

Kingdom of Tonga's State Action Plan on CO₂ Emissions Reductions from International Aviation

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Civil Aviation Division
of Tonga





FOREWORD

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Asia & Pacific Regional Office
International Civil Aviation Organization (ICAO)
United Nations Specialized Agency
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Bangkok 10900, Thailand.

Dear Mr. Ma,

RE: Initial Submission of the State Action Plan on CO² Emissions – Kingdom of Tonga

I am pleased to submit the initial State Action Plan of the Kingdom of Tonga's major initiatives to reduce CO₂ emissions from international aviation. The State Action Plan has been developed to align with the global standard set by Assembly Resolution A38 – 18. In addition, provide further contributions to global efforts set by the International Civil Aviation Organization's global aspirational goals for the international aviation sector: which include a 2% annual fuel efficiency improvement through 2050 and a carbon – neutral growth from 2020 onwards, coupled with a long – term global aspirational goal (LTAG) of net-zero carbon emissions by 2050.

As a Pacific Small Island Developing State (PSIDS), the Kingdom of Tonga is prone to the consequences of Climate Change at an appalling scale through recurring natural disasters. Our little contribution to international CO₂ emissions does not influence our stance but more so ensuring that we play our part in committing to implement ICAO's environmental protection programs towards greener aviation.

His Majesty; King Tupou VI of the Kingdom of Tonga's statement at COP 27: *The second challenge as an Ocean State is to offer affordable transportation that does not add to our Green House Gas Emissions. Our culture and history as peoples of the ocean has taught us to live in harmony with our environment. In the near future, we will need to urgently re-acquaint our people with such livelihoods and adopt cutting edge technologies that promote wind – powered, low carbon emitting modes of transport.* This State Action Plan supports His Majesty's vision and shall support the continuous effort by the Kingdom of Tonga towards ensuring the sustainability of lower carbon emitting modes of transport for the aviation sector.

I look forward to a continuous healthy working relationship as we work towards our global aspirational goals for the international aviation sector.

Yours sincerely,


Hon. Sevenitini Toumoua
Minister for Infrastructure



TABLE OF CONTENTS

FOREWORD	2
EXECUTIVE SUMMARY.....	4
1. INTRODUCTION	5
1.1 Background and Objective	5
1.2 Contact Information	5
2. OVERVIEW OF CIVIL AVIATION IN TONGA.....	5
2.1 Current situation and future trend	5
2.1.1 Air Operators.....	6
2.1.2 Airport Operators	6
2.1.3 Air Navigation Service Providers	7
2.1.4 Numbers of Passengers from 2019 - Current.....	7
3. BASELINE SCENARIO	7
3.1 Methodology and data	7
3.2 Baseline	8
4. MITIGATION MEASURES	10
4.1 Sustainable Aviation Fuels*	12
4.2 Market-based Measures by CORSIA*	12
4.3 Supplemental benefits for domestic sectors	12
5. EXPECTED RESULTS	12
6. ASSISTANCE NEEDS.....	15



EXECUTIVE SUMMARY

This initial action plan provides an overview of Tonga's major initiatives to reduce CO₂ emissions from international aviation. Tonga is committed to managing the carbon footprint of the Tonga Civil Aviation industry while improving its safety and efficiency. More so, Tonga as a member state under ICAO; must adhere to the rules and standards set out in order to stay compliant; so to meet ICAO Assembly Resolution A38 – 18 under its Environment obligations. Tonga has established this State Action Plan document entailing its stance on reducing aviation greenhouse gas (GHG) emissions as well as addressing aviation environment matters.

More so, with this plan; Tonga hopes to address issues beyond the small international aviation operation it currently experiences. The State Action Plan shall demonstrate to ICAO the effectiveness of actions currently undertaken with the goal to meet the global standard set by Assembly Resolution A38 – 18. Emphasis shall be placed with the hope that this action plan will showcase and communicate to the aviation governing body ICAO; Tonga's efforts to address the Environmental Impacts of Aviation with its current operation.

Additionally, the State of Tonga looks to further incorporate the vision of His Majesty's vision as highlighted at COP 27: ***The second challenge as an Ocean State is to offer affordable transportation that does not add to our Green House Gas Emissions. Our culture and history as peoples of the ocean has taught us to live in harmony with our environment. In the near future, we will need to urgently re-acquaint our people with such livelihoods and adopt cutting edge technologies that promote wind – powered, low carbon emitting modes of transport.*** As mentioned, Tonga as a member State will develop this plan with the emphasis that it will not only fulfil the vision stated by His Majesty's speech but also its obligations to the International Civil Aviation Organization and establishing a long – term roadmap on climate change for the international aviation sector with involvement from all interested parties at a national level.

Taking into account what has been achieved so far, the SAP sets a goal for reducing CO₂ emissions from aviation activities to contribute 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-neutral growth from 2020 onwards, coupled with a long-term global aspirational goal (LTAG) of net-zero carbon emissions by 2050.

This action plan is a living document that will be continually reviewed and updated in accordance with the ICAO Assembly Resolution A41-21: Consolidated statement of continuing ICAO policies and practices related to environmental protection - Climate change. Tonga is committed to implementing ICAO's environmental protection programs toward greener aviation.



1. INTRODUCTION

1.1 Background and Objective

This Action Plan describes the circumstances of civil aviation activities in Tonga and its key stakeholders that have initiated some efforts to reduce CO₂ emissions in aviation through various methods or mitigation measures. In addition, this State Action Plan dwells in to detail the mitigation measures selected as part of the National Action Plan Taskforce is close collaboration to address CO₂ emissions reduction in international aviation at the national level. Due to the State not operating international flights with the designated national carrier – the IPCC methodology is the best fit method in calculating the average CO₂ emissions from 2023 as the baseline year until 2050. The calculations and results provided by the Environmental Benefits Tool (EBT) provided a projection of the trends of CO₂ emissions with and without the implementation of these measures. This is also described, reflecting the positive impact of these initiatives on the carbon footprint of the national aviation sector in Tonga. These mitigation measures focus mainly on Sustainable Aviation Fuels (SAF), Market – Based Measures by CORSIA and Supplemental Benefits for Domestic Sectors.

Furthermore, these initiatives represent Tonga’s contribution towards the achievement of the global aspirational goals set by the ICAO. 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, as well as adopted a collective long-term global aspirational goal (LTAG) of net-zero carbon emissions by 2050. It also answers ICAO’s call to its Member States during its 41st Assembly (2022) to submit voluntary States’ Action Plans to communicate on the progress towards the environmental goals set by ICAO and, where appropriate, request assistance in implementing these plans.

1.2 Contact Information

- Name of the Authority: *Ministry of Infrastructure – Civil Aviation Division.*
- Point of Contact: *Mr. James Panuve (CORSIA Focal Point)*
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2. OVERVIEW OF CIVIL AVIATION IN TONGA

2.1 Current situation and future trend

Air transport is an enabler of social and economic growth. For smaller island States like Tonga it is indispensable for tourism and other sectors of the economy that rely on aviation. It generates



benefits to consumers and the wider economy by providing vital national, regional and international connectivity. These virtual bridges in air transport enable the economic flows of goods, investments, people and ideas that are the fundamental drivers of economic growth in Tonga supporting Strategic Pillar 4 outcomes of the National Work Plan.

For Tonga, air connectivity is essential to meeting educational and medical needs which enables effective regional integration with its Pacific neighbours. The most important benefits from air transport go to passengers and shippers and the spill over impacts on their businesses. The value to passengers, shippers and the economy can be seen from the spending of foreign tourists and the value of exports. A key economic flow, stimulated by good air transport connection is foreign direct investment, creating productive assets that will generate a long-term flow Gross Domestic Product (GDP) for Tonga.

Growth in the aviation sector within the South Pacific region is dependent on ensuring that the aviation system is allowed and enabled to increase capacity to accommodate future growth. A reliable network of air links, within Tonga and among island countries and to major hubs such as New Zealand and Australia and beyond, is therefore essential to the viability of countries in this region from humanitarian, political and economic perspectives.

2.1.1 Air Operators

Air Operators	ICAO	IATA	Type of Operations (scheduled/non-scheduled, passengers/cargo, domestic/international)
Air New Zealand	ANZ	NZ	Scheduled, Passengers/ Cargo & International
Fiji Airways	FJI	FJ	Scheduled, Passengers/ Cargo & International
Qantas	QFA	QF	Scheduled, Passengers/ Cargo & International
Fiji Link (Pacific Sun)	FJA	FJ	Scheduled, Passengers/ Cargo & International
Lulutai Airlines	TON	L8	Scheduled, Passengers/ Cargo & Domestic

2.1.2 Airport Operators

The following table provides an overview of the airport operators in Tonga in order to frame the aviation work under the perspective of the airport operators' side. Currently, there are six airports with only two ports operating an International Schedule.

Airport Operators	Airport Names and Cities	Domestic/International
Tonga Airports Ltd	Fua'amotu Airport – Tongatapu	Domestic & International
	Lupepau'u Airport – Vava'u	Domestic & International
	Salote Pilolevu Airport – Ha'apai	Domestic
	Kaufana Airport – 'Eua	Domestic
	Kuini Lavinia Airport –	Domestic



	Niuafo'ou	
	Mata'aho Airport – Niuatoputapu	Domestic

2.1.3 Air Navigation Service Providers

Air navigation services provided in Tonga include the following: Air Traffic Management; Communications, Navigation, and Surveillance (CNS), Meteorological Service (MET), and Search and Rescue (SAR).

Air Navigation Service Providers	Type of Service
Aeronautical Information Services	AIP provided under contract by Aeropath New Zealand NOTAM Service provided by Airways New Zealand
Instrument Flight Procedure	Aeropath New Zealand

2.1.4 Numbers of Passengers from 2019 - Current

The table below depicts the number of both International & Domestic Passengers from 2019 – Current. In addition, the table also provides numbers for air cargo for both International & Domestic flights from 2019 – Current.

Year	Number of Passengers		Number of Air Cargo (KG's)	
	Domestic & International	International	Domestic & International	International
2019	286774	221012	1,344,055	1,211,934
2020	74006	44436	821,855	768,614
2021	64735	6025	937,774	832,265
2022	90295	48082	1,465,286	1,376,137

3. BASELINE SCENARIO

3.1 Methodology and data

The baseline scenario describes the historical evolution of fuel consumption, CO₂ emissions, and traffic in Tonga as well as the expected future evolution in the absence of measures.



Given the availability of data (annual RTK and annual international fuel consumption from international flights) is very limited and constrained to Tonga’s small level of operation internationally. The Environmental Benefit Tool (EBT) version v2.8.2 is used to assist in the process of defining a baseline scenario, estimating the quantifiable benefits resulting from the selected mitigation measures, and generating the estimated expected results until 2050. Therefore, since Tonga does not operate internationally with the designated airline Lulutai – the IPCC methodology is recommended to be used in calculating the data.

<i>Aerodrome Pairs</i>	<i>No. of Flights</i>	<i>Aircraft Type</i>	<i>CO2 (KG)</i>	<i>No. of Pax/ Month</i>	<i>GCD (km)</i>	<i>RTK/Month (kg)</i>	<i>RTK/Month (Ton)</i>	<i>RTK/ Year (Ton KM)</i>
TBU – AKL	21	321 (A321)	657,578	5952	2004	1192780800	1192780.8	
TBU – AKL	9	789 (B789)	423,781					
TBU – NAN	24	739 (B7M8)	378,562	2519	869	218901100	218901.1	
TBU – NAN	1	738 (B738)	15,058					
TBU – NAN	1	AT7 (ATR72)	4620					
TBU – SYD	8	738 (B737)	340,463	926	3586	332063600	332063.6	
TOTAL						1743745500	1743745.5	20924946

Based on available data, Method A (to which the State - Tonga has a current fleet size of ten aircraft or less) was selected when using the EBT. Tonga currently operates to three overseas ports (Auckland, Nadi & Sydney) on six different aircraft types supported by the statistics on passenger numbers for departures. As such, these various pieces of information are entered onto the EBT and calculations provide final numbers for RTK per Year as well as the CO2 per Year. In addition, the following inputs are collected and used in developing the baseline:

- **Baseline year:** 2023
- **International RTK:** 20924946 Tonne – Kilometres
- **International fuel burn:** 6911Tonne
- **Number of aircrafts used for international flights:** 6 Aircrafts (A321, B789, B7M8, B738, ATR72, B737)
- **Annual RTK growth:** 5.8 % (Average for the Asia Pacific Region)

3.2 Baseline

The following table and chart provide an estimated baseline of fuel consumption and CO2 emissions for international flights for the years 2023 to 2050. For the definition of “international



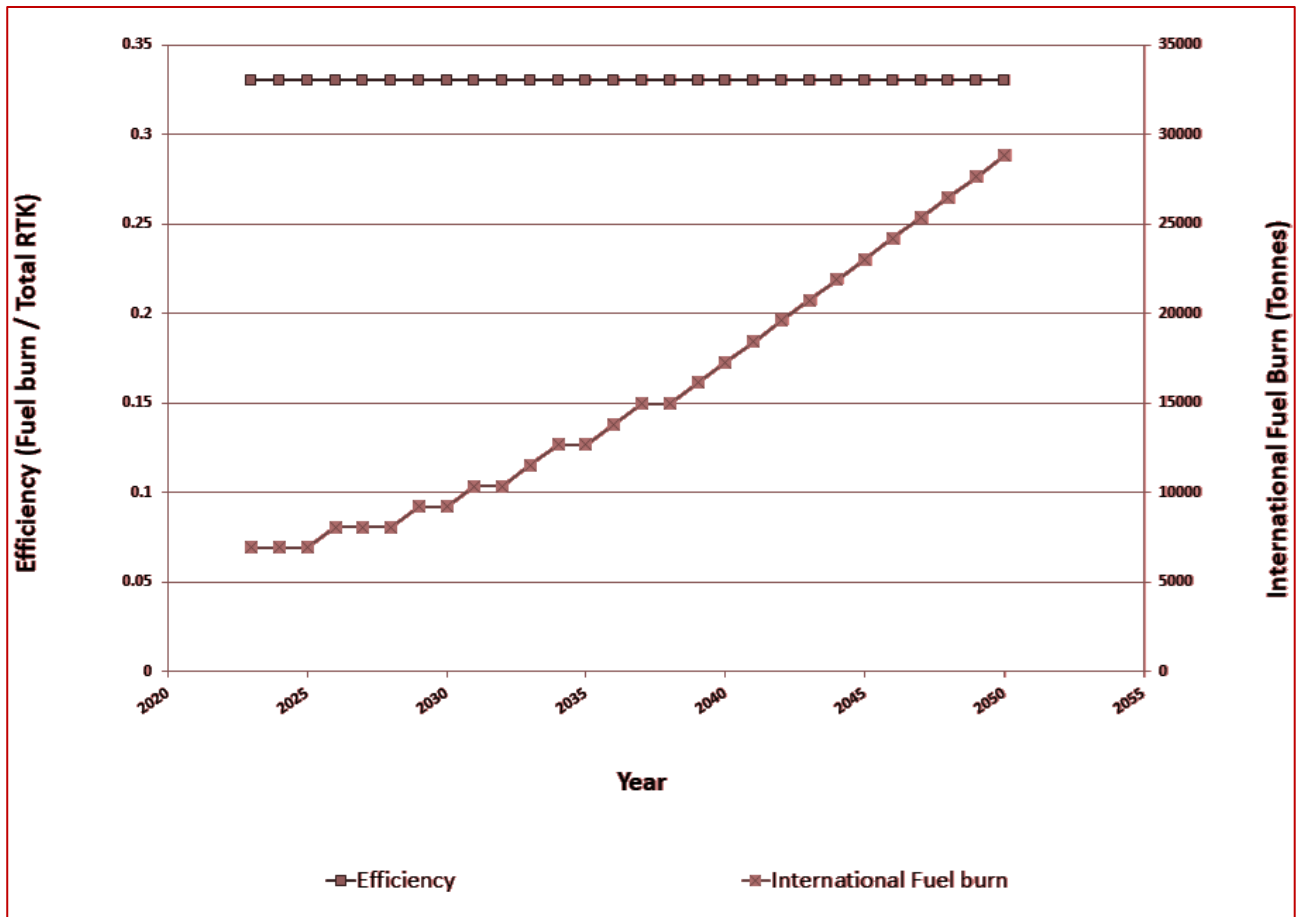
flight” used in this document, reference is made to the IPCC methodology with all CO2 emissions by international flights departing from the state of Tonga. This is due to the fact that Tonga does not have designated airline which operates internationally. As such, provided below is the Baseline Scenario for International Flights which was calculated using the Environmental Benefit Tool (EBT).

Table: Baseline Scenario for International Flight (generated by the EBT)

<i>Year</i>	<i>International RTK (‘000)</i>	<i>International Fuel Burn (Tonnes)</i>	<i>Efficiency (Fuel Burn/ RTK)</i>
2023	20,925.00	6,911.00	0.330
2024	20,925.00	6,911.00	0.330
2025	20,925.00	6,911.00	0.330
2026	24,412.50	8,062.83	0.330
2027	24,412.50	8,062.83	0.330
2028	24,412.50	8,062.83	0.330
2029	27,900.00	9,214.67	0.330
2030	27,900.00	9,214.67	0.330
2031	31,387.50	10,366.50	0.330
2032	31,387.50	10,366.50	0.330
2033	34,875.00	11,518.33	0.330
2034	38,362.50	12,670.17	0.330
2035	38,362.50	12,670.17	0.330
2036	41,850.00	13,822.00	0.330
2037	45,337.50	14,973.83	0.330
2038	45,337.50	14,973.83	0.330
2039	48,825.00	16,125.67	0.330
2040	52,312.50	17,277.50	0.330
2041	55,800.00	18,429.33	0.330
2042	59,287.50	19,581.17	0.330
2043	62,775.00	20,733.00	0.330
2044	66,262.50	21,884.83	0.330
2045	69,750.00	23,036.67	0.330
2046	73,237.50	24,188.50	0.330
2047	76,725.00	25,340.33	0.330
2048	80,212.50	26,492.17	0.330
2049	83,700.00	27,644.00	0.330
2050	87,187.50	28,795.83	0.330

Graph: Baseline Scenario for International Flight (generated by the EBT)





As shown above, it was identified that fuel consumption will be around 9,214.67 tonnes in 2030 and around 28,795.83 tonnes in 2050.

4. MITIGATION MEASURES

According to ICAO Doc 9988 Chapter 4 and Appendix A, the Basket of Measures to limit or Reduce CO2 Emissions from International Civil Aviation are provided and Tonga has provided four groups of emissions mitigation measures to which Tonga’s aviation stakeholders plan to implement. However, due to Tonga using the IPCC methodology – the mitigation measures will be limited to only a select few.

<i>Basket of Measures</i>	<i>Tonga’s Proposed Actions</i>	<i>Stakeholder</i>	<i>Timeframe</i>	<i>Estimated Cost</i>	<i>Assistance Needs</i>
Sustainable Aviation Fuels (SAF)	Subscription to ACT – SAF in order to gain a broader understanding and knowledge on the effect of Sustainable Aviation Fuels.	Civil Aviation Division	2022 - 2024	Low to Medium	Capacity Building, Research & Knowledge Sharing
Market – Based	Voluntary inclusion of Tonga in the Carbon	Civil		Low to Medium	Capacity Building,



Measures by CORSIA	Offsetting and Reduction Scheme for International Aviation (CORSIA)	Aviation Division	2022 - 2024		Research & Knowledge Sharing
Supplemental Benefits for Domestic Sectors	Airport Improvements - Installation of LED lighting as opposed to classic lighting	Tonga Airports Ltd	2024 - 2026	Medium to High	Financial & Technical
	Reduced energy demand and preferred cleaner energy sources - Use cleaner alternative sources of power generation (Solar Panels, Wind Turbines/ Generators) - Use cleaner and energy efficient heater/ cooler and/ or minimize heater/ cooler utilization - Reduce electrical demand (Switch off unnecessary lights, promote usage of stairs as opposed to lifts)	Tonga Airports Ltd	2024 - 2030	Medium to High	Financial, Research & Knowledge Sharing
	Enhanced Ground Support Equipment (GSE) Management - Reduce distance travelled - Avoid unnecessary idling of equipment	Tonga Airports Ltd	2024 - 2026	Medium to High	Financial, Research & Knowledge Sharing
	Conversion of GSE to cleaner fuels - Electrical operated ground vehicles - Gas operated ground vehicles - Alternative fuel operated ground vehicles	Tonga Airports Ltd	2024 - 2030	Medium to High	Financial, Technical, Research & Knowledge Sharing
	Improved Transportation to and from airport	Tonga	2024 - 2030	Medium to	Financial



	<ul style="list-style-type: none"> - Improved public transport access - Improved employee transportation. 	Airports Ltd		High	
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4.1 Sustainable Aviation Fuels*

- a. Subscription to ICAO ACT – SAF program in order to gain a broader understanding and knowledge on the effect of Sustainable Aviation Fuels.

4.2 Market-based Measures by CORSIA*

- a. Voluntary participation of Tonga in the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) from its Pilot Phase.

4.3 Supplemental benefits for domestic sectors

- a. Airport Improvements
 - i). Installation of LED lighting as opposed to classic lighting
- b. Reduced energy demand and preferred cleaner energy sources
 - i). Use cleaner alternative sources of power generation (Photovoltaic panels, wind generators)
 - ii). Use cleaner heater/ cooler equipment and/ or minimize heater/ cooler utilization
 - iii). Reduce electrical demand (Switch off unnecessary lights, promote usage of stairs instead of lifts)
- c. Enhanced Ground Support Equipment (GSE) Management
 - i). Reduce distance travelled
 - ii). Avoid unnecessary idling of equipment
- d. Conversion of GSE to cleaner fuels
 - i). Electrical operate ground vehicles
 - ii). Gas operated ground vehicles
 - iii). Alternative fuel operated ground vehicles
- e. Improved Transportation to and from airport.
 - i). Improved public transport access
 - ii). Improved employee transportation.

There are 3 groups derived from the Basket of Measures that are currently planned to be undertaken by Tonga’s aviation stakeholders.

5. EXPECTED RESULTS

The Baseline Scenario provided an outlook for Tonga until 2050 which in return highlights CO2 Emissions and Fuel Burn. However, certain steps have been initiated under Mitigation Measures by Tonga as a State which hopes to implement accordingly in order to provide results for savings on Fuel and CO2. Therefore, by implementing the measures mentioned above – including; Sustainable Aviation Fuels (SAF), Market – based Measures by CORSIA and Supplemental Benefits for Domestic Sector, it is estimated that the total fuel and CO2 savings are as follows:

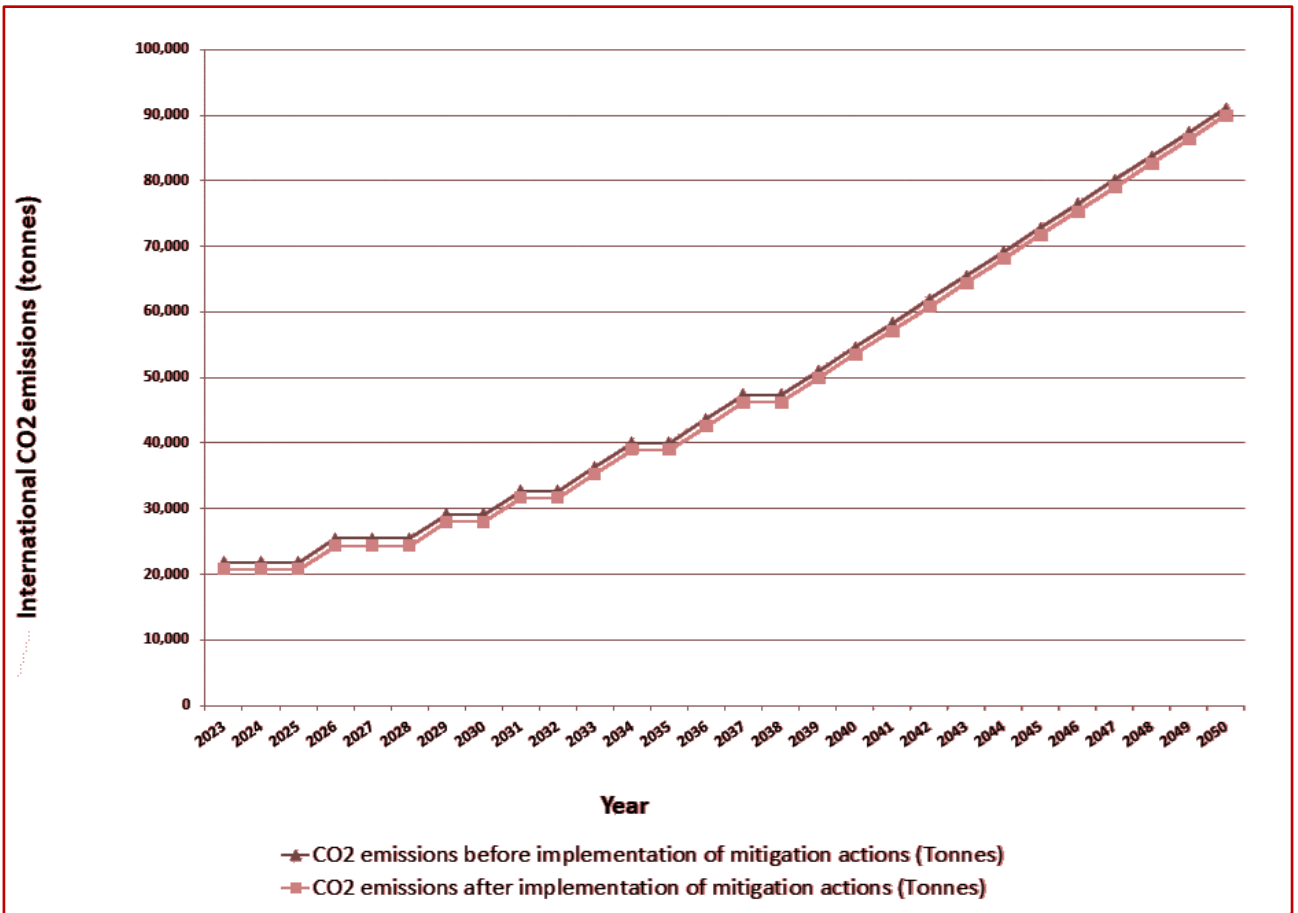


Table: Expected Results: CO2 Savings (generated by the EBT)

Year	Annual CO2 emissions <u>before</u> implementation of mitigation actions (Tonnes)	Annual CO2 emissions <u>after</u> implementation of mitigation actions (Tonnes)	Annual CO2 savings (Tonnes)	Change CO2 Savings (%)
2023	21,838.76	20,747.76	1,091.00	-5.00
2024	21,838.76	20,747.76	1,091.00	-5.00
2025	21,838.76	20,747.76	1,091.00	-5.00
2026	25,478.55	24,387.55	1,091.00	-4.28
2027	25,478.55	24,387.55	1,091.00	-4.28
2028	25,478.55	24,387.55	1,091.00	-4.28
2029	29,118.35	28,027.35	1,091.00	-3.75
2030	29,118.35	28,027.35	1,091.00	-3.75
2031	32,758.14	31,667.14	1,091.00	-3.33
2032	32,758.14	31,667.14	1,091.00	-3.33
2033	36,397.93	35,306.93	1,091.00	-3.00
2034	40,037.73	38,946.73	1,091.00	-2.72
2035	40,037.73	38,946.73	1,091.00	-2.72
2036	43,677.52	42,586.52	1,091.00	-2.50
2037	47,317.31	46,226.31	1,091.00	-2.31
2038	47,317.31	46,226.31	1,091.00	-2.31
2039	50,957.11	49,866.11	1,091.00	-2.14
2040	54,596.90	53,505.90	1,091.00	-2.00
2041	58,236.69	57,145.69	1,091.00	-1.87
2042	61,876.49	60,785.49	1,091.00	-1.76
2043	65,516.28	64,425.28	1,091.00	-1.67
2044	69,156.07	68,065.07	1,091.00	-1.58
2045	72,795.87	71,704.87	1,091.00	-1.50
2046	76,435.66	75,344.66	1,091.00	-1.43
2047	80,075.45	78,984.45	1,091.00	-1.36
2048	83,715.25	82,624.04	1,091.00	-1.30
2049	87,355.04	86,264.04	1,091.00	-1.25
2050	90,994.83	89,903.83	1,091.00	-1.20

Graph: CO2 emissions baseline vs. after implementation of mitigation measures (generated by the EBT)





The graph above provides a graphical representation of CO2 emissions before implementation of mitigation actions (Blue Colour). In addition, the green line represents CO2 emissions after implementation of mitigation actions as generated by the EBT.



6. ASSISTANCE NEEDS

In light of the above State Action Plan, Tonga is still afforded with numerous ways to improve and maximize efforts to reduce CO2 emissions from the aviation sector. However, these mitigation measures promise positive results but are also hindered by numerous factors which can affect the development of assistance provided.

In conjunction with the small international operation that currently takes place in Tonga, there are numerous assistance requirements which can hold back the development of this State Action Plan. As such, Financial Capability is the outlying factor that can determine a lot of these developments coming or falling through. To be at a financially stable stance provides Tonga with the ability to fund a lot of these activities which promote the proposed actions. Financing can help with capacity building – in which personnel from the State can attend trainings, workshops or meetings to further enhance their knowledge and confidence in undertaking all the required tasks mentioned within this State Action Plan. As well as capacity building for the development of sustainable aviation fuel from the authority role and sharing implementation experience. More so, financing can provide another factor of knowledge sharing between States – having an expert in the fields required down in Tonga to provide hands on training and information sharing on joint projects in both policy and implementation.

Furthermore, Tonga has mentioned the actions of reducing energy demand and using alternative sources of cleaner or greener energy. This could fall in line with the development of green technology for aviation by installation of LED lightings, use of greener cooling systems, establishing solar or wind powered energy, preference for electrical operated ground vehicles or alternative fuel operated ground vehicles. All these factors can be driven by the financial support or funding for these projects.

A key note can also be that the future plans also do not fall off the radar but rather a slower approach to implementation. Such mitigation factors which could be determined for the future include Navigation and airport system management issues. The long term is not hindered by the current mitigation factors but also as an approach for future developments within the State Action Plan.

