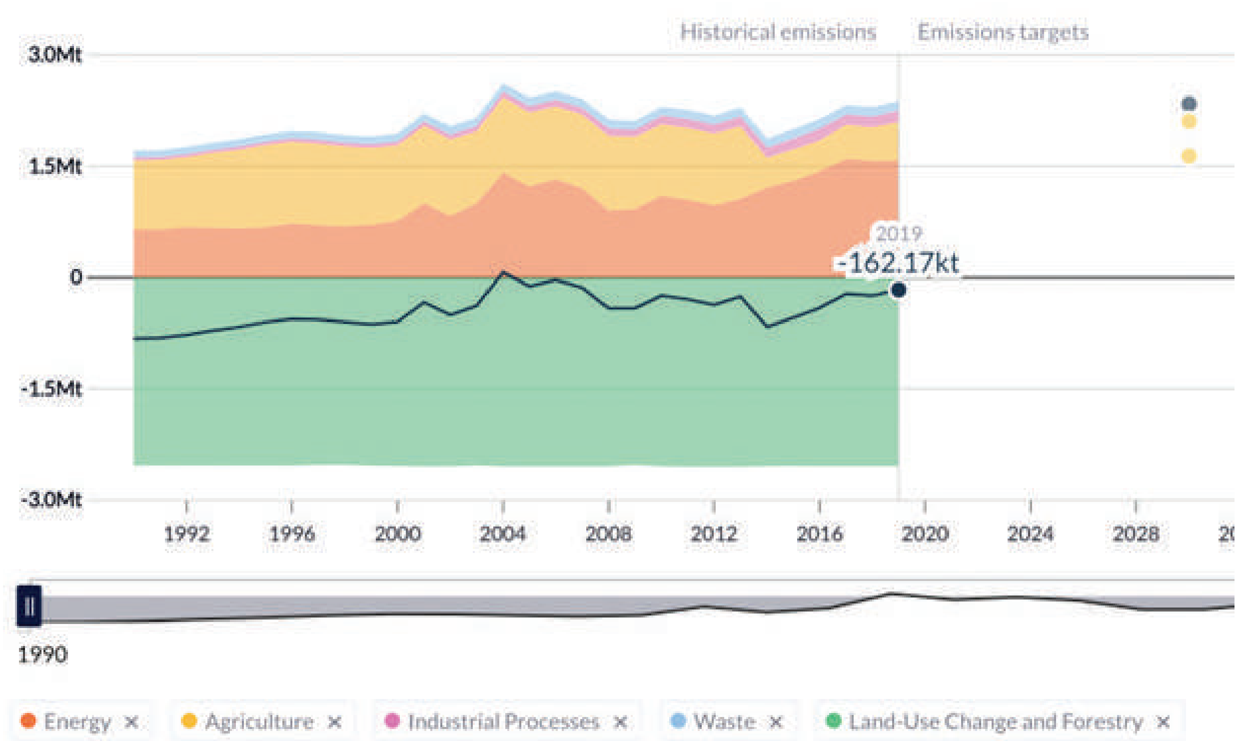
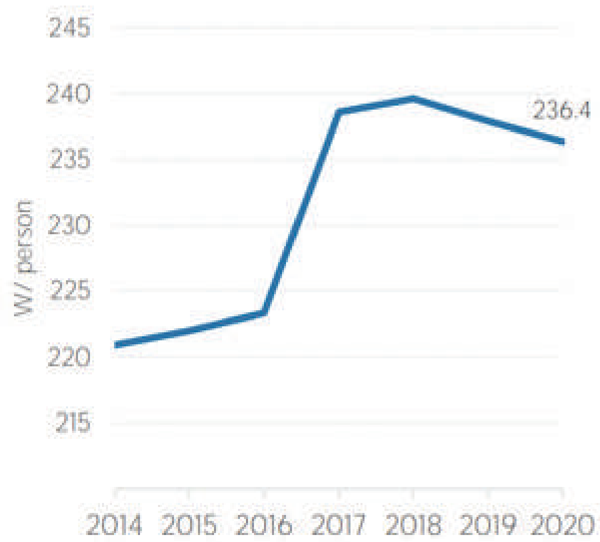
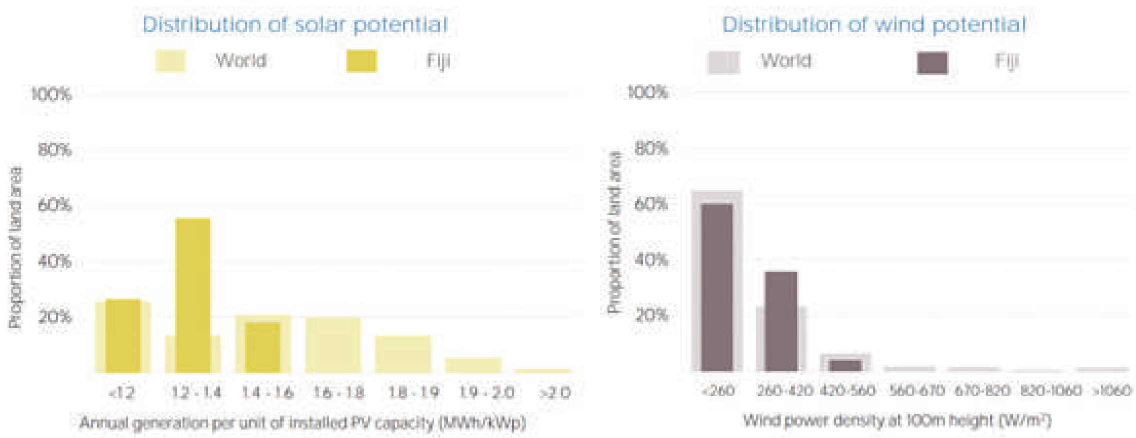


Figure 12 - **Fiji renewables capacity per capita**



Renewable resource profile

Figure 13 - **Solar and wind potential, Fiji**[91]



Fiji has good solar and wind potential, with both tracking roughly around the global average. This provides considerable flexibility for Fiji when planning the ideal mix of renewable capacity to be built to decarbonise its energy supply.

[91] *(IRENA, 2022c: 4).*

FOSSIL FUEL PHASE OUT

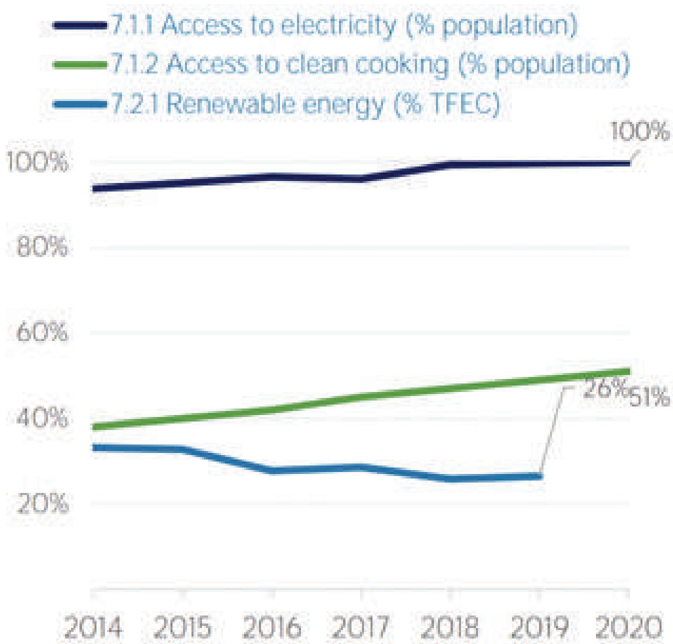
Opportunities

A phase out of fossil fuels presents a variety of advantages and opportunities for Fiji. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Fiji to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

The lion's share of Fiji's annual emissions come from energy, driven by diesel generation for electricity, and vehicle emissions from transport. A100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it. While Fiji's people have good access to electricity, only 51% of its population has access to clean cooking. Increasing the penetration of decentralised renewables and electrifying domestic cooking will result in both economic and health benefits for Fiji's people.

Figure 14 - **Access to electricity and clean cooking, Fiji**



Costs and challenges

We estimate the cost of transitioning the remainder of Fiji's electricity generation from fossil fuels to renewables as approximately $278.91 million for the total installed cost of an entirely solar PV system, and $192.85 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are more substantial than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Fiji	325.45	$278.91 million	$48	145.55	$192.85 million	$33

While Fiji currently enjoys substantial hydro/marine electricity capacity, the large drop in the cost of solar PV and wind generation over the past decade makes solar and wind much more cost-effective options for new generation than new hydroelectric assets.

SOLOMON ISLANDS

AT A GLANCE

Flag

703,995
Population[88]

27,990
Land area (km²)

1,553,440
Exclusive Economic Zone (km²)

$1.457 billion
GDP (USD)

$2,001
GDP/capita (USD)

2.1%
Unemployment rate %

$222.57 million
Total national debt (USD)

1.824 billion
Solomon Islands dollars
Total national debt (Local Currency)

15.58%
Debt as % of GDP

Key industries

Tourism, Agriculture, Fishing, Forestry, Mining.

ECONOMIC OVERVIEW

Despite its mineral wealth (predominantly bauxite, gold and nickel) Solomon Islands is one of the poorest nations profiled in this report, with its per capita GDP of just over $2,000 placing it second last, in front of Kiribati. Solomon Islands' emissions, however, place it second highest, after Papua New Guinea. Like many Pacific Island Countries, Solomon Islands' worker transition task is made less challenging due to the lack of a significant fossil fuel extraction sector.

The vast majority of Solomon Islands' emissions come from the LUCF sector: an area where it can effectively seek to take action. Solomon Islands' renewable electricity generation, at 7%, is one of the lowest in the Pacific and can readily be improved with a rapid build-out of wind and solar capacity. Its relatively low debt-to-GDP ratio should be exploited to unlock public financing of these projects, and the co-benefits they will bring across climate, cheap power, and public health.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Solomon Islands' Nationally Determined Contribution

2030

Conditional

- 27% reduction in GHG emissions by 2025 and 45% reduction in GHG emissions by 2030 compared to a Business As Usual (BAU) projection.

Unconditional

- 12% reduction below 2015 level by 2025 and a 30% reduction below 2015 levels by 2030 compared to a Business As Usual (BAU) projection.

2050

-

EMISSIONS PROFILE

Figure 15 - **Solomon Islands emissions profile**

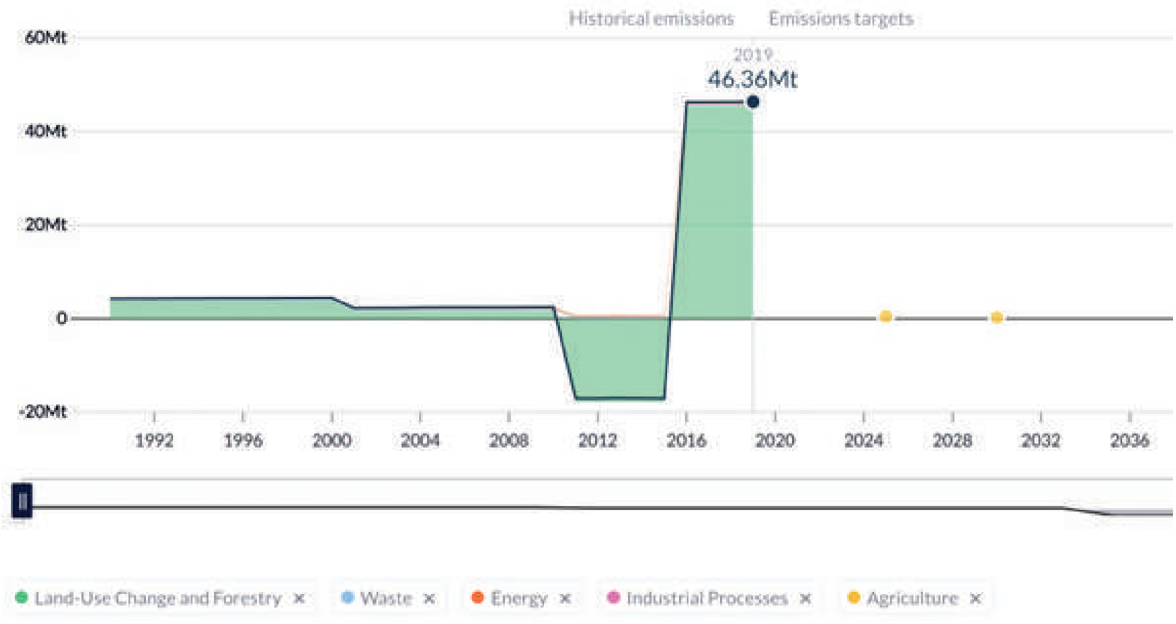
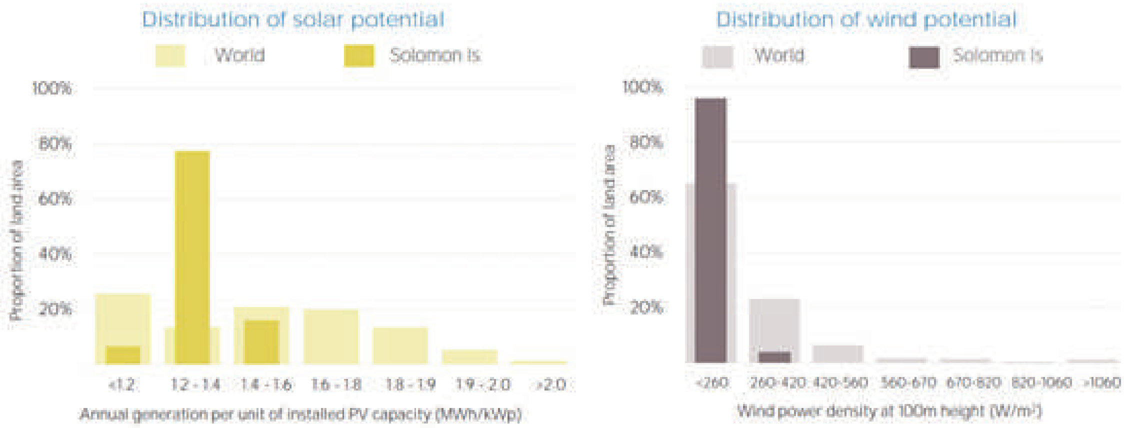


Figure 16 - **Solomon Islands renewables capacity per capita**

Renewable resource profile

Figure 17 - **Solar and wind potential, Solomon Islands**[92]



While Solomon Islands has good solar potential, its potential wind resources track at the lower end of the global average. This suggests that new build-out of renewable capacity should be dominated by solar PV where possible.

[92] (IRENA, 2022d: 4).

FOSSIL FUEL PHASE OUT

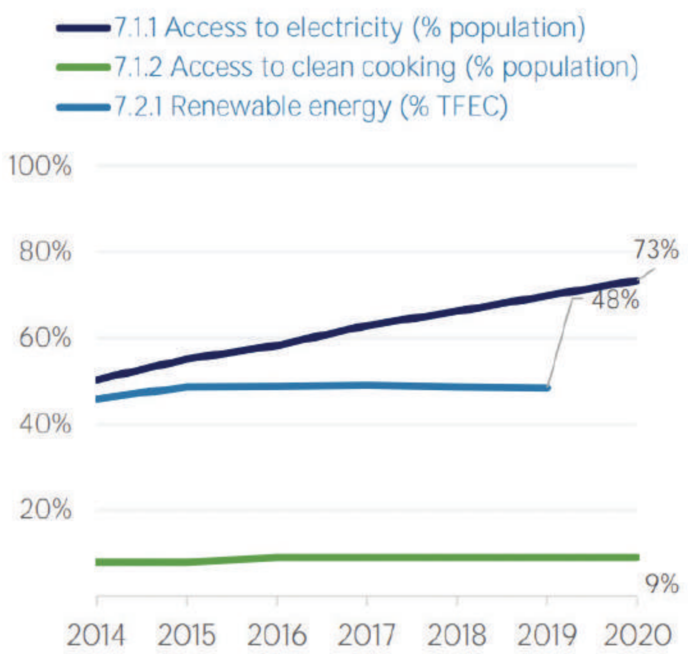
Opportunities

A phase out of fossil fuels presents a variety of advantages and opportunities for Solomon Islands. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Solomon Islands to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

While most of Solomon Islands' calculated annual emissions come from the LUCF sector, its energy sector emissions come entirely from oil, driven by diesel generation for electricity, and vehicle emissions from transport. A100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it. While Solomon Islands' people have relatively good access to electricity (at 71%) improvements can also be made here. However, it has one of the lowest rates of access to clean cooking among nations profiled (at just 9%). Increasing the penetration of decentralised renewables and electrifying domestic cooking will result in both economic and health benefits for Solomon Islands' people.

Figure 18 - **Access to electricity and clean cooking, Solomon Islands**[93]



[93] (IRENA, 2022d, 1).

Costs and challenges

We estimate the cost of transitioning the remainder of Solomon Islands' electricity generation from fossil fuels to renewables as approximately $55.95 million for the total installed cost of an entirely solar PV system, and $41.18 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are more substantial than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity	Total installed cost	LCOE (USD/ MWh)	Total new onshore wind capacity build	Total installed cost	LCOE (USD/ MWh)
Solomon Islands	69.49	$59.55 million	$48	31.08	$41.18 million	$33

VANUATU

AT A GLANCE

Flag

314,464
Population

12,190
Land area (km²)

66,3251
Exclusive Economic Zone (km²)

$928.64 million
GDP (USD)

$3,223
GDP/capita (USD)

7.94%
Unemployment rate %

$400.74 million
Total national debt (USD)

49.5 billion vatu
Total national debt (Local Currency)

40%
Debt as % of GDP

Key industries

Agriculture, Fishing, Forestry, Livestock, Tourism, Services.

ECONOMIC OVERVIEW

Vanuatu falls around the median of the PICs profiled by this report by population and Gross Domestic Product. Vanuatu has no domestic fossil fuel extraction industry, and only a very small proportion of its population employed in fossil fuel-related jobs, with just 265 workers employed in the energy sector as a whole. As such, Vanuatu's transition to a 100% renewable energy system presents fewer workforce challenges than for other nations.

Vanuatu's greenhouse gas emissions profile is dominated by its agriculture sector. With regard to fossil fuels, its proportion of renewable electricity generation, at 28%, is lower than comparable Pacific economies, such as Samoa, Solomon Islands and Kiribati, and can readily be improved with a rapid build-out of wind and solar capacity.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Vanuatu's Nationally Determined Contribution

2030

- Sector specific target of transitioning to close to 100% renewable energy in the electricity sector by 2030. This target would replace nearly all fossil fuel requirements for electricity generation in the country and be consistent with the National Energy Road Map (NERM) target of 65% renewable energy by 2020.
- This contribution would reduce emissions in the energy sector by 72Gg by 2030.

2050

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EMISSIONS PROFILE

Figure 19 - **Vanuatu emissions profile**

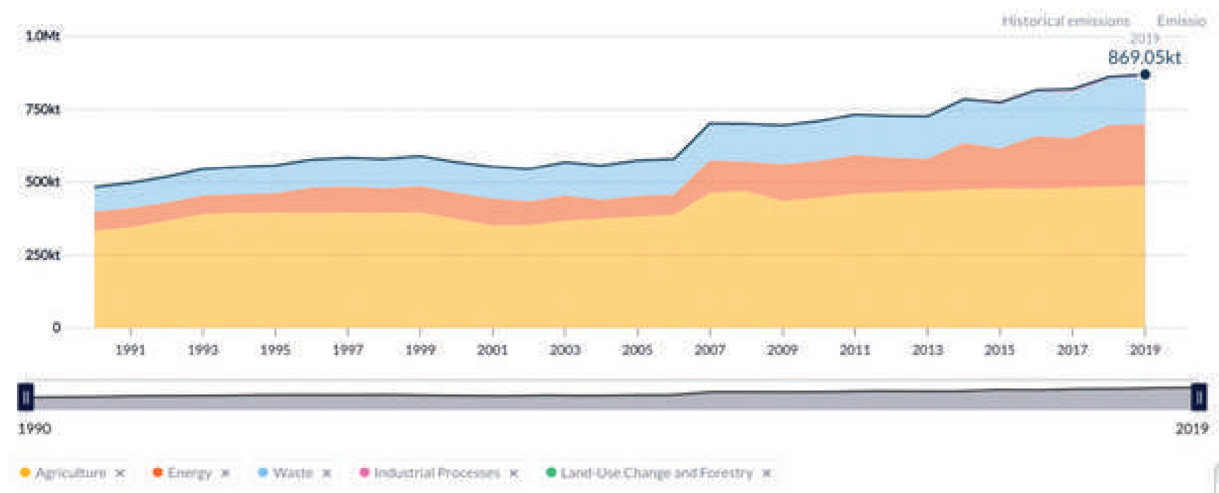
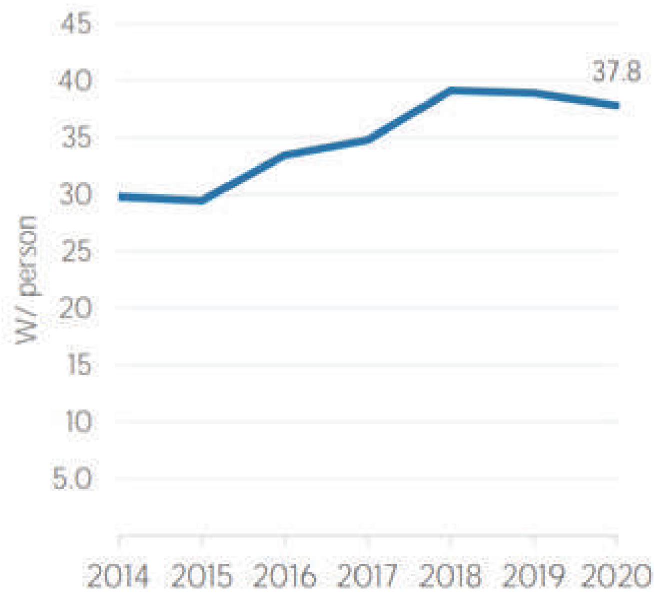
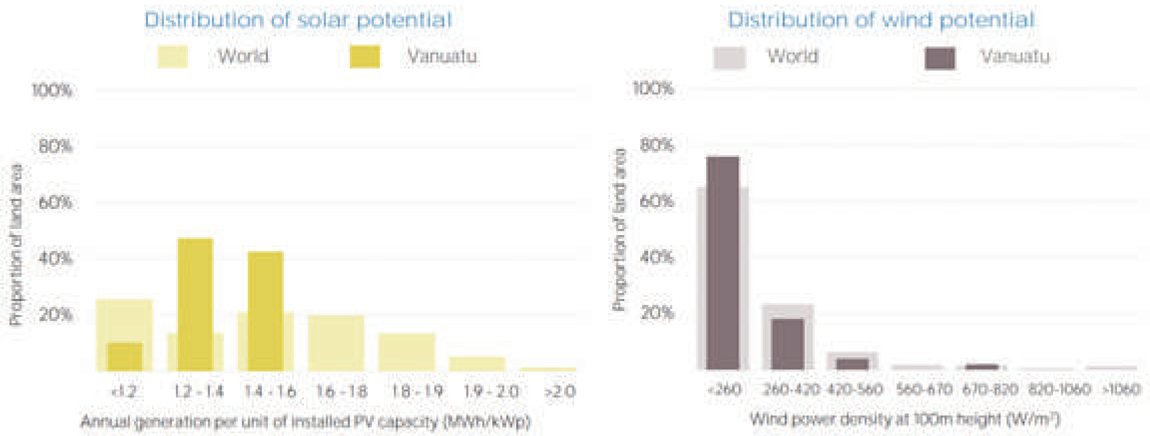


Figure 20 - **Vanuatu renewables capacity per capita**



Renewable resource profile

Figure 21 - **Solar and wind potential, Vanuatu**[94]



Vanuatu has strong solar and wind potential, with some sites performing near the top of the global distribution for onshore wind resources. When planning the ideal mix of renewable capacity to be built to decarbonise Vanuatu's energy supply, therefore, it is recommended that wind be given preference to solar PV except for locations where wind resources are low.

[94] *(IRENA, 2022i: 4).*

FOSSIL FUEL PHASE OUT

Opportunities

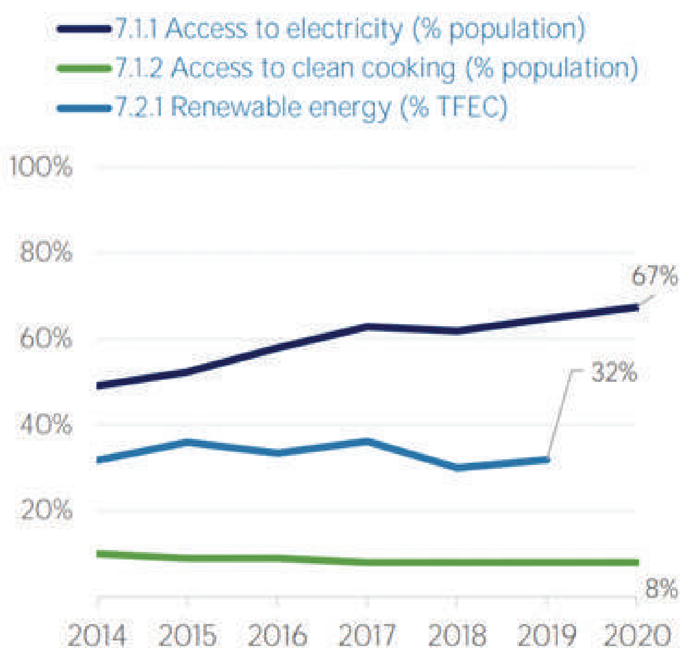
A phase out of fossil fuels presents a variety of advantages and opportunities for Vanuatu. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Vanuatu to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

While most of Vanuatu's calculated annual emissions come from agriculture, its energy sector emissions come entirely from oil, driven by diesel generation for electricity, and vehicle emissions from transport. A 100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it. Moreover, removing the need to import diesel fuel from overseas would be of great benefit to Vanuatu's balance of trade figures, and the positive economic effects that would result.[95]

Vanuatu's people have moderate access to electricity (at 67%) and improvements can also be made here. However, it has one of the lowest rates of access to clean cooking among nations profiled (at 8%). Increasing the penetration of decentralised renewables and electrifying domestic cooking will result in both economic and health benefits for Vanuatu's people.

Figure 22- **Access to electricity and clean cooking, Vanuatu**[96]



[95] (Asian Development Bank, 2022).
[96] (IRENA, 2022i, 1).

Costs and challenges

We estimate the cost of transitioning the remainder of Vanuatu's electricity generation from fossil fuels to renewables as approximately $34.03 million for the total installed cost of an entirely solar PV system, and $23.53 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are higher than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Vanuatu	39.71	$34.03 million	$48	17.76	$23.53 million	$33

SAMOA

AT A GLANCE

Flag

200,144
Population

2,830
Land area (km²)

127,950
Exclusive Economic Zone (km²)

$792.86 million
GDP (USD)

$3,967
GDP/capita (USD)

14.5% (2017)
Unemployment rate %

$392 million
Total national debt (USD)

1078 million tālā
Total national debt (Local Currency)

49%
Debt as % of GDP

Key industries

Agriculture, Fishing, Manufacturing, Tourism.

ECONOMIC OVERVIEW

Samoa is relatively prosperous compared to the other nations profiled in this report, with its per capita GDP placing it in third position. Like many Pacific Island Countries, Samoa's worker transition task is made less challenging due to the lack of a significant fossil fuel extraction sector.

Samoa's leading source of greenhouse gas emissions is energy, followed by agriculture. Samoa's proportion of renewable electricity generation, at 38%, is one of the highest in the Pacific. However, Samoa will need to commission a significant amount of new renewable generation to meet its laudable renewable electricity target of 100% by 2025.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Samoa's Nationally Determined Contribution

2030

Conditional

- commits to generating 100% of its electricity from renewable energy sources by **2025**
- reduce overall GHG emissions by 26 per cent in 2030 compared to 2007 levels

2050

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EMISSIONS PROFILE

Figure 23– **Samoa emissions profile**

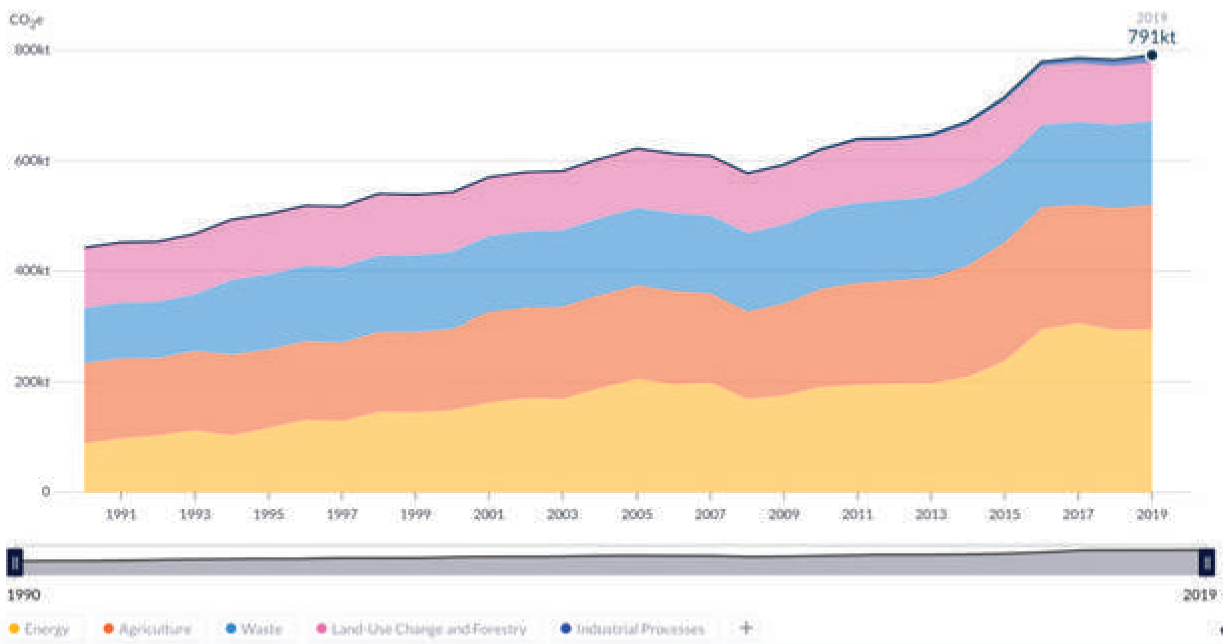
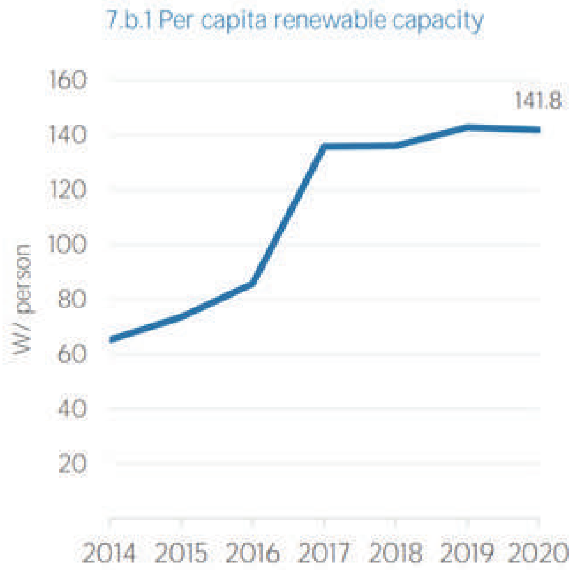
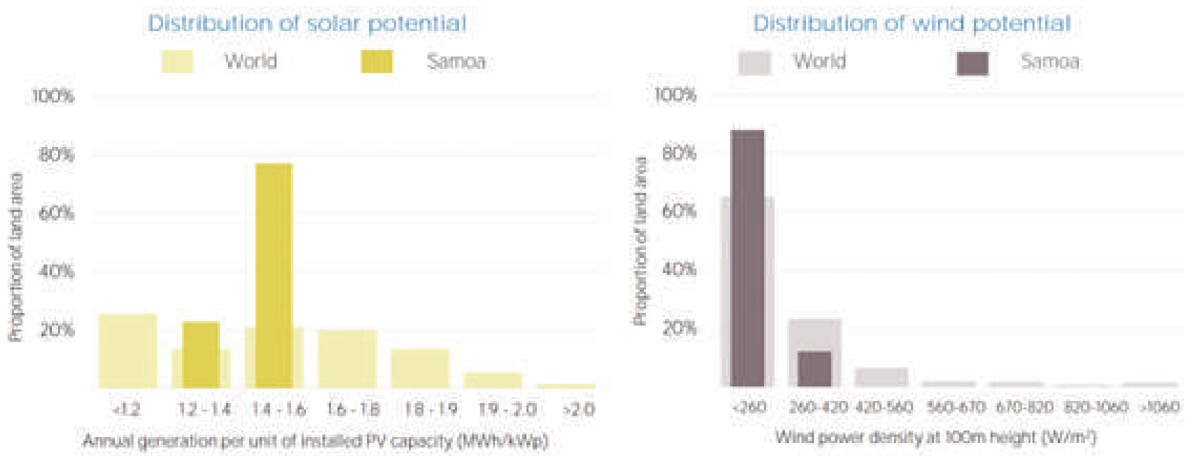


Figure 24 - **Samoa renewables capacity per capita**



Renewable resource profile

Figure 25 - **Solar and wind potential, Samoa[97]**



Vanuatu has strong solar and wind potential, with some sites performing near the top of the global distribution for onshore wind resources. When planning the ideal mix of renewable capacity to be built to decarbonise Vanuatu's energy supply, therefore, it is recommended that wind be given preference to solar PV except for locations where wind resources are low.

[97] *(IRENA, 2022e: 4).*

FOSSIL FUEL PHASE OUT

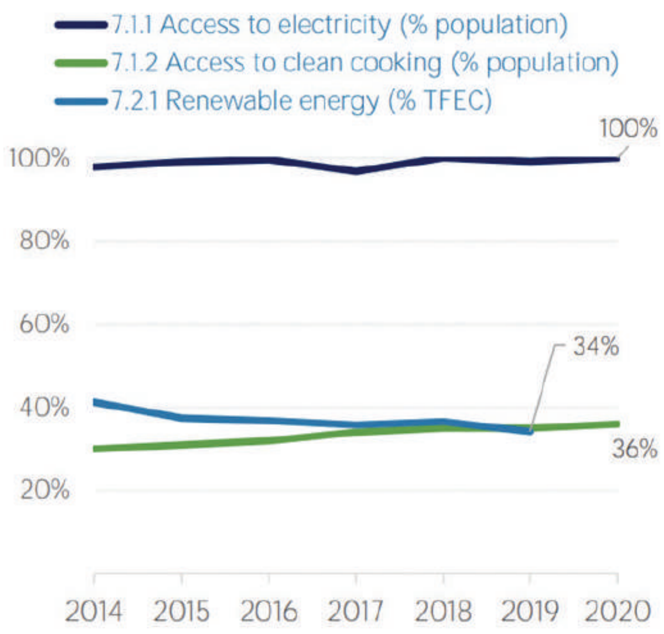
Opportunities

A phase out of fossil fuels presents a variety of advantages and opportunities for Samoa. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Samoa to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

Samoa's leading source of emissions is its energy sector, whose emissions come entirely from oil, driven by diesel generation for electricity and vehicle emissions from transport. A 100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it. While Samoa's people have close to universal access to electricity their rate of access to clean cooking remains low, at 36%. Increasing the penetration of renewables and electrifying domestic cooking will result in both economic and health benefits for Samoa's people.

Figure 26- **Access to electricity and clean cooking, Samoa**[96]



[98] (IRENA, 2022e, 1).

Costs and challenges

We estimate the cost of transitioning the remainder of Samoa's electricity generation from fossil fuels to renewables as approximately $65.02 million for the total installed cost of an entirely solar PV system, and $44.96 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are more substantial than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Samoa	75.87	$65.02 million	$48	33.93	$44.96 million	$33

KIRIBATI

AT A GLANCE

Flag

121,388
Population

810
Land area (km²)

3,441,810
Exclusive Economic Zone (km²)

$197.1 million
GDP (USD)

$1,632
GDP/capita (USD)

8.6% (2017)
Unemployment rate %

$69 million
Total national debt (USD)

106.7 million
Australian dollars
Total national debt (Local Currency)

35%
Debt as % of GDP

Key industries

Agriculture, Fisheries, Real Estate, Tourism.

ECONOMIC OVERVIEW

Kiribati is the poorest Pacific country of those profiled in this report, both by GDP and GDP per-capita metrics, and one of the poorest in the region as a whole. Kiribati has no fossil fuel extraction sector, making its worker transition less challenging.

Kiribati's leading source of greenhouse gas emissions by far is its energy sector, with its proportion of renewable electricity generation, at 14%, among the lowest in the Pacific, and can readily be improved with a rapid build-out of new wind and solar capacity. Effective international finance and investment will be indispensable to phasing out fossil fuels in Kiribati, as reflected in its conditional NDC.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Kiribati's Nationally Determined Contribution

2030

Conditional

- On receiving external support, Kiribati's conditional contribution will reduce emissions by 35,880tCO2e annually by **2025** and by 38,420tCO2e annually by **2030**.

Unconditional

- In the absence of receiving any external support, in addition to the carbon storage in the ocean ecosystem, Kiribati's unconditional contribution will reduce emissions by 10,090tCO2e annually throughout the period 2020 to 2030.

2050

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EMISSIONS PROFILE

Figure 27- **Kiribati's emissions profile**

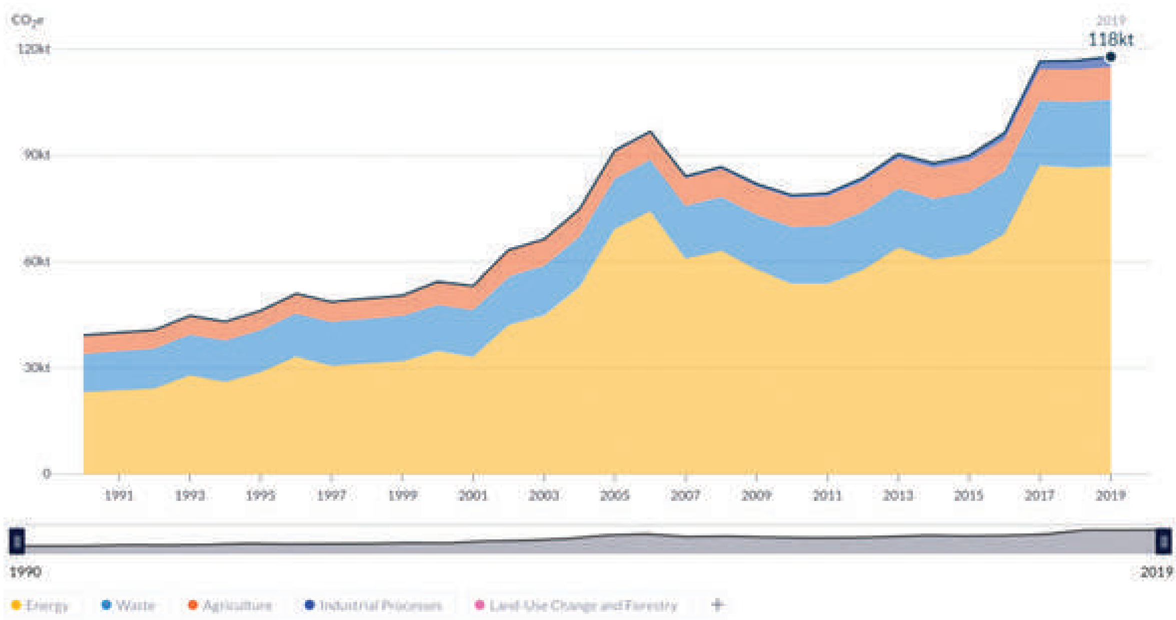
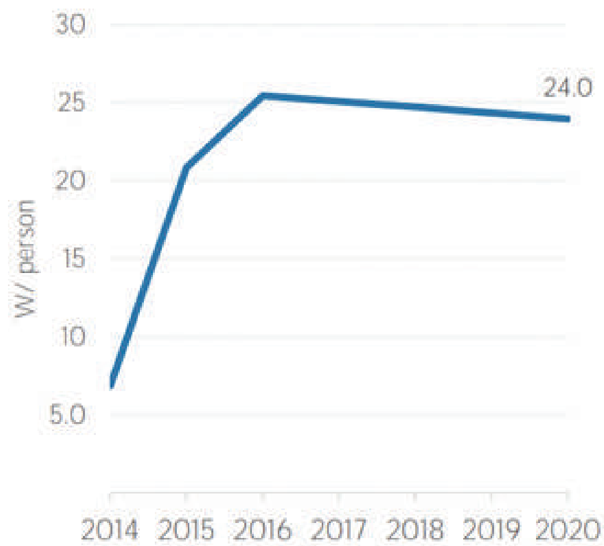
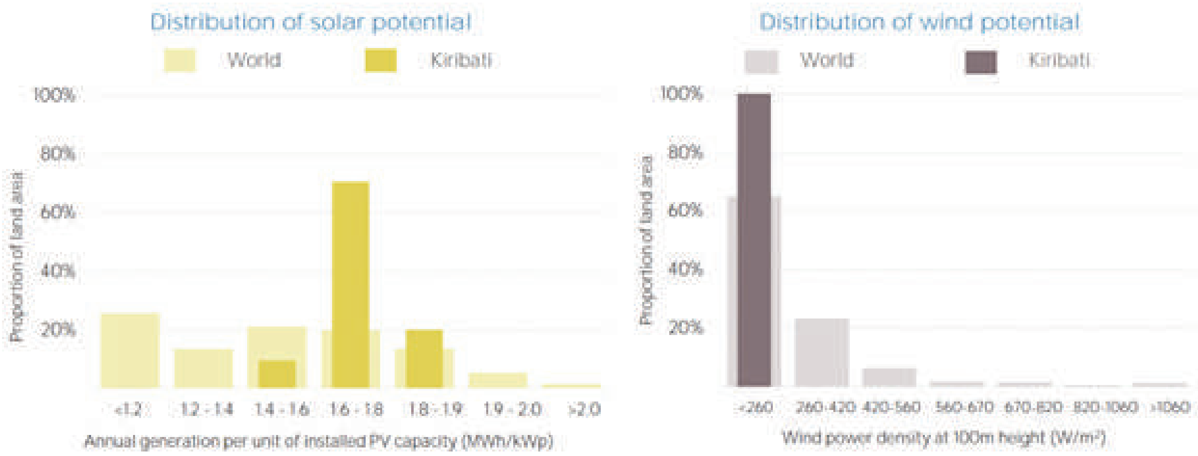


Figure 28 - **Kiribati renewables capacity per capita**



Renewable resource profile

Figure 29 - **Solar and wind potential, Kiribati**[99]



Kiribati has strong solar energy potential, but weak wind potential when compared to the global average. When planning the ideal mix of renewable capacity to be built to decarbonise Kiribati's energy supply, it is recommended that solar PV be given preference over wind.

[99] *(IRENA, 2022f: 4).*

FOSSIL FUEL PHASE OUT

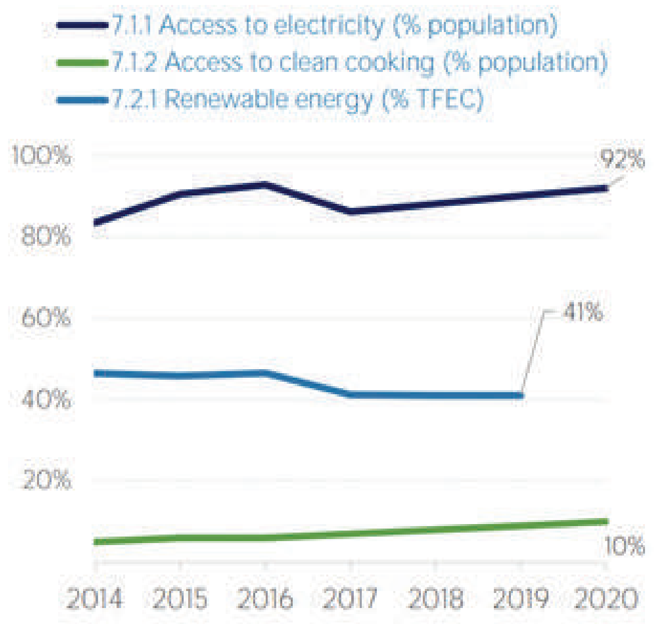
Opportunities

A phase out of fossil fuels presents a variety of advantages and opportunities for Kiribati. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Kiribati to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

Much like Samoa, Kiribati's leading source of emissions is its energy sector, whose emissions come entirely from oil, driven by diesel generation for electricity and vehicle emissions from transport. A 100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it. Access to electricity, at 92%, is among the best in the Pacific. However, Kiribati's rate of access to clean cooking is one of the lowest in the region, at just 10%. Increasing the penetration of renewables and electrifying domestic cooking will result in both economic and health benefits for the people of Kiribati.

Figure 30- **Access to electricity and clean cooking, Kiribati**[100]



[100] (IRENA, 2022f, 1).

Costs and challenges

We estimate the cost of transitioning the remainder of Kiribati's electricity generation from fossil fuels to renewables as approximately $18.84 million for the total installed cost of an entirely solar PV system, and $13.02 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are more substantial than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Kiribati	21.98	$18.84 million	$48	9.83	$13.02 million	$33

FEDERATED STATES OF MICRONESIA

AT A GLANCE

Flag

116,255
Population

700
Land area (km²)

2,996,420
Exclusive Economic Zone (km²)

$401.9 million
GDP (USD)

$3,830
GDP/capita (USD)

(2013)
24.35%
Unemployment rate %

$103.65 million
Total national debt (USD)

103.65 million
US dollars
Total national debt (Local Currency)

25.4%
Debt as % of GDP

Key industries
Tourism, Agriculture, Fisheries

ECONOMIC OVERVIEW

Federated States of Micronesia is the second smallest of the PICs profiled in this report by population, and roughly average by GDP per capita. While Federated States of Micronesia has no fossil fuel extraction sector, making its worker transition less challenging, its energy system is almost entirely dominated by diesel oil, with only 2% of its energy coming from renewable sources, and just 7% of its electricity generation. Federated States of Micronesia therefore has a greater task ahead of it than many similar PICs in aligning with a decarbonised world.

Federated States of Micronesia's leading source of greenhouse gas emissions by far is its energy sector, and can readily be improved with a rapid build-out of new wind and solar capacity. Effective international finance and investment will be indispensable to phasing out fossil fuels in Federated States of Micronesia, as reflected in its conditional NDC.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Federated States of Micronesia's Nationally Determined Contribution

2030

Conditional

- Subject to the availability of external additional financing, technical and capacity building support from the international community, by 2025 Micronesia could reduce up to 35% of greenhouse gas emissions compared to a base year of 2000. This is an approximate 94,000tCO2e.

Unconditional

- In the absence of external support, Micronesia commits to unconditionally reduce its greenhouse gas emissions by 28% by **2025** compared to a baseline year of 2000. This is an approximate 108,000tCO2e.

2050

-

EMISSIONS PROFILE

Figure 31 - **Federated States of Micronesia's emissions profile**

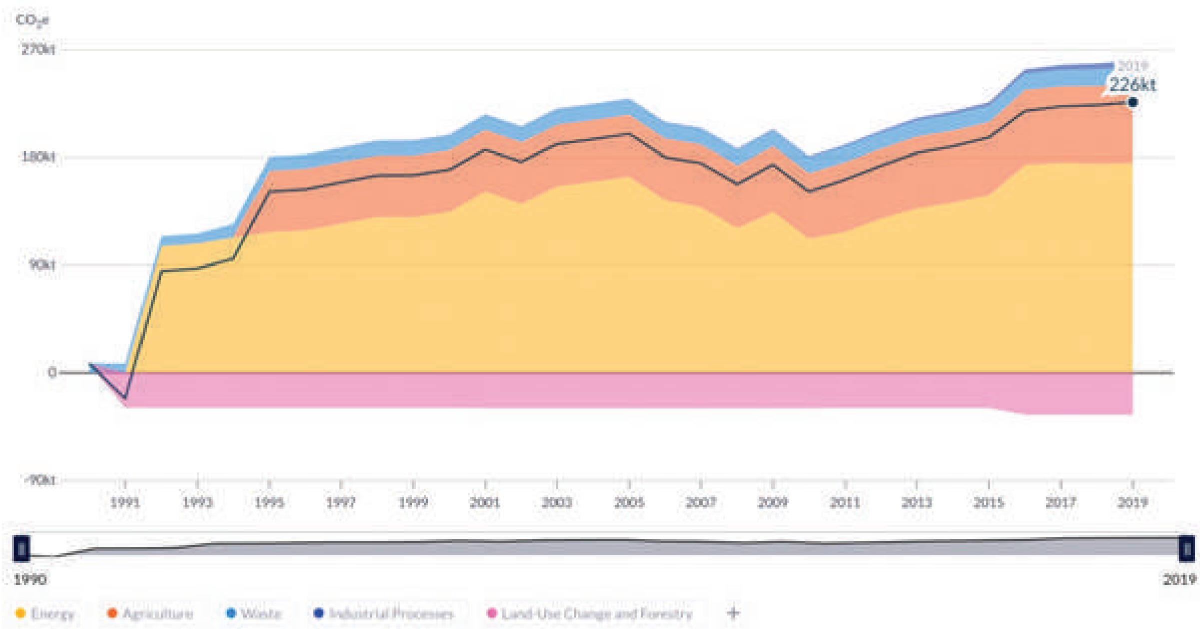
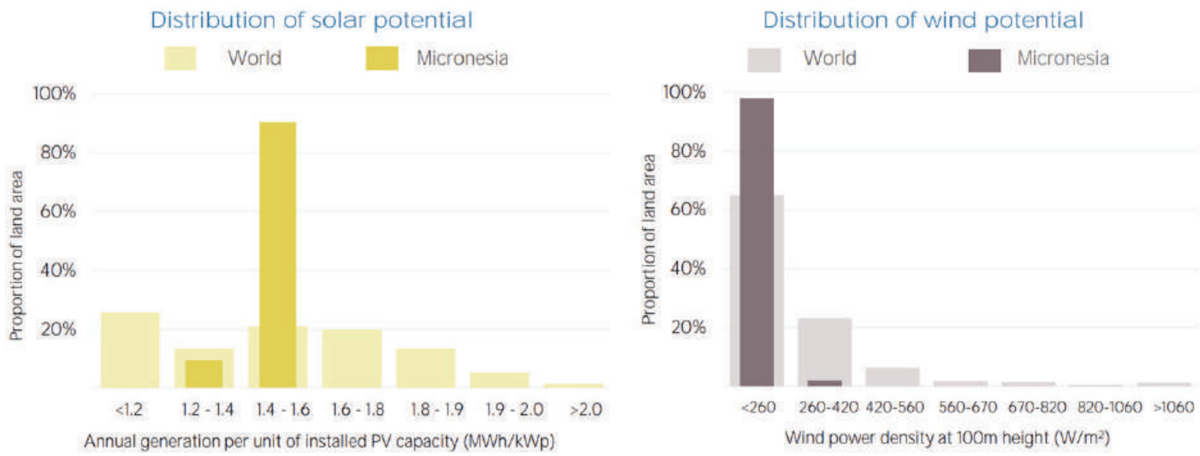


Figure 32 - **Federated States of Micronesia renewables capacity per capita**

Renewable resource profile

Figure 33 - **Solar and wind potential, Federated States of Micronesia[101]**



Federated States of Micronesia's energy potential is similar to that of Kiribati: it has strong solar energy potential, but weak wind potential when compared to the global average. When planning the ideal mix of renewable capacity to be built to decarbonise Federated States of Micronesia's energy supply, it is recommended that solar PV be given preference over wind.

[101] *(IRENA, 2022f: 4).*

FOSSIL FUEL PHASE OUT

Opportunities

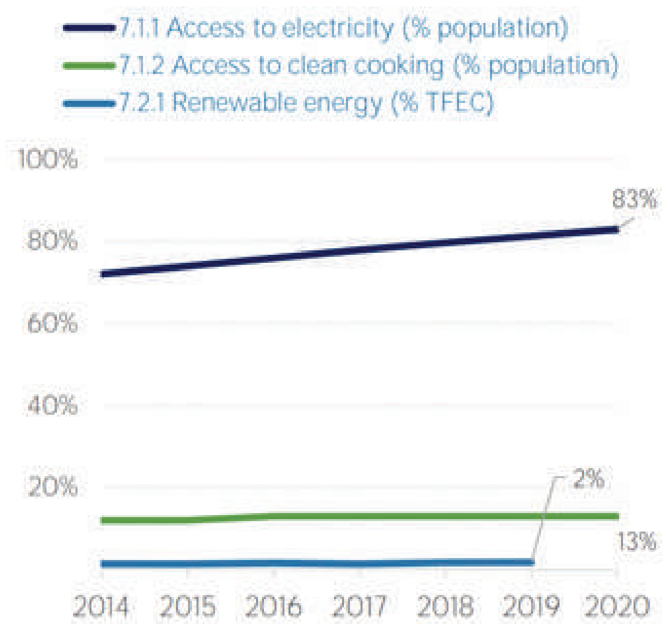
A phase out of fossil fuels presents a variety of advantages and opportunities for Federated States of Micronesia. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Federated States of Micronesia to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

Much like Samoa and Kiribati, Federated States of Micronesia's leading source of emissions is its carbon-heavy energy sector, whose emissions come overwhelmingly from oil, driven by diesel generation for electricity and vehicle emissions from transport. With its current proportion of renewable electricity generation at just 2%, Federated States of Micronesia has a long way to go on its decarbonisation pathway. Nevertheless, a 100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it.

Access to electricity, at 83%, is relatively strong. However, Federated States of Micronesia's rate of access to clean cooking is one of the lowest in the region, at 13%. Increasing the penetration of renewables and electrifying domestic cooking will result in both economic and health benefits for the people of Federated States of Micronesia.

Figure 34- **Access to electricity and clean cooking, Federated States of Micronesia.**[102]



[102] (IRENA, 2022g, 1).

Costs and challenges

We estimate the cost of transitioning the remainder of Federated States of Micronesia's electricity generation from fossil fuels to renewables as approximately $36.46 million for the total installed cost of an entirely solar PV system, and $25.21 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are more substantial than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
FS of Micronesia	42.54	$36.46 million	$48	19.03	$25.21 million	$33

TUVALU

AT A GLANCE

Flag

11,925
Population

30
Land area (km²)

749,790
Exclusive Economic Zone (km²)

$54.28 million
GDP (USD)

$5,083
GDP/capita (USD)

(2017 Data)
24.03%
Unemployment rate %

$3.26 million
Total national debt (USD)

5.04 million
Australian dollars
Total national debt (Local Currency)

6%
Debt as % of GDP

Key industries
Fishing, Tourism, Agriculture.

ECONOMIC OVERVIEW

Tuvalu is the smallest Pacific Island Country profiled in this report, both by population - just 11,925 people - and GDP, which are both an order of magnitude smaller than the next lowest ranked nation. As such, international finance and assistance will be critical for Tuvalu to decarbonise its energy system and its economy.

Tuvalu has no fossil fuel extraction sector, with its main sources of greenhouse gas emissions coming from energy and agriculture. Its energy system is almost entirely dominated by diesel oil, with only 4% of its energy coming from renewable sources, and 16% of its electricity generation. Tuvalu has a significant task ahead of it if it is to meet its laudably ambitious NDC of entirely decarbonising its electricity generation sector by 2025.

CLIMATE CHANGE POLICIES AND COMMITMENTS

Tuvalu's Nationally Determined Contribution

2025

NDC to 2025

- Tuvalu commits to a reduction of emissions of greenhouse gases from the electricity generation (power) sector, by 100% i.e. almost zero emissions by 2025.

Tuvalu's indicative quantified economy-wide target for a reduction in total emissions of GHGs from the entire sector to 60% below 2010 levels by 2025.

2050

-

EMISSIONS PROFILE

Figure 35- **Tuvalu's emissions profile**

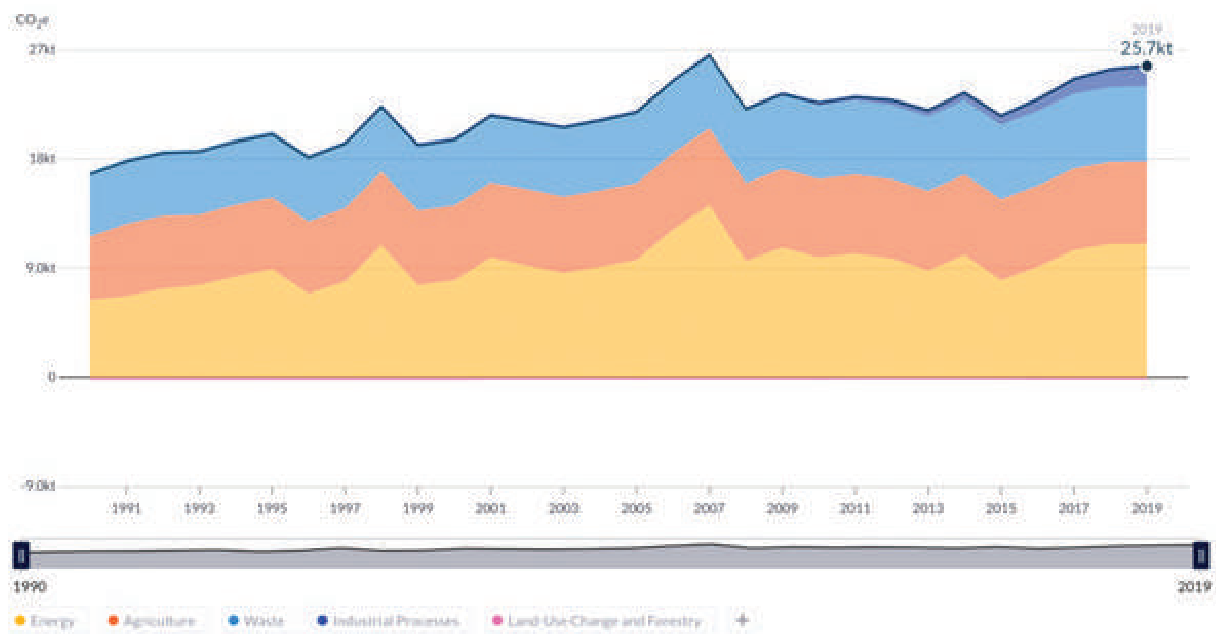
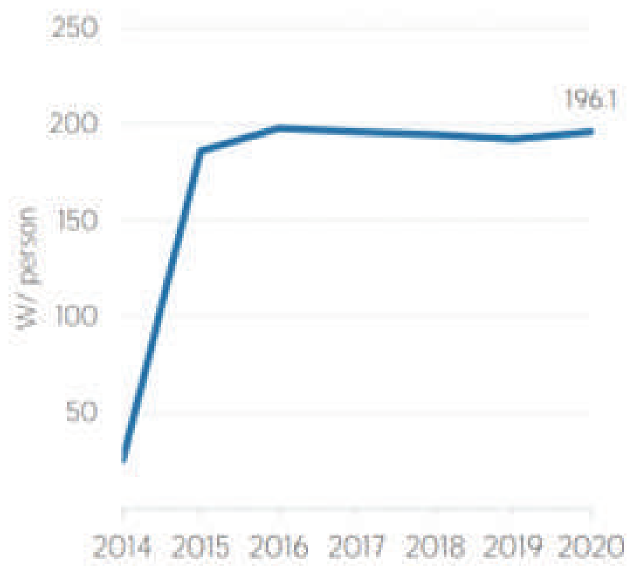
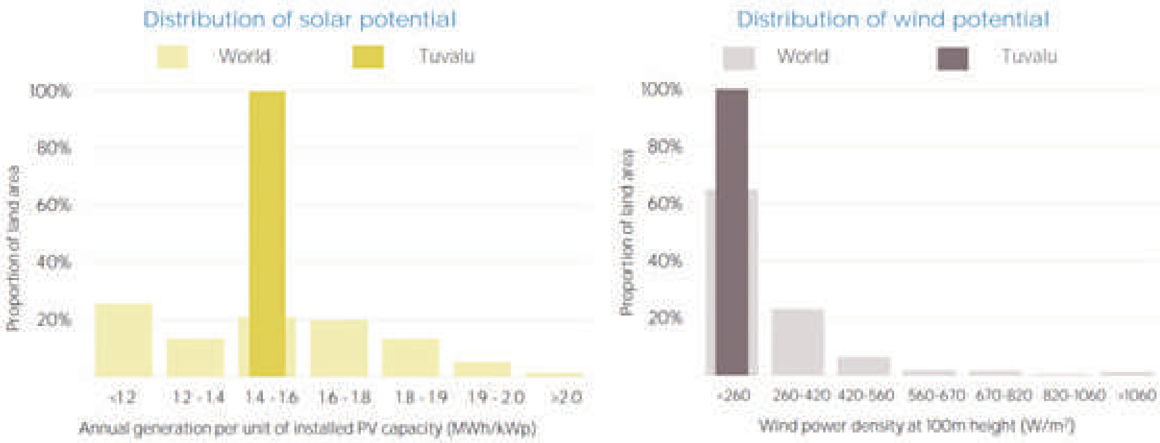


Figure 36 - **Tuvalu renewables capacity per capita**



Renewable resource profile

Figure 37- **Solar and wind potential, Tuvalu**[103]



Tuvalu's energy potential is similar to that of Federated States of Micronesia and Kiribati: it has strong solar energy potential, but weak wind potential when compared to the global average. When planning the ideal mix of renewable capacity to be built to decarbonise Tuvalu's energy supply, it is recommended that solar PV be given preference over wind.

[103] *(IRENA, 2022h: 4).*

The challenge for Tuvalu comes not from its renewable energy potential, but its small landmass: it will be difficult to physically fit the solar PV panel required on the small amount of free land available. Tuvalu, and other nations with similar geographic constraints, will need to explore other generation options, such as offshore wind and floating solar.

FOSSIL FUEL PHASE OUT

Opportunities

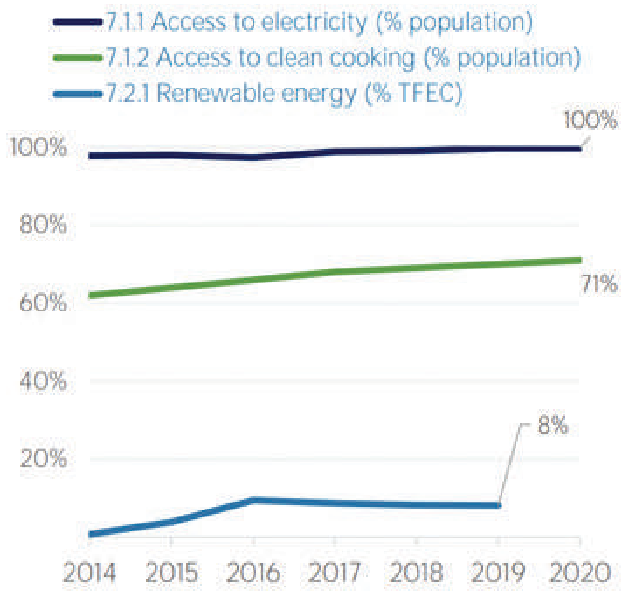
A phase out of fossil fuels presents a variety of advantages and opportunities for Tuvalu. Section 3.1 of this report outlined these opportunities for the Pacific as region, including:

1. Cheaper electricity, from wind and solar, that will reduce energy prices and boost the local economy
2. Public health benefits from the steep air pollution drops that will result from decarbonising electricity, industry, and transport
3. Energy independence that will enable Tuvalu to advocate more robustly for its interests on the global stage
4. Wider access to (cheap) electricity for communities currently lacking access to electricity for power and cooking

Much like Samoa, Kiribati, and Federated States of Micronesia, Tuvalu's leading source of emissions is its carbon-heavy energy sector, whose emissions come overwhelmingly from oil, driven by diesel generation for electricity and vehicle emissions from transport. With its current proportion of renewable electricity generation at 16%, Tuvalu has progress to make on its decarbonisation pathway. A 100% renewable electricity grid will provide cheaper power and a reduction in emissions, along with the air pollution benefits that accompany it.

Access to electricity is among the best in the region, with access to clean cooking relatively high at 71%. Nevertheless, increasing the penetration of renewables and electrifying domestic cooking will result in additional economic and health benefits for the people of Tuvalu.

Figure 38- **Access to electricity and clean cooking, Tuvalu**[104]



Costs and challenges

We estimate the cost of transitioning the remainder of Tuvalu's electricity generation from fossil fuels to renewables as approximately $4.86 million for the total installed cost of an entirely solar PV system, and $3.36 million for the total installed cost of a system consisting only of onshore wind. In practice, the best mix will be determined by local factors, including available and suitable sites, access to technology, finance, and investor appetite.

It is important to emphasise that the above figures relate to upfront costs only. Although these are more substantial than upfront costs for small-scale diesel generation, when the full cost of producing electricity from these projects is spread out over the lifetime of each type of generation, including ongoing fuel costs and expressed as an LCOE figure, solar PV and onshore wind come out cheaper than coal, oil or gas generation assets.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Tuvalu	5.67	$4.86 million	$48	2.54	$3.36 million	$33

[104] (IRENA, 2022h, 1).

12. GLOBAL FOSSIL FUELS PHASE OUT: THE ROLE OF THE 'DEVELOPED' WORLD

12.1 THE INEQUALITY OF THE CLIMATE CRISIS

While frontline communities, like Pacific Island Countries, are currently bearing the brunt of the climate crisis, they are the least responsible for its creation. That responsibility lies squarely with the developed Global North whose long history of mining and burning fossil fuels - under the guise of nation states and their domiciled corporations - is most to blame for the accumulated emissions in the earth's atmosphere and the harms they have caused, and will continue to cause, to the planet and its human and animal inhabitants.

As demonstrated by Richard Heede's groundbreaking research:

'nearly two-thirds of carbon dioxide emitted since the 1750s can be traced to the 90 largest fossil fuel and cement producers, most of which still operate today.'[105]

While current annual emissions are geographically more widely distributed across the world, industrialised nations remain by far the biggest greenhouse gas emitters, with the top 15 largest emitters producing around 71.88% of annual emissions, compared to the Pacific's 0.23%.[106]

The UNFCCC has long emphasised a similar dynamic, stating clearly, with regard to 'small island developing states' that:

'Although small island developing States are among the least responsible of all nations for climate change, they are likely to suffer strongly from its adverse effects and could in some cases even become uninhabitable. This is what makes them such a special case requiring the help and attention of the international community.'[107]

[105] *(Heede, 2014); (Climate Accountability Institute, 2020).*
[106] *See above, 1.1.*
[107] *(UNFCCC, 2005, 2).*

12.2 DIFFERENTIATED RESPONSIBILITY

The principle of differentiated responsibility expressed in this statement is recognised by the global consensus that:

1. Developed nations must lead decarbonisation efforts, in line with the Nationally Determined Commitments to reduce emissions as agreed to in the Paris Agreement
2. These targets represent a floor, not a ceiling, and that they must be ratcheted up over time
3. Developed nations must provide climate finance to developing nations to enable them to decarbonise without harming their economic development and poverty reduction efforts
4. Fossil fuels must be phased out as a matter of urgency, including both extraction and use of coal, oil and gas

As such, the developed world must take the lead in committing to fossil fuel non-proliferation through concrete, time-bound and actionable plans to stop the mining of coal, oil and gas and their use domestically. This demands both national commitments to a non-proliferation treaty, as well as robust efforts in global fora, and through bilateral relationships, at exerting geopolitical pressure on recalcitrant nations and fossil fuel corporations.

Further, as outlined by the authoritative Civil Society Equity Review, supported by over 200 international organisations and movements, the climate finance pillar of this position is the key missing element to achieving internationally just decarbonisation.[108] Global finance negotiations must be urgently recalibrated because of the significant gap between what has been pledged and what is actually needed to achieve this goal. As the Review makes clear a global finance effort must:

1. 'Address the urgent need to accelerate finance for adaptation, which currently accounts for no more than 6 to 7% of the current… total delivered climate finance'
2. 'Address Loss and Damage and a facility for its delivery'
3. 'Finance commitments should be expressed clearly in national NDCs, including by meeting the expressed capacity building requirements of the Global South. They should engage so as to make the various forums within the UNFCCC fit for constructive exchange and substantive follow through, including the Mitigation Work Programme, the Forum on Response Measures, the Katowice Committee of Experts, and the Paris Committee on Capacity Building to mention the various opportunities to engage within the Global Stocktake itself.'[109]

Material finance must also be accompanied by in-kind support through the sharing of expertise on renewable energy technologies, adapted to the unique geography of the Pacific region and its states.

[108] *(Civil Society Equity Review, 2022).*
[109] *(Civil Society Equity Review, 2022, 6).*

12.3 **JUSTICE, NOT JUST MITIGATION**

While those most responsible for the crisis must take the lead in addressing its causes, the task of decarbonisation and fossil fuel non-proliferation has to centre the needs and voices of frontline communities. Pacific Islands Countries have the most to lose from the impacts of climate change and as such their demands must guide the specific mechanisms by which climate mitigation and adaptation are to be carried out. The task before the world, therefore, is one intimately tied up with global justice, including economic justice, that seeks to address the wrongs of the past in order to build a more prosperous and just future.

The Pacific bears deep scars of past injustice as exemplified, previously, by the colonialism that allowed its islands to be claimed as possessions by foreign powers and their atolls used as nuclear testing sites, and, now, by ongoing economic exploitation. This unequal relationship continues to be intentionally perpetuated, not least by the dominant colonial powers in the region.[110]

[110] *See, for example, (Edney-Browne, 2021), on the role of Australia in this regard.*


NETWORK DEVELOPMENT
GOALS

13. CONCLUSIONS

A global phase-out of fossil fuels is overwhelmingly positive for Pacific Island Countries.

Substantial and rapid cuts to greenhouse gas emissions are needed to limit global warming to 1.5 degrees. If ambitious action is taken to decarbonise economies and substantially reduce the mining and burning of coal, oil and gas, the Pacific islands stand a fighting chance against a range of climate risks that threaten their very habitability. These include sea level rise, wave surge, increasingly severe tropical cyclones, ocean acidification, heavy rainfall, and drought, which in turn impact upon infrastructure, food and water security, ecosystem services, biodiversity, human health, the economy and cultural heritage.

A domestic energy transition in the Pacific would increase energy security, improve energy access, and offer multiple adaptation co-benefits. Renewable energy systems have been proven to withstand climate impacts, such as extreme weather, far better than fossil fuel energy systems, which are alarmingly vulnerable in comparison. Having their own renewable energy sectors would also save Pacific Island Countries considerable money, as fossil fuel imports are costly and the market increasingly volatile to price and supply shocks. With the exception of Papua New Guinea, Pacific Island Countries do not have a significant fossil fuel sector and as such would not be required to support a substantial workforce through a major transition.

However, the Pacific is in the unfortunate position of being 'double exposed' to the harms of the climate crisis and to the efforts undertaken to address it. The Pacific contains the world's largest deposits of Energy Transition Metals, which will be in exponentially higher demand as a result of the global renewable energy transition. These metals, such as copper, nickel, cobalt and lithium, are found in the Pacific's landmasses and deep ocean, and multinational corporations are already moving in to begin deep sea mining as early as 2024.

Deep sea mining is a destructive activity that further threatens the ocean and the ecosystem services it provides for human communities in the Pacific, including food resources. Having experienced the impacts of climate change first and worst, it would add insult to injury if the Pacific also carried the burden of negative impacts from the energy transition. Substantial efforts must be taken worldwide to ensure all negative impacts of the energy transition are carried in a fair and equitable way across developed and developing countries. Transformational and post-growth approaches to the just transition may be required to reduce the demand the human population is placing on the world's finite resources, including its energy resources.

Finally, Pacific Island Countries face significant challenges in implementing energy transitions, including large up-front costs, knowledge gaps, and lack of access to technologies. As the least responsible for the climate crisis, Pacific Island Countries - and all Small Island Developing States - must receive much more international climate finance so they can afford to build their own renewable energy sectors.

[105] *(Heede, 2014); (Climate Accountability Institute, 2020).*
[106] *See above, 1.1.*
[107] *(UNFCCC, 2005, 2).*

APPENDIX 1: EMISSIONS FIGURES METHODOLOGY

When undertaking a comparative analysis of national data, such as emissions profiles or renewables penetration, it is critical to be able to use consistent data sources across all metrics and geographies as much as possible. This is both to ensure that any calculations use the same baselines and so that it is possible to compare like with like when looking beyond the immediate area of inquiry. Doing so makes it possible, for example, to say that the Pacific's annual greenhouse gas emissions represent 0.23% of the global total and to be sure that the measurements for each have been consistently applied in doing so.

We have chosen, therefore, to use Climate Watch Data figures and charts throughout for greenhouse gas emissions levels and breakdowns, while for renewable energy we use International Renewable Energy Agency (IRENA) data and charts, down to the most recent years available, as the most authoritative and complete data sets available for each area. One outcome of this choice is that at times the figures used in this report may vary from official figures published by individual states profiled. It is important to emphasise that our choice not to use those official figures in such cases is not, and should not be seen as, making an inference about the accuracy of those official reports. Rather, it is done to enable us to meaningfully compare numbers across geographies and sectors: a task that would be less methodologically sound were we to use a number of differently calculated figures for each.

Despite their often controversial and rubbery nature, we have also included Land Use Change and Forestry (LUCF) emissions in our calculations, choosing to follow the UNFCCC and the Paris Agreement on Climate Change practice in this regard.

[111] *(Climate Watch, 2020a); (IRENA, n.d.).*

APPENDIX 2: ENERGY GENERATION METHODOLOGY

Energy generation

The breakdown of renewable and non-renewable energy generation was sourced from the International Renewable Energy Agency (IRENA)'s 2022 data set[112]

Non-renewable/fossil fuel breakdown

IRENA Energy Profiles provide an energy generation breakdown for renewable sources (hydro + marine, solar, wind, bioenergy and geothermal). These country profiles do not provide a generation breakdown for non-renewable sources (oil, gas and coal); however, Total Energy Supply (TES) and Energy-related CO2 emissions are disaggregated by non-renewable sources.

Using deductive reasoning, for Pacific Island Countries where the available Energy Supply data or CO2 emissions data from IRENA only indicated oil as a source (with gas and coal at 0%), we have concluded that oil is the sole non-renewable source of energy generation in that country.

In Papua New Guinea, where both oil and gas contribute to Energy Supply and Energy-related CO2 emissions, we have deduced that oil makes up the majority of non-renewable generation and gas the minority because of oil's higher contribution to Energy Supply and Energy-related CO2 emissions. We have not provided exact numeric figures for non-renewable composition in Papua New Guinea because of the limitations of calculating generation volume backwards from emissions data (often resulting in inaccurate conclusions unless the energy values of the fossil fuel sources, and the efficiency of the generation methods, are known).

Fossil fuel imports

Fossil fuel import data was accessed through the International Trade Centre (ITC) Trade Map database, searching each Pacific Island Country's imports using the Harmonised System (HS) codes for each fossil fuel.[113] The following HS codes were input:

Oil/Diesel: HS Code 2710 (Petroleum oils)

Gas: HS Code 27111100 (Liquified Natural Gas)

HS Code 271121 (Gas in a gaseous state)

Coal: HS Code 2701 (Coal; briquettes, ovoids and similar solid fuels manufactured from coal)

Where ITC data was more than 5 years old, or if the ITC lacked required data, the Observatory of Economic Complexity (OEC) Product in Country database was used.[114]

[112] *(IRENA, n.d.).*
[113] *(International Trade Centre, n.d.).*
[114] *(Observatory of Economic Complexity, n.d.).*

Calculating the renewables build out required for electricity decarbonisation

Section 3.2.4 of this report shows the estimated total amount of renewable capacity that would need to be built in each Pacific nation profiled, across different technologies, to replace its electricity generation that is currently provided by fossil fuels.

The table from that section is reproduced here for the sake of convenience.

Nation	Current RE generation (MWh/year)	Current fossil fuel generation (MWh/year)	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)
Papua New Guinea	1,263,000	827,000	586.36	262.24
Fiji	679,000	459,000	325.45	145.55
Solomon Islands	7,000	98,000	69.49	31.08
Vanuatu	22,000	56,000	39.71	17.76
Samoa	65,000	107,000	75.87	33.93
Kiribati	5,000	31,000	21.98	9.83
FS of Micronesia	4,000	60,000	42.54	19.03
Tuvalu	2,000	8,000	5.67	2.54

In order to arrive at these figures we:

1. Take the current annual electricity generation, in megawatt hours (MWh) sourced from fossil fuels

2. Multiply it by:

$$\frac{1}{\text{Global weighted average capacity factor of the renewable source}}$$

3. Divide that figure by the number of hours in a year (8760)

The final figure represents the total capacity in megawatts (MW) that would be required to be built for the renewable generation resource in question.

We use the following capacity factors for solar PV and onshore wind, derived from IRENA's authoritative *Renewable Technology Innovation Indicators* report.[115]

Solar PV	0.161
Onshore wind	0.36

Calculating the cost of the renewables build out required for electricity decarbonisation

Section 3.2.4 of this report shows the estimated total amount of renewable capacity that would need to be built in each Pacific nation profiled, across different technologies, to replace its electricity generation that is currently provided by fossil fuels.

The table from that section is reproduced here for the sake of convenience.

Nation	Total new Solar PV capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $857,000/ MW	LCOE (USD/ MWh)	Total new onshore wind capacity build that would be required to replace current fossil fuel supply (MW)	Total installed cost average (USD) = $1,325,000/ MW	LCOE (USD/ MWh)
Papua New Guinea	586.36	$502.5 million	$48	262.24	$347.47 million	$33
Fiji	325.45	$278.91 million	$48	145.55	$192.85 million	$33
Solomon Islands	69.49	$59.55 million	$48	31.08	$41.18 million	$33
Vanuatu	39.71	$34.03 million	$48	17.76	$23.53 million	$33
Samoa	75.87	$65.02 million	$48	33.93	$44.96 million	$33
Kiribati	21.98	$18.84 million	$48	9.83	$13.02 million	$33
FS of Micronesia	42.54	$36.46 million	$48	19.03	$25.21 million	$33
Tuvalu	5.67	$4.86 million	$48	2.54	$3.36 million	$33

The upfront cost of building the required capacity is calculated by:

1. Taking the total capacity required in megawatts, as arrived at in the previous calculation step, above
2. Multiplying it by the total installed average cost per MW of the particular generation technology

The total installed average cost per MW figure is sourced from IRENA's latest Renewable Power Generation Costs report.[116]

[116] (IRENA, 2022a, 15).

APPENDIX 3: EMPLOYMENT FIGURES METHODOLOGY

Workforce statistics were sourced where available from each country's most recent Labour Force Survey (LFS) or Household Income and Expenditure Survey (HIES) results, accessed through relevant government statistics bureau/department/division websites.[117] Where unavailable, the International Labour Organisation (ILO) Employment and Environmental Sustainability Factsheets series were used to find a percentage of employment in Electricity, Gas, Steam and Air Conditioning Supply.[118] This percentage was then applied to the country's total labour force figure, found on the The World Bank's World Development Indicators Database.[119]

[117] *See for example (The Government of Samoa Bureau of Statistics, n.d.).*
[118] *(International Labour Organisation, 2022).*
[119] *(World Bank, n.d.).*

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