ACTION PLAN FOR CO_2 EMISSION REDUCTION FROM INTERNATIONAL CIVIL AVIATION IN VANUATU

December 2023

State Action Plan 2023 developed in response to the International Civil Aviation Organization (ICAO) Assembly Resolution A41-21

CIVIL AVIATION AUTHORITY

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LIST OF ABBREVIATIONS

ANSP Air Navigation Service Provider

APU Auxiliary Power Unit

ATFM Air Traffic Flow Management

ATM Air Traffic Management

AVL Airports Vanuatu Limited

CAAV Civil Aviation Authority of Vanuatu

CO_2 Carbon dioxide

GHG Green House Gas

GPU Ground Power Unit

GSE Ground Service Equipment

ICAO International Civil Aviation Organization

NAPT National Action Plan Team

ACKNOWLEDGMENTS

We acknowledge the financial, technical and strategic support of International Civil Aviation Organization (ICAO) – Asia Pacific (APAC) on Capacity Building for CO_2 Mitigation from International Aviation. This has aided develop States' Action Plan. The support of the European Aviation Safety Agency (EASA) through Pacific Aviation Safety Office (PASO) has also been an essential for the department to develop and submit the State Action Plan on Emissions Reduction for Vanuatu.

FORWARD

To meet ICAO Assembly Resolution A41-21, Vanuatu has put together this State Action Plan detailing its actions to reduce aviation greenhouse gas (GHG) emissions.

This plan to ICAO elaborates on the activities Vanuatu is undertaking to address CO2 emissions from international aviation. This plan was intended to demonstrate to ICAO the effectiveness of actions being taken and to enable ICAO to measure Vanuatu's progress towards meeting the global goals set by Assembly Resolution A41-21.

It is hoped that this action plan highlights and communicates, both at the national and international level, Vanuatu's efforts to address GHG emissions from international aviation.

EXECUTIVE SUMMARY

This action plan provides an overview of the primary initiatives of the Civil Aviation Authority of Vanuatu (CAAV) in partnership with the Vanuatu aviation industry and other Vanuatu government departments to reduce GHG emissions from international aviation. CAAV is committed to managing the carbon footprint of the Vanuatu aviation industry while simultaneously enhancing its safety and efficiency. ICAO methodology was used in the preparation of this State Action Plan.

Recognising the effects of global warming, Vanuatu has been sincerely exerting efforts to minimizing the aviation's carbon footprint through measures such as, but not limited to, air traffic improvements, airports initiatives as well as aircraft emissions reduction measures.

Considering achievement to date, the SAP sets a goal to reduce CO_2 emissions from aviation activities, which is expected to contribute to global efforts in line with the Assembly Resolution A41-21 and ICAO Doc 9988. To help reach this goal, the SAP identifies five key measures that are expected to have the greatest environmental impact: Aircraft related technology development, Improved ATM and Infrastructure use, Operational improvements; Market based measure and Airport improvements.

The SAP is a living document that will be constantly reviewed through:

- Regular meetings of the NAPT and aviation stakeholders
- Annual reporting on the progress towards achieving the SAP's target.
- A review of the SAP within three years

Vanuatu is committed to the implementation of concrete actions towards a cleaner aviation.

1. INTRODUCTION

The Vanuatu government established the Civil Aviation Authority of Vanuatu with statutory obligations under the Civil Aviation Authority Act 1999, Cap.258, to provide regulatory oversight of the civil aviation industry and support an integrated, safe, responsive, and sustainable air transport system.

Vanuatu is an island nation located in the western Pacific Ocean. This archipelago of over 80 islands, which extends 1,300 kilometres from north to south, is of volcanic origin. It is some 1,750 km east of northern Australia, 500 km northeast of New Caledonia, west of Fiji and southeast of the Solomon Islands. Vanuatu is located between latitudes 12° to 23° south and longitudes 166° to 173° east. Vanuatu's terrain is mostly mountainous, with narrow coastal plains. It comprises 83 islands, of which 65 are inhabited, with total land area of 12,336 km^2 and a maritime exclusive economic zone of 680,000 km^2. The two largest islands, Espiritu Santo and Malekula, make up nearly 50 percent of the total land mass. Larger islands are characterized by rugged volcanic peaks and tropical rainforests.

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 cattle raising.

To support the main economic sectors mentioned above, the country is connected through a network of roads and air transport. Vanuatu's geographic and demographic structure pose obstacles to development efforts. The population is scattered over approximately 80 widely distributed islands, 65 of which are populated (2009 national census), making travel difficult and costly. The distance between southernmost and northernmost islands is over 800 km. Vanuatu's geography also complicates and increases the cost of building infrastructure. With population clusters so small, it is difficult to justify such projects both economically and financially. The logistical challenges of moving large construction equipment from islands to island deter contractors and increase prices. Once built, limited capacity and resources to maintain infrastructure leads to asset deterioration. Consequently, significant gaps exist in providing and operating physical infrastructure, particularly in poor and remote rural areas.

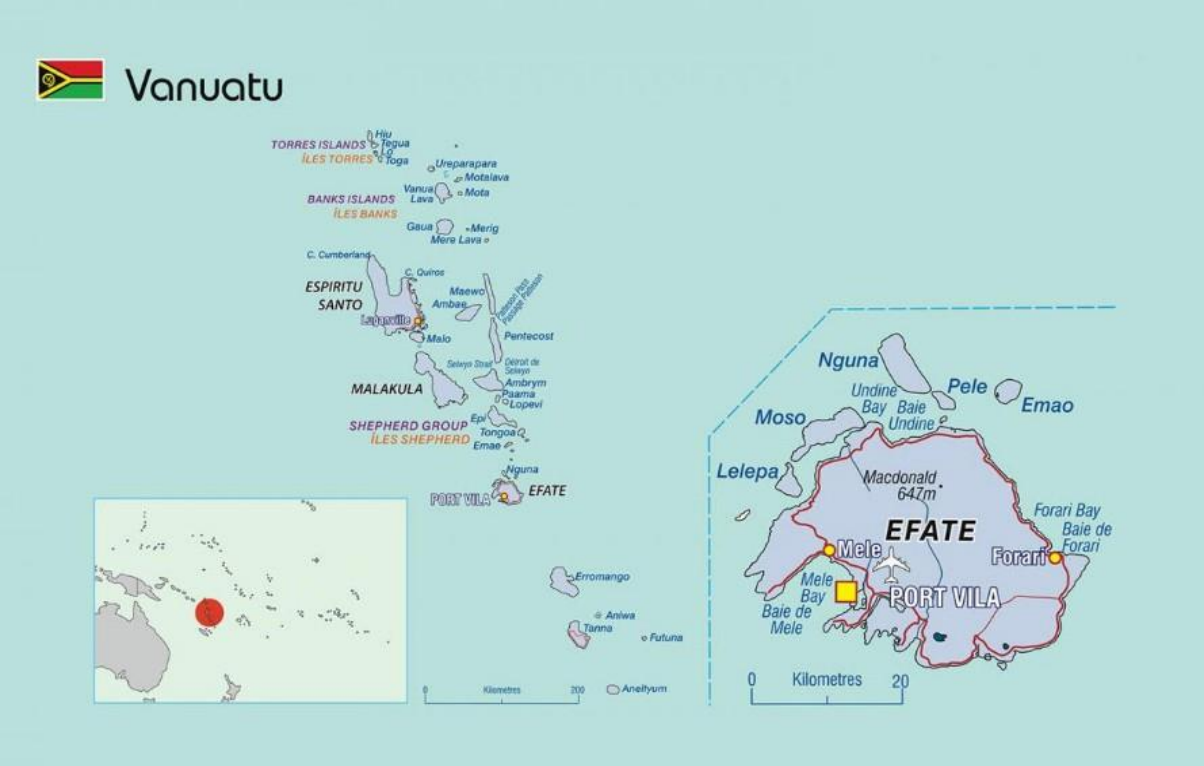


Figure 1: Vanuatu geographical location

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. The runway is long enough to accommodate most commercial aircraft, although it imposes weight restrictions for some (for example, Boeing 767 and 777 and Airbus A330). Vanuatu depends on its airfields. Internationally they are the gateways for tourism, a major contributor to GDP, and domestically they are the primary means of travel between the islands.

As an island nation with an open economy, Vanuatu is heavily dependent on transportation services and with this heavy reliance on the aviation transport industry, its sustainability is vital to our economy. Vanuatu is therefore committed to addressing the climate change impacts on aviation. The Vanuatu aviation industry is already achieving reductions in GHG emissions from improvements that are being made in the aviation industry and will continue this path to ensure that it meets or exceeds the goals it has set.

The two major players in Vanuatu's efforts to reduce its aviation GHG emissions are the Airports Vanuatu Limited (AVL) and its subsidiaries bodies, which were Vanuatu Terminal Services (VTS) providing regulated air cargo agent services and ground handlings, Air Navigation Services and Vanuatu's National Airline, Air Vanuatu Limited.

Airports Vanuatu Limited is a fully owned State enterprise established to own and operate the Bauerfield International Airport and manages Pekoa International Airport on behalf of the Government.

Air Vanuatu Limited is Vanuatu's national flag carrier, offering sublime flight services to the tropical islands and the South Pacific for nearly over 10 years. The Vanuatu government owns majority shares in the airline. The airline is made up of modern Boeing aircraft; 1 Boeing 737-800 and 1 ATR 72 – 600 which operate both domestic and international routes and 1 Twin Otter and 1 Islander aircraft which are operating domestic routes only.

1.1 ENVIRONMENT

Recognizing the importance of climate change and global warming, the Government of Vanuatu has been making effort to establish policies and regulation to protect the environment and mitigate greenhouse gas emissions. The Action Plan for CO_2 Emissions Reduction in international aviation presents the initiatives of the civil aviation sector towards the fight against climate change. It has been elaborated through an inclusive process with the relevant stakeholders of the aviation sector in Vanuatu, under the leadership of the Civil Aviation Authority of Vanuatu.

This Action Plan describes the civil aviation sector in Vanuatu and its main actors, who compose the National Action Plan Team (NAPT) for CO_2 emissions reduction in aviation. The Action Plan then details the set of mitigation measures selected by the NAPT to address CO_2 emissions reduction in international aviation at the national level. The forecast of the trends of CO_2 emissions with and without the implementation of these measures is also described, reflecting the positive impacts of these initiatives on the carbon footprint of the national aviation sector in Vanuatu. These mitigation measures are mainly focused on improving airport infrastructure and operations and, on improving the fuel management of the national airline, which is still at its exploratory stage. These initiatives represent Vanuatu's contribution towards the achievement of the global aspirational goals set by the International Civil Aviation Organization (ICAO) during its 37th Assembly in 2010: carbon-neutral growth from 2020 onward and a 2% annual increase in fuel efficiency up to 2050. It also answers ICAO's call to its Member States during its 38th Assembly (2013) to submit voluntary States' Action Plans to communicate on the progress toward the environmental goals set by ICAO and to request assistance if needed to implement these plans.

1.2 NATIONAL ACTION PLAN TEAM

The initiatives for CO_2 emissions reduction in international aviation in Vanuatu will be implemented by a National Action Plan Team, composed of the main relevant stakeholders in the aviation sector and coordinated by CAAV. The institutions participating in the NAPT are shown below:

No	Organization	Category	Representation
1	Civil Aviation Authority of Vanuatu (CAAV)	Government	• National Focal Point • Flight Operations • Airworthy inspections • Air Navigation Services • Aerodromes division

2	Airports Vanuatu Limited (AVL)	Government/State Own Enterprises	• Air Navigation Services • Technical Services • Air Traffic Services
3	Air Vanuatu Limited	National Airline	• Operations
4	Ministry of Infrastructure & Public Utilities (MIPU)	Government	• Architect/Environment
5	Department of Climate Change (DoCC)	Government	• Mitigation Section
6	Department of Environment and Conservation	Government	• Compliance and enforcement
7	Department of Energy	Government	• Climate change
8	Pacific Petroleum	Private	• Petroleum
9	Department of Strategic, Policy, Planning & Aid Coordination (DSPPAC)	Government	• Infrastructure Division

Table 2: National Action Plan Team

The NAPT of Vanuatu was officially created and held its first meeting in November 2021. It will meet regularly to follow the development and implementation of the Action Plan.

2. BASELINE OF CO_2 EMISSIONS IN INTERNATIONAL AVIATION

Most aviation-related measures affect both domestic and international operations. To every extent possible, Vanuatu has distinguished between domestic and international aviation for the collection of fuel consumption and traffic data. Emissions from airport and/or ground support equipment operations are considered as domestic emissions and are beyond the scope of Resolution A41-21.

For this plan, only international emissions have been taken into consideration. The definition of international emission (in italics below) as stipulated in the ICAO Doc 9988, Guidance on the Development of State Action Plans on CO_2 Emissions Reduction Activities, was applied.

A flight stage is defined as the operation of an aircraft from take-off to its next landing and is classified as either international or domestic based on the following:

a) International. A flight stage with one or both terminals in the territory of a State, other than the State in which the air carrier has its principal place of business.

b) Domestic. A flight stage not classifiable as international. Domestic flight stages include all flight stages flown between points within the domestic boundaries of a State by an air carrier whose principal place of business is in that State. Flight stages between a State and territories belonging to it, as well as any flight stages between two such territories, should be classified as domestic. This applies even though a stage may cross international waters or over the territory of another State.

The ICAO methodology was used in this action plan to differentiate between international and domestic emissions.

2.1 CALCULATION METHOD

The baseline data for international RTK represents the evolution from international aviation up to 2050 in the absence of mitigation measures (*business as usual* scenario). In the case of Vanuatu, the historical data on fuel burnt and RTK for the years 2019 were obtained from the main national airline and data published from ICAO website on Vanuatu traffic data. Future updates of the Action Plan will take as far as possible account of all other domestic national airlines as well. Only international flights according to ICAO definition were considered for the baseline calculation.

Following ICAO's methodology described in ICAO Doc 9988, the fuel efficiency calculated for 2019 was assumed to remain constant until the baseline horizon (2050). On the other hand, the air traffic increase in the coming years was estimated using ICAO Circular 313, which forecasts a traffic (RTK) growth of 5.80% per year in the Asia/Pacific Region.

Calculation of greenhouse gas emissions ➢ CO_2 emissions = Amount of Fuel Burnt x Emissions factor ➢ Emissions factor = 3.16

2.2 RESULTS

The baseline obtained for fuel burn up to 2050 is depicted in tabular and graphical formats on Table 1 and Figure 3 respectively. According to these results, in the absence of mitigation measures, fuel burn from international aviation will grow from 11,823.67 tons in 2020 to 65,030.19 tons in 2050, which represents an increase of 450% in thirty-one years.

Baseline

Year	International RTK ('000)	International Fuel burn (Tonnes)	Efficiency (Fuel burn / RTK)
2019	25,714.08	11,823.67	0.460
2020	25,714.08	11,823.67	0.460
2021	25,714.08	11,823.67	0.460
2022	25,714.08	11,823.67	0.460
2023	25,714.08	11,823.67	0.460
2024	25,714.08	11,823.67	0.460
2025	25,714.08	11,823.67	0.460
2026	25,714.08	11,823.67	0.460
2027	38,571.12	17,735.51	0.460
2028	38,571.12	17,735.51	0.460
2029	38,571.12	17,735.51	0.460
2030	38,571.12	17,735.51	0.460
2031	38,571.12	17,735.51	0.460
2032	51,428.16	23,647.34	0.460
2033	51,428.16	23,647.34	0.460
2034	51,428.16	23,647.34	0.460
2035	51,428.16	23,647.34	0.460
2036	64,285.20	29,559.18	0.460
2037	64,285.20	29,559.18	0.460
2038	64,285.20	29,559.18	0.460
2039	77,142.24	35,471.01	0.460
2040	77,142.24	35,471.01	0.460
2041	77,142.24	35,471.01	0.460
2042	89,999.28	41,382.85	0.460
2043	89,999.28	41,382.85	0.460
2044	102,856.32	47,294.68	0.460
2045	102,856.32	47,294.68	0.460
2046	115,713.36	53,206.52	0.460
2047	115,713.36	53,206.52	0.460
2048	128,570.40	59,118.35	0.460
2049	128,570.40	59,118.35	0.460
2050	141,427.44	65,030.19	0.460

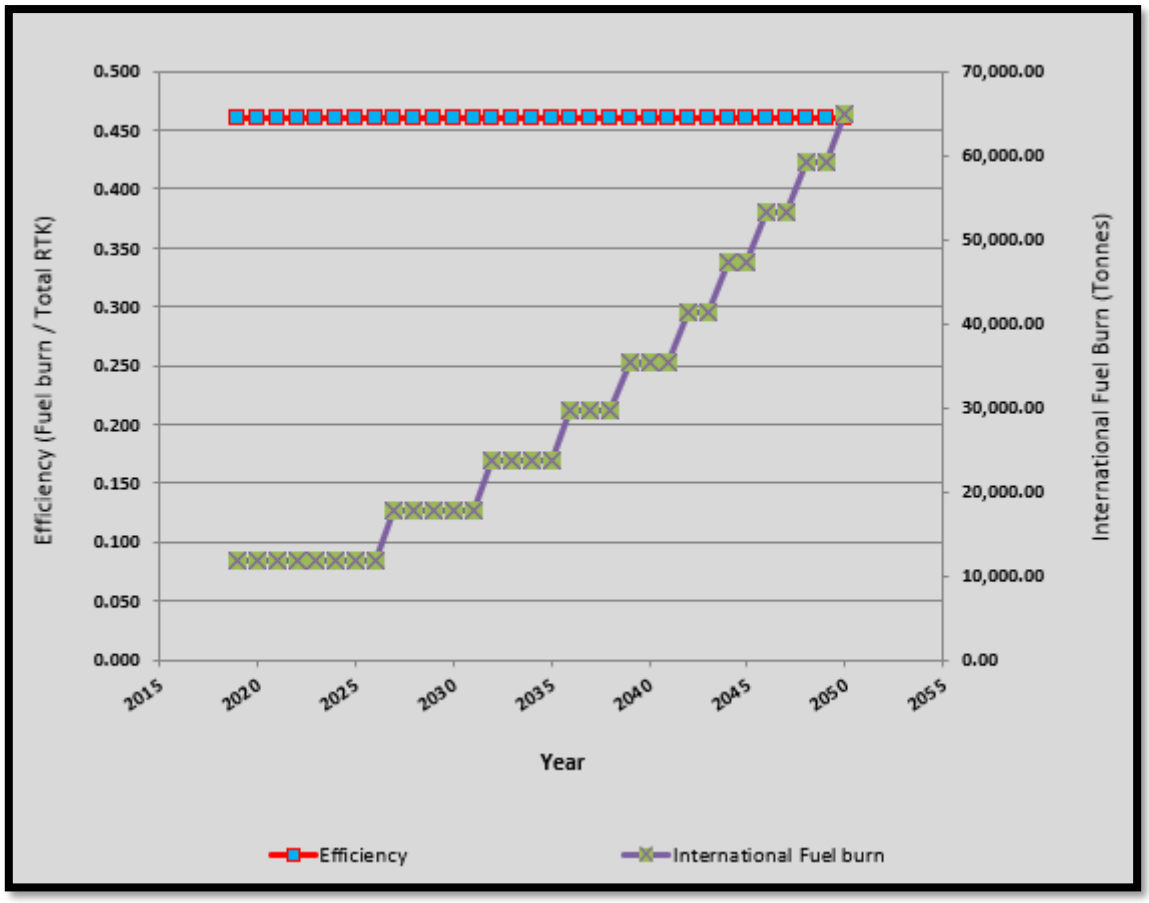


Figure 3: Baseline for international aviation

3. BASKET OF MEASURES FOR VANUATU

The mitigation measures selected to reduce CO_2 emissions from international aviation were focused on four categories from ICAO's basket of measures:

1. Aircraft-related technology development
2. Improved Air Traffic Management (ATM) and infrastructure use, and airport improvement
3. Potential use of sustainable aviation fuels
4. Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

The list of selected mitigation measures is described in more details in Annex 1.

3.1 AIRCRAFT-RELATED TECHNOLOGY DEVELOPMENT

The airline is investing into purchase of new aircraft and retrofitting and upgrade improvements on existing aircraft.

3.2 IMPROVED AIR TRAFFIC MANAGEMENT (ATM) AND INFRASTRUCTURE USE, AND AIRPORT IMPROVEMENT

A more efficient ATM planning, ground operations, terminal operations and a more collaborative research endeavour. Installation of airport infrastructure such as Fixed Electrical Ground Power and Pre-Conditioned Air to allow aircraft APU (Auxiliary Power Unit) switch-off.

3.3 POTENTIAL USE OF SUSTAINABLE AVIATION FUELS

Vanuatu is promoting capacity building for its personnel and related industry to gain more knowledge on sustainable aviation fuels (SAF) development process and requirement – joining ICAO assistance, capacity-building, and assistance on SAF (ACT-SAF).

3.4 CORSIA

Vanuatu's voluntary participation in CORSIA offsetting requirements since its Pilot Phase.

4. EXPECTED RESULTS

The implementation of the mitigation measures selected by Vanuatu will lead to the reduction of an average of 29,374 tons fuel burn from international aviation per year for aircraft technology only and a few of the ATM and infrastructure improvements identified. Other mitigation measures identified in section 3 have yet to be quantified and will be carried out once more data is at hand.

This quantification was performed using both a state methodology (available data) and ICAO's rule of thumb for the measure concerning the purchase of new aircraft.

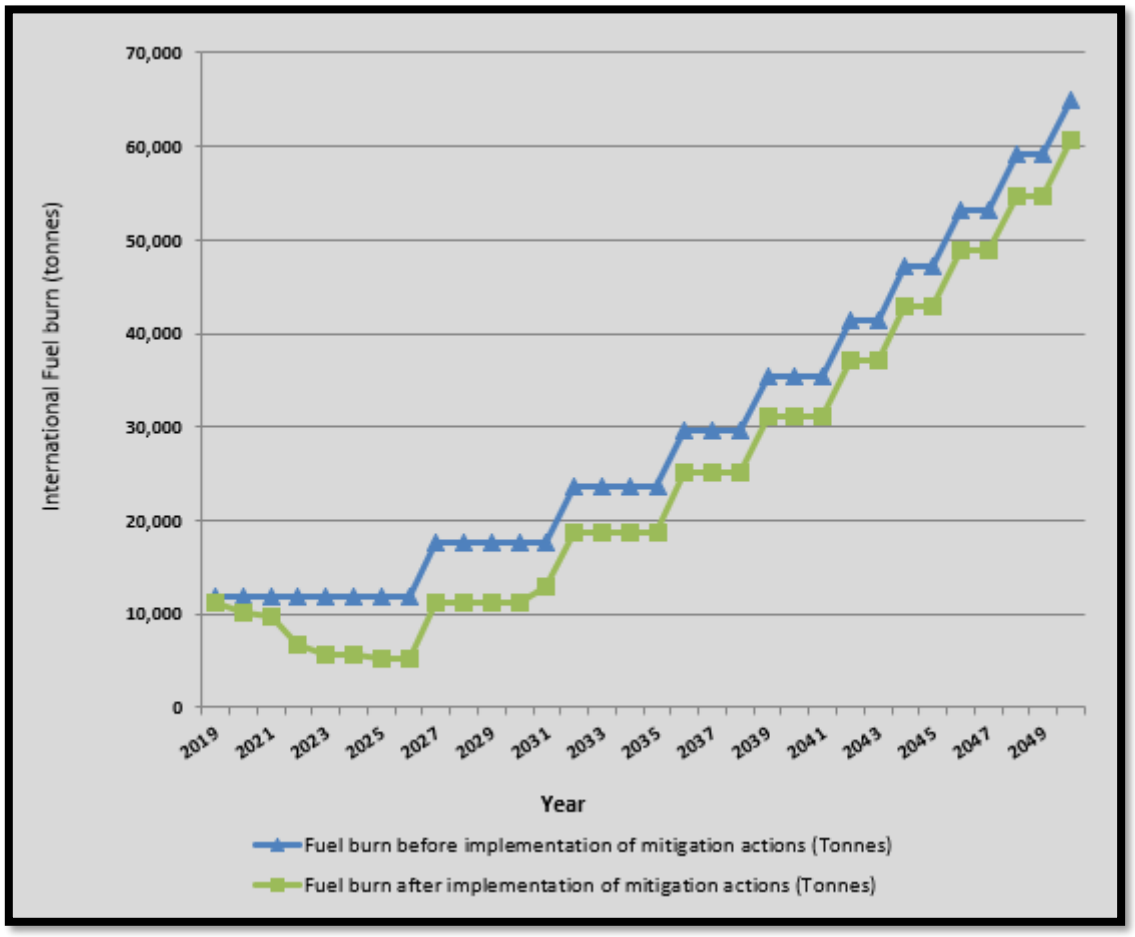
The measures on the improvement of Ground Support Equipment (GSE) will lead to the reduction of domestic CO_2 emissions only and are hence considered as co-benefits. These reductions have not been quantified (more data is required) and other measures outlined. The expected results over the baseline horizon are depicted in on Table 2 and Table 3.

Figure 4 provides a graphical representation of these results and confront them with the fuel burn before and after implementation of actions. The expected results had shown an improvement of 0.04% of annual fuel efficiency after mitigation of actions.

EXPECTED RESULTS: FUEL SAVINGS

Year	Annual Fuel burn before implementation of mitigation actions (Tonnes)	Annual Fuel burn after implementation of mitigation actions (Tonnes)	Annual Fuel savings (Tonnes)	Change Fuel savings (%)
2019	11,823.67	11,173.67	650.00	-5.50
2020	11,823.67	10,263.97	1,559.70	-13.19
2021	11,823.67	9,763.97	2,059.70	-17.42
2022	11,823.67	6,724.41	5,099.26	-43.13
2023	11,823.67	5,636.60	6,187.07	-52.33
2024	11,823.67	5,636.60	6,187.07	-52.33
2025	11,823.67	5,239.48	6,584.19	-55.69
2026	11,823.67	5,239.48	6,584.19	-55.69
2027	17,735.51	11,151.31	6,584.19	-37.12
2028	17,735.51	11,151.31	6,584.19	-37.12
2029	17,735.51	11,151.31	6,584.19	-37.12
2030	17,735.51	11,151.31	6,584.19	-37.12
2031	17,735.51	12,851.31	4,884.19	-27.54
2032	23,647.34	18,763.15	4,884.19	-20.65
2033	23,647.34	18,763.15	4,884.19	-20.65
2034	23,647.34	18,763.15	4,884.19	-20.65
2035	23,647.34	18,763.15	4,884.19	-20.65
2036	29,559.18	25,224.98	4,334.19	-14.66
2037	29,559.18	25,224.98	4,334.19	-14.66
2038	29,559.18	25,224.98	4,334.19	-14.66
2039	35,471.01	31,136.82	4,334.19	-12.22
2040	35,471.01	31,136.82	4,334.19	-12.22
2041	35,471.01	31,136.82	4,334.19	-12.22
2042	41,382.85	37,048.65	4,334.19	-10.47
2043	41,382.85	37,048.65	4,334.19	-10.47
2044	47,294.68	42,960.49	4,334.19	-9.16
2045	47,294.68	42,960.49	4,334.19	-9.16
2046	53,206.52	48,872.32	4,334.19	-8.15
2047	53,206.52	48,872.32	4,334.19	-8.15
2048	59,118.35	54,784.16	4,334.19	-7.33
2049	59,118.35	54,784.16	4,334.19	-7.33
2050	65,030.19	60,695.99	4,334.19	-6.66

Table 1: Expected Results of fuel savings



Annual Fuel efficiency improvement before implementation of mitigation actions :	0.00%
Annual Fuel efficiency improvement after implementation of mitigation actions :	0.04%

EXPECTED RESULTS: CO_2 SAVINGS

Year	Annual CO_2 emissions before implementation of mitigation actions (Tonnes)	Annual CO2 emissions after implementation of mitigation actions (Tonnes)	Annual CO_2 savings (Tonnes)	Change CO_2 savings (%)
2019	37,362.80	35,308.80	2,054.00	-5.50
2020	37,362.80	32,434.16	4,928.64	-13.19
2021	37,362.80	30,854.16	6,508.64	-17.42
2022	37,362.80	21,249.12	16,113.67	-43.13
2023	37,362.80	17,811.66	19,551.14	-52.33
2024	37,362.80	17,811.66	19,551.14	-52.33
2025	37,362.80	16,556.74	20,806.05	-55.69
2026	37,362.80	16,556.74	20,806.05	-55.69
2027	56,044.20	35,238.14	20,806.05	-37.12
2028	56,044.20	35,238.14	20,806.05	-37.12
2029	56,044.20	35,238.14	20,806.05	-37.12
2030	56,044.20	32,435.93	23,608.26	-42.12
2031	56,044.20	37,807.93	18,236.26	-32.54
2032	74,725.59	55,555.26	19,170.33	-25.65
2033	74,725.59	55,555.26	19,170.33	-25.65
2034	74,725.59	55,555.26	19,170.33	-25.65
2035	74,725.59	55,555.26	19,170.33	-25.65
2036	93,406.99	75,040.59	18,366.40	-19.66
2037	93,406.99	75,040.59	18,366.40	-19.66
2038	93,406.99	75,040.59	18,366.40	-19.66
2039	112,088.39	92,787.92	19,300.47	-17.22
2040	112,088.39	92,787.92	19,300.47	-17.22
2041	112,088.39	92,787.92	19,300.47	-17.22
2042	130,769.79	110,535.25	20,234.54	-15.47
2043	130,769.79	110,535.25	20,234.54	-15.47
2044	149,451.19	128,282.57	21,168.61	-14.16
2045	149,451.19	128,282.57	21,168.61	-14.16
2046	168,132.59	146,029.90	22,102.68	-13.15
2047	168,132.59	146,029.90	22,102.68	-13.15
2048	186,813.99	163,777.23	23,036.75	-12.33
2049	186,813.99	163,777.23	23,036.75	-12.33
2050	205,495.38	181,524.56	23,970.82	-11.66

CO2 emissions from
International aviation before and after implementation of actions

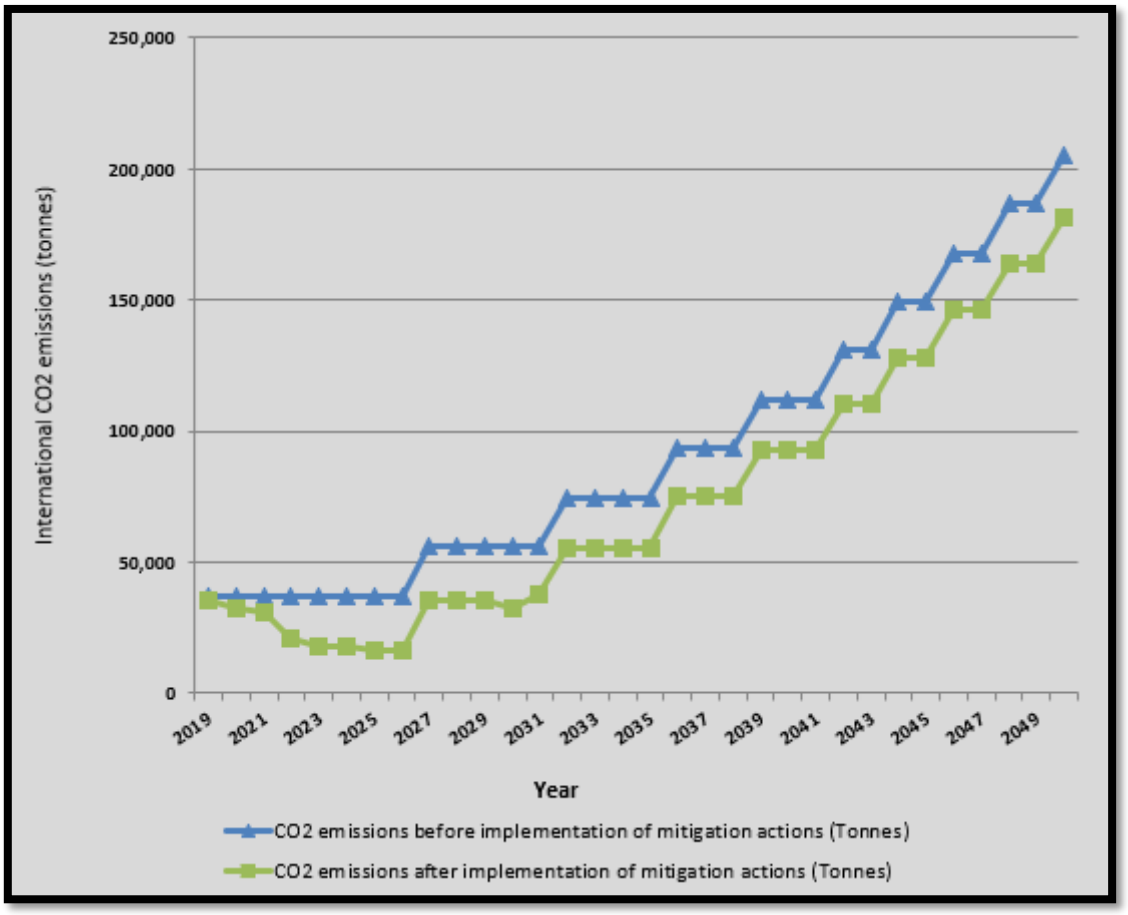


Table 2: Baseline for fuel burn before and after implementation of mitigation measures

5. ASSISTANCE NEEDS

The assistance needed to implement the Action Plan is multi-fold and includes mostly technical as well as financial support from external stakeholders.

Vanuatu is particularly looking for assistance in the following areas:

1. Support in updating the present Action Plan,
2. Support in the development of technical capacity,
3. Support in financial capacity in the implementation of mitigation measures,
4. Assistance to set up systems for the monitoring of emissions in the national airlines and airports,
5. Support in collaborate research endeavours,
6. Support in supply and installation of complete solar unit
7. Support in the development of a pilot project for sustainable aviation fuels for aircraft and ground-based vehicles in Vanuatu.
8. Research and development
9. Financial support
10. Education

The details on the measures for the feasibility study and the mini solar farm project is described in Annex 2 and 3.

ANNEX 1: LIST OF SELECTED CO2 MITIGATION MEASURES

Basket of Measures	**Vanuatu's proposed actions**	**Stakeholder**	**Start Date**	**Completion Date**	**Estimate cost**	**Assistance Need**
Aircraft-related technology development	- Addition of the national carriers to the fleet - Purchasing of 1 ATR737-600 and 1 Islander and 1 twin otter to commence operations in 2023	Airline	2022		- Cost of additional training if required. - Re-engining existing aircraft - Purchase of new aircraft	Funding and Training
Alternative fuel	Feasibility study research Join the ICAO ACT-SAF programme	CAAV Airlines Oil company	2022		- Costs of additional training and feasibility study.	Funding, Training, and Feasibility Study
Improved air traffic management and related infrastructure use	- Runway lighting in NVVV (Port Vila) changed to LED. - RNAV GNSS Approach – to transition to RNP charts - Full implementation of Performance Based Navigation (PBN) implementation - Published AIPV – Area Navigation (RNAV) Global Navigation Satellite System (GNSS) Approach for NVSF,	Airline AVL PWD	2022		- Costs of additional training if required. - Costs of construction of production facilities and Logistics	Funding and Training

	NVVF, NVSG, NVSO, NVSA, NVSP, NVSS, NVSC, NVVV, NVVW - Runway light in NVVW (Tanna) – solar lighting					
Airport Improvements	- Exploring the options of replacing classic runway lights with LED lights for Port Vila and Tanna - Airports Council International - Carbon Neutral Airport is ongoing. - International Terminal – Lighting upgrade to LEDs - GATIC Drainage for fuel spill off installed – apron area. - Landside car parking upgraded to paid car parking and solar lighting. - Trial exercise for a mini solar farm to be implemented at the NVVV control tower site - Full ADS-B implementation - AVL master plan – has laid out strategic plans for increasing airport land – North of the NVVV (Port Vila) runway for a big solar farm. - Installation of fixed electrical ground power and pre-conditioned air to allow aircraft APU switched off.	AVL Airline PWD	2021		- Costs of additional training if required. - Costs of construction of production facilities and Logistics	Funding and Training

Economic/Market based measures	Developing regulatory systems for CORSIA	CAAV Airline	2021		- Costs of additional training if required. - Costs of MRV and offsetting requirements	Training and potential development of CORSIA eligible emissions units projects in Vanuatu
Regulatory measures/other	- Enhancing weather forecasting services - Requiring transparent carbon reporting - Conferences and workshops	CAAV AVL Airline	2021		- Costs of additional training if required.	Training

ANNEX 2: FEASIBILITY STUDY FOR LOW CARBON EMISSIONS AVIATION SECTOR IN VANUATU

Technical Assistance Plan – Project Proposal

Country	**Vanuatu**
Title	**Feasibility study for low carbon emissions aviation sector in Vanuatu**
Director Department of Civil Aviation Authority of Vanuatu **Director General Ministry of Infrastructure & Public Utilities (MIPU)**	**Ms. Grace Naparau, Director Civil Aviation Authority of Vanuatu** **Mr. Johnson Binaru, Director General, Ministry of Infrastructure & Public Utilities (MIPU)**
Proponent	**Mrs. Patricia Cyrus Namak, Emissions and Environment Officer, Civil Aviation Authority of Vanuatu**

Executive summary:

Vanuatu is a small island country in the Pacific which depends almost entirely on imported fossil fuel for its energy and transport needs.

The continuous reliance on these fossil fuels is not only unsustainable for Vanuatu but goes against Vanuatu 's national climate change mitigation ambition as reflected in its Nationally Determined Contributions, its Climate Change and Disaster Risk Reduction Policy, its National Energy Roadmap and Vanuatu's National Sustainable Development Plan.

Aviation is one of the most significant contributors to greenhouse emissions, which has a significant impact on climate change. With the increasing demand for air travel, it is important to address the issue of aviation emissions to ensure a sustainable future.

Vanuatu imports over 56 million litres of fuel each year with diesel being the largest volume (63%). Of this, land transport has the lion share of 50% followed by electricity (38%). Consequently, it is safe to say that the largest contributor of GHG emissions in Vanuatu comes from the land transport sector.

There is very little information available on the aviation sector. The information on aviation are very fragmented due to the unclear institutional frameworks in place. It is therefore very difficult to make evidence-based decision making in terms of policy and legislative frameworks for low emission within the sector.

Furthermore, at its 41st Session in 2022, the ICAO Assembly reaffirmed the two global aspirational goals for the international aviation sector of 2 per cent annual fuel efficiency improvement through 2050 and carbon-neutral growth from 2020 onwards. The 41st ICAO Assembly also agreed on a collective long-

term global aspirational goal (LTAG) of net-zero carbon emissions from international aviation by 2050, consistent with and supports the Paris Agreement's temperature goal.

Hence, Vanuatu has made this request to study the aviation sector and clearly identify the feasibility of reducing GHG emissions through the implementation of energy efficiency measures and promote low – carbon aviation.

This technical assistance is aimed at clearly identifying the feasibility of reducing GHG emissions through the implementation of energy efficiency measures and promote low – carbon aviation sector for Vanuatu.

The general objectives are to:

1. Identify the policy, legislative and regulatory barriers to improving the energy efficiency in the aviation sector
2. Assessing Vanuatu's readiness to engage in the aviation transition to Net Zero, including the technical capacity and needs of national institutions based on international and regional best practices
3. Identify the technical , financial, institutional awareness and capacity barriers to improving the energy efficiency within the sector
4. Develop an implementation plan, budget and an M&E framework for the barrier removals for supporting a vibrant and low emission sector
5. Develop a GCF Project Concept Note for Vanuatu using the information and data collected from the feasibility study

The anticipated activities to be performed by the TA would include:

1. Desktop Study and Inception Report - this report would confirm the consultant's understanding of the assignment, his/her approach and methodology and some of his/her findings on the current status of aviation sector in Vanuatu
2. Consultations and Workshops - The Technical assistant will be based in Vanuatu for the duration of the assignment. The consultant is expected to conduct extensive consultations with key stakeholders including a series of national workshops for face-to-face meetings. All matters relating to the gender aspects of the project will be dealt with in the workshops.
3. Surveys and Baseline Assessments -The consultancy may consider conducting surveys during the assignment to confirm any uncertainty in the assignment and to establish baseline data for the project for future M&E purposes.
4. Capacity Development on Low Emission aviation sector - Given that energy efficiency in the aviation will be new for many people in Vanuatu especially when, if we are considering introducing electric and hybrid planes, biofuels, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), sustainable Aviation fuels (SAF) and Low Carbon Aviation Fuel (LCAF) it is important that some of the policy makers including senior officials of the Government are aware and taught on the benefits of transitioning to cleaner energy.

The scope of work would include:

1. Analysing current carbon emissions: the current carbon emissions of the aviation industry will be analysed to determine the baseline emissions and identify the major sources of emissions.
2. Identifying low carbon solutions: A comprehensive analysis will be conducted to identify potential low carbon solutions
3. Evaluating the economic feasibility: The economic feasibility of low carbon emissions will be evaluated, including the potential costs, benefits, and return on investment.

4. Assessing regulatory landscape: The regulatory landscape will be assessed to determine the potential regulatory barriers and opportunities for low carbon solution.

It is expected that the following deliverables will be the outcome of this TA:

1. Draft Feasibility Study Report on Low Emissions in Vanuatu's aviation Sector
2. Final Feasibility Study Report on Low Emissions in Vanuatu's aviation Sector
3. Draft a GCF Project Concept Note Proposal for the funding of the Low Emission in Vanuatu's aviation Sector
4. Consultation and Workshop Reports
5. Capacity Development Report

Expected duration of the assignment will be for a period of 6 months.

Estimated Budget

The estimated budget for the feasibility study totals up to the 15,250,000VT

Background and context

Aviation and Energy scenario in Vanuatu

Vanuatu is an archipelago with a population of 234,000 people spread across 83 volcanic islands in the West Pacific. It faces the challenges of managing its heavy reliance on fossil fuel while providing clean, reliable and affordable electricity to the 67% of its population who still live without it. In accordance with the Vanuatu National Energy Road Map, the Government of Vanuatu has set targets of increasing access to electricity as well as increasing utilization of renewable energy. Vanuatu's generation fuel mix includes diesel, wind, solar and biofuels. Aviation fuels are petroleum-based fuels, or petroleum and synthetic fuel blends, used to power aircraft and also fuels used for ground use such as heating, ground handling and electricity at terminals.
Aviation is one of the most significant contributions to greenhouse gas emissions, which has a significant impact on climate change. With the increasing demand for air travel, it is important to address the issue of aviation emissions to ensure sustainable future.

There are 28 airfields in Vanuatu. Airports Vanuatu Limited (AVL) operates the three main airports at Port Vila (Bauerfield), Luganville (Pekoa) and Tanna (Whitegrass). The other 25 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. The runway is long enough to accommodate most commercial aircraft, although it imposes weight restrictions for some (for example, Boeing 767 and 777 and Airbus A330). Vanuatu depends on its airfields. Internationally they are the gateways for tourism, a major contributor to GDP, and domestically they are the primary means of travel between the islands.

Vanuatu is heavily dependent on transportation services and with this heavy reliance on the aviation transport industry, its sustainability is vital to our economy. Vanuatu is therefore committed to addressing the climate change impacts on aviation. The Vanuatu aviation industry is already achieving reductions in GHG emissions from improvements that are being made in the aviation industry and will continue on this path to ensure that it meets or exceeds the goals it has set.

The two major players in Vanuatu's efforts to reduce its aviation GHG emissions are the Airports Vanuatu Limited (AVL) and its subsidiaries bodies, which were Vanuatu Terminal Services (VTS)

providing regulated air cargo agent services and ground handlings, Air Navigation Services (ANS) and Vanuatu's National Airline, Air Vanuatu Operations Limited (AVOL).

Ongoing efforts on sustainable energy in Vanuatu

Vanuatu has set itself targets on green growth and had achieved satisfactory progress. The updated National Energy Road Map focusses on five priorities: Accessible energy, affordable energy, secure and reliable energy, sustainable energy and green growth.

Energy efficiency in the aviation sector

Vanuatu 's effort to reduce reliance on fossil fuel and increase access to clean, reliable and affordable energy sources has focused mostly on the 38% of the fuel imports that is used for power generation. Very little has been done about the 5% of the fuel imports that is consumed in the domestic aviation taking out international aviation.

The nature of aviation sector in Vanuatu is made up of a National Airline (Air Vanuatu) operating larger fleets both domestic and international and a few individual business owners operating smaller fleets domestic and chattered flights services to meet mainly the demands of tourism industry. Vanuatu is heavily dependent on transportation services and with this heavy reliance on the aviation transport industry, its sustainability is vital to our economy.

Aviation is absolutely critical to Vanuatu's economy, providing essential transport links for tourism, trade and disaster response and recovery. Vanuatu's aviation industry is the third largest in the Pacific (excluding Australia and New Zealand) in terms of aviation activities traffic size and complexity after PNG and Fiji. Improving safe, secure and sustainable domestic and regional aviation connectivity is critical for creating economic growth opportunities for Vanuatu. Efficient and safe air travel is vital to Vanuatu's tourism sector, regional integration, foreign trade and the broader economy.

Vanuatu depends almost entirely on imported fossil fuel for its energy and transport needs. For which 13.8% of Jet Fuel for international aviation and 0.3% of Avgas for domestic aviation. The continuous reliance on these fossil fuels is not only unsustainable for Vanuatu but goes against Vanuatu 's national climate change mitigation ambition as reflected in its Nationally Determined Contributions, its Climate Change and Disaster Risk Reduction Policy, its National Energy Roadmap, and Vanuatu's National Sustainable Development Plan.

Emissions from aircraft and ground vehicles, equipment's, as well as from power use in buildings, all contributing to climate change and local air quality issues. Noise from aircraft for local residents. Potential to damage local wildlife and habitats and water courses. As well as emitting CO_2 from burning fuel, planes affect the concentration of other gases and pollutants in the atmosphere. They result in a short-term increase, but long-term decrease in ozone (O_3); a decrease in methane (CH_4); emissions of water vapour; soot; sulphur aerosols; and water contrails which are all contributing impacts of environmental aviation emissions.

In addition, in 2022, the ICAO Assembly reaffirmed the two global aspirational goals for the international aviation sector of 2 per cent annual fuel efficiency improvement through 2050 and carbon-neutral growth from 2020 onwards, as well as adopted a collective long-term global aspirational goal (LTAG) of net-zero carbon emissions by 2050.

To achieve its environmental goals and promote sustainable growth of international aviation, ICAO is pursuing a basket of measures, including aircraft technology improvements, operational improvements, sustainable aviation fuels, and market-based measures (such as CORSIA).

As climate change is a megatrend, the aviation sector in Vanuatu is taking its first steps in addressing it.

The main aviation sector issues and constraints to sustainable economic development identified in Vanuatu can be summarized as follows: much needed airport infrastructure improvement, the lack of management and planning across all government agencies and institutions responsible for the aviation sector, main functional weaknesses occur in operations, finance, management and planning of the aviation sector. While social issues cannot be ignored, environmental health concerns has been highlighted as contributing factor to risk of fire from oil spillage near the apron and respiratory cases. The high costs of fuel remains an issue in the aviation sector contributing to the high operating costs each year. The department of civil aviation under the Ministry of Infrastructure and Public Utilities having a key role in regulating the aviation sector is constrained by the lack of capacity to perform these tasks.

Vanuatu faces unique challenges in its aviation sector and have therefore seeking technical assistance by way of study aimed at clearly assessing and identifying the feasibility of reducing carbon emissions through the implementation of energy efficiency measures in the sector.

The study will not only demonstrate but unleash:

1. The policy, legislative and regulatory barriers to improving the energy efficiency in the aviation sector
2. Vanuatu's efforts and readiness to engage in the aviation transition to Net Zero, including the technical capacity and needs of national institutions based on international and regional best practices
3. The technical , financial, environmental, regulatory, institutional awareness and capacity barriers to improving the energy efficiency within the sector
4. Develop an implementation plan, budget and an M&E framework for the barrier removals for supporting a vibrant and low emission sector
5. A GCF Project Concept Note for Vanuatu using the information and data collected from the feasibility study

Problem Statement

There is very little progress in improving the climate change mitigation aspects of the aviation sector in Vanuatu. This is due to a number of barriers:

1. Policy and Legislative – the lack of quantified energy efficiency target in the sector. This is due to lack of adequate technical information. Policy makers felt reluctant to make bold decisions without reliable data and tangible evidence.
2. Financial barriers: Vanuatu relies heavily on donor funding due to its fragile economy and limited income generation initiatives. There is inadequate budget allocated to make improvements in the aviation sector.
3. Technical and Institutional barriers – limited capacity and skilled personnel in the country to conduct the technical assessment and feasibility study on the future of low carbon emissions within the sector. The institutional arrangements need to be assessed on its effectiveness and efficiency in addressing aviation sector issues in Vanuatu.
4. Education and Awareness – the technological improvements in the aviation sector is only known and appreciated by a few people. The majority of the people do not understand the climate change, environmental and economic benefits that derived from the use of low efficient aviation system.

Resources and Budget

The budget break down foe feasibility study for low carbon emissions in the aviation sector.

1. Personal: 6,000,000VT
The personal cost will cover the salaries and benefits of the consultant himself/herself under the supervision of the CAAV

2. Data Collection and analysis: 250,000VT
The budget covers data collection and analysis costs, including field logistics/local transportation for field survey and visits/meeting with appropriate stakeholders (eg., Ministries, airlines, airport operators, ANSP, etc.). If necessary, purchase of industry reports, academic journals, and government publications and data analysis tools should also be covered.

3. Travel and accommodation costs: 1,000,000VT
The budget covers travel and transportation expenses from TA home country to Vanuatu and vice versa, as well as accommodation expenses for the duration of the assignment.

4. Reporting: 5,000,000VT
A comprehensive report will be prepared outlining the findings of the feasibility study, including the potential low carbon solutions, their economic feasibility, and the regulatory landscape. A draft GCF project Concept Note Proposal for the funding of the low emission in the aviation sector, consultations, workshops and capacity development reports. One policy brief articulating policy gaps, opportunities and recommendations to enhance national policies and implementation of low emissions measures within the sector. Report detailing the capacity gaps, support needs and defined technical assistance activities needed to address the capacity gaps.

5. Capacity Building: 1,000,000VT
The budget will be used for capacity building activities on aviation environmental protection strategies for all stakeholders in Vanuatu. The budget will also be used for dissemination of the results of the feasibility study.

6. Miscellaneous: 2,000,000VT
This budget will cover any unexpected costs that may arise during the feasibility study.

Expected Analysis

1. Technical assessment
   Outline the main technical aspects to be evaluated, taking into account Vanuatu's unique characteristics. This may include evaluating the feasibility of potential mitigating measures, including operational improvements (by airlines, ANSP, and airport operators), the use of sustainable Aviation Fuel (SAF), and the implementation of CORSIA. Discuss the suitability of these technologies/approaches to Vanuatu's circumstances (airports, airlines, geography, natural resources, and economic situation.

2. Environmental impact analysis
   Highlighting the environmental benefits that can be achieved through low emissions in Vanuatu. Emphasis the reduction in greenhouse gas emissions, local air pollution, and noise levels, and the potential positive impact on Vanuatu's natural environment and tourism sector.

3. Financial/economic impact analysis

The economic feasibility of potential low carbon solutions will be evaluated using a variety of economic tools, such as cost-benefit analysis and return on investment analysis. Addressing the economic considerations involved in adopting low emissions technologies/procedures in Vanuatu's aviation sector. Analyse the potential costs and benefits of implementing new technologies, including fuel and maintenance savings, impact on ticket prices, and potential economic opportunities such as local production of sustainable aviation fuels or other potential components.

4. Regulatory and policy assessment
   The regulatory landscape will be assessed to determine the potential regulatory barriers and opportunities for low carbon solutions. Explore the existing regulatory and policy landscape in Vanuatu and assess its suitability for low aviation emissions. Identify any gaps or barriers and propose recommendations for policy frameworks, incentives, or regulation that could support the adoption of low emissions technologies in Vanuatu.

Risk Assessment

Potential Risk	**Mitigation Measure**
Project failure to reach desired objectives	Proper planning outlining the deliverables and outcome of the project
Lack of sufficient knowledge and information in the sector for Vanuatu	Technical expertise and background checks on the TA
Cost Risks	Proper and accurate planning by the TA
Data availability	An accurate data estimating method

Conclusion

Reducing carbon emissions in the aviation sector is crucial to achieving a sustainable future. Vanuatu recognizes the importance of contributing to global efforts in line with ICAO's global aspirational goals for the international aviation sector, which include a 2% annual fuel efficiency improvement through 2050 and carbon neutrality, as well as a long-term global aspirational goal (LTAG) of net-zero carbon emissions by 2050. This feasibility study will assess the potential for low carbon solutions, including CORSIA, biofuels, electric/hybrid planes, operations and improved air traffic management. By conducting this feasibility study, we can identify the most promising low carbon solutions and develop a roadmap for implementing them in the aviation industry for Vanuatu towards the transition to Net Zero carbon dioxide emissions from aviation by 2050.

TOWER SOLAR PROJECT- VILA

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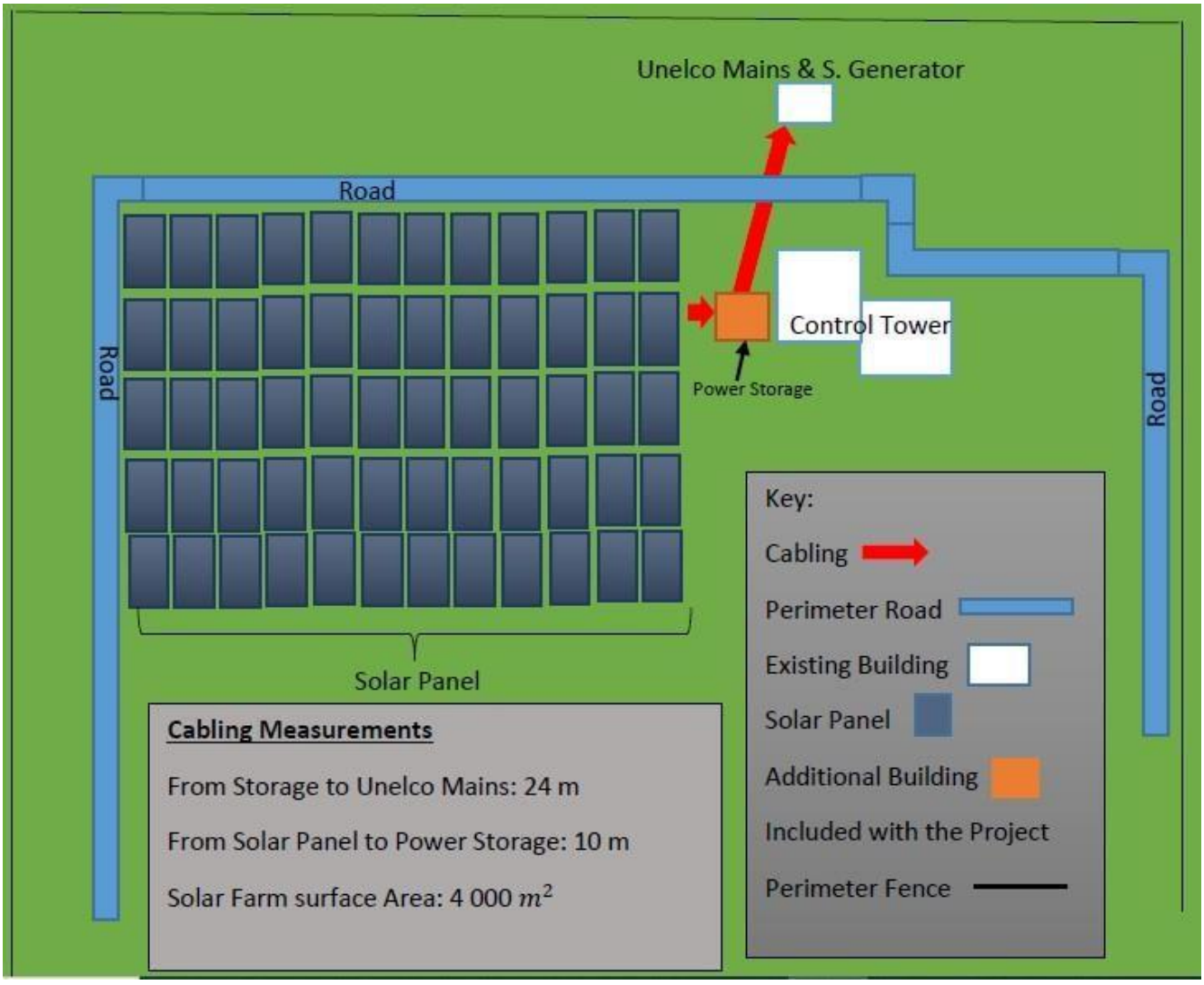
Introduction

The Idea of having a solar farm project was based on our light bills keep increasing in our company while pandemic will not stop. On the other hand, with less income, small profit and high expenses in our company. Gearing up to be fully solar-powered could massively reduce overall operating costs for airports and lower the operational carbon emissions.

Air Navigation Services (ANS) is an essential section within Airports Vanuatu Limited in Port Vila comprise of Air Traffic Services (ATS), Aeronautical Information Services (AIS) and Technical Services (TS) has the need of a Solar Project to minimize the cost of our electricity.

Solution and Planning

Part 1.
Solar Planning.



Appliance data.

Floor Level	Appliance	Quantity	Power Rating	Total Power
Ground Floor	Light	8	50 W	400 W
	light	20	36 W	720 W
	Light	3	72 W	216 W
	PC	2	690 W	1380 W
	Woofer	1	150 W	150 W
	Monitor	2	30.4 W	60.8 W
	Telephone	2	3 W	6 W
	Rice Cooker	1	710 W	710 W
	Ice Box	1	250 W	250 W
	PAPI 11 & PAPI 29	8	200 W	1600 W
	Electric Heater	1	950 W	950 W
	Fan	2	66 W	132W
	Air Con	4	839.5 W	3358W
	RWY Control Board	1	460 W	460 W
	Strobe Light	4	230 W	920 W
	Electric Frying band	1	2300 W	2300 W
	CCR (RWY A)	1	2990 W	2990 W
	CCR (RWY B)	1	3380 W	3380 W
	CCR (TWY)	1	1700 W	1700 W
	CCR (CGL)	1	1050 W	1050 W
	Total Ground Floor Power			**22,732.8 W**
Second Floor	Printer	1	1200 W	1200 W
	PC	1	690 W	690 W
	Telephone	1	3 W	3 W
	Light	5	75 W	360 W
	Fan	2	66 W	132 W
	Air Con	1	2415 W	2415 W
	Network Switch	1	6 W	6 W
	Library Light	1	20 W	20 W
	Total Second Floor Power			**4826 W**
Third Floor	Air Con	1	1403W	1403W
	PC	3	-----	3680 W
	ADSB Monitor	1	368 W	368 W
	Recorder Monitor	1	345 W	345W
	Icom Radio	1	15 W	15 W

	UPS	1	480 W	480 W
	Zyxel Link	1	16 W	16 W
	Electrodata Recorder	1	220 W	220 W
	4 RF Link	1	1150 W	1150 W
	Internet Link	1	1380 W	1380 W
	Power Supply	1	632 W	632 W
	Light	7	-----	510 W
	CCR Control	1	460 W	460 W
	UPS	1	3680 W	3680 W
	Radio	1	8 W	8 W
	Total Third Floor Power			**14,347 W**
Control Room	PC	5	1380 W	6900 W
	Radio	1	19.2 W	19.2 W
	Power Supply	2	-------	1265 W
	Met Monitor	1	22.8 W	22.8 W
	Rice Cooker	1	770 W	770 W
	Monitor	4	368 W	1472 W
	Printer	1	667 W	667 W
	Fridge	1	161 W	161 W
	Air Con	1	3701 W	3703 W
	Electric kettle	1	2300 W	2300 W
	Heater	1	2100 W	2100 W
	Radio	1	920 W	920 W
	ILS/VOR Monitor	2	345 W	690 W
	VOR Indicator	1	12 W	12 W
	NDB Monitor	1	1380 W	1380 W
	Telephone	3	3 W	9 W
	Light	13	75 W	975 W
	Total Control Room Power			**23,366 W**
	TOTAL POWER = 65, 272 W			

The Existing Power Planning.

The Unelco Three Phase Existing Power will remain as **standby power**. The components that will interlock the solar system and Unelco power are:
Automatic Change Over switch or
Auto Transfer Switch.

This type of system must include in the Project.

Under Civil Aviation Rules; the changeover between mains and standby power should be less than 5 seconds when there is a fault on mains power.

Total costing of the solar project by PCS Limited.

The total cost of the system includes;

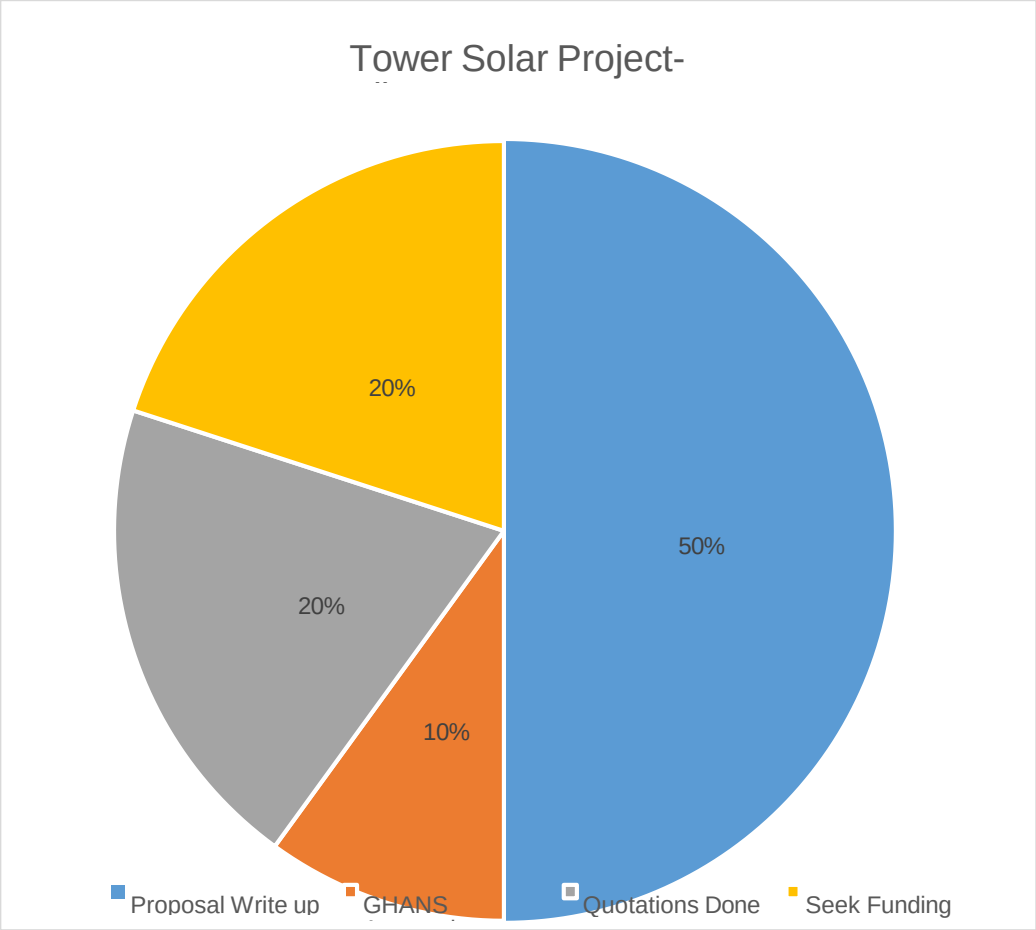
Solar Panels -108 x 490w Trina solar panels.
Ritar 20pzv3000 Batteries -2 x 48v Banks.
Solar controllers and solar inverters (2x450/200, 1 x 450/100 victron and 1 x Fronus 20kw AC inverter.)
Battery Inverters – 3 x 48v Victron Quattro Inverters.
Additional smaller items, including breakers, cablings, enclosures.
Ground Mount Screw Foundation Frame for PV Panels.
Installation of Ground Mount, Solar Panels Controllers, Inverters, Commissioning and Testing.
Power System Building- (6.6x3.6m concrete block

Estimated Budget

The estimated budget for the mini solar farm totals up to 23,390,000VT

Deliverable and Success Criteria.

Pie chart below Shows the progress of Tower Solar Project – Vila. Blue, Orange and Grey were all done. The yellow is Seek Funding and is not yet done.



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