



# Decarbonising the Pacific

*a national policy and sectoral target review*



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## Edoardo Santagata

### PhD Student



Edoardo is a PhD student at UNSW researching the broad themes of energy security and resilience in Pacific Island countries and territories. The main aim of this research is to develop a framework to integrate energy resilience into modelling energy futures and developing sound energy policies which can help achieve the Pacific's energy targets. Some topics he has explored for the application of this framework include the decarbonisation of energy supply chains, transport, shipping and navigation, as well as novel financing approaches.

Edoardo's consultancy experience includes assessment of clean shipping technologies, bioethanol production, and fuel efficiency policies in various Pacific locations. His previous work also includes innovative energy access models for remote communities using nature-based designs that rely on geothermal energy.

#### **Presentation Topics:**

##### **Scenario-based modelling for e-mobility in the Pacific**

- Reviewing the current state of e-mobility in the Pacific
- Introducing a resilience framework to understand and model e-mobility
- Discussing relevant data and modelling for decarbonisation
- Case study: Micronesia

##### **Decarbonising the Pacific: a national policy and sectoral target review**

- Introducing decarbonisation strategies for the Pacific
- Discussing national and sectoral emissions, their associated targets and policies, and path forward to achieve a decarbonised Pacific.



# DECARBONISATION Context

Strategies to achieve Net Zero

 Paris Agreement 2015

Below 1.5°C warming  
COP21, 196 Countries

ENERGY

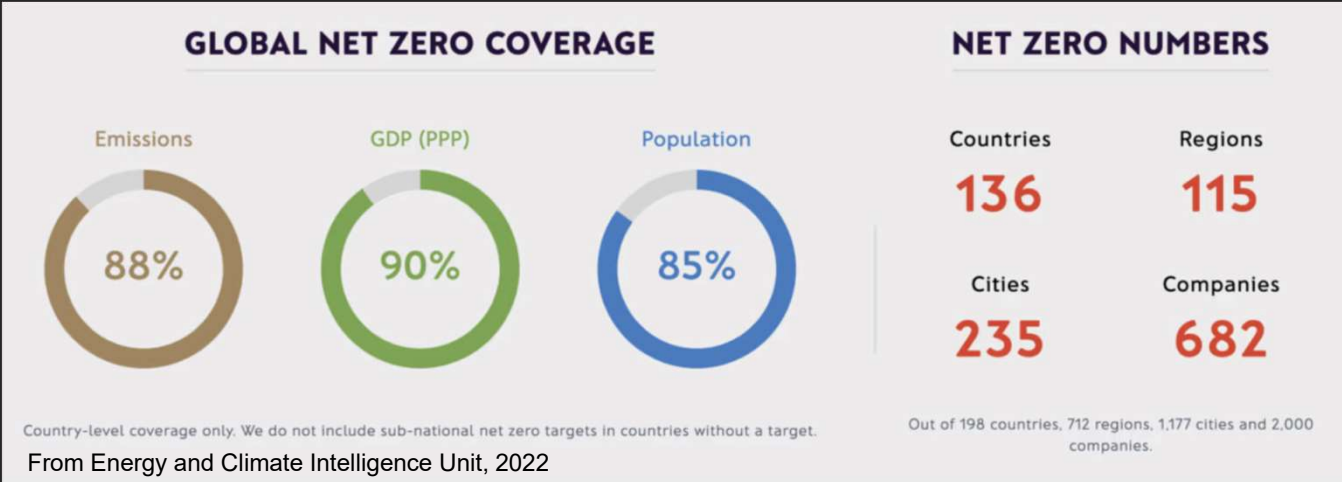


Renewable Energy  
Energy Efficiency  
Energy Sufficiency

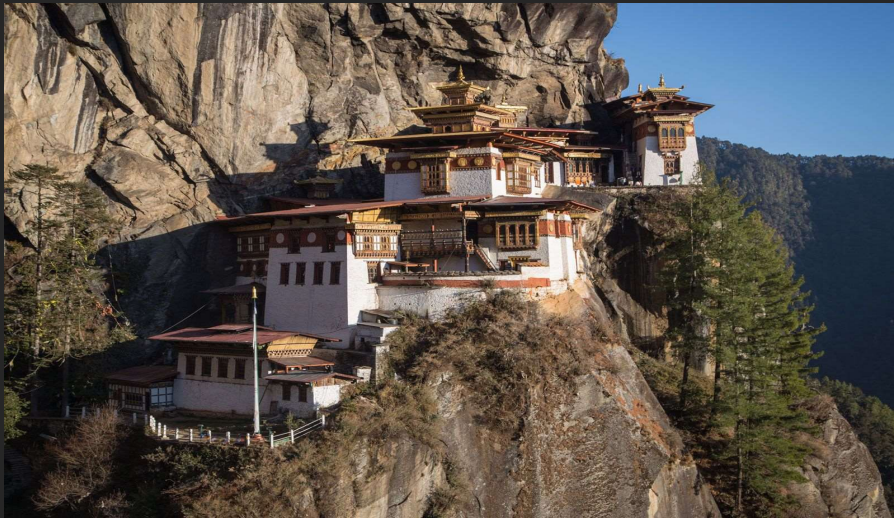


## Some Requirements...

- Exploration of technologies
- Cross-sectoral Dynamics
- Demand Shifts
- Capital Re-allocation
- High investment Costs
- Job Creation & Skills update
- Global & National Policy Action



# Examples of NET ZERO Economies



*Bhutan*

727,145 people 38,394 km<sup>2</sup>

*GDP: US\$9.8billion tot US\$12,970 per capita*

*Energy: 2,335 MW 11,059 GWh 100% access*



*Suriname*

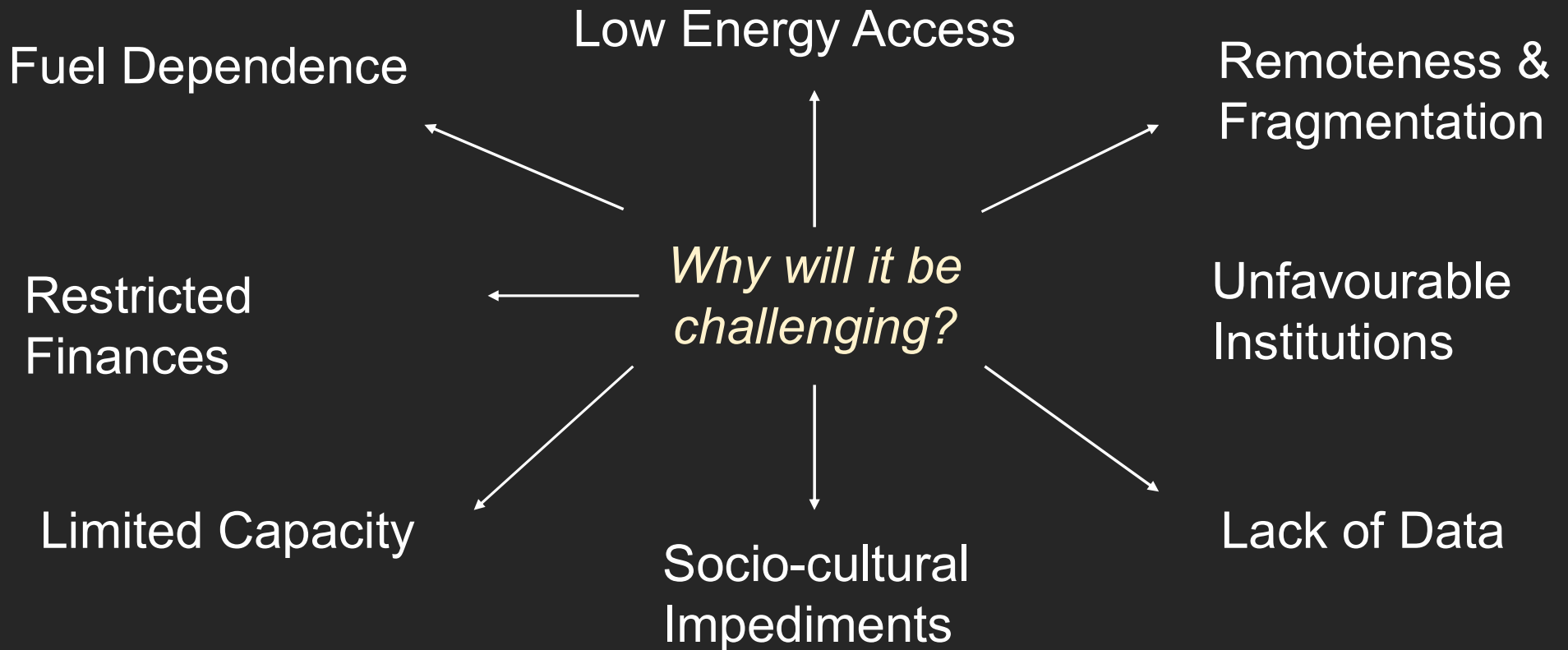
632,638 people 163,821 km<sup>2</sup>

*GDP: US\$10.7billion tot US\$17,350 per capita*

*Energy: 561 MW 1,755 GWh 94-98%  
access*

# DECARBONISATION for the Pacific

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# DECARBONISATION PRINCIPLES

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Common Understanding



Economic Competitiveness



Operationalisation



Policy & Regulation



Partnerships



Stakeholder Engagement

# POLICY & TARGET Review

Study conducted in June 2022

## Review Method



### 15 PICTs

Papua New Guinea  
Vanuatu  
Solomon Islands  
Cook Islands  
Fiji  
Micronesia  
French Polynesia  
Kiribati  
Nauru  
New Caledonia  
Niue  
Palau  
Samoa  
Tonga  
Tuvalu

Keyword search in policy  
databases (*Asia Pacific Energy Portal*,  
*PRDRSE4ALL*, governments, external)

“energy”, “electricity”, “climate”, “shipping”, “transport”, “fuel”,  
“navigation”, “land”, “petroleum”, “renewable”, “emissions”,  
“decarbonisation”, “sustainability”, “infrastructure”, “plan”,  
“strategy”, “target”, “policy”



## Emissions from *CAIT 2018*

*Database* (unless otherwise specified)

- Ambiguity regarding reporting framework
- Inconsistency across datasets
- Temporality restrictions

# Energy Targets

Country	Renewable Energy (% <sub>capacity</sub> )		Total Energy Consumption (TJ)	Energy Efficiency (MJ/\$2017 PPP GDP) (SDG7 2019)	Energy Efficiency Target	Energy Consumption Reduction Target
	Current	Target				
Papua New Guinea	50%	78% by 2030 (NDC 2020)	121184	4.6	N/A - but amply discussed in NEP 2017	N/A – discussion of projected increased petroleum demand and incentivisation of increased liquefied petroleum gas consumption, as well as expectations regarding domestic consumption of coal via resource discoveries in the Gulf Province. Oil consumption aimed to be replaced with gas and biofuel consumption primarily (NEP 2017)
Vanuatu	30%	100% by 2030 - includes copra oil (INDC 2015); 65% renewable electricity used by rural tourism bungalows by 2030 (NDC 2020)	2850	3.8	15% energy savings in energy sector by 2030 (INDC 2015); 13% electricity sector end use efficiency by 2030 (NDC 2020); 14% improvement in biomass end use efficiency by 2030 (NDC 2020); 5% increase in Energy Efficiency in Commercial and Residential Sector by 2030 (NDC 2020)	20 % Biodiesel (biofuel) Blending in Diesel by 2030 (NDC 2020)
Solomon Islands	48.5%	100% by 2050 (NDC 2021)	6705	4.9	Commitments to improve energy efficiency and conservation by regulating imports of electrical appliances by 2035 (NDC 2021)	N/A - but Tina River Hydropower set to reduce requirements
Cook Islands	5%	100% by 2020 (INDC 2011) - lapsed, unreachd; 100% by 2025 (CCP 2018)	850	NA	Continuing the REDD initiatives in energy efficiency. • Funding be sought to provide energy audits for industry and commercial sectors. • Funding to be sought to provide training programs for energy auditing (TNC 2019); 100% EE by 2025 (CCP 2018)	10% reduction in average monthly energy consumption in residential, commercial, and public sectors, as well as reduction of fossil fuel imports by 10% by 2015 – both as part of ADB’s PEEP Phase 2 Project (CIIP 2012) – no specific updates regarding achievement of target were provided in Technical Assistance Completion Report (ADB, 2016)
Fiji	27.9%	100% by 2030 (NDC 2015)	22160	2	10% energy efficiency improvements by 2030 (INDC 2015); Energy intensity (power consumption per unit of GDP in kWh/FJD) 0.219 in 2015, 0.215 in 2020, 0.209 in 2030 by 2015, 2020, 2031 against a 2011 baseline + Energy intensity (fuel consumption per unit of GDP in L/FJD) at 0.079 in 2015 and 2020, 0.077 in 2030 by 2015, 2020, 2030 against a 2011 baseline (NEP 2006)	32% by 2020 & 22% by 2030 reduction in fuel imports (GGF 2014)



# Energy Targets

Country	Renewable Energy (% <sub>capacity</sub> )		Total Energy Consumption (TJ)	Energy Efficiency (MJ/\$2017 PPP GDP) (SDG7 2019)	Energy Efficiency Target	Energy Consumption Reduction Target
	Current	Target				
Micronesia	1.75%	10% of electricity in urban centres and 50% in rural areas by 2020 (SDP 2004)	1385	5.6	50% increase in energy efficiency by 2020 (NEP 2012) – no specific outcomes provided	30% reduction in use of fossil fuels by 2020 (NEP 2012) – no specific outcomes provided
French Polynesia	7.56%	75% by 2030 (ETP 2015; NDC 2016)	8859	N/A	N/A	N/A
Kiribati	41%	100% by 2025 (KIER 2017); 23% South Tarawa, 40% Kiritimati, 40% Outer islands by 2025 (INDC 2015)	1327	6	22% South Tarawa, 20% Kiritimati, 20% Outer Islands by 2025 (INDC 2015); Reduction on total losses (technical and non-technical) of 9.68% equivalent to 2,033 MWh energy saved by 2025 (KIER 2017); 75% of households in urban areas access to modern forms of cooking fuel (LPG) by 2025 (KIER 2017)	12.32% reduction on electricity demand equivalent to 2,586MWh avoided from generation by 2025 - electricity generation, buildings, water and sewage, transport, cooking (KIER 2017) 45% reduction in use of fossil fuel by 2025 in Tarawa - 23% through RE and 22% with EE. 60% red for Kiritimati (40% RE 20% EE), and 60% for outer islands (same) (KIER 2017); Kerosene imports reduced by 50% by 2025 (base-year 2014) (KIER 2017)
Nauru	0.7%	100% by 2050 (NDC 2015)	502	5.1	30% improvement in energy efficiency by 2020 (NERM review 2018) – no specific outcomes provided	30% energy savings as conditional contribution as part of NDC, and PV projects expected to reduce diesel demand (NDC 2015; NERM review 2018)
New Caledonia	4,4%	100% by 2030 (STENC 2016)	38121	N/A	N/A - but role of efficiency standards discussed (STENC 2016)	20% in primary consumption (with mining and Metallurgy), 25% in final consumption (excluding mining and Metallurgy by 2030 (STENC 2016)
Niue	23.3%	80% by 2025 (NiSERM 2015)	76	N/A	4% energy savings from supply side management program by 2025 (NiSERM 2015)	15% of total billed electricity consumption reduced by 2025 (NiSERM 2015)

# Energy Targets

Country	Renewable Energy (% <sub>capacity</sub> )		Total Energy Consumption (TJ)	Energy Efficiency (MJ/\$2017 PPP GDP) (SDG7 2019)	Energy Efficiency Target	Energy Consumption Reduction Target
	Current	Target				
Palau	0.05%	45% by 2025 (INDC 2015)	2133	9.2	35% by 2025 (INDC 2015)	30% electrical energy consumption by 2020 (Climate Change Policy 2015) – no specific outcomes provided
Samoa	37%	100% by 2025 (INDC 2015)	4528	4.2	N/A – although its importance is mentioned in legislation (Energy Efficiency Act 2017)	N/A – although its importance is mentioned in legislation (Energy Management Act 2020)
Tonga	1.7%	70% by 2030 (NDC 2020)	1521	3	Reduction to 9% for electricity line losses by 2020 (NDC 2015). Energy efficiency mentioned in wider policy plans (TSDF 2015) – no specific outcomes provided. Energy Efficiency Master Plan 2018 proposes full adherence to MEPS and labelling by 2022. Line losses reduced to smallest possible amount by 2030. Incentivise solar hot water heater purchase (TEEMP 2018)	N/A – although some projects are expected to reduce fuel demand (TERM 2010). Plentiful targets to reduce fossil fuel consumption via vehicle electrification, fuel standards, biodiesel blends, and private vehicle use reduction (TEEMP 2018)
Tuvalu	9.9%	100% by 2025 (INDC 2015)	61	3	Energy efficiency increase of 30% by 2020 (TMPREEE 2012) – no specific outcomes provided. Energy Efficiency Act 2016 prescribes labelling and standardisation. Various energy efficiency measures for appliances and buildings (MPREEET 2012).	20% reduction in fuel imports against 2010 by 2020 (GSEP 2012) – achieved. 30% reduction of electricity demand in Funafuti (MPREEET 2012) – no specific outcomes provided.

# Total & Sectoral Emissions

Country	Sectoral Emissions Breakdown (MtCO <sub>2</sub> -e)												Total Emissions (MtCO <sub>2</sub> -e)
	Total Energy	LULUCF	Fugitive	Agriculture	Waste	Electricity & Heat	Transport	Manufacturing & Construction (M&C)	Other fuels	Industry	Aviation & Shipping	Buildings	
Papua New Guinea	13.31	41.1	5.29	4.77	4.63	2.89	2.13	1.87	0.95	0.27	0.25	0.17	64.09
Vanuatu	0.218	0.01	N/A	0.48	0.161	0.05	0.12	N/A	0.043	0.005	0.044	0.005	0.867
Solomon Islands	0.381	45.4	N/A	0.07	0.352	0.09	0.234	0.023	0.034	0.133	0.036	0.001	46.35
Cook Islands	0.086	0	N/A	0.02	N/A	0.031	0.055	N/A	N/A	N/A	0.038	N/A	0.098
Fiji	2.15	-2.54	N/A	0.37	0.13	0.4	0.987	0.292	0.356	0.172	0.479	0.117	0.283
FSM	0.187	-0.03	N/A	0.07	0.013	0.076	0.103	N/A	0.009	0.005	0.037	N/A	0.236
French Polynesia	0.243 (EDGAR, 2018)	N/A	N/A	0.145 – with waste (EDGAR, 2018)	0.145 – with agriculture (EDGAR, 2018)	N/A	0.502 (EDGAR, 2018)	0.108 – with industry (EDGAR, 2018)	N/A	0.108 – with M&C (EDGAR, 2018)	N/A	0.075	0.939 (EDGAR, 2020)
Kiribati	0.079	0	0	0.01	0.018	0.027	0.034	0.001	0.008	0.003	0.002	0.009	0.11
Nauru	0.071	0	0	0	0.003	0.036	0.016	0.033 (2011)	0.02	1E-03	0.03	0	0.766
New Caledonia	3.816 (EDGAR, 2018)	N/A	N/A	0.05 – with waste (EDGAR, 2018)	0.05 – with agriculture (EDGAR, 2018)	N/A	1.634 (EDGAR, 2018)	1.362 – with industry (EDGAR, 2018)	N/A	1.362 – with M&C (EDGAR, 2018)	N/A	N/A	7.323 (EDGAR, 2020)
Niue	0.007	0	0	0	N/A	0.003	0.004	0	0	0	0.002	0	0.006
Palau	0.288	0	0	0.02	0.019	0.101	0.179	0	2E-6	0.001	0.06	0.008	0.321
Samoa	0.325	0.11	0	0.2	0.151	0.085	0.181	0	0.011	0.113	0.051	0.047	0.798
Tonga	0.2	0	0	0.08	0.065	0.049	0.133	0	0.01	0.004	0.02	0.009	0.347
Tuvalu	0.012	0	0	0.01	0.006	0.006	0.005	0	0.001	0.002	0	0	0.026

# National Emissions Targets

Country	INDC/NDC?	National Target
Papua New Guinea	Yes, NDC	50% by 2030, C-0 by 2050 (NCCDMP 2014)
Vanuatu	Yes, NDC	C-0 by 2050 (IISD 2019)
Solomon Islands	Yes, NDC	14% by 2025 + 33% by 2030 against 2015, With assistance: 27% by 2025 and 45% by 2030 and C-0 by 2050 (NDC 2021)
Cook Islands	Yes, INDC	38% by 2030 against 2006 + conditional 48% extra (81% total reduction) (INDC 2011); Confirm a zero emissions target for the Cook Islands by 2040 (CCP 2018)
Fiji	Yes, NDC	C-0 by 2050 - also a sector-wide goal (CCA 2021) (LEDS 2019)
FSM	Yes, INDC	28% by 2025 against 2000 (INDC 2011) + conditional: 35%
French Polynesia	Yes, NDC as part of France	15% against 2010 by 2030 (NDC 2016) - excludes agriculture
Kiribati	Yes, INDC	13.7% by 2025 and 12.8% by 2030 compared to a BaU projection (2000-2014) (INDC 2015) + conditional with assistance 48.8% by 2025 49% by 2030 and 61.8% by 2030
Nauru	Yes, NDC	C-0 by 2050 (NDC 2015)
New Caledonia	Yes, NDC as part of France	15% from 2020 to 2021 emissions (PSO 2020) - lapsed
Niue	Yes, INDC	N/A - but sectoral targets to reduce emissions
Palau	Yes, INDC	20% by 2020 against 2005 (Climate Change Policy 2015)
Samoa	Yes, NDC	26% by 2030 against 2007 (NDC 2021)
Tonga	Yes, NDC	N/A - but sectoral targets to reduce emissions
Tuvalu	Yes, INDC	N/A – but target for energy sector



# Sectoral Emissions

Country	Sectors							
	Energy	LULUCF	Shipping (Included in energy)	Agriculture	Waste	Transport	Buildings	Mining & Metallurgy
Papua New Guinea	EE, NBS, DC + RE Target (NDC 2020)	10 Mt against 2015 by 2030; 25% deforestation and degradation reduction (NDC 2020)	N/A	N/A - but tied into LULUCF and 10% people increased resilience of food and water security; annual net 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 by 2030 (NDC 2020)	N/A	N/A	N/A	N/A
Vanuatu	30% (72Gg) compared to BAU projections in 2010-2030 period by 2030 (3% per annum increase) (INDC 2015); Updated NDC shows 40% (78.786 Gg CO2e) (NDC 2020)	No specific NDC actions identified for forestry sub-sector as the measures to reduce deforestation and promote good land care to accepted mitigation practices are still under development under the REDD+ initiative. However, forestry aimed at being C-0, sustainable logging, and participation in REDD+ (NDC 2020)	40% emissions reduction for domestic marine shipping by 2030 (PBSP 2019)	9% emissions reduction against BAU for livestock (reduction of 30.977 Gg CO2eq in 2030) by 2030 via Training and capacity building for livestock farming and pasture management, Converting Pastures to Silvopastoral Livestock Systems, and International Collaboration to Improve Livestock Efficiency	56% emissions reduction against BAU (29.335 Gg in 2030 in comparison to BAU scenario) by 2030 via MSW (with 1 composting plant), 3 waste-to-energy plants, recycling, plastics strategy, and wastewater management (1000 bio-toilets) (NDC 2020)	N/A	Construction of 10 energy efficient buildings by 2030 (NDC 2020)	N/A

# Sectoral Emissions

Country	Sectors							
	Energy	LULUCF	Shipping (Included in energy)	Agriculture	Waste	Transport	Buildings	Mining & Metallurgy
Solomon Islands	All solar photovoltaic systems and hydropower will be contributing to reductions in GHG emissions by 55,347.31 tCO <sub>2</sub> e annually (NDC 2021)	Protect at least 20% of the terrestrial and inland water; 15% of coastal and marine areas enabling ecological, representative and well-connected system of protected area in the country (NDC 2021)	40% emissions reduction for domestic marine shipping by 2030 (PBSP 2019)	Support resource owners implement carbon assessments and carbon trading through agriculture mitigation (NDC 2021)	Landfill recovery, recycling, and other waste modelling conducted to understand potential of waste management (Solomon Islands – Waste Data report 2018)	N/A -	N/A	N/A
Cook Islands	38% emissions reduction in electricity by 2020 against 2006 (INDC 2011)	N/A	N/A	Little opportunity is seen in this sector for meaningful emissions reductions due to the overall decline in this sector (TNC 2019)	The conversion of the current household septic tank waste disposal system to a piped system with centralised disposal could provide opportunities for emissions reductions. In addition to septic waste, other solid waste disposal options currently being pursued (TNC 2019)	N/A - but transport emissions impacts studied (TNC 2019)	N/A	N/A

# Sectoral Emissions

Country	Sectors							
	Energy	LULUCF	Shipping (Included in energy)	Agriculture	Waste	Transport	Buildings	Mining & Metallurgy
<b>Fiji</b>	30% against 2013 by 2030 (RE Target 20%, EE 10%) (NDC 2015); C-0 by 2050 (CCA 2021)	C-0 by 2050 (CCA 2021); Internal waters, archipelagic waters, territorial seas, contiguous zone and exclusive economic zone to be 100% sustainably and effectively managed + 30% of Fiji's internal waters, archipelagic waters, territorial seas, contiguous zone and exclusive economic zone to be designated as a marine protected area by 2030 (CCA 2021); signed a landmark agreement with the Forest Carbon Partnership Facility (FCPF) - 90% landmass initiative aims to reduce emissions by 2.5 million tonnes over five years and will also contribute to restoration of ecosystem services essential for increasing resilience to climate change, such as soil retention and flood regulation (WB 2021)	40% emissions reduction for domestic marine shipping by 2030 (NDC 2015); C-0 by 2050 (CCA 2021)	C-0 by 2050 (CCA 2021) - but there exists Assessment of the Co-benefits of Greenhouse Gas Mitigation Options for Agriculture in Fiji (Doran-Browne et al. 2020)	C-0 by 2050 (CCA 2021)	C-0 by 2050 (CCA 2021)	C-0 by 2050 (CCA 2021)	N/A - but contribution to electricity consumption recognised (LEDS 2018)
<b>FSM</b>	N/A	March 2014, a land protection deal ('conservation easement') was declared in Kosrae, protecting 78 acres of forested wetland (KIRMA 2014)	NA	N/A - there is an Agriculture Policy 2012-2016	N/A	N/A	N/A	N/A
<b>French Polynesia</b>	N/A	N/A	N/A	N/A	N/A	N/A	N/A - but encouraging eco-construction as strategy to reduce emissions (NDC 2016)	N/A

# Sectoral Emissions

Country	Sectors							
	Energy	LULUCF	Shipping (Included in energy)	Agriculture	Waste	Transport	Buildings	Mining & Metallurgy
Kiribati	47% by 2025 - not as target but as indication of what can be achieved with intended RE and EE projects (KIER 2017)	N/A	50% by 2050 (KIER 2017)	NA - but extensive KAS 2020 for other matters	N/A	N/A	N/A	N/A
Nauru	6MW Solar Farm contributes 11,155 tons of CO2 equivalent annually - which is roughly 16% of annual emissions (NDC 2015)	N/A - but various initiatives for sustainable land management (NDC 2015)	Completion of new port facility by 2023 with estimated reductions in CO2 emissions are 535,400 tons over 50-year lifetime (NDC 2015)	N/A - mostly concerned with food imports	N/A - but enhancement of waste management facility plan (NDC 2015)	N/A - but automobile dependency to be reduced	N/A - but passive cooling for buildings discussed	N/A
New Caledonia	N/A	N/A	N/A	N/A	N/A	15% reduction by 2030 - 40kt in one year (STENC 2016)	35% reduction by 2030 for residential and tertiary sectors - 70kt in one year (STENC 2016)	10% reduction by 2030 - 140kt in one year (STENC 2016)
Niue	N/A - but RE Target and quantified emissions impact (NDC 2015)	N/A - but National Forest Policy to guide preservation and enhancement of current sink (NDC 2015)	N/A	N/A - not reported in 2009 inventory used for commitments (NDC 2015)	N/A - not reported in 2009 inventory used for commitments (NDC 2015)	N/A	N/A - but building code renewal (NDC 2015)	N/A
Palau	22% by 2025 against 2005 (INDC 2015)	N/A - but sustainable management of carbon sinks by 2020 (Climate Change Policy 2015)	N/A - but Palaureg.com points out participation in decarbonisation process for shipping	N/A - but some pilot projects (SPREP 2008)	N/A	N/A	N/A	N/A



# Sectoral Emissions

Country	Sectors							
	Energy	LULUCF	Shipping (Included in energy)	Agriculture	Waste	Transport	Buildings	Mining & Metallurgy
Tonga	13% by 2030 against 2006 (NDC 2020)	N/A – but planting 1 million trees by 2023 and identification of a target in the 2025 NDC (NDC 2020)	N/A – but collaboration with IMO proposed (NDC 2020)	N/A – but identification of target in the 2025 NDC (NDC 2020)	N/A – but identification of target in the 2025 NDC (NDC 2020)	N/A – but 10% of light duty vehicles electrified by 2030, all diesel containing 10% biodiesel by 2030, 30% improvement in fuel economy for new light duty vehicles by 2030, 20% reduction of private vehicle use by 2030 (TEEMP 2018)	N/A – discussed in Energy Efficiency Master Plan 2018 but no specification of energy and associated emissions saved	N/A
Tuvalu	100% in electricity generation and 60% in whole energy sector by 2025 (INDC 2015)	N/A – lack of data inventory prevents establishment of precise target	40% emissions reduction for domestic marine shipping by 2030 (PBSP 2019)	N/A – lack of data inventory prevents establishment of precise target	N/A – lack of data inventory prevents establishment of precise target	N/A – lack of data inventory prevents establishment of precise target	N/A – lack of data inventory prevents establishment of precise target	N/A

# CONCLUSIONS — key takeaways from this review

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Ambitious targets with limited planning

Clear relationships between energy & emissions integrated in action plans

Integration of themes such as Blue Carbon to exploit potentials of the Pacific

Sectoral plans that include consideration of spill-over

Updated target summary based on COP27 announcements

Integration within decarbonisation models to explore opportunities and implications of net zero

1% of global emissions — but leading by example