

The Republic of Vanuatu First Biennial Update Report

**UNDER THE UNITED NATIONS FRAMEWORK
CONVENTION ON CLIMATE CHANGE
(UNFCCC)**



**The Government of
The Republic of Vanuatu**

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Foreword



It gives me great pleasure to present to you Vanuatu's First Biennial Update Report (BUR) to the United Nations Framework Convention on Climate Change (UNFCCC).

Vanuatu's first BUR focus on GHG inventory for 2016 & 2017; mitigation actions/measures; constraints and gaps related to financial, technical and capacity and support needs and BUR support received and needed.

The Biennial Update Report (BUR1) includes:

Updated National circumstances and institutional arrangements, National GHG inventory for 2016 & 2017, Mitigation actions and their effects - methodologies and assumptions, Constraints and gaps, and related financial, technical and capacity needs - support needed and received. Level of support received for the preparation and submission of BUR Domestic MRV and Any other relevant information.

The preparation for the BUR1 would not have been possible without the cooperation and commitment of numerous experts and stakeholders and the provision of valuable data from government ministries, agencies, organisations, and non-governmental organisations. I would like to express my sincere gratitude to them and the Technical Working Groups and Sub-Working Groups for their hard work and dedication. I would also like to take this opportunity to thank the UNFCCC, Global Environment Facility (GEF) and United Nations Development Programme (UNDP) for facilitating the preparation of this report.



Honourable Bruno Leingkone TAO (MP)

Minister

Ministry of Climate Change

Acronyms and Abbreviations

ACSE GIZ/EU	Adapting to Climate Change and Sustainable Energy
ADB	Asian Development Bank
AE	Accredited Entities
AF	Adaptation Fund
AFD	Agence Française de Développement
AFOLU	Agriculture, Forestry and Other Land Use (2006 IPCC Guidelines)
AGM	Annual General Meeting and Disaster Management
Annex I	Parties included in Annex I to the UNFCCC
AOSIS	Alliance of Small Island States
APTC	Australia-Pacific Technical College
AusAID	Australian Agency for International Development
BMZ	Federal Ministry of Economic Cooperation and Development (Germany)
BUR	Biennial Update Report
CBO	Community-Based Organisation
CC	Climate Change
CCA	Climate Change Adaptation
CCCPIR	Coping with Climate Change in the Pacific Islands Region Project
CCDRM	Climate Change and Disaster Risk Management
CCDRR	Climate Change and Disaster Risk Reduction
CCFWG	Climate Change Finance Working Group
CCM	Climate Change Mitigation
CDCCC	Community Disaster and Climate Change Committee
CDM	Clean Development Mechanism (implemented under the Kyoto Protocol)
CDP	Community Development Plans
CF	Climate Finance
CFR	Climate Finance Roadmap
CFRP	Climate Finance Readiness for the Pacific Project
CLEWS	Climate Early Warning Systems
COP	Conference of the Parties
CPEIR	Climate Public Expenditure and Institutional Review
CROP	Council of Regional Organisations in the Pacific
CSO	Civil Society Organisation
DARD	Department of Agriculture Degradation
DEPC	Department of Environmental Protection and Conservation
DEPC	Department of Environmental Protection and Conservation
DFAT	Australian Department of Foreign Affairs and Trade
DFID	Department of International Development (UK)

Acronyms and Abbreviations

DLA	Department of Local Authorities
DoCC	Department of Climate Change
DoE	Department of Energy
DoF	Department of Forests
DoFT	Department of Finance and Treasury
DRR	Disaster Risk Reduction
DSPPAC	Department of Strategic Policy, Planning and Aid Coordination
FAO	Food and Agriculture Organization
FMIS	Financial Management Information System
FRDP	Framework for Resilient Development in the Pacific
GCCA	Global Climate Change Alliance
GCCI	Global Climate Change Initiative (US)
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEF	Global Environment Facility
GGGI	Global Green Growth Institute
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GoV	Government of Vanuatu
GWP	Global Warming Potential
INDC	Intended Nationally Determined Contribution
INGO	International Non-Governmental Organisation
IPCC	Intergovernmental Panel on Climate Change
IPP	Independent Power Producer
IPPU	Industrial Processes and Product use (2006 IPCC Guidelines)
IPSAS	International Public-Sector Accounting Standards
IRCCNH	Increasing Resilience to Climate Change and Natural Hazards
ISACC	Institutional Strengthening of PICs to Adapt to Climate Change Project
IUCN	International Union for Conservation of Nature
LPG	Liquefied Petroleum Gas
M&E	Monitoring and Evaluation
MALFFB	Ministry of Agriculture, Livestock, Forestry, Fisheries and Biosecurity
MCCA	Ministry of Climate Change Adaptation, Meteorology and Geo-hazards, Energy, Environment
MFEM	Ministry of Finance and Economic Management
MIPU	Ministry of Infrastructure and Public Utilities
MoCC	Ministry of Climate Change

MOFA	Ministry of Foreign Affairs (Japan)
MoTI	Ministry of Trade and Industry
MoU	Memorandum of Understanding
MRV	Measurement, Reporting and Verification
NAB	National Advisory Board
NAB	National Advisory Board for Climate Change and Disaster Risk Reduction
NAB Sec	National Advisory Board for Climate Change and Disaster Risk Reduction Secretariat
NAMA	Nationally Appropriate Mitigation Actions
NAP	National Adaptation Plan
NAPA	National Adaptation Programme of Action
NDA	National Designated Authority
NDC	Nationally Determined Contributions
NDMO	National Disaster Management Office
NGEF	National Green Energy Fund
NGO	Non-Governmental Organisation
NGOs	Non-Governmental Organizations
NIE	National Implementing Entity
Non-Annex I	Parties not included in Annex I to the UNFCCC
NSDP	National Sustainable Development Plan
NTR	Non-Tax Revenue
PACCSAP	Pacific-Australia Climate Change Science and Adaptation Planning
PCCFAF	Pacific Climate Change Finance Assessment Framework
PCCP	Pacific Climate Change Portal
PICs	Pacific Island Countries
PIFS	Pacific Islands Forum Secretariat
PMO	Prime Minister's Office
PMU	Project Management Unit
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SDGs	Sustainable Development Goals
SIDS	Small Island Developing States
SPC	The Pacific Community
SPREP	Secretariat of the Pacific Regional Environment Programme
SREP	Scaling-Up Renewable Energy Program (implemented through WB, ADB, AfDB, EBRD and
TNC	Third National Communication
TWG	Thematic Working Group
UNCDF	United Nations Capital Development Fund
UNDP	United Nations Development Programme

Acronyms and Abbreviations

UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations Office for Disaster Risk Reduction
UNOHCHR	Office of the United Nations Office of the High Commissioner for Human Rights
UNREDD	United Nations Programme on Reducing Emissions from Deforestation and Forest
URA	Utilities Regulatory Authority
USAID	United States Agency for International Development
USP	University of the South Pacific
VAF	Vulnerability Assessment Framework
VANGO	Vanuatu Association of Non-Government Organisations
VCAN	Vanuatu Climate Action Network
VCAP	Vanuatu Coastal Adaptation Project
VIT	Vanuatu Institute of Technology
VMGD	Vanuatu Meteorology and Geo-Hazards Department
VPMU	Vanuatu Project Management Unit
VREP	Vanuatu Rural Electrification Project
VSNO	Vanuatu National Statistics Office
VUI	Vanuatu Utility Infrastructure
WASH	Water, Sanitation and Hygiene
WB	World Bank
WHO	World Health Organisation
WMO	World Meteorological Organization

Executive Summary

National Circumstances

Vanuatu comprises of 83 islands, and lies in the middle of Fiji, Solomon Islands and New Caledonia. The indigenous people of Vanuatu, or ni-Vanuatu, are Melanesians. About 7–8% of the population are immigrants or descendants from Europe, Asia and countries in the Pacific Islands region. The independence of the sovereign state of Vanuatu was celebrated on 30 July 1980, and the country became the 155th member of the United Nations in September 1981. Vanuatu's national political structure consists of legislative, executive and judiciary branches. The legislative branch consists of a single chamber, parliament, with 52 seats. Members of parliament are elected every four years. Only 12 islands could be called significant in terms of their economy and population. The largest are Espiritu Santo (4010 Km²), Malekula (2,069 Km²), Efate (980 Km²) and Erromango (900 Km²). Santo also boasts the country's highest peak: 1,879m Mt Tabwemasana. Ambae, Ambrym and Tanna have peaks over, 1000m high. The largest of the islands, Espiritu Santo and Malekula cover 50% of the country's land mass and harbor the majority of Vanuatu's population.

Vanuatu's climate varies from wet tropical in the north to subtropical in the south, with much drier rain-shadow areas in between. The northern islands receive on average over 4000mm of annual rainfall, while the southern parts of the archipelago receive average annual rainfalls of 1500mm. Rainfall in the country is generally affected by the South Pacific Convergence Zone (SPCZ). The SPCZ intensifies during the wet season and moves further south bringing higher rainfall to Vanuatu. Low pressure systems embedded in this band of heavy rainfall often become tropical cyclones during the cyclone season. Tropical cyclones tend to affect Vanuatu between November and April. The number of cyclones varies widely from year to year, with none in some seasons but up to six in others.

Seventy-four percent (74%) of land in Vanuatu is covered with natural vegetation. Forest types include tropical lowland evergreen rain forest, broad-leaved deciduous forest, closed conifer forest, montane rain forest, cloud forest and coastal forest. There are about 1,000 vascular

plant species in Vanuatu of which around 150 are endemic. There is high diversity of orchids with 158 species and palms with 21 species, including 14 endemic species (GOV, 2014). There are 121 bird species, 28 species of reptiles and 12 species of Chiropterae (Flying Foxes and Bats). Invertebrate diversity is not fully described but includes the coconut crab (*Birgus latro*) the largest land crab, which is an important food resource in Vanuatu (GOV, 2014).

Vanuatu's marine and coastal biodiversity contribute to generating goods and services with a value totaling over VT4.5 billion. The values include the tourism and tuna fishing sectors. The net value of tourism in 2013 was approximately VT850 million. The value of tuna to Vanuatu, mainly from access fees, was about VT160 million in 2013. Coastal habitats are valued in terms of what they contribute to subsistence fishers (about VT580 million), small-scale inshore commercial fishers (VT290 million), coastal protection (VT1.6 billion) and carbon sequestration (VT760 million) (Pascal et al., 2015). According to the most recent Mini Census undertaken in 2016, Vanuatu's population was reported to be a total count of 272, 459 compared to a population count of 234,023 in the last 2009 census. Vanuatu's population is largely based within its' rural areas – 75 percent as per 2016 figures. Accordingly, the two provinces of Shefa and Sanma which host Vanuatu's urban centres of Port Vila and Luganville respectively have the highest populations. Vanuatu has a young population where up to 50 percent of its' population is under the age of 40 years. The population make up is such that it is close to a 1:1 male to female ratio although projections indicate a somewhat leveling of ratios by 2050.

Vanuatu is traditionally known for its strong cultural heritage tradition activities and subsistence farming. The four mainstays of Vanuatu's economy are agriculture, tourism, offshore financial services, and raising cattle. Exports include copra, kava, beef, cocoa, and timber, and imports include machinery and equipment, foodstuffs, and fuel. In 2017, Vanuatu's economy grew by 4.4 percent with a strong performance over the last three previous years.

Biomass and imported petroleum product are the main energy sources for Vanuatu. Biomass is principally used for

residential purposes such as for cooking and crop drying. However, petroleum products are important inputs into major sectors of the economy – electricity, industry, tourism, transportation, fishing and agriculture. Presently, Vanuatu primary needs are mainly met by imported petroleum. Consumption of petroleum has increased substantially, at an annual average rate of 6% over the years. The bulk of electricity is derived from diesel (71%) and renewable energy (29%). Renewable sources currently being utilized include hydro, solar, wind and biofuel.

The manufacturing sector in Vanuatu is very small and is driven by just few players mainly based in Luganville and Port Vila. It is estimated that Vanuatu has just 3.8% of manufacturing value added as a percentage of its' GDP. Tourism is a mainstay of the Vanuatu economy. Vanuatu has more recently embarked on a “greener” path as per its' National Sustainable Tourism Policy (VSTP). Given broad growth trends, the total international visitor arrivals to Vanuatu for September quarter 2019 stood at 63,407, reflecting a decline of 16% over the corresponding period in 2018.

Subsistence farming makes up more than 75% of all agriculture in Vanuatu. This type of farming centres around root crops such as Taro, Yam, Cassava and Sweet Potato. Additionally, subsistence farming focuses on consumption and cultural purposes. There is also small scale semi commercial farming that is concentrated around the urban areas. In general, the agricultural sector accounts for more than 75 percent of exports, of which the most important agricultural product is copra, which is the dried meat or dried kernel of the coconut used to extract coconut oil. Compared to other Pacific island countries, inshore marine areas are not extensive in Vanuatu. Inner reef areas are limited to narrow fringing reefs and the area covered by mangroves is quite small. A total of 161 vessels were reported in 2016 with just over half under 12 m length overall (LOA). In 2016, the aquaculture sector employed 34 women and 173 men. An estimated 38% of the people engaged in marine fishing and subsistence fisheries were women.

The average amount of solid waste generated per capita has increased steadily from 0.43 kg/person/day in 2011 to about 1.5 kg/person/day in 2017. Both the urban centers of Port Vila and Luganville have controlled disposal sites or landfill in as in Port Vila's case. Aside from disposal within the

urban controlled sites, common disposal methods include open backyard dumpsites, disposal at sea or on unused land, and burning. Liquid waste is not treated effectively via a reticulated system. Most houses and establishments have individual onsite disposal systems to manage liquid or sanitation waste water.

Life expectancy in Vanuatu has increased and now stands at 69.6 and 72.7 years for males and females, respectively (VNSO, 2009). But the country faces the dual challenges of dealing with both communicable diseases and the rapidly growing incidence of Non-Communicable Disease (NCD), notably diabetes and hypertension. People are living longer, but often with the burden of chronic illness and disability. Overall the health system faces significant challenges in its quest to achieve Universal Health Coverage.

Vanuatu operates a bilingual education system, with English and French languages being taught to According to the statistics of the ECCE sector in 2016, the number of enrolment and teachers shows increases compared to 2017 data. Overall the government's push for school grants has enables the increase of school enrolments across the education sector.

National Greenhouse Gas (ghg) Inventory (2016 & 2017)

The Vanuatu's biennial National Greenhouse Gas (GHG) Inventory report provides an update to the national GHG emissions by sectors as per the biennial update reporting guidelines for Non-Annex I Parties. In this report, a detailed description of the anthropogenic GHG emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) by sources and their removal by sinks has been presented for the years 2016 and 2017. This report also presents an account of the methodologies used, the quality assurance/ quality control (QA/QC) measures applied, the results of the key category analysis, and approach including quantification of the uncertainties associated with the estimates.

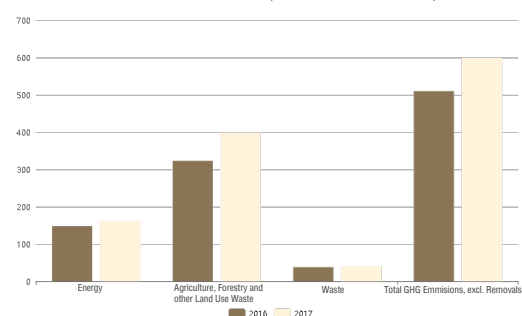
Republic of Vanuatu's GHG emissions for the year 2016 and 2017 were 509.531 Gg CO₂e and 600.209 Gg CO₂e respectively without removals,. The forestry sector remained a net sink and makes Vanuatu a net carbon negative country. A summary of GHG emissions excluding removals from Vanuatu for the year 2016 and 2017 presented in Table

ES-1 and shown in Figure ES-1.

Vanuatu's Total GHG Emission-Sector wise (excluding removals), Gg CO2eq: 2016 and 2017

Categories	2016	2017
1 - Energy	148.121	161.290
2 - Industrial processes and product use (ippu)	0	0
3 - Agriculture, forestry, and other land use (afolu)	323.022	399.381
4 - Waste	38.388	39.539
Total	509.531	600.209

Vanuatu's Total GHG Emission (excluding removals), Gg CO2eq



The GHG emissions from Vanuatu comprises of mainly Carbon Dioxide (CO₂) as major contributor from combustion of fossil fuel for generation of electricity, transportation and other sectors; Methane (CH₄) and Nitrous Oxide (N₂O) emissions from agriculture-livestock (Enteric fermentation and Manure management), Waste Sector (Solid waste and waste water) and Land. Livestock is a major source of Methane emission in Vanuatu. The Vanuatu's GHG inventory does not include the emissions from the indirect GHGs i.e. Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), Non-Methane Volatile Organic Compounds (NMVOC) and Sulphur dioxide (SO₂). These indirect GHG emissions are not accounted in the aggregated national GHG emissions. A summary of GHG emissions (excluding removals) are presented in Table ES-2.

Vanuatu's GHG Emission-Gas wise (excluding removals), Gg CO2eq

Inventory Year: 2016-2017	GHG Emissions (excluding Removals)			
	Gg CO ₂	Gg CH ₄	Gg N ₂ O	Total Gg CO ₂ eq.
2016	146.637	10.892	0.219	509.531
2017	159.669	13.512	0.235	600.209

The total GHG emissions in Vanuatu is contributed by three main sectors viz Agriculture (livestock and land), Energy and Waste Sectors. The average contribution of these sectors for the year 2016-2017 were: Agriculture (65%), Energy Sector (28%), and Waste Sector (7%), there is no contribution from industrial process and solvent & other product use (IPPU) sector. At the sub-sector level, the Livestock Enteric Fermentation and Manure Management is the major source of GHG emissions, the average emissions form these sub-categories are 43% and 20% respectively; followed by the transport sector 15%; Energy Industries (Electricity Generation) 8%; Solid Waste Disposal 6%; Manufacturing Industries and Construction 4%; Land Management 2%; Domestic Waste Water Treatment and Discharge and Other Sectors including Commercial, Institutional and residential both 1%.

Vanuatu's GHG Emission-Sector and Sub-sector wise (excl. removals), Gg CO2eq

Inventory Year: 2016-2017	Total CO ₂ Emissions, (Gg CO ₂ Equivalents)	
Total National Emissions and Removals: Categories	2016	2017
1 - Energy	148.121	161.290
1.A - Fuel Combustion Activities	148.121	161.290
1.A.1 - Energy Industries	40.698	43.700
1.A.2 - Manufacturing Industries and Construction	22.963	24.308
1.A.3 - Transport	77.962	86.101
1.A.4 - Other Sectors	6.498	7.181
2 - Industrial Processes and Product Use	-	-
3 - Agriculture, Forestry, and Other Land Use	323.022	399.381
3.A - Livestock	312.106	384.395
3.A.1 - Enteric Fermentation	202.547	269.999
3.A.2 - Manure Management	109.559	114.396
3.C - Aggregate sources and non-CO₂ emissions sources on land	10.917	14.985
3.C.6 - Indirect N ₂ O Emissions from manure management	10.917	14.985
4 - Waste	38.388	39.539
4.A - Solid Waste Disposal	30.658	31.732
4.D - Wastewater Treatment and Discharge	7.730	7.807
Total ghg emissions, excl. Removals	509.531	600.209

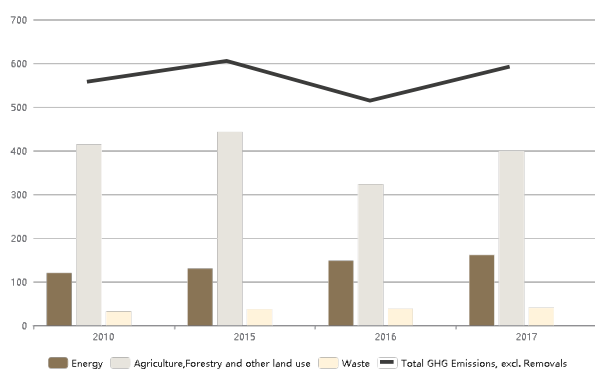
Key category analysis has been carried out to identify sources with significant impact (up to 95%) on total emission levels or trends. The primary purpose of key category analysis is to prioritize application of higher tier methodologies for key sectors, to design additional requirements of QA/QC for

these key categories, and to allocate and make the best use of available resources for sources with significant impact on total emission estimate. This would lead to a reduction in the uncertainties in the estimates to the maximum extent possible. In order to identify the key categories, both, level analysis and trend analysis has been carried out. The analysis excludes removals and includes all GHGs reported. The level assessment reveals that the CH₄ emission from the Livestock-Enteric Fermentation was the largest emission source with 45% of total emissions occurring in the country, followed by CH₄ emissions from manure management accounting for about 12%; CO₂ emissions from road transport accounting for about 11%; CO₂ emissions from energy industry/electricity generation for about 7%; N₂O emissions from Manure Management accounts for about 7%; CH₄ emissions form Solid Waste Disposal accounts for about 5%; CO₂ emissions from Manufacturing Industries and Construction for about 4%; Indirect N₂O Emissions from manure management about 2% and CO₂ emissions from Water-borne Navigation accounts for about 1%.

The CO₂ emissions from Road Transportation contributes around 50% to the trend, followed by CO₂ from Water-borne Navigation about 16% ; CH₄ emission from Solid Waste Disposal for about 11% ; CO₂ emission from Energy Industries/electricity generation about 8%; CO₂ emissions form Civil Aviation about 8%; CO₂ emissions from other Sectors about 1%; and N₂O emissions from Wastewater Treatment and Discharge and Road Transportation 1% each to the trend.

A consistent time series information on GHG inventory starting from the last full national communication (the inventory year 2010) to 2017 has been presented in Figure ES-2.

Time series of GHG Emissions (2010-2017)



In 2017, Vanuatu's total GHG (CO₂equivalent) emissions was around 0.0011% of the total absolute Global GHG emissions and estimated capita emissions of Vanuatu was approximately 2.137 tonnes of CO₂equivalent per person as compared to around 30% of the world average per capita emissions i.e. 7.039 tonnes of CO₂equivalent per person.

Mitigation Actions and their Effects

The Government of Republic of Vanuatu is fully committed to effective and transparent implementation of the Agreement and submitted its declaration. Vanuatu has negligible GHG emissions and forest sector act as a net sink; however, the Government of Republic of Vanuatu is fully committed to effective, and transparent implementation of the Paris Agreement (PA). The Government of Republic of Vanuatu notes with great concern that the objective of the Paris Agreement can only be achieved through a significant enhancement of the level of action complemented by international support provided to achieve conditional contributions, as reflected in the Nationally Determined Contributions (NDCs).

The Republic of Vanuatu's long-term vision on climate change and its aspirations are an integral part of the fundamental duties defined under its constitution - "To protect the Republic of Vanuatu and to safeguard the national wealth, resources and environment in the interests of the present generation and of future generations" - and are guided by its National Vision - "A stable, sustainable and prosperous Vanuatu" - outlined in the NSDP for 2016 to 2030, also known as Vanuatu 2030: The People's Plan. The CCDRR policy promotes good governance and establishes priorities and strategies for future climate actions. It also aims to deliver better information and improved assessments of climate change impacts and disaster risks, set key strategies, and transparently communicate to stakeholders, including communities, international donors and agencies. The Climate Change Act sets out governance and administrative provisions and provides for transparency. It also outlines roles and responsibilities for meteorology, geological hazards and climate change and for related purposes.

Vanuatu's National Energy Road Map (NERM) 2016-2030 and associated NERM Implementation Road Map is another ambitious policy guidance tool, first adopted in 2013 and

updated in 2016 for the target year 2030. Its vision is “to energize Vanuatu’s growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an educated, healthy, and wealthy nation.”

Vanuatu’s first NDC mitigation target is to transition to close to 100 percent renewable energy in the electricity (energy) sector by 2030. Achieving this target would involve replacing nearly all fossil fuel required to generate electricity in the country. Vanuatu is taking significant steps towards implementing the PA. The country has developed an NDC Implementation Road Map, including a first-of-its-kind measurement, reporting and verification (MRV) tool. Its purpose is to provide a pathway for implementing and monitoring climate change mitigation actions in Vanuatu that can help to achieve the target defined in Vanuatu’s NDC. Vanuatu’s updated NDC targets include activity-based mitigation targets, sectoral and policy targets in key sectors, including emissions reduction in some sub-sectors. The GHG emission reduction targets in this section are all conditional upon international support (financial and technical support) made available

The NDC Implementation Road Map (NDC-IR) seeks to provide a pathway for implementing specific mitigation actions in Vanuatu. Under the BAU electricity demand scenario, demand is projected to increase from 77.9 GWh in 2017 to 100.7 GWh in 2030, for a total increase of 29.4 percent. The NDC-IR has also identified the immediate priority interventions (such as coconut oil as fuel for electricity generation, solar and wind), including regulatory changes and a financial strategy leading to emission reductions and transformational change in the electricity supply sector over time. As part of an NDC initiative, Vanuatu is embarking on implementing an innovative, cutting-edge renewable energy technology using the swarm technology electrification approach.

The rural electrification NAMA design document focuses primarily on rural electrification and micro-grids to improve access to electricity in rural areas/outer islands. NAMAs are voluntary, non-binding policy instruments that provide a framework for pursuing a country’s national level development goals, while contributing to global greenhouse gas (GHG) mitigation efforts. IRENA Renewables Readiness Assessment report reiterates

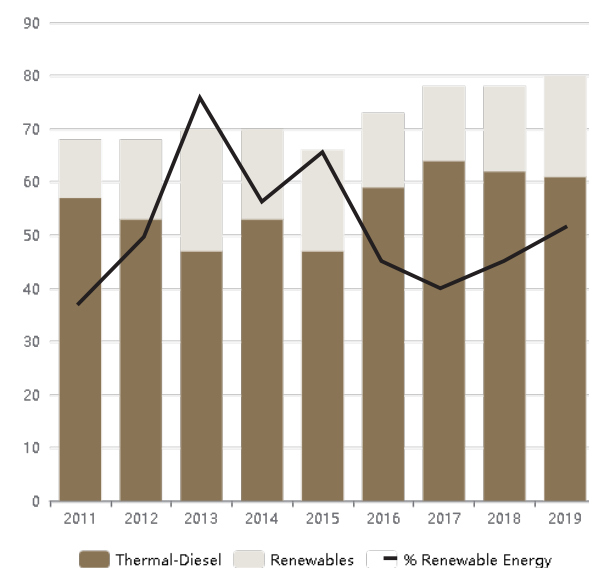
that, like all Pacific Island Countries (PICs), Vanuatu has excellent solar resources available throughout the country’s populated areas that could be used to generate electricity to offset the cost of imported fuels. The report suggests that to fulfil the NERM’s goals would require establishing and enforcing technical standards for grid-connected systems and regulatory capacity for small-scale distributed generation systems. In addition, detailed models of the grid need to be developed as the addition of intermittent sources, such as solar PV, could increase the stability of the (30MW) grid system on Efate, in particular.

The National Green Energy Fund is a national financing vehicle designed to assist the Government to achieve its National Energy Roadmap targets through both public and private investment in technology and infrastructure across Vanuatu. The fund will operate as a revolving fund, with anticipated initial start-up capital of \$10 million, to be sourced mainly from international sources and yearly contributions from domestically consolidated energy funds, totalling \$300,000.

A renewable energy-based off-grid electrification master plan for remote islands of Vanuatu was developed in 2016. The focus was on four pilot islands (Mataso, Makira, Emae and Aneityum) pre-selected by the GoV which would subsequently provide for broader replication to further remote islands.

Vanuatu’s key GHG emission sources can be classified into

Vanuatu’s energy generation mix 2011-2019 (kW)



two categories: energy-related emissions (due to fossil fuel combustion); and non-energy GHG emissions (Agriculture, Forestry and waste). The forestry sector is a net sink. Diesel-based generation is the main source of electricity, with total installed capacity of about 25.2MW (78 percent), followed by wind at 3.4 MW (10 percent), solar at 2.51 MW (8 percent) and hydro at 1.232 MW (4 percent).

The government also developed the NERM 2016–2030 to improve electricity access and affordability and, simultaneously, reduce GHG emissions. The various plans under the NERM have already been implemented and others are at various stages of planning and implementation. As of 2019, total grid-connected electricity generation capacity had reached 32.4 MW with total annual electricity generation of 80.5 GWh.

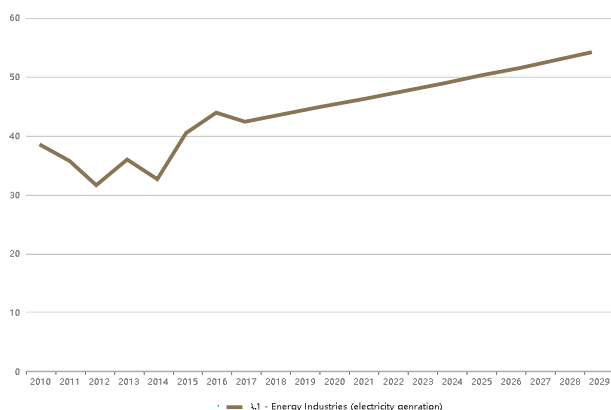
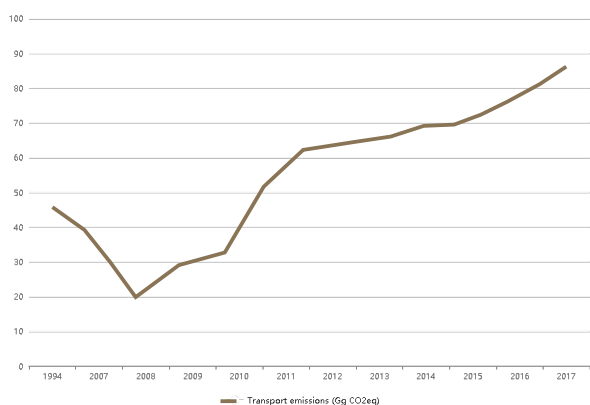


Figure 28 Energy industry/GHG emissions (Gg CO2eq) baseline scenario

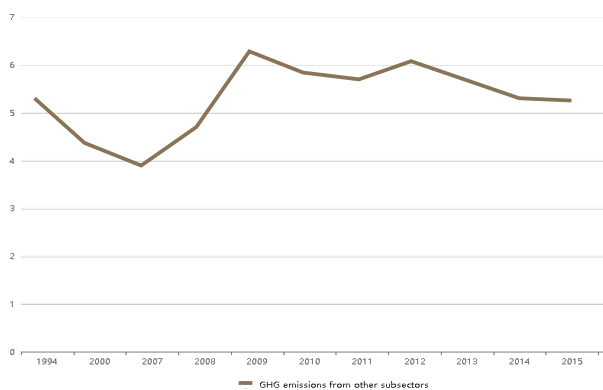
GHG emissions from Vanuatu’s transport subsector totalled 52.089 Gg CO2e in 2010 and had increased 38 percent by 2015 (72.135 Gg CO2e), for a compound annual growth rate of about 6 percent. Of the three main modes of transportation - road, aviation and marine), road/land



Transport subsector/GHG emissions (Gg CO2eq)

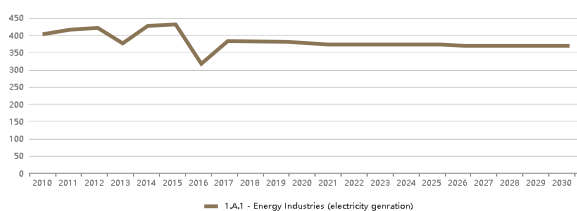
transport consumes just over 50 percent of all petroleum products imported for domestic consumption.

Total GHG emissions from the other subsectors total 5.882 Gg CO2e and 5.227 Gg CO2e for 2010 and 2015, respectively.



GHG emissions from other subsectors (Gg CO2eq)

Given the lack of systematic livestock farming practices, the livestock subsector produces higher emissions and it is difficult to implement GHG mitigation measures. In addition, the islands’ remoteness, the livestock farmers’ limited capacity, limited availability of technological and financial support, and cultural and social practices create challenges to introducing modern scientific ruminant and pasture management practices.

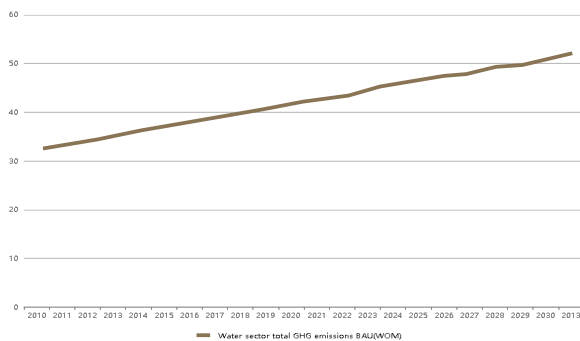


Livestock subsector GHG emissions baseline scenario (2030) (Gg CO2eq)

Although limited information is available on forest conversion or change in forest cover, discussions with the forest department and FAO data indicate that forest cover area has not changed significantly since 2000, including the GHG inventory for 2007–2015. The forestry sector in Vanuatu is a net carbon sink. The prominence of carbon sequestration in the national GHG inventory reflects the mandate of the national forest policy, which considers forests crucial to the well-being of the ni-Vanuatu population to fulfil essential

needs, such as obtaining wood, food, fodder and traditional remedies. Further, sustainable commercial logging practices are practiced in Vanuatu. The country is also committed to maintaining its forest cover and is expected to remain net carbon negative in the future. The REDD+ programme is being implemented in Vanuatu to improve sustainable forest management practices.

GHG emissions from the wastewater subsector totalled 7.304 GgCO₂e in 2010 and rose to 7.654 GgCO₂e in 2015. This subsector is responsible for around 22.16 percent of the waste sector’s GHG emissions and less than 1 percent of Vanuatu’s total GHG emissions.



Waste Sector GHG baseline emissions in Vanuatu (2010-2030)

Resource use for consumption in Vanuatu is estimated to be 59 percent circular. This means that the country relies on secondary or renewable materials and energy sources for 59 percent of the materials used for domestic consumption. The remaining 41 percent of material use is not circular and can be described as following a linear ‘take- make-waste’ trajectory. Those materials are mostly of foreign origin and collide with the country’s development ambitions because they create waste disposal problems and contribute to the deterioration of natural assets resulting from the pollution of soils, surface waters and marine environments.

However, the country can address these issues effectively because its population is directly exposed to and well-aware of the adverse impacts of pollution. The government is already prioritizing the conservation of natural assets for future generations over short-term gains. Circular economy analytics can identify the opportunities that contribute to that objective, as it aims to avoid waste and reduce the

extraction of primary resources. Vanuatu is already more circular than any other country whose circularity has been estimated.

The main circular economy opportunities and their ability to reduce greenhouse gas emissions and avoid solid waste involve:

- Converting grassland to silvopastoral livestock;
- Applying anaerobic digestion for municipal, industrial and agricultural organic waste. This will divert organic waste from landfills and produce both biogas and soil enhancers. Where volumes are too small for a biogas plant, or where the emphasis is on producing a good soil enhancer rather than producing biogas, composting can be used instead.
- Collaborating with development partners to develop circular procurement to reduce waste, resource extraction and GHG emissions associated with investments;
- Aligning Vanuatu’s tax regime with its development ambitions, increasing government revenue by taxing pollution and using these revenues to support the transition to a circular economy; and,
- Collecting and sorting recyclable materials and exporting those that cannot be used or processed domestically.
- to develop circular procurement to reduce waste, resource extraction and GHG emissions associated with investments;
- Aligning Vanuatu’s tax regime with its development ambitions, increasing government revenue by taxing pollution and using these revenues to support the transition to a circular economy; and,
- Collecting and sorting recyclable materials and exporting those that cannot be used or processed domestically.

The basic interventions which are planned to be implemented under the first NDC include:

Interventions under implementation or preparation: project under implementation such as VREP II or the Talise Hydro Power Project bring good contributions towards the target Coconut for Fuel Strategy: this is the key element in providing a sizeable contribution to achieving the NDC target and is the first implementation step.

Revision of the Electricity Supply Act: this is a key step for stronger involvement of the private sector and should allow attracting private capital for the investment into renewable energy projects. Batteries: a total of 37 MWh

of battery storage capacity are necessary to secure a well-functioning grid, where overproduction can be stored for later consumption.

In addition to these basic interventions, 2 options are suggested for achieving the first NDC target.

Option 1 includes the installation of 7.6 MW solar PV and 5.1 MW wind, which together can contribute around 30% to the target. The majority of the contribution towards the target (57%) will come from the use of coconut oil. Total costs of Option 1 are USD 73.3 m (excluding costs for the Sarakata hydro power project). It is assumed that a pricing arrangement for coconut oil can be found, which is not leading to ongoing operation costs, the costs for carrying out the Coconut for Fuel Strategy are included.

Option 2 includes the installation of 7.6 MW solar PV, which is seen as the renewable energy source with lowest generation costs. The main contribution in Option 2 will come from geothermal (36%), which requires successful drilling and considerable investment for the implementation. The availability of geothermal allows reducing the input of wind energy and it suggested that only half of the additional capacity (2.6 MW) is installed. The remaining gap will be covered by coconut oil and a total of around 6 million litres will be required to achieve the target. Total costs of Option 2 are USD 66.5 m (excluding costs for the Sarakata hydro power and the geothermal project). It is assumed that a pricing arrangement for coconut oil can be found, which is not leading to ongoing operation costs, the costs for carrying out the Coconut for Fuel Strategy are included.

Planned Mitigation Action under the Updated NDC include:

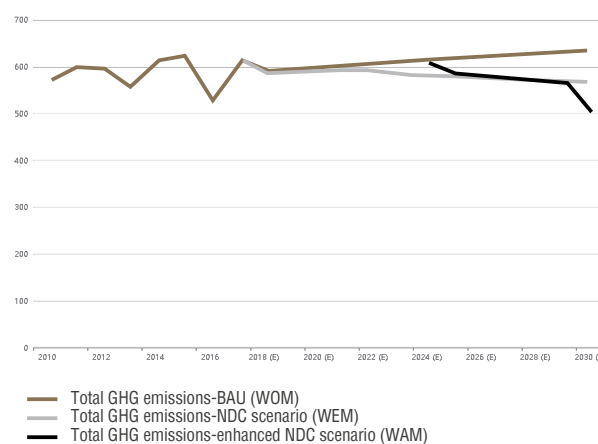
GHG EMISSIONS SECTOR NDC ACTIONS (EXISTING AND ENHANCED NDC SCENARIO)		Indicators	GHG MITIGATION	ESTIMATED ADDITIONAL COSTS
			Gg CO ₂ e/year	Million \$
TRANSPORT				
ADDITIONAL NDC MEASURE 1	Electric vehicles (e-mobility)		2.61	4.25
ADDITIONAL NDC MEASURE 1.1	Electric vehicles (e-buses) for public transportation	10% of total public buses replaced with electric buses	1.84	2.50
ADDITIONAL NDC MEASURE 1.2	Electric cars (e-cars) in Vanua-tu	10% of Gov-ernment fleet replaced with electric cars	0.08	1.00
ADDITIONAL NDC MEASURE 1.3	Electric two (e-bikes)/three-wheelers (e-rickshaw)	1000 numbers of electric two/three wheelers	0.68	0.75
ADDITIONAL NDC MEASURE 2	Biodiesel (biofuel) blending in diesel	20% of bio-diesel blending achieved	18.50	1.25
ADDITIONAL NDC MEASURE 3	Vehicle mileage and emis-sions standards	Milage and emission standards endorsed by Council of Min-isters	0.29	0.50
OTHER SECTORS				
ADDITIONAL NDC MEASURE 4	Biogas plants for commercial and residential use	1000 number of biogas plants made operational	3.50	10.00
ADDITIONAL NDC MEASURE 5	Energy efficiency in commer-cial and residen-tial sector		0.35	0.75
ADDITIONAL NDC MEASURE 5.1	Increase energy efficiency in commercial and residential sector	5% energy efficiency acheived	0.35	0.25
ADDITIONAL NDC MEASURE 5.2	Energy-efficient buildings (green buildings)	10 energy effi-cient buildings con-structed	NE	0.50
ADDITIONAL NDC MEASURE (CE STRAT-EGY 3.15)	Ecotourism supported by local communities	NE	NE	0.25
	IPPU sector NDC actions - Not applicable/not included			
	AFOLU sector NDC actions			
	Agriculture - Not applicable/not included			

LIVESTOCK				
ADDITIONAL NDC MEASURE 6	Training and capacity-building for livestock farming and pasture management	Number of training and capacity building programmes conducted	NE	0.35
ADDITIONAL NDC MEASURE (CE STRAT-EGY 3.1)	Converting pastures to silvopastoral livestock systems	Hectares of land switched to silvopastoral system	30.98	0.50
ADDITIONAL NDC MEASURE (CE STRAT-EGY 3.14)	International collaboration to improve livestock efficiency	Number of collaborative initiatives facilitated	NE	0.50
FORESTS - NOT INCLUDED				
Waste sector				
SOLID WASTE *				
ADDITIONAL NDC MEASURE 7	WTE plant for MSW		14.85	100.00
ADDITIONAL NDC MEASURE 7.1	WTE plant for Port Vila	Municipal Waste to energy plant made operational in Port Vila	14.27	55.00
ADDITIONAL NDC MEASURE 7.2	WTE plant for Luganville	Municipal Waste to energy plant made operational in Luganville	0.50	30.00
ADDITIONAL NDC MEASURE 7.3	WTE plant for Lenakel	Municipal Waste to energy plant made operational in Lenakel	0.08	15.00
ADDITIONAL NDC MEASURE (CE STRAT-EGY 3.2)	Compost municipal organic waste to produce soil enhancer	Tonnes of compost produced	10.94	1.50
ADDITIONAL NDC MEASURE (CE STRAT-EGY 3.9)	Collect, sort and export recyclable materials (indicative) for first phase for Port Vila	NE	NE	1.00
ADDITIONAL NDC MEASURE (CE STRAT-EGY 3.10)	National plastics strategy	Strategy developed and endorsed by Council of Ministers	NE	0.25
WASTEWATER				
ADDITIONAL NDC MEASURE 8	Wastewater management system in Vanuatu		3.57	52.50
ADDITIONAL NDC MEASURE 8.1	Centralized wastewater collection and treatment system in municipal areas, including awareness and capacity-building	Waste water reticulation & treatment systems installed	1.07	50.00
ADDITIONAL NDC MEASURE 8.2	Improvements to public and communal toilet facilities including bio-toilets	NE	2.50	2.50
TOTAL			157.01	173.60

The GHG scenario analysis for the updated NDC shows the following:

- GHG emissions under BAU scenario or WOM: Net GHG emissions (CO₂e) under the BAU scenario (if Vanuatu takes, or has taken no action ((WOM)) would reach 624.258 Gg in 2030.
- GHG emissions under existing NDC scenario or WEM: Net GHG emissions (CO₂e) might be 552.824 Gg in 2030 with actions that Vanuatu has already committed to under the existing NDC (WEM or WM). GHG emissions WEM are approximately 11 percent (71.434 Gg CO₂e) less than under the BAU scenario.
- GHG emissions under enhanced NDC scenario or WAM: Net GHG emissions (CO₂e) will be around 467.245 Gg CO₂e in 2030 with additional measures identified and to be included as enhanced NDC actions (that is, additional actions that Vanuatu will take to

further enhance its climate change-related ambitions (WAM). GHG emissions WAM total around 25 percent (157.013 Gg CO₂e) less than under the BAU scenario; in addition, the estimated investment would be around \$173.60 million.



Vanuatu Updated NDC GHG emissions scenario (2030) (Gg CO₂e)

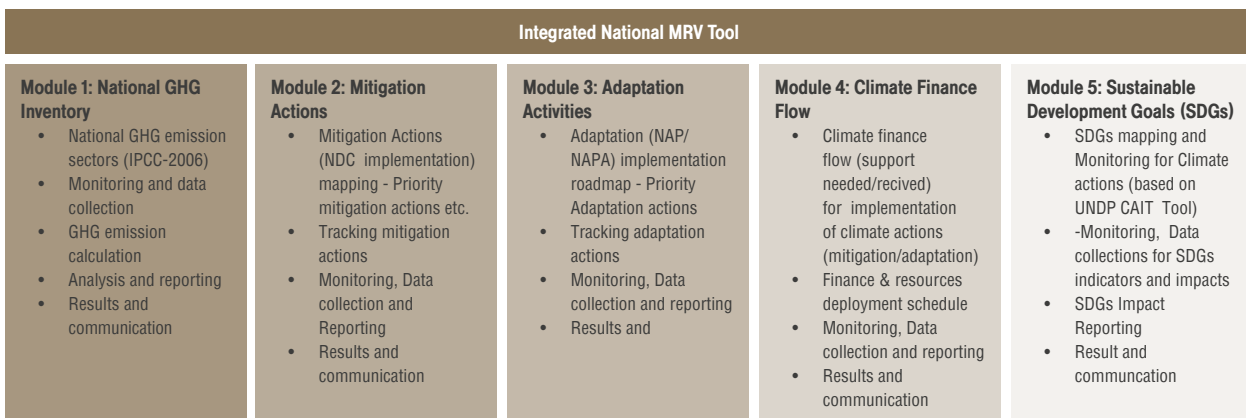
Vanuatu's National Monitoring, Reporting and Verification (MRV) Framework and Integrated MRV Tool

Vanuatu under its updated NDC programme has developed an integrated MRV tool including training and capacity building to cover mitigation sectors under the updated NDC to increase ambition and action by carrying out a detailed assessment of potential high impact sectors that can contribute to low-carbon development.

The Vanuatu's Integrated MRV Tool aims to assist the Department of Climate Change (DoCC), MOCC, Department of Finance and other line ministries/departments to develop

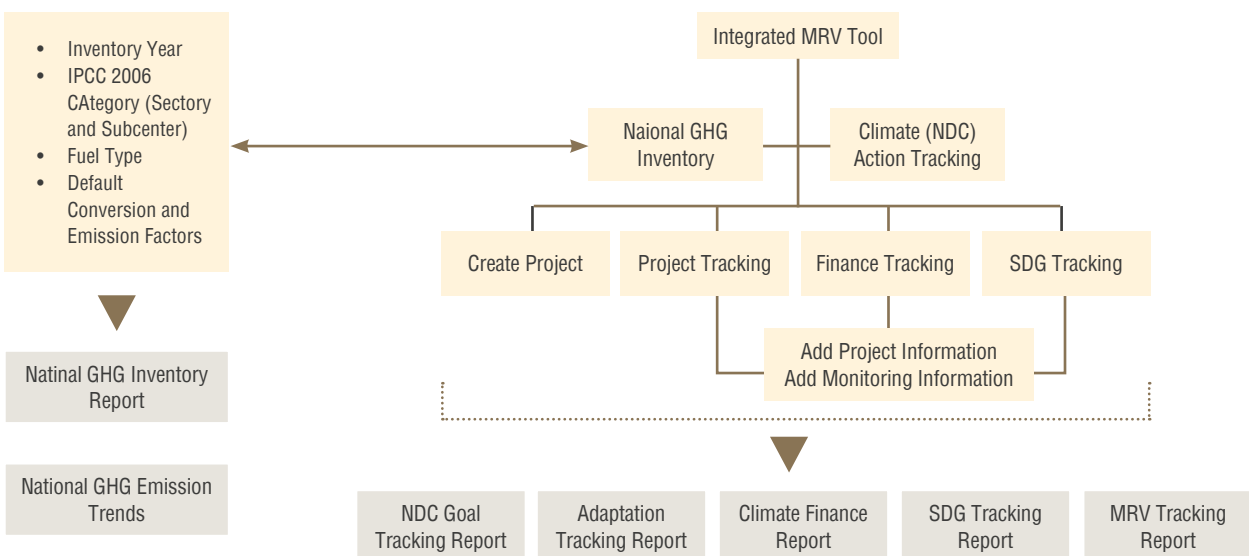
a concise and strategic domestic national MRV system to enhance monitoring, tracking, reporting and verifying of climate actions including GHG emissions; mitigation, adaptation and SDG impact of projects, programme, policies etc. ; and international, regional and domestic public and private climate finance flows. The Vanuatu's integrated MRV Tool is a robust tool built on available resources e.g. data, human resources, capacity etc. and existing systems of monitoring and reporting (data collection and analysis); with minimal additional burden to the reporting agency and relevant stakeholders.

Vanuatu's integrated MRV Tool will serve as a central to domestic and international reporting requirements on



Resultant Reports - Integrated MRV Report, NDC Report (National GHG Inventory Report (NIR), National Communications (NCs), Biennial reports (BR) and Biennial Update Reports (BUR), BTR, International Financial & Technical Support

Components of Integrated MRV Tool



Integrated MRV Tool – Design Structure

national GHG inventory, climate actions (mitigation and adaptation), support and SDG impact assessment. The Tool will cover the following key elements:

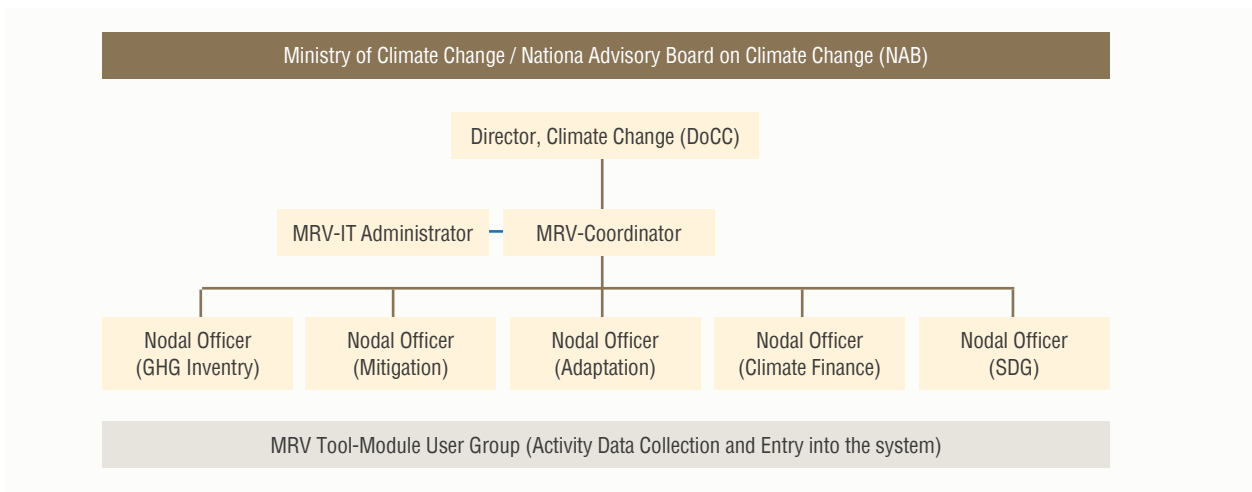
- National GHG Inventory
- Monitoring and Tracking: Climate Change Mitigation Actions/Projects and GHG emission reductions;
- Monitoring and Tracking: Climate Change Adaption Actions/Projects and Impacts;
- Monitoring and Tracking: Climate Finance Flow towards Climate Actions;
- Monitoring and Tracking: SDG impact of climate actions.

The integrated MRV Tool has a modular structure and essentially have five modules, each module will have following key features:

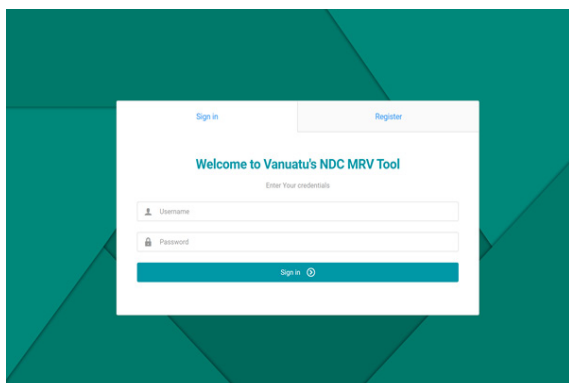
- Methods for generating, recording, storing, aggregating,

- collating and reporting data on monitored parameters;
- Sources of data, measurement methods and procedures, and data sharing protocols; including the frequency of monitoring/recording; and
- Procedures for reporting by both public institutions (national and county levels) and private entities and
- QA/QC procedures
- Linkages to SDGs
- Gender-responsive indicators
- Reporting templates for sectors and other institutions.

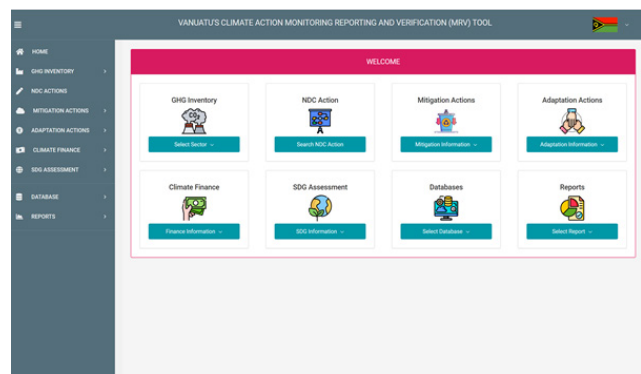
Vanuatu's integrated MRV tool is a web-based MRV Tool (deployed on cloud server – AWS, AZURE, Google Cloud etc) designed specifically considering the domestic and international reporting requirements on climate actions. The web-based online tool provides robustness and increases the accessibility of the MRV tool to the different user groups.



Integrated MRV Tool – Design Structure



Integrated MRV Tool - Login Page



Integrated MRV Tool - Landing Page

The integrated MRV Tool opens-up an opportunity to link domestic mitigation systems or mechanisms and the National Monitoring Reporting and Verification (MRV) to provide a supporting framework for the design, piloting, and scaling-up of market-based mechanisms. The outcome of the work will ultimately help the host country to develop and launch a system and software to record national GHG emission and emission reduction from mitigation action data (ITMOs) and potentially allow inter-linking among various (international) market-based mechanisms while avoiding double counting and enhancing environmental integrity.

Vanuatu's National Carbon Registry System is to be designed to serve dual purposes of data management and transaction registry. Thus, the national carbon registry will have two components:

1. Data Management System: which implies that it will collect, control, process, and analyze bottom-up data from national MRV (GHG inventory and mitigation actions) and regulatory sources. This would mean that the national carbon registry will control and consolidate the major chunk of GHG emissions data from all the sectors under national MRV. Therefore, this can be linked with a National Monitoring Reporting and Verification System (MRV) and enhance the transparency of the emissions data being reported under the domestic and international reporting requirements under the Paris Agreement.
2. Registry for Verified Mitigation Outcomes (Potentially used for Transactions, Transfer, and Cancellations): which implies that the national carbon registry will have national repository for verified mitigation outcomes from national climate actions. The national carbon registry may potentially used as a host and may link infrastructure of the market-based instruments (existing or upcoming for both domestic and international) by providing relevant details on registries and thus making inter-linking possible.

Vanuatu is already in advanced stages of discussion with Annex 1 parties to sign bilateral agreements for ITMO transfer through implementation of green and low carbon technologies as part of its NDC targets. The NDC Support Programme is providing further support to Vanuatu to assist in setting up the enabling environment for future ITMO transfers through a readiness support.

Climate Finance in Vanuatu and Support Received

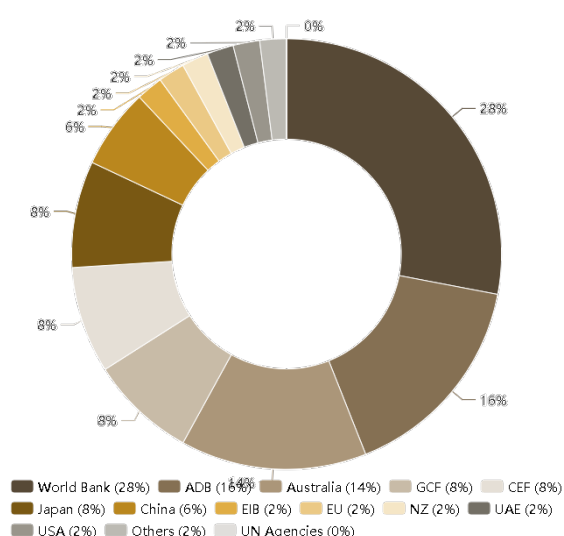
Climate change finance is a key priority to the Government of the Republic of Vanuatu. Gaining improved access to global climate change funds is critical to implement the resilient development agenda articulated in the National Sustainable Development Plan.

Although Vanuatu is increasing its access to international climate change finance, including project and readiness grants from the Green Climate Fund (GCF), there are still challenges in terms of meeting the reporting requirements of different funding sources and donors. Nevertheless, the Government is taking leadership and currently engages with a range of international development partners and regional organisations to progress its national priorities.

A large share of public climate change finance is bilaterally accessed, administered largely through traditional development agencies. Australia is Vanuatu's largest bilateral donor for climate change followed by Japan, China and New Zealand, according to the analysis of bilateral sources from 2014 to present.

The World Bank is the largest multilateral source for Vanuatu and has implemented a range of climate change related projects, such as the reconstruction and improvement of public assets damaged by Tropical Cyclone (TC) Pam, institutional strengthening and support of the energy sector and the Vanuatu REDD Plus Readiness Project. ADB is the second largest multilateral source and supports the Port Vila

Key Bilateral and Multilateral Sources for Climate Change-Related Funding to Vanuatu (2014-2016)



Urban Development project to improve drainage, roads and sanitation systems that would contribute to climate-resilient and sustainable urban development.

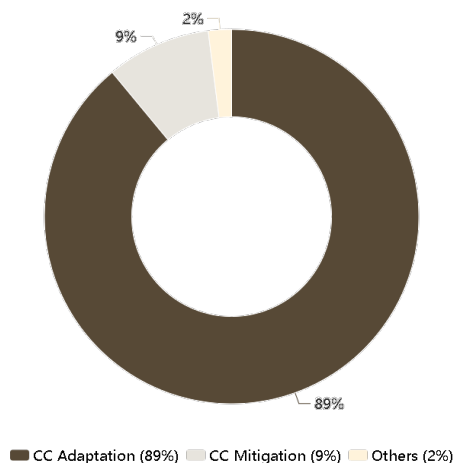
The Green Climate Fund (GCF) has become the newest channel through which international public climate change finance will flow over time.

Vanuatu currently receives climate change funding primarily as grants, concessional loans and technical support. These funds and assistance are either channelled through the Government financial system that can be tracked or provided directly to the beneficiaries through an implementing organization which is, without the proper reporting mechanism, outside the Government of Vanuatu's purview.

Around 78 climate change-related projects with clear national allocations to Vanuatu were considered for the period 2014 to 2016 from a range of sources, including the 2014-2016 Annual Budget Estimates, Aid Coordination Unit and project information from development partners. Regional projects with unclear national allocations for Vanuatu were not counted. Until 2016, approximately 21.4 billion Vatu (-USD200 million) was approved for climate change-related activities in Vanuatu from a wide range of sources.

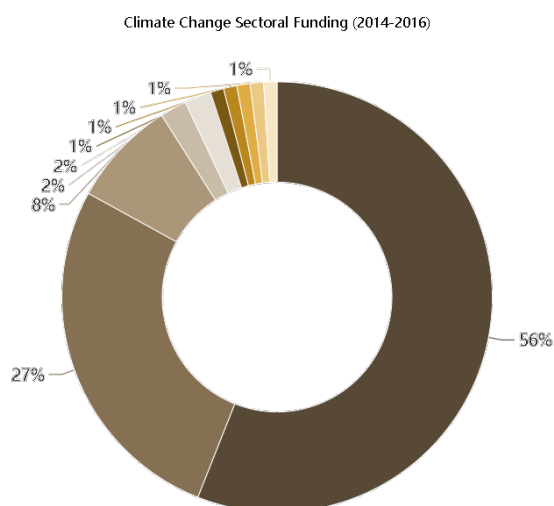
Climate change is likely to impact all sectors in Vanuatu, including agriculture, water, coastal and marine resources, infrastructure and tourism. Of the climate change finance accessed during 2014-2016, 89 per cent has been for climate change adaptation activities while 9 per cent was for mitigation activities. The other 2 per cent was related to disaster risk reduction and supporting mechanisms for

Breakdown of Climate Change Adaptation and Mitigation Funding Based on the 78 Projects (2014-2016)



mitigation and adaptation, such as capacity development, institutional and systems strengthening and governance.

Sectoral funding was aligned to the key sectors in the Peoples Plan 2030. A large share of climate change financing has been focused on infrastructure (56%). This is due to TC Pam recovery programmes and investment in major roads and wharves improvement works. Sectors, such as environment, which include agriculture, water resources management, biodiversity, conservation (27%) and energy (8%) received a fair share of financing, while the tourism, social, energy, health, education, forestry, governance and ICT sectors received between 1 per cent and 3 per cent of the total funding.



Vanuatu currently faces several challenges in regard to mobilizing climate finance. Access to climate finance is difficult because the different requirements of different sources are complex and cause duplication efforts. Traditionally, multilateral and bilateral financing intermediaries such as World Bank, UN Agencies and multilateral development banks (MDBs), have played an important role in distributing and channeling climate finance to Vanuatu. Direct access is limited by Vanuatu's inability to currently meet the strict fiduciary standards required by international funds.

Coordination of climate finance is also challenging due to the proliferation of climate finance mechanisms, and Vanuatu's developing NAB governance structures. Making detailed climate finance investment plans is still challenging, as Vanuatu's climate policy frameworks only indicate broad finance goals, but not targets, what will be financed and how.

Although the Paris Agreement on Climate Change recognises the special capacity constraints of small island developing states and least developed countries like Vanuatu, the access procedures to global climate funds are still cumbersome, costly and elusive. A key challenge that provincial administrations in Vanuatu face is the limited technical capacity in grant writing for climate change funding.

Constraints, Gaps, Technology and Capacity Building Needs

Vanuatu is continuously striving to improve national GHG estimation and reporting to the UNFCCC. To achieve continuous improvement in national reporting, constraints, gaps, and related financial, technical, and capacity building, needs should be identified, and appropriate measures taken and implemented to address them.

The Department of Climate Change (DoCC) has been established as part of the Government of Vanuatu's ongoing meaningful efforts of enhancing national resilience in the face of global climate change impacts. The DoCC has developed a three-year Strategic Plan (SP) (2021-2023) in order to align Vanuatu's climate change priorities along with the activities of the newly established department.

Data collection and validation of the data is the key aspect of the GHG inventory process. The data collection procedure in Vanuatu is yet to be formalized, the newly formed Department of Climate Change is formalizing the data collection process via suitable instruments e.g. legal contract, MoU, MoAs etc. In Vanuatu, key uncertainties are associated with data availability, missing data, lack of comprehensive information, data archiving and lack of country specific emission factors. Similarly, for Land Use Change and national forest resources currently there is no national data available. The waste sector also lacks information on waste generation characterization, composition, disposal and treatment. It can be concluded that with adequate training and capacity building on GHG inventory requirements, Vanuatu can provide more detailed and accurate information in subsequent GHG inventories.

There are many barriers for effective mitigation options in Vanuatu, many of which are common to developing countries in general and some are country specific. Access to capital is limited. The capital costs of renewable energy technologies are generally higher than those of conventional technologies.

substantial tariff barriers remain in many cases for imports of (emission reducing) foreign technologies including energy supply equipment.

Incentives for donors are weak mainly when energy demand is scarce and scattered. The main barrier to mitigation options being realised in Vanuatu (and most developing countries) has been the slow progress of finance transfer from the international UN mitigation effort.

Institutional and administrative difficulties can be serious obstacles to easy technology transfer. Also included here might be the difficulty in retaining qualified people in administrative positions in government. There appear to be difficulties, however, in country in terms of sharing information between government departments in Vanuatu improvements could be looked into here.

Domestic capacity building is an integral part of the Vanuatu's Integrated MRV tool development process. This is envisaged to be achieved through design and facilitation of a technical handholding and training on the established integrated MRV framework, database and tool. This include: development of appropriate training materials, modules including hands on exercises on the established national MRV framework, database and tool, physical/Virtual Class room training, Technical presentations and training materials/modules as appropriate, hands on technical training for stakeholders with relevant examples and exercises on the established national MRV framework, database and tool, train the stakeholders in addressing issues with data such as data gaps, inconsistencies including QA/QC.

The United Nations Environment Programme (UNEP) is implementing the Technology Needs Assessment (TNA) project in Vanuatu through the UNEP DTU Partnership (UDP). The overall goal of the TNA process is to come up with select technologies that will enable Vanuatu "to achieve development equity and environmental sustainability, and to follow a low emissions and low vulnerability development path".

The National Advisory Board to the Vanuatu Ministry of Climate Change decides on the sector selection process during the consultation meeting that was organized by the TNA coordinator. The sectors were selected taking into consideration the Vanuatu energy policies such as the

Vanuatu National Energy Framework Policy (2015) and the Vanuatu Climate Change and Disaster Risk Reduction Policy (2015) and the trends of the sectors as shown on the above tables. The agreed sectors to be included in this TNA process after several of the consultation meetings with the NAB, the TWG and relevant stakeholders are;

1. Energy Sector and technology options includes;

- Biodiesel/internal combustion technology
- Blending Fossil with Biodiesel

- Efficiency Wood Stove
- Battery Electric Vehicle
- Solar Electric Boat

2. Waste –to-Energy Sector and the technology options includes;

- Mechanical Biological Treatment
- Manure Based Biogas Digesters
- Compact Biogas Digester for Urban Households
- Anaerobic Digestion-Biogas Plant

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Chapter 1

National Circumstances

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National Circumstances

Vanuatu is an archipelago of volcanic islands and submarine volcanoes located between latitude 12° and 23° south and longitude 166° to 173° east. There is a distance of roughly 1,300 km from the northernmost island to the southernmost islands. The country's coastline extends for 2,528 km long with a total land area of 12,336 km², set within a 200-mile exclusive economic zone (EEZ) of approximately 680,000 km².

The country comprises of 83 islands, and lies in the middle of Fiji, Solomon Islands and New Caledonia. The country was first visited by Europeans in the early 17th century. James Cook explored the islands in 1774, giving them the name "New Hebrides", which lasted until independence on 30 July 1980. The first European settler was a cattle rancher who arrived in 1854. He was soon followed by cotton growers from Australia, and later by the French, who outnumbered the British three to one by the mid-1880s.

The ni-Vanuatu are culturally heterogeneous, a fact that is reflected in the large number of languages spoken in the country. With over 100 distinct tongues for its relatively small population, Vanuatu is thought to be the most linguistically diverse country (per capita) in the world. Vanuatu's national language, Bislama, is a form of Pidgin-English. Besides Bislama, the country's two official languages of government are English and French.



Figure 1 Map of Vanuatu

Prior to independence in 1980, Vanuatu was known as the New Hebrides and had been governed for 74 years by a joint Anglo-French Condominium. The first free and open elections were held in November 1979, after the various political parties and the Condominium powers within the country agreed to a constitution for the Republic. The independence of the sovereign state of Vanuatu was celebrated on 30 July 1980, and the country became the 155th member of the United Nations in September 1981.

Vanuatu's national political structure consists of legislative, executive and judiciary branches. The legislative branch consists of a single chamber, parliament, with 52 seats. Members of parliament are elected every four years. The executive consists of the prime minister and the Council of Ministers, all of whom are members of parliament (there are 13 ministers). The Judiciary consists of a Supreme Court with a Chief Justice and three judges. The Head of State is the President of the Republic and is elected for a period of five years by an electoral college consisting of members of parliament and presidents of provincial governments. There is a National Council of Chiefs that is mainly an advisory body to the government and is comprised of custom chiefs elected by their peers sitting in the Island Council of Chiefs. The Council of Chiefs advises on custom and tradition as well as the preservation and promotion of the country's culture and indigenous languages.

1.1 Geography and Climate

1.1.1 Geography

Vanuatu is an archipelago of volcanic islands and submarine volcanoes located between latitude 12° and 23° south and longitude 166° to 173° east. There is a distance of roughly 1,300 km from the northernmost island to the southernmost islands. The country's coastline extends for 2,528 km long with a total land area of 12,336 km², set within a 200-mile exclusive economic zone (EEZ) of approximately 680,000 km².

From low coral atolls to majestic volcanoes, Vanuatu is one

of the most geographically diverse nations in the Pacific region.

Only 12 islands could be called significant in terms of their economy and population. The largest are Espiritu Santo (4010 Km²), Malekula (2,069 Km²), Efate (980 Km²) and Erromango (900 Km²). Santo also boasts the country's highest peak: 1,879m Mt Tabwemasana. Ambae, Ambrym and Tanna have peaks over, 1000m high. The largest of the islands, Espiritu Santo and Malekula cover 50% of the country's land mass and harbor the majority of Vanuatu's population.

Most islands are either mountainous or steeply undulating, with 35 per cent of the country being above 300m (highest point: Tabwemasana 1,879m) and 55 per cent having slopes greater than 20 degrees. Some areas are so deeply dissected by gullies that they're virtually impenetrable. Generally, the steeper country is covered with lush forest and secondary growth, while coconut plantations and other agricultural pursuits dominate the usually narrow plains.

1.1.2 Geology

Vanuatu emerged from the sea about 22 million years ago, when a series of earth

movements on the ocean floor forced huge underwater mountains to surface. This event created the northern islands of Santo, Malekula and the Torres group. Next to appear were Maewo and Pentecost, between 5 and 11 million years ago. All the remaining islands resulted from two separate phases of earth movements that took place less than five million years ago.

Until about two million years ago the islands covered only a fraction of their present area. The dramatic increase during this geological blink of an eye has largely resulted from slow continued uplift, together with the formation of fringing coral reef. On some islands, ancient reefs have been raised several hundred meters above sea level. As well, new land is continuously being created as a result of volcanic activity.

Vanuatu lies squarely on top of the Pacific Ring of Fire. In fact, it is on the edge of the Pacific tectonic plate, which as being forced up and over the Indo-Australian plate. This action causes frequent earthquakes and volcanic eruptions.

Some areas of Vanuatu are being uplifted at a rate of 2cm a year, while others are subsiding. Seismographs record numerous earth tremors each day, though only a small number are strong enough to be noticed by the general population. An earthquake in 2001 rated over seven on the Richter scale caused considerable damage.

Vanuatu has nine active volcanoes, with seven being on land and two under the sea. The most famous is the easily accessible Mt Yasur on Tanna. Mt Garet, on Gaua, is potentially the most dangerous because of the thin layer of rock that separates its large crater lake from the molten magma underneath.

1.1.3 Climate

Vanuatu's climate varies from wet tropical in the north to subtropical in the south, with much drier rain-shadow areas in between. The northern islands receive on average over 4000mm of annual rainfall, while the southern parts of the archipelago receive average annual rainfalls of 1500mm. Rainfall in the country is generally affected by the South Pacific Convergence Zone (SPCZ). The SPCZ intensifies during the wet season and moves further south bringing higher rainfall to Vanuatu. Low pressure systems embedded in this band of heavy rainfall often become tropical cyclones during the cyclone season. Tropical cyclones tend to affect Vanuatu between November and April. The number of cyclones varies widely from year to year, with none in some seasons but up to six in others.

Mountains also play a role in the variations in rainfall across some islands. During the wet season, rainfall is particularly high on the windward (south-east) side of the mountain ranges of the bigger islands, and scarce on the leeward (north-west) sides, especially during the dry season.

Across Vanuatu the annual average temperatures are between 23.5–27.5°C. Changes in the temperature from season to season are strongly tied to changes in the surrounding ocean temperature.

From year to year, the El Niño Southern Oscillation (ENSO) creates variability to Vanuatu's climate. El Niño events tend to bring drier conditions as well as a late start to the wet season and cooler than normal dry seasons. The opposite occurs during La Niña events.

1.2 Environment and Ecosystem

1.2.1 Terrestrial biodiversity

Seventy-four percent (74%) of land in Vanuatu is covered with natural vegetation. Forest types include tropical lowland evergreen rain forest, broad-leaved deciduous forest, closed conifer forest, montane rain forest, cloud forest and coastal forest. Other notable vegetation includes swamp forest on Efate, kauri pine strands on Erromango and scattered mangrove forests covering around 3,000 ha (most of which occur on Malekula Island).

Lowland forest has largely been cleared and replaced by anthropogenic vegetation but forested areas remain the dominant landscape element on most islands. High forests are restricted on most of the islands (especially those that are densely populated, such as Pentecost, Ambae, Tanna and Shepherd; or have active volcanoes, such as Ambrym). However low montane forests are generally well preserved and occupy large areas. Secondary forests (often consisting of a Hibiscus community) are dense and in Vanuatu.

There are about 1,000 vascular plant species in Vanuatu of which around 150 are endemic. There is high diversity of orchids with 158 species and palms with 21 species, including 14 endemic species (GOV, 2014). There are 121 bird species, 28 species of reptiles and 12 species of Chiropterae (Flying Foxes and Bats). Invertebrate diversity is not fully described but includes the coconut crab (*Birgus latro*) the largest land crab, which is an important food resource in Vanuatu (GOV, 2014).

Invasive animal species are a threat in Vanuatu and include the Indian Mynah (*Acridotheres tristis*), the Giant African Snail (*Achatina fulica*) and the Rosy Wolf Snail (*Euglandina rosea*). *E. rosea* was introduced as a biological control agent for *Achatina fulica* but the species has caused the extinction of numerous native snails in other countries.

Another species of concern in Vanuatu is the Little Fire Ant (*Wasmannia auropunctata*), which has reduced arthropod species diversity in other locations, and may threaten crab species, including the coconut crab (GOV, 2014).

Vanuatu has one recorded extinction: the Tanna Ground Dove (*Gallicolumba ferruginea*). Extinction drivers for this

species are believed to have been hunting and predation by domesticated and feral mammals.

1.2.2 Inland Waters Biodiversity

Large rivers are present on the larger islands but the most common freshwater habitats are steep gradient mountain streams. Unique and rare habitats include freshwater lakes on several islands (including crater lakes on inactive volcanic islands) and subterranean streams in karst areas.

Exploration of caves on Santo revealed four species of invertebrate that were new to science and confined exclusively to these caves. Atolls and coral islets generally have underground freshwater lenses due to the porosity of the rock.

Most islands of Vanuatu contain a dense network of seas, lakes and rivers. The larger islands are well watered by rapid mountain rivers and creeks. Other freshwater systems include low gradient lowland streams, deep pits called blue holes, some lakes and swamps/marshes on plains. Most of the 25-30 lakes are crater lakes, with Lake Letas on the volcanic island of Gaua, being the largest freshwater system in the Pacific at 19 km² in area and 350 m deep. The caldera lakes of Ambae lie at an altitude of over 1,300m and are the highest of the South Pacific. Freshwater swamps and swamp forests are generally

restricted to fringing areas around lakes (Efate, Thion), in depressions on plateaux (Efate, Epi, Maewo and Gaua), in extinct volcanoes (Vanua Lava) or on floodplains (East Santo). Dasheen (taro) fields may sometime host freshwater species.

Streams and rivers in Vanuatu are highly variable in size and length and can be divided into six zones depending on altitude and water velocity: spring zone (over 800 m); higher course (450-800 m; steep); middle course (150-450 m; less than 10% slope), upper lower course (50-150 m) and lower course (less than 50 m; tidal). Understanding this typical zonation allows understanding of the distribution of freshwater species. While the majority of species are found in low velocity reaches, high velocity reaches often contain unique species adapted to this type of environment (e.g. *Sicyopterus* spp, Gobiidae). The estuarine zone is also an important thoroughfare for a freshwater fauna dominated

by migratory species.

All freshwater fishes in the identified important biodiversity areas are amphidromous (i.e. with a marine larval stage), providing a clear linkage between freshwater and marine ecosystems. Diversity is dominated by gobies and some endemism is known in the subfamily Sicydiinae. However, these are very small fish, which are not currently utilised by local communities or represented in indigenous taxonomies. The larger but non-endemic species like eels (*Anguilla* spp.), Spot-tail Bass (*Lutjanus fuscescens*), Mulletts (*Mugilidae*) and Grunters (*Terapontidae*) are utilised for food, as are neritid snails and prawns, and reduction in their populations is of direct concern to villagers. Surveys in Vanuatu indicate there may be some endemism in freshwater crustacea (Marquet et al. 2002). The intense utilisation of freshwater species for protein in some areas is having an impact on freshwater ecosystems but there is little to no research in this area.

Freshwater fish biodiversity can be highly localised and even small lake or stream systems may harbour unique locally evolved forms of life. The numbers of different species in any given freshwater habitat can be high even if the population numbers of the individual species are low. Generally speaking, the fauna of riverine systems has been better studied than other systems. The number of endemic species is greater in older islands that have retained a good natural vegetation cover and where flows have not been altered. Of the 96 known crustacean and fish species (29 decapod crustaceans and 67 fish), 5 are endemic to Vanuatu and 7 to both Vanuatu and New Caledonia.

1.2.3 Marine and Coastal Biodiversity

Vanuatu has a range of marine habitats and species, from inshore coral reefs to deepwater seamounts and canyons that generate these values and some are described in more detail here.

Vanuatu's coral reefs are categorised as either fringing, barrier or atoll reefs. Within each of these categories there are patch reefs, where the coral reef forms patches within a matrix of sand or seagrass.

Coral species generally have wide geographic ranges in the Indo-Pacific region, but many are listed as globally threatened

due to reef damage and bleaching, and will suffer additional impacts from sea temperature and pH changes associated with climate change. Reefs support a variety of mollusks, crustaceans and fishes, which in turn provide the main source of protein for people living in coastal villages. Coral reefs are also the habitat for most of the threatened coastal fishes of the region, such as Humphead Wrasse (*Cheilinus undulatus*), Green Bumphead Parrotfish (*Bolbometopon muricatum*) and Hump-backed Rock Cod (*Cromileptes altivelis*). White sand beaches adjacent to coral reefs are important nesting sites for Green Turtle (*Chelonia mydas*) and Hawksbill Turtle (*Eretmochelys imbricata*).

Seagrass beds occur in soft-bottom areas and, like coral reefs, require clear water (low turbidity) away from sediment plumes of large rivers. Seagrass beds are the habitat of Dugong (*Dugong dugon*), which reaches the eastern limits of its distribution in Vanuatu.

Results of aerial and postal surveys conducted at least 17 years ago (in 1987) indicated that dugongs occur in small groups (single or pairs of animals) throughout the sheltered waters of Vanuatu. Tame dugong are known to reside in Lamén Bay (Epi Island) and Tanna Bay (Tanna Island).

Mangroves are a marine habitat and widely recognised as an important nursery for juvenile fish. They also provide coastal buffering against tropical cyclones and other extreme weather events. As with terrestrial forests, mangroves and seagrass meadows remove and store carbon from the atmosphere.

Other ecosystem services include tourism, wood extraction and bioremediation and sediment trapping. In 2009, the Mangrove Ecosystems for Climate Change Adaptation and Livelihoods (MESCAL) project conducted an economic valuation of nine ecosystem services in Crab Bay, Malekula and Eratap on Efate Island. The study found that in 2012, 136.5 ha of mangroves in Crab Bay produced ecosystem services worth US\$586,000, while in Eratap, 31.2 ha produced ecosystem services worth US\$266,000.

Rocky shorelines occur along the coasts of islands of recent volcanic origin, or where rapid uplift or steep drop-offs preclude the development of coral reefs. The intertidal zones are frequented by people collecting gastropods for food.

Vanuatu's marine and coastal biodiversity contributes to generating goods and services with a value totalling over VT4.5 billion. The values include the tourism and tuna fishing sectors. The net value of tourism in 2013 was approximately VT850 million. The value of tuna to Vanuatu, mainly from access fees, was about VT160 million

in 2013. Coastal habitats are valued in terms of what they contribute to subsistence fishers (about VT580 million), small-scale inshore commercial fishers (VT290 million), coastal protection (VT1.6 billion) and carbon sequestration (VT760 million) (Pascal et al., 2015).

1.3 Population

According to the most recent Mini Census undertaken in

2016, Vanuatu's population was reported to be a total count of 272, 459 compared to a population count of 234,023 in the last 2009 census. Vanuatu's population is largely based within its' rural areas – 75 percent as per 2016 figures. Accordingly, the two provinces of Shefa and Sanma which host Vanuatu's urban centres of Port Vila and

Luganville respectively have the highest populations.

Provincial breakdown – Sanma, Malampa and Tafea Outside of the Vanuatu's two urban sites, Malampa and Tafea provinces both have substantial population numbers and growth rates – refer to Tables 2 and 3.

Vanuatu has one of the highest growth rate in the Pacific region. This is more pronounced in the urban settings of Port Vila and Luganville. Refer to Table 3.

Table 1 Population of Vanuatu (National Mini Census 2016)

Place of Residence	Population Count	Male	Female	Number of Households
Urban	67,749	34,506	33,243	14,048
Rural	204,710	103,759	100,951	41,479
Vanuatu	272,459	138,256	134,194	55,527

Table 2 Total population by province per year, 2009 – 2016. (National Census 2009; Mini Census 2016)

Place of Residence	2009	2010	2011	2012	2013	2014	2016
Torba	9,359	9,527	9,700	9,875	10,053	10,234	10,161
Sanma	45,855	39,978	40,360	40,749	41,090	41,476	54,184
Penama	30,819	31,249	31,685	32,127	32,575	33,030	32,534
Malampa	36,724	37,135	37,547	37,964	38,386	38,813	40,928
Shefa	78,723	81,544	84,468	87,499	90,644	93,893	97,602
Tafea	32,540	32,894	33,251	33,613	33,979	34,348	37,050
Vanuatu	234,023	239,374	244,847	250,445	264,652	271,087	272,459

Table 3 National average annual growth rate and population density with province breakdown (National Mini Census 2016)

Indicator	Vanuatu	Urban	Rural	Torba	Sanma	Penama	Malampa	Shefa	Tafea
Av. Annual population growth rate (%)	2.3	2.6	2.3	1.2	2.6	0.8	1.6	3.4	2.0
Population density (number of people/km2)	22			12	13	27	15	65	23

Vanuatu has a young population where up to 50 percent of its population is under the age of 40 years. The population make up is such that it is close to a 1:1 male to female ratio although projections indicate a somewhat levelling of ratios by 2050.



Figure 2 Population distribution by age and sex.
Source: Secretariat of the Pacific Community 2020 (<https://sdd.spc.int/vu>)

1.4 Economy

Vanuatu is traditionally known for its strong cultural heritage tradition activities and subsistence farming. The four mainstays of Vanuatu's economy are agriculture, tourism, offshore financial services, and raising cattle. Exports include copra, kava, beef, cocoa, and timber, and imports include machinery and equipment, foodstuffs, and fuel.

In 2017, Vanuatu's economy grew by 4.4 percent with a strong performance over the last three previous years. Subsequently it was further projected for the economy to grow by 3.4 percent in 2018 from 2017 growth levels. Growth was primarily driven by construction activities related to the on-going infrastructure development projects and reconstruction projects from TC Pam (VNSO 2019; RBV 2018).

The GDP growth of 4.4 percent in 2017 was mainly driven by industry, followed by services and agriculture. Though

the overall performance in industry has continued from the strong growth in two previous years, its contribution to GDP growth is less than services and agriculture. In terms of contribution by industries, services have the largest share of 65 percent which contributes to a positive growth of 1.8 percent in 2017 followed by agriculture fishing and forestry.

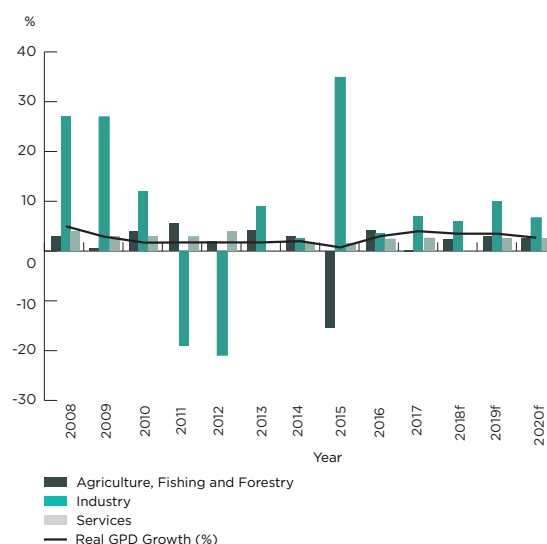


Figure 3 Real GDP Growth and Major Sector Growth. Source: Reserve Bank of Vanuatu September 2018 Quarter Economic Review

Table 4 Real GDP Growth (%)

Sector	2016	2017	2018f	2019f
Agriculture, Fisheries and Forestry	5.1	0.4	2.1	3.1
Industry	4.2	7.1	7	10.6
Services	2.9	2.9	3.2	2.6
Vanuatu	3.5	4.4	3.4	3.6

Source: VNSO 2017 National Accounts

1.4.1 Energy

The principal objective in Vanuatu's energy sector is to reduce dependency on fossil fuels, encourage use of renewable sources and increase energy security while managing demand through energy efficiency measures. Under the National Energy Road Map (2016 – 2030), Vanuatu's government has set targets of attaining 100 percent electricity generation from renewable sources and the accomplishment of 100 percent electricity by households by the year 2030.

Biomass and imported petroleum product are the main energy sources for Vanuatu. Biomass is principally used for residential purposes such as for cooking and crop drying. However, petroleum products are important inputs into major sectors of the economy – electricity, industry, tourism, transportation, fishing and agriculture. Presently, Vanuatu primary needs are mainly met by imported petroleum. Consumption of petroleum has increased substantially, at an annual average rate of 6% over the years.

The bulk of electricity is derived from diesel (71%) and renewable energy (29%). Renewable sources currently being utilized include hydro, solar, wind and biofuel.

1.4.2 Transport and Infrastructure

Vanuatu's geographic and demographic structure poses obstacles to efficient development. People are scattered over about 80 widely distributed islands, of which 64 have residents (2009 National Census). This makes travel difficult and costly. The distance from the southernmost to northernmost islands is over 800 km.

Vanuatu's geography also makes it difficult to build infrastructure efficiently and economically. Small population clusters make economic and financial justification difficult. Logistical problems of moving large construction equipment from island to island deter contractors and increases prices.

Once built, limited capacity and resources to maintain infrastructure leads to asset deterioration. Consequently, there are significant gaps in providing and operating physical infrastructure, particularly in poor and remote rural areas

Roads

Vanuatu is estimated to have 1,800 km of roads. Of these 234 km are sealed and 1,142 km are gravel. The remaining 400km are simple earth roads (VISP 2014).

Port Vila and Luganville urban areas account for the majority of sealed roads, and the recently improved Efate ring road and Santo East Coast Road represent the first extensive sealed roads outside the two main towns. On most islands other than Efate, Santo, and Tanna road links have developed largely to service remote communities administrative and economic needs. There are still many locations where separate stretches of road on a particular

island do not link.

Aviation

There are 29 airfields in Vanuatu. Airports Vanuatu Limited (AVL) operates the three main airports at Port Vila (Bauerfield), Luganville (Pekoa), and Tanna (Whitegrass). The other 26 are regulated by the Civil Aviation Authority of Vanuatu (CAAV) and run by the Public Works Department (PWD). The Bauerfield airport is Vanuatu's principal international gateway and handles around 250,000 international passengers per year. At present the runway is long enough to accommodate most commercial aircraft, although for some (Boeing 767, 777 and Airbus A330) has weight restrictions.

Shipping

Vanuatu depends on water transport with its population spread over 64 populated islands. However, limited infrastructure restricts cargo and passenger movement. Inadequate wharves and jetties constrain vessels from calling at many destinations in all but ideal weather conditions, including the main jetty for Isangel in Tanna. The principal wharves are in Port Vila and Luganville. There are also wharves on Malekula and Tanna that are adequate for conventional ships, but not in all sea conditions. The majority of calls to outer islands are made directly to a beach, or by lighters.

1.4.3 Industry

Manufacturing sector in Vanuatu is very small and is driven by just few players mainly based in Luganville and Port Vila. It is estimated that Vanuatu has just 3.8% of manufacturing value added as a percentage of its' GDP (National Industrial Development Strategy, 2018)

The industry sector overall grew by 7.1 percent in 2017 and with subsequent growth for 2018 placed at 7.0 percent, reflecting the slowdown and waning down of construction projects as they draw to completion. Forecast for 2019 was upgraded to 10.6 percent driven mostly by new projects.

There were improvements in the manufacturing sector with growth rate of 3.3 percent in 2018 from 2.0 percent in 2017 with increased output from leading bottled water,

beverages and coconut oil industries in Port Vila.

1.4.4 Tourism

Tourism is a mainstay of the Vanuatu economy. Vanuatu has more recently embarked on a “greener” path as per its’ National Sustainable Tourism Policy (VSTP). The policy seeks to strike a balance between economic viability, social acceptability and environmental responsibility. The VSTP also focuses on enhancing the resilience of Vanuatu’s cultural, social and ecological systems in the face of the changes, complexity and uncertainty. The Tropical Cyclone Pam event in 2015 particularly had significant impacts in slowing growth however the tourism sector is gradually recovering.

Given broad growth trends, the total international visitor arrivals to Vanuatu for September quarter 2019 stood at 63,407, reflecting a decline of 16% over the corresponding period in 2018. On the other hand, tourism recorded an increase of 19% over the previous 2018 quarter. The decline of visitor arrivals over corresponding period were attributed by the fall in number of visitor arrivals by sea.

Visitors by air made up 58% of all international visitors to Vanuatu. This stood at 36,587, indicating an increase of 9% over corresponding quarter in 2018 and also by 29% over June quarter 2019 (National Statistics Office, 2019).

1.4.5 Agriculture and Fisheries

Subsistence farming makes up more than 75% of all agriculture in Vanuatu. This type of farming centres around root crops such as Taro, Yam, Cassava and Sweet Potato. Additionally, subsistence farming focuses on consumption and cultural purposes. Subsistence farming is highly dependent on rain for irrigation and basic tools are used.

There is also small scale semi commercial farming that is concentrated around the urban areas. Semi commercial farming consists mainly of the following crops - green leafy vegetables, local island cabbage, Chinese cabbage, capsicum, eggplants, spices and herbs.

In general, the agricultural sector accounts for more than 75 percent of exports, of which the most important agricultural product is copra, which is the dried meat or dried kernel of

the coconut used to extract coconut oil. Coconut, cocoa, kava and coffee are the main cash crops. The production of beef and timber has grown in importance for the economy. Coconut oil is also used as fuel, a trend that has major implications for the cultivation and sale of locally grown coconuts.

According to the Reserve Bank of Vanuatu’s Quarterly Economic Review report (2018), kava exports contributed approximately 45.1 percent of total exports (USD 4.3 million estimate), followed by copra exports at 19.9 percent (USD 2 million estimate), coconut oil at 9.3 percent (USD 900,000 estimate), cocoa at 8.6 percent (USD 800,000 million estimate), other products at 11.1 percent (USD 1 million estimate) and the rest contributed by other exports. In line with domestic production, kava, cocoa, beef and coffee exports improved despite a fall in other commodities.

The impact of natural disasters (Tropical cyclones and Ambae volcanic eruptions) impacted the production of kava, copra, root crops and vegetables produces in northern islands of Vanuatu, attributing to an expected weaker growth in the agriculture sector in 2018.

Fisheries

Fisheries contribution to the GDP in 2012 was estimated as USD 5.5 million, 0.7 percent of the national GDP. The fisheries export value in 2015 was estimated at USD 100 million and import value at USD 5.1 million. Annual per capita consumption was 32.1 kg in 2013.

Compared to other Pacific island countries, inshore marine areas are not extensive in Vanuatu. Inner reef areas are limited to narrow fringing reefs and the area covered by mangroves is quite small. A total of 161 vessels were reported in 2016 with just over half under 12 m length overall (LOA).

Vanuatu has industrial scale distant water fisheries operating in the Atlantic Ocean, the Indian Ocean and the eastern Pacific Ocean in addition to its own EEZ and surrounding area with at least 96 longliners, 3 purse seiners and 2 trawlers active fishing vessels in 2015. However, total catch in distant waters has significantly reduced after the peak of almost 144 000 tonnes reached in 2006 and it was about 77 tonnes in 2016, in addition to 43 000 tonnes

taken in the western central Pacific fishing area where Vanuatu is located. Coastal fishing is primarily carried out for subsistence purposes and for sales for local markets. Subsistence fishing activities include coastal line and net fishing targeting demersal and small pelagic reef and lagoon fish, as well as reef gleaning and collection of shellfish and other invertebrates.

In 2016, the aquaculture sector employed 34 women and 173 men. An estimated 38% of the people engaged in marine fishing and subsistence fisheries were women. In addition, there are some coastal fisheries that are export oriented, including trochus, bêche-de-mer, and aquarium fish. The aquarium fishery has been in existence in Vanuatu for the last 15 years. In 2015, Vanuatu exported ornamental fish valued at USD 224 000 and corals and shells valued at USD 92 000.

Aquaculture efforts in Vanuatu have included attempts at raising oyster, rabbitfish, freshwater shrimp, trochus, green snail and tilapia in the past. In mid-1999 some spawning trials of giant clams were carried out, and some experimental culture of *Eucheuma* seaweed was also undertaken. Vanuatu aquaculture produced 16 tonnes of fish and shrimp in 2016, a drastic drop from 2014 due to devastation caused by cyclone Pam in 2015. Vanuatu leaders had shown interest in introducing more intensive fish farming techniques from Asian countries.

Vanuatu is a signatory to the UN Convention on the Law of the Sea, the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and central Pacific Ocean and the Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Vanuatu is also a party to the following treaties and agreements relating to the management of regional fisheries.

1.4.6 Waste

The average amount of solid waste generated per capita has increased steadily from 0.43 kg/person/day in 2011 to about 1.5 kg/person/day in 2017. Both the urban centers of Port Vila and Luganville have controlled disposal sites or landfill in as in Port Vila's case. Aside from disposal within the urban controlled sites, common disposal methods include open backyard dumpsites, disposal at sea or on

unused land, and burning.

The management and control of a landfill, such as the Port Vila landfill has been and continues to be a challenge. The problem of solid waste disposal is particularly pronounced in the urban areas as the waste from rural areas is generally scattered and does not pose much hazard. The Vanuatu government is currently working with JICA to improve the solid waste management situation in the country.

Reuse and recycling measures have been initiated for materials such as glass, metals and PET bottles. In 2018 Vanuatu introduced regulations to ban the importation and use of single use non-biodegradable plastics including shopping bags and polystyrene containers. Through the Department of Environment and Conversation, there has been a recent expansion of the ban to include plastic cutlery and grocery packaging.

Liquid waste is not treated effectively via a reticulated system. Most houses and establishments have individual onsite disposal systems to manage liquid or sanitation waste water.

1.4.7 Health and services sector

Life expectancy in Vanuatu has increased and now stands at 69.6 and 72.7 years for males and females, respectively (VNSO, 2009). But the country faces the dual challenges of dealing with both communicable diseases and the rapidly growing incidence of Non-Communicable Disease (NCD), notably diabetes and hypertension. People are living longer, but often with the burden of chronic illness and disability. At all levels of the health system and in the community, people are concerned about the impacts of NCDs in terms of premature death and increasing levels of disability – e.g. stroke, amputation, blindness and mental illness. For the health system, the costs of managing the NCD crisis are huge and growing daily.

While there are now fewer malaria cases, Vanuatu still has worrying levels of other communicable diseases such as Tuberculosis (TB) and Sexually Transmitted Infections (STIs). The challenge is to maintain the significant gains made as resistant strains of disease emerge, population mobility increases and development partner support decreases. And although 90% of people now have improved water

supply, almost half the population does not have proper sanitation. Along with poor hygiene, this helps spread infectious diseases such as TB, Acute Respiratory Infection (ARI), diarrhoea and skin diseases.

Vanuatu still lags behind in terms of maternal and child health. Although nine out of ten women giving birth now have skilled birth attendants, too many women still die in childbirth. Numbers of maternal deaths have actually increased over the past 3 years although this may be due to improvements made in reporting processes.

The Vanuatu health system is mainly classed into three (3) focus areas being Public Health, Curative Services and Corporate Services. The current health system structure is based on the Role Delineation Policy developed in 2004. While this is still a workable system, it is not able to achieve the first policy objective of ensuring equitable access to quality, affordable health services.

There are obvious physical challenges. Vanuatu has a small population (just over 270,000 in 2015) that is dispersed across 83 islands. Villages in remote areas are often small and isolated, and people who live there pay high transport costs (via boat or truck) to reach health facilities. In the wet season, travel by sea is often dangerous and roads may be cut by flooding. Overall the health system faces significant challenges in its quest to achieve Universal

1.5 Education

Vanuatu operates a bilingual education system, with English and French languages being taught to students throughout the country at Early Childhood Education (ECCE), Primary and Secondary schools. Table 5 below shows the number of schools and type of school.

According to the statistics of the ECCE sector in 2016 as outlined in table 6 and 7 below, number of enrolment and teachers shows big jumped compared to 2017 data. Reasonably this was due to the missing or incomplete data captured in Open Vanuatu Education Management Information System (VEMIS).

The number of enrolled children in the ECCE centres

throughout Vanuatu has increased by 4.9% in 2018 compared to 2017. At primary level, the number of students has increased by 7.7% in 2018 compared to 2017 and 3.9% at secondary level in 2018 compared to 2017. In terms of teaching staff, the number of teachers in ECCE and primary schools has also increased in 2018. However, Ministry of Education and Training (MoET) is still recording the number of the ECCE, Primary and Secondary school teachers by their qualification in the Open VEMIS. It is expected that 100% of these teachers will be recorded in the system by 2019.

Overall, school grants are the major incentive that has contributed to the increase of school enrolment across the three education sector. Many other programs may have also contributed in one way or another but the fact that more children are going to school is mainly because parents in the communities are no longer paying for their children tuition fees since 2010.

Table 5 Total number of schools in Vanuatu by School type, 2016 – 2018

Education Sector Level	2016	2017	2018
Early Childhood	566	520	838
Primary School	438	436	455
Secondary School	93	93	104
Post School Education and Training	7	7	7
Vanuatu	1,104	1,056	1,404

Source: Open VEMIS, 2018

Table 6 School enrolment trend by sector level, 2016 – 2018

Year	ECCE	Primary 1 - 6	Secondary 7+	Post School Education and Training	Total
2016	8,800	44,965	18,408	2,122	74,295
2017	14,921	49,005	19,231	2,291	85,448
2018	15,661	52,789	19,983	2,055	90,488

Source: Open VEMIS, 2018

Table 7 Total number of Teachers/Trainers by school type, 2016 – 2018

Year	ECCE	Primary	Secondary 7+	Post School Education and Training	Total
2016	311	1,548	761	174	2,794
2017	1,033	1,780	1,013	187	4,013
2018	1,306	1,908	980	166	4,360

Source: Open VEMIS, 2018

1.6 National Communications Institutional Arrangements

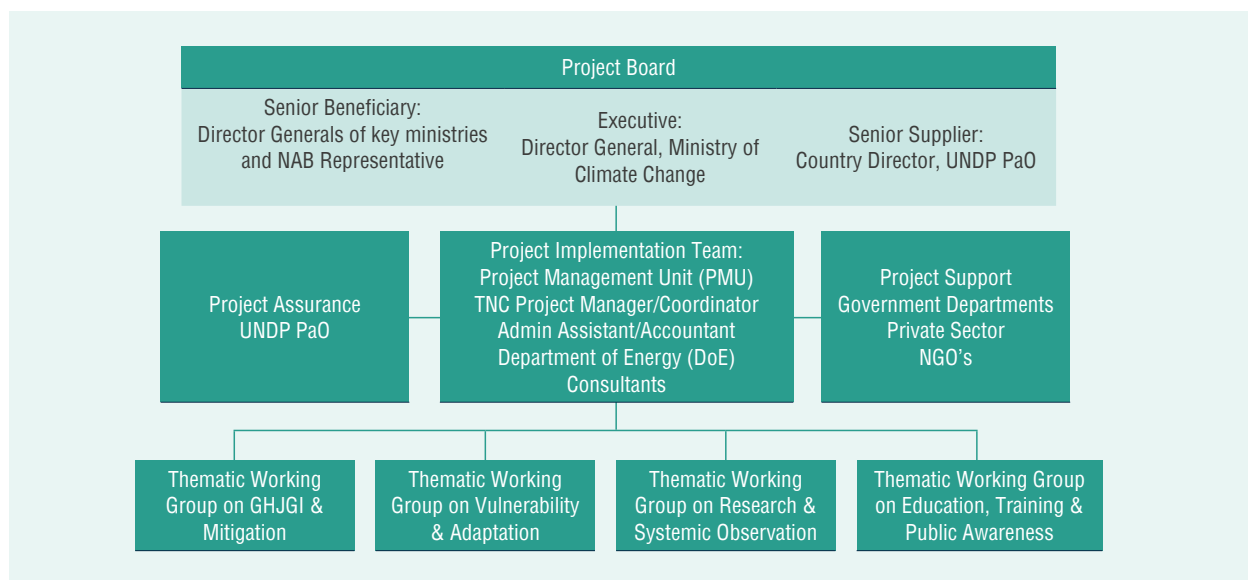
The third national communication of the Republic of Vanuatu is being implemented by the Ministry of Climate Change (MoCC), Government of Vanuatu in collaboration with United Nations Development Programme (UNDP). United Nations Development Programme (UNDP) is also supporting the Ministry of Climate Change, to build Vanuatu's national system for developing regular greenhouse gas (GHG) inventories, developing mitigation assessments and conducting vulnerability assessments as part of the Third National Communications (TNC) initiative.

Key steps towards the preparation of third national communication and national GHG inventory for the years 2007-2015 was as follows:

- Project Organization Structuring
- Thematic Working Group (TWGs) formation

- Stakeholder Consultation Process
- Training and Capacity building Programme
- Data collection, Identification of data gaps and uncertainty assessment
- Documents/data review for quality assurance
- Preparation of GHG Inventory Report
- Review and approval of the GHG Inventory Report

The TNC is being managed by the Project Board, mainly responsible for making by consensus, management decisions when guidance is required by the Project Manager, including recommendation for UNDP/Implementing Partner approval of project plans and revisions. The Project Board is comprised of: Director Generals of key stakeholder ministries and NAB representative as Senior Beneficiaries, Director-General, Ministry of Climate Change as the Executive and the Country Director, PaO as the Senior Supplier. The project assurance role shall be provided by the Fiji UNDP Country Office. Additional quality assurance shall be provided by the UNDP Regional Technical Advisor as needed. The structure of the project team is as follows:



The Department of Energy (DoE), Climate Change Project Management Unit (PMU), TNC project coordinator and consultants formed the project implementation team. The Ministry of Climate Change undertook tasks of consultation with other relevant government departments, the private sector and NGOs. The DoE was also responsible for central coordination of the development of the energy and climate change mitigation sector, provided technical and policy oversight etc.

Thematic Working Groups (TWGs)

The thematic working groups were formed to assist with the preparation of various components of the national communication viz National Greenhouse Inventory and Mitigation Analysis, Vulnerability and Adaptation, Research and systematic observation; and Education, training, public awareness and information and networking and Capacity-building.

Each thematic working group was comprised of a number of experts drawing both from public and private sectors,

communities, and NGOs, as appropriate. The following table presents the key agencies within the TWGs:

Table 8 Thematic Working Groups

Twgs	Members	
TWG - NATIONAL CIRCUMSTANCES	Department of Strategic Policy Planning and Aid Coordination (DESPAC)	
	Department of Environmental Protection and Conservation (DEPC)	
	Department of Finance and. Treasury (DFT)	
	Department of Foreign Affairs and External Trade (DFET)	
	National Advisory Board on Climate Change (NAB Sec)	
	Department of Women Affairs (DWA)	
	Department of Agriculture (DARD)	
	Fisheries Department	
	Department of Energy (DOE)	
TWG GHG- GREEN HOUSE GAS (GHGI)	Department of Energy (DOE)	
	Department of Forests (DoF)	
	Department of Agriculture (DARD)	
	Livestock Department	
	Port Vila Municipality Council (PVMC)	
	Utilities Regulatory Authority (URA)	
	Vanuatu National Statistics Office (NSO)	
	Department of Environmental Protection and Conservation (DEPC)	
Department of Biosecurity		
TWG - RESEARCH & SYSTEMATIC OBSERVATION	Vanuatu Meteorology & Geohazards Division (VMGD)	
	Vanuatu Meteorology & Geohazards Division (VMGD)	
TWG - VULNERABILITY ASSESSMENT AND ADAPTATION (V&A)	Department of Environmental Protection and Conservation (DEPC)	
	National Disaster Management Office (NDMO)	
	Vanuatu Meteorology & Geohazards Division (VMGD)	
	Department of Agriculture (DARD)	
	Department of Geology, Mines & Water Resources (DGMWR)	
	Department of Forests (DoF)	
	Fisheries Department	
	Ministry of Health (MoH)	
	Public Works Department (PWD)	
	Department of Local Authorities (DLA)	
	Lands Survey	
	Vanuatu Meteorology & Geohazards Division (VMGD)	
	TWG - MITIGATION	Vanuatu Meteorology & Geohazards Division (VMGD)
		Ministry of Agriculture
Ministry of Climate Change (MoCC)		
Ministry of Education and Training (MoET)		
National Disaster Management Office (NDMO)		
Vanuatu Meteorology & Geohazards Division (VMGD)		
Department of Environmental Protection and Conservation (DEPC)		
Department of Forests (DoF)		
Lands Survey		

1.7 Stakeholder Participation

Focused stakeholder consultation was carried out with in the government, public and private sectors, local and international development partners, NGOs and public groups. The first phase of the stakeholder consultation focused on the key objective of the third national communication and national GHG inventory project, inception and processes. The stakeholders were updated on the key steps of TNC and consulted on various aspect of GHG

inventory sectors e.g. data collection process, climate change mitigation, adaptation and V&A management. The second phase of stakeholder consultation involved the presentation of the results i.e. National GHG Inventory of Vanuatu for the years 2007-2015, data, standards and assumptions applied for Vanuatu’s National GHG inventory, data gaps and uncertainties etc. The objective of this phase was also to validate the assumptions and standards used for GHG inventory and seeks the inputs from wide stakeholders.

1.8 Gender Analysis

Vanuatu is traditionally a male-dominated and largely patriarchal society. Women's gendered roles as mothers and housewives in the traditional context have seen few women enter the public domain, including politics and positions of seniority for decision-making in both public and private sectors. Women have very low representation in Parliament and in other decision-making bodies. There are still prevailing social and cultural perceptions of leadership and male dominance of political parties and decision making.²⁰ However, there has been notable progress with an increase of women in senior management in the public sector of 3.4 per cent in 2016 compared to 0.3 per cent in 2010. Despite still not having any women in Parliament, the Vanuatu Parliament passed a historical amendment to the Municipalities Act providing for reserved seats for women in the municipal councils. The quota provision is regarded as a 'special temporary measure' and was implemented for the first time in the Port Vila Municipal Council elections that took place in December 2013.

Considerable progress was achieved with five women elected to the Port Vila Municipal Council and another five to the Luganville Municipal Council for 2014. This is a positive step to increase women's participation in high-level decision making forums with access to and control over resources relevant to climate change and the impact on gender and socially vulnerable groups.

There has been other evident progress for women in Vanuatu in the past two decades. According to the 2009 National Population and Housing Census: Gender Monograph, the gender gap in literacy and education has narrowed. The child mortality rate has significantly declined in the decade between 1999 and 2009 and there has been a notable drop in teenage pregnancy across the country.

In terms of labour participation, the proportion of women

in waged employment has substantially increased. A significant achievement over the recent years has been the introduction of the Family Protection Act (FPA) (approved in 2008 and in effect in 2009), which provides legal protection for victims of violence. Furthermore, various government ministries, including agriculture, public works, environment, health, education and lands have developed gender strategies and are taking proactive steps to integrate gender into their sector policies and plans.

Nevertheless, more women than men (49% and 41%, respectively) are involved in the subsistence economy and there are more female-headed single parent households with children, grandchildren or extended family members compared to men (Vanuatu National Statistics Office 2016).

A particular community based study by Care International (CARE 2015), where climate change resilience is concerned, on Tafea province revealed the following observations:

- Gardening is taking up a lot of time for both women and men but female headed households are facing particular challenges as they cannot draw on additional labour to help them.
- Gender distribution in the collection of water is most equitable in Tafea Province compared with other provinces.
- The presence of grandchildren can further increase women's workload, as well as alleviate the burden for older women.
- Slightly fewer girls than boys are enrolled in primary school in Tafea Province, whereas at secondary schools this is more or less equal. Women and men share concerns about the impacts of the cyclone on their children's education as many school buildings suffered extensive damage, lack regular access to water and most importantly children do not have enough to eat.
- Livelihood options for both women and men are extremely limited due to the scarcity of resources (especially so in Enimah village, Tanna island).

Chapter 2

National Greenhouse Gas Inventory

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National Greenhouse Gas Inventory

Introduction

The Vanuatu's National Greenhouse Gas Inventory report provides an update to the national GHG inventory by sectors as per the biennial update reporting guidelines for Non-Annex I Parties. As required by the guidelines, the Vanuatu's national GHG inventory prepared in accordance with paragraphs 8–24 in the “Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention” as contained in the annex to decision 17/CP.8⁷. The scope of the updates on national GHG inventories also consistent with capacities, time constraints, data availabilities and the level of support received for first biennial update reporting.

In this report, a detailed description of the anthropogenic Greenhouse Gases (GHG) inventory of the emissions of carbon dioxide (CO₂), methane (CH₄) and nitrous oxide (N₂O) (It is to be noted that Vanuatu has negligible or no emission of hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF₆), hence not applicable), by sources and their removal by sinks has been presented for the year 2016 and 2017. The sectors covered include Energy, Agriculture, Forestry and Land Use (AFOLU), and Waste (Vanuatu has no emissions from Industrial Processes and Product Use (IPPU) sector). GHG emissions from International bunker (international Aviation and international water-borne navigation have also been estimated and reported as memo items in the inventory; however, not included in the Vanuatu's total national GHG emissions. The Tier-1 methodological tier and IPCC default emission factors employed for GHG estimation.

This report also presents an account of the methodologies used, the quality assurance/quality control (QA/QC) measures applied, the results of the key category analysis, and approach-I quantification of the uncertainties associated with the estimates. As best practice, Vanuatu has carried out a key category analysis⁸ which helped to identify the most relevant GHG inventory categories for Vanuatu, and guided to focus available resources most efficiently. Furthermore,

an uncertainty assessment⁹ has been conducted on the estimates of emissions and removals, which identifies the potential for improvement.

A consistent time series of GHG inventory for the period of 2010–2017 is provided. A summary information table of inventories for previous submission years (i.e. for 2010 and 2015), as reproduced from previous submissions has also been included. Vanuatu has used 2006 IPCC Guidelines for Greenhouse Gas Inventories, and using the IPCC Inventory Software (Version 2.54- June 2017) to the extent possible as per extant capacities. There are some technological and capacity building challenges, constraints and gaps that have been highlighted separately in this report.

The Vanuatu's GHG inventory does not include the emissions from the indirect GHGs i.e. Oxides of Nitrogen (NO_x), Carbon Monoxide (CO), Non-Methane Volatile Organic Compounds (NMVOC) and Sulphur dioxide (SO₂). These indirect GHG emissions are not accounted in the aggregated national GHG emissions. The GHG emissions reported in Giga-grams (Gg) and the aggregated GHG emissions and removals are expressed in CO₂ equivalents (Gg CO₂e or CO₂eq) using the Global Warming Potential (GWP) defined by Fifth Assessment Report (AR5) by the Intergovernmental Panel on Climate Change (IPCC).

Institutional Arrangement for Inventory Preparation

In Vanuatu, National Advisory Board (NAB) is the supreme policy making and advisory body for all disaster risk reduction and climate change programs, projects, initiatives and activities in Vanuatu. NAB develops Disaster Risk Reduction (DRR) and Climate Change policies, guidelines and positions, advises on international and regional DRR and CC obligations, facilitates and endorses the development of new DRR & CC programs, projects, initiatives and activities, acts as a focal point for information sharing and coordination on CC/DRR, as well as guides and coordinates the development of national climate finance processes.

7 FCCC/CP/2002/7/Add.2; <http://unfccc.int/resource/docs/cop8/07a02.pdf>

8 IPCC 2006 Guidelines, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_4_Ch4_MethodChoice.pdf

9 The IPCC 2006 Guidelines, http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/1_Volume1/V1_3_Ch3_Uncertainties.pdf

The Ministry of Climate Change Adaptation (MoCC), Meteorology & Geo-Hazards, Energy, Environment and National Disaster Management is the nodal agency as part of the Government's efforts to streamline Vanuatu's climate change natural disaster responses and sustainable development of the environment. The Department of Climate Change (DoCC) has been established as part of the Government of Vanuatu's ongoing efforts for enhancing national resilience in the face of global climate change impacts. The department has been formed and mandated as per the 'Meteorology, Geological Hazards and Climate Change Act No. 25 of 2016 (Climate Change Act)', to ensure that high quality services are provided in relation to climate

change in Vanuatu.

The preparation of Vanuatu's National Greenhouse Gas Inventory was led by the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Environment, Energy and Disaster Management (MoCC) through the Department of Climate Change (DoCC) with support from the various Ministries and Government Departments, Public sector undertakings, Private sector development partners and NGOs. Many of these institutions / experts have been part of the inventory preparation exercise since Vanuatu's Initial National Communication, hence well aware about the national circumstances, capacities and limitations.

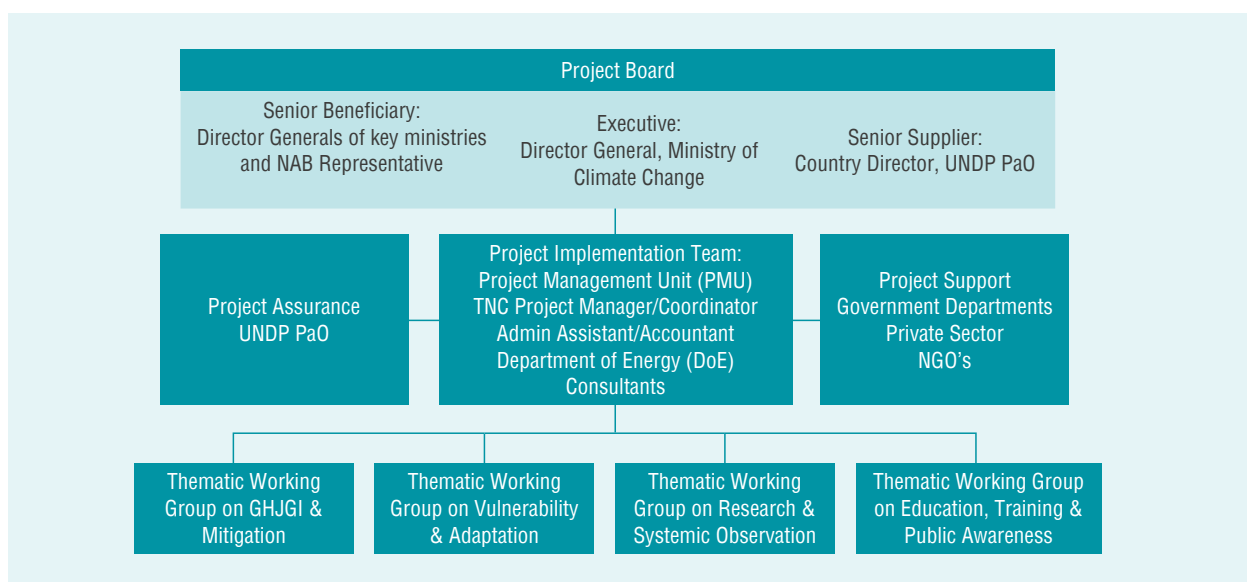


Figure 5 Institutional Arrangement and Organization Structure for National GHG Inventory

The National GHG Inventory of Vanuatu for the year 2016 and 2017 (under the Vanuatu's First Biennial Update Report to United Nations Framework Convention on Climate Change) is being managed by the Project Board; which is mainly responsible for making by consensus, management decisions when guidance is required by the Project Manager, including recommendation for UNDP (Implementing Partner) approval of project plans and revisions.

The Project Board is comprised of: Director General (DG) of key stakeholder ministries and National Advisory Board (NAB) on Climate Change & Disaster Risk reduction representative as Senior Beneficiaries, Director-General Ministry of Climate Change as the Executive and the

Country Director Pacific Office (PaO) as the Senior Supplier. The project assurance role was provided by the Fiji UNDP Country Office. Additional quality assurance shall be provided by the UNDP Regional Technical Advisor as needed.

The Department Climate Change (DoCC), the Department of Energy (DoE), project coordinator and consultants formed the project implementation team. The Ministry of Climate Change undertook tasks of consultation with other relevant government departments, the private sector and NGOs. The thematic working group (TWG) for national GHG inventory included representatives from Department of Energy (DOE), Department of Forests (DoF),

Department of Agriculture (DARD), Livestock Department, Port Vila Municipality Council (PVMC), Utilities Regulatory Authority (URA), Vanuatu National Statistics Office (NSO), Department of Environmental Protection and Conservation (DEPC), Biosecurity, private sector representatives from UNELCO and VUI etc.

Training and Capacity Building

Training and Capacity Building programme was designed and delivered to TWGs and key stakeholders. A technical training and hand-holding workshop on development of GHG inventory was organized for the TWGs and other relevant key stakeholders in Vanuatu. The overall objective was to empower the stakeholders in Vanuatu to achieve the necessary level of expertise to develop national GHG inventory through data collection, analysis, monitoring and reporting guidelines and procedures as required by UNFCCC. The stakeholders were also updated on IPCC 2006 Guidelines and Best Practices to develop the national GHG Inventory and GHG inventory software developed under the Integrated Monitoring, Reporting and Verification (MRV) Tool for Vanuatu.

Stakeholder Consultation

The focused stakeholder consultation was carried out with in the government and government departments, public and private sectors, local and international development partners, NGOs and public groups. The stakeholder consultation also involved presentation of the results i.e. National GHG Inventory of Vanuatu for the year 2016 and 2017, data, standards and assumptions applied for Vanuatu's National GHG inventory, data gaps and uncertainties etc.

The objective of the stakeholder consultation was also to validate the assumptions and standards used for GHG inventory and seeks the inputs from wide stakeholders. An important aspect of the stakeholder consultation was to update on the data gaps, uncertainties etc. and issues and activities to be considered to improve the quality, completeness and transparency of GHG inventory and updates on inventory improvement plan.

Quality Assurance/Quality Control and Review Mechanism

A quality assurance/quality control (QA/QC) review mechanism was the integral part of the process and was devised in order to improve transparency, consistency, comparability, completeness, and accuracy of third national communication and national greenhouse gas inventory. An internal QA/QC plan was developed and roles and responsibilities were defined for the FBUR and GHG Inventory Team Members. The QA/QC process and review mechanism implemented at all level of data collection, inventory preparation and reporting.

The inventory team routinely conducted checks consistency of the data and information provided by the different stakeholders (line ministries, government departments, Organizations, Public and private sector etc), to ensure data integrity, correctness, and completeness. In case of discrepancy or incompleteness, the inventory team consulted the relevant stakeholders and experts to reduce the data uncertainty, appropriate corrections, address errors and omissions. The sub-sectoral and sectoral calculations of GHGs were shared with the TWGs for technical review of categories and sub-category activity data, emission factors, estimation parameters, and calculation methods. The inputs provided by the TWGs were addressed and GHG emission reduction calculation was revised. On finalization of the GHG Inventory calculations, draft report was prepared and shared with the TWGs.

Further, the draft report and GHG inventory calculations presented during the stakeholder consultation to seek inputs and finalize the report.

Independent Third Party Review of National GHG Inventory (NIR)

An independent third party review of NIR was coordinated by UNDP-UNEP Global Support Programme (GSP) and was conducted from 9 to 14 December 2020 by Dr. Carlos López, consultant in national GHG emissions inventories as per the requirements indicated in the UNFCCC Decision 17/CP.8 Annex, the UNFCCC Decision 2/CP.17 Annex III, and to the advice of the IPCC Guidelines and Guidance indicated in these decisions for the preparation of the inventories to be included in the National Communications and Biennial Update Reports from non-Annex I Parties under the UNFCCC. The reviewer also takes into account the requirements and flexibilities established to prepare

and report the inventory for Small Island Developing State (SIDS) and Least Developed Countries (LDC).

The Independent reviewer has also examined NIR's adherence to the guidance provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories; additionally considered criteria and recommendations provided in other key methodological documents and tools related to the inventory process including IPCC, 2017; UNDP, 2005; US-EPA-USAID, 2011; UNFCCC-GCE, 2012; EEA, 2019, UNFCCC, 2014, UNFCCC, 2017 and UNFCCC, UNDP-GSP, 2019. The quality of the Inventory was mainly assessed through the examination of how were followed the principles TCCCA3 on reporting, established in the IPCC Good Practice Guidances 2000 and 2003 and the 2006 IPCC Guidelines. The main outcomes of QA/QC and review process was overall improvement in the quality of data collection, calculations, reporting and inclusion of the key criteria analysis, uncertainty estimates and subsequent improvements in the future GHG Inventory i.e. Inventory Improvement Plan (IIP).

2.1 Vanuatu's GHG Emissions: 2016, 2017

Overview

The GHG emissions from Vanuatu has been estimated based on the methodology discussed in the previous section for the year 2016–2017; and presented here. The following section includes the total GHG emissions by sources and removals by sinks for the years 2016-2017; further trend analysis also incorporated against the GHG emissions estimated in the previous years (as a part of First, Second and Third National Communication i.e. year 1994, 2000, 2007-2015).

The republic of Vanuatu remains the net carbon negative in terms of net GHG emissions including the removals. However, the total national GHG emissions excluding removals in year 2017 reached to 600.209 Gg CO₂e (in

comparison to 299.387 Gg CO₂e estimated for year 1994 under the first national communication and 585.387 Gg CO₂e estimated for year 2000 under the second national communication); This comprises direct CO₂ emission 159.669 Gg, CH₄ emission 13.512 Gg and N₂O emissions 0.235 Gg during 2017. Emissions of other GHGs like per fluorocarbons (PFCs), hydro fluorocarbons (HFCs) and Sulphur hexafluoride (SF₆) not estimated since very limited (negligible) applications and no manufacturing of the products containing these gases.

By way of comparison, in 2017, the total global GHG emissions¹⁰, excluding emissions from land-use change (LUC), reached a record 49.2 GtCO₂e. Including LUC adds another 4.2 GtCO₂, bringing the total to 53.5 GtCO₂e, which is an increase of 0.7 GtCO₂e (1.3%) compared with 2016. The increase in global CO₂ emissions in 2017 (1.2%) resulted from stronger Gross Domestic Product (GDP) growth (estimated at 3.7%) and slower declines in energy and especially carbon intensity. In absolute terms Vanuatu's total GHG (CO₂equivalent) emissions was around 0.0011% of the total Global GHG emissions for year 2017.

The global per capita GHG emissions (in terms of tonnes of CO₂e per person) for the year 2017 was about 7.039 tonnes of CO₂equivalent per person per year (tCO₂e/Person/Year) (Considering Global population for 2017 was 7.6 billion persons¹¹); in comparison the per capita GHG emission (in terms of tonnes of CO₂e per person) in Vanuatu come out approximately 2.137 tonnes of CO₂equivalent per person for year 2017 (Population of 0.280 Million persons); which is around 30% of the world average during that period.

The above analysis shows that, the total annual GHG emissions and annual average per capita GHG emissions (tonnes/person/year) in Vanuatu remained very low as compare to global average GHG emissions. Furthermore, Vanuatu remained net carbon neutral including the removals from the forestry sector. Forest acts a sink for GHG emission from Vanuatu, almost 74% of the land area in Vanuatu is covered by natural vegetation, with around one third covered by forest; which is more than 36.1% (440,000 hectares covered by tropical forest).

¹⁰ Emissions Gap Report 2018 <https://www.unenvironment.org/resources/emissions-gap-report-2018>

¹¹ World Population Prospects: The 2017 Revision <https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html>

The net removal from forest sector for the year 2015¹² was (-) 6973.689 Gg CO₂e; however due to unavailability of 2016 and 2017 data the estimation of removals was not conducted for 2016 and 2017. The updated forest sector data and emissions (removal) will be part of Vanuatu's upcoming REDD+ report.

Total GHG Emissions: 2016, 2017

The total GHG emissions (excl. Removals) in Vanuatu for the year 2016 was 509.531 Gg CO₂e and 2017 was 600.209 Gg CO₂e. The following graph and table present the Vanuatu's total GHG emissions in Gg CO₂e (excl. Removals) for the inventory year 2016 and 2017.

Table 9 Vanuatu's Total GHG Emission-Sector wise (excluding removals), Gg CO₂e: 2016 and 2017

Categories	2016	2017
1 - Energy	148.121	161.290
2 - Industrial processes and product use (ippu)	0	0
3 - Agriculture, forestry, and other land use (afolu)	323.022	399.381
4 - Waste	38.388	39.539
Total	509.531	600.209

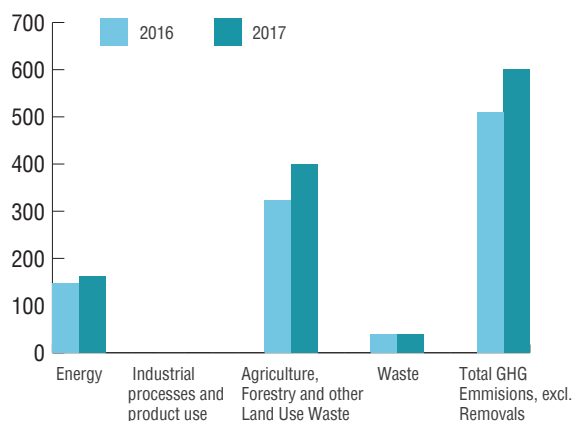


Figure 6: Vanuatu's Total GHG Emission - Sector wise (excluding removals), Gg CO₂e: 2016 and 2017

The above tables and figures present that, the total GHG emissions from Vanuatu is increased in 2017 in comparison 2016, indicative increase in CO₂ emission followed by CH₄ and N₂O emissions. Evidently the main GHG emissions from Vanuatu comprises of mainly Carbon Dioxide (CO₂)

as major contributor from combustion of fossil fuel for generation of electricity, transportation and other sectors; Methane (CH₄) and Nitrous Oxide (N₂O) emissions from agriculture-livestock (Enteric fermentation and Manure management), Waste Sector (Solid waste and waste water) and Land. Livestock is a major source of Methane emission in Vanuatu.

However, as discussed above the republic of Vanuatu is net carbon negative, since the land-use change and forestry sector is a net sink of CO₂ in Vanuatu. In the current inventory, under Land Use Change and Forestry sector, CO₂ emissions/removals are not estimated. The CO₂ removals from the forestry sector were estimated -1.1534 Gg of CO₂e for the year 1994; -7,913.14 Gg of CO₂e for the year 2000 and (-) 6973.689 Gg CO₂e for the year 2015.

Sector Wise GHG Emissions: 2016, 2017

The following table present the sector and sub-sector wise GHG emissions in Vanuatu for the year 2016 and 2017.

Table 10 Vanuatu's GHG Emission-Sector and Sub-sector wise (excl. removals), Gg CO₂e:2016 and 2017

Inventory Year: 2016-2017	Total CO ₂ Emissions, (Gg CO ₂ Equivalents)	
Total National Emissions and Removals: Categories	2016	2017
1 - Energy	148.121	161.290
1.A - Fuel Combustion Activities	148.121	161.290
1.A.1 - Energy Industries	40.698	43.700
1.A.2 - Manufacturing Industries and Construction	22.963	24.308
1.A.3 - Transport	77.962	86.101
1.A.4 - Other Sectors	6.498	7.181
2 - Industrial Processes and Product Use	-	-
3 - Agriculture, Forestry, and Other Land Use	323.022	399.381
3.A - Livestock	312.106	384.395
3.A.1 - Enteric Fermentation	202.547	269.999
3.A.2 - Manure Management	109.559	114.396
3.C - Aggregate sources and non-CO ₂ emissions sources on land	10.917	14.985
3.C.6 - Indirect N ₂ O Emissions from manure management	10.917	14.985
4 - Waste	38.388	39.539
4.A - Solid Waste Disposal	30.658	31.732
4.D - Wastewater Treatment and Discharge	7.730	7.807
Total ghg emissions, excl. Removals	509.531	600.209

As discussed above the main GHG emission sectors and sub-sectors in Vanuatu includes:

1. Energy Sector – (Direct Fuel Consumption for Combustion Activity)
 - Energy Industries (Electricity Generation)
 - Manufacturing Industries and Construction
 - Transportation
 - Road Transportation
 - Aviation (Domestic)
 - Water-borne Navigation (Domestic)
 - Other Sectors – Commercial, Institutional and Residential
2. Agriculture, Forestry, and Other Land Use (AFOLU)
 - Livestock
 - Land
3. Waste Sector
 - Solid Waste
 - Unmanaged Waste Disposal Sites (Municipal Solid Waste-MSW)

4. Wastewater Treatment and Discharge

- Domestic Waste Water Treatment and Discharge

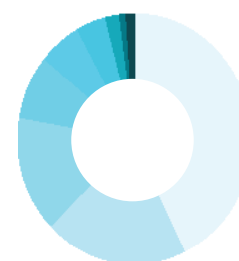
Note: GHG emissions from international aviation and international water borne navigation has been calculated as memo item and not included in the total GHG emissions from Vanuatu.

The total GHG emissions in Vanuatu contributed by three main sectors viz Agriculture (livestock and land), Energy and Waste Sectors. The average contribution of these sector for the year 2016-2017 were Agriculture (65%), Energy Sector (28%), and Waste Sector (7%), there is no contribution from industrial process and solvent & other product use (IPPU) sector.

The following table present the sub-category wise GHG emissions from Vanuatu during the inventory 2016 and 2017.

Table 11 Vanuatu's GHG Emission- sub-category wise (excl. removals), Gg CO2eq:2016 and 2017

Inventory Year: 2016-2017 Sub-Categories	Total CO2 Emissions, (Gg CO2 Equivalents)	
	2016	2017
1.A.1 - ENERGY INDUSTRIES	40.698	43.700
1.A.2 - MANUFACTURING INDUSTRIES AND CONSTRUCTION	22.963	24.308
1.A.3 - TRANSPORT	77.962	86.101
1.A.4 - OTHER SECTORS	6.498	7.181
3.A.1 - ENTERIC FERMENTATION	202.547	269.999
3.A.2 - MANURE MANAGEMENT	109.559	114.396
3.C.6 - INDIRECT N2O EMISSIONS FROM MANURE MANAGEMENT	10.917	14.985
4.A.2 - UNMANAGED WASTE DISPOSAL SITES	30.658	31.732
4.D.1 - DOMESTIC WASTEWATER TREATMENT AND DISCHARGE	7.730	7.807
TOTAL GHG EMISSIONS, EXCL. REMOVALS	509.531	600.209



- 1.A.4 - Other Sectors (1%)
- 4.D.1 - Domestic wastewater treatment and discharge (1%)
- 3.C.6 - Indirect N2O Emissions from manure management (2%)
- 1.A.2 - Manufacturing Industries and Construction (4%)
- 4.A.2 - Unmanaged waste disposal sites (6%)
- 1.A.1 - Energy Industries (8%)
- 1.A.3 - Transport (15%)
- 3.A.2 - Manure Management (20%)
- 3.A.1 - Enteric Fermentation (43%)

Figure 7: Vanuatu's Average GHG Emission – Sub-category wise (Gg CO2eq): 2016 and 2017

The above table and graph of sub-sectoral (sub-category wise) GHG emission of Vanuatu for the inventory years 2016-2017 shows that the Livestock Enteric Fermentation and Manure Management is the major source of GHG emissions, the average emissions from these sub-categories are 43% and 20% respectively; followed by the transport sector 15%; Energy Industries (Electricity Generation) 8%; Solid Waste Disposal 6%; Manufacturing Industries and Construction 4%; Land Management 2%; Domestic Waste Water Treatment and Discharge and Other Sectors including Commercial, Institutional and residential both 1%.

Gas by Gas Emission Inventory: 2016, 2017

The gas by gas GHG emission inventory for Vanuatu for the inventory years 2016 and 2017 discussed in this section. As discussed above, the main GHG emission sectors in Vanuatu includes Energy, AFOLU and Waste sector. Greenhouse gases covered in this analysis include Carbon di-oxide (CO₂), Methane (CH₄) and Nitrous-oxide (N₂O), the estimated quantum of these main GHGs presented in table-2 and table 5.

The emission from other direct GHGs i.e. hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and Sulphur hexafluoride (SF6) have not been included here since HFCs, PFCs, SF6 are not directly imported or sold in Vanuatu; hence direct emission of these gases does not occur; however negligible amount of these gases present in equipment like air conditioners (ACs), Refrigerators, switch-boards and circuit-breakers etc. further non-of the activity listed under Tier-1 approach to estimate emissions from these gases applicable for Vanuatu.

The national GHG inventory also doesn't include the emission of precursor gases like Carbon Monoxide (CO), Nitrogen Oxides (NOx) and non-Methane Volatile Organic Compounds (NMVOC) and other gases not controlled by the Montreal Protocol, such as Sulphur Oxides (SOx); 'due to lack of detailed activity data and due to high uncertainty involved in estimation of emissions from indirect gases. Hence, the project team decided to improve the quality of data and shall estimate emission from these gases during future national GHG Inventory.

The data analysis confirms that CO2 is the most potent GHG in Vanuatu. This is primarily due to fossil fuel combustion emissions from energy industries mainly electricity generation, manufacturing industries & construction and other commercial, institutional and residential; and tail gas emissions from transportation-road transport, domestic aviation and water borne transportation. Next most prominent GHG in Vanuatu is CH4 mainly from the livestock, land management, solid waste and waste water sub- sectors; followed by N2O mainly from livestock, land management and waste water sub-sector. The gas wise GHG emissions form Vanuatu for the inventory year 2016 and 2017 presented here:

Table 12 Gas wise GHG Emission (excluding removals), Gg: 2016 -2017

Inventory year: 2016-2017	Ghg emissions (excluding removals)			
Year	Gg CO2	Gg CH4	Gg N2O	Total Gg CO2eq.
2016	146.637	10.892	0.219	509.531
2017	159.669	13.512	0.235	600.209
Average	153.153	12.202	0.227	554.870
Percentage share in total ghg emissions (gg co2eq.)	27.6%	61.6%	10.8%	100%

The detailed analysis of all three potent GHGs are discussed in the following section.

Carbon dioxide (CO2)

Net CO2 emissions in Vanuatu was estimated for the period 2016 and 2017 presented in the table and graph below. The energy sector and sub-sectors are the main source of CO2 emissions, accounting for approximately 100% of CO2 emissions. The CO2 emissions from Vanuatu has shown the increasing trend historically and under the inventory period 2016 and 2017, the net CO2 emissions in year 2016 was 146.637 Gg and increase to 159.669 Gg (8.9% increased) in 2017. The combustion of fossil fuels remains the main contributor of CO2 emissions in Vanuatu.

Table 13 CO2 Emission: 2016 -2017

Inventory Year: 2016-2017	co2 emissions (gg)	
Categories and sub-categories	2016	2017
1 - Energy		
1.A.1 - Energy Industries	40.565	43.557
1.A.2 - Manufacturing Industries and Construction	22.889	24.229
1.A.3 - Transport	76.695	84.714
1.A.4 - Other Sectors	6.487	7.169
Net co2 emissions (gg)	146.637	159.559

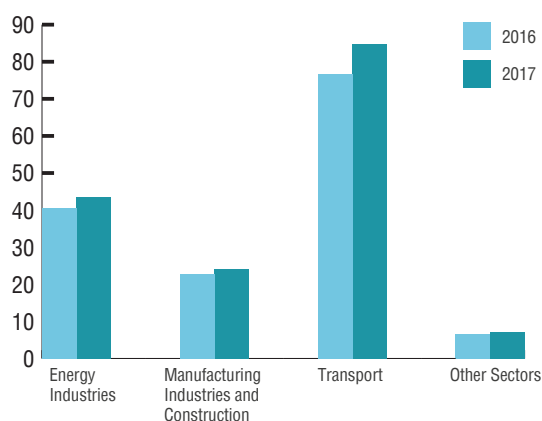


Figure 8: Vanuatu's Net CO2 Emission – Sub-category wise (Gg): 2016 and 2017

The Sub-sector (sub category) analysis of the total CO2 emission present that the Transportation sub-sector (52.7%) i.e. Road Transport (78.6%), Domestic Aviation (9.6%) and Domestic Water Borne Navigation (11.7%) are the main source of CO2 emission in Vanuatu; followed by the Energy Industry – Electricity Generation (27.5%), Manufacturing Industries and Construction (15.4%) and remaining from Other sectors (4.5%) i.e. commercial, institutional and residential sub-sectors.

Methane (CH₄)

Net Methane (CH₄) emissions in Vanuatu was estimated for the inventory year 2016 and 2017, presented in the graph and table below. About 90% of Methane emission in Vanuatu comes from the agriculture sector i.e. from Livestock- Cattle, Swine, Horses, Goat and Chicken; enteric fermentation and manure management, the waste (Solid waste -MSW, Waste water) sector is the second largest source of CH₄ emissions, accounting about 10% of emissions. Minor fraction of methane comes from the energy sector; mainly as the emissions from combustion of fossil fuel (0.06%).

Table 14 Methane (CH₄) Emission: 2016 -2017

Inventory Year: 2016-2017	CH ₄ Emissions, (Gg)	
Total National Emissions and Removals: Categories	2016	2017
1 - Energy		
1.A - Fuel Combustion Activities	0.006	0.007
1.A.1 - Energy Industries	0.002	0.002
1.A.2 - Manufacturing Industries and Construction	0.001	0.001
1.A.3 - Transport	0.004	0.004
1.A.4 - Other Sectors	0.000	0.000
3 - Agriculture, Forestry, and Other Land Use		
3.A - Livestock	9.633	12.215
3.A.1 - Enteric Fermentation	7.234	9.643
3.A.2 - Manure Management	2.399	2.572
4 - Waste	1.252	1.290
4.A - Solid Waste Disposal	1.095	1.133
4.D - Wastewater Treatment and Discharge	0.157	0.157
Net methane (ch₄) emissions (gg)	10.892	13.512

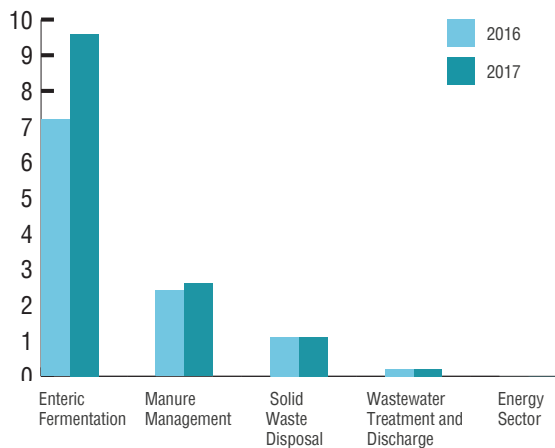


Figure 9 Vanuatu's Net Methane (CH₄) Emission – Sub-category wise (Gg): 2016 and 2017

The Methane (CH₄) emissions from Vanuatu has shown minor increasing trend over the years 2016 and 2017, the net CH₄ emissions in year 2016 was 10.892 Gg and increase to 13.512 Gg (24% increase) in 2017; the increase in methane emission is due to increase in livestock and waste generation also unscientific and unorganized waste management practices during the year; the open dumping and decay of waste increased the net methane emissions in Vanuatu. The contribution of Methane emissions in Vanuatu's net GHG emission is increasing rapidly and calls for serious action on improving the livestock manure management and municipal solid and waste water management practices.

Nitrous Oxide (N₂O)

The net Nitrous oxide (N₂O) emissions in Vanuatu is estimated to be 0.219 Gg in 2016 and 0.235 Gg in 2017; which is about 7% increase in a year. The main source of N₂O emissions in Vanuatu is from livestock manure management (68.1%), Land management (24.1%), Waste water (5.5%) and energy sector (2.3%) mainly transport sector tail gas emissions (mobile combustion) and minor emission from stationery combustion. The following graph and table present N₂O emission in Vanuatu for the inventory year 2016 and 2017.

Table 15 Nitrous oxide (N₂O) Emission: 2016 -2017

Inventory Year: 2016-2017	CH ₄ Emissions, (Gg)	
Total National Emissions and Removals: Categories and sub-categories	2016	2017
1 - Energy		
1.A - Fuel Combustion Activities	0.005	0.005
1.A.1 - Energy Industries	0.0003	0.0004
1.A.2 - Manufacturing Industries and Construction	0.0002	0.0002
1.A.3 - Transport	0.0044	0.0048
1.A.4 - Other Sectors	0.0000	0.0000
3 - Agriculture, Forestry, and Other Land Use		
3.A - Livestock	0.160	0.160
3.A.1 - Enteric Fermentation	0.160	0.160
3.A.2 - Manure Management	0.041	0.057
3.C.6 - Indirect N ₂ O Emissions from Manure Management	0.013	0.013
4 - Waste	0.013	0.013
4.D - Wastewater Treatment and Discharge	0.219	0.235
Net nitrous oxide (n₂o) emissions (gg)	10.892	13.512

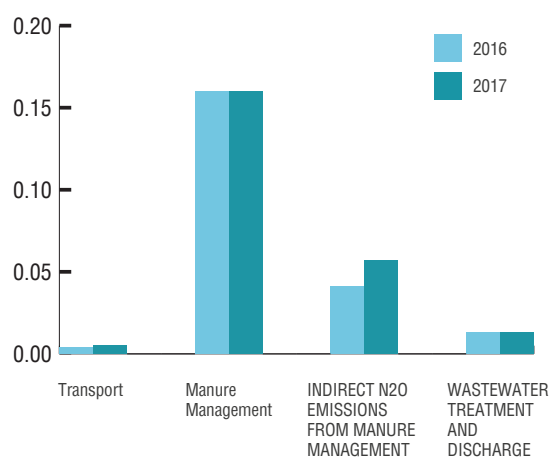


Figure 10 Vanuatu's Nitrous oxide (N2O) Emission – Sub-category wise (Gg): 2016 and 2017

Other GHGs (PFCs, HFCs and SF6)

Emissions from per-fluorocarbons (PFCs), hydro-fluorocarbons (HFCs) and Sulphur hexafluoride (SF6) in Vanuatu is not estimated since very limited (negligible) application and lack of activity (consumption) data; furthermore the products containing these gases are not produced in the country.

Indirect Greenhouse Gases (NOx, CO, NMVOC)

Apart from the direct GHG emissions in Vanuatu; the other indirect emissions of NOx, CO, NMVOC and SO2 takes place; however, they are not main source of the GHGs and have very negligible quantum. Due to lack of data and due to high uncertainty involved estimation of emissions from indirect gases in Vanuatu e.g. NOx, CO, NMVOC, SO2 not accounted under this GHG inventory for year 2016 and 2017.

Memo Items

In accordance with 2006 IPCC guidelines, CO2 emissions from International Bunkers and burning of biomass are not included under the national items, only International Bunkers i.e. international aviation and international water borne navigation have been estimated and reported separately as memo items in the inventory.

International Bunkers

International bunkers include international aviation and

international water borne navigation. Total CO2 emissions from international aviation and international water borne navigation for the year 2016 and 2017 were estimated and presented in the following table and graph, while emissions from other gases were insignificant. These emissions are not counted under national total GHG emissions.

Table 16 International Bunkers Emissions (Gg CO2): 2016 -2017

Inventory Year: 2016-2017	CO2 Emissions, (Gg)	
International bunkers emissions	2016	2017
International bunkers		
1.A.3.A.I - international aviation (international bunkers)	20.156	22.824
1.A.3.D.I - international water-borne navigation (international bunkers)	1.092	1.406
NET GHG EMISSIONS (GG CO2EQ.)	21.248	24.230

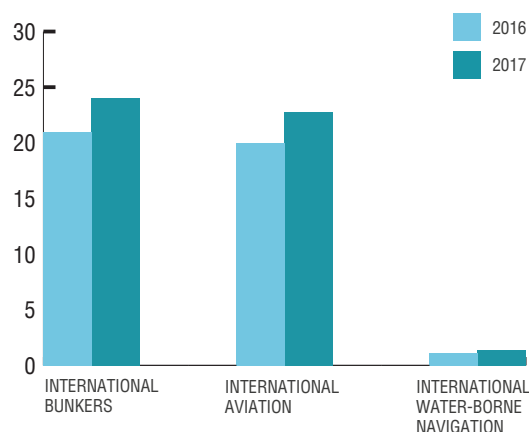


Figure 11 International Bunkers Emissions (Gg CO2): 2016 and 2017

Biomass

Vanuatu has a rich bio-diversity and abundance of biomass availability; Biomass has been a major source of energy for Vanuatu with 70% of the population living in rural areas that do not have access to grid connected electricity. Biomass was extensively used by the rural population for cooking, crop drying and other household tasks, rather than diesel powered electricity.

It is important to note that mostly the rural and some of the urban households use biomass as primary source of energy; Biomass remains the main source of energy for cooking with ~85% of households using wood and coconut shells. Hence, efficient application of Biomass is an important

aspect of National Energy Roadmap with a specific target to improve biomass end-use (cooking and drying) efficiency up to 14% by 2030.

However, there is little accurate information available on biomass produced and utilized in Vanuatu, the data collection and QA/QC procedure will be implemented for future inventory report.

Bio-fuels (Coconut Oil)

Coconut gardening is one of the major agricultural activities of households in Vanuatu; hence large quantity of coconut oil produced and used as a biofuel. Biofuels (coconut oil) have been used for electricity generation in Vanuatu for a number of years. Diesel generators in the Efate and Malekula grids have been converted by the operator (UNELCO) to be able to both use coconut oil and conventional diesel. The consumption of copra oil-based generation and total coconut oil consumption during the year 2011-2019 presented in the following figure:

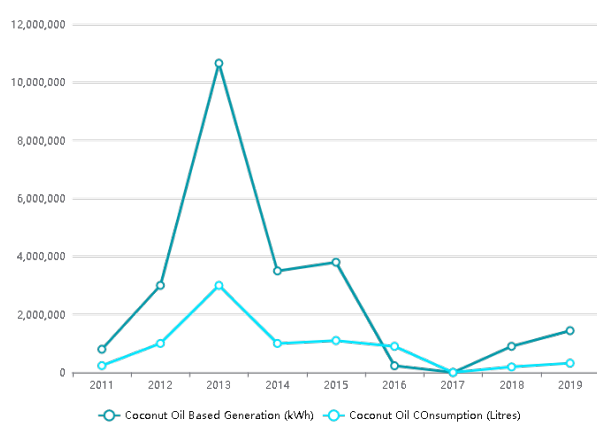


Figure 12 Coconut Oil based generation and Coconut Oil Consumption: 2011-2019

Bio-fuel mainly coconut oil is an important part of Vanuatu's green growth strategy and government has taken an ambitious target to increase the proportion of electricity generated from biofuels up to 57% by 2030. Greater use of

coconut oil is envisaged to help in achieving the renewable electricity generation target. As it involves substituting for existing fuels, it does not rely on increased demand or require new generation infrastructure for grid-based electricity systems, however, requires financial and capacity building to develop coconut supply chain and incentive-based pricing mechanisms (since price of coconut oil on the international market affects producers' willingness to supply coconut oil to electricity generators).

2.2 GHG Emission Trend Analysis: 2010-2017

Total GHG Emission Trend: 2010-2017

This section of the report presents an analysis of Vanuatu's Greenhouse Gas (GHG) emission estimates across key emission intensive sectors namely Energy, Agriculture (Livestock, Forestry, and Land-use), Waste and by gas, for the years 2010 to 2017. The total GHG emissions (excluding removals) from Vanuatu presented in the following tables and graphs.

Table 17 Total GHG Emissions and removals by year and sector (Gg CO₂) : 2010 -2017

YEAR	2010	2015	2016	2017	% CHANGE BETWEEN 2010 AND 2017
SECTORS	Gg CO₂-eq				
ENERGY	119.662	129.550	148.121	161.290	34.8%
INDUSTRIAL PROCESSES AND PRODUCT USE (IPPU)	Not Estimated (NE)	NE	NE	NE	NE
AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU)	414.914	443.380	323.022	399.381	-3.7%
WASTE	32.241	37.275	38.388	39.539	22.6%
TOTAL GHG EMISSIONS, EXCL. REMOVALS	566.818	610.204	509.531	600.209	5.9%

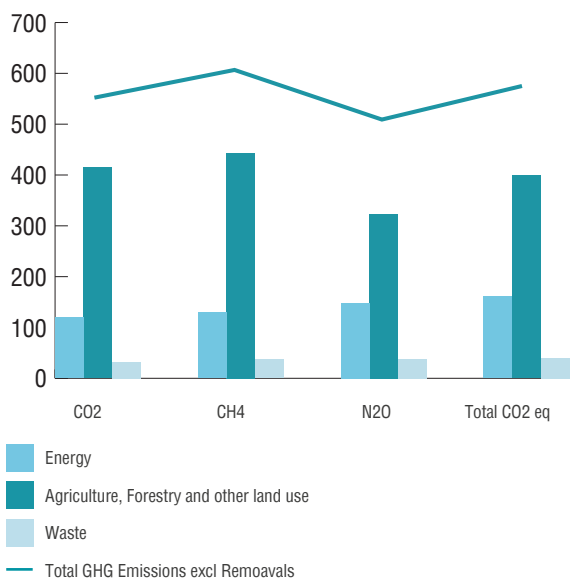


Figure 13 Total GHG Emissions and removals by year and sector (Gg CO2eq) : 2010 -2017

The total GHG emissions of Vanuatu increased from 566.818 Gg CO2eq. in 2010 to 600.209 Gg in 2017 over 7 years; the increase in total GHG emissions depicted due to increase in economic activity and inclusion of additional sectors in GHG inventory over the GHG inventory years.

Vanuatu's energy sector has seen major increase in total GHG emission during the period 2011 and 2017. The total energy sector emission in 2010 was about 119.662 Gg CO2eq; which is increased 34.8% to 161.290 Gg CO2eq in the year 2017. The higher GHG emission is mainly due to increase in diesel-based electricity generation and reduction in renewable electricity generation. Further, the fossil fuel consumptions also increase in transportation sector. The detailed assessment of energy sector included in sectoral analysis section of this report.

The AFOLU (mainly livestock) sector emission in Vanuatu was 414.914 Gg CO2eq in 2010; which is reduced (-) 3.7% in 2017 to 399.381 Gg CO2eq. The GHG emission from AFOLU sector is mainly attributed by the Livestock Sector, Livestock farming is an important economic activity in Vanuatu, Cattle and Beef export is a source of major revenue for economy. Although cattle are the most important livestock in Vanuatu in terms of their contribution to the economy, the animals such as pigs and chickens are of considerable importance within the context of subsistence agriculture or household

activities, both as a source of food and the role these play in the country's culture and customs (especially pigs). However, there is a lack of manure management; hence the emissions from the livestock sector both the enteric fermentation and manure management have the higher share in the total GHG emissions from Vanuatu.

The GHG emission reduction in 2017 in comparison to 2010 is mainly due to loss of livestock (animal life) in 2015 due to cyclone Pam. The (mini) census conducted post Pam in the year 2016 presented the livestock population reduction, hence the overall GHG emission from AFOLU sector in 2017 lesser than 2010.

The waste sector emission in 2010 was 32.241 Gg CO2eq, which is increase to 39.539 Gg CO2eq, about 22.6% in the year 2017. The waste sector emission increase is mainly due to increase in population and increasing consumption pattern of population; further there was no waste management or treatment facility introduced in Vanuatu during the years. The detailed assessment of waste sector included in later section of this report.

Gas-wise Emission Trend: 2010-2017

The gas wise GHG emissions trend 2010-2017 (Gg) in Vanuatu presented below; as discussed in the prevision section of the report the major share of GHG emissions includes CO2, CH4 and N2O respectively; further the CO2 emission is mainly forming the energy sector i.e. combustion of the fossil fuel; and CH4 and N2O emissions are mainly attributed from the Agriculture (Livestock and land use) and Waste sector (Municipal Solid waste and waste water).

Similar to the total sectoral GHG emissions the CO2 emission in Vanuatu increased in 2017 comparison to the 2010 emissions i.e. from 118.590 Gg to 159.669 Gg in 2017. Methane emissions has seen relatively negative growth mainly due to reduction in livestock population in 2017 in comparison to 2010, however methane emissions from waste sector increased during the same period; the total methane emission was 13.776 Gg in 2010 and in 2017 was 13.512 Gg i.e. reduction of (-) 1.9%. Further, minor decrease of 0.5% observed in total N2O emission during this period; which is due to livestock and poor land management practices in Vanuatu. The further assessment included in sectoral analysis (later section of the report).

Table 18 Total GHG Emissions and removals by year and Gas (Gg): 2010 -2017

Year	2010	2015	2016	2017	% CHANGE BETWEEN 2010 AND 2017
GAS	Gg				
CO2	118.590	128.206	146.637	159.669	34.6%
CH4	13.776	14.818	10.892	13.512	-1.9%
N2O	0.236	0.253	0.219	0.235	-0.5%
HFCS	Not Estimated (NE)	NE	NE	NE	NE
PFCS	NE	NE	NE	NE	NE
SF6	NE	NE	NE	NE	NE
TOTAL CO2EQ	566.818	610.204	509.531	600.209	5.9%

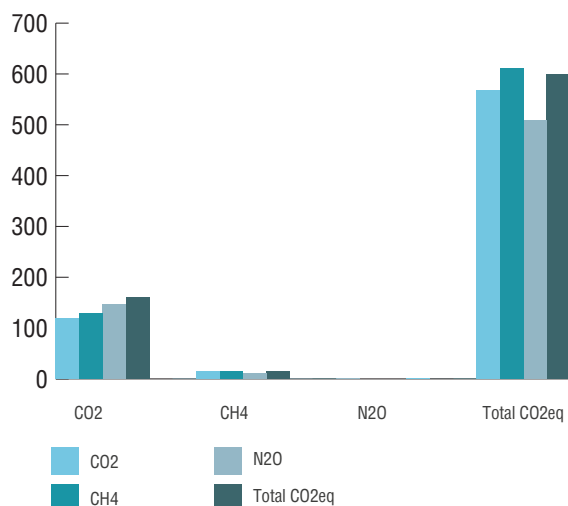


Figure 14 Total GHG Emissions and removals by year and sector (Gg CO2eq) : 2010 -2017

2.3 GHG Emission Sector Analysis – 2017

This section of the report presents the sectoral GHG emission in Vanuatu during the inventory year 2016 and 2017. The overall GHG emissions for year 2016-2017 and GHG emission trend analysis from 2017-2010, suggest three major sectors contributing Vanuatu's 100% GHG emissions i.e. Energy, Agriculture (Livestock) and Waste Sector; however, the Forests are the net sink or removal. The following section gives analysis of each of these GHG

emission sector and sub-sector for the year 2017.

2.3.1 Energy Sector

In the year 2017, the total emission from energy sector was 161.290 Gg CO2e which contributed 26.9% to the total national GHG emissions (excluding removals). Energy sector emitted 100% of the total national CO2 emissions. This was predominated by fossil fuel combustion activities, comprising of energy industries (27.1%), manufacturing industries and construction (15.1%), transport (53.4%) and other sectors (4.5%) of total emissions from the energy sector. Following table and figure gives the relative

Table 19 Energy Sector Emissions (in Gg CO2-equiv): 2010 -2017

Inventory Year: 2016-2017	TOTAL GHG EMISSIONS (GG CO2EQ.)	
	2016	2017
Category		
1 - ENERGY	148.121	161.290
1.A - FUEL COMBUSTION ACTIVITIES	148.121	161.290
1.A.1 - ENERGY INDUSTRIES	40.698	43.700
1.A.2 - MANUFACTURING INDUSTRIES AND CONSTRUCTION	22.963	24.308
1.A.3 - TRANSPORT	77.962	86.101
1.A.4 - OTHER SECTORS	6.498	7.181

distribution of GHG emissions across the energy sector.

Comparison with Reference Approach

The reference approach was also used to estimate CO2 emissions from fuel combustion for the year 2016 and 2017. The GHG Emissions from the energy sector were estimated using reference and sectoral approaches using IPCC Tier 1 analytical framework. Under the reference approach, GHG emissions were estimated using only the fuel consumption data for each type of fuel. The results of estimated CO2 emissions for the GHG inventory year 2016 and 2017 using reference approach has been estimated and compared with the CO2 emissions estimated using sectoral approach. The difference in estimates of CO2 emissions from fuel combustion using the sectoral and reference approaches was within $\pm 1\%$. The reference approach emissions were around 97% from liquid fuel combustion, around 3% from gaseous fuel combustion. Table below presents the calculation results using reference and sectoral approach.

Table 20: Energy Sector CO2 Emissions using Reference and Sectoral Approach, 2016 and 2017

Inventory Year	REFERENCE APPROACH				SECTORAL APPROACH		DIFFERENCE	
	Apparent Consumption (TJ)	Excluded Consumption (TJ)	Apparent Consumption -Excluding Non-energy uses (TJ)	CO2 Emission (Gg)	Energy Consumption (TJ)	CO2 emission (Gg)	Energy Consumption (%)	CO2 emission %
2016	2311.042	296.642	2014.399	146.638	2044.317	148.816	-1%	-1%
2017	2530.766	338.196	2192.570	159.669	2192.570	159.669	0%	0%

2.3.2 Fuel Combustion Activities

2.3.2A Energy Industries

Electricity generation accounted for approximately 7.3% of the total national emissions excluding removals in 2017. Within 'Energy Sector' it is the predominant source and amounts to about 27.1% of emissions. Major fuels consumed in the power plants for electricity generation in Vanuatu includes diesel and coconut (copra) oil. The consumption pattern of the aforesaid fuel in power sector has been shown in following figure.

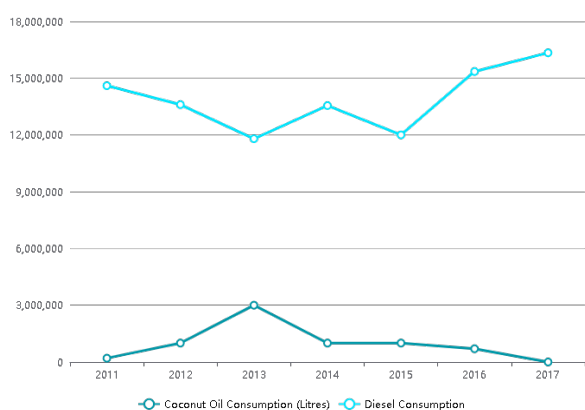


Figure 15 Share of fuel consumption for electricity production for the year 2011-2017

2.3.2B Manufacturing Industries and Construction

In 2017, the manufacturing industries and construction sector emitted 24.308 Gg CO₂e, which was approximately 15.1% of total CO₂e emissions from the energy sector and 4% of total national GHG emissions (excluding removals). The emission from this sector is mainly CO₂ emission from the consumption of fossil fuel, and further sub-categorization of the fuel consumption in different industries are not available.

Vanuatu has a small light-industry sector mainly catering to the local market. The Manufacturing, Industry and Construction sub-sector comprises the manufacturing, construction, quarry, wholesale and retail sectors along with the fish processing, copra and various coconut products as well as beef industry. However, the fuel consumption and emissions of the export industries are subject to the international market condition.

2.3.2C Transport - Road, Civil Aviation, and Water-borne Navigation

GHG emissions from the transport sector are 86.101 Gg CO₂e which is about 53.4% of total CO₂e emissions from the energy sector and 14.35% of total national GHG emissions (excluding removals). of the total GHG emissions from the energy sector in the country for the year 2017. Road transport sector accounted for 78.6% of the total GHG emissions from the transport sector, followed by civil aviation (9.6%) and water borne navigation (11.7%).

Road transport is the largest consumer of commercial fuel energy within the transportation system in Vanuatu. Mainly two fuel types are used in road transport sectors i.e. petrol (gasoline) and diesel. In addition, lubricants are also used for two-stroke engines. Off-road transportation has also been accounted under road transport.

For Aviation sector, comprising of domestic and international aviation, segregated Aviation Gasoline (AVG) and Jet Kerosene (DPK) consumption data for both the sectors is obtained. The emission estimates made for the combustion of AVG and DPK in international aviation is reported separately as a memo item under international bunkers.

The Navigation sector emission estimates are based on fuel consumption (Gas / Diesel Oil, Gasoline/Petrol and Kerosene) segregated across national and international maritime fleet. Emissions estimates made for international

fleets is reported as memo item under marine bunkers separately.

2.3.2D Other sectors

Other sectors include commercial/institutional sector, residential sector and agricultural/fisheries sector. Cooking, lighting, space heating, space cooling, refrigeration, and pumping characterize the residential, commercial, and agriculture sectors included in this category. Fuels consumed are electricity (for lighting, heating, cooling, and pumping), liquefied petroleum gas (LPG; for cooking), kerosene (for lighting and cooking), diesel (for generating power for pumping and lighting), and charcoal, and fuel wood (for cooking). This excludes the GHG emissions due to use of electricity which has been reported under 1A1a. The major fuels consumed in residential sector are firewood, LPG and kerosene.

In 2017, the Other sectors together emitted 7.181 Gg of CO₂e, of which approximately 4.5% of total CO₂e emissions from the energy sector and 1.2% of total national GHG emissions (excluding removals). The biomass consumption in the residential sector (mainly from cooking) is mostly renewable biomass, collected from the forest land, in the absence of data emission from the biomass combustion not included in the national inventory report.

2.3.3 Industrial Processes and Product Use

In Vanuatu, IPPU sector is non-existent in the absence of any major industry or industrial process emissions. Hence, GHG emissions from this sector considered as not estimated for the inventory years 2016 and 2017.

2.3.4 Agriculture

Overview of Agriculture Sector Emissions

In the year 2017, the agriculture sector emitted 399.381 Gg CO₂e, of which 85.6% was methane, and 14.4% was nitrous oxide. The emissions from agriculture sector amounted to 64% of the gross emissions of Vanuatu in 2017. Methane (CH₄) emissions occur from this sector due to livestock rearing (enteric fermentation and manure management).

N₂O is mainly emitted (direct and indirect) from manure management. The GHG emissions from sub-sectors of the agriculture sector are illustrated in following figure.

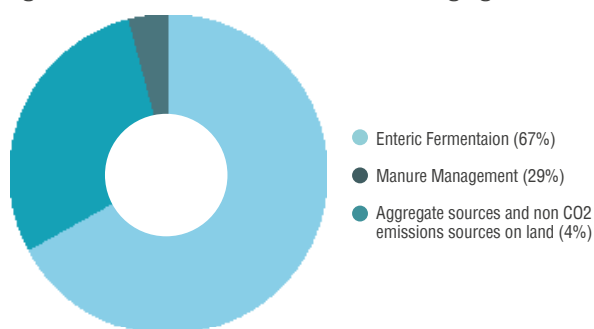


Figure 16 Distribution of GHG emissions by sub-sectors from the Agriculture sector in 2017 (Gg)

2.3.4A Livestock

The livestock sector is a major contributor to food security and an essential component of livelihood for a vast majority of the people of the Republic of Vanuatu. The sector plays an important role in local cultures and the economic development of Vanuatu. Vanuatu has large livestock population; however, yet to realize its full potential in the livestock sector.

The data and information on the total livestock population and livestock farming practices are very limited in Vanuatu. The data used for the inventory year 2016 and 2017 is based on the national (mini) census -2016, and Quarterly and Annual Statistical Reports published by Vanuatu National Statistics Office (VSNO). The following table present the data used for estimation of GHG emissions from the livestock sector.

Table 21: Animal population and livestock category, 2016 and 2017

SPECIES/LIVESTOCK CATEGORY	Number of animals N (T)	
	2016	2017
T		
CATTLE	1,15,540	1,55,473
GOATS	16,288	23,040
HORSES	7,259	5,897
SWINE	89,305	93,106
POULTRY	5,14,912	6,52,457
TOTAL	7,43,304	9,29,973

Enteric Fermentation

Methane is produced in herbivorous animals as a by-product of enteric fermentation, a digestive process by which carbohydrates are broken down by micro-organisms into simple molecules for absorption into the bloodstream. The amount of methane that is released depends on the type of digestive tract, age, and weight of the animal, and the quality and quantity of the feed consumed. Ruminant livestock (e.g., cattle, goat, sheep) are major sources of methane and moderate amounts produced from non-ruminant livestock (e.g., pigs, horses).

Livestock population data as per the inventory year 2017, is based on the national (mini) census -2016, and Quarterly and Annual Statistical Reports published by Vanuatu National Statistics Office (VSNO), and the average value of the methane emission factor for a particular category of the animal were used for the calculation of total methane emission. The methane emission factors for pigs, horses, donkey and other animals, were taken from the IPCC 2006 default values. In Vanuatu, most cattle manure is managed as a solid on pastures and ranges, except dairy cows where there is some usage of lagoons. About half of the swine manure is managed in anaerobic lagoons.

Total methane produced due to enteric fermentation was 9.6428 Gg in 2017, following table indicates methane emissions from various livestock categories for the year 2017.

Table 22: Emissions from enteric fermentation in 2017

SPECIES/LIVESTOCK CATEGORY	2017	CH4 EMISSIONS FROM ENTERIC FERMENTATION
T	Number of animals	Gg CH4 Enteric
CATTLE	1,55,473	9.32838
GOATS	23,040	0.1152
HORSES	5,897	0.106146
SWINE	93,106	0.093106
POULTRY	6,52,457	0
TOTAL	9,29,973	9.6428

Manure Management

This section estimates CH₄ and N₂O produced during

the storage and treatment of manure, and from manure deposited on pastures. The term 'manure' is used here collectively to include activity data from both dung and urine (i.e. the solids and the liquids) produced by livestock. Livestock population data as per the inventory year 2017, is based on the national (mini) census -2016, and Quarterly and Annual Statistical Reports published by Vanuatu National Statistics Office (VSNO), Methane production from volatile solids of each class of animals was estimated according to animal waste management system as well as according to the climatic condition.

Total methane was estimated for a particular category of livestock by multiplying the manure management emission factor with total dung produced which is estimated by taking digestibility of the feeds into account. The IPCC-2006 default value for the region have been used for calculation. The methane emissions come from the decomposition of manure under anaerobic conditions during storage and treatment, produces methane; and N₂O is produced directly and indirectly during the storage and treatment of manure. The emission of N₂O generated by manure in the system 'pasture, range, and paddock' occur directly and indirectly from the soil, and are therefore reported under the category 'N₂O Emissions from Managed Soils'. Direct N₂O emissions occur via combined nitrification and denitrification of nitrogen contained in the manure. Indirect emissions result from volatile nitrogen losses that occur primarily in the forms of ammonia and NO_x during storage as solid. The manure management emitted 2.572 Gg of CH₄ and 0.160 Gg of N₂O in 2017; following table present emissions from the manure management system from various livestock categories.

Table 23: Emissions from manure management in 2017

SPECIES/LIVESTOCK CATEGORY	2017	CH4 EMISSIONS FROM MANURE MANAGEMENT	ANNUAL DIRECT N2O EMISSIONS FROM MANURE MANAGEMENT
T	Number of animals	Gg CH4 Manure	Gg N2O yr-1
CATTLE	1,55,473	0.311	0.133896
GOATS	23,040	0.004	0.001576
HORSES	5,897	0.010	3.62E-05
SWINE	93,106	2.235	0.02432
POULTRY	6,52,457	0.013	8.29E-05
TOTAL	9,29,973	2.572	0.160

2.3.5 Aggregate sources and non-CO2 emissions sources on land

There are two pathways of N₂O emissions from soils - direct and indirect. Direct N₂O emissions to estimated using net N additions to soils (synthetic or organic fertilizers, deposited manure, crop residues) and mineralization of N in soil due to cultivation/land-use change on mineral soils. Since, in Vanuatu there is no use of fertilizers, this category is not applicable and only indirect emission from manure management applied.

2.3.5A - Indirect N₂O Emissions from Manure Management

The indirect N₂O emission was estimated from volatilization of NH₃ and NO_x from managed soils and the subsequent re-deposition of these gases and their products (NH₄ and NO₃) to soils and after leaching and runoff of N, mainly as NO₃ from managed soils. Total emissions of N₂O from managed soils have been estimated and presented in the below table, the IPCC default emission factors (EFs) used for calculating N₂O emission from this emission category. The manure management system lead to indirect emission of 0.057 Gg of N₂O in 2017; following table present indirect N₂O emission from various livestock categories.

2.4 Waste

The waste sector includes estimation of GHG emissions, mainly Methane (CH₄) and Nitrous oxide (N₂O) emission estimate from the following key categories:

- Solid Waste Management and Disposal (excluding biological waste)
- Domestic and Commercial wastewater handling (there is no industrial waste water generation)

In the year 2017, the waste sector emitted 39.539 Gg CO₂e, of which is 6.59% of total national GHG emissions. The total methane emissions form waste sector was 1.290 Gg and nitrous oxide emissions was 0.013 Gg. Methane (CH₄) emissions occur from solid and waste water disposal and N₂O is mainly emitted from waste water discharge. The

following table illustrate the waste sector emissions:

Table 24: Waste Sector GHG Emissions (Gg): 2016, 2017

	2016	2017
TOTAL CH₄ EMISSIONS (MSW)	1.09	1.13
TOTAL CH₄ EMISSIONS (WW)	0.16	0.16
TOTAL CH₄ EMISSIONS (WASTE SECTOR)	1.25	1.29
TOTAL N₂O EMISSIONS	0.01256	0.01286
TOTAL CO₂ EQ	38.388	39.539

2.4.1 Solid waste disposal: estimation of methane emission from landfill sites

In Vanuatu, there is a marked difference between Rural and Urban lifestyles with rural population generating substantially less or no per capita solid waste. In addition, existence of Municipal Solid Waste (MSW) dumps in rural areas is minimal as most of the organic waste is recycled as cattle feed and farm compost. Also, MSW is relatively scattered and moreover shallow waste depths of disposal do not induce anaerobic conditions. These conditions are responsible for low level of methane emissions in rural areas. On the other hand, urban population produces much higher per capita MSW and thus the generation of organic fraction is relatively high. Urban areas are constrained for recycling of organic matter. Dumpsites are relatively large in area with substantial depths. These conditions are favorable to methane generation. Hence, MSW related methane emissions are mostly from urban areas in Vanuatu.

First Order Decay (FOD) model has been applied for calculation of methane emission from landfill sites. In a FOD model, the decay rate of carbon in the waste is governed by a first order reaction. Thus, the rate of decay is directly proportional to the amount of carbon remaining in the disposal site. This model is built on an exponential factor that describes the fraction of degradable material which each year is degraded into CH₄ and CO₂. One key input in the model is the amount of degradable organic matter in the waste disposed at the solid waste disposal site. Degradable Organic Carbon (DOC) is the organic carbon in the waste that is amenable to biochemical decomposition. The basis for the calculation is the amount of Decomposable Degradable Organic Carbon (part of the organic carbon that will be degradable under an anaerobic condition) at

the disposal site of solid waste after initial decomposition under aerobic condition. The spreadsheet model estimates the amount of decomposable DOC in the disposal site, taking into account of the amount deposited each year and the amount.

In the absence of actual monitored data, the MSW generation in Vanuatu estimated from the urban population of Port Vila, Luganville and Lenakel and using average 1-1.5 kg/person/day and waste composition was taken from the study conducted by the JPRISM Team in the year 2015 as the Weight of waste component (wt%) in pacific island countries.

Table 25: Activity data for solid waste disposal in 2017

KEY PARAMETERS	2017
URBAN POPULATION	75310
RURAL POPULATION	205558
TOTAL POPULATION	280868
TOTAL SOLID WASTE (MSW) GENERATED-TON	43981
WASTE DISPOSED AT MANAGED SITES (LANDFILL) -TON	0
WASTE DISPOSED AT UN-MANAGED SITES (LANDFILL, OPEN DUMPING) -TON	43981
NO OF LANDFILL	3
UNCONTROLLED WASTE DUMPS	3

The municipal solid waste composition considered for this GHG inventory presented in the following figure.

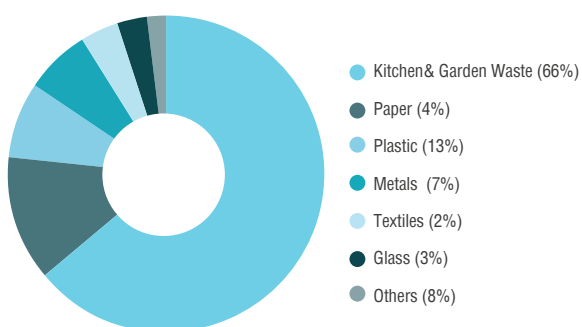


Figure 17 MSW Characterization (wt%) - JPRISM Team Study Report

2.4.2 Wastewater Treatment and Discharge

In Vanuatu, the waste water generation from commercial activity is very limited and almost negligible/zero waste water generation from industrial activity; hence main source

of waste water is domestic source. Methane is emitted from wastewater when it is handled anaerobically. The effluents may be treated on site (uncollected) and finally disposed of untreated/partially or fully treated into nearby environment (surface waters and marine disposals). Emissions from domestic wastewater handling are estimated for both urban and rural centres. Population forecast was done for all states based on 2016 (mini) Census Data. Methane emission estimates have been made using Tier-1 approach of the IPCC by incorporating country-specific emission factors and country-specific data.

In 2017, GHG emissions from domestic and commercial wastewater treatment and disposal were 7.807 Gg of CO₂e, of which 0.157 Gg (≈4.4 Gg CO₂e) Methane and 0.013 Gg (≈15,556 Gg CO₂e) was nitrous oxide.

Table 26: Activity data for waste water disposal in 2017

KEY PARAMETERS	2017
POPULATION	280,868
TOTAL WASTE WATER GENERATED (MLD)	21.91
WASTEWATER AND SEWAGE TREATMENT (SEPTIC SYSTEM) (MLD)	9.49
WASTEWATER'S SOURCE	Domestic
WASTEWATER'S ORGANIC CONTENT (DOMESTIC EFFLUENT) -MG/LITER	52
WASTEWATER'S ORGANIC CONTENT (SEPTIC SYSTEM) -MG/LITER	150
WASTEWATER TREATED (MLD)	0

2.5 Key Category Analysis-2017

Key Category Analysis (KCA) has been carried out to identify sources with significant impact on total emissions or trend, accounting for up to 95% of the total emissions. The primary purposes of key category analysis are to prioritize higher tier methodologies for the key sectors, to design additional requirements of QA/QC for key sources, and to allocate and make best use of available resources for sources with significant impact on total emissions, which would lead to reduction in the uncertainties in the estimates to the maximum extent possible. In order to identify the key sources, both, level analysis and trend analysis have been carried out using approach 1. The KCA also helps in

Table 27: KCA: Aggression Level of Analysis for Approach-1

IPCC CATEGORY CODE	IPCC CATEGORY	GREENHOUSE GAS	REMARKS
ENERGY			
1.A.1	Energy Industries - Fuel Combustion Activities	CO2, CH4, N2O	All fuel
1.A.2	Manufacturing Industries and Construction - Fuel Combustion Activities	CO2, CH4, N2O	All Fuel
1.A.3.A	Civil Aviation - Fuel Combustion Activities	CO2, CH4, N2O	Domestic Aviation only
1.A.3.B	Road Transportation – Fuel Combustion Activities	CO2, CH4, N2O	Road
1.A.3.D	Water-borne Navigation	CO2, CH4, N2O	Domestic Navigation only
1.A.4	Other Sectors	CO2, CH4, N2O	Institutional, Commercial and Residential,
AGRICULTURE, FORESTRY AND OTHER LAND USE			
3.A.1	Enteric Fermentation	CH4	All category of Livestock
3.A.2	Manure Management	CH4, N2O	All category of Livestock
3.C.6	Indirect N2O Emissions from manure management	N2O	All category of Livestock
WASTE			
4.A	Solid Waste Disposal	CH4	MSW Waste – Urban

The notation keys:

L = key category according to level assessment; T = key category according to trend assessment; and Q = key category according to qualitative criteria.

prioritisation of limited resources and time.

The key categories for the Vanuatu’s national GHG inventory have been identified in terms of their contribution to the absolute level of national GHG emissions and removals. Basic Approach 1 has been adopted for quantitative analysis in objective manner, accounting uncertainties and suggested aggregation level of analysis. The analysis is excluding removals and includes all GHGs reported. Following tables show level assessment for key source analyses for 2017 emissions. Further, uncertainty analysis for CO2, CH4, N2O is given for corresponding key categories.

2.6 Uncertainty Analysis

Uncertainties are introduced in emission estimates due to the use of activity data and emission factors from direct measurement or from the literature, and assumptions based on expert judgement. An uncertainty assessment using approach 1 was carried out for key categories (below table). The uncertainty of estimates has been depicted by a range in which the estimated emission lies. Uncertainties associated

with the activity data were sourced from the data source or from the researchers who have done the collection of such data, and are based on expert judgement of inventory estimation teams, and/or from IPCC 2006 Guidelines. The emission factor uncertainties are related to the standard deviation of the measured emission factors, and if taken from the literature, then the uncertainties mentioned in the said literature are considered.

The overall uncertainty in Vanuatu’s national GHG emission estimations i.e. Percentage uncertainty in total inventory was estimated as 23%; and the trend in national emissions between the base year and the current year has been estimated as 6%. The Approach-1 Uncertainty calculation table annexed to this report. The major uncertainty contributed from the AFOLU and Waste sector followed by the Energy sector.

In Vanuatu, key uncertainties are associated with data availability, missing data, lack of comprehensive information, data archiving and lack of country specific emission factors. It is recognized that having country specific emission factors and more detailed activity data will help reduce uncertainty in future inventory. For example, in the energy sector there is good data available on fuel imports into the country but there is lack of information on end usage.

Table 28 Uncertainty range for key Sector emissions

IPCC CATEGORIES	GAS	ACTIVITY DATA UNCERTAINTY	EMISSION FACTOR / ESTIMATION PARAMETER UNCERTAINTY	COMBINED UNCERTAINTY
		Input data %	Input data %	Input data %
1 - ENERGY				
1.A - FUEL COMBUSTION ACTIVITIES				
1.A.1 - ENERGY INDUSTRIES	CO2	0.95	0.00	0.95
1.A.2 - MANUFACTURING INDUSTRIES AND CONSTRUCTION	CO2	0.95	0.00	0.95
1.A.3 - TRANSPORT	CO2	0.95	0.00	0.95
1.A.4 - OTHER SECTORS	CO2	0.95	0.00	0.95
2 - INDUSTRIAL PROCESSES AND PRODUCT USE	CO2	0.95	0.00	0.95
3 - AGRICULTURE, FORESTRY, AND OTHER LAND USE				
3.A - LIVESTOCK	CH4, N2O	0.30	0.00	0.25
3.B - LAND	N2O	0.30	0.00	0.25
3.C - AGGREGATE SOURCES AND NON-CO2 EMISSIONS SOURCES ON LAND	N2O	0.30	0.00	0.40
4 - WASTE	CH4, N2O	0.50	0.00	0.40

2.7 Notes for Future National GHG Inventory of Vanuatu (Inventory Improvement Plan)

- Precursor gases: The estimation and reporting of the precursors for national inventories emissions i.e. carbon monoxide (CO), oxides of nitrogen (NOx), non-methane volatile organic compounds (NMVOCs), and sulphur dioxide (SO2) may be considered to the extent possible and based on national circumstances and possibilities.
- Key Category Analysis: (If data are available) The key category analysis will be performed for emissions and removals separately within a given category or for different pools. Further, the level assessment will be performed for the base year of the inventory and the latest inventory year. Also qualitative criteria will be used to identify additional key categories up to the threshold of 95-97% of cumulative emissions.
- The activity data collection and review process will be improved and higher tier (tier-2) analysis of GHG from the key categories and sub-categories identified for Vanuatu proposed for the next inventory. The activity data collection, review process and QA/QC procedure will be developed and implemented for all the key categories and sub-categories. Specially, activity data necessary to estimate, to the extent possible, the emissions of fluorinated gases, especially in the category 2F1 Refrigeration and Air Conditioning.
- Procedural arrangements: (a) Data Collection: The activity data collection from the industry, public and private sector as well as institutions and department will be formalized via suitable instrument e.g. legal contracts, MoUs, MoAs, or other legal documents. (b) The Department of Climate Change will initiate the regulation to formalize the database management and archives.
- Implementation Integrated Monitoring, Reporting and Verification (MRV Tool) for National GHG Inventory: The department of Climate Change shall implement and operationalise the web based integrated monitoring, reporting and verification system for national GHG inventory.
- Biomass and Biofuel Consumption: The Biomass and Biofuel (coconut oil) consumption data collection and QA/QC procedure will be implement to include these fuels in the future inventory reports.

- Livestock Data: The livestock emission both enteric fermentation and manure management are key category; hence more frequent and granular data will be obtained from the Animal husbandry department. In the future inventory the applicability of higher tier method (Tier 2- method) will be adopted for this subcategory if subjective to the data availability.
- Forestry and Other Land Use: Limited data and information available from this sub-sector hence tier-1 method used in this report. However; Vanuatu is implementing REDD+ programme and more qualitative data and information shall be available in near future. Higher tier method will be used in future GHG inventory.
- Waste Sector Data: The waste (Solid waste and waste water) sector activity data monitoring and reporting has been initiated in urban centres; higher tier method (Tier-2) will be applied for the future inventory period.
- Capacity building and training activities will be conducted for the stakeholders involved mainly for monitoring and data collection. Further the stakeholders will be sensitizing on accuracy, traceability and transparency of data, QA/QC and reporting aspects of national GHG inventory.
- GHG Inventory Software: Latest version of IPCC GHG inventory software will be used

Annexure 1.A Summary Report for GHG Emissions Inventory – 2017

Inventory Year: 2017	Emissions (Gg)			Emissions (Gg)			Emissions CO2 Equivalents (Gg)				Emissions (Gg)			
	CO2	CH4	N2O	CO2 Equivalents	HFCs	PFCs	SF6	Other halogenated gases with CO2 equivalent conversion factors (3)	Other halogenated gases without CO2 equivalent conversion factors (4)	NOx	CO	NMVOCs	SO2	
1 - Energy	159.669	0.007	0.005	161.29										
1.A - Fuel Combustion Activities	159.669	0.007	0.005	161.29										
1.A.1 - Energy Industries	43.557	0.002	0	43.7	NO	NO	NO	NO	NO	NE	NE	NE	NE	
1.A.2 - Manufacturing Industries and Construction	24.229	0.001	0	24.308	NO	NO	NO	NO	NO	NE	NE	NE	NE	
1.A.3 - Transport	84.714	0.004	0.005	86.101	NO	NO	NO	NO	NO	NE	NE	NE	NE	
1.A.4 - Other Sectors	7.169	0	0	7.181	NO	NO	NO	NO	NO	NE	NE	NE	NE	
1.A.5 - Non-Specified	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.B - Fugitive emissions from fuels														
1.B.1 - Solid Fuels	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.B.2 - Oil and Natural Gas	NA	NA	NA	NA	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.B.3 - Other emissions from Energy Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.C - Carbon dioxide Transport and Storage														
1.C.1 - Transport of CO2	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.C.2 - Injection and Storage	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
1.C.3 - Other	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
2 - Industrial Processes and Product Use														
2.A - Mineral Industry														
2.A.1 - Cement production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
2.A.2 - Lime production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
2.A.3 - Glass Production	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
2.A.4 - Other Process Uses of Carbonates	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
2.A.5 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	
2.B - Chemical Industry														

2.F.4 - Aerosols	NE	NE	NE	NE	NE	NO	NO	NO	NE	NE	NE	NE	NE	NE
2.F.5 - Solvents	NE	NE	NE	NE	NE	NE	NO	NO	NE	NE	NE	NE	NE	NE
2.F.6 - Other Applications (please specify)	NE	NE	NE	NE	NE	NE	NO	NO	NE	NE	NE	NE	NE	NE
2.G - Other Product Manufacture and Use														
2.G.1 - Electrical Equipment	NE	NE	NE	NE	NE	NO	NE	NO	NE	NE	NE	NE	NE	NE
2.G.2 - SF6 and PFCs from Other Product Uses	NE	NE	NE	NE	NE	NO	NE	NO	NE	NE	NE	NE	NE	NE
2.G.3 - N2O from Product Uses	NE	NE	NE	NE	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.G.4 - Other (Please specify)	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
2.H - Other														
2.H.1 - Pulp and Paper Industry	NE	NE	NE	NE	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.H.2 - Food and Beverages Industry	NE	NE	NE	NE	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
2.H.3 - Other (please specify)	NE	NE	NE	NE	NE	NO	NO	NO	NO	NO	NO	NO	NO	NO
3 - Agriculture, Forestry, and Other Land Use														
3.A - Livestock	0	12.215	0.16	384.395										
3.A.1 - Enteric Fermentation	0	9.643	0	269.999	NO	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.A.2 - Manure Management	0	2.572	0.16	114.396	NO	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.B - Land														
3.B.1 - Forest land	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.B.2 - Cropland	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.B.3 - Grassland	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.B.4 - Wetlands	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.B.5 - Settlements	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.B.6 - Other Land	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.C - Aggregate sources and non-CO2 emissions sources on land	0	0	0.057	14.985										
3.C.1 - Emissions from biomass burning	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.C.2 - Liming	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3.C.3 - Urea application	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
3.C.4 - Direct N2O Emissions from managed soils	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.C.5 - Indirect N2O Emissions from managed soils	NE	NE	NE	NE	NE	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.C.6 - Indirect N2O Emissions from manure management	0	0	0.057	14.985	NO	NO	NO	NO	NO	NE	NE	NE	NE	NE
3.C.7 - Rice cultivations	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	0	0	0	0
3.C.8 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	0	0	0	0
3.D - Other														

3.D.1 - Harvested Wood Products	NE	NE	NE	NE	NO	NO	NO	NO	NO	0	0	0	0
3.D.2 - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	0	0	0	0
4 - Waste	0	1.29	0.013	39.539									
4.A - Solid Waste Disposal	0	1.133	0	31.732	NE	NE	NE	NE	NE	NE	NE	NE	NE
4.B - Biological Treatment of Solid Waste	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
4.C - Incineration and Open Burning of Waste	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
4.D - Wastewater Treatment and Discharge	0	0.157	0.013	7.807	NE	NE	NE	NE	NE	NE	NE	NE	NE
4.E - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
5 - Other													
5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
5.B - Other (please specify)	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO
Memo Items (5)													
International Bunkers	24.23	0	0.001	24.425									
1.A.3.a.i - International Aviation (International Bunkers)	22.824	0	0.001	22.998	NO	NO	NO	NO	NO	NE	NE	NE	NE
1.A.3.d.i - International water-borne navigation (International bunkers)	1.406	0	0	1.428	NO	NO	NO	NO	NO	NE	NE	NE	NE
1.A.5.c - Multilateral Operations	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
TOTAL GHG EMISSIONS, EXCL. REMOVALS	159.669	13.512	0.235	600.209									
TOTAL GHG EMISSIONS, INCL. REMOVALS	NE	NE	NE	NE									

NOTATION KEY	Definition	Explanation
NE	Not estimated	Emissions and/or removals occur but have not been estimated or reported.
IE	Included elsewhere	Emissions and/or removals for this activity or category are estimated and included in the inventory but not presented separately for this category.
C	Confidential information	Emissions and/or removals are aggregated and included elsewhere in the inventory because reporting at a disaggregated level could lead to the disclosure of confidential information.
NA	Not applicable	The activity or category exists but relevant emissions and removals are considered never to occur.
NO	Not occurring	An activity or process does not exist within a country.

Annexure 2 Key Category Analysis – 2017

A	B	C	D	E	F	G
IPCC CATEGORY CODE	IPCC Category	Greenhouse gas	2017 Ex.t (Gg CO2 Eq)	Ex.t (Gg CO2 Eq)	Lx.t	Cumulative Total of Column F
3.A.1	Enteric Fermentation	METHANE (CH4)	269.999	269.999	0.44984	0.45
3.A.2	Manure Management	METHANE (CH4)	72.020	72.020	0.11999	0.57
1.A.3.B	Road Transportation	CARBON DIOXIDE (CO2)	66.610	66.610	0.11098	0.68
1.A.1	Energy Industries	CARBON DIOXIDE (CO2)	43.557	43.557	0.07257	0.75
3.A.2	Manure Management	NITROUS OXIDE (N2O)	42.376	42.376	0.07060	0.82
4.A	Solid Waste Disposal	METHANE (CH4)	31.732	31.732	0.05287	0.88
1.A.2	Manufacturing Industries and Construction	CARBON DIOXIDE (CO2)	24.229	24.229	0.04037	0.92
3.C.6	Indirect N2O Emissions from manure management	NITROUS OXIDE (N2O)	14.985	14.985	0.02497	0.94
1.A.3.D	Water-borne Navigation	CARBON DIOXIDE (CO2)	9.949	9.949	0.01658	0.96
1.A.3.A	Civil Aviation	CARBON DIOXIDE (CO2)	8.154	8.154	0.01359	0.97
1.A.4	Other Sectors	CARBON DIOXIDE (CO2)	7.169	7.169	0.01194	0.98
4.D	Wastewater Treatment and Discharge	METHANE (CH4)	4.400	4.400	0.00733	0.99
4.D	Wastewater Treatment and Discharge	NITROUS OXIDE (N2O)	3.407	3.407	0.00568	1.00
1.A.3.B	Road Transportation	NITROUS OXIDE (N2O)	1.068	1.068	0.00178	1.00
1.A.3.D	Water-borne Navigation	NITROUS OXIDE (N2O)	0.144	0.144	0.00024	1.00
1.A.3.B	Road Transportation	METHANE (CH4)	0.099	0.099	0.00017	1.00
1.A.1	Energy Industries	NITROUS OXIDE (N2O)	0.093	0.093	0.00016	1.00
1.A.3.A	Civil Aviation	NITROUS OXIDE (N2O)	0.061	0.061	0.00010	1.00
1.A.2	Manufacturing Industries and Construction	NITROUS OXIDE (N2O)	0.051	0.051	0.00009	1.00
1.A.1	Energy Industries	METHANE (CH4)	0.049	0.049	0.00008	1.00
1.A.2	Manufacturing Industries and Construction	METHANE (CH4)	0.027	0.027	0.00005	1.00
1.A.3.D	Water-borne Navigation	METHANE (CH4)	0.015	0.015	0.00002	1.00
1.A.4	Other Sectors	NITROUS OXIDE (N2O)	0.007	0.007	0.00001	1.00
1.A.4	Other Sectors	METHANE (CH4)	0.005	0.005	0.00001	1.00
1.A.3.A	Civil Aviation	METHANE (CH4)	0.002	0.002	0.00000	1.00

Annexure 3 Uncertainty Analysis (Approach-1)

Gas	Base year emissions or removals	Year t emissions or removals	Activity data uncertainty	Emission factor/estimation parameter uncertainty	Combined uncertainty	Contribution to Variance by Category in Year t	Type A sensitivity	Type B sensitivity	Uncertainty in trend in national emissions introduced by emission factor / estimation parameter uncertainty	Uncertainty in trend in national emissions introduced by activity data uncertainty	Uncertainty in trend in national emissions introduced into the national emissions
1 - Energy											
1.A - Fuel Combustion Activities											
1.A.1 - Energy Industries	38,021	43.7	0.95	0	0.95	0	0.01	43.7	0	0.01	0
1.A.2 - Manufacturing Industries and Construction	23,671	24,308	0.95	0	0.95	0	0	24.31	0	0	0
1.A.3 - Transport	52,089	86,101	0.95	0	0.95	0.02	0.05	86.1	0	0.05	0
1.A.4 - Other Sectors	5,882	7,181	0.95	0	0.95	0	0	7.18	0	0	0
2 - Industrial Processes and Product Use	0	0	0.95	0	0.95	0	0	0	0	0	0
3 - Agriculture, Forestry, and Other Land Use											
3.A - Livestock	400,576	384,395	0.3	0	0.25	0.03	0.07	384.4	0	0.02	0
3.B - Land	0	0	0.3	0	0.25	0	0	0	0	0	0
3.C - Aggregate sources and non-CO2 emissions sources on land	14,339	14,985	0.3	0	0.4	0	0	14.99	0	0	0
4 - Waste	32,241	39,539	0.5	0	0.4	0	0.01	39.54	0	0	0
Total	566,818	600,209			0.05						0
Percentage uncertainty in total inventory:											23%
Trend uncertainty:											6%

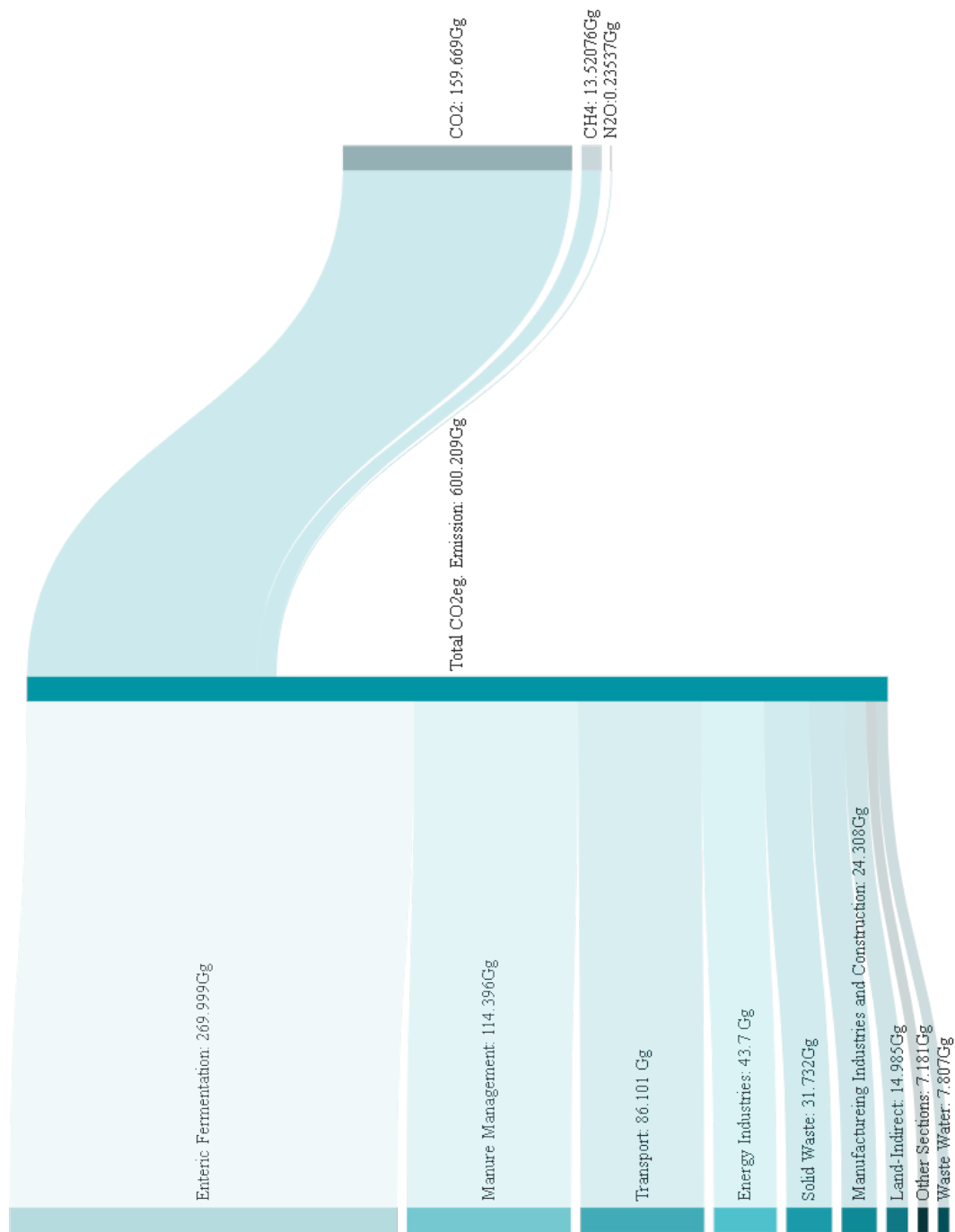
Annexure 4 Trend Analysis – 2010-2017

A	B	C	D	E			F
IPCC CATEGORY CODE	IPCC Category	Greenhouse gas	2010 Year Estimate Ex0 (Gg CO2 Eq)	2017 Year Estimate Ext (Gg CO2 Eq)	Trend Assessment Tx,t	% Contribution to Trend	Cumulative Total
1.A.1	Energy Industries	CARBON DIOXIDE (CO2)	37.897	43.557	0.006	8.36%	8%
1.A.1	Energy Industries	METHANE (CH4)	0.043	0.049	0	0%	8%
1.A.1	Energy Industries	NITROUS OXIDE (N2O)	0.081	0.093	0	0%	8%
1.A.2	Manufacturing Industries and Construction	CARBON DIOXIDE (CO2)	23.596	24.229	0	0%	8%
1.A.2	Manufacturing Industries and Construction	METHANE (CH4)	0.026	0.027	0	0%	8%
1.A.2	Manufacturing Industries and Construction	NITROUS OXIDE (N2O)	0.049	0.051	0	0%	8%
1.A.3.a	Civil Aviation	CARBON DIOXIDE (CO2)	4.488	8.154	0.006	8.30%	17%
1.A.3.a	Civil Aviation	METHANE (CH4)	0.001	0.002	0	0%	17%
1.A.3.a	Civil Aviation	NITROUS OXIDE (N2O)	0.033	0.061	0	0%	17%
1.A.3.b	Road Transportation	CARBON DIOXIDE (CO2)	43.371	66.61	0.036	50%	67%
1.A.3.b	Road Transportation	METHANE (CH4)	0.065	0.099	0	0%	67%
1.A.3.b	Road Transportation	NITROUS OXIDE (N2O)	0.711	1.068	0.001	0.77%	68%
1.A.3.d	Water-borne Navigation	CARBON DIOXIDE (CO2)	3.366	9.949	0.011	16%	84%
1.A.3.d	Water-borne Navigation	METHANE (CH4)	0.005	0.015	0	0%	84%
1.A.3.d	Water-borne Navigation	NITROUS OXIDE (N2O)	0.048	0.144	0	0%	84%
1.A.4	Other Sectors	CARBON DIOXIDE (CO2)	5.872	7.169	0.002	2%	86%
1.A.4	Other Sectors	METHANE (CH4)	0.004	0.005	0	0%	86%
1.A.4	Other Sectors	NITROUS OXIDE (N2O)	0.006	0.007	0	0%	86%
3.A.1	Enteric Fermentation	METHANE (CH4)	285.824	269.999	0	0%	86%
3.A.2	Manure Management	METHANE (CH4)	70.436	72.02	0	0%	86%
3.A.2	Manure Management	NITROUS OXIDE (N2O)	44.315	42.376	0	0%	86%
3.C.6	Indirect N2O Emissions from manure management	NITROUS OXIDE (N2O)	14.339	14.985	0	0%	86%
4.A	Solid Waste Disposal	METHANE (CH4)	24.937	31.732	0.009	13%	99%
4.D	Wastewater Treatment and Discharge	METHANE (CH4)	4.4	4.4	0	0%	99%
4.D	Wastewater Treatment and Discharge	NITROUS OXIDE (N2O)	2.904	3.407	0.001	0.81%	100%
Total GHG Emissions, excl. Removals			566.818	600.209	0.072	1	

Annexure 5 Reference Approach GHG Emissions – 2016 and 2017

Inventory Year	Reference Approach			Sectoral Approach			Difference	
	Apparent Consumption (TJ)	Excluded Consumption (TJ)	Apparent Consumption -Excluding Non-energy uses (TJ)	CO2 Emission (Gg)	Energy Consumption (TJ)	CO2 emission (Gg)	Energy Consumption (%)	CO2 emission %
2016	2311.042	296.642	2014.399	146.638	0	148.816	100%	-1%
2017	2530.766	338.196	2192.57	159.669	2530.766	179.109	-15%	-12%

Annexure 5 Vanuatu's National GHG Emissions – 2017



Chapter 3

Mitigation Actions and their Effects

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3.2	Vanuatu's Nationally Determined Contribution (NDC)	82
3.3	Key GHG Emission Sectors	93

Mitigation Actions and their Effects

Background

The Republic of Vanuatu is an island nation located in the Western Pacific Ocean. Vanuatu is an archipelago of over 80 islands stretching 1,300 kilometers from North to South in the Western Pacific Ocean. Vanuatu's society, environment and economy are highly vulnerable to climate change and disaster risks. In Vanuatu climate change is likely to impact all sectors especially agriculture, water, coastal and marine resources and infrastructure as well as tourism. The devastating consequences of the category 5 tropical cyclone in March 2015 and the subsequent severe El Nino event highlight country's risk from natural disasters. Predicted increases in extreme weather from climate change means Vanuatu will face even greater impacts in the future, also living with the constant threat of volcanic eruptions, earthquakes and tsunamis.

The Paris Agreement (PA) was adopted on 12 December 2015 at the 21st session of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC). The Republic of Vanuatu signed the PA on 22 April 2016 and deposited its instrument of ratification on 21 September 2016.

The agreement came into force on 4 November 2016. Its central aim is to strengthen the global response to the threat of climate change by holding the increase in the global average temperature this century to well below 2° C above pre-industrial levels and pursuing efforts to limit the temperature increase even further to 1.5° C. Additionally, it aims to strengthen the ability of countries to deal with the impacts of climate change.

The Government of Republic of Vanuatu is fully committed to effective and transparent implementation of the Agreement and submitted its declaration, which reads, in part:

“WHEREAS the Government of the Republic of Vanuatu declares its understanding that ratification of the Paris Agreement shall in no way constitute a renunciation of any rights under any other laws, including international law, and the communication depositing the Republic's instrument

of ratification shall include a declaration to this effect for international record;

FURTHERMORE, the Government of the Republic of Vanuatu declares that, in light of best scientific information and assessment on climate change and its impacts, it considers the emission reduction obligations in Article 3 of the Kyoto Protocol, the Doha Amendment and the aforesaid Paris Agreement to be inadequate to prevent global temperature increase of 1.5 degrees Celsius above pre-Industrial levels and as a consequence, will have severe implications for our national interests...”

Vanuatu has negligible GHG emissions and forest sector act as a net sink; however, the Government of Republic of Vanuatu is fully committed to effective, and transparent implementation of the Paris Agreement (PA). The Government of Republic of Vanuatu notes with great concern that the objective of the Paris Agreement can only be achieved through a significant enhancement of the level of action complemented by international support provided to achieve conditional contributions, as reflected in the Nationally Determined Contributions (NDCs).

3.1 National Climate Change Policy and Planning Framework

The Republic of Vanuatu's long-term vision on climate change and its aspirations are an integral part of the fundamental duties defined under its constitution - “To protect the Republic of Vanuatu and to safeguard the national wealth, resources and environment in the interests of the present generation and of future generations” - and are guided by its National Vision - “A stable, sustainable and prosperous Vanuatu” – outlined in the NSDP for 2016 to 2030, also known as Vanuatu 2030: The People's Plan.

National Sustainable Development Plan (NSDP): 2016-2030⁷

⁷ Vanuatu 2030 – The People's plan - National Sustainable Development Plan 2016 to 2030 (2016), available from: <https://www.govvu/index.php/resources/vanuatu-2030>

Vanuatu 2030: The People’s Plan charts Vanuatu’s long-term vision and serves as the highest-level overarching policy framework for achieving a stable, sustainable and prosperous Vanuatu by 2030. The collective developmental aspirations under the NSDP include:

- A vibrant cultural identity underpinning a peaceful, just and inclusive society;
- Supported by responsive and capable state institutions delivering quality public services, including health and education, to all citizens;
- Maintaining a pristine natural environment on land and at sea that serves our food, cultural, economic and ecological needs;
- With enhanced resilience and adaptive capacity to

climate change and natural disasters;

- And, a stable economy based on equitable, sustainable growth that creates jobs and income-earning opportunities accessible to all people in rural and urban areas.

These collective aspirations are to be delivered through the 15 national SDGs, reflecting the priorities expressed by the ni-Vanuatu people through a programme of national consultation. The NSDP: 2016-2030 is based on three pillars - society, environment and the economy - and each pillar is further divided into goals, which in turn are broken down into a series of policy objectives. The three NSDP pillars incorporate 98 policy objectives across 15 goals.

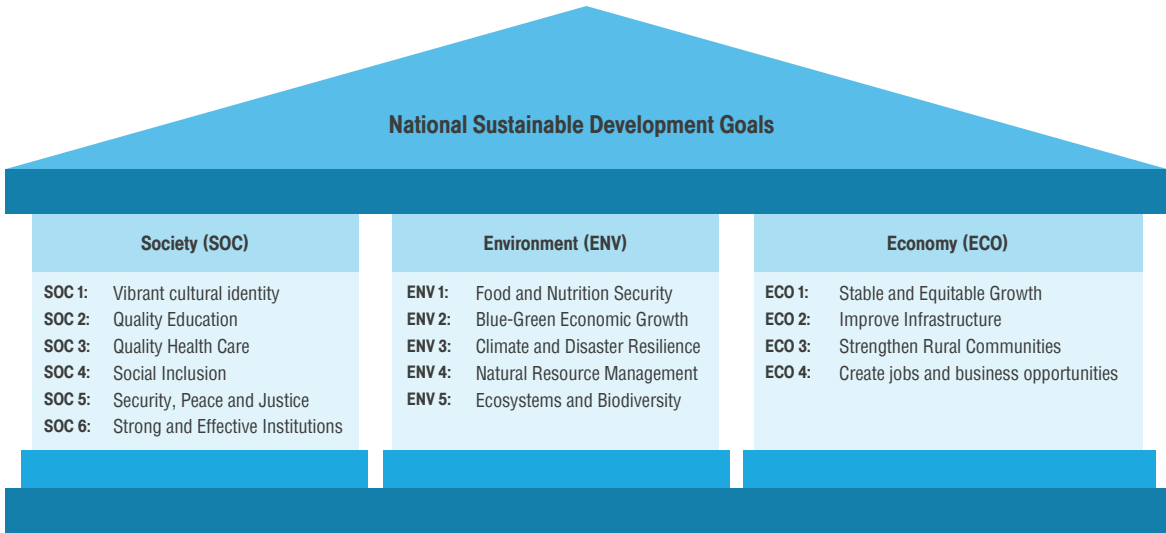


Figure 18 National Sustainable Development Goals (NSDP) 2016-2030

Vanuatu’s Climate Change and Disaster Risk Reduction Policy (CCDRR) 2016-2030⁸

The CCDRR policy promotes good governance and establishes priorities and strategies for future climate actions. It also aims to deliver better information and improved assessments of climate change impacts and disaster risks, set key strategies, and transparently communicate to stakeholders, including communities, international donors and agencies. The policy builds on existing systems

and the country’s cultural heritage to improve Vanuatu’s resilience, incorporates project and outcomes monitoring and evaluation, and captures experiences and lessons learned to inform planning and good practices. The policy applies six principles: accountability; sustainability; equity; community focus; collaboration; and, innovation. It emphasizes coordination and communication at all levels of government and across sectors and communities for effective implementation and engages provincial authorities, area councils and groups in society, especially women and vulnerable groups (including the elderly, disabled and

⁸ Government of the Republic of Vanuatu (2015), Vanuatu Climate Change and Disaster Risk Reduction Policy 2016-2030, available from : <https://docc.gov.vu/images/publications/Vanuatu%20Climate%20Change%20and%20Disaster%20Risk%20Reduction%20Policies%202016-2030.pdf>

youth) in planning, decision-making and community action, in line with decentralization.

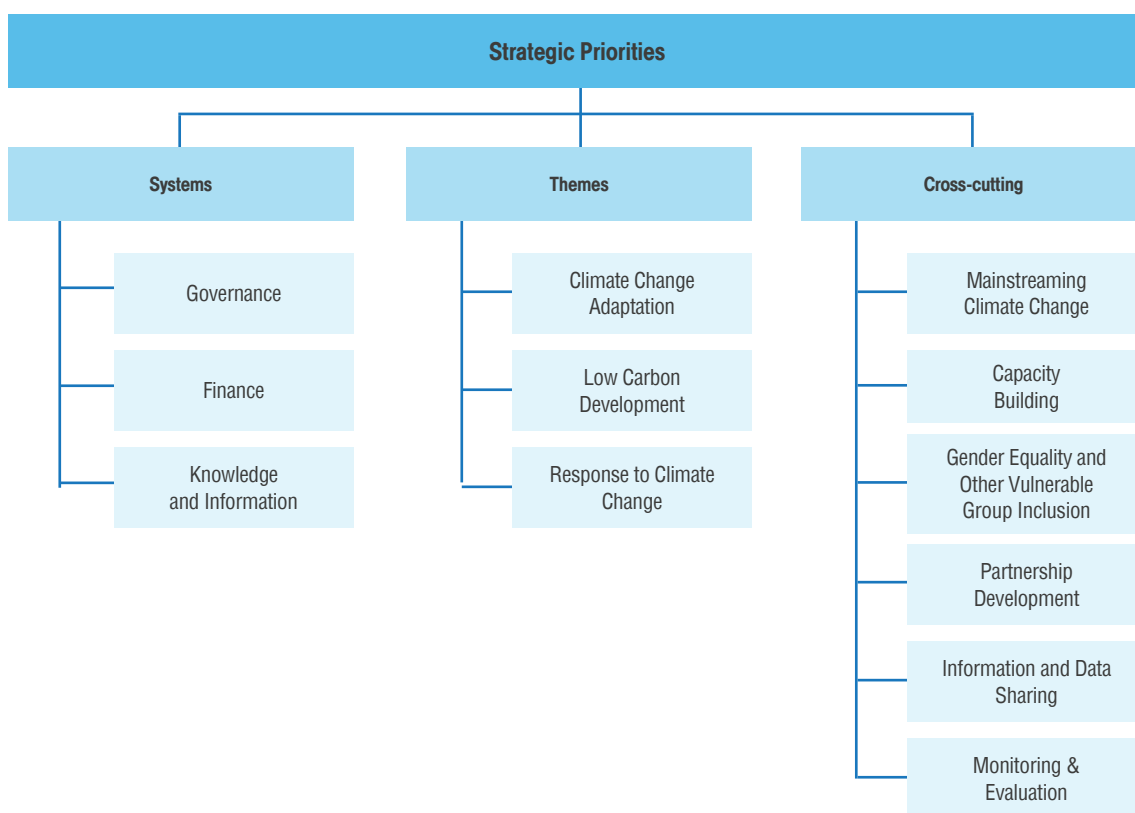


Figure 19 Vanuatu's strategic climate change priorities and actions

The GoV is committed to six key priorities to guide the country's climate change and disaster risk reduction efforts. These priorities fall into two categories: systems and themes. Systems include governance, finance, knowledge and information, while themes include climate change adaptation and disaster risk reduction, low-carbon development, and response and recovery. A number of cross-cutting issues have also been considered in developing this policy and will be applied during implementation, including social and gender inclusion, capacity-building, multi-hazard approaches, partnerships and mainstreaming into the business of a broad range of agencies and sectors. The policy includes high-level strategies and detailed actions, lead and support agencies, resources, and timelines will be further developed for implementation.

The Meteorology, Geological Hazards and Climate Change Act No. 25 of 2016 (Climate Change Act of 2016)

The Climate Change Act sets out governance and

administrative provisions and provides for transparency. It also outlines roles and responsibilities for meteorology, geological hazards and climate change and for related purposes. The Act's key objectives are to:

- a. ensure that high-quality services are provided in relation to weather, climate, flood forecasting and geological hazards in Vanuatu;
- b. promote capacities of governments, communities and organizations to understand and respond to risks arising from weather events, climate change and geological hazards;
- c. specifically address the needs of shop and aircraft operators and tourists to access all necessary weather forecasts, bulletins, alerts, warnings and information concerning geological hazards that may impact the safety of their operations or activities;
- d. facilitate the use and application within Vanuatu of relevant information, forecasts, bulletins and warnings generated and disseminated to and by local, regional and international bodies; and,

- e. ensure that the government and the public are informed of matters related to weather, climate and geological hazards and can make effective use of such information and data and respond to warnings and alerts about such events to protect the environment and the safety and welfare of the community.

The Climate Change Act emphasizes application of the precautionary principle when discharging responsibilities and functions or exercising powers. This principle is also applied to ensure that in the event of a threat of damage to the environment or a risk to human safety and health from weather events, geological hazards and the impacts of climate change within Vanuatu, the lack of certainty in terms of scientific evidence regarding the extent of adverse effects is not used as a pretext to prevent or avoid making a decision to respond to or minimize the potential adverse effects or risks.

The Act also formalized the establishment of key institutions for climate-related services, specifically, the NAB, Department of Climate Change (DoCC), Department of Meteorology (DoM), and Department of Geological Hazards.

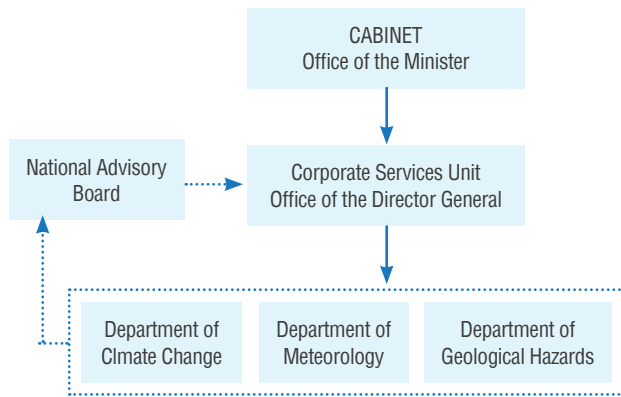


Figure 20 Climate Change Act of 2016: – institutional structure

Vanuatu’s National Energy Road Map (NERM) 2016-2030 and associated NERM Implementation Road Map⁹

This is another ambitious policy guidance tool, first adopted in 2013 and updated in 2016 for the target year 2030. Its vision is “to energize Vanuatu’s growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an educated, healthy, and wealthy nation.”

The NERM 2013 identified five priorities for the energy sector: access, petroleum supply, affordability, energy security and climate change. The NERM 2016 was revised and updated to include accessible energy, affordable energy, secure and reliable energy, sustainable energy, and energy for green growth. The NERM 2016 sets out objectives and targets and proposes 68 key actions to achieve these priorities and contribute to the NERM’s overall vision. The priorities reflect the high-level outcomes the Government ultimately seeks to achieve in the energy sector and subsectors (that is, petroleum and other liquid fuels, electricity, and cooking fuels).

The DoE is implementing and monitoring the NERM 2016-2030, as well as an associated comprehensive NERM-IP, including an NERM Monitoring, Verification and Evaluation (NERM-MRV) Plan. The updated NERM 2016-2030 formed the basis for developing the initial NDC and, as such, is critical for achieving Vanuatu’s stated NDC targets.

⁹ Government of Vanuatu (2019), Vanuatu National Energy Roadmap (2016-2030) – Implementation Plan, available from: https://doe.govvu/images/docs/publications/Implementation_Plan.pdf

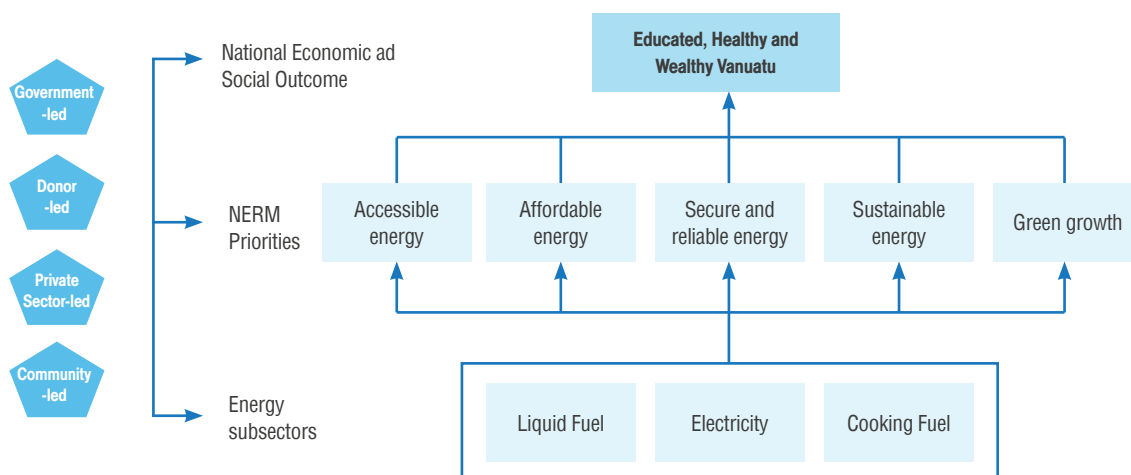


Figure 21 Vanuatu's NERM 2016-2030: priorities and implementation approaches

The NERM-IP includes a long list of investments and actions that could help meet the NERM targets. The planned activities were grouped into the following categories:

- Investments and donor programmes
- Policies, laws and regulations
- Analysis and studies
- Capacity-building and institutional development
- Other

This category basically covers the following types of investments:

- Renewable energy
- Rural electrification
- Energy efficiency
- Grid extension

The following table summarizes the updated NERM 2016-2030's quantitative targets for 2020 and 2030:

Table 29 Vanuatu's NERM 2016-2030 Priorities and Targets for 2020 and 2030

	PRIORITY/OBJECTIVE	INDICATOR	2020 TARGET	2030 TARGET
ACCESSIBLE ENERGY	Increase electricity access by households in and near concession areas	% with access	90%	100%
	Increase electricity access by households in off-grid areas	% with access	100%	100%
	Increase electricity access by public institutions (on- and off-grid)	% with access	100%	100%
AFFORDABLE ENERGY	Improve the efficiency of diesel generation	Grams of diesel fuel/kWh of electricity	20% improvement from year 2012	No target
	Reduce the cost of distributing petroleum products in Vanuatu	Distribution cost in Vanuatu/litre	10% reduction	(not applicable)
SUSTAINABLE ENERGY	Increase the proportion of electricity generated from renewable sources	% of grid-based electricity from renewable sources	65%	15% reduction
	Improve electricity sector end-use efficiency	% savings on BAU projection	5%	100%
	Improve transport (land and marine) energy efficiency	% savings on BAU projection	2%	13%
	Improve biomass end-use (cooking and drying) efficiency	% saving on BAU projection	5%	10%
	Ensure all energy infrastructure projects comply with government and donor environmental and social safeguard requirements	% of projects complying	100%	14%
	Increase the proportion of electricity generated from biofuels	% of electricity generated from biofuels	10%	100%

GREEN GROWTH	Increase renewable electricity use by rural tourism bungalows	% of bungalows using renewable energy sources for electricity supply	25%	57%
	Increase renewable electricity use by rural tourism bungalows	% of bungalows using renewable energy sources for electricity supply	25%	65%

Vanuatu's First Nationally Determined Contribution (NDC) and Implementation Road Map¹⁰

Vanuatu's first NDC mitigation target is to transition to close to 100 percent renewable energy in the electricity (energy) sector by 2030. Achieving this target would involve replacing nearly all fossil fuel required to generate electricity in the country. Vanuatu is taking significant steps towards implementing the PA. The country has developed an NDC Implementation Road Map, including a first-of-its-kind measurement, reporting and verification (MRV) tool. Its purpose is to provide a pathway for implementing and monitoring climate change mitigation actions in Vanuatu that can help to achieve the target defined in Vanuatu's NDC.

The NDC Implementation Road Map (NDC-IR) seeks to provide a pathway for implementing specific mitigation actions in Vanuatu. Under the BAU electricity demand scenario, demand is projected to increase from 77.9 GWh in 2017 to 100.7 GWh in 2030, for a total increase of 29.4 percent.

The NDC-IR has also identified the immediate priority interventions (such as coconut oil as fuel for electricity generation, solar and wind), including regulatory changes and a financial strategy leading to emission reductions and transformational change in the electricity supply sector over time. As part of an NDC initiative, Vanuatu is embarking on implementing an innovative, cutting-edge renewable energy technology using the swarm technology electrification approach.

Rural Electrification NAMA

The rural electrification NAMA design document focuses primarily on rural electrification and micro-grids to improve access to electricity in rural areas/outer islands. NAMAs are voluntary, non-binding policy instruments that

provide a framework for pursuing a country's national level development goals, while contributing to global greenhouse gas (GHG) mitigation efforts. Thus, their dual objective is to mitigate global climate change, while allowing domestic development objectives to be reached. On the other hand, the NDCs' prime objective is to reduce global GHG emissions, although it is acknowledged that developing countries will have the opportunity to improve population well-being (at least until their per capita emissions reach world average levels, at which time the pressure to reduce emissions will intensify).

The NAMA covers two interventions:

- Intervention 1: Micro-grids will be established. Rural communities/tourism and agricultural facilities/health centres/schools are the focus of these micro-grids based on their demand for electricity for lighting, cooling and services from other electrical appliances. The micro-grids will use renewable energy sources (solar, wind and hydro) and will provide electricity for lighting, radio and phone charging for households and for service and production activities in rural productivity zones.
- Intervention 2: Existing electricity grids will be expanded on different islands. Households, public institutions and tourism/commercial consumers within the proximity of lines will be connected. Electricity will be provided for lighting, audio/TV, mobile phone charging, coastal fishing (refrigeration of the fish catch), tourism facilities (lodges), agricultural facilities (preparing, processing and packaging produces) and handicraft production.

The total cost of the NAMA is estimated at around \$5.5 million. This includes support to cover the investment costs of the two interventions as well as extensive capacity-development efforts. According to the NAMA report,

¹⁰ Vanuatu's NDC Implementation Roadmap (2018), available from: <https://www.undp.org/content/dam/LECB/events/2019/20190220-ndc-roadmap-vanuatu/undp-ndc-implementation-roadmap-vanuatu-mar-2019.pdf>

emission reductions over the NAMA's 15- year lifetime will reach around 13,500 tons of CO₂, which amounts to around 900 tons per annum or 0.9Gg per annum.

Under the UNDP NDC Support Programme, Vanuatu's DoE conducted a detailed techno-economic feasibility study for a solar micro-grid for the Wintua and Lorlow village communities in South West Bay on Malekula island. Under the NAMA programme, the MoCC has secured funding from the Government of Austria to implement a solar micro-grid for the Wintua and Lorlow village communities. The solar PV micro-grid was commissioned during September 2020.

IRENA Renewables Readiness Assessment

This detailed 2015 report reiterates that, like all Pacific Island Countries (PICs), Vanuatu has excellent solar resources available throughout the country's populated areas that could be used to generate electricity to offset the cost of imported fuels.

The report notes that several solar photovoltaic (PV) projects with total capacity of more than 2.6 megawatts (MW) are under consideration. Interest from independent power producers (IPPs) in solar PV electricity generation has been increasing. Moreover, the first stage 4 MW geothermal plant is expected to go on stream before 2020 and some hydropower may also be added. The Port Vila grid currently has 3 MW of wind and the 26.5 MW diesel generator sets use between 5 percent and 20 percent coconut oil (the quantity depends on the availability and economics of using the biofuel) instead of diesel. The Luganville grid on Espiritu Santo has a 1.2MW hydro plant and 2.9 MW diesel generators. In addition, a small amount of grid-connected solar PV is available.

The report suggests that to fulfil the NERM's goals would require establishing and enforcing technical standards for grid-connected systems and regulatory capacity for small-scale distributed generation systems. In addition, detailed models of the grid need to be developed as the addition of intermittent sources, such as solar PV, could increase the stability of the (30MW) grid system on Efate, in particular.

In terms of major mitigation options, this report identifies

a mix of geothermal, wind, biofuels and solar PV as the key technologies suitable for Vanuatu. However, the report does not set ambitious goals in terms of projected installed capacity of PV, citing grid stability concerns that would limit PV penetration to a few MW.

In addition, geothermal sources are still at the exploratory stage and with estimated upper temperatures of around 50–60 degrees C, plant efficiency is likely to be relatively low. One of the problems the report identified was how to handle the large night-time load on the Efate grid from solar PV, in particular. Most of this load is likely to come from air conditioning. One option would be to generate cooled water during the day and circulate the water from storage tanks at night. The other more conventional option for load shifting would be to use storage batteries.

National Green Energy Fund (NGEF)

Established in 2018, the National Green Energy Fund is a national financing vehicle designed to assist the Government to achieve its National Energy Roadmap targets through both public and private investment in technology and infrastructure across Vanuatu. The fund will operate as a revolving fund, with anticipated initial start-up capital of \$10 million, to be sourced mainly from international sources and yearly contributions from domestically consolidated energy funds, totalling \$300,000. It will offer four types of funding:

- Debt via intermediaries, including financial institutions and non-financial institutions in Vanuatu;
- Project equity for project developers and technology providers;
- Risk sharing, in the form of a first loss facility for local banks; and,
- Small grants for public institutions (no more than 5 percent of total fund investments).

The National Green Energy Fund aims to boost households and public institutions' energy access, while also providing a pathway for local businesses and industries to invest in clean, climate - resilient energy that meets their economic needs, creating transformative opportunities for rural communities. With the National Green Energy Fund established and functioning, Vanuatu is well positioned to deliver renewable

energy access and achieve energy savings across key economic sector including water, agriculture, fisheries and tourism.

The National Green Energy Fund is helping to channel finance toward clean energy technologies and infrastructure on the remote islands. The operations and administration of the Fund is overseen by a Board that is represented by the Government and civil society and promotes gender inclusion to enable greater participation of women and other vulnerable groups in clean energy development in Vanuatu.

Renewable Energy Electrification Master Plan for Vanuatu

A renewable energy-based off-grid electrification master plan for remote islands of Vanuatu was developed in 2016. The focus was on four pilot islands (Mataso, Makira, Emae and Aneityum) pre-selected by the GoV which would subsequently provide for broader replication to further remote islands. The master plan has two main components:

- i. Provide preliminary technical designs for renewable-energy based electrification for the four islands; and,
- ii. Based on this sample of islands, develop a masterplan for electrifying Vanuatu's outer islands through affordable renewable energy.

The RE masterplan introduced RE resources in Vanuatu suitable for small-scale rural electrification, Pacific island experiences with rural RE, the legal and institutional context in Vanuatu, and likely appropriate technologies and mechanism for implementing RE. The Site Visits and Survey analysis described the visits to the four islands, the limitations of the surveys undertaken, and results for 15 villages, which provide a broad indication of the priority of services desired, the willingness to pay and the ability to pay. The effect of village geography and size on technical options is discussed.

Renewable Energy Resources and Prioritized Renewable Energy Projects and Technologies for Emae, Makira, Mataso and Aneityum provided more detail on the available renewable energy resources and technologies and the Pacific experience, particularly with solar, biofuel, wind and

small hydropower. Solar photovoltaic (PV) technologies are recommended as the most appropriate for the four islands studied and rural Vanuatu generally.

Preliminary Technical Design of Potential Renewable Energy Projects for the Selected Islands considered a range of design criteria (including cyclone survivability; compliance with Vanuatu's policies, laws and regulations; equipment reliability; suitability for expected electricity demand patterns; and sustainability). It recommended a standardized model approach and provides preliminary designs which generally combine a mix (even within a single community) of solar home systems, mini-grids and pico-solar for 16 sites (15 villages and a tourism island).

Financing Requirements & Mechanisms and Recommended Institutional Models. Potential sources of finance for electrifying the four islands and a broader national off-grid electrification program are surveyed. It is estimated that at least US\$50 million, and probably considerably more, will be required to meet the updated National Energy Roadmap objective of electrification of all remote off-grid households by 2030. A range of institutional models is assessed. For Vanuatu, a renewable energy utility is recommended based on its successful application in Tonga with national government, provincial government and community involvement providing policies and oversight with full time managers working in each province to oversee local technicians on each island.

Vanuatu National Forest Policy (2013-2023)

Vanuatu acknowledges the need to adapt to climate change and seeks to "integrate climate change adaptation issues into forestry sector planning and activities." However, enforcement of regulations is hindered by the fact that all forests are privately owned, while the constitution calls on from landowners to manage their land in a way that "safeguards the national wealth, resources and environment in the interests of the present generation and of future generations."

The policy identifies integrating climate change mitigation issues into forestry sector planning and activities as a specific objective. In particular, this includes developing a national REDD+ initiative, to be undertaken by the DoF, the

NAB and non-governmental organizations (NGOs).

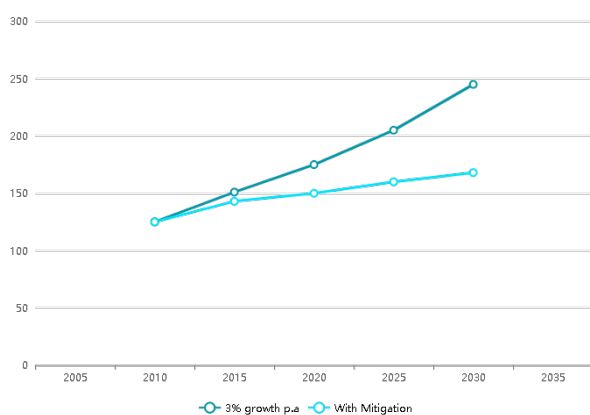
Reduced Emissions from Deforestation and Forest Degradation (REDD+) Programme

For forestry sector mitigation, Vanuatu is engaging both the government and civil society organizations as main stakeholders in the national REDD+ program in Vanuatu. The DOF, with NAB oversight and the Vanuatu Geo-Hazard and Meteorological Department (VGMD) as the focal point, is taking the lead role as the key implementing agency in implementing the national REDD+ program in Vanuatu.

3.2 Vanuatu’s Nationally Determined Contribution (NDC)

First Nationally Determined Contribution (NDC) 2016

The main mitigation contribution is to achieve the outcomes and targets under the National Energy Road Map (NERM) and Second National Communication (SNC) extended to 2030. The mitigation contribution for the Vanuatu INDC submission is a 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. Emissions in this sector were around 130 Gg in 2010 but are expected to rise to 240 Gg by 2030 (3% per annum).



The mitigation would thus reduce BAU emissions in the electricity sub-sector by 100% and in the energy sector as a whole by 30%. The target would be conditional, depending on funding commensurate with putting the transition in place being made available from external sources. In addition, Vanuatu will pursue the other mitigation measures in the Vanuatu National Energy Roadmap (2013- 2020), the Scaling Up Renewable Energy in Low Income Countries (SREP) report and Vanuatu’s Renewables Readiness Assessment (RRA) report undertaken by IRENA. These measures would include a vigorous program of energy efficiency to reduce emissions in all sectors except agriculture and forestry by 15%. The transition to renewable energy based electricity could be accelerated through review and revision of agricultural (coconut oil sector) national policy. Opportunities for reducing the high emissions levels in agriculture will simultaneously be pursued with cooperative programs with nations having similarly high emissions in this sector. The forestry sector mitigation will be attended to as part of the existing REDD+ program. The Government is also aware that waste management is an other area that need attention.

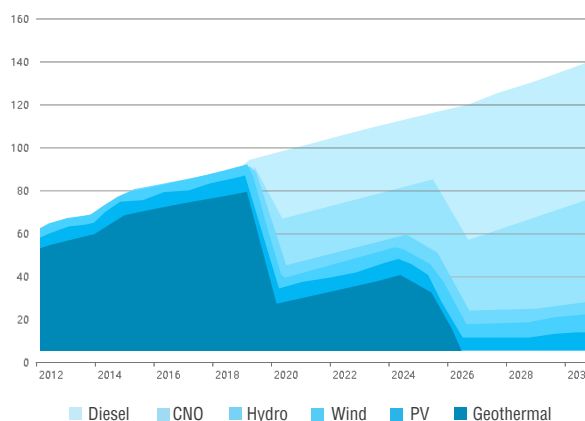


Table 30 Mitigation Contribution

MITIGATION CONTRIBUTION	
TIME FRAME	2020 - 2030
TYPE OF CONTRIBUTION	Sectoral commitment focussed on a transition to renewable energy in the electricity generation sub-sector under energy generation.
TARGET LEVEL	To approach 100% renewable energy in the electricity sub-sector contingent upon appropriate financial and technical support made available
GHG REDUCTIONS	100% below BAU emissions for electricity sub-sector and 30% for energy sector as a whole.
SECTORS	<p>Mainly electricity generation sub-sector but with ancillary mitigation possible in forestry, agriculture, transport and energy efficiency sector wide.</p> <p>The key planned mitigation interventions include:</p> <ul style="list-style-type: none"> • Doubling of the wind installed capacity to 5.5 MW by 2025 • Installing 10 MW grid connected solar PV by 2025 • Commissioning the proposed first stage 4 MW Geothermal plant by 2025 • Adding 10 MW grid connected solar PV by 2030 • Commissioning the second stage 4 MW Geothermal plant by 2030 • Substituting and/or replacement of fossil fuels with coconut oil based electricity generation <p>The proposed interventions would need substantial external funding of around US\$180 million to proceed at the time frame needed. In addition, substantial technology transfer would be required including institutional support and training.</p> <p>Additional planned mitigation interventions include:</p> <ul style="list-style-type: none"> • National Energy Road Map (US\$ 210.5 million indicative - with some overlap) • Rural Electrification Nationally Appropriate Mitigation Action (NAMA) (US\$ 5 million indicative) • Off grid renewable energy projects under Scaling Up Renewable Energy in Low Income Countries Program (US \$34.2 million) • Energy efficiency measures to be pursued across the board to enable 15% savings in the energy sector. • Forestry sector measures to reduce deforestation and promote good land care to accepted mitigation practices according to REDD+ • Planned cooperation with New Zealand and other nations interested in mitigating methane (CH₄) and associated emissions for ruminant and pasture management
GASES	Carbon Dioxide (CO ₂)
METHODOLOGY	<p>The electricity sector emissions were analysed using data from the utilities, customs department and relevant assessments, studies and reports from development partners and civil society organizations. The data for electricity generation were entered into the GHG emission estimation model and converted to CO₂ emissions using standard conversion factors. The extrapolated data from the above sources suggests the kWh consumption in the electricity sector will rise at 3.6% per annum until 2020 after which a slightly lower growth rate is used to give an average increase of 3% until 2030.</p> <p>Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories and UNFCCC software “Non Annex 1 National Greenhouse Gas Inventory Software, Version 1.3.3 was used for the GHG inventory. Sectoral data for GHG estimation compiled from various sources primarily using national data collected from annual reports, statistical reports, studies and brochures of related department/institutions. The projections of emissions data to 2010 was reported in the SNC from similar data sources as the 2000 data and has a similar uncertainty analysis.</p>
PLANNING PROCESS	<p>Vanuatu’s INDCs is well aligned with the Government’s Priority Action Agenda Policy Objective 4.5 which is most relevant to Climate Change and states, “to ensure the protection and conservation of Vanuatu’s natural resources and biodiversity, taking climate change issues in consideration.” The contribution is also based on the research undertaken for a number of national initiatives including the Vanuatu National Energy Roadmap (2013- 2020), the Scaling Up Renewable Energy in Low Income Countries (SREP) report, Rural electrification NAMA design document by UNDP MDG Carbon and Vanuatu’s Renewables Readiness Assessment (RRA) report undertaken by IRENA . In addition, relevant data and information has been used from the Government of Vanuatu and various private and civil society organizations. Extensive consultations with all relevant stakeholders were held during the preparation of Vanuatu’s INDC.</p>
MONITORING AND EVALUATION	<p>The monitoring and reporting on the adaptation activities of the INDC will be conducted at the Ministry level by the CCDRR PMU in close collaboration with the M&E unit of the Prime Minister’s Office, as is the current practice with projects being implemented under the oversight of the NAB. This will ensure that achievements in the implementation of the INDC priorities are appropriately captured and reported on in the Government’s Annual Development Report prepared by the Prime Minister’s Office.</p>

Small Island Developing States (SIDS) has been recognised by the United Nations Framework Convention on Climate Change (UNFCCC) and Intergovernmental Panel on Climate Change (IPCC) as the most vulnerable countries to face the effects of climate change. Vanuatu being a part of SIDS share similar challenges.

Vanuatu anticipates many impacts from climate change on its society, economy, environment and human health and Vanuatu through the Ministry of Climate Change is actively cooperating with United Nations agencies and international partners to assess these effects and develop appropriate plans through climate change adaptation and mitigation. Vanuatu's adaptation plans and programmes intends to support progress towards the country's national development priorities and the goal of environmental sustainability, by ensuring that a focus on reducing vulnerabilities and risks is incorporated into planning and activities across all sectors of the economy and society.

FAIRNESS, EQUITY AND AMBITION

Vanuatu is also keen to reduce its reliance on fossil fuels for the energy needs. The National Energy Road Map, which sets out a clear strategy and action plan for the development and use of alternative and sustainable energy sources, has an ambitious goal of reducing the country's high reliance on imported fossil fuel by meeting 65% of its electricity needs from renewable energy sources.

Vanuatu's past emissions have been miniscule and have only become locally significant in the past decade or two. In general development issues dominate rather than climate change mitigation.

Vanuatu is a small developing nation with absolute levels of CO2 eq emissions very small at under 0.0016% of world emissions. The country is also one of the most vulnerable to the effects of climate change and has much to lose should the worst predictions from increased temperature levels eventuate. As such the country will do its best to mitigate but would require financial, technical and capacity building support to do so.

Updated Nationally Determined Contribution (NDC) 2021

Mitigation Component of Updated NDC

VANUATU'S UPDATED NATIONALLY DETERMINED CONTRIBUTIONS (NDCS)	
TYPE	Activity-based mitigation targets, sectoral and policy targets in key sectors, including emissions reduction in some sub-sectors. The GHG emission reduction targets in this section are all conditional upon international support (financial and technical support) made available.
COVERAGE	Energy; Agriculture, Forestry and Other Land Use (AFOLU); and Waste
TIMEFRAME	From 1st January 2021- 31st December 2030
ENERGY	<p>Energy Industry (Electricity Generation)</p> <ul style="list-style-type: none"> By 2030, Renewable Energy Capacity Addition and substituting (replacement) of fossil fuels with Coconut (Copra) Oil based Electricity Generation: transitioning to close to 100% renewable energy in the electricity generation sector. <p>Transport</p> <ul style="list-style-type: none"> By 2030, 10% improvement in transport (land and marine) energy efficiency Electric Vehicles (e-Mobility): by 2030, (a) Introduce Electric Vehicles (e-buses) for public transportation (10% of total Public Buses); (b) Introduce Electric Cars (e-Cars) in Vanuatu (10% of government fleet); and (c) 1000 Electric Two wheelers (e-bikes) /Three Wheelers (e-rickshaw) By 2030, 20 % Bio-diesel (bio-fuel) Blending in Diesel By 2030, Milage and Emission Standards for Vehicles <p>Other Sectors - Commercial, Institutional and Residential</p> <ul style="list-style-type: none"> By 2030, (a) 100% electricity access by households in off-grid areas; (b) 100% electricity access by public institutions (on- and off-grid); (c) 13% electricity sector end-use efficiency; (d) 14% improve biomass end use (improved cook stoves and drying) efficiency; (e) 65% renewable electricity use by rural tourism bungalows. By 2030, installation of 1000 numbers of Biogas Plants for Commercial and Residential Use By 2030, Increase Energy Efficiency in Commercial and Residential Sector, (a) 5% increase in Energy Efficiency in Commercial and Residential Sector; and (b) 10 <p>Numbers of Energy Efficient Building (Green Building)</p> <ul style="list-style-type: none"> By 2030, Increase Ecotourism Supported by Local Communities <p>These three energy sub-sector targets collectively can reduce GHG emissions approximately 78.786 Gg CO2e from energy sector in comparison to BAU scenario in 2030, which is around 40% reduction in comparison to energy sector's GHG emissions from the BAU scenario.</p>

IPPU	Not applicable for Vanuatu, hence not included.
AFOLU	<p>Livestock</p> <ul style="list-style-type: none"> • By 2030, Training and capacity building for livestock farming and pasture management • By 2030, Converting Pastures to Silvopastoral Livestock Systems • By 2030, International Collaboration to Improve Livestock Efficiency <p>The impact of above mitigation measures in livestock sub-sector's net GHG emissions reduction of about 30.977 Gg CO₂e in 2030; which is around 9% lesser than the GHG emissions in BAU scenario.</p> <p>It is to be noted that, actual GHG mitigation potentials of the above measures are not estimated due to lack of availability of data and defined methodology; however, the cumulative impact of these measure will result in higher than the estimate GHG emissions reductions.</p> <p>Forestry</p> <ul style="list-style-type: none"> • The forestry sector in Vanuatu is a net carbon sink. • Sustainable logging practices are being practiced in Vanuatu for commercial logging. • Vanuatu is committed to maintaining its forest cover in the country and is expected to remain net carbon negative in future as well. The REDD+ programme is currently being implemented in Vanuatu to improve sustainable forest management practices. <p>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. Based on the results and outcome from the REDD+ initiative, potential mitigation interventions shall be included in future NDC update.</p>
WASTE	<p>Solid Waste (Municipal Solid Waste)</p> <ul style="list-style-type: none"> • By 2030, Implement Waste to Energy Plant for Municipal Solid Waste (MSW): (a) Waste to Energy Plant for Port Vila; (b) Waste to Energy Plant for Luganville; and (c) Waste to Energy Plant for Lenakel. • By 2030, Introduce Composting for municipal organic waste to produce soil enhancer • By 2030, Implement Collect, Sort and Export of Recyclable Materials (first phase) for Port Vila • By 2030, Develop and Implement National Plastics Strategy <p>Waste Water</p> <ul style="list-style-type: none"> • By 2030, Implement Waste Water Management System in Vanuatu: (a) Centralised Waste water collection and treatment system in municipal area including awareness and capacity building • By 2030, Improvements to Public and Communal Toilet Facilities including Bio- Toilets <p>With the waste sector mitigation measures, the waste sector's net GHG emissions will reduce about 29.335 Gg in 2030 in comparison to BAU scenario; which is around 56% lesser than the BAU scenario GHG emissions. It is to be noted that, GHG mitigation potentials for some of the measures identified for the waste sector are not estimated due to lack of data availability of methodology; however, the cumulative impact of the additional measure will result in higher GHG emissions reductions from waste sector.</p>

Table 31 Vanuatu's Updated Nationally Determined Contributions (NDCs)

DETAILED DESCRIPTION OF MITIGATION COMPONENT OF NDC																																																																
1. QUANTIFIED INFORMATION ON THE REFERENCE POINT, INCLUDING, AS APPROPRIATE, A BASE YEAR																																																																
A. REFERENCE YEAR(S), BASE YEAR(S), REFERENCE PERIOD(S) OR OTHER STARTING POINT(S)	2010 (Base year)																																																															
B. QUANTIFIABLE INFORMATION ON THE REFERENCE INDICATORS, THEIR VALUES IN THE REFERENCE YEAR(S), BASE YEAR(S), REFERENCE PERIOD(S) OR OTHER STARTING POINT(S), AND, AS APPLICABLE, IN THE TARGET YEAR	<p>As per the Greenhouse Gas Inventory (under the second National Communication Report), the net GHG emissions (excluding removals) for the base year, was 728.359 Gg CO₂eq. The direct GHG emission for the following IPCC sectors is:</p> <p>Energy: 122.44 Gg CO₂eq IPPU: 0 Gg CO₂eq AFOLU: 587.48 Gg CO₂eq Waste: 10.75 Gg CO₂eq Others: 0 Gg CO₂eq</p> <p>The quantified targets presented in this section are all conditional, will be implemented upon international (Technical and Financial) support by 2030.</p> <p>Energy Sector:</p> <table border="1"> <thead> <tr> <th>Target Indicator</th> <th>2010</th> <th>2025</th> <th>2030</th> </tr> </thead> <tbody> <tr> <td>Renewable Energy Generation -Grid Connected (%)</td> <td>11.69%</td> <td>50%</td> <td>100%</td> </tr> <tr> <td>Improve transport (land and marine) energy efficiency</td> <td>-</td> <td>-</td> <td>10%</td> </tr> <tr> <td>Improve biomass end use (cooking and drying) efficiency</td> <td>-</td> <td>-</td> <td>14%</td> </tr> <tr> <td>Electric Vehicles – e-Buses</td> <td>-</td> <td>-</td> <td>10% of public transport buses</td> </tr> <tr> <td>Electric Vehicles – e-Cars</td> <td>-</td> <td>-</td> <td>10% of government fleet</td> </tr> <tr> <td>Electric Vehicles – 2/3 wheelers</td> <td>-</td> <td>-</td> <td>1000 No.</td> </tr> <tr> <td>Bio-diesel (bio-fuel) Blending in Diesel</td> <td>-</td> <td>-</td> <td>20%</td> </tr> <tr> <td>Renewable electricity use by rural tourism bungalows</td> <td>-</td> <td>-</td> <td>65%</td> </tr> <tr> <td>Energy Efficiency in Commercial and Residential Sector</td> <td>-</td> <td>-</td> <td>5%</td> </tr> <tr> <td>Energy Efficient Building (Green Building)</td> <td>-</td> <td>-</td> <td>10 No.</td> </tr> </tbody> </table> <p>Waste Sector:</p> <table border="1"> <thead> <tr> <th>Target Indicator</th> <th>2010</th> <th>2025</th> <th>2030</th> </tr> </thead> <tbody> <tr> <td>Waste to Energy Plant</td> <td>-</td> <td>-</td> <td>3</td> </tr> <tr> <td>Composting Plant</td> <td>-</td> <td>-</td> <td>1</td> </tr> <tr> <td>Public and Communal Toilet Facilities including Bio-Toilets</td> <td>-</td> <td>-</td> <td>1000</td> </tr> </tbody> </table>				Target Indicator	2010	2025	2030	Renewable Energy Generation -Grid Connected (%)	11.69%	50%	100%	Improve transport (land and marine) energy efficiency	-	-	10%	Improve biomass end use (cooking and drying) efficiency	-	-	14%	Electric Vehicles – e-Buses	-	-	10% of public transport buses	Electric Vehicles – e-Cars	-	-	10% of government fleet	Electric Vehicles – 2/3 wheelers	-	-	1000 No.	Bio-diesel (bio-fuel) Blending in Diesel	-	-	20%	Renewable electricity use by rural tourism bungalows	-	-	65%	Energy Efficiency in Commercial and Residential Sector	-	-	5%	Energy Efficient Building (Green Building)	-	-	10 No.	Target Indicator	2010	2025	2030	Waste to Energy Plant	-	-	3	Composting Plant	-	-	1	Public and Communal Toilet Facilities including Bio-Toilets	-	-	1000
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D. FOR STRATEGIES, PLANS AND ACTIONS REFERRED TO IN ARTICLE 4, PARAGRAPH 6, OF THE PARIS AGREEMENT, OR POLICES AND MEASURES AS COMPONENTS OF NATIONALLY DETERMINED CONTRIBUTIONS WHERE PARAGRAPH 1(B) ABOVE IS NOT APPLICABLE, PARTIES TO PROVIDE OTHER RELEVANT INFORMATION	<p>The policies presented in this section will be developed/enhanced and implemented upon international (Technical and Financial) support by 2030. The policy targets that are not quantified are:</p> <p>Energy Sector:</p> <ul style="list-style-type: none"> • Implementation of NERM: 2016-2030 • National coconut oil strategy • Milage and Emission Standards for Vehicles • National Electric Vehicles (e-Mobility) Policy • Energy Efficiency in Commercial and Residential Sector policy • Ecotourism Policy (Supported by Local Communities) <p>AFOLU Sector:</p> <ul style="list-style-type: none"> • Sustainable Forest Management Policy and REDD+ Programme/ strategy • Livestock farming and pasture management <p>Waste Sector:</p> <ul style="list-style-type: none"> • Municipal Solid Waste Management Policy – Waste to Energy and Composting, Recycling etc. • Waste Water Management Policy 																																																															

<p>E. INFORMATION ON SOURCES OF DATA USED IN QUANTIFYING THE REFERENCE POINT(S)</p>	<p>The key data references and documents assessed (but not limited) include:</p> <ul style="list-style-type: none"> • Vanuatu's first Nationally Determined Contributions (NDC); • National Sustainable Development Plan: 2016-2030 (NSDP or Vanuatu 2030: The People's Plan); • Climate Change and Disaster Risk Reduction (CCDRR) Policy; • Meteorology, Geological Hazards and Climate Change Act No.25 of 2016; • National Energy Roadmap (NERM): 2016-2030 and NERM-Implementation Plan; • NDC implementation roadmap; • National Communications (NC-1,2 and 3-draft); • Utilities Regulatory Authority (URA) Reports • Data and information provided by the Government of Vanuatu line ministries and departments; Public and Private Sector and, • Stakeholder consultation including NGOs and Development Partners • International experts' consultation
<p>F. INFORMATION ON THE CIRCUMSTANCES UNDER WHICH THE PARTY MAY UPDATE THE VALUES OF THE REFERENCE INDICATORS</p>	<p>Under following circumstances under which Vanuatu may update or change the values of the reference indicators:</p> <ul style="list-style-type: none"> • Some of the actions are part of NERM-implementation plan and subject to international support (Technical and Financial); in the delay or absence of support. • In the next greenhouse gas inventory, Vanuatu may update the reference indicators of existing sectors and/or may provide new values for sectors that were not previously covered. • Vanuatu is very prone to natural disasters (Typhoon, tsunami, cyclones, earthquake, volcano eruption etc.), in the case of any major natural disaster or pandemic situation similar to COVID-19, Vanuatu may update/change the reference point. • Vanuatu is in the process of from the least developed country (LDC) category; hence any major change in economic and social environment may lead to update or change the values of the reference indicators.
<p>2. TIME FRAMES AND/OR PERIODS FOR IMPLEMENTATION</p>	
<p>A. TIME FRAME AND/OR PERIOD FOR IMPLEMENTATION, INCLUDING START AND END DATE, CONSISTENT WITH ANY FURTHER RELEVANT DECISION ADOPTED BY THE CMA;</p>	<p>From 1st January 2021- 31st December 2030</p>
<p>B. WHETHER IT IS A SINGLE-YEAR OR MULTI-YEAR TARGET, AS APPLICABLE.</p>	<p>Single-year target 2030, including updates on 2025 targets. (The NDC interventions will be implemented phase wise as per annual workplan; however, the selected target year is 2030).</p>
<p>3. SCOPE AND COVERAGE</p>	
<p>A. GENERAL DESCRIPTION OF THE TARGET</p>	<p>Sectoral activity-based and policy targets, including emissions reduction in some sectors.</p> <p>The Government of Vanuatu will meet conditional targets upon on international support on financing, technology transfer and/or capacity building.</p>
<p>B. SECTORS, GASES, CATEGORIES AND POOLS COVERED BY THE NATIONALLY DETERMINED CONTRIBUTION, INCLUDING, AS APPLICABLE, CONSISTENT WITH IPCC GUIDELINES;</p>	<p>The IPCC Sectors, Sub-sector and Gases applicable for Vanuatu:</p> <p>(1) Energy</p> <ul style="list-style-type: none"> • Energy Industries - Electricity Generation/Renewable Energy • Transport • Other Sectors (Residential, Institutional and Commercial) <p>(2) Industrial Processes and Product Use (IPPU) - Not Applicable</p> <p>(3) Agriculture, Forestry, and Other Land Use (AFOLU)</p> <ul style="list-style-type: none"> • Livestock • Forests – Not Included <p>(4) Waste</p> <ul style="list-style-type: none"> • Solid Waste • Waste Water <p>Gases:</p> <ul style="list-style-type: none"> • Carbon Dioxide (CO2) • Methane (CH4) • Nitrous Oxide (NO2)
<p>C. HOW THE PARTY HAS TAKEN INTO CONSIDERATION PARAGRAPHS 31(C) AND (D) OF DECISION 1/CP.21;</p>	<p>Vanuatu is a small island nation with limited economic sectors and activity; hence all the IPCC sectors, sub-sectors and categories are not applicable.</p> <p>In addition, Vanuatu has on technical, financial and skilled resources limitation to collect data, process and analysis of data; hence some of the category not critical or with negligible existence have been excluded. All the key categories and gases identified for Vanuatu have been included in the NDC.</p> <p>Furthermore, Vanuatu is willing to include other remaining categories of anthropogenic emissions or removals (as may become applicable) in its future nationally determined contributions and will continue to include it for all future NDCs.</p> <p>Vanuatu will extend the scope of the coverage of its NDC over time to all categories of anthropogenic emissions and removal, as more robust data becomes available.</p>

D. MITIGATION CO-BENEFITS RESULTING FROM PARTIES' ADAPTATION ACTIONS AND/OR ECONOMIC DIVERSIFICATION PLANS, INCLUDING DESCRIPTION OF SPECIFIC PROJECTS, MEASURES AND INITIATIVES OF PARTIES' ADAPTATION ACTIONS AND/OR ECONOMIC DIVERSIFICATION PLANS.

Please refer section 4 Adaptation Component of NDC

4. PLANNING PROCESS

A. INFORMATION ON THE PLANNING PROCESSES THAT THE PARTY UNDERTOOK TO PREPARE ITS NDC AND, IF AVAILABLE, ON THE PARTY'S IMPLEMENTATION PLANS, INCLUDING, AS APPROPRIATE:

I. DOMESTIC INSTITUTIONAL ARRANGEMENTS, PUBLIC PARTICIPATION AND ENGAGEMENT WITH LOCAL COMMUNITIES AND INDIGENOUS PEOPLES, IN A GENDER-RESPONSIVE MANNER;

The Republic of Vanuatu's NDC has been developed through an inclusive and participatory process, with a series of public and in-person consultations.

The Republic of Vanuatu's NDC enhancement process was led by the Department of Climate Change (DoCC) under the guidance of the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management (MoCC).

The stakeholders of all line ministries and department of Government of Vanuatu engaged in the NDC enhancement/ revision including Department of Energy (DoE), Department of Environmental Protection and Conservation, Department of Forests, Department of Meteorology, Department of Geological Hazards, Department of Fisheries, Department of Livestock, Department of Biosecurity, Department of Strategic Planning and Aid Coordination, Department of Women's Affairs gender policy etc. also participated in the NDC enhancement process.

The private sector including utility companies, energy sector vendors, development partners and NGOs were engaged and consulted during the NDC revision process. The consultation was carried out at the national level given the small size and population of Vanuatu and COVID-19 emergency measures sub-national level consultation could not take place. However; the government departments, private sector participants, NGOs and development partners also involve with the projects and programme at sub-national level and adequately represented sub-national level stakeholders.

Gender equality and other vulnerable group inclusion was an integral part of NDC enhancement process, the gender expert with the DoCC Team was engaged in NDC enhancement and reviewed the enhanced NDC options to review the gender-responsive considerations. The enhanced NDC actions/measures complies with key issues and requirements of gender sensitive design as per the national policies and 'Gender Analysis and Nationally Determined Contributions (NDCs)' guidance.

None of the identified enhanced NDC actions impacts negatively on gender equality and women's rights, limits access or influence on women's access to and control over natural resources and the goods and services covered under the enhanced NDC.

Furthermore, the align with the requirements under NSDP and NERM; both the policy extensively covers the gender responsive, youth-specific needs and roles; specifically, on green employment, awareness and capacity building.

The enhanced NDC actions/measure will contribute positively on gender, youth and other vulnerable group-specific needs and will provide them opportunities to play actively role in design and implementation.

Series of internal and external consultation carried out during the NDC enhancement process and a national level public consultation conducted to receive the comments and feedback on NDC.

Further, the enhanced/ revised NDC has been endorsed by the Vanuatu's National Advisory Board on Climate Change & Disaster Risk reduction (NAB - the supreme policy making and advisory body for all disaster risk reduction and climate change programs, projects, initiatives and activities in Vanuatu) and Council of Ministers (CoM), Government of Vanuatu.

II. CONTEXTUAL MATTERS, INCLUDING, INTER ALIA, AS APPROPRIATE:

(A) NATIONAL CIRCUMSTANCES, SUCH AS GEOGRAPHY, CLIMATE, ECONOMY, SUSTAINABLE DEVELOPMENT AND POVERTY ERADICATION;

The Republic of Vanuatu is an island nation located in the Western Pacific Ocean. Vanuatu is an archipelago of over 80 islands stretching 1,300 kilometers from North to South in the Western Pacific Ocean. Vanuatu is located between latitude 12° to 23° South and longitude 166° to 173° East. Vanuatu's terrain is mostly mountainous, with narrow coastal plains with a total land area of 12,336 km² and a maritime exclusive economic zone of 680,000 km². Almost 74% of the land area in Vanuatu is covered by natural vegetation, with around one third covered by forest; which is more than 36.1% (440,000 hectares covered by tropical forest).

The largest island is Espiritu Santo, while the island of Efate is home to the capital, Port Vila and the central Vanuatu Government. From largest to smallest, the islands are Espiritu Santo, Malekula, Efate, Erromango, Ambrym, Tanna, Pentecost, Epi, Ambae or Aoba, Vanua Lava, Gaua, Maewo, Malo, and Anatom or Aneityum. The two largest islands; Espiritu Santo and Malekula comprise nearly 50% of the total land mass. Larger islands are characterised by rugged volcanic peaks and tropical rainforests. The highest peak, Mount Tabwemasana on Espiritu Santo, is 1877m above mean sea level and the total coastline is about 2,528 km long.

Vanuatu is geographically located in the "ring of fire" and the "cyclone belt" of the Pacific. The island nation is located in a seismically and volcanically active region and has high exposure to geologic hazards, including volcanic eruptions, earthquakes, tsunamis and landslides. Almost 81% of its landmass and 76% of its population is exposed to two or more potential hazards including volcanic eruptions, cyclones, earthquakes, droughts, tsunamis, storm surge, coastal and river flooding and landslides.

Vanuatu is situated in a tropical maritime climate with characteristic uniform temperature, high humidity and variable rainfall. The tropical climate is moderated by southeast trade winds that occur from May to October. There are two main seasons, hot and wet from November to April, and cool and dry from May to October. Being an equatorial country, Vanuatu has relatively uniform temperature throughout the year with daily temperature ranging from 20°C to 30°C. Temperatures in the warmest months (January- February) are about 4°C higher than those in the coolest months (July-August).

According to the most recent (Mini) census undertaken in 2016, Vanuatu's population was reported to be a total count of 272,459 compared to a population count of 234,023 in the last 2009 census. Vanuatu's population is largely based within its' rural areas – 75% as per 2016 mini census.

Vanuatu is traditionally known for its strong cultural heritage tradition activities and subsistence farming. The four mainstays of Vanuatu's economy are agriculture, tourism, offshore financial services, and raising cattle. Exports include copra, kava, beef, cocoa, and timber, and imports include machinery and equipment, foodstuffs, and fuel.

In 2017, Vanuatu's economy grew by 4.4% with a strong performance over the last three previous years. Subsequently it was further projected for the economy to grow by 3.4% in 2018 from 2017 growth levels. Growth was primarily driven by construction activities related to the on-going infrastructure development projects and reconstruction projects from tropical cyclone Pam (VNSO 2019; RBV 2018).

(B) BEST PRACTICES AND EXPERIENCE RELATED TO THE PREPARATION OF THE NDC;

In addition to the planning process discussed in section 4 (a) (i). The Government of Vanuatu has taken one of its kind initiative to identify the circular economy options for Vanuatu and constituted the metabolic analysis of its economy and economic sectors.

A metabolic assessment has been conducted to define a resource efficient and low-carbon future for Vanuatu. The metabolic assessment observed that, the average material uses and per capita GHG emissions in Vanuatu is low in comparison to the global average. The existing consumption-based resource footprint of Vanuatu is 58% relatively circular. Already for 58% of the materials used, the country is relying on secondary or renewable materials and energy sources.

The remaining 42% of material use is not circular and can be characterised as following a linear 'take-make-waste' trajectory. These 42% of materials are mostly of foreign origin and collide with the development ambitions of the country since they create issues with waste disposal and the deterioration of natural assets as a result of the pollution of soils, surface waters and marine environments. The circular economy analysis identified some of the opportunities which contribute to the domestic and transboundary (international) GHG emission reductions. Some of the key circular economy actions (CE strategies) identified by the metabolic assessment have been include in Vanuatu's enhanced NDC.

Furthermore, the Government of Vanuatu has also developed and implemented Integrated Monitoring, Reporting and Verification (MRV) Tool for Energy Sector (currently being enhanced to cover additional mitigation sectors according to the updated NDC) and a Monitoring, Reporting Verification Tool for NERM 2016-2030.

Vanuatu's integrated MRV Tool is a first of its kind initiative to integrate most of the domestic and international climate action monitoring, tracking and reporting requirements. Further, it supports government agencies, development partners, d and NGOs towards evidence-based decisions and data insights reporting. Vanuatu's integrated MRV Tool has been customized to track, monitor and report data critical for climate actions and sustainable development goals.

	<p>(C) OTHER CONTEXTUAL ASPIRATIONS AND PRIORITIES ACKNOWLEDGED WHEN JOINING THE PARIS AGREEMENT;</p> <p>The Government of Republic of Vanuatu is fully committed to effective, and transparent implementation of the Paris Agreement (PA) and supports the its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, also limit global average temperature rise to 1.5°C; this may poses lower risks for Vanuatu in comparison to 2°C or higher temperatures. The Government of Vanuatu’s commitment reflect in its declaration:</p> <p>“WHEREAS the Government of the Republic of Vanuatu declares its understanding that ratification of the Paris Agreement shall in no way constitute a renunciation of any rights under any other laws, including international law, and the communication depositing the Republic’s instrument of ratification shall include a declaration to this effect for international record;</p> <p>FURTHERMORE, the Government of the Republic of Vanuatu declares that, in light of best scientific information and assessment on climate change and its impacts, it considers the emission reduction obligations in Article 3 of the Kyoto Protocol, the Doha Amendment and the aforesaid Paris Agreement to be inadequate to prevent global temperature increase of 1.5 degrees Celsius above pre-Industrial levels and as a consequence, will have severe implications for our national interests...”</p>
<p>B. SPECIFIC INFORMATION APPLICABLE TO PARTIES, INCLUDING REGIONAL ECONOMIC INTEGRATION ORGANIZATIONS AND THEIR MEMBER STATES, THAT HAVE REACHED AN AGREEMENT TO ACT JOINTLY UNDER ARTICLE 4, PARAGRAPH 2, OF THE PARIS AGREEMENT, INCLUDING THE PARTIES THAT AGREED TO ACT JOINTLY AND THE TERMS OF THE AGREEMENT, IN ACCORDANCE WITH ARTICLE 4, PARAGRAPHS 16-18, OF THE PARIS AGREEMENT;</p>	<p>Not applicable.</p>
<p>C. HOW THE PARTY’S PREPARATION OF ITS NDC HAS BEEN INFORMED BY THE OUTCOMES OF THE GLOBAL STOCKTAKE, IN ACCORDANCE WITH ARTICLE 4, PARAGRAPH 9, OF THE PARIS AGREEMENT</p>	<p>As a responsible party to PA, Government of Vanuatu will comply with the decisions under PA and actively participate in the first global stocktake in 2023.</p> <p>Furthermore, Vanuatu, enhanced NDCs for the period 2020-2030 is more ambitious than its previous one, both in terms of its sectoral coverage and in terms of its net emission reduction contribution as well.</p> <p>Vanuatu calls on all Parties to increase ambition in line with the best available and most recent science and obligations under the agreement.</p>
<p>D. EACH PARTY WITH AN NDC UNDER ARTICLE 4 OF THE PARIS AGREEMENT THAT CONSISTS OF ADAPTATION ACTION AND/OR ECONOMIC DIVERSIFICATION PLANS RESULTING IN MITIGATION CO-BENEFITS CONSISTENT WITH ARTICLE 4, PARAGRAPH 7, OF THE PARIS AGREEMENT TO SUBMIT INFORMATION ON:</p>	<p>I. HOW THE ECONOMIC AND SOCIAL CONSEQUENCES OF RESPONSE MEASURES HAVE BEEN CONSIDERED IN DEVELOPING THE NDC</p> <p>Please refer section 4 Adaptation Component of NDC and annex</p> <p>II. SPECIFIC PROJECTS, MEASURES AND ACTIVITIES TO BE IMPLEMENTED TO CONTRIBUTE TO MITIGATION CO-BENEFITS, INCLUDING INFORMATION ON ADAPTATION PLANS THAT ALSO YIELD MITIGATION CO-BENEFITS, WHICH MAY COVER, BUT ARE NOT LIMITED TO, KEY SECTORS, SUCH AS ENERGY, RESOURCES, WATER RESOURCES, COASTAL RESOURCES, HUMAN SETTLEMENTS AND URBAN PLANNING, AGRICULTURE AND FORESTRY; AND ECONOMIC DIVERSIFICATION ACTIONS, WHICH MAY COVER, BUT ARE NOT LIMITED TO, SECTORS SUCH AS MANUFACTURING AND INDUSTRY, ENERGY AND MINING, TRANSPORT AND COMMUNICATION, CONSTRUCTION, TOURISM, REAL ESTATE, AGRICULTURE AND FISHERIES.</p> <p>Please refer section 4 Adaptation Component of NDC and annex</p>
<p>5. ASSUMPTIONS AND METHODOLOGICAL APPROACHES, INCLUDING THOSE FOR ESTIMATING AND ACCOUNTING FOR ANTHROPOGENIC GREENHOUSE GAS EMISSIONS AND, AS APPROPRIATE, REMOVALS:</p>	
<p>A. ASSUMPTIONS AND METHODOLOGICAL APPROACHES USED FOR ACCOUNTING FOR ANTHROPOGENIC GREENHOUSE GAS EMISSIONS AND REMOVALS CORRESPONDING TO THE PARTY’S NATIONALLY DETERMINED CONTRIBUTION, CONSISTENT WITH DECISION 1/CP.21, PARAGRAPH 31, AND ACCOUNTING GUIDANCE ADOPTED BY THE CMA;</p>	<p>Vanuatu account for its anthropogenic GHG emissions and removals using the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories).</p> <p>Two additional guidelines will be considered for quality assurance: the IPCC Good Practice Guidance and Uncertainty Management in National GHG Inventory (2000) and the IPCC Good Practice Guideline for Land Use, Land-Use Change, and Forestry (2003).</p>
<p>B. ASSUMPTIONS AND METHODOLOGICAL APPROACHES USED FOR ACCOUNTING FOR THE IMPLEMENTATION OF POLICIES AND MEASURES OR STRATEGIES IN THE NATIONALLY DETERMINED CONTRIBUTION;</p>	<p>As discussed above, Vanuatu will also apply specific assumptions and methodologies where relevant when accounting for various policies and measures in its Biennial Update Report, Biennial Transparency Report, or National Communications.</p>

<p>C. IF APPLICABLE, INFORMATION ON HOW THE PARTY WILL TAKE INTO ACCOUNT EXISTING METHODS AND GUIDANCE UNDER THE CONVENTION TO ACCOUNT FOR ANTHROPOGENIC EMISSIONS AND REMOVALS, IN ACCORDANCE WITH ARTICLE 4, PARAGRAPH 14, OF THE PARIS AGREEMENT, AS APPROPRIATE;</p>	<p>As discussed above, The IPCC 2006 Guidelines have been used to calculate emissions in the GHG Inventory for National Communication and NDC.</p>
<p>D. IPCC METHODOLOGIES AND METRICS USED FOR ESTIMATING ANTHROPOGENIC GREENHOUSE GAS EMISSIONS AND REMOVALS;</p>	<p>Further to above discussion, the preparation of national GHG inventories for Vanuatu, uses both Tier1 and Tier2 methodologies (as appropriate) of 2006 IPCC guidelines.</p>
<p>E. SECTOR-, CATEGORY- OR ACTIVITY-SPECIFIC ASSUMPTIONS, METHODOLOGIES AND APPROACHES CONSISTENT WITH IPCC GUIDANCE, AS APPROPRIATE, INCLUDING, AS APPLICABLE:</p>	<p>I. APPROACH TO ADDRESSING EMISSIONS AND SUBSEQUENT REMOVALS FROM NATURAL DISTURBANCES ON MANAGED LANDS;</p> <p>As discussed in the above sections, all the categories are not applicable for Vanuatu. Furthermore, due to limited data availability and capacity limitation, not all the sectors are covered in Vanuatu's NDC.</p> <p>However, in the future, Vanuatu would like to update its emission inventories; and will cover all the applicable sectors following the 2006 IPCC guidelines.</p> <p>II. APPROACH USED TO ACCOUNT FOR EMISSIONS AND REMOVALS FROM HARVESTED WOOD PRODUCTS;</p> <p>Please refer 5 (e) (i)</p> <p>III. APPROACH USED TO ADDRESS THE EFFECTS OF AGE-CLASS STRUCTURE IN FORESTS;</p> <p>Please refer 5 (e) (i)</p>
<p>F. OTHER ASSUMPTIONS AND METHODOLOGICAL APPROACHES USED FOR UNDERSTANDING THE NATIONALLY DETERMINED CONTRIBUTION AND, IF APPLICABLE, ESTIMATING CORRESPONDING EMISSIONS AND REMOVALS, INCLUDING:</p>	<p>I. HOW THE REFERENCE INDICATORS, BASELINE(S) AND/OR REFERENCE LEVEL(S), INCLUDING, WHERE APPLICABLE, SECTOR-, CATEGORY- OR ACTIVITY-SPECIFIC REFERENCE LEVELS, ARE CONSTRUCTED, INCLUDING, FOR EXAMPLE, KEY PARAMETERS, ASSUMPTIONS, DEFINITIONS, METHODOLOGIES, DATA SOURCES AND MODELS USED;</p> <p>Not Applicable</p> <p>II. FOR PARTIES WITH NATIONALLY DETERMINED CONTRIBUTIONS THAT CONTAIN NON-GREENHOUSE-GAS COMPONENTS, INFORMATION ON ASSUMPTIONS AND METHODOLOGICAL APPROACHES USED IN RELATION TO THOSE COMPONENTS, AS APPLICABLE;</p> <p>Not Applicable</p> <p>III. FOR CLIMATE FORCERS INCLUDED IN NATIONALLY DETERMINED CONTRIBUTIONS NOT COVERED BY IPCC GUIDELINES, INFORMATION ON HOW THE CLIMATE FORCERS ARE ESTIMATED;</p> <p>Not Applicable</p> <p>IV. FURTHER TECHNICAL INFORMATION, AS NECESSARY;</p> <p>Not Applicable</p>
<p>G. THE INTENTION TO USE VOLUNTARY COOPERATION UNDER ARTICLE 6 OF THE PARIS AGREEMENT, IF APPLICABLE.</p>	<p>Vanuatu will explore opportunities for climate resilient socio-economic development with international cooperation and support including carbon market under Article 6.</p>
<p>6. HOW THE PARTY CONSIDERS THAT ITS NDC IS FAIR AND AMBITIOUS IN LIGHT OF ITS NATIONAL CIRCUMSTANCES</p>	
<p>A. HOW THE PARTY CONSIDERS THAT ITS NDC IS FAIR AND AMBITIOUS IN THE LIGHT OF ITS NATIONAL CIRCUMSTANCES;</p>	<p>Vanuatu is a small island least developed country, that has an insignificant contribution to global GHG emissions, historically it's GHG emissions have been very low: Vanuatu's total CO₂equivalen emissions was around 0.0011% of the Global GHG emissions for year 2015. Though, Vanuatu is among the most vulnerable to climate change and its impact.</p> <p>Further, Vanuatu has taken an ambitious target of transitioning to close to 100% renewable energy in the electricity sector by 2030. With this enhanced NDC, Vanuatu is planning to further reduce it's national GHG emissions by 2030.</p> <p>This NDC, and the accompanying information, reflects Vanuatu's commitment under the Paris Agreement to address climate change.</p>
<p>B. FAIRNESS CONSIDERATIONS, INCLUDING REFLECTING ON EQUITY;</p>	<p>Same as above</p>
<p>C. HOW THE PARTY HAS ADDRESSED ARTICLE 4, PARAGRAPH 3, OF THE PARIS AGREEMENT;</p>	<p>Vanuatu's enhanced NDC builds on the ambition of its first NDC, both in terms of its sectoral coverage and in terms of its net emission reduction contribution as well.</p>

D. HOW THE PARTY HAS ADDRESSED ARTICLE 4, PARAGRAPH 4, OF THE PARIS AGREEMENT;	In addition to the sectoral activity-based targets for electricity generation, transport energy efficiency, other livestock, waste sector, this NDC also includes additional policy targets for sectors where data and/or baseline information is not available such as for livestock, solid waste and waste water management. This paves way for Vanuatu to establish economy-wide emissions target, based on national circumstances and capabilities.
E. HOW THE PARTY HAS ADDRESSED ARTICLE 4, PARAGRAPH 6, OF THE PARIS AGREEMENT.	In addition to the sectoral activity-based targets Vanuatu's enhanced NDC also includes policy targets (See section 1(d)) for areas where data and/or baseline information is not available. These areas include livestock and waste management.
7. HOW THE NDC CONTRIBUTES TOWARDS ACHIEVING THE OBJECTIVES OF THE CONVENTION AS SET OUT IN ITS ARTICLE 2	
A. HOW THE NDC CONTRIBUTES TOWARDS ACHIEVING THE OBJECTIVE OF THE CONVENTION AS SET OUT IN ITS ARTICLE 2;	Please refer section 6(a)
B. HOW THE NDC CONTRIBUTES TOWARDS ARTICLE 2, PARAGRAPH 1(A), AND ARTICLE 4, PARAGRAPH 1, OF THE PARIS AGREEMENT.	Please refer section 6(a)

Means of Implementation

The tentative cost of achieving the Vanuatu's conditional mitigation targets is estimated to be USD \$ 173.6 Million. This cost estimation does not cover the costs of existing measures i.e. measures included in the first NDC of Vanuatu); since these measure are already under implementation and already budgeted under NERM:2016-2030. Furthermore, the costs for additional measures are tentative and based on similar international experiences, national circumstances of Vanuatu and other assumptions. A detailed scoping and feasibility study of enhanced NDC measures will be conducted under the NDC implementation roadmap development to determine the exact additional investment requirements.

To achieve the conditional targets, Vanuatu anticipates financial, technological and capacity building support from global funds such as the Green Climate Fund, Global Environment Facility, Adaptation Fund, Least Developed Countries Fund; and bilateral/multilateral agencies and development partners. These funds will be utilized to bolster limited national resources and technical capacities for scaling up climate action.

The activities will be implemented over a period of 10 years (2021 -2030) by integrating them under the budget as various subsidy policies, projects or programmes. As these targets are well aligned with the country's existing policies and plans, they will have high ownership and will be implemented in a timely manner. Vanuatu has already in place the institutional structure for implementation of enhanced NDC, the National Advisory Board (NAB), is the supreme policy making and advisory body for all disaster risk reduction and climate change programs, projects,

initiatives and activities in Vanuatu. NAB develops Disaster Risk Reduction (DRR) and Climate Change policies, guidelines and positions, advises on international and regional DRR and CC obligations, facilitates and endorses the development of new DRR & CC programs, projects, initiatives and activities, acts as a focal point for information sharing and coordination on CC/DRR, as well as guides and coordinates the development of national climate finance processes.

The Ministry of Climate Change Adaptation (MoCC), Meteorology & Geo-Hazards, Energy, Environment and National Disaster Management is the nodal agency as part of the Government's efforts to streamline Vanuatu's climate change natural disaster responses and sustainable development of the environment. The Department of Climate Change (DoCC) within the Ministry of Climate Change, mandated to: ensure that high quality services are provided in relation to climate change in Vanuatu. The Ministry and the National Advisory Board (NAB) are mandated with coordinating all government and non-government initiatives addressing climate change and disaster risk reduction in the country.

The Vanuatu's enhanced NDC will be implemented in close coordination with other line ministries like Ministry of Infrastructure and Public Utilities (MIPU), Ministries of Education and Health, Ministry of Finance etc. other government departments specially Department of Energy (DoE), Department of Environment, Utilities Regulatory Authority (URA); Public and private sector mainly UNELCO Engie (UNELCO), Vanuatu Utilities & Infrastructure Limited (VUI) and Other Private Sector Service Providers; Doner agencies and development partners and Non-governmental Organizations (NGOs).

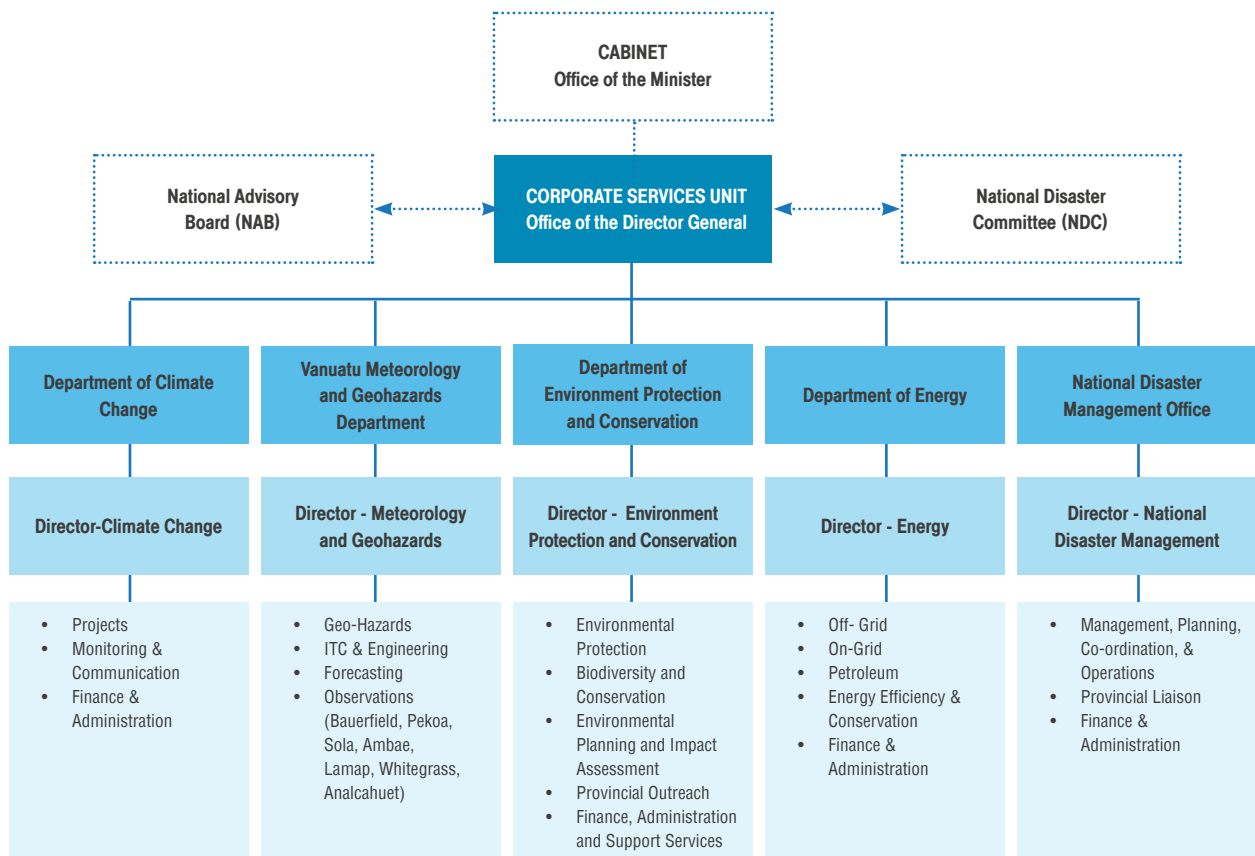


Figure 22 Vanuatu's Climate Change-Organizational Structure

3.3 Key GHG Emission Sectors

Vanuatu's key GHG emission sources can be classified into two categories: energy-related emissions (due to fossil fuel combustion); and non-energy GHG emissions (Agriculture, Forestry and waste). The forestry sector is a net sink.

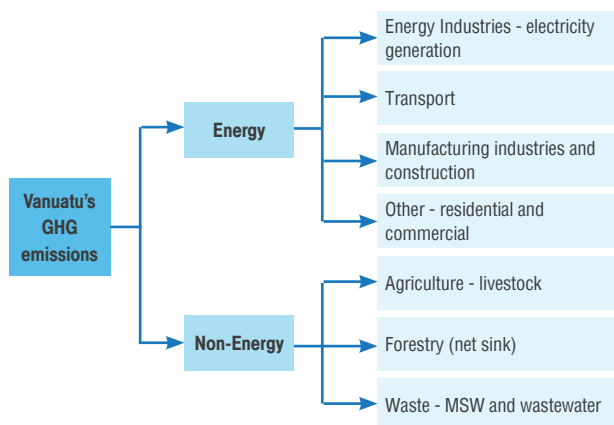


Figure 23 Vanuatu's GHG emissions: sectors and subsectors (excluding removals)

3.3.1 Energy and its Sub-Sectors

The energy sector and its sub-sectors are one of Vanuatu's leading GHG emitters. Energy sector emissions come from fuel combustion activities (fossil fuels or petroleum products) associated with the energy industry (electricity generation), manufacturing industries and construction, transportation (road and domestic aviation and water-borne navigation, excluding international aviation and international marine transport), and other sectors (such as commercial, institutional and residential).

Electricity Generation

The energy industries or electricity generation subsector contributes about 25 percent of total CO₂ emissions from the energy sector and about 5 percent of Vanuatu's total CO₂ emissions. The country's electricity system can be classified into two types: grid-connected and off-grid. Off-grid systems can be broken down further into mini-micro grids and standalone electricity generation systems (both renewable and fossil fuel-based).

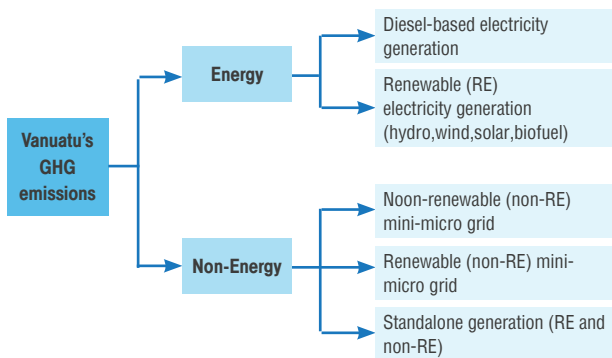


Figure 24 Overview of Vanuatu's Electricity Generation

Two electricity utilities - Vanuatu Utilities and Infrastructure Limited (VUI) for Luganville and UNELCO Engie (UNELCO) for Efate Island - operate grid-connected electricity. Vanuatu's Utilities Regulatory Authority (URA) regulates the country's electricity sector.

Electricity generation has shown a steady increase over the last 5 years. From a total of 69 GWh in 2012, electricity generation in the concession areas (Efate, Santo, Malekula and Tanna) has increased to 77.14 GWh in 2017. This represents an annual increase of 2.3% p.a. Electricity generation in 2015 was lower due to the effects from cyclone Pam, but the drop in 2015 was already compensated in the following year. In the same time period, the share of renewables was fluctuating between 33.7% in 2013 and 17.7% in 2017. The main reason for these fluctuations and especially the drop in the share of renewables in 2016 and 2017 is due to higher world market prices for copra, which reduced the use of coconut oil in electricity generation (in 2017, no electricity was generated from coconut oil).

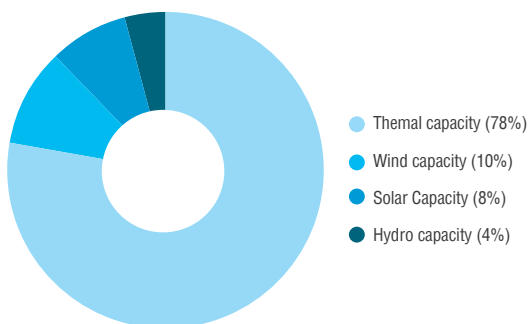


Figure 25 Vanuatu's existing installed capacities 2019 (kW)

Diesel-based generation is the main source of electricity, with total installed capacity of about 25.2MW (78 percent), followed by wind at 3.4 MW (10 percent), solar at 2.51 MW (8 percent) and hydro at 1.232 MW (4 percent). Diesel-based electricity generators are the major source of GHG emissions. Further, generation efficiency of the diesel generation plants is also an important aspect of higher diesel consumption in the energy sector. The GoV has identified GHG emissions from electricity generation as key to reducing overall GHG emission and an important feature in achieving energy security and provide affordable energy.

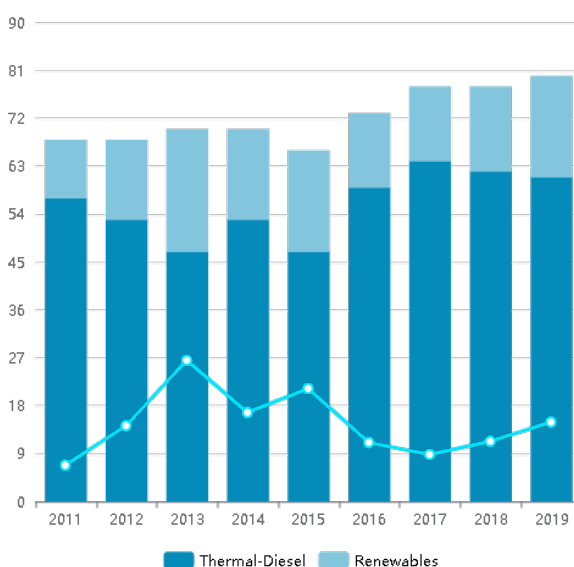


Figure 26: Vanuatu's energy generation mix 2011-2019 (kW)

The government also developed the NERM 2016–2030 to improve electricity access and affordability and, simultaneously, reduce GHG emissions. The various plans under the NERM have already been implemented and others are at various stages of planning and implementation. As of 2019, total grid-connected electricity generation capacity had reached 32.4 MW with total annual electricity generation of 80.5 GWh. Figure 12 illustrates thermal and renewable generation over the period 2011-2019.

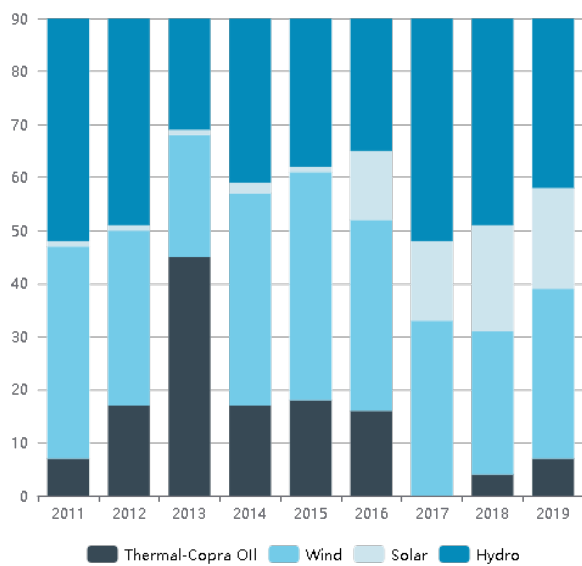


Figure 27 Share of type of renewable energy in total RE generation 2011-2019 (%)

The GHG emissions scenario for Vanuatu's energy industry (electricity generation subsector) based on historical emissions, with projections for the period 2010-2030 made using the statistical model is shown in the below figure. The emissions are estimated to rise steadily and reach around 54Gg CO₂ eq by 2030.

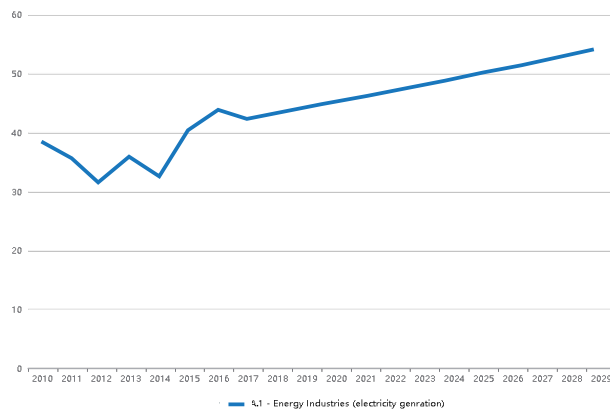


Figure 28 Energy industry/GHG emissions (Gg CO₂eq) baseline scenario

Manufacturing industries and construction

Vanuatu has a small light-industry sector mainly catering to the local market. The Manufacturing, Industry and Construction sub-sector comprises the manufacturing, construction, quarry, wholesale and retail sectors, although currently making a minor contribution to Vanuatu GDP.

Manufacturing value added, at around 4% of GDP in 2015; however, Vanuatu has untapped potential to move up the industrial value chain. Organic beef from Vanuatu is well-known throughout the Pacific and exported as far as Japan and Norway, wood processing and coffee industry have good potential and under-exploited as of now.

The manufacturing sector in Vanuatu is primarily related to fish processing, copra and various coconut products as well as growing beef industry. The primary manufacturing industries includes:

- Agriculture Industries
- Livestock Industries
- Forestry Industry
- Fisheries Industry

The manufacturing industries and construction sub-sector has shown un-even distribution of fuel consumption and respective overall GHG emission, this is largely due to critical nature of the industries and multiple international and domestic issues. This sub-sector is largely depending on the international export and market prices, the volatility of both affects the overall performance of the sub-sector.

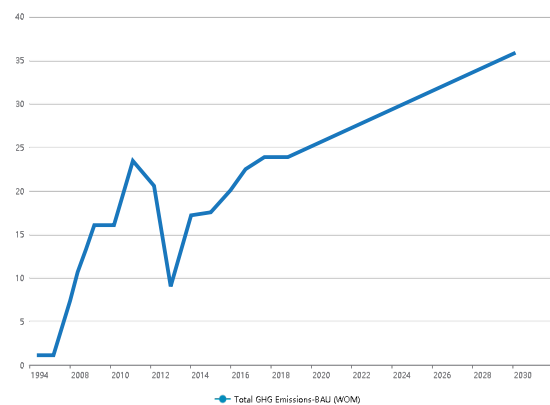


Figure 29 Manufacturing industries and construction/GHG emissions (Gg CO₂eq) baseline scenario

The construction sub-sector in Vanuatu has also seen negative growth during the inventory years. The construction activity is being driven by private-sector retail, residential and a number of donor-funded government construction projects mostly on the island of Efate, particularly in Port Vila. The slow construction activity and scrapping of some key projects hampered the growth.

The manufacturing, industries and construction sector in Vanuatu has shown considerable potentials for growth despite alleged high costs of production and low utility rates on production facilities given low supply of raw materials for certain products. Given the manufacturing, industry and construction favouring policies and support of the government, domestic and international organization; the emission from this sub-sector will steadily increase in future.

Transport

Transportation is a vital sector that has contributed enormously to achieving Vanuatu's development objectives. It will continue to serve as a driver for economic growth and development. Vanuatu's transport sector has seen significant growth in the past few years, but has become the energy sector's largest GHG emitter and fossil fuel consumer. It includes inland road transportation, domestic aviation and marine transportation. Vanuatu has no rail network and, considering its geographical limitations, is unlikely to initiate a rail network in the future. The transport subsector accounts for over half of Vanuatu's domestic petroleum demand (excluding bunkering, international aviation and international maritime).

As figure below shows, within the transport subsector, road transport's 83 percent share of total fuel consumption and GHG emissions is highest, followed by domestic aviation (11 percent) and domestic water-borne navigation (6 percent).

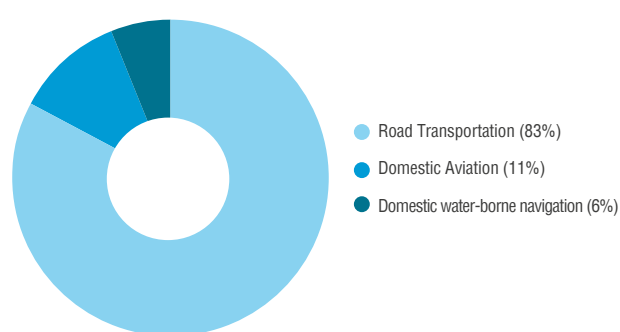


Figure 30 Transport sector fuel consumption (2010-2015)

Road transportation

Road transportation in Vanuatu includes primarily public and private transport vehicles, such as cars, buses, motor bikes,

pick-ups and trucks. Vanuatu has a limited road network (approximately 3,000 km) in rural and urban areas (sealed, gravel and earth) that are used as feeder and arterial roads and are managed by the PWD. However actual road network length is not known as the islands also include many local bush roads that the PWD does not maintain.

Efate, the most populated island, has a sealed ring road and other islands have limited link roads. However, the road network infrastructure is increasing and improving rapidly, thanks to development assistance and programmes.

The road transport sector is also important for the economy as it contributes approximately 4-5 percent of total government revenue annually through road taxes, vehicle licenses and vehicle import duties.

Although Vanuatu's road network is limited, the number of vehicles is growing rapidly. Vehicle registrations in Vanuatu grew by 6.2 percent/year between 2007-2016. This growth is expected to continue as road infrastructure, urbanization and incomes continue to grow. The growth in the number of new registered vehicles is particularly high for buses, cars and motor bikes, which grew at annual rates of 9.66 percent, 4.77 percent and 1.62 percent, respectively, between 2007-2016.

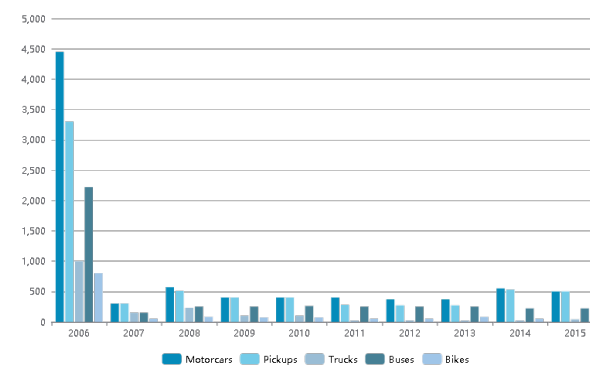


Figure 31 Motor vehicle registration in Vanuatu

The actual number of vehicles operating in Vanuatu is not known as a comprehensive vehicular database is not available. New vehicles registered in different years by the customs department are reported on a quarterly/annual basis and the number of vehicles removed from the roads is unknown. Public transport vehicles include primarily minibuses and taxis.

The number of vehicles in Vanuatu will likely increase in the future due to increased economic activity, GDP, per capita

income and overall transport infrastructure. The estimated cumulative new vehicles will reach over 25,000 in 2025 and over 32,000 by year 2030, compared to just around 5,000 in 2010. Diesel and gasoline (petrol) consumption are likely to increase by 227 percent and 147 percent, respectively, compared to 2010. In addition, overall GHG emissions from the transport sector are estimated to reach 87.81 Gg CO₂e in 2025 and 98.60 Gg CO₂e in 2030.

Aviation

Aviation is critical to Vanuatu's economy, providing essential transport links for tourism, trade, and disaster response and recovery. Vanuatu has three international airports: Bauerfield Airport-Port Vila (Efate); Pekoa Airport-Luganville (Espiritu Santo); and White Grass Airport-Whitesands (Tanna) along with other 26 outer Island airports and airstrips. The aviation sector is still nascent and has yet to achieve its potential, due primarily to economical and geographical reasons.

Water-borne navigation

As an island nation, Vanuatu depends highly on water-borne navigation for domestic and international trade, tourism, and transportation. The effectiveness and efficiency of water transport, both international and inter-island shipping, are highly correlated to Vanuatu's economic development level. However, remote communities on the outer islands lack reliable, consistent and frequent shipping services.

Vanuatu has two international wharves in Port Vila and Espiritu Santo and public wharves and jetties for inter-island operations. Three main passenger vessels provide less expensive transport among three of the major populated islands: (1) Vanuatu Ferry, which also carries cargo, travels between Port Vila, Santo, Malekula and Tanna; (2) Vanuatu Cargo, the Vanuatu Ferry's sister ship; and (3) The Big Sista. These ships also continue through and service the more populated islands. Some of the smaller cargo vessels can carry up to five passengers but are not designed for passenger transport.

Diesel oil and gasoline/petrol are the main fuels used for water-borne navigation. Most inter-island shipping services are privately owned and operated (mainly Vanuatu Ferry and Big Sista), generally by single ship owners. Shipping operators set fees and charges to carry passengers and

freight based on the cost of operations. For financial reasons, they must often migrate to routes with sufficient passenger and cargo volumes to maintain commercial viability or reduce the frequency of ship calls to build demand. Further, management and technical expertise in the domestic shipping industry is limited, which makes operations less efficient and increases fuel consumption and GHG emissions.

GHG emissions from Vanuatu's transport subsector totalled 52.089 Gg CO₂e in 2010 and had increased 38 percent by 2015 (72.135 Gg CO₂e), for a compound annual growth rate of about 6 percent. Of the three main modes of transportation - road, aviation and marine), road/land transport consumes just over 50 percent of all petroleum products imported for domestic consumption.

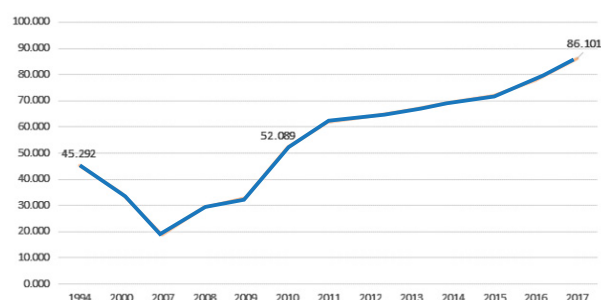


Figure 32 Transport subsector/GHG emissions (Gg CO₂eq)

Commercial, Institutional and Residential Sub-sectors

Other subsectors under the energy sector include direct fuel consumption, primarily in commercial, institutional, residential and any other uncategorized and unorganized sectors or for any other purposes. This includes hotels, tourism bungalows, guest houses, restaurants, retail and shopping complexes. The other subsectors under the energy sector contribute around 0.98 percent of total GHG emissions and consume about 2.5 percent of total fossil fuel (mainly kerosene, LPG, diesel and petrol) imported into Vanuatu. This subsector is the leading consumer of LPG imported into Vanuatu, primarily for commercial and domestic cooking; annual domestic demand for LPG totals approximately 3 million litres. Other fuels (diesel, petrol and kerosene) are used primarily for lighting and electricity generation in off-grid areas, and are used on a limited basis in grid-connected areas due to reliability and availability constraints.

Mostly rural (and some urban) households use biomass as their primary source of energy, mainly for cooking, with approximately 85 percent of households using wood and coconut shells. However, little accurate information is available on biomass produced and utilized in Vanuatu.

Total GHG emissions from the other subsectors total 5.882 Gg CO₂e and 5.227 Gg CO₂e for 2010 and 2015, respectively. Figure below presents historical GHG emissions from manufacturing industries and the construction subsector.

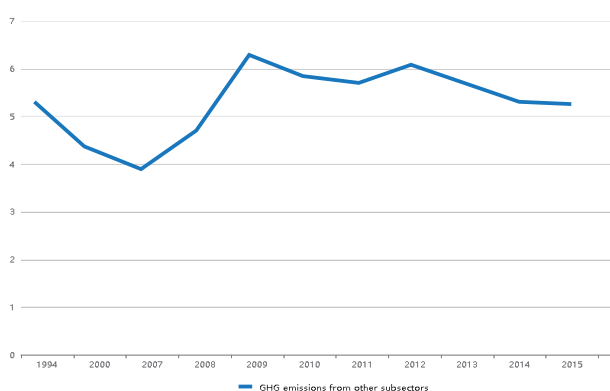


Figure 33 GHG emissions from other subsectors (Gg CO₂e)

3.3.2 Industrial processes and product use (IPPU)

The IPPU sector covers GHG emissions from industrial processes as an output of non-energy related activities. In Vanuatu, this sector is virtually non-existent due to the absence of any major industry or industrial process activities. It also covers emissions from solvents and other products containing volatile compounds (primarily non-methane volatile organic compounds). Vanuatu does not import any solvents, refrigerants or ozone-depleting substances (ODS) directly, except for a small amount of refrigerant and ODS used in air conditioning and refrigeration equipment only.

3.3.3. Agriculture, forestry, and other land use (AFOLU)

Vanuatu's agriculture (livestock) subsector is the major

contributor of methane emissions and the leading contributor of GHG emissions within the AFOLU sector. On the other hand, the forestry sector is a net carbon sink; as a result, Vanuatu's net carbon emissions are negative. The AFOLU sector assessment and potential mitigation actions include:

Agriculture

Vanuatu has a very small agriculture sector. Farming activities are limited to subsistence farming, kitchen gardens, and mainly fruit and vegetable cultivation. In the absence of any major crop cultivation, rice cultivation or any chemical fertilizer use, this subsector does not produce any GHG emissions and is thus not considered under the NDC.

Livestock

Livestock are an integral part of the country's farming systems and essential to the livelihoods of a vast majority of Vanuatuans. The sector plays an important role in local cultures and the country's economic development. The livestock subsector is the major contributor of methane emissions and the leading contributor of GHG emissions. The main livestock animals include cattle, poultry (chickens) and pigs. Vanuatu is known as the Pacific's largest and best beef producer and exporter. Figure 30 presents the category-wise livestock population.

Livestock enteric fermentation (due to the digestive system of ruminant animals like cattle, buffalo, sheep and goats) and the manure management system are the primary sources of GHG emissions. Cattle account for the majority of methane emissions in this category.

Vanuatu's subtropical environment is well suited to and provides a conducive environment for cattle farming. This has resulted in significant growth in the number of cattle since 1994 and, thus, a significant source of GHG emissions.

The Ministry of Agriculture Livestock Fisheries Forests and Bio Security (MALFFB) is pursuing initiatives to increase the country's livestock population, considering beef an important export commodity, source of revenue and key food source.

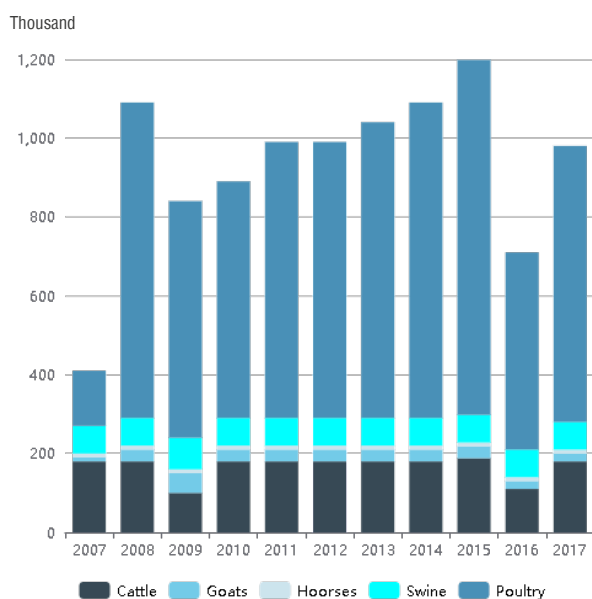
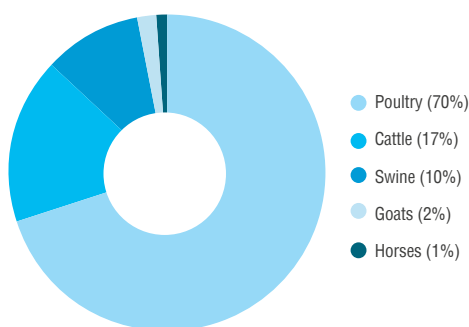


Figure 34 Livestock category and population (2007-2017)

Given the lack of systematic livestock farming practices, the livestock subsector produces higher emissions and it is difficult to implement GHG mitigation measures. In addition, the islands' remoteness, the livestock farmers' limited capacity, limited availability of technological and financial support, and cultural and social practices create challenges to introducing modern scientific ruminant and

Table 33 Forestry sector CO₂ removals (2007-2015)

	ANNUAL INCREASE IN BIOMASS CARBON STOCKS DUE TO BIOMASS GROWTH	ANNUAL CARBON LOSS DUE TO BIOMASS REMOVALS	NET ANNUAL CARBON UPTAKE () OR RELEASE (-)	CONVERSION TO CO ₂ ANNUAL EMISSION (-) OR REMOVAL ()
	(tons C/yr-1)	(tons C/yr-1)	(tons C/yr-1)	(Gg CO ₂)
2007-2009	2,109,800	194,938.45	1,914,861.55	(+) 7,021.15
2010-2015	2,109,800	207,884.95	1,901,915.05	(+) 6,973.68

pasture management practices.

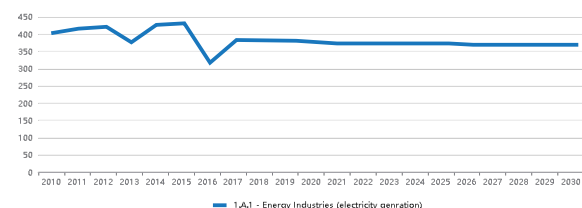


Figure 35 Livestock subsector GHG emissions baseline scenario (2030) (Gg CO₂eq)

MALFFB is working to increase the ni-Vanuatu population's capacity to improve livestock farming practices. Modern and scientific livestock farming and pasture management practices are expected to be implemented in due course.

Forest

Vanuatu's land area totals about 12,336km², with more than 36.1 percent (440,000 hectares) covered by tropical forest. Another 4,800 hectares are covered with planted forests; about 3 percent of mid-to-high forests (about 6,000 hectares) and 0.7 percent of low forests (about 1,400 hectares) are in protected areas. Vanuatu's forests are also home to some 108 known species of amphibians, birds, mammals and reptiles and at least 870 species of vascular plants. The coastal region is also rich in sea life, with more than 4,000 species of marine molluscs.

Table 32 Forest cover in Vanuatu (2007-2015)

TOTAL LAND AREA (HECTARES)	1,219,000	
FOREST COVER AREA (HECTARES)	440,000	36.3%
OTHER WOODED LAND (HECTARES)	475,000	39.3%
OTHER LAND (HECTARES)	297,000	24.4%

Although limited information is available on forest conversion or change in forest cover, discussions with the forest department and FAO data indicate that forest cover area has not changed significantly since 2000, including the GHG inventory for 2007-2015.

The forestry sector in Vanuatu is a net carbon sink. The prominence of carbon sequestration in the national GHG inventory reflects the mandate of the national forest policy, which considers forests crucial to the well-being of the ni-Vanuatu population to fulfil essential needs, such as obtaining wood, food, fodder and traditional remedies.

Further, sustainable commercial logging practices are practiced in Vanuatu. The country is also committed to maintaining its forest cover and is expected to remain net carbon negative in the future. The REDD+ programme is being implemented in Vanuatu to improve sustainable forest management practices.

3.3.4 Waste sector

Vanuatu's waste sector includes primarily solid waste and wastewater. GHG emissions from this sector come mainly from municipal solid waste disposal (excluding biological waste and industrial waste, which Vanuatu does not produce) and domestic and commercial wastewater discharge (industrial wastewater is generated). The main GHG emissions are methane (CH₄) and nitrous oxide (N₂O).

Municipal solid waste (MSW)

Municipal solid waste (MSW) disposal in urban areas (Port Vila, Luganville and Lenakel) is a key source of GHG emissions in Vanuatu. Rural populations generate little or no waste due to their subsistence lifestyle. MSW sector emissions include primarily methane emissions from the anaerobic decomposition of MSW disposed at the Bouffa landfill site in Port Vila and the Luganville and Lenakel solid waste landfill sites. Further, open dumping of MSW and the lack of waste management practices have led to higher GHG emissions in Vanuatu. MSW disposal is responsible for about 5 percent of the country's total GHG emissions and 78 percent of total GHG emissions from the waste sector. It is one of the major concerns for the country.

Common methods of MSW disposal include open backyard dumpsites, disposal at sea or on unused land, and burning. However, the areas noted above have waste collection systems and the MSW collected is sent to landfill sites. In recent years, waste collection efficiency has increased throughout municipal areas, reaching around 90 percent in the cities. Figure 33 shows the urban population, MSW generation and MSW compositions.

The waste composition analysis suggests that a significant quantity of the MSW generated in the urban areas is biodegradable. Further rapid urbanization and population increase are expected to contribute to further increases in the overall amount of MSW generated. In the absence of any scientific waste management practices, GHG emissions from the waste sector will thus increase.

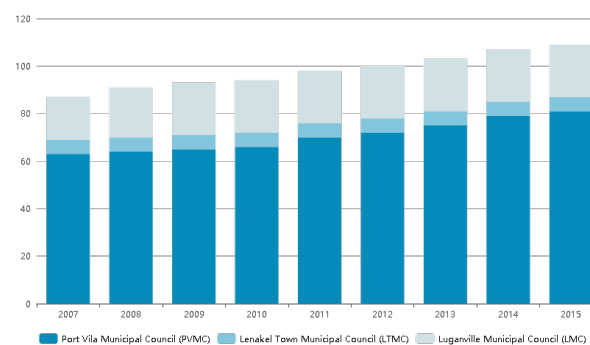
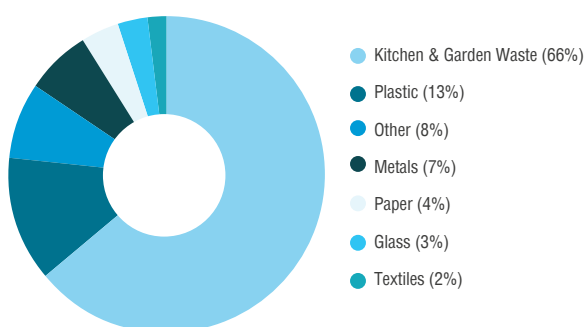


Figure 36 MSW Generation and the composition in Vanuatu (2007-2015)

Wastewater

Domestic and commercial wastewater discharge is another source of GHG emissions (CH₄ and N₂O) in Vanuatu. Because no major industries are active in the country, there are no emissions related to industrial wastewater discharge. Wastewater is generated primarily by sanitation systems and domestic and commercial activity, largely handled by decentralized or open septic systems. Decentralized septic

tanks are used for all formal developments in urban areas, along with ventilated improved pit toilets and water-seal pit latrines. Sanitation services in informal housing areas are of very poor quality, polluting the ground and water and posing dangers to human health. Sanitation facilities in rural areas are also of poor quality and include primarily pit latrines or bush toilets. Hotels and the Port Vila hospital have wastewater treatment plants that typically operate beyond their capacity. Septic tank systems allow waste to decompose but the process leaves sludge as a by-product. In urban areas, private service providers remove the residual sludge in tankers and dispose of it at designated sites. Urban and provincial centres lack effective systems to manage storm water and runoff.

GHG emissions from the wastewater subsector totalled 7.304 GgCO₂e in 2010 and rose to 7.654 GgCO₂e in 2015. This subsector is responsible for around 22.16 percent of the waste sector’s GHG emissions and less than 1 percent of Vanuatu’s total GHG emissions. Lacking an adequate waste water management system, GHG emissions from this subsector are increasing due to population growth and urbanization. Apart from these emissions, wastewater poses serious health and environmental risks. Uncontrolled nutrient discharges, nitrates and phosphates from sewage, septic outflows, siltation and industrial waste, combined with poor natural flushing, are more serious public health concerns than bacterial contamination. In 2017, a sewage treatment facility was installed in Port Vila to deal with waste disposal from septic tanks.

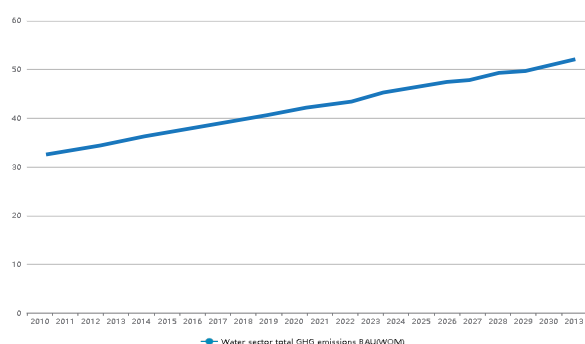


Figure 37 Waste Sector GHG baseline emissions in Vanuatu (2010-2030)

11 http://prdrse4all.spc.int/system/files/vanuatu_energy_roadmap_2013.pdf

12 http://www.greengrowthknowledge.org/sites/default/files/downloads/policy-database/Updated%20Vanuatu%20National%20Energy%20Road%20Map%202016-2030_1.pdf

3.4 Vanuatu’s GHG Mitigation Actions

3.4.1 Mitigation Actions Under the National Energy Road Map (NERM)

Vanuatu’s National Energy Roadmap (NERM) 2013-2020¹¹ was published in 2013 and provided the vision “To energise Vanuatu’s growth and development through the provision of secure, affordable, widely accessible, high quality, clean energy services for an Educated, Healthy, and Wealthy nation.” The five energy sector priorities were access, petroleum supply, affordability, energy security, and climate change.

In 2015-2016 the NERM was revised. The updated NERM 2016-2030¹² was completed and launched in 2016.

It has identified five strategic areas for policy intervention in the energy sector, which include:

- Accessible energy,
- Affordable energy,
- Secure and reliable energy,
- Sustainable energy and
- Green Growth.

The updated version of the NERM includes the following aspects:

- Priorities and objectives: Re-frames the NERM priorities to reflect desired outcomes for Vanuatu’s energy sector and to incorporate new areas of emphasis.
- Progress: Provides an update on how well Vanuatu is meeting the targets (and what progress might look like by 2020 and 2030).
- Targets: Sets 2030 targets for targets that previously only had targets for 2015 and 2020, and adds new targets to help catalyse faster progress in particular areas.
- Implementation Plan: Refines and adds actions needed to achieve the updated targets and objectives.

Over the past years, various stakeholders have been

working intensively on the preparation and implementation of a number of activities. The following table lists all activities, which have been finalised and have provided contributions to the NERM targets.

Table 34 NERM projects finalized

INVESTMENT/ACTION	MAIN OUTCOME(S) IT CONTRIBUTES TO	LEAD RESPONSIBILITY	UPDATE
UNDINE BAY SOLAR PV SYSTEM (510KW)	Access, sustainability, green growth	UNELCO	Completed [2016]
GPOBA GRID BASED ELECTRICITY PROJECT	Access	DoE, World Bank, UNELCO and VUI	Completed [2019]
THE LIGHTING OF LUGANVILLE TOWN STREETS	Access	VUI	Completed
NORTH EAST MALEKULA RURAL ELECTRIFICATION PROJECT	Access	GoV, EU, UNELCO	Completed [2017]
KAWENE 1.5MW GRID-CONNECTED SOLAR FACILITY, EFATE (ENERGY FACILITY 2)	Sustainability	GoV, EU, UNELCO,	Completed [2018]
LOLTONG HYDRO PROJECT, NORTH PENTECOST	Access, sustainability, green growth	Governments of New Zealand, Australia, and Vanuatu	Completed [2016]
PREPARE A DETAILED DESIGN FOR, AND ESTABLISH, A NATIONAL GREEN ENERGY FUND,	Access, sustainability, green growth	DoE, MFEM, NGEF Taskforce, GGGI	Completed [Phase One: 2018]
RURAL BIOGAS PROJECT FOR ONESUA PRESBYTERIAN COLLEGE AND AGRICULTURE COLLEGE	Access, sustainability, green growth	EU, GIZ DoE,	Completed [2019]
PILOT SOLAR REFRIGERATION FOR RURAL BUNGALOWS	Access, green growth	Government of Germany (BMZ), GGGI, DoE, DoT, Skills Program	Completed [2017]
INTRODUCE MANDATORY STANDARDS AND LABELING SYSTEM (MEPS) FOR REFRIGERATORS, FREEZERS, AIR CONDITIONING, AND LIGHTING THROUGH PARLIAMENTARY APPROVAL OF THE ENERGY EFFICIENCY OF ELECTRICAL APPLIANCES, EQUIPMENT AND LIGHTING PRODUCTS BILL	Sustainability, affordability	DoE	Completed [2017]
INCORPORATE MEPS INTO GOVERNMENT PROCUREMENT POLICIES FOR APPLIANCES AND VEHICLES	Sustainability, affordability	DoE & Dept. of Finance and Treasury	Completed [2018]
RENDER THE LUGANVILLE CONCESSION AGREEMENT	Affordability, security, and reliability	DoE	Completed [2019]
DEVELOP AN ELECTRIFICATION PLAN FOR RENEWABLE ENERGY IN REMOTE ISLANDS	Access, sustainability, green growth	GIZ	Completed [2017]
UNDERTAKE MARKET DEMAND ASSESSMENT FOR THE NGEF	Access, sustainability, green growth	DoE, GGGI	Completed [2018]
CARRY OUT JOINT PLANNING SESSIONS BETWEEN DIFFERENT MINISTRIES TO IDENTIFY KEY ENERGY SECTOR ACTIVITIES THAT CAN CONTRIBUTE TO OBJECTIVES IN OTHER SECTORS (MOU WITH MINISTRY OF HEALTH)	Green growth	DoE and other government agencies	Completed
DEVELOP A STRATEGIC AND WORKING PARTNERSHIP ARRANGEMENT WITH THE DEPARTMENT OF RURAL WATER SUPPLY SO THAT IT IS COORDINATED AND PARALLEL ROLLOUT OF BOTH ELECTRICITY AND WATER PROJECTS THROUGHOUT THE COUNTRY (MOU WITH MINISTRY OF LANDS)	Green growth	DoE and Dept. of Rural Water Supply	Completed
SUPPORT DEPARTMENT OF TOURISM AND AGRICULTURE TO PROMOTE THE USE OF SOLAR TECHNOLOGIES IN THESE SECTORS	Green growth, access	DoE, DoA, Dept. of Tourism, GGGI	Completed
SOLAR PV MICRO-GRID FOR WINTUA AND LORLOW COMMUNITIES ON MALEKULA ISLAND	Access, sustainability, green growth	DoE, Austrain Government	Completed 2020

Planned Mitigation Interventions under the NERM

Accessible Energy

Vanuatu is making good progress with increasing access to electricity. Electricity access by households in and near concession areas is at 71.7%, thereby close to achieving the 2020 target of 75% and getting close to reaching the 2030

target of 100%. Electricity access by off-grid households has increased considerably over the last years to more than 50%. Achieving the 2020 target of 60% is likely and the country is on a good track of achieving the 2030 target.

The activities in the table below are planned for the priority Accessible Energy:

Table 35 Activities Planned under Accessible Energy

MITIGATION ACTION	NATURE OF ACTION & COVERAGE	PROGRESS INDICATORS	OBJECTIVES OF ACTION	STATUS OF IMPLEMENTATION
VANUATU RURAL ELECTRIFICATION PROJECT (VREP II)	Off-grid rural electrification, Pan Vanuatu	Number of rural community households having access to electricity	Under VREP II, microgrids will be installed and Solar Home Systems will be disseminated to off-grid households. Until 2022, a total of 8,400 households will be electrified. The project is fully financed and operational.	Under Implementation
EXTENSION OF GLOBAL PARTNERSHIP ON OUTPUT BASED AID (GPOBA) GRID-BASED ELECTRICITY ACCESS PROJECT	Grid extension, Concession areas	Number of additional households connected to grid	The GPOBA provided one-off subsidies to assist low-income households to connect to the existing electricity grid in concession areas in Port Vila, Tanna, Malekula and Luganville. A continuation of the project is suggested, funding has not been secured. A minimum of additional 1,000 households needs to receive electricity access to achieve the NERM targets.	Proposed
BARRIER REMOVAL FOR ACHIEVING THE NATIONAL ENERGY ROAD MAP TARGETS OF VANUATU (BRANTV)	Off-grid rural electrification, Pan Vanuatu	Number of rural community households having access to electricity	2,000 households will gain access to village-scale power systems or to family compound-scale Nano-grids installed in all compounds in a village. Project is fully financed and activities started. Work will end in 2022. It is important to note that there will be 20 hydro sites, equating to (approx. 50 HH*20 villages) households which will have access onto the mini-grid, while the other 1000 will have access to community-based or Nano/compound-based solar systems in terms or incremental or productive use, but no house connections.	Under Implementation
WINTUA/LORLOW SOLAR PV MINI-GRID	Off-grid rural electrification, South West Bay, Malekula	Number of rural community households having access to electricity	Under the Wintua/Lorlow mini-grid funded through NAMA facility, around 75 households and 14 public buildings will be electrified. The project is fully financed and construction is completed.	Commissioned and Operational
AMBRYM MINI-GRID	Off-grid rural electrification, Ambrym	Number of rural community households having access to electricity	Erection of 2 solar PV mini-grids on Ambrym island, connecting around 160 households to the grid. The concept will be handed in at GCF SAP proposal go be submitted to GCF in 2019.	Proposed
DISTRIBUTED ENERGY GENERATION	Electrification of unelectrified households in concessional areas	Number of additional households having access to electricity in concessional areas	DoE is interested to explore the option of using the “Distributed Energy Generation” by installing micro/mini-grids in concession areas (Efate, Santo, Malekula & Tanna) in locations where grid extension is hard to reach or very expensive. Once the grid penetration is achieved eventually the micro/mini-grids could be integrated on to the main grid.	Proposed
ELECTRIFICATION OF ALL EDUCATIONAL AND HEALTH CENTRES BY 2022	Electrification of unelectrified health centres in outer islands of Vanuatu	Number of rural health centres having access to electricity	DoE is keen to launch a program similar to VREP focusing on electrification of all education and health centres in Vanuatu by 2022. The idea is to have a targeted approach to electrify on one of the key sub-sectors (Schools & Health centres) and replicate the approach across other sub-sectors.	Proposed

Affordable Energy

The activities in the table below are planned for the priority Affordable Energy:

Table 36 Activities Planned under Accessible Energy

MITIGATION ACTION	NATURE OF ACTION & COVERAGE	PROGRESS INDICATORS	OBJECTIVES OF ACTION	STATUS OF IMPLEMENTATION
CONVERSION OF DIESEL GENERATORS ON TANNA	Energy efficiency improvement, concessional areas	Percentage of coconut oil blending achieved	Existing diesel generators should be converted to make sure coconut oil can be used for electricity generation.	Proposed
INVESTMENT IN BARGE	Fuel Distribution, Pan Vanuatu	Number of barges built	Invest in a barge to improve the efficiency and reliability of fuel distribution within Vanuatu by shifting away from deliveries of fuel in drums and towards the use of regular bulk deliveries to outer islands.	Under implementation

Sustainable Energy

Vanuatu is behind target on the share of renewables for electricity generation. New solar PV capacities have been added over the last years, but the decline in the use of coconut oil (due to a price increase for coconut oil, which made it non-competitive to diesel) had negative results on the share of renewables. The government has launched the NDC Implementation Roadmap in April 2019. The roadmap elaborates which combination of measures is necessary to

reach the NDC (and thereby also the NERM target) of 100% renewable energy in electricity generation by 2030. For electricity sector end-use efficiency, the planned national energy efficiency strategy and action plan would be an important starting point to define the status quo, baseline, and interventions necessary to improve efficiency.

The activities in the table below are planned for the priority Sustainable Energy:

Table 37 Activities Planned under Sustainable Energy

MITIGATION ACTION	NATURE OF ACTION & COVERAGE	PROGRESS INDICATORS	OBJECTIVES OF ACTION	STATUS OF IMPLEMENTATION
BRENWE 400 KW HYDRO POWER PROJECT	Renewable energy (hydro power) based electricity generation, Malekula	Kwh of electricity generated	The Brenwe Hydro Power project is a 400kW run-of-river hydropower plant on the island of Malekula. The project is currently being implemented financed through an ADB loan and contributions from the Government of Vanuatu. Completion is expected in 2022.	Under Implementation
SARAKATA 800 KW HYDRO POWER EXTENSION PROJECT	Renewable energy (hydro power) based electricity generation, Santo	Kwh of electricity generated	Preparation of the project is underway, currently, the feasibility study is being carried out. Funding through Japanese Grant for Projects envisaged, the project will also receive a contribution from the Government of Vanuatu. Commissioning is expected for 2023.	Under Implementation
TALISE 75 KW MICRO HYDRO POWER PROJECT	Renewable energy (hydro power) based electricity generation, Maewo	Kwh of electricity generated	This project is implemented through IUCN (International Union for Conservation of Nature) and funded by the Government of Austria and Italy with co-financing from the Government of Australia and Government of Vanuatu	Commissioned and Operational
REVISION OF ELECTRICITY SUPPLY ACT AND COCONUT FOR FUEL STRATEGY	Electricity sector Policy development to support achieving NERM targets, Pan Vanuatu	Policy endorsed by Council of Ministers and URA	Revision of the Electricity Supply Act is necessary to allow Independent Power Producers (IPPs) to erect grid-connected renewable energy projects. The Coconut for Fuel Strategy is a key component of the NDC Implementation Roadmap to secure a well-established agreement among all relevant stakeholders to provide coconut oil for electricity generation	Proposed

EXPANSION OF SOLAR PV	Renewable energy (solar PV power) based electricity generation, Efate	Kwh of electricity generated	Solar PV will be expanded by 7.6 MW on Efate to achieve the total installed capacity of 10 MW, in combination with storage capacity.	Proposed
EXPANSION WIND	Renewable energy (wind power) based electricity generation, Efate	Kwh of electricity generated	Addition of 5.1 MW (Option 1) or 2.6 MW (Option 2) on Efate, in combination with storage capacity.	Proposed
GEOTHERMAL	Renewable energy (Geothermal power) based electricity generation, Efate	Kwh of electricity generated	The first stage of 4 MW in Takara, providing a base load to the Efate grid. Batteries will need to be added to the grid to balance the fluctuations in the production of electricity from wind and solar.	Proposed
NATIONAL ENERGY EFFICIENCY STRATEGY AND ACTION PLAN	Energy efficiency sector Policy development to support achieving NERM targets, Pan Vanuatu	Policy endorsed by Council of Ministers	Development of a national energy efficiency strategy and action plan. The DoE, through the NDA, is in the process of applying for GCF Readiness funding to undertake this task.	Proposed
IMPORT DUTIES, TARIFFS, AND VAT REFORM	Renewable energy sector fiscal incentives, Pan Vanuatu	Fiscal incentives regulation endorsed by Council of Ministers	Reform import duties, tariffs and VAT to encourage imports of energy efficient and renewable energy equipment	Partly implemented
PILOT PROJECTS HYBRID/ELECTRIC VEHICLES	Low emission land transport, Pan Vanuatu	Number of hybrid/ electric vehicles in operation	Develop a pilot project for hybrid/electric vehicles for government.	Proposed
IMPROVED COPRA/ COCOA DRYERS SOLD FOR CASH TO DEPT OF AGRICULTURE	Energy efficiency in agriculture sector, Pan Vanuatu	Number of improved dryers installed	Solar/biomass hybrid system (100W fan with 250W solar with 0.5 kWh battery for up to 10 hours drying) for smoke-free high-quality drying of coconut for copra or grated coconut for oil production, and can also be used for cassava flour drying and fruit/meat dehydrating.	Proposed
SOLAR REFRIGERATORS/ FREEZERS FOR RURAL BUSINESSES, COMMUNITIES AND FISHERMEN.	Green Growth, Outer Island Communities	Number of solar refrigerators/freezers installed for rural businesses	Estimated demand of 500 over 3 years or 150/year, needs lending capital to be affordable. \$2000 each at scale. 20% deposit or equity required, 80% from NGEF. Census stats note 4% of 57,000 urban people and 21% of 177,000 rural households engage in fishing, so a total of 40,000 people or 8000 around households. Assuming 50% could benefit from a solar fridge/freezer costing \$2000-3000 each, the market potential is up to \$8-12 million.	Proposed
ANELCAUHAT VILLAGE MICROGRID ON ANEITYUM, FOR 231 HOUSEHOLDS.	Rural electrification, Aneityum	Number of rural households having access to electricity	160 kW 800 kWh microgrid for daily demand of 246 kWh/day with 30kW peak load. Aiming to use Tesla batteries. No generator backup included forecast reliability of 99%. Cost of Vt 160 million including VAT; revenue estimated at Vt 120/kWh Vt 13.4 million/year (Vt 4834/house/month average). 5-year additional service contract + 20% risks charges applied for Vt 238 million total of which Vt 106 million is sought (other funding from cruise ship companies and VREP 2). Cost is \$6500-9800/ household.	Proposed
DEMONSTRATION OF SOLAR PICO-GRID PILOT FOR RURAL VANUATU USING LOW VOLTAGE DC (60V) DISTRIBUTION AND 20-100W PER HOUSEHOLD.	Rural electrification, Pan Vanuatu	Number of rural households having access to electricity	Possible to serve up to 50 households nearby too via grid or battery charging services. A hybrid 1-2kW system with back generator to give >99% reliability. Income is likely to be Vt 1000-3000 (\$10-30)/house or bungalow per month or \$1500-3000/ year for the whole project. US\$15,000.	Proposed

There are a number of projects, which are currently under implementation or preparation. These are the following:

- Brenwe 400 kW Hydro Power Project
- Sarakata 800 kW Hydro Power Extension Project
- Vanuatu Rural Electrification Project (VREP) Phase II (micro-grids)
- Talise 75 kW Micro Hydro Power Project
- NGEF capitalisation funding to co-finance current and pipeline RE projects to increase number of beneficiaries.

These projects are expected to be implemented until 2022 and are expected to increase the share of renewables to 34% in 2023. For achieving the NDC target of close to 100% of renewables in 2030, 2 different options have been elaborated in the NDC Implementation Roadmap defining additional measures required. The following figure summarizes the interventions included in each of the options.

Green Growth

The development of the NDC has shown that coconut oil is a major component in achieving the NDC target of close to 100% electricity from renewable energies. In contrast to solar PV and wind, there is no need to store electricity as diesel generators fire with coconut oil would operate based on demand. NDC Option 2, which projects the use of around 6 million litres of coconut oil in 2030, the share of coconut oil in electricity generation would reach more than 20%, thus over-achieving the NERM target of 14%.

For renewable electricity in bungalows, there is good progress and the 2020 target has been already achieved. Further efforts are being made for increasing the share and reaching the 2030 target of 65%. The easiest approach would be to encourage tourism operators to further access VREP I and VREP II, as the systems approved for these programs are well-suited for tourism bungalows. There is only a small number of additional electrifications required (around 20 bungalows remaining for achieving the 65% target).

The activities in the table below are planned for the priority Green Growth:

Table 38 Activities Planned under Green Growth

MITIGATION ACTION	NATURE OF ACTION & COVERAGE	PROGRESS INDICATORS	OBJECTIVES OF ACTION	STATUS OF IMPLEMENTATION
Coconut for Fuel Strategy	Renewable energy sector Policy development to support achieving NDC targets, Concessional areas	Policy endorsed by Council of Ministers	The Coconut for Fuel Strategy is a key component of the NDC Implementation Roadmap to secure a well-established agreement among all relevant stakeholders to provide coconut oil for electricity generation.	Under Implementation
Coconut oil	Fuel blending/ replacement, Concessional areas	Volume of coconut oil used as fuel for electricity generation	Usage in Efate grid up to a maximum of 12.5 million litres (Option 1) or 6 million litres (Option 2) in 2030. Agreements between key stakeholders based on Coconut for Fuel Strategy.	Partly implemented on Efate grid
Expansion of VREP I and VREP II for bungalows	Renewable energy for tourism, Outer Islands	Number of tourism bungalows connected to RE electricity	Use the existing structure in the VREP program to supply RE equipment to remaining bungalows.	Partly implemented
Solar system for small and medium tourism operators	Renewable energy for tourism, Outer Islands	Number of tourism bungalows connected to RE electricity	It is estimated 43 off grid bungalows of 1-2-star rating require 0.4-1kW systems, of which 50% may take up an offer. This would total approximately 12kW of demand or \$120,000 worth at \$10,000/kW. NGEF may provide 80% debt to 20% other finance from the owner or developer.	Proposed

The NERM implementation plan which includes the name of the activity, a description, estimated costs, lead responsibility, current status and year of planned implementation is provided below.

Table 39 NERM Implementation Plan

Mitigation Action	Objectives of Action	Priority	Cost	Lead responsibility	Status	Timing
Accessible energy						
Extension of VREP I	There is considerable unused fund under VREP I. According to the latest Project Report (Jan-Jun 2018), a total of USD 3.14 million has still been available by 30 June 2018. Taking into account the total budget (USD 7.8 million) and the number of households which received access to electricity between project start and 30 June 2018 (6,034), approximately 4,000 additional off-grid households can be provided with access to electricity. Reducing the grant contribution per household (aligning with VREP II) would help in increasing this number to around 6,000 households.	High	USD 6.2m	DoE, World Bank	Ongoing, fully financed	2019
VREP II	Under VREP II, microgrids will be installed and Solar Home Systems will be disseminated to off-grid households. Until 2022, a total of 8,400 households will be electrified. The project is fully financed and operational.	High	USD 5.4m	DoE, World Bank	Ongoing, fully financed	2022
Extension of GPOBA	The GPOBA provided one-off subsidies to assist low-income households to connect to the existing electricity grid in concession areas in Port Vila, Tanna, Malekula and Luganville. A continuation of the project is suggested, funding has not been secured. A minimum of additional 1,000 households needs to receive electricity access to achieve the NERM targets.	High	USD 1.1m	DoE	No financing	2025
BRANTV	2,000 households will gain access to village-scale power systems or to family compound-scale nano-grids installed in all compounds in a village. Project is fully financed and activities started. Work will end in 2022.	High	USD 20.8m (entire project)	DoE, GEF, UNDP	Ongoing, financed	2022
Wintua/Lorlow mini-grid	Under the Wintua/Lorlow mini-grid, around 75 households and 14 public buildings will be electrified. The project is fully financed and construction is about to start.	High	USD 1.1m	DoE, the Austrian government	Ongoing, financed	2020
Ambrym mini-grid	Erection of 2 hybrid solar PV & wind mini-grids on Ambrym island, connecting around 160 households to the grid. The concept is being prepared with DoE Office.	High	USD 2m	DoE, GCF	No financing	2022
Distributed Energy Generation	DoE is interested to explore the option of using the "Distributed Energy Generation" by installing micro/mini-grids in concession areas (Efate, Santo, Malekula & Tanna) in locations where grid extension is hard to reach or very expensive. Once the grid penetration is achieved eventually the micro/mini-grids could be integrated on to the main grid.	High	USD 5m	DoE	No financing	2023

Electrification of all Educational and Health Centres by 2022	DoE is keen to launch a program similar to VREP focusing on electrification of all education and health centers in Vanuatu by 2022. The idea is to have a targeted approach to electrify on one of the key sub-sectors (Schools & Health centres) and replicate the approach across other sub-sectors. DoE is of the view that this kind of approach could assist in efficient utilization of resources and fast track achieving the NERM targets. DoE intends to explore potential subsidy options under VREP and GCF submissions.	High	USD 1.3m	DoE, Ministry of Health, Ministry of Education & Training	DoE, Ministry of Health, Ministry of Education & Training	2022
Extension of VREP I II	A minimum of an additional 800 households needs to receive electricity access to achieve the NERM targets.	High	USD 0.3m	DoE	No financing	2025
Affordable energy						
Conversion of diesel generators on Tanna	Existing diesel generators should be converted to make sure coconut oil can be used for electricity generation.	Medium	n/a	DoE, UNELCO	No financing	2021
Investment in Barge	Invest in a barge to improve the efficiency and reliability of fuel distribution within Vanuatu by shifting away from deliveries of fuel in drums and towards the use of regular bulk deliveries to outer islands	Medium	USD 1.6m	GoV & Pacific Petroleum	No financing	2022
Sustainable energy						
Brenwe 400 kW Hydro Power Project	The Brenwe Hydro Power project is a 400kW run-of-river hydropower plant on the island of Malekula. Funding secured is secured and the project will be fully financed through an ADB loan and contributions from the Government of Vanuatu. Completion is expected in 2022.	Medium	USD 6.5m	DoE, UNELCO	Preparation for implementation, fully financed	2022
Sarakata 800 kW Hydro Power Extension Project	Preparation of the project is underway, currently, the feasibility study is being carried out. Funding through Japanese Grant for Projects envisaged, the project will also receive a contribution from the Government of Vanuatu. Commissioning is expected for 2023	Medium	n/a	VUI, GoV	Feasibility study under preparation, funding under preparation	2023
Vanuatu Rural Electrification Project (VREP) Phase II (micro-grids)	VREP II will finance around 4.5 MW installed capacity of solar PV with battery backup, generating around 2.7educational GWh annually of solar-based power. The project has received approval and implementation has started. It is expected that the installations of SHS and microgridsare finalised by 2022, therefore 2023 will be the first year of full operation of these systems.	High	USD 6.8m	DoE, World Bank	Ongoing, fully financed	2023
Talise 75 kW Micro Hydro Power Project	Project is currently under preparation and will be supported through the BRANTV Project. It is expected that the project will be operational latest 2022.	Medium	USD 0.5m	DoE, GEF, UNDP	Ongoing, fully financed	2022
Revision of Electricity Supply Act and Coconut for Fuel Strategy	Revision of the Electricity Supply Act is necessary to allow Independent Power Producers (IPPs) to erect grid-connected renewable energy projects. The Coconut for Fuel Strategy is a key component of the NDC Implementation Roadmap to secure a well-established agreement among all relevant stakeholders to provide coconut oil for electricity generation.	High	USD 0.3m	DoE, Ministry of Agriculture and Rural Development, Ministry of Trade and Finance, URA, Coconut oil producers, utilities	Financing under preparation	2020

Batteries (Efate grid)	Due to the planned expansion of renewable energy capacities (solar PV and wind), batteries are a key component for the functioning of the grid. Surplus electricity will be stored and will then be consumed at times when renewables do not provide sufficient contribution.	Medium	USD 25.9m	DoE, UNELCO	No financing	
Expansion of solar PV	Solar PV will be expanded by 7.6 MW on Efate to achieve a total installed capacity of 10 MW, in combination with storage capacity.	High	USD 11.7m	DoE, UNELCO	No financing	2022-2026
Expansion wind	Addition of 5.1 MW (Option 1) or 2.6 MW (Option 2) on Efate, in combination with storage capacity.	Medium	USD 13.5m	DoE, UNELCO	No financing	2022-2026
Coconut oil	Usage in Efate grid up to a maximum of 12.5 liters (Option 1) or 6 million liters (Option 2) in 2030. Agreements between key stakeholders based on Coconut for Fuel Strategy.	High	n/a	DoE, Ministry of Agriculture and Rural Development, Ministry of Trade and Finance, URA, Coconut oil producers, UNELCO	No financing	2020-2030
Geothermal	The first stage of 4 MW in Takara, providing a base load to the Efate grid. Batteries will need to be added to the grid to balance the fluctuations in the production of electricity from wind and solar.	Medium	n/a	DoE	No financing	n/a
Mini geothermal	A potential project in Takara under investigation, using 50°C warm source without deep drilling. A draft business proposal submitted to DoE.	Medium	n/a	DoE, Greenstorc Oceania	n/a	n/a
Solar for hydrogen	An Australian company is interested to develop a 3.5 MW solar farm, which will be used in a second phase to produce hydrogen (to be used in pilot fuel cell cars) and feed excess to the grid. The company is currently negotiating land for the project. DoE has received a draft proposal.	Medium	USD 6.0m	DoE, MyGrid Vanuatu	No financing	n/a
Airport solar farm	Airports Vanuatu Limited (AVL) has expressed interest to implement 1 or 2 MW solar farm as part of the airport upgrade project. It's still not clear whether it would be a grid-connected or a stand-alone initiative.	Medium	n/a	Airports Vanuatu Limited (AVL)	No financing	n/a
BRANTV	12,000 households will be provided with energy efficient cookstoves under the program	High	USD 20.8m (entire project)	DoE, GEF, UNDP	Ongoing, financed	2022
National energy efficiency strategy and action plan	Development of a national energy efficiency strategy and action plan. In the process of applying for GCF Readiness funding to undertake this task.	High	USD 0.3m	Ministry of Climate Change, GGGI	No financing	2020
Import duties, tariffs, and VAT reform	Reform import duties, tariffs, and VAT to encourage imports of energy efficient and renewable energy equipment: <ul style="list-style-type: none"> - Energy efficient products for use in buildings—in particular, efficient electrical appliances and lights - Spare parts for vehicles and marine vessels - Energy efficient vehicles - Improved cookstoves and crop dryers - Renewable energy systems (solar PV, wind, biomass) and spare parts 	High	n/a	Ministry of Finance (with DoE)	No financing	2020
GHG Emission Inventory Tool	Develop GHG Emission Inventory for the transport sector based on GIZ-IFEO tool.	Medium	USD 0.1m	DoE, Ministry of Infrastructure and Public Utilities, Public Works Department	No financing	2021
Pilot projects hybrid/electric vehicles	Develop pilot demonstration project for 10 hybrids/electric vehicles for government including solar carports for charging of vehicles.	Medium	USD 0.9m	DoE	No financing	2022

Strategy for energy efficiency in the transport sector (including in tourism uses) and development of action plan for cost-effective implementation	Development of a strategy to improve efficiency in the transport sector.	Medium	USD 0.3m	DoE, Ministry of Infrastructure and Public Utilities, Public Works Department	No financing	2021
Green growth						
COCONUT FOR FUEL STRATEGY	The Coconut for Fuel Strategy is a key component of the NDC Implementation Roadmap to secure a well-established agreement among all relevant stakeholders to provide coconut oil for electricity generation.	High	Costs already covered under Sustainable Energy	DoE, Ministry of Agriculture and Rural Development, Ministry of Trade and Finance, URA, Coconut oil producers, utilities	Financing under preparation	2020
COCONUT OIL	Usage in Efate grid up to a maximum of 12.5 litres (Option 1) or 6 million litres (Option 2) in 2030. Agreements between key stakeholders based on Coconut for Fuel Strategy.	High	Costs already covered under Sustainable Energy	DoE, Ministry of Agriculture and Rural Development, Ministry of Trade and Finance, URA, Coconut oil producers, UNELCO	No financing	2020-2030
EXPANSION OF VREP I OR VREP II FOR BUNGALOWS	Use the existing structure in the VREP program to supply equipment to around 20 bungalows.	Medium	0.1	DoE, Ministry of Tourism	No financing	2022

3.4.2 Circular Economy Mitigation Opportunities in Vanuatu

Economic growth is often accompanied by a gradual decrease in the quality of ecosystems and a gradual deterioration of natural assets such as soils, marine environments, fish and forests. By redefining development from a systems perspective, governments can grow their infrastructure and building stock and meet society's needs, while moving away from the linear economic model that places long-term development ambitions at risk.

The systems approach outlined for Vanuatu departs from a focus on a single sector or industry. It even departs from defining the country's ability to influence emissions only within its national borders. Rather, it defines collaborative strategies to develop a circular economy along domestic and international value chains that are aligned with national objectives to safeguard natural assets, avoid waste and reduce greenhouse gas (GHG) emissions.

This way of thinking opens new avenues for Vanuatu to take action on its climate ambitions and commitments under the Paris Agreement and align these with its efforts to achieve

the Sustainable Development Goals (SDGs), which relate to primary resource extraction and waste. This approach redefines development and growth, viewing them through the lens of metabolic efficiency and inspired by nature, where waste does not exist.

Identifying complementary GHG mitigation opportunities through the circular economy is part of an effort to further enhance Vanuatu's Nationally Determined Contribution (NDC) or its mitigation pledge under the Paris Agreement.

Efforts to enhance the NDC's ambition already consider a range of interventions that, together, aim to reduce national GHG emissions by 82,685 tCO₂e by 2030, when considering all sectors except livestock. The measures already considered aim to expand renewable energy capacity, vehicle efficiency and electrification, and biodiesel blending.

Consumption in Vanuatu is 59 percent circular

Resource use for consumption in Vanuatu is estimated to be 59 percent circular. This means that the country relies on secondary or renewable materials and energy sources for

59 percent of the materials used for domestic consumption. The remaining 41 percent of material use is not circular and can be described as following a linear 'take- make-waste' trajectory. Those materials are mostly of foreign origin and collide with the country's development ambitions because they create waste disposal problems and contribute to the deterioration of natural assets resulting from the pollution of soils, surface waters and marine environments.

However, the country can address these issues effectively because its population is directly exposed to and well-aware of the adverse impacts of pollution. The government is already prioritizing the conservation of natural assets for future generations over short-term gains. Circular economy analytics can identify the opportunities that contribute to that objective, as it aims to avoid waste and reduce the extraction of primary resources. Vanuatu is already more circular than any other country whose circularity has been estimated. With domestic consumption estimated to be 59 percent circular, it far exceeds the global average of 8.6 percent, Austria's 9.7 percent and the Netherlands' 24.5 percent. The country plans to make its power production fully renewable, has imposed bans on the extraction of minerals near vulnerable coastlines, and seeks international cooperation to reduce GHG emissions from livestock and more closely monitor the development of fish stocks to avoid excessive extraction. All these ambitions will make Vanuatu even more circular.

Circular economy opportunities in Vanuatu

This concise analysis aims to be solution-oriented by identifying circular economy opportunities across sectors that are aligned with the development ambitions of the Government of Vanuatu and the people who live in the country. Taken together, the circular economy opportunities proposed here can help avoid, between today and 2030, around 44 percent of solid waste, decrease primary resource extraction and reduce the trade deficit. They would also reduce domestic GHG emissions by 10 percent, or by 44 percent when taking into account only emissions from non-livestock sectors. When taking a consumption-based approach to allocating emissions, they also reduce foreign emissions in the value chains for products imported into Vanuatu by 18 percent.

The main opportunities involve:

- Converting grassland to silvopastoral livestock;
- Applying anaerobic digestion for municipal, industrial and agricultural organic waste. This will divert organic waste from landfills and produce both biogas and soil enhancers.
- Where volumes are too small for a biogas plant, or where the emphasis is on producing a good soil enhancer rather than producing biogas, composting can be used instead.
- Collaborating with development partners

Applying the circular economy concept to drive greenhouse gas mitigation

Vanuatu is on the frontlines of climate change. It is highly exposed to its impacts change, even as the country adopts policy measures that will help preserve natural assets and keep GHG emissions per capita low. With an annual per capita material footprint of 6.1 tonnes and a per capita carbon footprint of 2.1 tCO₂e, Vanuatu's population already maintains a small carbon and material footprint.⁵ Furthermore, reports suggest that the country's people rank among the happiest in the world.

Vanuatu's 80 islands have chosen to depart from the traditional development pathway, where the use of large amounts of carbon-intensive materials helps build infrastructure, assemble stocks of consumer goods and provide material wealth. Instead, Vanuatu prioritizes its national resources and seeks to further advance national well-being without increasing material consumption and thereby avoid associated environmental impacts. The circular economy can guide the country in reducing its material impact even further, also targeting also the remaining 41 percent of material use for consumption that is still linear and that threatens the country's natural asset base, such as its fishing stocks, forests and soils.

The circular economy is an economic concept that aims to decouple economic growth from resource use, making material use regenerative, and minimize the use of finite, non-renewable resources. It does so by optimizing the use of existing assets and materials, thus reducing the use of primary materials and lowering the output of harmful wastes. By focusing on what is already available and altering the design of new products and assets, the circular economy concept can help Vanuatu define a development pathway

that diversifies its economy, avoids waste and meets the needs of its inhabitants without degrading its natural assets.

The strategy of avoiding the depletion and degradation of natural assets aligns well with the country's goal to develop as a 'blue economy.' In a blue economy, economic development and policies focus on the sustainable use of oceanic resources, based on the notion that these resources are finite and vulnerable to anthropogenic activities. This requires fisheries to be managed sustainably and fishing activities to be monitored,⁸ preserving ecosystem health and avoiding pollution. The sustainable management of ocean resources also calls for an unprecedented level of collaboration across nation-states and between the public and private sectors,⁹ as pollution travels great distances in a marine environment. Collaboration, sustainable extraction levels and avoiding pollution are also the fundamentals of a circular economy.

This analysis of circular economy opportunities for Vanuatu seeks to help reduce the waste flow of imported materials, while also examining how to improve the resource efficiency of all material use, including domestically-sourced materials. The analysis focuses on materials with a relatively large carbon footprint. Where they include imported goods and materials, their reduction will also help to decrease emissions in other countries. Understanding the flow of materials and identifying where materials and products can be reduced, re-used and recycled reveals the most promising circular economy opportunities. Like a living organism, a country's population needs clean air to breathe, healthy food and clean water to live, energy for thermal comfort, and mobility and materials to deliver houses, vehicles and other consumer goods. Mapping a country's 'metabolic system' helps us understand how it uses material resources to deliver valuable services – such as nutrition, shelter and mobility – to its residents and identify opportunities for improvement. Finally, the circular economy can help Vanuatu communicate how it has consistently chosen an alternative to the linear development pathway and takes responsibility for future and past generations, as well as for the lives of those on distant shores.

The main circular economy opportunities and their ability to reduce greenhouse gas emissions and avoid solid waste involve:

- Converting grassland to silvopastoral livestock;
- Applying anaerobic digestion for municipal, industrial and agricultural organic waste. This will divert organic waste from landfills and produce both biogas and soil enhancers. Where volumes are too small for a biogas plant, or where the emphasis is on producing a good soil enhancer rather than producing biogas, composting can be used instead.
- Collaborating with development partners to develop circular procurement to reduce waste, resource extraction and GHG emissions associated with investments;
- Aligning Vanuatu's tax regime with its development ambitions, increasing government revenue by taxing pollution and using these revenues to support the transition to a circular economy; and,
- Collecting and sorting recyclable materials and exporting those that cannot be used or processed domestically.
- to develop circular procurement to reduce waste, resource extraction and GHG emissions associated with investments;
- Aligning Vanuatu's tax regime with its development ambitions, increasing government revenue by taxing pollution and using these revenues to support the transition to a circular economy; and,
- Collecting and sorting recyclable materials and exporting those that cannot be used or processed domestically.

3.4.3 Mitigation Actions under the Nationally Determined Contribution (NDC)

Planned Mitigation Action under the First NDC

Vanuatu has submitted its INDC to United Nations Framework Convention on Climate Change (UNFCCC) on 29 September 2015 and the same document was endorsed and submitted as the first Nationally Determined Contribution (NDC) on 21 September 2016. Although being a Small Island State with a small carbon footprint, Vanuatu has committed to a challenging mitigation target in its NDC of transitioning to close to 100% renewable energy in the electricity sector by 2030 (Conditional target). Achieving this target would replace nearly all fossil fuel requirements for electricity generation in the country.

The basic interventions which are planned to be implemented include:

- Interventions under implementation or preparation: project under implementation such as VREP II or the Talise Hydro Power Project bring good contributions towards the target
- Coconut for Fuel Strategy: this is the key element in providing a sizeable contribution to achieving the NDC target and is the first implementation step.
- Revision of the Electricity Supply Act: this is a key step for stronger involvement of the private sector and should allow attracting private capital for the investment into renewable energy projects. Batteries: a total of 37 MWh of battery storage capacity are necessary to secure a well-functioning grid, where overproduction can be stored for later consumption.

In addition to these basic interventions, 2 options are suggested for achieving the first NDC target.

Option 1 includes the installation of 7.6 MW solar PV and 5.1 MW wind, which together can contribute around 30% to the target. The majority of the contribution towards the target (57%) will come from the use of coconut oil. Total costs of Option 1 are USD 73.3 m (excluding costs for the Sarakata hydro power project). It is assumed that a pricing arrangement for coconut oil can be found, which is not

leading to ongoing operation costs, the costs for carrying out the Coconut for Fuel Strategy are included.

Option 2 includes the installation of 7.6 MW solar PV, which is seen as the renewable energy source with lowest generation costs. The main contribution in Option 2 will come from geothermal (36%), which requires successful drilling and considerable investment for the implementation. The availability of geothermal allows reducing the input of wind energy and it suggested that only half of the additional capacity (2.6 MW) is installed. The remaining gap will be covered by coconut oil and a total of around 6 million litres will be required to achieve the target. Total costs of Option 2 are USD 66.5 m (excluding costs for the Sarakata hydro power and the geothermal project). It is assumed that a pricing arrangement for coconut oil can be found, which is not leading to ongoing operation costs, the costs for carrying out the Coconut for Fuel Strategy are included.

Planned Mitigation Action under the Updated NDC

The updated NDC for Vanuatu includes: activity-based mitigation targets, sectoral and policy targets in key sectors, including emissions reduction in some sub-sectors. The GHG emission reduction targets are all conditional upon international support (financial and technical support) made available.

Table 40 Vanuatu's Updated NDC Mitigation Actions

GHG emissions sector NDC actions (existing and enhanced NDC scenario)			GHG MITIGATION	ESTIMATED ADDITIONAL
			Gg CO2e/year	Million \$
TRANSPORT				
Additional NDC measure 1	Electric vehicles (e-mobility)		2.61	4.25
Additional NDC measure 1.1	Electric vehicles (e-buses) for public transportation	10% of total public buses replaced with electric buses	1.84	2.5
Additional NDC measure 1.2	Electric cars (e-cars) in Vanuatu	10% of Government fleet replaced with electric cars	0.08	1
Additional NDC measure 1.3	Electric two (e-bikes)/three-wheelers (e-rickshaw)	1000 numbers of electric two/three wheelers	0.68	0.75
Additional NDC measure 2	Biodiesel (biofuel) blending in diesel	20% of bio-diesel blending achieved	18.5	1.25
Additional NDC measure 3	Vehicle mileage and emissions standards	Milage and emission standards endorsed by Council of Ministers	0.29	0.5
OTHER SECTORS				
Additional NDC measure 4	Biogas plants for commercial and residential use	1000 number of biogas plants made operational	3.5	10

Additional NDC measure 5	Energy efficiency in commercial and residential sector		0.35	0.75
Additional NDC measure 5.1	Increase energy efficiency in commercial and residential sector	5% energy efficiency acheived	0.35	0.25
Additional NDC measure 5.2	Energy-efficient buildings (green buildings)	10 energy efficient buildings constructed	NE	0.5
Additional NDC measure (CE strategy 3.15)	Ecotourism supported by local communities IPPU sector NDC actions - Not applicable/not included AFOLU sector NDC actions Agriculture - Not applicable/not included		NE	0.25
LIVESTOCK				
ADDITIONAL NDC MEASURE 6	Training and capacity-building for livestock farming and pasture management	Number of training and capacity building programmes conducted	NE	0.35
ADDITIONAL NDC MEASURE (CE STRATEGY 3.1)	Converting pastures to silvopastoral livestock systems	Hectares of land switched to silvopastoral system	30.98	0.50
ADDITIONAL NDC MEASURE (CE STRATEGY 3.14)	International collaboration to improve livestock efficiency	Number of collaborative initiatives facilitated	NE	0.50
Forests - Not included				
Waste sector				
SOLID WASTE *				
ADDITIONAL NDC MEASURE 7	WTE plant for MSW		14.85	100.00
ADDITIONAL NDC MEASURE 7.1	WTE plant for Port Vila	Municipal Waste to energy plant made operational in Port Vila	14.27	55.00
ADDITIONAL NDC MEASURE 7.2	WTE plant for Luganville	Municipal Waste to energy plant made operational in Luganville	0.50	30.00
ADDITIONAL NDC MEASURE 7.3	WTE plant for Lenakel	Municipal Waste to energy plant made operational in Lenakel	0.08	15.00
ADDITIONAL NDC MEASURE (CE STRATEGY 3.2)	Compost municipal organic waste to produce soil enhancer	Tonnes of compost produced	10.94	1.50
ADDITIONAL NDC MEASURE (CE STRATEGY 3.9)	Collect, sort and export recyclable materials (indicative) for first phase for Port Vila		NE	1.00
ADDITIONAL NDC MEASURE (CE STRATEGY 3.10)	National plastics strategy	Strategy developed and endorsed by Council of Ministers	NE	0.25
WASTEWATER				
ADDITIONAL NDC MEASURE 8	Wastewater management system in Vanuatu		3.57	52.50
ADDITIONAL NDC MEASURE 8.1	Centralized wastewater collection and treatment system in municipal areas, including awareness and capacity-building	Waste water reticulation & treatment systems installed	1.07	50.00
ADDITIONAL NDC MEASURE 8.2	Improvements to public and communal toilet facilities including bio-toilets		NE	2.50
Total			157.01	173.60

Note: NE=Not estimated

The GHG scenario analysis for the updated NDC shows the following:

- GHG emissions under BAU scenario or WOM: Net GHG emissions (CO₂eq) under the BAU scenario (if Vanuatu takes, or has taken no action ((WOM)) would reach 624.258 Gg in 2030.
- GHG emissions under existing NDC scenario or WEM: Net GHG emissions (CO₂eq) might be 552.824 Gg in 2030 with actions that Vanuatu has already committed to under the existing NDC (WEM or WM). GHG emissions WEM are approximately 11 percent (71.434 Gg CO₂e) less than under the BAU scenario.
- GHG emissions under enhanced NDC scenario or WAM: Net GHG emissions (CO₂eq) will be around 467.245 Gg CO₂eq in 2030 with additional measures identified and to be included as enhanced NDC actions (that is, additional actions that Vanuatu will take to further enhance its climate change-related ambitions (WAM). GHG emissions WAM total around 25 percent (157.013 Gg CO₂e) less than under the BAU scenario; in addition, the estimated investment would be around \$173.60 million.

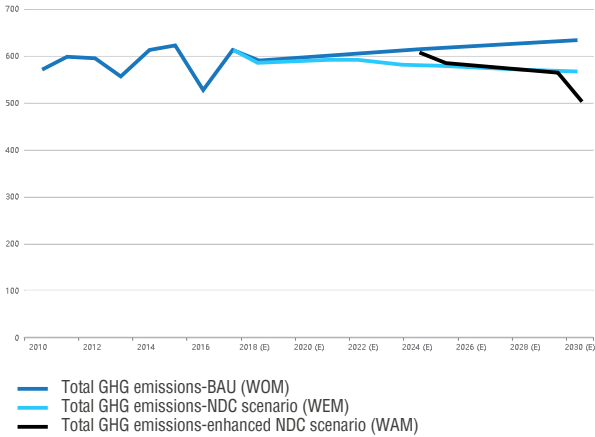


Figure 38 Vanuatu Updated NDC GHG emissions scenario (2030) (Gg CO₂eq)

In addition:

- Similar to the conditional targets under the current NDC, all recommended additional measures/targets under the enhanced NDC submission would be conditional on receiving sufficient funding from external sources to implement the transition.
- The costs for existing NDC measures (NDC Actions 1, 2 and 3 (Existing measures 1, 2 and 3)) have not been included in this report because they are already budgeted under the current NDC implementation road map, NERM:2016-2030. The costs of additional measures are estimates based on similar international examples and best practices, inputs from relevant sectoral expertise and other assumptions. Vanuatu intends to develop a detailed implementation road map for the updated NDC, which would involve a detailed techno-economic analysis of the additional interventions. The road map is expected to provide a firm cost estimate for achieving the GHG targets.
- The recommendations and related estimated emission reductions are based on the realistic NDC enhancement goals that the GoV intends to consider and commit to under the PA.
- Additional opportunities exist to further increase the ambition (for example, by increasing the number of e-vehicles or number of waste treatment plants). However, the GoV intends to take a precautionary approach that would involve assessing the results of the enhanced NDC interventions and further revising the targets considered during the 2025 NDC update.
- Although livestock is the most GHG-intensive sector in Vanuatu, it contributes significantly to Vanuatu's economy. Any interventions to mitigate/reduce emissions from the livestock sector could be economically and politically sensitive. Consequently, mitigating emissions from the livestock sector has not been considered under the NDC update.



Chapter 4

Vanuatu's National Monitoring, Reporting and Verification (MRV) Framework and Integrated MRV Tool

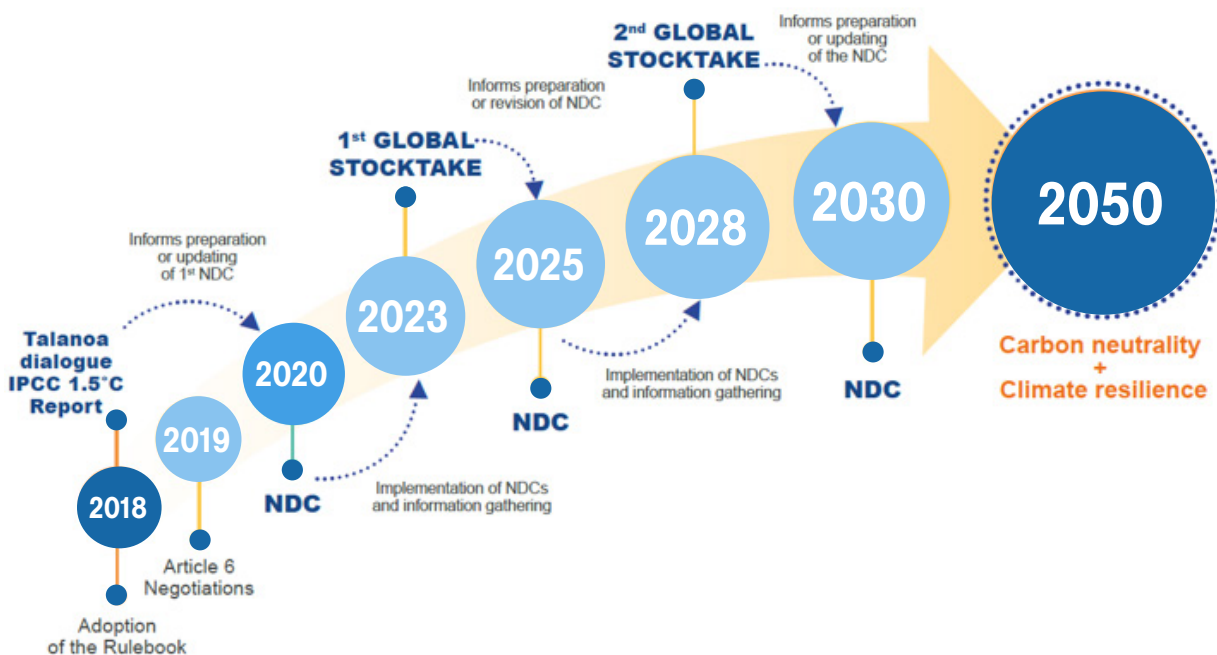
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Vanuatu's National Monitoring, Reporting and Verification (MRV) Framework and Integrated MRV Tool

Introduction

The Paris Agreement, adopted in December 2015, sets out a global action plan that puts the world on track to avoid dangerous climate change by limiting global warming to well below 2°C. It refers to NDC 'Nationally Determined Contributions' that each individual country should make to achieve the worldwide goal set to reduce emissions of greenhouse gases (GHG's). As part of this Agreement, all countries agreed to an enhanced transparency framework (ETF) for action and support (Article 13), with built-in

flexibility which considers Parties' different capacities and builds upon collective experience. The purpose of the framework for transparency of actions is to provide a clear understanding of climate change action in light of the objective of Article 2 of the Convention, including clarity and tracking of progress towards achieving Parties' individual nationally determined contributions, and Parties' adaptation actions, including good practices, priorities, needs and gaps, to inform the global stock take under Article 14 of the Paris Agreement.



The enhanced transparency framework demands substantial and immediate progress in countries' domestic monitoring reporting and verification (MRV) systems and strategic de-carbonization planning. This entails moving from often disintegrated, not consistently updated and different-methodologies for data collection to integrated and robust systems. This requires countries to set up new transparency governance structures, develop and implement MRV

methodologies, and update, implement, and integrate new data and information flows with pre- defined periodicity. A key condition for successful implementation of the Paris Agreement's transparency requirements is the provision requiring adequate and sustainable financial support and capacity building to enable developing countries to significantly strengthen their efforts to build robust domestic and MRV processes.

Vanuatu is a Party to the United Nations Framework Convention on Climate Change (UNFCCC), Kyoto Protocol (KP) and The Paris Agreement (PA); and taking significant steps towards implementing the Paris Agreement (PA). Vanuatu's NDC implementation roadmap has identified the immediate interventions to be taken up as a priority including regulatory changes and a financial strategy leading to emission reductions and transformational change in the electricity supply sector over time.

In Vanuatu, the Department of Climate Change (DoCC) within the Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Energy, Environment and Disaster Management (hereafter MoCC) is the nodal agency responsible for overseeing and implementing climate change activities (mitigation, adaptation and cross cutting), monitoring climate finance, including communication and awareness raising.

Under the support from The Climate Action Enhancement Package (CAEP), funded by German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU) Vanuatu is: (i) Enhancing the current NDC, including by raising ambition, as part of the Paris Agreement's NDC update process and (ii) Fast-track implementation of NDCs, through in-country technical expertise and capacity building.

A robust Monitoring (Measuring), Reporting and Verification (MRV) system is important for national policy decisions and is a key requirement under UNFCCC and the Paris Agreement. Vanuatu is expected to participate in existing MRV arrangements of the UNFCCC including preparation and submission of National GHG inventory reports, National Communications and Biennial Update Reports (BUR) as well international consultation and analysis processes. Further, under the PA commitments, Vanuatu will be subjected to participate in the enhanced transparency framework (ETF), which builds on the existing arrangements and shall require to communicate the National GHG Inventory, National Communications, Biennial transparency reports (BTR), Progress on NDC Implementation, Adaptation Communications and Reporting on Support (Provided/Received).

Vanuatu under its updated NDC programme has developed an integrated MRV tool including training and capacity building to cover mitigation sectors under the updated

NDC to increase ambition and action by carrying out a detailed assessment of potential high impact sectors that can contribute to low-carbon development.

The Vanuatu's Integrated MRV Tool aims to assist the Department of Climate Change (DoCC), MOCC, Department of Finance and other line ministries/departments to develop a concise and strategic domestic national MRV system to enhance monitoring, tracking, reporting and verifying of climate actions including GHG emissions; mitigation, adaptation and SDG impact of projects, programme, policies etc. ; and international, regional and domestic public and private climate finance flows. The Vanuatu's integrated MRV Tool is a robust tool built on available resources e.g. data, human resources, capacity etc. and existing systems of monitoring and reporting (data collection and analysis); with minimal additional burden to the reporting agency and relevant stakeholders.

4.1 Structure of Vanuatu's MRV Framework

Integrated MRV Tool that has been developed for Vanuatu is an Information and communications technology (ICT) based MRV system designed specifically considering the requirement of Vanuatu, extensive desktop review of documents, followed by the stakeholder consultation and discussion with MoCC. The integrated MRV tool provides an overarching structure, approach, and methodology towards:

- National GHG emission monitoring and inventory;
- The basis for international and domestic reporting requirements (e.g. National Communications (NCs), Biennial Update Reports (BUR), etc.);
- Real-time monitoring of GHG mitigation and climate change mitigation actions;
- Real-time monitoring of progress and impact of climate change adaptation actions;
- Climate Financial flow and progress towards implementation of climate actions;
- Monitoring Impact on Sustainable Development Goals (SDGs) from climate change actions;

The key steps for designing the integrated MRV system

are depicted in the figure below. It is important that the existing national processes for data gathering and monitoring are examined before the MRV system is designed and implemented to allow for efficient integration and strengthening between what exists and what will be developed. Appropriate monitoring indicators and

parameters (e.g., sectoral & sub-sectoral data needs) will be identified so that the key parameters could be monitored at either the NDC action level, sectoral or, sub-sector level. In addition, the developed national MRV system is envisaged to be periodically reviewed and improved during the lifetime of the NDC roadmap.

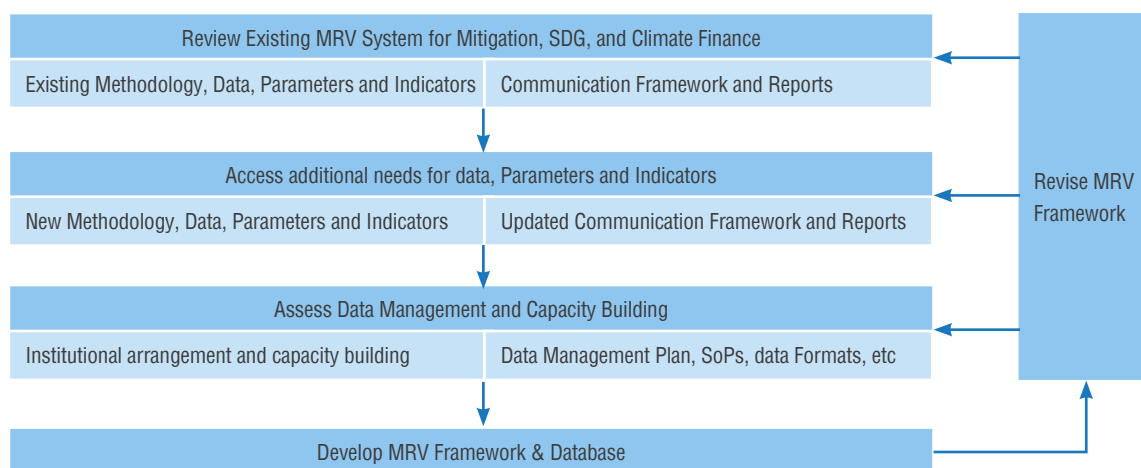


Figure 39 MRV System Development Roadmap

The other important aspect of this integrated MRV tool is to encourage involvement and cooperation of key public and private sector stakeholders (including utilities, equipment, and fuel suppliers, other government ministries and departments and other development partners) through continuous capacity building and awareness creation for

long term sustainability. The integrated MRV Tool would assist in the development of robust data collection and monitoring system, the establishment of sectoral database including network with the central data repository. The below figure provides an overview and structure of integrated MRV tool

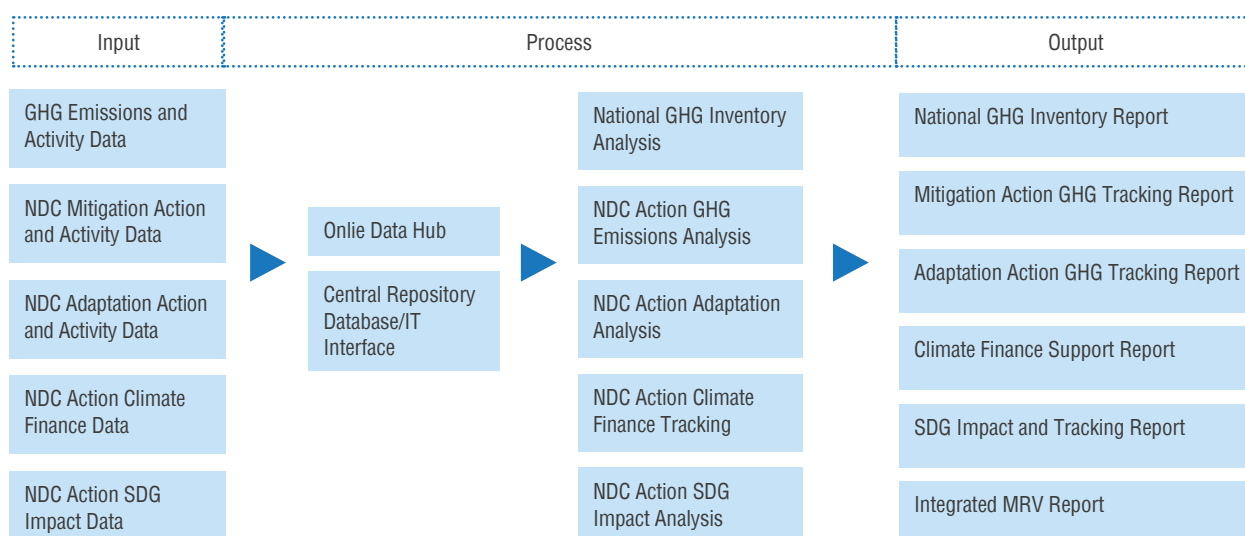


Figure 40 Structure Of Integrated MRV System

The integrated MRV tool considers utilizing both the Top-down and Bottom-up approaches for monitoring and verification of the data. It is envisaged that the combined approach is considered appropriate for Vanuatu keeping in mind the financial, institutional and manpower resources availability.



Figure 41 MRV System Approaches

The approach adopted for MRV system design and implementation framework in Vanuatu is essentially through utilization of the existing institutional and information management system for knowledge and information sharing. This is being through an integrated MRV system for Vanuatu focusing on objective and key results to be communicated domestically and under international transparency framework. This approach has been discussed in the following section of the report.

The integrated MRV framework rollout strategy has four important aspects:

- Data-measurement, monitoring, and reporting, including interactive IT, enabled data collection

templates for activity level and sectoral data;

- Institutional Collaboration – build on existing data collection and data sharing network, well defined key roles and functions;

Analysis, Reporting and Communication – data processing, analysis and review, report generation, communication, online public access database and archiving; and Support Infrastructure – IT Hardware and Software (implementation and O&M support), continuous training and capacity building.

4.2 Key elements of Vanuatu’s Integrated MRV Tool

Vanuatu’s integrated MRV Tool will serve as a central to domestic and international reporting requirements on national GHG inventory, climate actions (mitigation and adaptation), support and SDG impact assessment. The Tool will cover the following key elements:

- National GHG Inventory
- Monitoring and Tracking: Climate Change Mitigation Actions/Projects and GHG emission reductions;
- Monitoring and Tracking: Climate Change Adaption Actions/Projects and Impacts;
- Monitoring and Tracking: Climate Finance Flow towards Climate Actions;
- Monitoring and Tracking: SDG impact of climate actions.

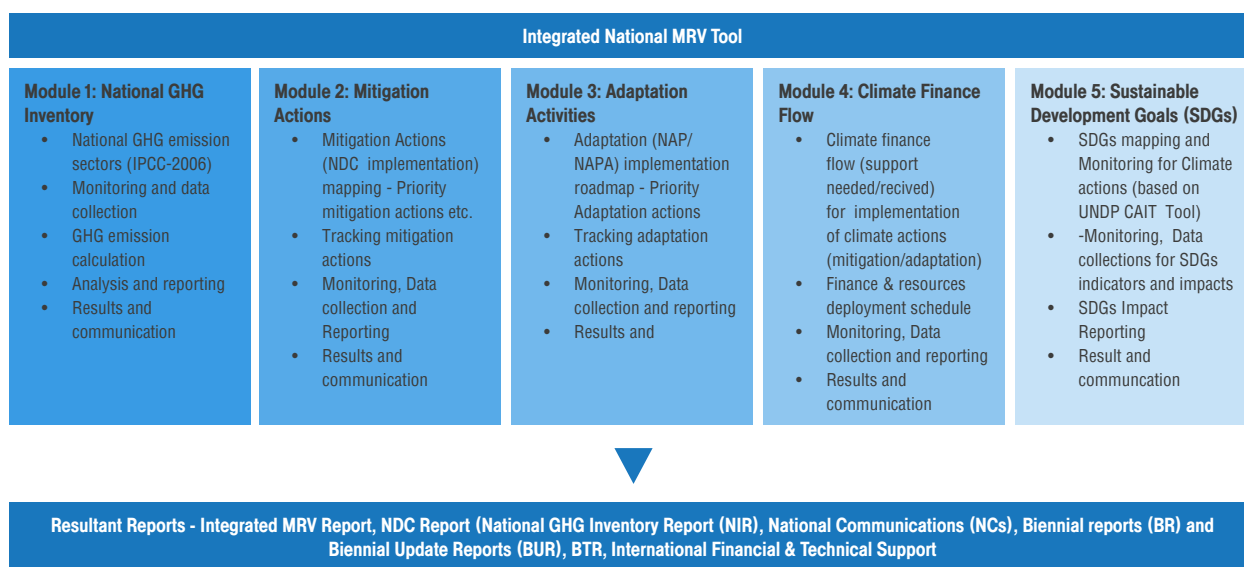


Figure 42 Components of Integrated MRV Tool

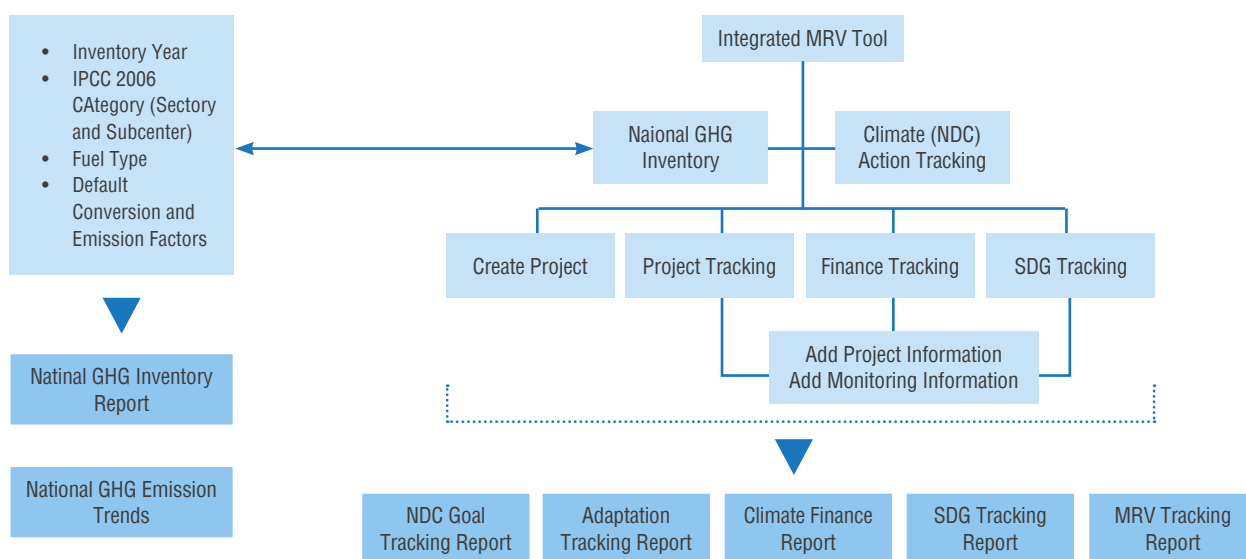


Figure 43 Integrated MRV Tool – Design Structure

The integrated MRV Tool has a modular structure and essentially have five modules, each module will have following key features:

- Methods for generating, recording, storing, aggregating, collating and reporting data on monitored parameters;
- Sources of data, measurement methods and procedures, and data sharing protocols; including the frequency of monitoring/recording; and
- Procedures for reporting by both public institutions (national and county levels) and private entities and
- QA/QC procedures
- Linkages to SDGs
- Gender-responsive indicators
- Reporting templates for sectors and other institutions.

4.2.1 Integrated MRV Tool – Design Principle

The integrated MRV Tool has been developed with simple design principles to provide the ‘Enabling’ system for user the tool has user friendly interface and provide simple guidance not stringent rules and requirements; The ‘Flexible’ modular approach gives more freedom of MRV and accommodates specific national circumstances and future development; ‘Leveraging’ - Build upon existing and emerging work in the country and utilises domestic expertise; ‘Participatory’ - Engage strategic process stakeholders broadly in development process.

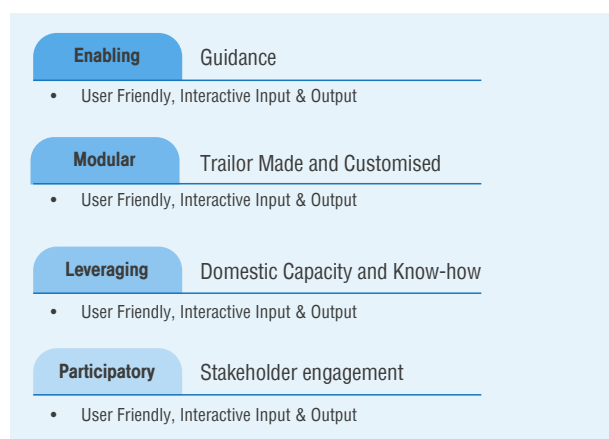


Figure 44 Integrated MRV Tool – Design Principle

The monitoring of GHG emission reductions, SDG parameters and financial flow for each project/ programme will also result in improved international/ bilateral cooperative cooperation. Further, the resultant GHG emission reductions may be used as internationally transferred mitigation outcomes (ITMO’s) under Article 6 of the Paris Agreement. The integrated MRV also fulfils most of the defined requirement of enhanced transparency framework (ETF) under the Paris Agreement (PA) and can be expanded for market and non-market approaches under Article 6 of PA.

The unique feature of the integrated MRV Tool is ability to monitor, track and report the SDG impacts (full

environmental, social and economic impacts as per the UNDP CIAT Tool) for each climate actions (mitigation action and adaptation activities) at the project/programme level; which immensely assists in aligning climate actions including NDCs, NAPs, NAMAs etc. with SDG's through linking the policies and priorities for climate actions with the national sustainable development goals.

Finally, the integrated MRV tool helps in achieving multiple objectives, such as: Tracking and reporting GHG Inventory, Progress on Climate Actions and NDCs, promoting integrated national planning, assess transformational impacts resulting from processes and outcomes of policies and actions, that drive structural changes in society towards climate change

mitigation, adaptation and sustainable development.

4.2.3 Integrated MRV Tool – Institutional Structure

Vanuatu's integrated MRV tool is a web-based MRV Tool (deployed on cloud server – AWS, AZURE, Google Cloud etc) designed specifically considering the domestic and international reporting requirements on climate actions. The web-based online tool provides robustness and increases the accessibility of the MRV tool to the different user groups.

The following figure shows the structure of the user groups.

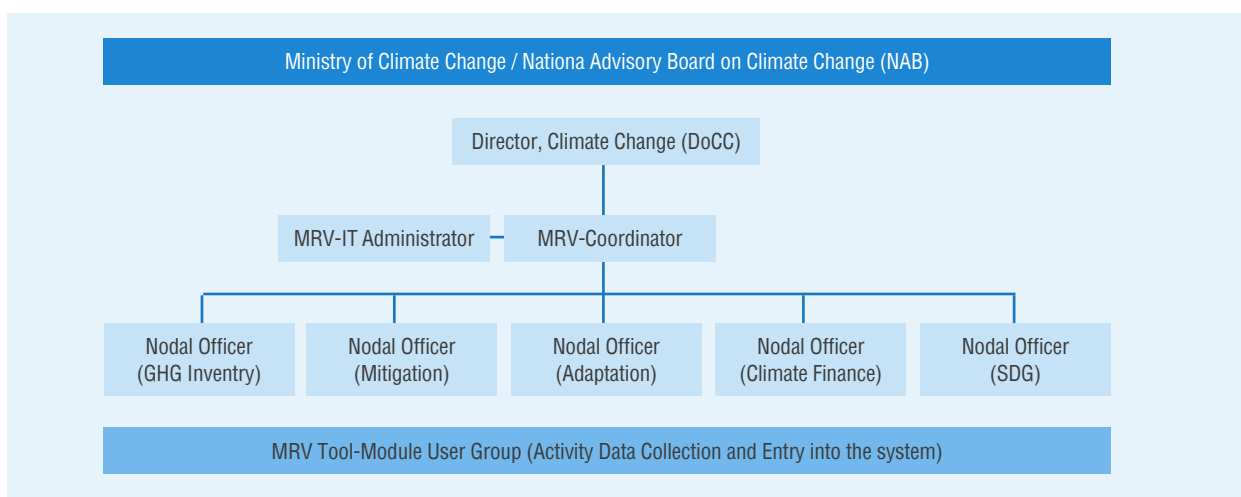


Figure 45 Integrated MRV Tool – Institutional Structure

User Registration

At first, each user needs to register with the MRV administration system. The process of registration will be a simple web-based process, where in user need to fill-in the registration form with personal details, roles and level of access required and submit for approval with the relevant authority.

The MRV-IT Administrator shall approve the user registration and on approval user can access the integrated MRV Tool using the internet connection on any device (work computer, home computer, laptop, tablet etc.).

The users can access the tool using any web-browser using their login credentials. The users of integrated MRV Tool

are the members of the MRV team (or any other relevant team (s) assigned by DOCC for preparation of national GHG inventories, NDC Actions/Mitigation/Adaptation Monitoring, Climate Finance/Support monitoring and SDG Tracking).

Roles and responsibility of key officials are presented here:

Director, Climate Change Department

The Director climate change at DOCC shall be heading the entire MRV system. The Director-DOCC shall further update to the Cabinet Secretary and National Climate Change Council (NCCC) on the implementation and progress of MRV System.

MRV Coordinator

Shall have overall responsibility of integrated MRV Tool and MRV Reports. MRV Coordinator shall review the MRV

System and MRV reports on periodic basis (quarterly, half yearly) or at least once in a year; shall also responsible for backstopping and capacity building.

MRV Administrator

Shall have overall responsibility of Integrated MRV Tool implementation and functions. MRV Administrator will be a Master User with all privileges and rights; shall also Approve, edit and delete user registration and access, approve/edit emission factors, database etc. on recommendation of MRV Coordinator or Nodal Officer.

Nodal Officers

Shall have the right to Validate and Verity the entered

activity data. Each Module shall have at least one Nodal Officer (best practice to have more than one nodal officer for each module); designated by the MRV Coordinator. Nodal officer shall validate and verify the activity data entered in the Integrated MRV tool i.e. approve or reject.

MRV Module and Sector User Group

Will have the right to enter/edit data in respective sector(s). Module or Sector User will be provided these rights by the MRV Administrator on recommendation of their Nodal Officer or MRV Coordinator.

Each user is assigned a role and different levels of the access rights, roles are not necessarily identical to a person's title (e.g. National Focal Point) and that a person can take on several roles. There can be single or multiple users for each module; however, the best practice is to limit the integrated MRV tool users, to avoid duplicity/inconsistency.

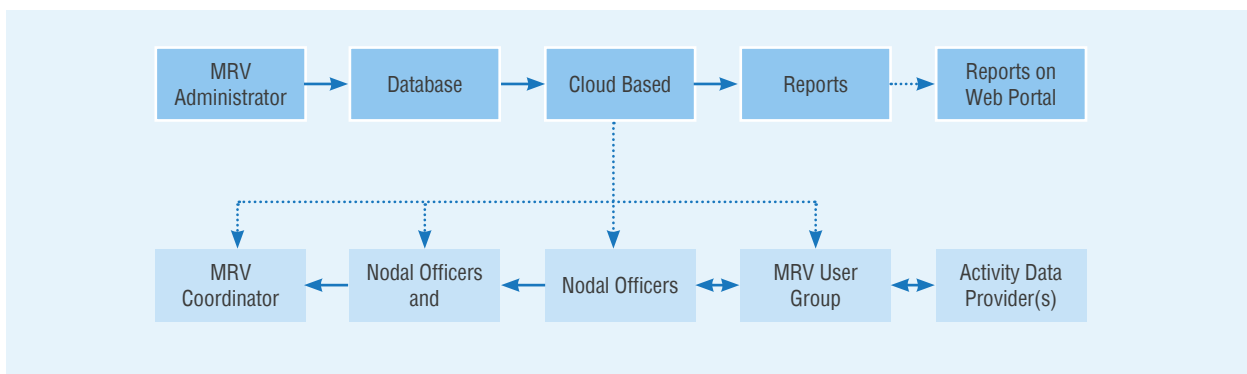


Figure 46 Integrated Mrv Tool – Operational Overview

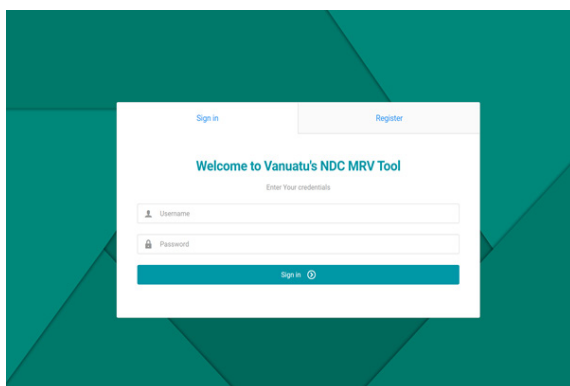


Figure 47 Integrated MRV Tool - Login Page

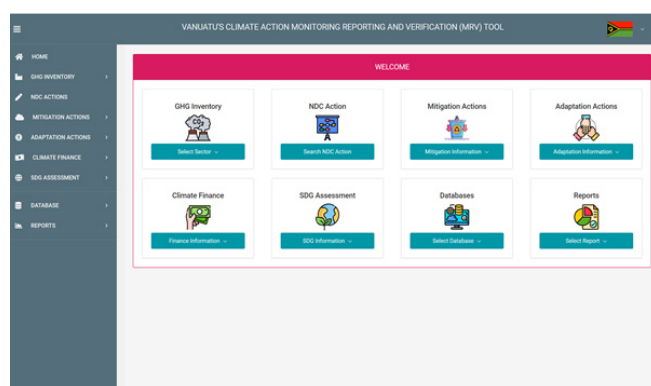


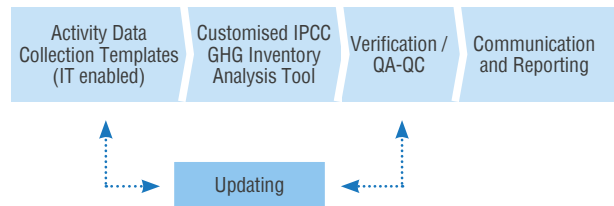
Figure 48 Integrated MRV Tool - Landing Page

4.3 Module-1: GHG Inventory

A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases (GHGs), prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change (IPCC) and agreed upon by the Conference of the Parties serving as the meeting of the Parties (CoP/MoP) to the Paris Agreement (PA Article 13, Paragraph 7a).

The National GHG inventory is typically an annual inventory of anthropogenic emissions by sources and removals by sinks of greenhouse gases (GHGs) not controlled by the Montreal Protocol. This shall also provide, implied emission factors, activity data and supplementary information. The national GHG inventory can be done at several levels i.e. National level, Sub-National level, organizational, institutional or facility level as per the domestic capacity and interest. However, as per the international reporting requirement GHG emissions shall be monitored at the National Level. Each country (party) shall regularly provide this information, hence two important aspects for National GHG Inventory are Frequency and Quality of GHG emission Reporting and Measurement.

The national GHG inventory module under the MRV tool builds upon the previous national GHG inventories and database that collects relevant information, existing sectoral and local data monitoring and collection systems, existing institutional network and improved upon the system with integrating new tools (IT enabled), SOPs, capacity building and training, and international best practices to meet the unique requirement and circumstances of Vanuatu.



The objective of the national GHG inventory is to communicate and reporting on annual anthropogenic GHG emission from source and removal from sink. Direct GHG emissions of gases: Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Oxides of nitrogen (NO_x), Carbon monoxide (CO), Non-methane volatile organic compounds (NMVOC) and Sulphur dioxide (SO₂) from different sectors like Sectors: Energy, Industrial Processes and Product use (IPPU), Agriculture, Forestry and Other Land Use (AFOLU) and Waste. The GHG inventory module designed for Vanuatu is based on the IPCC National Greenhouse Gas Inventory Tool and emission calculation templates. The purpose of this module is customize the IPCC inventory tool with specific requirements of Vanuatu and make it more user friendly and resource efficient, the GHG inventory module is to implement Tier1 methodologies in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories for the preparation of national GHG inventories according to 2006 IPCC Guidelines either for complete inventories or for separate categories or groups of categories. The basic approach of the GHG inventory module is to enable filling out the 2006 IPCC Guidelines category worksheets with the activity and emission factor data. In addition, it also supports many other functions related to database administration, Quality Control, data compilation as well as data reporting.

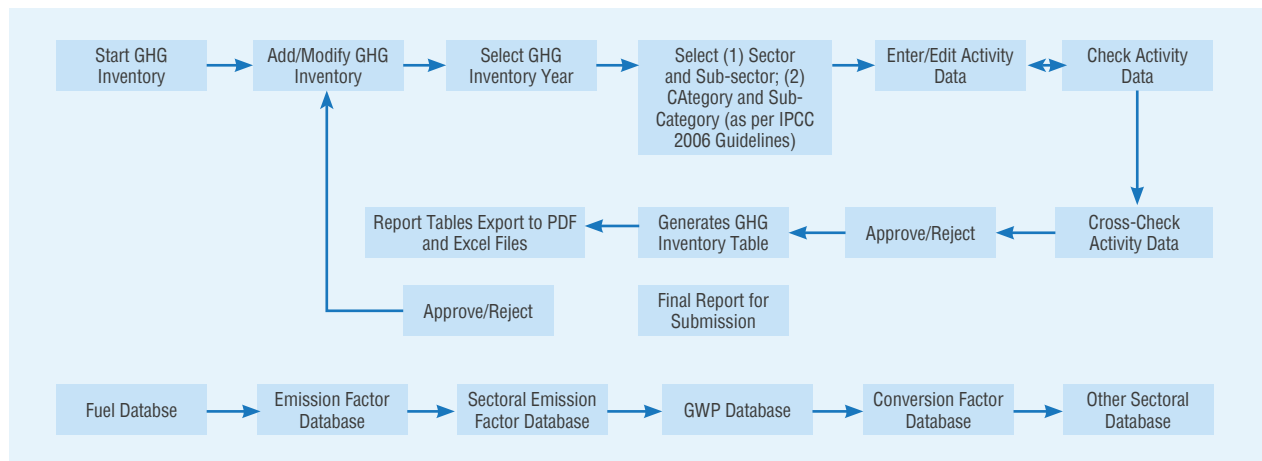


Figure 49 Integrated MRV Tool – Ghg Inventory Process Flow

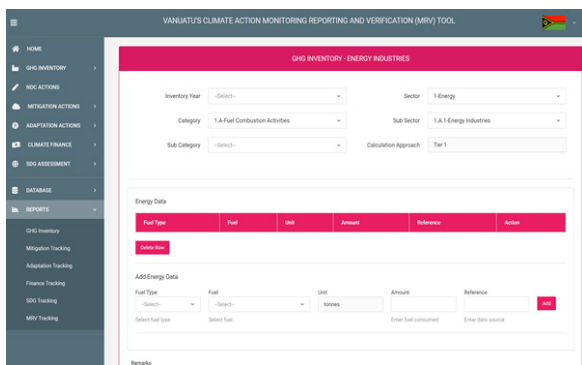


Figure 50 Integrated MRV Tool – GHG Inventory Sample Data Entry Page

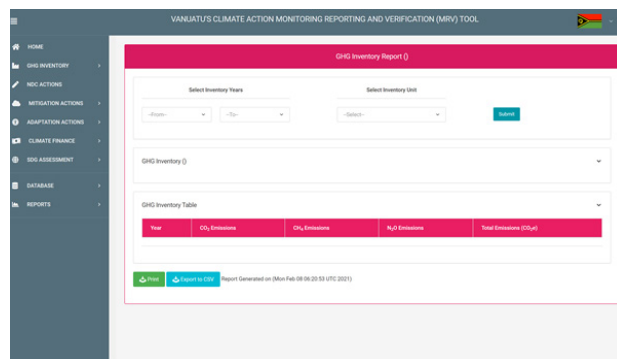


Figure 51 Integrated MRV Tool – GHG Inventory Sample Report Page

4.4 Module 2: Mitigation Action Tracking

Each Party shall regularly provide the information necessary to track progress made in implementing and achieving its nationally determined contribution (PA - Article 13, Paragraph 7b).

The national climate change mitigation actions monitoring and tracking is an important aspect of the integrated MRV tool. The rationale for introducing this module under integrated MRV is to track, monitor and update the progress to policy/decision makers, project implementers, managers and stakeholders on the status and progress of mitigation actions in Vanuatu. The national GHG inventory gives an overall picture of total emissions in the past. However, the mitigation action tracker provides information on progress made towards meeting the NDC/Non-NDC commitments including check on GHG reduction impact, success or gaps on policies and actions taken towards GHG mitigation.

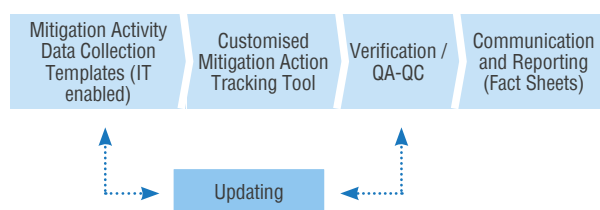
So far under the PA, international accounting guidelines and reporting requirement on NDC Mitigation Actions are yet to be formulated. However, the agreement gives an important information to policy makers at the national level to track actions towards NDC commitments. The NDC Mitigation action tracker demonstrates the progressive approach of Vanuatu's integrated MRV Tool and further strengthen the Vanuatu's commitment toward achieving NDC targets.

The Mitigation Action Tracking Module focus on both project implementation and operation phase. The bottom

up approach has been to develop a comprehensive and integrated system considering the unique requirement of Vanuatu. However, this living monitoring framework and shall be updated on periodic basis or as and when required. It is important to integrate the existing national processes for project monitoring with the new tool to avoid duplication and maximize the use of resources.

The NDC/mitigation action tracking module will allow for efficient integration and strengthening between what exists and what is expected be developed. Importantly, appropriate monitoring indicators and parameters (e.g., raw data needs) will be identified and monitored at either the mitigation action level, or at the sub-sector level.

The Mitigation action tracking tool will follow similar bottom approach and methodology as follows:



The key Steps and illustrative example of Climate Change Mitigation action tracking are as follows:

Step 1: Identification of NDC Mitigation Action to be Monitored

The mitigation actions (projects or programme) to be monitored, reported and communicated will be identified from the NDC.

- NDC Mitigation Actions/Projects

- Other Mitigation Projects (non-NDC projects)

Step 2: Identification of parameters / data to be monitored

The key monitoring parameters and KPIs for each mitigation actions shall be identified including the field level activity data monitoring sheets. The data monitoring, collection and reporting (data sheets) will use the IT/web-enabled systems. The data sheet includes both quantitative and

qualitative data with periodicity of monitoring such as:

- Financial Parameters e.g. Total Project Cost, Budget allocation, Payments and Balance etc.
- Technical Parameters e.g. Type of Solar Panels, Capacity, Generation (import/export) etc.
- Environmental Parameters e.g. GHG emission reductions, Saving of Diesel etc.
- Social Parameters e.g. No of employment generated, direct/indirect benefits etc.

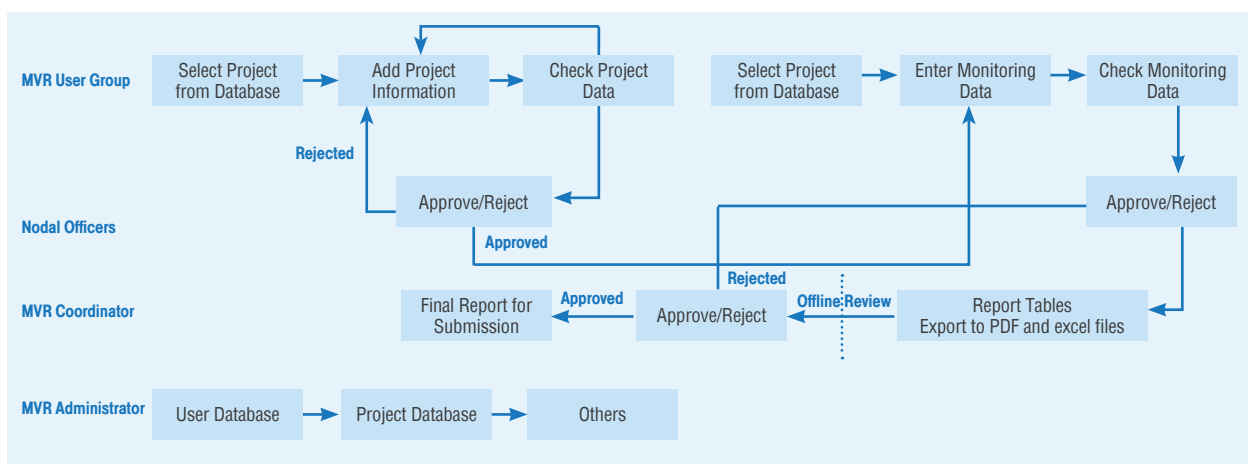


Figure 52 Integrated MRV Tool – Mitigation Action/Adaptation Action/Climate Finance And Sdg Process Flow

Following figure illustrative on Mitigation Action Tracking Module – Create Project:

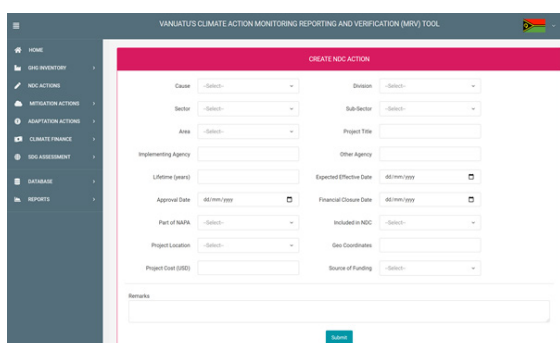


Figure 53 Integrated Mrv Tool – Create Project Page

Step 3: The Monitored data shall be stored at Central Database/Data-hub

The central database/data hub (on cloud) shall have all activity level operational monitored data as well as project level data from the respective ministries, departments and

implementation/operation agency.

Step 4: Analysis of Data

The data collected in database will be processed as per the designed tool and specific requirements for communication and reporting such as renewable electricity generation, GHG emissions etc. as per the requirement. This data can be used for multiple input/output as required for reporting.

Step 5: Verification and QA/QC

The data collected at central database/data and analysis of output/outcome shall be verified by the designated agency or official prior to finalization. The Verification team may request revision in data monitoring or update in data sheet if required. The detailed QA/QC procedure will be developed under capacity building and training module.

Following figure illustrative on Mitigation Action Tracking

Module – Project Information and monitoring

Step 6: Communication and Reporting

The result of the analysis, project fact sheet shall be communicated to the respective ministries and department on monthly basis; however, the updates on web-based

portal shall be on half yearly or annual basis. The project fact sheet shall be ready to use and accessible to the stakeholders.

Following figure illustrative on Mitigation Action Tracking Module – Mitigation Report

The screenshot shows the 'Project Information' page in the MRV tool. It features a sidebar with navigation options like HOME, GHG INVENTORY, and MITIGATION ACTIONS. The main content area is a form with multiple sections: 'Project Information' with fields for sector, location, agency, and dates; 'Performance Indicators' with a table for tracking metrics; and a 'Remarks' section at the bottom. A 'Save' button is visible at the bottom right of the form.

Figure 54 Integrated Mrv Tool – Project Information Page

This screenshot shows the 'Project Monitoring Information' page. It follows the same layout as Figure 54 but includes additional monitoring-specific fields like 'Project Contributions', 'Project Status', and 'Gender Inclusiveness Assessment'. The 'PERFORMANCE INDICATORS' table and 'Remarks' section are also present.

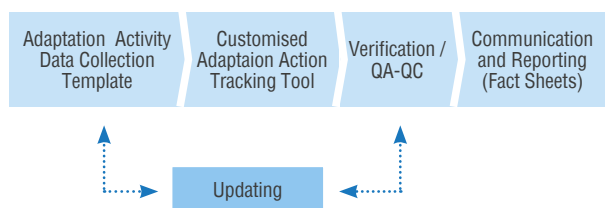
Figure 55 Integrated MRV Tool – Project Monitoring Information Page

The screenshot displays the 'Mitigation Tracking Report' page. It includes a 'Select Year' dropdown menu and a 'Get Report' button. Below this is a 'Mitigation Performance Graph' section and a 'Mitigation Report Table' with columns for Project ID, Division, Sector, Implementing Agency, Emission Reductions Achieved (tCO₂e), and Emission Reductions Expected (tCO₂e). A footer note indicates the report was generated on 08th Feb 08:08:34.031 UTC 2021.

Figure 56 Integrated MRV Tool – Mitigation Action Report Page

4.5 Module 3: Adaptation Action Tracking

The Climate Change adaptation action monitoring and tracking module has been designed as per the UNDP CIAT Tool. The Adaptation action tracking tool follows similar bottom approach and methodology for GHG inventory and Mitigation Action Tracking as follows:



The adaptation action monitoring and tracking tool will follow the similar key steps as illustrative in the Climate Change Mitigation action tracking section; however, while the mitigation action tracking will be based on quantitative information only; the adaptation module shall have both the qualitative and quantitative information.

Step 1: Identification of Adaptation Action to be Monitored

The Adaptation actions (projects or programme) to be monitored, reported and communicated will be identified from the NDC/NAP etc.

NDC Adaptation Actions/Projects

Other Adaptation Projects (non-NDC projects)

Step 2: Identification of parameters / data to be monitored

The key monitoring parameters and KPIs for adaptation actions shall be identified including the field level activity data monitoring sheets. The data monitoring, collection and reporting (data sheets) will use the IT/web-enabled systems. The data sheet includes both quantitative and qualitative data with periodicity of monitoring such as:

- Financial Parameters e.g. Total Project Cost, Budget

allocation, Payments and Balance etc.

- Technical Parameters e.g. To be defined
- Social Parameters e.g. No of employment generated, direct/indirect benefits etc.
- Gender Responsive parameters

Step 3: The Monitored data shall be stored at Central Database/Data-hub

The central database/data hub (on cloud) shall have all activity level operational monitored data as well as project level data from the respective ministries, departments and implementation/operation agency.

Step 4: Analysis of Data

The data collected in database will be processed as per the designed tool and specific requirements for communication and reporting such as renewable electricity generation, GHG emissions etc. as per the requirement. This data can be used for multiple input/output as required for reporting.

Step 5: Verification and QA/QC

The data collected at central database/data and analysis of output/outcome shall be verified by the designated agency or official prior to finalization. The Verification team may request revision in data monitoring or update in data sheet if required. The detailed QA/QC procedure will be developed under capacity building and training module.

Step 6: Communication and Reporting

The result of the analysis, project fact sheet shall be communicated to the respective ministries and department on monthly basis; however, the updates on web-based portal shall be on half yearly or annual basis. The project fact sheet shall be ready to use and accessible to the stakeholders.

The following table presents the illustrative list of adaptation priority criteria and respective qualitative and quantitative assessment indicator:

Adaptation Information - Baseline/ Annual Monitoring Data					
Adaptation Priority Area	Quantitative Assessment	Qualitative question	Quantitative Question	Base Year (Baseline) Data	Monitoring Year Data (Annually)
1 Agriculture					
1.1	Does the action enhance crop productivity?	Yes/ NO/ NA	1.1.1 No. of farmers with crop insurance		
1.2	Does the action enhance crop productivity in the livestock sector?	Yes/ NO/ NA	1.1.2 No. of farmers with accessing agriculture input subsidies		
1.3	Does the action enhance productivity in the fisheries sector?	Yes/ NO/ NA	1.1.3 No. of institutions harvesting water		
1.4	Does the action diversity livelihoods to adjust to a changing climate?	Yes/ NO/ NA	1.1.4 Percentage of pre-and post-harvest losses		
			1.1.5 Acreage under irrigation		
			1.2.1 Hectares of rangeland re-seeded		
			1.2.2 Million cubic meters (MCM) of water storage in (Arid and Semi-Aride Land) ASALS		
			1.2.3 No. of atrmers accessing livestock insurance		
			1.3.1 No. of cages for fish farming		
			1.3.2 No. of fish ponds		
			1.3.3 No. of farmers using low-carbon recirculating aquaculture systems		
			1.4.1 No. of households supported to diversity value chains		
2 Forestry					
2.1	Does the action promote afforestation and reforestation degraded?	Yes/ NO/ NA	2.1.1 Hectares and land afforested or deforested		
2.2	Implement initiatives to reduce deforestation and forest degradation	Yes/ NO/ NA	2.1.2 No. of TIPS signed		
2.3	Does the action restore degraded aindscapes (ASALS and rangelands)?	Yes/ NO/ NA	2.2.1 No. of hectares of forest land protected		
2.4	Does the action promote sustainable timber production on privately-owned land?	Yes/ NO/ NA	2.3.1 No. of hectares of restored degraded landscapes		
2.5	Does the action conserve land area for wildlife?	Yes/ NO/ NA	2.4.1 No. of hectares of private-sector based plantations		
			2.5.1 Percentage of terrestrial and inland water areas conserved		
			2.5.2 No. of hectares of wilflife conservation areas		
			2.5.3 No. of incidents of human-wildlife conflict		
			2.5.4 Percentage of dispersal area and migratory pathways secured		

6 Risk management			
6.1	Does the action increase No. of households and entities benefiting from devolved adaptive services, including National Safety Net Programme and County Climate Change Funds (CCCFs)?	Yes/ NO/ NA	6.1.1 No. of beneficiaries of social protection mechanism (food and cash transfers)
6.2	Does the action improve ability of people to cope with drought?	Yes/ NO/ NA	6.1.2 No. of households benefiting from Hunger Net Safety programme
6.3	Does the action improve ability of people to cope with floods?	Yes/ NO/ NA	6.1.3 Amount of funding allocated to climate change actions through CCCFs in Countries with fund regulations
			6.2.1 No. of recipients of Climate Information Services
			6.2.2 No. of early warning systems for droughts
			6.3.1 No. of early warning systems for floods

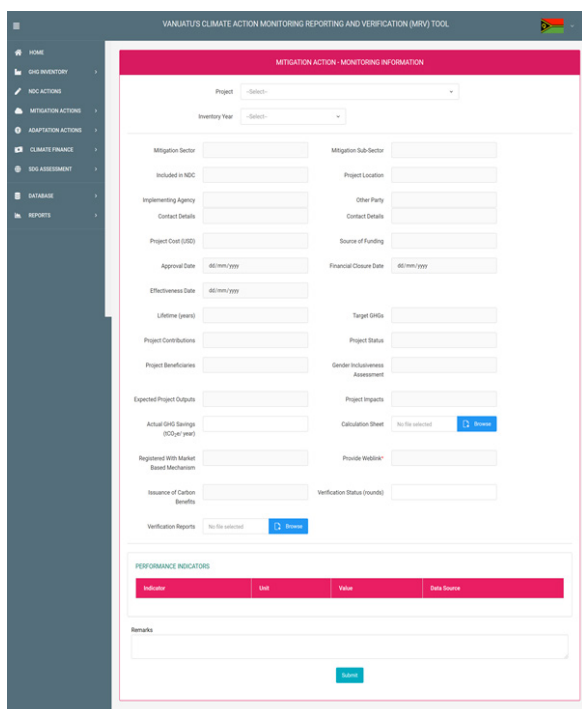


Figure 58 Integrated MRV Tool Adaptation Action Project Monitoring Information Page

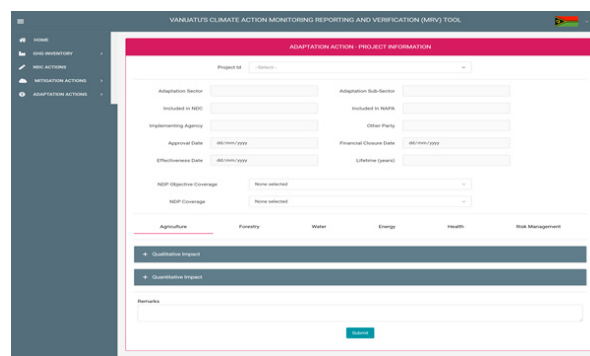


Figure 57 Integrated MRV Tool Adaptation Action Project Information Page

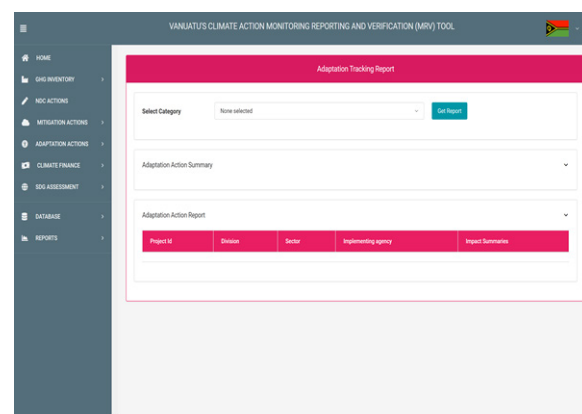


Figure 59 Integrated MRV Tool Adaptation Action Project Report

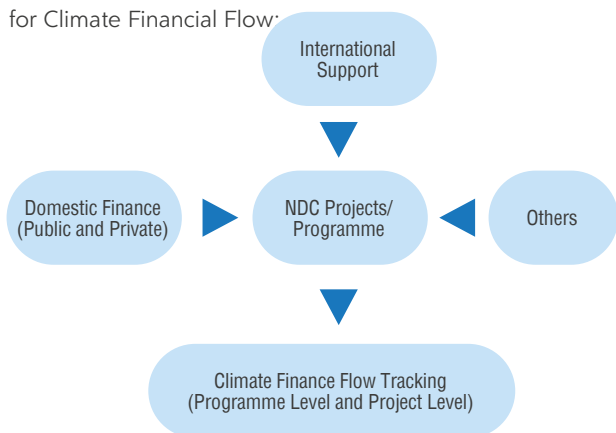
4.6 Module 4: Climate Finance Flow Tracking

Developing country Parties should provide information on financial, technology transfer and capacity-building support needed and received (PA - Article 9, 10 and 11). Finance is primarily covered by Article 9 of the Paris Agreement, which re-establishes the precedent that developed countries should take the lead for mobilising finance (Article 9.3). Details on the finance pledged and provided will be biennially communicated by developed countries (Articles 9.5 and 9.7). Developing countries can also contribute to finance but this obligation is voluntary (Article 9.2). The provision of financial resources should aim to achieve a balance between adaptation and mitigation (Article 9.4). Note that Article 6 of the Paris Agreement covers the use of market mechanisms, which may also provide a source of finance for mitigation and adaptation actions.

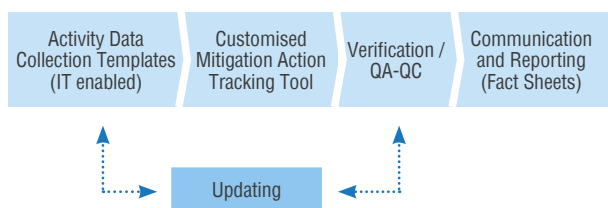
The PA agreement has given due importance to international and domestic financial flow for Climate Change (mitigation and adaptation). Further, the transparency framework under PA highlights the key requirement though the details of monitoring and reporting, common modalities and procedures, detailed guidelines are yet to be finalized. However, the integrated MRV tool considers tracking the international financial and technology support (provision, received and impact of support) towards developing monitoring system, implementing GHG mitigation actions, training and capacity building etc.

Two prong (top down and bottom up) approaches is being envisaged for designing the Climate Finance Flow Tracking Tool which includes the international and domestic financial flow towards the implementation of NDC commitment and achieving climate change and interlinked sustainable development goals to be monitored, reported and communicated. The following figure depicts the approaches

for Climate Financial Flow:



The Climate Financial Flow tracking shall follow the same workflow as discussed above. However, the major difference here would be equal importance given to the programme level data as well as activity level data.



The climate finance flow monitoring and tracking tool will follow the similar key steps as illustrative in the Climate Change Mitigation action tracking section.

The key Steps and illustrative example for Climate Finance Tracking are as follows:

Step 1: Identification of NDC Projects and Programme and level of reporting requirements

The financial requirements and financial support available to be mapped in accordance with the NDC objectives, sectors/subsectors, priority and Output/Outcomes.

- Climate Action (Adaptation/Mitigation)
- Possible Sources of Financial Support (International, Domestic-Public and Private etc.)

Step 2: Identification of parameters and data to be monitored

The key financial monitoring parameters and KPIs for each project and programme shall be identified including the field level activity data monitoring indicators. The data monitoring, collection and reporting (data sheets) will have online database. The parameters and indicators selected for climate finance flow module are based on the GCF financial monitoring and proposal preparation tool; the monitoring and tracking tool broadly include following:

- Total Project Cost and support available Costs
- Possible Sources of Grant, Loan, equity/debt components for project implementation;
- Domestic (public and private investment) available/possible;
- Budget allocation with contingencies and associated financial risks
- Disbursement plan (milestone or time based) etc.
- Payments and Balance of payments etc.

Step 3: The Monitored data shall be stored at Central Database/Data-hub

The central database/data hub shall keep the activity level operational monitored data as well as project level data from the respective ministries, departments and implementation/operation agency.

Measuring the amount mobilized:

- Face value of instrument guaranteed vs. total project
- Operational and Maintenance Cost
- Variable Cost

Step 4: Analysis of Data

The data collected at central database/data hub shall be processed as per the designed tool and specific requirements for communication and reporting like total budget allocation, domestic component, international component, loans etc.

- Equity/Debt
- Total Project Cost
- Financial Assistance Requirements

Step 5: Verification and QA/QC

The data collected at central database/data and analysis of output/outcome shall be verified by the designated agency or official prior to finalization. The Verification team may request revision in data monitoring or update in data sheet if required.

communicated to the respective ministries and department on monthly basis; however, the updates on web-based portal shall be on half yearly or annual basis. The project fact sheet shall be ready to use and accessible to the stakeholders.

Step 6: Communication and Reporting

The result of the analysis, project fact sheet shall be

Following figures illustrative on Climate Finance Tracking Module – Report:

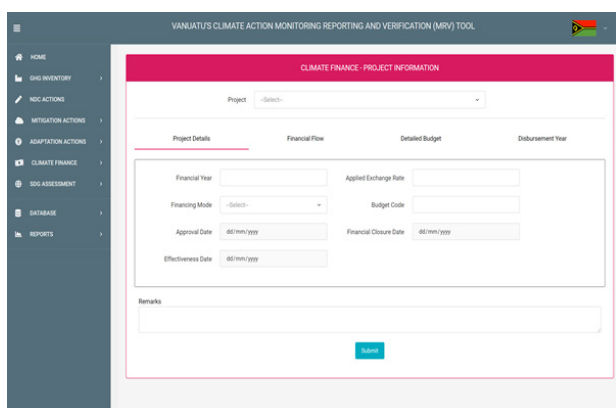


Figure 60 Integrated MRV Tool – Climate Finance Project Information Page

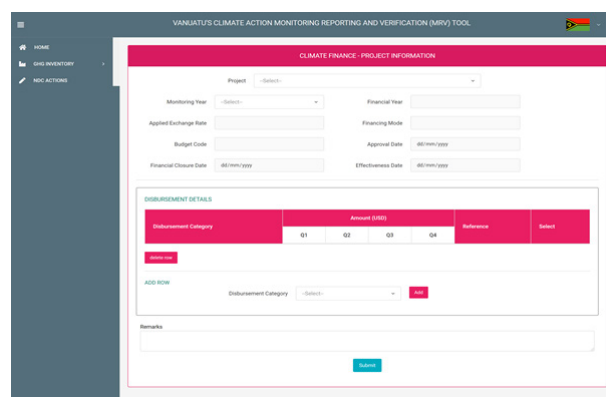


Figure 61 Integrated MRV Tool – Climate Finance Project Monitoring Information Page

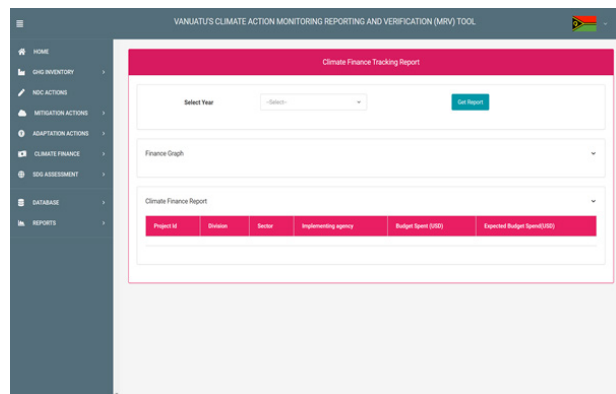


Figure 62 Integrated MRV Tool – Climate Finance Tracking Report

4.7 Module 5: SDGs Tracking

As discussed earlier the sustainable development goals are an important aspect to measure the social impact of the climate action (mitigation and adaptation activities). Hence the integrated MRV Tool shall also monitor the impact of the climate actions on selected Sustainable Development Goals (SDGs).

In the absence of any standard accounting standard for Sustainable Development Goals (SDGs) including monitoring and progress tracking tools existing available SDG tracking tools have been evaluated for climate action and suitable SDG monitoring and reporting. The SDG tracking tool proposed here is based on the UNDP SDG Monitoring tool. The SDG Module envisaged for the Integrated MRV tool also adopts the bottom-up and top-down approaches as discussed in the mitigation action and GHG inventory sections.

The SDG module is based on SDG tool developed by UNDP-UNDP CIAT Tool; however, this has been be customized for specific requirement of Vanuatu keeping in mind the local context and capacity/resources available. The SDG Module provides guidance for MRV and data collection with the aim of aligning the efforts to national reporting requirements to the UNFCCC for NDCs and to track progress made towards the SDGs. The SDG module helps in managing the design, development, implementation, financing, measurement, reporting and verification of the various types of actions. This will enable to identify significant impacts, define indicators, quantify impacts and set targets and track the progress of the actions towards the NDCs. The tool is a bottom-up tool that can be applied to track 'significant, direct impacts' of actions.

The key Steps and illustrative example of for SDG Tracking are as follows:

Step 1: Identification of NDC Projects and Programme

The NDC roadmap defines the program and projects to be implemented in Vanuatu. The SDG monitoring and reporting requirements considered at project level and summarized at project level.

- Possible SDGs benefits and level of benefits (Qualitative and Quantitative)

Step 2: Identification of parameters and data to be monitored

The SDG parameters and KPIs for each project shall be defined including the field level activity micro and macro data with-in the monitoring sheets. The data monitoring, collection and reporting (data sheets) will used the IT/web-enables systems (to be decided by the respective government ministry and department, since there may be some sensitive information not to be disclosed); including following:

Step 3: The Monitored data shall be stored at Central Database/Data-hub

The central database/data hub shall keep the activity level operational monitored data as well as project level data from the respective ministries, departments and implementation/operation agency.

Step 4: Analysis of Data

The SDG data collected at central database/data hub shall be processed as per the UNDP SDG tool and specific requirements for communication and reporting like total employment generated, access to energy, water etc.

Step 5: Verification and QA/QC

The data collected at central database/data and analysis of output/outcome shall be verified by the designated agency or official prior to finalization. The Verification team may request revision in data monitoring or update in data sheet if required.

Step 6: Communication and Reporting

The result of the analysis, project fact sheet shall be communicated to the respective ministries and department annually.

SDG module of the integrated MRV tool monitor, track and report following 7 SDGs (as applicable); further the SDG impact assessment shall be conducted on both qualitative and quantitative dimensions.

Table 41 Mapping the NDC implementation modules to the SDGs

SDG	GOVERNANCE	MITIGATION	ADAPTATION	FINANCE	MRV
1. NO POVERTY - END POVERTY IN ALL ITS FORMS EVERYWHERE	✓		✓	✓	
2. ZERO HUNGER - END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE		✓	✓		
3. GOOD HEALTH AND WELL-BEING - ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES		✓	✓		
4. QUALITY EDUCATION - ENSURE INCLUSIVE AND EQUITABLE QUALITY EDUCATION AND PROMOTE LIFELONG LEARNING OPPORTUNITIES FOR ALL					
5. GENDER EQUALITY - ACHIEVE GENDER EQUALITY AND EMPOWER ALL WOMEN AND GIRLS	✓	✓	✓		
6. CLEAN WATER AND SANITATION - ENSURE AVAILABILITY AND SUSTAINABLE MANAGEMENT OF WATER AND SANITATION FOR ALL		✓	✓		
7. AFFORDABLE AND CLEAN ENERGY - ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL		✓	✓		
8. DECENT WORK AND ECONOMIC GROWTH - PROMOTE SUSTAINED, INCLUSIVE AND SUSTAINABLE ECONOMIC GROWTH, FULL AND PRODUCTIVE EMPLOYMENT AND DECENT WORK FOR ALL	✓	✓	✓	✓	✓
9. INDUSTRY, INNOVATION AND INFRASTRUCTURE - BUILD RESILIENT INFRASTRUCTURE, PROMOTE INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION AND FOSTER INNOVATION		✓	✓	✓	
10. REDUCED INEQUITIES - REDUCE INEQUALITY WITHIN AND AMONG COUNTRIES	✓			✓	
11. SUSTAINABLE CITIES AND COMMUNITIES - MAKE CITIES AND HUMAN SETTLEMENTS INCLUSIVE, SAFE, RESILIENT AND SUSTAINABLE	✓	✓	✓	✓	✓
12. RESPONSIBLE CONSUMPTION AND PRODUCTION - ENSURE SUSTAINABLE CONSUMPTION AND PRODUCTION PATTERNS		✓			
13. CLIMATE ACTION - TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS	✓	✓	✓	✓	✓
14. LIFE BELOW WATER - CONSERVE AND SUSTAINABLY USE THE OCEANS, SEAS AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT		✓	✓		
15. LIFE ON LAND - PROTECT, RESTORE AND PROMOTE SUSTAINABLE USE OF TERRESTRIAL ECOSYSTEMS, SUSTAINABLY MANAGE FORESTS, COMBAT DESERTIFICATION, AND REVERSE LAND DEGRADATION AND HALT BIODIVERSITY LOSS		✓	✓		
16. PEACE, JUSTICE AND STRONG INSTITUTIONS - PROMOTE PEACEFUL AND INCLUSIVE SOCIETIES FOR SUSTAINABLE DEVELOPMENT, PROVIDE ACCESS TO JUSTICE FOR ALL AND BUILD EFFECTIVE, ACCOUNTABLE AND INCLUSIVE INSTITUTIONS AT ALL LEVELS	✓				✓
17. PARTNERSHIPS FOR THE GOALS - STRENGTHEN THE MEANS OF IMPLEMENTATION AND REVITALISE THE GLOBAL PARTNERSHIP FOR SUSTAINABLE DEVELOPMENT	✓			✓	✓

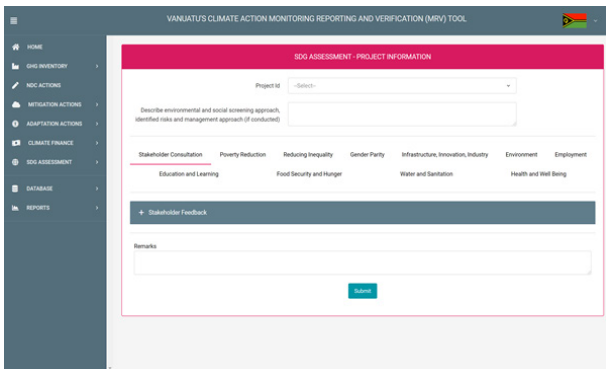


Figure 63 Integrated MRV Tool – SDG Assessment Project Information

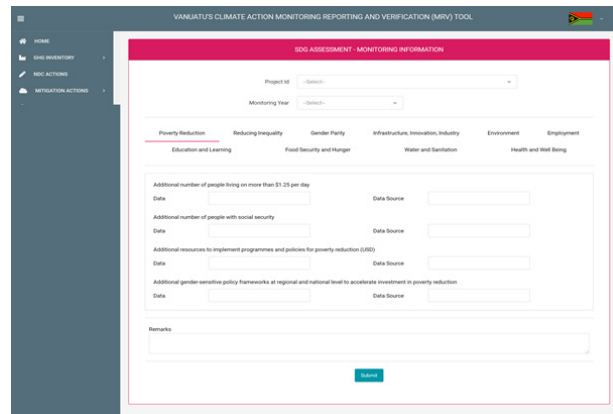


Figure 64 Integrated MRV Tool – SDG Assessment Monitoring Information

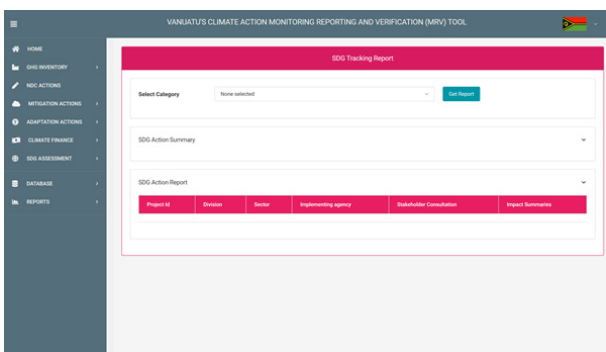


Figure 65 Integrated MRV Tool – SDG Tracking Report

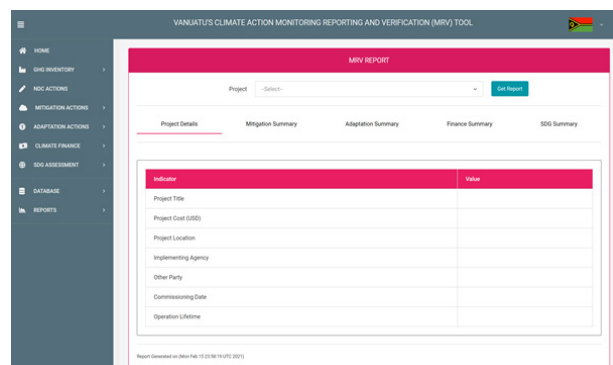


Figure 66 Integrated MRV Tool – Consolidated Project MRV Report (Mitigation/Adaptation/Climate Finance/Sdg)

4.8 Opportunities to Expand and Improve the MRV System

The proposed integrated MRV Tool will fulfill most of the domestic and international climate action reporting requirements for Vanuatu. However, there is a need in the future to develop and strengthen existing institutional structure, integration of public and private sector in implementation and improving the MRV system including extensive capacity building exercise to be carried out within the institutions and other stakeholders.

Further, there is also opportunity to expand the scope of this integrated MRV Tool to include the Climate Change Mitigations Registry System or National Registry System. There is also scope to develop the domestic and regional registry system for the carbon market and emission trading (for all the mitigation sectors or any specific sector e.g.

Waste, Renewable Energy, Energy Efficiency etc.

The Paris Climate Change Agreement (PA), specifically Article 6, provides an opening for Parties to voluntarily cooperate in the implementation of their nationally determined contributions (NDCs) through the transfer of mitigation outcomes (MOs) i.e. Internationally Transferable Mitigation Outcomes (ITMOs).

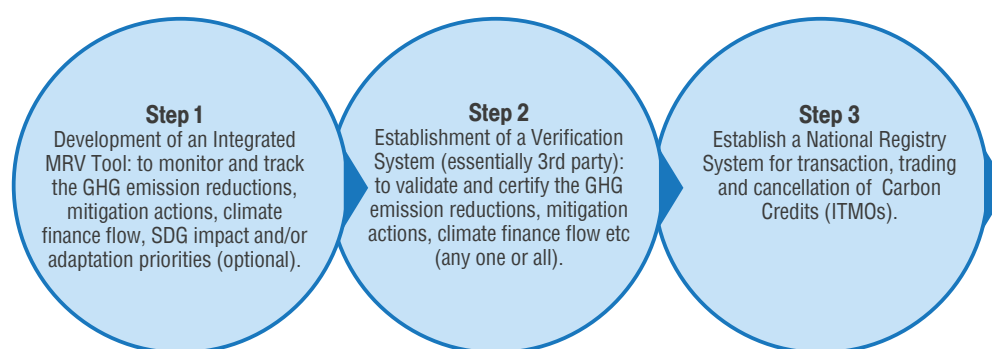
The ITMOs will be essentially generated from climate change mitigation actions/projects implemented by the party and within or outside of the NDC; further, the NDCs will make a corresponding adjustment to prevent double counting, questions remain about how to treat ITMOs generated outside an NDC, which do not contribute to double counting. To encourage countries to reduce emissions from outside their NDCs while both safeguarding and raising climate ambition, the National Carbon Registry may play a key role. The design and implementation of a robust and 'future-proof' National Carbon Registry will

have multiple potential benefits and mitigate risks of double counting and environmental integrity.

The integrated MRV Tool opens-up an opportunity to link domestic mitigation systems or mechanisms and the National Monitoring Reporting and Verification (MRV) to provide a supporting framework for the design, piloting, and scaling-up of market-based mechanisms. The outcome of the work will ultimately help the host country to develop and launch a system and software to record national GHG emission and emission reduction from mitigation action data (ITMOs) and potentially allow inter-linking among various (international) market-based mechanisms while avoiding double counting

and enhancing environmental integrity.

The National Carbon Registry System involve large legal and financial interests. Trust in the accuracy and integrity of the reported data is therefore a prerequisite for a well-functioning registry system. To ensure accuracy and integrity of data a robust monitoring, reporting and verification (MRV) system is essential. Verification is essential to enhance trust in a carbon registry system. Where systems have large financial implications, participation is voluntary or international exchange of units is planned, this trust is paramount for successful implementation.



The National Carbon Registry System requires a comprehensive assessment of legal, regulatory, financial and institutional arrangements and is envisaged to complement the socio-economic and development goals of the host country. The initial assessment requires to carry out system assessment and design of a national carbon registry system through the development of its functional and technical specifications in the context of supporting and facilitating a set of existing policies and instruments for greenhouse gas (GHG) mitigation and GHG reductions in the host country.

The National Carbon Registry System is to be designed to serve dual purposes of data management and transaction registry. Thus, the national carbon registry will have two components:

1. Data Management System: which implies that it will collect, control, process, and analyze bottom-up data from national MRV (GHG inventory and mitigation actions) and regulatory sources. This would mean that

the national carbon registry will control and consolidate the major chunk of GHG emissions data from all the sectors under national MRV. Therefore, this can be linked with a National Monitoring Reporting and Verification System (MRV) and enhance the transparency of the emissions data being reported under the domestic and international reporting requirements under PA.

2. Registry for Transactions, Transfer, and Cancellations: which implies that the national carbon registry will host and link infrastructure of the market-based instruments (existing or upcoming for both domestic and international) by providing relevant details on registries and thus making inter-linking possible.

As next step, Government of Vanuatu may consider developing the national or sectoral registry system to track and transfer the mitigation credits generated with in the country and eligible to transfer to other national or international registry system.

4.9 Vanuatu's Internationally Transferable Mitigation Outcomes (ITMOs) Readiness Initiative

The Paris Climate Change Agreement (PA), specifically Article 6 of PA provides an opening for Parties to voluntarily cooperate in the implementation of their nationally determined contributions (NDCs) through the transfer of mitigation outcomes (MOS) i.e. Internationally Transferable Mitigation Outcomes (ITMOs). The ITMOs will be essentially generated from climate change mitigation actions/projects/programmes implemented by Vanuatu and within or outside of the NDC; further, the NDCs shall make a corresponding adjustment to prevent double counting, questions remain about how to treat ITMOs generated outside an NDC, which do not contribute to double counting. To encourage countries to reduce emissions from outside their NDCs while both safeguarding and raising climate ambition, the Vanuatu's National Carbon Registry may play a key role. The design and implementation of a robust and 'future-proof' National Carbon Registry will have multiple potential benefits and mitigate risks of double counting and environmental integrity.

The primary objective of the Vanuatu's National Carbon Registry System is to scale-up and shape the future of cost-effective domestic GHG mitigation actions; however, this will be an effective tool for tracking the climate action mitigation outcomes and ITMOs. This will also help in achieving the Vanuatu's climate change mitigation objectives. Paris Agreement (PA) also opens up opportunities for the Vanuatu's National Carbon Registry System with domestic and international emission trading provisions and participating in the envisaged complex network of international and domestic market-based mechanisms post-2020. The National Carbon Registry System also channel to design and pilot new domestic market-based instruments.

Vanuatu's National Carbon Registry System involve large legal and financial interests. Trust in the accuracy and integrity of the reported data is, therefore, a prerequisite for a well-functioning registry system. To ensure accuracy and integrity of data robust monitoring, reporting and verification (MRV) system are essential. Verification is essential to

enhance trust in a carbon registry system, climate actions mitigation outcomes and ITMOs.

The establishment of a National Carbon Registry System in Vanuatu requires a comprehensive assessment of legal, regulatory, financial and institutional arrangements and shall complement the socio-economic and development goals of the host country. The inception stage requires to carry out system assessment and design of a national carbon registry system through the development of its functional and technical specifications in the context of supporting and facilitating a set of existing policies and instruments for greenhouse gas (GHG) mitigation and GHG reductions in the host country.

The objective is also to link Vanuatu's domestic mitigation systems or mechanisms and the National Monitoring Reporting and Verification (MRV) to provide a supporting framework for the design, piloting, and scaling-up of market-based mechanisms. The outcome will ultimately help Vanuatu to develop and launch a system and software to record national GHG emission and emission reduction from mitigation action data (mitigation outcomes) and may be extended inter-linking among various (international) market-based mechanisms in future, while avoiding double counting and enhancing environmental integrity.

Vanuatu's National Carbon Registry System on implementation is envisaged to manage the national GHG inventory and GHG emission reductions (Mitigation Outcomes) achieving from the various mitigation actions implemented and operational (bottom-up data from the robust national MRV system) and hence strengthen MRV and transparency. This will also facilitate consistency in available data for accurate reporting for greater transparency. Thereby Vanuatu's national carbon registry will provide bottom-up data from the national MRV and verification systems. Thus, the National Carbon Registry System shall record GHG emission data and implements a market-based instrument by supporting issuance, transfer, and cancellation of credits.

Vanuatu's National Carbon Registry System is to be designed to serve dual purposes of data management and transaction registry. Thus, the national carbon registry will have two components:

1. Data Management System: which implies that it will collect, control, process, and analyze bottom-up data from national MRV (GHG inventory and mitigation actions) and regulatory sources. This would mean that the national carbon registry will control and consolidate the major chunk of GHG emissions data from all the sectors under national MRV. Therefore, this can be linked with a National Monitoring Reporting and Verification System (MRV) and enhance the transparency of the emissions data being reported under the domestic and international reporting requirements under the Paris Agreement.

2. Registry for Verified Mitigation Outcomes (Potentially used for Transactions, Transfer, and Cancellations): which implies that the national carbon registry will have

national repository for verified mitigation outcomes from national climate actions. The national carbon registry may potentially be used as a host and may link infrastructure of the market-based instruments (existing or upcoming for both domestic and international) by providing relevant details on registries and thus making inter-linking possible.

Vanuatu is already in advanced stages of discussion with Annex 1 parties to sign bilateral agreements for ITMO transfer through implementation of green and low carbon technologies as part of its NDC targets. The NDC Support Programme is providing further support to Vanuatu to assist in setting up the enabling environment for future ITMO transfers through a readiness support.



Chapter 5

Climate Finance in Vanuatu and Support Received

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Climate Finance in Vanuatu and Support Received

Background

The provision of international climate change finance is expected to increase as we approach 2030 and beyond. This is in line with the pledges made at the fifteen session of the Conference of the Parties (COP15) in Copenhagen in 2009 with a reaffirmation at COP 16 in Cancun, in 2010, where developed countries committed to jointly mobilise up to USD100 billion per year by 2020 from a wide range of sources to assist vulnerable developing countries. This is further confirmed in Article 9 of the Paris Agreement, including seeking a new quantitative target by 2025 to build on USD100 billion as the floor. However, this increase in funding opportunity is being accompanied by an increase in the complexity to access these funds and coordinate with a range of implementing agencies.

The range and scale of global climate change funding sources are substantial for small island developing states like Vanuatu, and the administrative requirements to access and manage these funds can be a challenge. However, Vanuatu is quite advanced as one of a few Pacific Island countries (PICs) to have already tapped into both readiness and project funding from the Green Climate Fund, as well as other sources. There are useful lessons learnt that could inform future engagement with bilateral and multilateral sources.

Climate change finance is a key priority to the Government of the Republic of Vanuatu. Gaining improved access to global climate change funds is critical to implement the resilient development agenda articulated in the National Sustainable Development Plan. Section 7.2 of the National Climate Change and Disaster Risk Reduction (CCDRR) Policy also recognise finance as a key priority to “ensure that adequate resourcing is available for climate change and disaster risk reduction activities, build financial capacity to manage resources, and enable access to increased international funding”. The CCDRR Policy also acknowledges the need for robust financial systems to gain access to and ensure accountable management of substantial climate change and

disaster risk reduction funding.

Although Vanuatu is increasing its access to international climate change finance, including project and readiness grants from the Green Climate Fund (GCF), there are still challenges in terms of meeting the reporting requirements of different funding sources and donors. Nevertheless, the Government is taking leadership and currently engages with a range of international development partners and regional organisations to progress its national priorities.

For instance, the National Advisory Board has been operational for a number of years to coordinate climate change and disaster risk management actions in Vanuatu. In 2013, the Government established a dedicated Ministry of Climate Change Adaptation, Meteorology and Geohazards, Energy, Environment and Disaster Management. In that same period, the Government also requested UNDP to undertake a Climate Public Expenditure and Institutional Review (CPEIR). The report was finalised and adopted in 2014. After the twenty second Conference of the Parties (COP 22) to the United Nations Framework Convention on Climate Change, the Government set up a Climate Finance Working Group followed by the convening of a national climate finance forum. A Climate Finance Roadmap is already in place and has strong linkages to the Public Financial Management (PFM) Roadmap.

5.1 Climate Change Funding in Vanuatu

Although there has been significant commitment to increase the flow of climate change finance from developed to developing countries to USD100 billion per year by 2020, improved access to these climate change financing sources remains a key challenge for PICs. This is due to the complexity and variety of requirements imposed by these climate change funding sources, which may cause duplication of efforts at the national level. Traditional multilateral and

bilateral financing intermediaries, such as the World Bank, the Asian Development Bank and UN Agencies have played an important role in distributing and channelling climate change finance to Vanuatu. However, direct access has been limited by Vanuatu's inability to meet the strict fiduciary standards required by international climate change funders.

Having a better understanding of climate change finance flows is essential to addressing the constraints of developing countries, such as the Pacific region in the development of climate change financing opportunities. The commitment to increase the flow of climate change finance from developed to developing countries has added to the already existing complexities of the global climate change finance landscape. For the Pacific, a total of USD 748 million in finance was reported to have been committed between 2010 and 2014, targeting climate change activities.

Bilateral Funding Sources

A large share of public climate change finance is bilaterally accessed, administered largely through traditional development agencies. Australia is Vanuatu's largest bilateral donor for climate change followed by Japan, China and New Zealand, according to the analysis of bilateral sources from 2014 to present.

Australia has directly supported major activities in Vanuatu, relating to the Recovery and Development Program, Roads for Development Program, Water, Sanitation and Hygiene (WASH) in schools, and through regional projects, such as the Pacific Risk Resilience Program (PRRP), Pacific-Australia Climate Change Science and Adaptation Planning (PACCSAP) programme, Governance for Growth Program and the Pacific iCLIM Project.

Germany has supported Vanuatu in CC activities since 2009 through various programmes, including an adaptation-focused SPC-GIZ joint programme, a GIZ-European Union (EU) Adaptation to Climate Change and Sustainable Energy programme, a GIZ- International Union for Conservation of Nature (IUCN) Marine Adaptation programme, a GIZ-SPC REDD+ programme and, most recently, Germany has provided support through a GCF Readiness programme and a DFAT-GIZ Climate Finance Readiness for the Pacific Project. Most of the German climate finance is channelled through regional modalities (most programmes are regional).

The Government of Japan provided support for the installation of Himawari satellite receiving system to obtain more frequent and clear satellite weather information through the Vanuatu Meteorology and Geo-Hazard Department. Other projects supported include the development of the Port Vila Lapetasi International Multipurpose Wharf through the Ministry of Infrastructure and Public Utilities and Poverty Reduction Program through the Prime Minister's Office. These are climate proofed.

China supported Vanuatu through a concessional loan for road upgrading in Tanna and in North Malekula while New Zealand has provided funding for the Tourism Infrastructure Project, Pacific Risk Tool for Resilience (PARTner Project) and co-financing for the Vanuatu Rural Electrification Project (VREP). Other bilateral donors that have provided funding for renewable energy, climate change adaptation and natural resource management and community preparedness in Vanuatu include the European Union, United Arab Emirates, United States of America, Germany and France.

Multilateral Funding Sources

The World Bank is the largest multilateral source for Vanuatu and has implemented a range of climate change related projects, such as the reconstruction and improvement of public assets damaged by Tropical Cyclone (TC) Pam, institutional strengthening and support of the energy sector and the Vanuatu REDD Plus Readiness Project. ADB is the second largest multilateral source and supports the Port Vila Urban Development project to improve drainage, roads and sanitation systems that would contribute to climate-resilient and sustainable urban development. A feasibility study on the development of hydro-power stations on Malekula and Santo was also supported by ADB, including the upgrade of port facilities in Port Vila with improved berthing facilities.

ADB, through the Regional Technical Support Mechanism funded from the regional programme of the Pilot Programme for Climate Resilience (PPCRP) has also supported Vanuatu through the provision of technical assistance to develop a proposal to the Green Climate Fund.

The Green Climate Fund (GCF) has become the newest channel through which international public climate change finance will flow over time. In 2016, a grant of USD23

million was approved by GCF for a climate services project in Vanuatu. The implementing entity for this Project is the Secretariat of the Pacific Regional Environment Program (SPREP) and it is executed by the Government of Vanuatu through the Vanuatu Meteorology and Geo-hazards Department.

Similarly, GEF has been supporting Vanuatu in a number of environmental sustainability initiatives, such as the integrated sustainable land and coastal management; coastal zone adaptation and community resilience to climate change and natural hazards; Vanuatu's National Communications to the UNFCCC, as well as the Intended Nationally Determined Contribution (INDC). Other UN Agencies, such as the World Meteorological Organization (WMO) and Food and Agriculture Organisation (FAO), as well as other countries, such as Germany and Australia are supporting Vanuatu with the TC Pam recovery programme. Agencies, such as the Australian

Bureau of Meteorology supported the set-up of a Climate Data for the Environment (CliDE) database. Other multilateral support is geared towards the construction of a 2.75 MW wind farm on Efate Island by the European Investment Bank and technical support by Global Green Growth Institute to the Department of Energy.

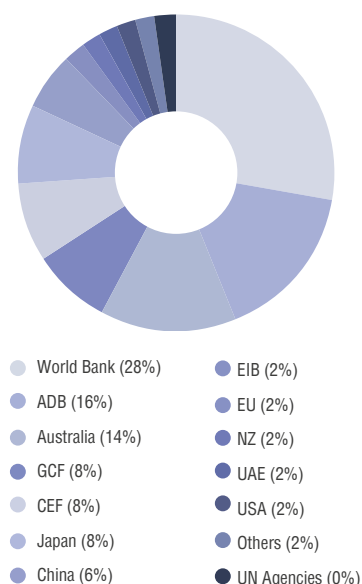


Figure 67 Key Bilateral and Multilateral Sources for Climate Change-Related Funding to Vanuatu (2014-2016)

External Climate Change Funding in Vanuatu

Vanuatu currently receives climate change funding primarily as grants, concessional loans and technical support. These funds and assistance are either channelled through the Government financial system that can be tracked or provided directly to the beneficiaries through an implementing organization which is, without the proper reporting mechanism, outside the Government of Vanuatu's purview. Additionally, the risks associated with these modalities (also common to other PICs), include double counting of climate change funding by source donors, intermediaries and on-ground implementing agencies. Many community groups, NGOs and private sector organisations, including some donors will continue to prefer direct access to funding, recognising the bureaucratic processes of government financial systems. This is unavoidable but important to ensure that reporting of such support feeds to the national budget planning processes. Lack of a common definition and understanding of climate change finance constitutes major concern of what counts and what should be reported. As a result, the format and level of detail presented to the Government of Vanuatu is different, making it more challenging to find consistency.

Accessed Climate Change Funding

Around 78 climate change-related projects with clear national allocations to Vanuatu were considered for the period 2014 to present from a range of sources, including the 2014-2016 Annual Budget Estimates, Aid Coordination Unit and project information from development partners. Regional projects with unclear national allocations for Vanuatu were not counted. Until 2016, approximately 21.4 billion Vatu (~USD200 million) was approved for climate change-related activities in Vanuatu from a wide range of sources.

It is important to underscore that there are a number of large multi-million resilient infrastructure projects, which may inflate the reported figures. Also, it is not clear how much of these approved funds have actually been disbursed to Vanuatu or expended. It was also noted that the funds accessed were largely in the form of grants and aid-in-kind (88%) and concessional loans (12%). Vanuatu's experience is unique from other PICs because there is a large focus on concessional loans.

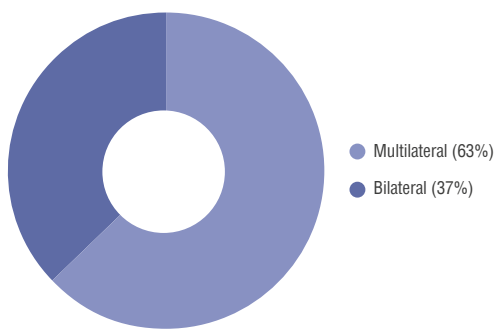


Figure 68 Bilateral versus Multilateral Breakdown (2014-2016)

Adaptation and Mitigation

Climate change is likely to impact all sectors in Vanuatu, including agriculture, water, coastal and marine resources, infrastructure and tourism. Of the climate change finance accessed during 2014-2016, 89 per cent has been for climate change adaptation activities while 9 per cent was for mitigation activities. The other 2 per cent was related to disaster risk reduction and supporting mechanisms for mitigation and adaptation, such as capacity development, institutional and systems strengthening and governance.

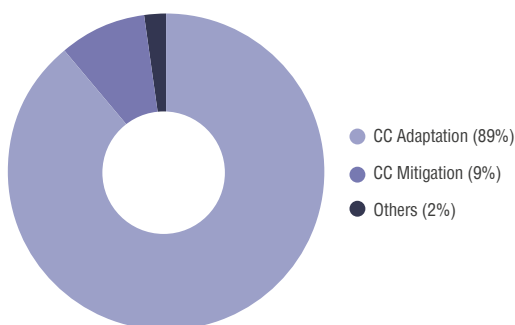


Figure 69 Breakdown of Climate Change Adaptation and Mitigation Funding Based on the 78 Projects (2014-2016)

This is in line with Vanuatu's priority where adaptation is the immediate issue. Adaptation expenditure is high because of the large capital infrastructure projects that focus on port development, road infrastructures, sustained livelihoods and increased food security.

Although a large share of funding has been for adaptation activities, Vanuatu has continued its efforts in the reduction of greenhouse emissions through renewable energy, energy efficiency and conservation. The Vanuatu National Energy Roadmap 2016-2030 implemented by the Department of Energy has provided a strategic direction on energy, including climate change mitigation through increased

use of renewable and geothermal energy and promoting sustainable uses of land and forests. The NDC target of Vanuatu also focuses on renewable energy and the cost for implementing the conditional NDC targets is at least USD400 million.

Sectoral Funding

Sectoral funding was aligned to the key sectors in the Peoples Plan 2030. A large share of climate change financing has been focused on infrastructure (56%). This is due to TC Pam recovery programmes and investment in major roads and wharves improvement works. Sectors, such as environment, which include agriculture, water resources management, biodiversity, conservation (27%) and energy (8%) received a fair share of financing, while the tourism, social, energy, health, education, forestry, governance and ICT sectors received between 1 per cent and 3 per cent of the total funding.

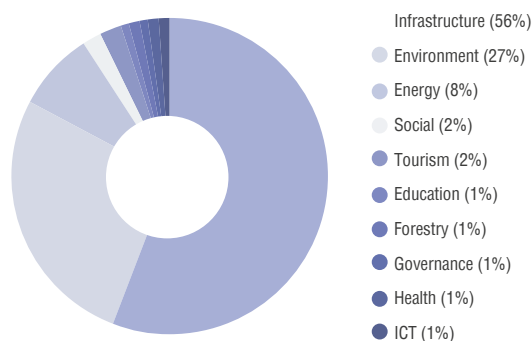


Figure 70 Climate Change Sectoral Funding (2014-2016)

Domestic Climate Change Funding

The objective of the CCDRR Policy 2016-2030 in relation to finance is to ensure that adequate resourcing is available for climate change and disaster risk reduction activities, build financial capacity to manage resources and enable access to increased international funding. It is also expected that robust financial systems are in place and operating effectively for Vanuatu to gain access and ensure accountability in managing climate change and disaster risk reduction funding. These objectives could only be effectively achieved with commitment from all levels of Government and stakeholders, and with the support of development partners and donors.

The establishment of NAB is critical and a key component in the governance of climate change finance where it is responsible for policy formulation and advice to the Government of Vanuatu on climate change and disaster risk-related matters. Its role also includes facilitation and endorsing new Disaster Risk Reduction (DRR) and CC initiatives, projects and programs and coordinating the development of national climate change finance processes.

More recently, the Global Green Growth Institute (GGGI) and the Government of Vanuatu embarked on a joint initiative aimed at accelerating financial flows to increase electricity access in off-grid areas, renewable energy and energy efficiency investments in furtherance of the country's NDC under the Paris Agreement. In June 2016, the Vanuatu Council of Ministers formally approved the National Green Energy Fund's design and overall structure, including the establishment of a task force. The National Green Energy Fund (NGEF) Task Force comprises the Prime Minister's Office, the Ministry of Climate Change Adaptation, Ministry of Finance and Economic Management and the Ministry of Internal Affairs with GGGI acting as the Government advisor, providing support on fund design and technical aspects.

5.2 Climate Finance and Development Effectiveness in Vanuatu

Climate change and disaster are cross-cutting development issues that have the potential to reverse years of development gains. One single climate-induced disaster can undo decades of progress – for instance, Cyclone Evan in Samoa in 2012 was estimated to have cost 30 per cent of Samoa's GDP. Damages from Cyclone Pam in 2015 cost Vanuatu around 64 per cent of GDP, and the costs of damage from Cyclone Winston in Fiji in 2016 was estimated close to FJD2 billion (20 per cent of GDP). Therefore, for Small Island Developing States, it is very difficult to differentiate climate change finance from financing for development.

With the expected increase in the amount of international climate change finance that will flow to the region, development effectiveness will be very critical to ensure the expected impacts and outcomes are achieved.

Global frameworks, such as the Paris Declaration, Accra

Agenda for Action, and Busan Partnership for Effective Development Cooperation, guide efforts to improve development effectiveness at the global level. At the regional level, external development support should be aligned to the Framework for Pacific Regionalism (FPR), SAMOA Pathway, Framework for Resilient Development in the Pacific (FRDP), Pacific Principles on Aid Effectiveness and Cairns Compact on Strengthening Development Coordination in the Pacific (Forum Compact).

Positioning and Linkages

Development support for climate change can only be sustained and absorbed if the assistance is aligned and harmonised to national priorities and systems. In Vanuatu, it means aligning climate change support to the pillars of the NSDP and the national CCDRR Policy.

In Vanuatu, donors such as the European Union had previously provided budget support for climate change. Vanuatu's National Indicative Programme for the EDF11 is on rural development. Australia and New Zealand deliver their bilateral support to Vanuatu on a programmatic grants basis. French support to Vanuatu is now mostly facilitated through the European Union. Japan and China still prefer project-based approach. Unlike other PICs, Vanuatu is accessing a significant amount of funding relevant to climate change objectives as loans and concessional loans.

Due to the range of different modalities of development support, coordination will be critical to ensure that all development support, whether it uses country systems or not, are tracked and reported. It is noted that 58 per cent of climate change funds accessed by Vanuatu between 2014 to 2016 is outside of the direct purview of the national budget (off-budget). Therefore, tracking and reporting on all development support is important to aid further maintenance or sustainability of project pilot activities. The climate change funds being accessed by Vanuatu are primarily project-based and some loans. This means that the Government of Vanuatu must remain flexible and not limit its options on the kind of instruments that it can access for climate change. Building the capacity of government officials to write project proposals will be vital. There is currently no formal donor-to-donor coordination mechanism in Vanuatu where donors can share information and status updates and lessons learnt on projects. However, Head of Missions meet regularly but

informally. Sectoral groups, such as education, meet on a regular basis. Having a formal donor-to-donor coordination meeting (including discussions on climate change issues) on a monthly or two-monthly basis will be beneficial. This will be an opportunity for sharing lessons learnt/ status updates to promote coherence and joint work programs, including with non-traditional partners and emerging players. At the regional level, a similar coordination mechanism for climate change that exists for donors and regional organisations based in Suva, Fiji is the Development Partners on Climate Change (DPCC).

Accountability

The Government ensures that there is accountability for all external support received and tax-payers' money. Similarly, donors place a lot of value in ensuring funds provided to the Government achieve expected results. The launching of the NSDP M&E Framework by DSPPAC is a key step in addressing this. This will be complemented by the ministry corporate plans, annual reporting and six-monthly M&E reporting to DSPPAC for the Annual Development Report. While the NSDP sets out the key indicators and targets, a possible challenge that the Government might face in terms of mobilising resources to implement the NSDP priorities is the lack of costing for both the NSDP and the M&E framework.

There is need to enhance the M&E capacity of DSPPAC and line ministries to be able to measure, process and report on the tangible impacts and outcomes of all CCDRM support on the communities, environment, culture and infrastructure. Currently, partners engaging with the Government of Vanuatu do not report through the same entry point. Although the Ministry of Foreign Affairs is the mandated political focal point for all external partners wishing to engage with Vanuatu, there is evidence that some projects and partners are by-passing that requirement and are contacting line ministries directly for mission requests and approvals. To support the Government to effectively coordinate country missions, donors, projects and regional organisations should channel all entry requests to the Ministry of Foreign Affairs instead of making direct requests to ministries or technical focal points. Similarly, national technical focal points for international frameworks and multilateral mechanisms should always channel official communication from the Government to partners through the Ministry of Foreign Affairs. The Government should enforce a "no mission period" during the critical months for budget planning and preparation.

Private Sector and Civil Society

Private sector and civil society play a key role in supporting development effectiveness in Vanuatu.

In terms of private sector, there is a lot of interest from the private sector to engage in climate change financing investment, including access to the Green Climate Fund Private Sector Facility. However, there is still a lot of confusion and sense of frustration in understanding the procedures for access. The Ministry of Climate Change Adaptation, in particular the GCF National Designated Authority (using the TA support provided by Commonwealth Secretariat and the GCF readiness grant), will need to proactively engage with the private sector stakeholders/ entities to raise awareness on access procedures for the GCF Private Sector Facility.

However, Vanuatu has made some recent progress in strengthening the public-private partnership arrangements. The Government has signed a Memorandum of Understanding with the Vanuatu Chamber of Commerce, and a Vanuatu Disaster Resilience Business Committee was also launched. Vanuatu and Fiji are currently the only two PICs that have established national disaster resilience business councils or committees, which link to a Pacific Disaster Resilience Business Network. The recent private sector mapping is also a useful exercise to identify specific gaps.

In terms of civil society engagement, the Vanuatu Association of NGOs (VANGO) is the mandated member of the NAB. However, VANGO is inactive due to resourcing issues and thus cannot effectively undertake this role. This is a common challenge faced in other PICs where the umbrella NGO body is inactive to coordinate NGO efforts.

NGOs have well established networks in the communities across Vanuatu. The Government should support NGOs to build community readiness and awareness for climate change financing. Another issue is that during TC Pam, a considerable amount of support was channelled directly through international NGOs. Most of those funds are now exhausted and some NGOs are scaling down on their staffing and activities. Sustaining these activities might be a challenge since Government was not a partner in some of these undertakings. NGOs reporting to both the DSPPAC and NAB would help to address this.

5.3 Financial Support Received

Table 42 Vanuatu Climate Change and Disaster Risk Reduction Funding Received

PROJECT TITLE	Type of Project	Funding Source	Total Funding	Implementing Agency	Project Duration
1 Vanuatu Community Resilience Project	Community Awareness Disaster Response	VCC			2012-2015
2 Vegetation and land cover mapping and improving food security for building resilience to a changing climate in Pacific island communities	Pilot / Trial / Demonstration Project Community Awareness Research	SPC	4.0 million USD	GIZ	2013-2015
3 Marine and Coastal Biodiversity Management in Pacific Island Countries (MACBIO) Project	Advisory services, capacity building				
4 Mangrove Rehabilitation for Sustainably Managed Healthy Forests (MARSH) Project	Training, Sustainable Management, Pilots	USAID	TOTAL: USD 7,500,000 (for PNG, Solo Is and Vanuatu) Vanuatu: 2,500,000	International Union For the Conservation of Nature and Natural Resources (IUCN)	5 years (October 2012 to September 2017)
5 CARE Climate Change Adaptation Project focusing on Food Security					
6 Pacific Adaptation to Climate Change Project	Pilot / Trial / Demonstration Project	GEF	712,637 USD	SPREP, UNDP	2013-2015
7 WISE REDD Project	Formal Education Program, policy support	USAID	200,000USD	Conservation International and Live & Learn Vanuatu	2013-2016
8 EDF10 ACP-EU Project: Building Safety & Resilience in the Pacific	Disaster Response, planning and governance	European Union EDF10 ACP - EU	1350000 EURO	SPC	2013-2017
9 Nambawan Vanuatu REDD Project		Private Equity (possibly CDM Bazaar loan)	500,000 USD	REDD+ Implementation	2014
10 Adaptation Costs and Benefits Scenarios	Planning and Governance, Research	Australian Aid - Pacific Australia Climate Change Science and Adaptation Planning (PACCSAP) Program	A\$98,862.50 (incl GST)	AECOM Pacific Australia Climate Change Science and Adaptation Planning (PACCSAP) Program	2014
11 Climate Zone National Competition 2014				Ministry of Education	2014
12 Pacific Islands Coastal Community Adaptation Project (C-CAP)	Community Awareness Disaster Response Planning and Governance Policy Support	United States Agency for International Development	US\$1,4,460,224	PMU	2012-2014
13 Enhanced Climate Change Resiliency of Food Production Systems in Selected Pacific Island Countries	Planning and Governance Community Awareness	SPC/USAID		PMU	2013
14 Strengthening Vanuatu's International Climate Change Negotiating Capacity	Capacity building	Oxfam, GIZ	10,489,000 VUV	PMU	2013
15 Sharing Perceptions of Adaptation, Resilience and Climate Knowledge (SPARCK)	Research, Community Awareness, Vulnerability Assessment, Educational Capacity Building	UNESCO Science Council		UNESCO Apidae Development Innovations	2015
16 Using mobile phones to improve climate change project monitoring and evaluation in the Pacific	Research, pilot	University of Melbourne	AUD\$24700	University of Melbourne	2013

17	CCIA – Climate Change Awareness Initiative – high school students promoting the science and impacts of climate change through media projects	Research, Media Production, Community Awareness, Educational Capacity Building, Mentoring	Pacific Media Assistance Scheme (PACWAS), an AusAID funded regional media program; funding coordinated via: Australian Broadcasting Corporation (ABC)	\$143,000 AUD over four countries in the Pacific.	Apidae Development Innovations	2013-2015
18	Tourism Component- SPC-GIZ Coping With Climate Change in the Pacific Island Region	Institutional strengthening; Mainstreaming; Pilot Testing of Adaptation	German Government- BMZ	\$150,000AUD	PMU	2012-2014
19	Natural Solutions to Climate Change in Pacific Islands Region: Implementing Ecosystem-based Adaptation	Community Awareness Planning and Governance Policy Formulation and Integration Policy Support	International Climate Initiative (German Government)	Vanuatu component Euros 2,150,000	Secretariat of the Pacific Regional Environment Programme in collaboration with the SPC-GIZ Coping with Climate Change in the Pacific Island Region Program (CCCPIR)	2014-2019
20	LIDAR Survey of Aneityum for sustainable traditional agriculture, food security and monitoring of environmental change	Survey and Mapping Research to assess environmental change	To be secured after NAB approval	12,800,000 vatu	Ministry of Climate Change Adaptation, Meteorology, Geo-Hazards, Environment and Energy and Vanuatu Cultural Centre (VKS)	1 year
21	Global Climate Change Alliance – Vanuatu Project (GCCA-V)					
22	Vanuatu Infrastructure Reconstruction and Improvement Project	Capacity Building Disaster Response Field Implementation	International Development Association Crisis Response Window	US\$25 million credit and US\$25 million grant	Ministry of Infrastructure and Public Utilities	Jun-2016 – April 2022
23	Critical Ecosystem Partnership Fund	Funding - Small Grants				
24	Mangrove Ecosystems for Climate Change Adaptation & Livelihoods (MESCAL) Project	Capacity Building Community Awareness Field Implementation Knowledge Communication	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) under its International Climate Initiative.		IUCN	Dec-2009-Dec 2013
25	Adapting to Climate Change and Sustainable Energy (ACSE) EU-GIZ Project Primary Groups	Field Implementation Pilot / Trial / Demonstration Project	European Union (EU)	*	Implemented by fifteen PACPs with a partner entity of their choice. Implemented through on-the-ground projects on climate change adaptation (CCA) and sustainable energy (SE).	Apr-2014-June 2019
26	NARI Agriculture Project		EU	Euro 10, 000	Department of Agriculture	Jan-2013-Jan 2016
27	Pacific Resilience Program	Field Implementation Planning and Governance Policy Formulation and Integration Policy Support		US\$45	Secretariat of the Pacific Community (SPC)	15-Jun
28	South Pentecost - Ecosystems Based Adaptation	Community Awareness Informal Training Courses	ADB	US\$149,707	Live and Learn Vanuatu	
29	Yumi Redi- Everyone is prepared	Capacity Building Community Awareness Disaster Response	EU	1200000	Save The Children Red Cross Care Oxfam	Jul-2015-Dec 2016
30	Pacific Risk Resilience Programme (PRRP)	Community Awareness Planning and Governance Research	Australian Aid	US\$4,000,000	VMGD / UNDP / Live & Learn	Jan-2013-Jun 2016

* Component 1: the EU-GIZ Adapting to Climate Change and Sustainable Energy Component (18.64 million Euros) which is administered by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ); Component 2: the Energy Catalytic Component (10 million Euros) which is jointly managed by the EU with the Asian Development Bank (ADB) and New Zealand in selected PACPs; and Component 3: the Technical and Vocational Education and Training (TVET) Component on sustainable energy and climate change adaptation (6.1 million Euros) which is jointly managed by the EU with the Secretariat of the Pacific Community (SPC) in partnership with the University of the South Pacific.

31	Testing and modeling preventative measures to limit the spread and ecological impact of invasive species in Small Islands Developing States (SIDS)	Pilot	European Union	The project will be implemented with communities in partnership with Government departments.	Dec-2011-Nov 2016
32	USP/EU GCCA Climate Change Adaptation Project	Capacity Building Community Awareness Disaster Response Field Implementation Informal Training Courses Knowledge Communication Pilot / Trial / Demonstration Project Research	European Union	8 million Euros	Jan-2011-Aug 2017
33	ACP-EU Building Safety and Resilience in the Pacific	Capacity Building Community Awareness Disaster Response	European Union	19367000	55 months effective from 5 th September 2013.
34	GPOBA Grid Based Electricity Access Project	Planning and Governance Policy Support	World Bank	4.9 million USD	Aug-2015-Aug 2018
35	Vanuatu Ecosystems & Adaptation Project	Adaptation; full project	GCF	30million (USD)	5 years
36	UN Habitat City Resilience Profiling	Research, Planning, Capacity Building	EU and UN Habitat	Inception phase: US\$100,000 Indicative Implementation budget: US\$600,000	Inception 6 months with a view for 24 months implementation
37	Localising Global Climate Change Policies in Vanuatu: reception of knowledge and cultural transformations	[Educational, Training, Infrastructure, Research, Pilots....] Research	German Research Foundation (DFG)	326.298 Euro	05/07/2016 to 04/07/2019
38	Enhancing Early Warning Systems to build greater resilience to hydrometeorological hazards in the Pacific SIDS (Fiji, Papua New Guinea, Solomon Islands, Timor-Leste and Vanuatu)	strengthening hazard monitoring infrastructure, Strengthening community-based preparedness	GCF	*	2017-2022
39	Mainstreaming Disaster Risk Reduction	Institutional strengthening; Technology investment and transfer; Training; Community capacity building	Government of Japan- Policy and Human Resource Development Trust Fund (PHRD)	US\$2.728.000	2013-2015 (3 years / 3 ans)
40	EU-GIZ Adapting to Climate Change and Sustainable - Energy Component	Pilot, Institutional strengthening; Technology investment and transfer; Training; Community capacity building	10th European Development Fund (EDF 10)	**	Apr-2016-Dec 2018
41	Coastal Cities Resilience (Luganville) Project	[Educational, Training, Infrastructure, Research, Pilots....]	US AID/OFDA	US\$387,558	Dec-2016-May 2018

* The Project total amount for all five countries will be between USD 10 million and USD 50 million. The estimate of costs for the main components is under-way. Estimate for Vanuatu will be provided at a later stage.

** Component 1: the EU-GIZ Adapting to Climate Change and Sustainable Energy Component (18.64 million Euros), Component 2: the Energy Catalytic Component (10 million Euros), Component 3: the Technical and Vocational Education and Training (TVET) Component on sustainable energy and climate change adaptation (6.1 million

42	Adaptation to Climate Change in the Coastal Zone in Vanuatu	Capacity Building Community Awareness Knowledge Communication Planning and Governance Policy Support	GEF Least Developed Countries Fund (LDCF)	30897253	Ministry of Climate Change Department of Environmental Protection and Conservation Ministry of Lands and Natural Resources United Nations Development Programme	Jan-2007- Dec 2017
43	Vanuatu Cross Cutting Capacity Development Project		GCF	US\$550,000	Department of Environmental Protection and Conservation	Jan-2017-Dec 2017
44	Coping with Climate Change in the Pacific Island Region - CCCPIR (SPC-GIZ)	Capacity Building, Community Awareness, Disaster Response, Formal Education Program, Informal Training Courses, Knowledge Communication, Pilot / Trial / Demonstration Project, Planning and Governance, Policy Formulation and, Integration, Policy Support	German Federal Ministry for Economic Cooperation and Development (BMZ)	US\$3,491,650	Secretariat of the Pacific Community (SPC) & Secretariat of the Pacific Regional Environment Programme (SPREP)	Jan-2009-June 2019
45	Climate Change Finance Readiness for the Pacific	(Educational, Training, Infrastructure, Research, Pilots....) Capacity development, training, policy and strategy development, project proposal development	Australian Department of Foreign Affairs and Trade (DFAT)	US\$1,700,000	Deutsche Gesellschaft für technische Zusammenarbeit (GIZ) GmbH (German technical cooperation) Pacific Islands Forum Secretariat (PIFS) Collaborating closely with: Pacific Financial Technical Assistance Centre (PFTAC) Pacific Community (SPC)	Jan-2016-Dec 2018
46	Cloud Nasara - Pacific Climate Animation Project	Community Awareness Pilot / Trial / Demonstration Project	Australian Department of Foreign Affairs and Trade (DFAT)		Red Cross/Red Crescent Climate Centre Vanuatu Meteorology and Geo-hazards Department GIZ	Aug-2012-Sept 2013
47	Vanuatu Rural Electrification Project (VREP)		MFAT	US\$18,870,000	Department of Energy	Jan-2012-Mar 2018
48	Barrier Removal for Achieving the National Energy Road Map Targets of Vanuatu (BRANTV)	Capacity Building, Community Awareness, Field Implementation, Informal Training Courses, Pilot / Trial / Demonstration Project, Planning and Governance, Policy Formulation and Integration, Policy Support	GEF Least Developed Countries Fund (LDCF)	US\$2,639,726	Vanuatu Ministry of Climate Change and Natural Disaster (Department of Energy)	Aug-2017-Aug 2022
49	Yumi stap redi long klaemet, jenis - Vanuatu NGO Climate Change Adaptation Consortium Program	Community Awareness	DFAT		Vanuatu Red Cross Society	Jul-2012-Dec 2014
50	YUMI REDI 2: Disaster Risk Reduction	Community Awareness	DFAT		CARE International	41548
51	Together, Becoming Resilient	Community Awareness Planning and Governance	USAID		Vanuatu Red Cross Society	Jul-2014-Jaan 2016
52	Pacific CLIM project	Pilot / Trial / Demonstration Project	DFAT (Department of Foreign Affairs and Trade - Australian Government	AUD 1.94 million	Griffith University and SPREP (piloting in three countries: Vanuatu, Fiji and Tonga)	March 2014 - June 2016 (28 months)
53	Increasing Resilience to Climate Change and Natural Hazards in Vanuatu (IRCCNH)	Funding small grants, pilot/Trail/ Demonstration, planning and governance, Policy support, Training, Community awareness and capacity building.	Global Environment Facility (GEF), The European Union (EU), Africa and Caribbean Pacific (ACP) Natural Disaster Risk Reduction and Recovery (NDRR) Program.	US\$11,520,000	Vanuatu Meteorology and Geo-hazards Department (VMGD)	Jun 2013-Dec 2018

54	Low Emission Capacity Building Programme Phase II (LECB II) or NDC program	Pilot / Trial / Demonstration Project Policy Formulation and Integration Policy Support	GEF SGP	USD 5959000 and additional amount of USD 304,500 from Climate Action Enhancement Package (CAEP)	Ministry of Climate Change	Jan-2017-Nov 2020
55	Pacific Climate Change Collaboration Influencing and Learning (PACCCIL) Project	Capacity Building Community Awareness Policy Formulation and Integration Policy Support Research	Australian Aid	US\$1,894,298	Oxiam Vanuatu	Jul-2018-June 2022
56	Vanuatu Coastal Adaptation Project (VCAP)	Capacity building, communication and awareness, community based approach, EIA, infrastructure, mainstreaming, monitoring and vulnerability assessments	LDCF (GEF), Government, UNDP & Other	USD 30,897,253	Department of Climate Change / UNDP	5 years (July 2014 - June 2018)
57	ICLIM 1 Project	Climate Change data and information management	DFAT (Department of Foreign Affairs and Trade – Australian Government	AUD 1.94 million	Griffith University and SPREP (piloting in three countries; Vanuatu, Fiji and Tonga	March 2014 – June 2016, 28 months
58	Solar and Bio-Solar electrification of Vanuatu with the implementation of a sector-specific Climate Early Warning System 'Dashboard'	Infrastructure and the implementation of the first Climate Early Warning System (CLEWS) for Vanuatu	EU-GIZ Adapting to Climate Change and Sustainable Energy (ACSE) Programme	880,000 Euros	Department of Energy, Department of Livestock, VMGD	36 Months
59	Building Resilience of Health Systems in Pacific Island LDCs to Climate Change		LDCF through UNDP	4-5 million USD	WHO/UNDP - Donor Agency (Technical Agencies), MoH and MCC - implementing agencies	5 Years
60	Mainstreaming global environmental priorities into national policies and programmes (CB2) / Cross Cutting Capacity Development (CCCD)	Mainly Strengthening capacity at national level in meeting international obligations stated in the global treaties of which Vanuatu has ratified.	GEF	550,000USD	UNDP/Vanuatu Government (DEPC)	3-4 years
61	Implementation of the RESCCUE Project in Vanuatu	Build Resilience of Ecosystems and Societies to Climate Change	French Development Agency (AFD) and the French Global Environment Facility (FFEM)	Euro 709,500	Coordinated by the Secretariat of the Pacific Community. Implemented by Opus International Consultants (New Zealand) Ltd and a number of local and regional partners.	October 2015 - September 2018
62	Pacific Partnership on Ocean Acidification (PPOA)	Pilot sites, capacity building, national and local governance	NZ Ministry of Foreign Affairs and Trade, and the Principality of Monaco Ministry of Foreign Affairs	NZD\$1.8 mil + €180,000, divided between regional and national objectives. There should be ~NZD\$250,000 for work in Vanuatu.	SPREP in partnership with the SPC and the USP	July 2015 - June 2019
63	Pacific Risk Tool for Resilience (Partner) Project	The project is more a type of pilot project to build the capacity at regional, national down to provincial to be able to understand and use the risk scope tools	MFAT Funding	NZD 2.4mil. FUNDING FOR VANUATU: NZD 98,400	VMGD and NDMO lead – collaboration with SPC-GSD, GNS Science, SAMOA, NDMO and NIWA	3 years
64	Climate Information Services for Resilient Development in Vanuatu	Adaptation;	GEF (USD 22 million), Other (USD 3.6820 million)	USD 26.635 million	SPREP, VMGD	2017 - 2021

65	Vanuatu GCF Readiness Program	Institutional Strengthening	GCF	USD 226,000	NAB Secretariat, GIZ	Jan 2017 - Jun 2018
66	Readiness Support for The Development of the National Green Energy Fund	Feasibility Study	National Green Energy Fund	USD 296,000	Department of Energy, NGEF Taskforce	2016 - 2018
67	Disaster Resilience for Pacific SIDS (RESPAC)	Early warning systems, preparedness	UNDP/Russia	USD 7,500,000 Vanuatu: USD 535,714	UNDP Pacific Office	3 years (June 2016 - December 2019)
68	USAID Institutional Strengthening for Pacific Island countries to Adapt to Climate Change (ISACC) Project	Policy strengthening/development, capacity building and training, peer to peer exchange	USAID (United States Agency for International Development)	USD5million	Pacific Community (SPC), Secretariat of the Pacific Regional Environment Programme (SPREP), Pacific Islands Forum Secretariat (PIFS)	Sept 2015 - Sept 2020
69	Vanuatu Green Energy Project	Capacity Building, Field implementation, Other	GCF (USD 40million)/Peats/PCSL	40 million (USD)	Pacific Carbon Syndicate LTD	5 years
70	Vanuatu National Community-based Climate Change Adaptation Project	Capacity building, Community awareness, Field implementation, informal training course, Knowledge communication, planning and governance	GCF	30 million (USD)	Save the Children	2019-2026
71	Climate Resilient Islands Programme (CRIP)	Ecosystems, livelihoods, DRR, Knowledge & Learning and water	MFAT Funding	170,280,841.74 VUV	Live & Learn Vanuatu	4 years
72	Reducing the Environmental Impacts of Displacement in the Pacific	Disaster Risk Reduction	UNEP	70,000 (USD)	IOM	8 Months
73	Pacific Adaptation to Climate Change and Resilience Building Project	scale up adaptation/Ecosystem-Based Adaptation (EBA) pilots	EU	32,200,000vvt increased to 45,000,000vvt	MoCC	2020-2022
74	SPC Additional Funding Proposal to PACRES Project	Adaptation	EU	12 million Vatu	MoCC	2020-2022
75	Together, Becoming Resilient	Community awareness	USAID	US \$500,000	Vanuatu Red Cross Society	2010-2015
76	WISE REDD Project	Forestry Mitigation	United States of America Department of State (Conservation International)	US \$200,000	Live and Learn; Forestry	2013-2016
77	Building Safety & Resilience in the Pacific	Adaptation	EDF10 ACP-EU	US \$1.4 million	EU, SPC	2013-2017
78	Support Community Planning (SCP) Project : Mitigating the Impact of Disasters by Coping with Water Challenges	Adaptation	OFDA / USAID	US \$550,000	French Red Cross (FRC) / Vanuatu Red Cross Society (VRCS)	2015-2018
79	Vanuatu Cultural Centre (VKS); Localizing Global Climate Change Policies in Vanuatu: reception of knowledge and cultural transformations	Capacity building , community awareness, field implementation, information training course, knowledge communication, planning and governance.	German Research Foundation (DFG)	US \$355,000	Institute of Social and Cultural Anthropology Ludwig-Maximilians-Universität München	2016-2019
80	Education, Economic Development, Gender & Protection, Shelter	Capacity building , community awareness, field implementation, information training course, knowledge communication, planning and governance.	The Australian Aid Program under the ANCP Gender Action Platform and ActionAid Australia's Arise Fund		Action Aid; Department of Women s Affairs	2017-2019
81	Institutional Strengthening for Pacific Island Countries to Adapt to Climate Change Project (ISAAC)	Adaptation	US AID	US \$5 million	SPC / SPREP	2015-2020
82	Technology Needs Assessment (TNA) project	Mitigation:	GEF (administered by UNEP)	USD 131 980	Ministry of Climate Change	2018-2020

83	International Youth Cooperation Project (IYP) or Pikinini i Redi long Disasta	Capacity building	Japanese Red Cross Society (JRCS)	US \$200,000	Vanuatu Red Cross Society	2017-2020
84	GCF Readiness and Preparatory Support Programme - Mobilizing the Vanuatu Private Sector Towards Climate Change Action	Cross-cutting	Green Climate Fund (GCF)	US \$350,000	Global Green Growth Institute (GGGI); Vanuatu Chamber of Commerce and Industry (VCCI); Vanuatu Business Resilience Council (VBRC)	2019-2020
85	Integrated Sustainable Land and Coastal Management (ISLCM) Project	Adaptation	GEF 5	US \$4.6 million	DEPC / FAO	2017-2021
86	Building Resilient Communities in Vanuatu (BRCV) Program	Adaptation	USAID Office for Foreign Disaster Assistance	\$ 500,000 USD	Vanuatu Red Cross Society	2018-2021
87	Disaster READY	Disaster Risk Reduction	DFAT	\$3.2M (5 Years)	Save the Children	2018-2022
88	Barrier Removal for Achieving the National Energy Road Map Targets of Vanuatu (BRANTV)	Disaster Risk Reduction	Global Environment Facility (GEF)	US \$2.6 million	Department of Climate Change / UNDP	2017-2022
89	Vanuatu Rural Electrification Project II (VREP II)	Mitigation	SPREP, New Zealand Government and World Bank IDA	US \$14.1 million	Department of Energy	2017-2022
90	UN Climate Resilience Initiative A2R: People with Disabilities (PWDs)	Gender	UNDP / US AID (Concept) / seek funding after concept	US \$30 - 40 million	UNDP / VSPD / MoJCS	2020-2024
91	Vanuatu Coastal Adaptation Project II (VCAP II)	Adaptation	GEF / LDCF	US \$12.5 million	Department of Climate Change / UNDP	2021-2026
92	Pacific Disaster Management Partnership (PDMP)	Disaster Risk Reduction	ARC	US \$500,000	Vanuatu Red Cross Society	-
93	Vanuatu Community-based Climate Resilience Project	Capacity building, community awareness, field implementation, information training course, knowledge communication, planning and governance.	GCF	30million	Save The Children Implementing Entities: Departments of Agriculture, Fisheries and Water; Provincial governments; Care; Oxfam; civil society organisations and local communities	2019-2026
94	Managing waste in Vanuatu Through circular economies and recycling solutions	Community awareness, knowledge communication, policy formulation and intergration, policy support	GCF	USD \$40,000,000	DEPC in conjunction with directly involved private-sector partners	
95	Enhancing Adaptation and Community Resilience by improving water security	Mitigation: Energy access and power generation Adaptation: Most vulnerable people and communities, Health and well-being, and food and water security, Infrastructure and built environment		USD 13,590,000	Department of Water Resources, Ministry of Works	2020-2045
96	Australian Humanitarian Program (AHP)	Disaster Risk Reduction	AHP (Through Oxfam in Vanuatu)	25,000,000	Wan Smolbag	2018-2022
97	South Pentecost - Ecosystems Based Adaptation	Community awareness, informal training courses	ADB	US\$149,707	Live & Learn	2017
98	WISE REDD Project	Widening Informed Stakeholder Capacity on REDD+	United States of America Department of State (Conservation International)	US \$200,000	Live & Learn	2016
99	YUMI STRONG	Awareness	AUSAID 5 Other 1	VT 34038693.53	CARE International	2011 - 2016
100	HPA DRB Innovation Fund	Awareness	AUSAID HPA FUNDING	VT 6084698.26	CARE International	2011 - 2017
101	EI Nimo ERF	Awareness	CARE INT SECRETARIAT	VT 4897988.28	CARE International	2011 - 2018
102	YUMI STRONG	Awareness	USAID	VT 53488546.22	CARE International	2011 - 2019
103	YUMI STRONG	Awareness	SAVE THE CHILDREN AUSTRALIA	VT 31144507.05	CARE International	2011 - 2020

104	El Nino ERF	Awariness	AUSAID HPA FUNDING	VT 21727084.64	CARE International	2011 - 2021
105	El Nino ERF	Awariness	OFDA THRU C/USA	VT 94744814.68	CARE International	2011 - 2022
106	HPA DRR Innovation Fund	Awariness	CARE UK	VT 603906.48	CARE International	2011 - 2023
107	VCAN	Advocacy/Civil Society strengthening	PACIFIC ISLANDS FORUM SECRETARIAT	VT 7282578.44	CARE International	10th July 2017 to 30th September 2018
108	DISASTER RISK REDUCTION AHP	Awariness	THE WHITELUM GROUP	VT 8180343.47	CARE International	2017-2019
109	CDCCC RESEARCH	CDCCC Research	WORLD VISION INTERNATIONAL	VT 4195909	CARE International	2017-2020
110	Disaster READY	Awariness	THE WHITELUM GROUP	VT 120799944.22	CARE International	2017-2021
111	CYCLONE PAM SCHOOL RECONSTRUCTION	Awariness	KRAMER AUSENCO (VANUATU)	VT 5442807.90	CARE International	2017-2022
112	CDAC NETWORK AND AN CARE INT PARTNERSHIP	Awariness	CDAC Network	VT 23749776.52	CARE International	2017-2023

5.4 Climate Finance Issues and Challenges for Vanuatu

Climate Financing Mechanism of the Convention

The fiduciary standards required for accreditation under the Adaptation Fund have been very strict and stringent. This has proven to be a great challenge for most developing country parties under the Kyoto Protocol in achieving NIE accreditation that promotes direct access to climate change adaptation funding under the Adaptation Fund. The Republic of Vanuatu is concerned that within the Asia-Pacific region, where only one NIE was accredited under the Adaptation Fund, the number of NIE will be very low.

Working towards meeting its obligations under the Adaptation Fund fiduciary standards, the Republic of Vanuatu insists on the difference of capabilities between Multinational Implementing Entities (MIEs) and NIEs, and therefore recommends that developing country parties under the Kyoto Protocol, and in particular the most vulnerable Parties such as the Pacific SIDS, be allowed more flexibility in meeting those standards. The Republic of Vanuatu suggests that the Parties consider adopting an approach of minimum principles to which potential NIEs must demonstrate equivalency.

Republic of Vanuatu suggests that the Adaptation Fund and other UNFCCC financing avenues provide funding in degrees to Non Annex I NIEs based on the level of achievement in meeting those standards. A gradual approach could be adopted to ensure that NIEs are proposed minimum principles and given support to improve their eligibility while enabling the country to start taking ownership of the funding and implementation of climate change projects. In this sense, Non Annex I NIEs could access smaller grants and work upwards until their capacity is built and the fiduciary standards fully met.

The Republic of Vanuatu recommends that more consideration be given to capacity building efforts of NIEs. Under this proposal, a system may be devised where an interim entity plays the role of the NIE if the national fiduciary requirements haven't been met yet, while simultaneously building the capacity of the NIE and ensuring that progress is made towards the NIE's accreditation leading to a swift

handover to national institutions. Within this note, the Republic of Vanuatu would like to bring the attention of Parties on the challenges faced by SIDS Governments in their efforts to stand as qualifying institutions. Due to small-sized governmental agencies and their inequality of capabilities, meeting the first fiduciary requirement of clear legal status and under one national umbrella seems unlikely in the SIDS. Consequently, the Republic of Vanuatu calls the UNFCCC Financial Mechanism to acknowledge the limitations of the Adaptation Fund fiduciary standards and discuss alternative financing avenues and requirements to promote direct access in the Financial Mechanisms of the Convention.

It is necessary that the Financial Mechanisms of the Convention demonstrate further efforts in enabling Non Annex I countries, in particular the SIDS with small Governments and spread out capabilities, to take direct ownership and control of the funding and implementation of climate change projects.

Multi-lateral, Bi-lateral and Domestic Funding issues

Vanuatu currently faces several challenges in regard to mobilizing climate finance. Access to climate finance is difficult because the different requirements of different sources are complex and cause duplication efforts. Traditionally, multilateral and bilateral financing intermediaries such as World Bank, UN Agencies and multilateral development banks (MDBs), have played an important role in distributing and channeling climate finance to Vanuatu. Direct access is limited by Vanuatu's inability to currently meet the strict fiduciary standards required by international funds.

Coordination of climate finance is also challenging due to the proliferation of climate finance mechanisms, and Vanuatu's developing NAB governance structures. Ensuring country ownership has been difficult. It is difficult for Vanuatu to monitor, report, and verify (MRV) climate finance, as well as to account for its effective and equitable use. Keeping track of climate finance has been particularly difficult for Vanuatu due to unclear attributions (dedicated climate funds (i.e. those that only invest in climate activities) and climate - relevant funds (i.e. where climate - relevant activities are part of the investment, even though they are not explicitly identified or labelled as mitigation or adaptation activities as such) are labelled as climate finance). Additionally, much

climate finance flows through civil society agencies without being officially reported through Government tracking processes. Use of different accounting practices also makes it difficult to adequately tracked by Government.

Making detailed climate finance investment plans is still challenging, as Vanuatu's climate policy frameworks only indicate broad finance goals, but not targets, what will be financed and how. There are gaps in national and sectoral policies and strategies that should direct the mobilization of climate resources. Vanuatu does not yet have a concrete climate investment pipeline. This is due in part to a lack of predictability of finance from various sources.

DSPPAC is the key entity in coordinating aid and development planning at the national level. The Department has an established process for capturing information on all development projects being implemented within Vanuatu. The current issue is that the NAB project approval process is seen as a duplication of the existing functions of DSPPAC. Going forward, it will be important for DSPPAC and NAB to align and harmonise their processes (particularly project profile/ project brief forms where possible) and ensure project information can be shared between the two entities where necessary.

Although the Paris Agreement on Climate Change recognises the special capacity constraints of small island developing states and least developed countries like Vanuatu, the access procedures to global climate funds are still cumbersome, costly and elusive. As the global commitment of mobilising USD100 billion per year draws near, Vanuatu will expect to see an influx in the number of partners that want to engage, thus coordination will be a key challenge. Without the right human capacity, Vanuatu will be faced with either not effectively accessing available funding opportunities, or face the risk of slow implementation of activities from funds accessed. This is a common challenge among many PICs, and is even more serious in the smaller island states of the Pacific. It is important to understand that limited capacity is often cited by donors as the main reason for not allocating greater volumes of assistance or delivering support through

a limited range of modalities.

Although there are challenges in providing staffing or operational budget for activities approved for the Ministry of Climate Change, the Ministry is adequately capacitated to access and manage international climate change finance. Currently, MoCC has a total staff of just over 100, including staff in the headquarter office in Port Vila and the provinces. A number of these positions are not permanent – either contracted or temporary. For the purpose of accessing, managing, evaluating and reporting on climate change finance, the Ministry will need to strengthen its capacity in coordination and information sharing (NAB Secretariat with DSPPAC/ Aid Coordination), monitoring and evaluation and project development expertise in the Project Management Unit (PMU). The key challenge is how to fully maximise and coordinate the range of technical expertise that sit in different line ministries.

A key challenge that provincial administrations in Vanuatu face is the limited technical capacity in grant writing for climate change funding. At the national level, it has proven to be a challenge to absorb project-funded staff at the end of projects due to competing priorities and limited financial resources. Apart from MCCA, there is not much dedicated human capacity in other ministries and departments to understand and engage in undertakings related to climate change finance. The same government officials are part of many other committees. Partners that engage with Vanuatu should seriously look at more sustainable and programmatic approaches to ensure that trained capacity and expertise is retained within Government. Vanuatu's unique context requires the utilisation of existing mechanisms and committees instead of establishing new ones, just for the sake of aligning with regional efforts or good practice in other countries. This requires Vanuatu to strategically engage and ensure that all future CCDRM projects have an integral component or focus on capacity building and transfer of knowledge, particularly if it involves external consultants.



Chapter 6

Constraints, Gaps, Technology and Capacity Building Needs

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Constraints, Gaps, Technology and Capacity Building Needs

Introduction

According to decision 2/CP.17, non-Annex I Parties should provide updated information on constraints and gaps, and related financial, technical, and capacity-building needs. Also, non-Annex I Parties should provide updated information on financial resources, technology transfer, capacity building, and technical support received from the Global Environment Facility.

With regard to the development and transfer of technology, non-Annex I Parties should provide information on technology needs, which must be nationally determined, and on technology support received.

Accordingly, this chapter seeks to provide a brief description of the constraints and gaps identified in previous national climate change communications. It will also identify newly arising constraints and gaps, and needed actions and resources required to overcome them.

6.1 Institutional Constraints and Gaps and Capacity Building Needs

Vanuatu is continuously striving to improve national GHG estimation and reporting to the UNFCCC. To achieve continuous improvement in national reporting, constraints, gaps, and related financial, technical, and capacity building, needs should be identified, and appropriate measures taken and implemented to address them.

In order to fulfil the obligations arising from the Cancun and Durban Conference of Parties (COP) decisions related to the submission of national communications and biennial update reports, further support is needed to continue to develop and consolidate existing technical and institutional capacities and to continue the efforts of integrating climate change into national policies, plans, and programs.

The Department of Climate Change (DoCC) has been established as part of the Government of Vanuatu's ongoing meaningful efforts of enhancing national resilience in the face of global climate change impacts. The department has been formed and mandated as per the 'Meteorology, Geological Hazards and Climate Change Act No.25 of 2016 (Climate Change Act)'.

The DoCC has developed a three-year Strategic Plan (SP) (2021-2023) in order to align Vanuatu's climate change priorities along with the activities of the newly established department. The strategic plan will be used by the DoCC as a guide for alignment of resources, programs and activities with national climate change priorities.

The DOCC's three year SP aligns with relevant national and regional policies/frameworks including: National Sustainable Development Plan (NSDP) 2016-2030; Climate Change and Disaster Risk Reduction Policy (CCDRR) 2016-2030; National Adaptation Plan of Action (NAPA), Nationally Determined Contributions (NDC) roadmap & Monitoring Reporting and Verification (MRV) framework; Regional Framework for Resilient Development in the Pacific (An Integrated Approach to Address Climate Change and Disaster Risk Management -FRDP) 2017-2030 and the global Sustainable Development Goals (SDGs). In addition, the SP should also demonstrate DoCC's contribution towards advancing Vanuatu's National Sustainable Development Plan (2016-2030) particularly in relation to the Environment Pillar 3: Climate & Disaster Resilience.

The objective of DoCC is to ensure high quality services are provided in relation to climate change (climate actions-mitigation, adaptation, cross-cutting and climate science); promote capacities of government, communities and organizations to understand and respond to risk arising from Climate Change; address the need of government, community and organizations and ensure that the government and public are informed of matters related to climate change.

Furthermore, the DoCC also acts as a nodal agency responsible for overseeing and implementing Climate Change Activities (mitigation, adaptation and cross-cutting), Monitoring Climate Finance, including Communication and awareness raising etc.

The following table consists of a list of issues, both strategic and operational including the strategic goals identified for DoCC.

Table 43 Vanuatu Department of Climate Change (DoCC) issues and goals

STRATEGIC ISSUES	STRATEGIC GOALS
Lack of mainstreaming climate change into sectoral plans	Mainstreaming Climate Change into sectoral plans, policies and budgets of relevant line ministries
Uncertain assessment of the effects of climate change and climate actions (mitigation and adaptation) within vanuatu.	Support and develop interventions (mitigation and adaptation) for realistic assessment of climatic change and climate action impacts
Untapped climate change mitigation and adaptation potentials.	Identify and implement potential climate change mitigation and adaptation actions including framework/roadmaps for implementation
Limited inflow of investment into the climate change (mitigation and adaptation) sectors	Explore and enhance opportunities for increasing level of climate finance for climate actions (mitigation, adaptation and cross cutting)
Lack of technical support (technical knowledge and expertise) available to stakeholders on climate change or climate change science.	Identify and implement actions to enhance the technical knowledge of stakeholders through focused interventions
Lack of data for monitoring and evaluation of climate change and its impacts including sdg benefits in vanuatu.	Implementation and strengthening of MRV system (for data collection, review, archiving, analysis and development of database) for climate actions and impacts (mitigation and adaptation) and SDG benefits
Low level of awareness among stakeholders (internal and external) within vanuatu and outside about the causes and implications of climate change and climate variability in vanuatu.	Awareness and capacity building programmes for stakeholders within Vanuatu on Climate Science, Variability and associated Climate Actions (Mitigation, Adaptation)
Improved communication with International community (Governments, organizations, development agencies/partners) on implication of climate change in Vanuatu and support needed	Change in observed mean
Low level of implementation of international climate change adaptation and mitigation obligations.	Identify the gaps and build capacities among the stakeholders to enhance implementation of international climate change obligations.
Lack of support to develop and implement appropriate educational resources and programmes on climate change topics.	Identify and provide support in introducing and strengthening climate change science into formal and informal education system in Vanuatu
Untapped traditional practices and knowledge relating to climate change mitigation/adaptation including weather and climate through the observation of weather indicators occurring in nature and by other means.	Provide support and explore opportunities from traditional practices and knowledge relating to climate change mitigation/adaptation and weather and climate
Limited research and development (r&d) activities within the department and outside on climate actions and climate science.	Identify potential collaborations and support R & D activities within the department and outside on climate actions and climate science.
Lack of information dissemination, knowledge sharing, decision support tools on climate change adaptation and mitigation and risk reduction strategy	Identify and provide support to explore and strengthen cooperation within the region and beyond on knowledge and information exchange. Enhance and strengthen ICT technologies for knowledge sharing

6.2 Green House Gas (GHG) Inventory Gaps, Constraints and Capacity Building Needs

Data collection and validation of the data is the key aspect of the GHG inventory process. The data collection procedure in Vanuatu is yet to be formalized, the newly

formed Department of Climate Change is formalizing the data collection process via suitable instruments e.g. legal contract, MoU, MoAs etc. The data collection procedure adopted for inventories was by office notifications issued by the Director General, Ministry of Climate Change to relevant ministries and department, identified organizations, public-private sector and institutions. The data collected and database repository, archives are maintained at the Department of Climate Change.

In Vanuatu, key uncertainties are associated with data availability, missing data, lack of comprehensive information, data archiving and lack of country specific emission factors. It is recognized that having country specific emission factors and more detailed activity data will help reduce uncertainty in future inventory. For example, in the energy sector there is good data available on fuel imports into the country but there is lack of information on end usage.

Similarly, for Land Use Change and national forest resources currently there is no national data available. The waste sector also lacks information on waste generation, characterization, composition, disposal and treatment. It can be concluded that with adequate training and capacity building on GHG inventory requirements, Vanuatu can provide more detailed and accurate information in subsequent GHG inventories.

Energy sector Gaps and Uncertainty

For the energy sector reference approach, there were uncertainties in the data from the Pacific Petroleum that need to be addressed in future reports as well as instituting some level of quality control and independent assurance of data integrity. No national energy balance available, further energy datasets available are fragmented with irregular data reporting.

For the sectoral approach, it is recognized that there are considerable gaps in information regarding sectoral usage in the energy sector that need to be addressed by obtaining data directly from the fuel supply companies. In addition, having two independent data sources would then lead to better data quality assurance and the ability to cross check quantities. In general uncertainties of around $\pm 51\%$ would not be unreasonable for the energy sector.

Agriculture Gaps and Uncertainty

Uncertainties in the agricultural sector are inherent due to the lack of detailed census data in livestock population, type of livestock, animal numbers, manure management practices. The uncertainties are suggested to be higher than the energy sector and amount to around $\pm 30\%$.

Forestry Sector gap and uncertainty

The forest cover area and removal of biomass are the key

data required for the forestry sector. Further, the uncertainty observed in Land Use Change, currently there is no national data available. The extent of the national forest resources is estimated based on reports and studies undertaken in the past and also crosschecked with FAO data.

Waste gaps and Uncertainties

Although there were a number of limitations in the data quality for the waste sector, the overall relatively low emissions from this sector made the final uncertainties not a large problem in terms of the total emissions profile for Vanuatu.

An inventory improvement plan (IIP) to reduce the uncertainties has been developed as part of the TNC which is envisaged to assist in more robust future GHG inventories of Vanuatu.

An independent third party review of NIR under the TNC was coordinated by the UNDP-UNEP Global Support Programme (GSP) as per the requirements indicated in the UNFCCC Decision 17/CP.8 Annex, the UNFCCC Decision 2/CP.17 Annex III, and to the advice of the IPCC Guidelines and Guidance indicated in these decisions for the preparation of the inventories to be included in the Second and Third National Communications and Biennial Update Reports from non-Annex I Parties under the UNFCCC. The review also takes into account the requirements and flexibilities established to prepare and report the inventory for Small Island Developing State (SIDS) and Least Developed Countries (LDC).

The Independent reviewer has also examined NIR's adherence to the guidance provided in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (hereinafter referred to as "2006 IPCC Guidelines"); additionally considered criteria and recommendations provided in other key methodological documents and tools related to the inventory process including IPCC, 2017; UNDP, 2005; US-EPA-USAID, 2011; UNFCCC-GCE, 2012; EEA, 2016, UNFCCC, 2014 and UNFCCC, 2017. The quality of the Vanuatu's GHG Inventory Report was also assessed through the examination of how the principles of transparency, consistency, comparability, completeness and accuracy (TCCCA) on reporting, established in the IPCC

Good Practice Guidance 2000 and 2003 and the 2006 IPCC Guidelines. Additionally, the independent reviewer also considered review of the NIRs for 1994 and 2000, 2005, 2010 included respectively in the first (NC1, 1999) and second national communications (NC2, 2016).

The main recommendations of QA/QC and review process was overall improvement in the quality of data collection, calculations, reporting and inclusion of the key criteria analysis, uncertainty estimates and subsequent improvements in the future GHG Inventory i.e. Inventory Improvement Plan (IIP).

6.3 GHG Mitigation Measures Gaps, Constraints and Capacity Building Needs

There are many barriers for effective mitigation options in Vanuatu, many of which are common to developing countries in general and some are country specific. The IPCC lists some common barriers including:

Capital

Access to capital is limited. The capital costs of renewable energy technologies are generally higher than those of conventional technologies. Also, owing to the risks perceived for new technologies, financing costs will tend to be higher.

Trade barriers

Although many countries are revising their trade policies in order to liberalise markets, substantial tariff barriers remain in many cases for imports of (emission reducing) foreign technologies including energy supply equipment.

Vested Interests

National interest groups such as powerful extraction and construction companies can influence technology choices in favour of conventional technologies.

Institutional and administrative difficulties

Such difficulties exist in terms of developing technology transfer contracts, which can be a necessity to qualify regional construction companies as potential partners of the entrepreneurship.

Regional Cooperation

There is a need for greater regional cooperation among developing countries, both in R&D work and in the international commercial contracting network.

Access to information

Developing countries have in general poor access to information. It is one thing to recognise that the information and technology desired are available but is quite another issue to gain access to them.

Differing needs

The needs of the developing countries are quite different to those of the developed countries. Developing countries are generally still focused on large capacities of cheap, reliable power with low technical risk, and have new technologies as a lower priority. In addition, most developing countries rate development as a higher priority than reducing emissions.

Economic incentives

Incentives for donors are weak mainly when energy demand is scarce and scattered. This barrier can be minimised by the additional potential value gained through JI/CDM schemes.

These barriers are discussed specifically in terms of the specific situation below:

Capital/Finance

The main barrier to mitigation options being realised in Vanuatu (and most developing countries) has been the slow progress of finance transfer from the international UN mitigation effort. To date there has been an emphasis on obtaining market finance and on market mechanisms to pay for mitigation options.

The current status of the Paris agreement (2015) is testament to the difficulty in assuming market forces will

provide the necessary money flows. Projections for the current global iNDCs indicate that some trillions of US\$ would be needed to be transferred to developing countries just to keep the temperature increase below 3.7 degrees. Unless this transfer eventuates, the action plans developed for mitigation are not likely to be actually acted upon and will continue to exist in paper format only.

To progress keeping the temperature increase below 2 degrees will require an even higher level of transfer and a real commitment on the part of the developed nations of the world and at the same time a real level of decrease in developed country emissions. Vanuatu has been fortunate in recent years in that there has been a good deal of aid and technical expertise made available from the multi-lateral, bi-lateral and other global climate finances sources.

Vested interests

These constitute a considerable barrier in several areas. One is in terms of data sharing. In the Vanuatu it has been difficult to extract sectoral and sub-sectoral data from the major stakeholders. Another is in the transport sector where the vehicle importing companies have considerable interest in increasing the number of vehicles. Finally, the vested interest of the private sector in growing the economy is often at odds with serious emissions reduction.

Institutional and administrative difficulties

Such in country difficulties can be serious obstacles to easy technology transfer. Also included here might be the difficulty in retaining qualified people in administrative positions in government.

Regional cooperation

This has generally not been a large problem in the Pacific as there are a number of regional organisations (SPC, SPREP etc.) fostering cooperation all with good intentions in assisting with climate change mitigation and adaptation.

Access to information

There appear to be difficulties, however, in country in terms of sharing information between government departments

in Vanuatu improvements could be looked into here.

Differing needs

The differing needs of all developing countries compared to the developed nations is a serious barrier globally to emissions reduction, a barrier that has played out at all of the major UN meetings designed to encourage countries to cooperate on emissions reductions. The issue is one of equity and of who has been responsible for past emissions. In almost all cases developing countries insist that climate change must be integrated with development not subservient to development.

Economic incentives

The problem of attracting aid transfers was covered in the lack of capital barrier but in addition there has been a problem of private sector participation in Vanuatu, particularly in terms of the on-grid electricity sector. There are of course other barriers including the lack of expertise in country to facilitate the realization of mitigation options, but these are largely also related to lack of finance due to a brain drain of experienced people from the country to greener pastures in terms of salaries. Government departments in particular have great difficulty retaining qualified staff due to relatively low salary levels. Training is obviously needed but unless such measures are accompanied by mechanisms to keep the trained staff, they are less likely to succeed.

6.3.1 MRV Capacity Building Needs

Domestic capacity building is an integral part of the Vanuatu's Integrated MRV tool development process. This is envisaged to be achieved through design and facilitation of a technical handholding and training on the established integrated MRV framework, database and tool. This include: development of appropriate training materials, modules including hands on exercises on the established national MRV framework, database and tool, physical/Virtual Class room training, Technical presentations and training materials/modules as appropriate, hands on technical training for stakeholders with relevant examples and exercises on the established national MRV framework, database and tool, train the stakeholders in addressing issues with data such as data gaps, inconsistencies including QA/QC.

6.4 Technology Needs Assessment

The United Nations Environment Programme (UNEP) is implementing the Technology Needs Assessment (TNA) project in Vanuatu through the UNEP DTU Partnership (UDP). Also, the University of South Pacific (USP) is providing technical support for the Pacific Countries.

The overall goal of the TNA process is to come up with select technologies that will enable Vanuatu “to achieve development equity and environmental sustainability, and to follow a low emissions and low vulnerability development path”.

Selection of TNA mitigation sectors which are: Energy and Waste-to-Energy sectors was an administrative decision by the National Advisory Board (NAB) to the Vanuatu Ministry of Climate Change and Adaptation and consistent with national efforts to chart a trajectory for green development and strengthen Vanuatu’s image of a responsible global citizen. In fact, the energy sector especially the electricity generation sub-sector, transport, livestock, Nitrous Oxide (N₂O) from agriculture soils and waste sectors feature consistently among the top five sources of carbon dioxide (CO₂) and methane (CH₄) emissions in the Vanuatu Third National Communication to the UNFCCC.

The National Advisory Board to the Vanuatu Ministry of Climate Change decides on the sector selection process during the consultation meeting that was organized by the TNA coordinator. The sectors were selected taking into consideration the Vanuatu energy policies such as the

Vanuatu National Energy Framework Policy (2015) and the Vanuatu Climate Change and Disaster Risk Reduction Policy (2015) and the trends of the sectors as shown on the above tables. The agreed sectors to be included in this TNA process after several of the consultation meetings with the NAB, the TWG and relevant stakeholders are;

1. Energy Sector and technology options includes;
 - Biodiesel/internal combustion technology
 - Blending Fossil with Biodiesel
 - Efficiency Wood Stove
 - Battery Electric Vehicle
 - Solar Electric Boat
2. Waste –to-Energy Sector and the technology options includes;
 - Mechanical Biological Treatment
 - Manure Based Biogas Digesters
 - Compact Biogas Digester for Urban Households
 - Anaerobic Digestion-Biogas Plant

Prioritized Mitigation Technology Needs in the Energy Sector

In the light of the mitigation options, the Government of Vanuatu has been actively developing a range of frameworks and plans to guide the country and its stakeholders, towards a low emissions development trajectory. The range of acts, policies, plans and strategies of relevance to deal with climate change threats were developed and enacted. The Vanuatu’s Nationally Determine Contribution (NDC) aims to achieve an ambitious mitigation contribution with a transitioning to close to 100% renewable energy in the

Table 44 Prioritized Mitigation Needs for Energy Sector

No.	Technologies	Climate Change Mitigation Benefits	Applicability and Potential
1	Biodiesel/Internal Combustion Technology	Reduction in GHG	Mainstreaming Climate Change into sectoral plans, policies and budgets of relevant line ministries
2	Blending Fossil with Biodiesel	Reduction in GHG	Support and develop interventions (mitigation and adaptation) for realistic assessment of climatic change and climate action impacts
3	Efficiency Wood Stove	Reduce GHG emissions by 210,000	Identify and implement potential climate change mitigation and adaptation actions including framework/roadmaps for implementation
4	Battery Electric Vehicle	GHG	Explore and enhance opportunities for increasing level of climate finance for climate actions (mitigation, adaptation and cross cutting)
5	Solar electric boat	Reduction in ghg	Identify and implement actions to enhance the technical knowledge of stakeholders through focused interventions

electricity sector by 2030. This contribution would reduce emissions in the energy sector by 72Gg by 2030. Emissions in this sector recorded around 130Gg in 2010 but are expected to rise to 240Gg by 2030 (3% per annum).

Prioritized Mitigation Technology Needs in the Waste Sector

The key source of methane emissions from solid waste management and disposal include emissions from anaerobic decomposition of waste disposed at Bouffa landfill site, Port Vila and Luganville solid waste disposal site. Solid waste disposal constitutes 41% of GHG emissions from waste sector in Vanuatu and is one of the major concerns for the country. The problem of solid waste disposal is particularly pronounced in the urban areas as the waste from rural areas is generally scattered and does not pose much hazard.

The sanitation system in Vanuatu is largely decentralized, consisting of private managed household and commercial septic tanks for the collection of human waste. These allow the decomposition of the waste but the process leaves sludge as a by-product. Periodically the residual sludge is removed by private service providers through tankers and disposed of at a designated site. Emissions from this sub-sector constitutes 59% of GHG emissions from the waste sector and are quite significant. GoV, with support from ADB is currently considering developing a sludge treatment facility at Port Vila.

Currently, waste disposal facilities within the municipal

centers do not possess or employ any form of technology for purposeful waste treatment. MSW deposited at officially designated dumpsites is allowed to build up and decay without any intervention. Waste that is not transferred to dumpsites but left on household premises is often burnt in pits, barrels, or open fires. It is proposed landfill technologies, anaerobic digesters and aerated pile composting as means of curbing fugitive methane emissions from large primitive dumpsites that do not incorporate safeguards for climate protection. In addition to groundwater protection, elimination of nuisance factors and minimization of health risks, sanitary landfill technology makes it possible to safely capture methane gas (from decomposing MSW) for use as an energy fuel, or, if not needed, oxidized using a flare system. However, emissions reduction largely depends on the efficiency of leakage control measures and methane capture sub-systems.

Anaerobic digester technology replicates waste decomposition processes under anaerobic conditions. Thus, the technology is able to reduce landfill spatial requirements, reduce methane ordinarily emitted from primitive dumpsites and produce recyclable products. Moreover, anaerobic digesters can be deployed on a variety of scales and significantly reduce transportation costs. Diverting compostable material from landfill to composting operations, as a way of avoiding CH₄ emissions, could potentially deliver GHG emission reductions of about 83%. Aerated static pile composting is particularly suited for facilities processing wet organic materials and large feedstock volumes.

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