

# **BOTSWANA'S ACTION PLAN FOR CO<sub>2</sub> EMISSIONS REDUCTION FROM INTERNATIONAL AVIATION**



**December 2021**

## **CIVIL AVIATION AUTHORITY OF BOTSWANA**

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## ACRONYMS

**The following is a list of acronyms used in this document:**

ATM	Air Traffic Management
AWEG	Aviation Environment Working Group
CAAB	Civil Aviation Authority of Botswana
CKGR	Central Kalahari Game Reserve
CO <sub>2</sub>	Carbon dioxide
EBT	Environmental Benefits Tool
EU	European Union
GDP	Gross Domestic Product (per capita)
GSE	Ground Support Equipment
IATA	International Air Transport Association
ICAO	International Civil Aviation Organisation
KIA	Kasane International Airport
MBM	Market Based Measures
MIA	Maun International Airport
MTC	Ministry of Transport and Communications
NAPT	National Action Plan Team
PGMIA	Phillip Matante International Airport
RTK	Revenue Tonne Kilometre
SAP	State Action Plan
SSKIA	Sir Seretse Khama International Airport
UNESCO	United Nations Educational Scientific Cultural Organisation
VFR	Visual Flight Rules

## **I. EXECUTIVE SUMMARY**

The International Civil Aviation Organization (ICAO) Assembly Resolutions A37-19 and A38-18 are key milestones in the global collective drive to minimize the impact of aviation on climate change. In addition to set global aspirational goals – carbon-neutral growth from 2020 and a 2 per cent annual increase in fuel efficiency up to 2050, the Assembly instituted the voluntary submission of States' Action Plans. They are tool for States to communicate on the progress toward the environmental goals set by the ICAO Assembly, and to the international community regarding their efforts to reduce CO2 emissions from international aviation and to request necessary assistance.

Botswana has prepared an Action Plan as a tool that will be used to showcase and communicate both at the national and international levels, Through the Action Plan, Botswana has identified, quantified mitigation measures and will be implementing the environmental mitigation measures that will contribute to the ICAO global aspirational goals for international aviation.

The action plan is focused on international civil aviation and is being supported by the ICAO - European Union (EU) Assistance Project on Capacity Building for CO2 mitigation for international aviation.

## II. INTRODUCTION

Botswana is a land-locked country situated in the centre of Southern Africa with a population of 2.3 million. The territory is roughly triangular-approximately 600 miles (965km) from north to south and 600 miles from east to west with its eastern side protruding into a sharp point. Its eastern and southern borders are marked by river courses. Botswana is bounded by Namibia to the west and north (the Caprivi Strip), Zambia and Zimbabwe to the north-east and South Africa to the Southeast and South. Botswana is home to the Okavango Delta situated deep in the Kalahari Basin.



Botswana's transport system has evolved as it supported the economic growth of the country over the past five decades. The transport sector (which includes road, railways, and aviation networks) has since developed to a level that helped propel the country's economy to a middle-class income country. The Okavango Delta is a major asset to the tourism industry in Botswana and it has been voted the 1000th world heritage site by the United Nations Educational, Scientific and Cultural Organisation (UNESCO) in 2013.



Botswana's Economy is built on a foundation of diamond mining, prudent fiscal policies, and a cautious foreign policy. Diamond mining contributes to 50% of government revenue mainly through its 50 :50 joint venture with De Beers in the Debswana Diamond Company. Botswana has the 4th highest gross national income per capita in purchasing power in Africa and above the world average.

Tourism is an increasingly important industry in Botswana accounting for 12% to GDP. Because it has one of the worlds unique systems, the Okavango Delta, Botswana offers game viewing and birding both in the Okavango Delta and the Chobe National Park, which is home to the largest herd of free ranging elephants in the world. The Central Kalahari Game Reserve (CKGR) offers game viewing and wilderness in Southern Africa. There are several national parks and game reserves with their abundant wildlife and wetlands, and these are the major tourist attractions. The main safari destinations are Moremi Game Reserve in the Okavango Delta, and Chobe National Park

Agriculture provides a livelihood for 70% of the rural population, Subsistence farming and livestock farming predominate. This sector is plagued by erratic rainfall and poor soils and the foot and mouth disease on livestock. Agriculture meets only a small portion of food needs and contributes just 2.6% to GDP primarily through beef exports.

Botswana 's population is divided into twelve (12) major ethnic groups and three (3) distinct mixed settler groups. The major groups comprise of **Tswana, Bakalanga, Batswapong, Babirwa, Basarwa, Bakgalagadi, Bayei, Hambukushu, Banoka, Bahurutshe, Baherero and Basubiya**. The 3 mixed settler groups comprise of Asians, the British and European, as well as people from different African countries.



### III. BACKGROUND: NATIONAL CIVIL AVIATION SECTOR

Under the Civil Aviation Authority of Botswana (CAAB) Act of 2011, the CAAB mandate is to promote aviation, safety and security and ensure the regular and efficient use and development of civil aviation in Botswana. CAAB commenced full operations on 10 April 2009 as a statutory corporation under the Ministry of Transport and Communications (MTC). CAAB is responsible for regulation of air transport, providing air navigation services, managing airports, and advising the government on all aspects of civil aviation. CAAB conforms to international standards overseen by international organizations such as International Civil Aviation Organisation and the International Air Transport Association (IATA).



The Civil Aviation Authority of Botswana operates four (4) international airports which are: Sir Seretse Khama International Airport (SSKIA), Maun International Airport (MIA), Phillip Matante International Airport (PGMIA) and Kasane International Airport (KIA). There are two domestic airports and 26 satellite airfields around the country. Aviation connects distant, remote, and inaccessible places in a vast country such as Botswana.





This versatility brought about by flying is a critical contributory factor to economic growth, as people, goods and services are transferred easily. Aviation is categorized into Civil Aviation (non-military air transport) and Military Aviation (Military Air Transport). Civil Aviation activities include, among others the following:

- Commercial air transport services
- General aviation (non-commercial air transport, photography and surveying)
- Airport services
- Air Navigation Services
- Aviation training

BOTSWANA AVIATION STATISTICS 2018											
	Aerodrome	Aircraft					Passenger				
		International		Domestic		Total	International		Domestic		Total
		Arrivals	Departures	Arrivals	Departures		Arrivals	Departures	Arrivals	Departures	
2018	SSKIA	5,626	5,638	2,305	2,413	15,982	181,078	183,497	41,986	40,625	447,186
	MAUN	1,964	2,051	22,862	22,822	49,699	42,497	49,624	93,639	85,654	271,414
	KASANE	1,309	1,259	5,210	5,264	13,042	17,530	20,094	31,316	38,138	107,078
	F/TOWN	404	378	921	937	2,640	4,388	3,896	14,202	14,212	36,698
	S/PHIKWE	5	4	63	64	136	14	14	92	96	216
	GHAZI	4	4	17	16	41	12	14	20	22	68

Table 1: Botswana aviation statistics 2018

Under commercial air transport services, a distinction is usually made between scheduled and non-scheduled air traffic. In Botswana Domestic Scheduled passenger service is currently operated by the national carrier, Air Botswana, and Mack Air. International scheduled flights in and out of the country are carried out by Air Botswana and Mack Air and two other foreign international air carriers, which are Ethiopian Airlines and South African AirlinK. Extensive non-scheduled services operated with small aircraft out of Maun and Kasane in the north are an essential component of the tourism industry in the Okavango Delta and the Chobe areas. Typically, scheduled services from Johannesburg and Gaborone bring tourists to Maun for an immediate connection with small aircraft providing direct air transport to the camps and lodges. The volume of VFR traffic is such that Maun is the busiest airport in Botswana in terms of departing and arriving aircraft. Currently there are fourteen chartered flight operators and five (5) are private air operators. The chartered flight goes to areas not serviced by Air Botswana and 80% of this service is to the immaculate Okavango Delta and Chobe areas in the northern part of the country.

#### IV. NATIONAL ACTION PLAN TEAM

The National Action Plan (NAPT) committee was formed after Botswana requested for assistance from ICAO regarding their initiative with the European Union Commission for capacity building for Carbon Dioxide (CO<sub>2</sub>) emissions mitigation from International Aviation. The CAAB notified the Minister of Transport and Communications (MTC) through an official notice. The NAPT, was officially established through Decision No 1/CAAB 13/1/22 I of 2021, by notification to the Minister of Transport and Communications (MTC).

For Botswana to fully participate and benefit from the Project, we have formed a State Aviation Environment Working Group (AEWG) as a policy advisory group to provide recommendations on Aviation environmental issues, as required from time to time. The committee was formed with the objective of developing the State Action Plan for Botswana on Carbon dioxide Emissions Reduction and identify mitigation measures that can be implemented to reduce emissions. ICAO assigned a Technical Project Consultant Mr. Didier Moukalan to assist Botswana in this Project. An official letter was written to our stakeholders requesting for members to join the AEWG to achieve its mandate.

The committee comprises of the following organizations,



Organization	Category	Position of representative
<b>Civil Aviation Authority of Botswana</b>	Government	<ul style="list-style-type: none"> <li>• Focal Point</li> <li>• Alternate Focal Point</li> <li>• Aeronautical Telecoms Engineer</li> <li>• Principal Aviation Safety Officer</li> <li>• Inspector, Meteorology</li> </ul>
<b>Ministry of Transport and Infrastructure</b>	Government	<ul style="list-style-type: none"> <li>• Transport Planner</li> </ul>
<b>Ministry of Environment, Natural Resources Conservation and Tourism</b>	Government	<ul style="list-style-type: none"> <li>• Chief Meteorologist</li> </ul>
<b>Air Botswana</b>	National Airline Operator	<ul style="list-style-type: none"> <li>• Head of Flight Operations</li> </ul>
<b>Major Blue Air</b>	National Airline Operator	<ul style="list-style-type: none"> <li>• Operations Manager</li> </ul>
<b>Kalahari Air Services</b>	Ground Handling	<ul style="list-style-type: none"> <li>• Operations Coordinator</li> </ul>
<b>Aircraft Ground Handling Services</b>	Ground Handling	<ul style="list-style-type: none"> <li>• Manager, Finance</li> </ul>
<b>Puma Energy Botswana</b>	Fuel Provider	<ul style="list-style-type: none"> <li>• Aviation Depot Manager</li> </ul>

Table 2: List of organization members of the NAPT

The first meeting was held on December 4, 2020, for all focal points appointed by their states with the ICAO-EU Technical Project Consultant. The objective of this meeting was to capacitate focal points in preparation for the development of the SAP's by providing more information on the activities of the project.

The AWEG held its first meeting to appraise the selected working group members of the mandate of the committee and come up with a work plan regarding activities that are to be undertaken for the development of the SAP and introduce the ICAO-EU Technical Project Consultant that we will be working with through-out the project. During the second meeting of the committee, Technical Project Consultant made a thorough presentation on how to go about collecting data and shared the template for data collection that has been developed by ICAO. This is the data that would eventually be used for the calculation of the baseline. Another meeting was convened by Technical Project Consultant to share the results of the baseline after calculation.

The committee also held a meeting to discuss the process of identifying and selecting mitigation measures from the ICAO basket of measures. After selection and submission of measures the committee shared with the Technical Project Consultant who in turn assisted us to make proper descriptions of the measures and avail the required information, which he used to quantify the measures to get the expected results. The Technical Project Consultant has been very supportive and guiding us in developing this action plan.

## V. BASELINE FOR CO2 EMISSIONS IN INTERNATIONAL AVIATION

To understand the benefits that can be expected from the implementation of mitigation measures selected by Botswana, it is useful to quantify both the historic fuel consumption and traffic, as well as to project into the future what would happen in the absence of the measures contained in the action plan.

### 5.1. Data Collection

The baseline for CO2 emissions in international aviation represents the evolution of CO2 emissions in international aviation up to 2050 in the absence of mitigation measures. The baseline was calculated using one (1) year of historic data (2019) provided by the national airline Air Botswana as the airline that operates international flights and another operator Major Blue Air that operates international flights. Only international flights according to ICAO definition were considered for the baseline calculation.

### 5.2. Calculation method

Due to the small size of the fleet, the NAPT has selected method A as per ICAO Doc 9988 and using the ICAO Environmental Benefit Tool (EBT) tool. The information's below were entered to the EBT forecast the future fuel burn and emissions data to develop the Baseline Scenario:

- Horizon time: from 2019 to 2050
- International RTK 2019: 6 776 887
- International fuel burn 2019 (tonnes): 3 170,95
- Number of aircraft in 2019: 8
- Annual RTK growth rate = 4% using ICAO Circular 333

### 5.3. Baseline results

According to the results, in the absence of mitigation measures, CO2 emissions from international aviation in Botswana will continue to grow from **10,020 tonnes of CO2 (tCO2)** in 2019 to **32,566 tCO2** in 2050, which represents an increase of 225% in thirty years.

The fuel efficiency calculated for 2019 was **0.47 L/tkm** and assumed to remain constant until the baseline horizon time 2050. The fuel consumption forecast in the absence of mitigation measures is presented in the table and figure below.

BASELINE				
Year	International RTK ('000)	International Fuel burn (t)	International CO2 emissions (t)	Fuel efficiency
2019	6 776,88	3 170,95	10 020	0,47
2020	6 776,88	3 170,95	10 020	0,47
2021	6 776,88	3 170,95	10 020	0,47
2022	6 776,88	3 170,95	10 020	0,47
2023	7 623,99	3 567,32	11 273	0,47
2024	7 623,99	3 567,32	11 273	0,47
2025	8 471,10	3 963,69	12 525	0,47
2026	8 471,10	3 963,69	12 525	0,47
2027	8 471,10	3 963,69	12 525	0,47
2028	9 318,21	4 360,06	13 778	0,47
2029	9 318,21	4 360,06	13 778	0,47
2030	10 165,32	4 756,43	15 030	0,47
2031	10 165,32	4 756,43	15 030	0,47
2032	11 012,43	5 152,79	16 283	0,47
2033	11 012,43	5 152,79	16 283	0,47
2034	11 859,54	5 549,16	17 535	0,47
2035	11 859,54	5 549,16	17 535	0,47
2036	12 706,65	5 945,53	18 788	0,47
2037	13 553,76	6 341,90	20 040	0,47
2038	13 553,76	6 341,90	20 040	0,47
2039	14 400,87	6 738,27	21 293	0,47
2040	15 247,98	7 134,64	22 545	0,47
2041	15 247,98	7 134,64	22 545	0,47
2042	16 095,09	7 531,01	23 798	0,47
2043	16 942,20	7 927,38	25 051	0,47
2044	17 789,31	8 323,74	26 303	0,47
2045	18 636,42	8 720,11	27 556	0,47
2046	19 483,53	9 116,48	28 808	0,47
2047	19 483,53	9 116,48	28 808	0,47
2048	20 330,64	9 512,85	30 061	0,47
2049	21 177,75	9 909,22	31 313	0,47
2050	22 024,86	10 305,59	32 566	0,47

Table 3: Baseline for CO2 emissions from international aviation



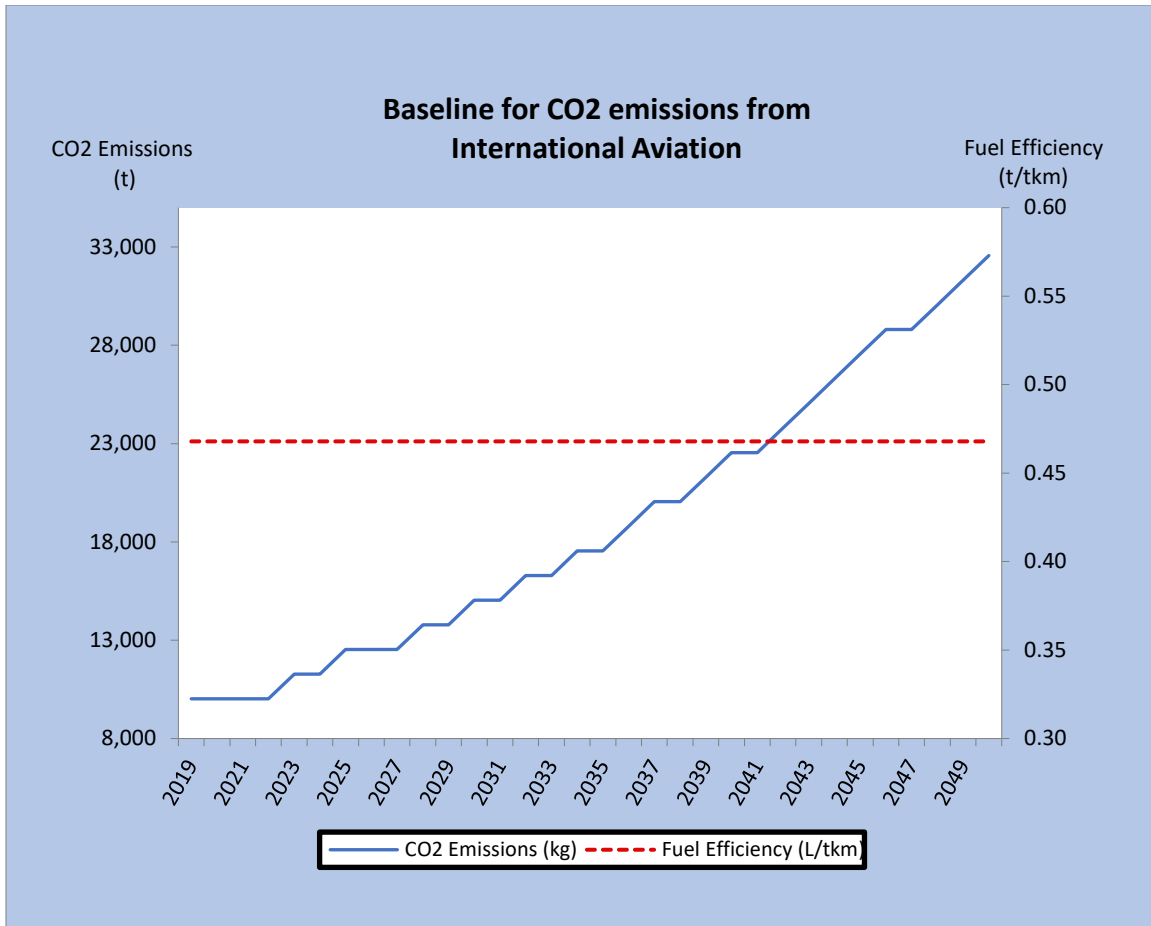


Figure 1: Botswana baseline scenario for CO2 emissions from international aviation

## VI. BASKET OF MEASURES FOR BOTSWANA

ICAO has various measures that states, air carriers, civil aviation authorities can select from a basket of measures. A program of action has been adopted on international aviation and climate change, which included global aspirational goals in the form of fuel efficiency, a basket of measures and the means to measure progress. The mitigation measures selected to reduce CO2 emissions from international aviation are focused on three (3) categories from ICAO's basket of measures: operational improvements, Market Based Measures (MBM) and airport improvements

### 6.1. Operational improvements

The CAAB is always planning on synchronizing network management between departure and arrival at Maun International airport for all aircraft in the Air Traffic Management system. This measure will be done by improving traffic flows through sequencing. The CAAB plans to improve access to optimum flight levels through climb/descend procedures and this will improve surveillance coverage in the Gaborone flight information region (FIR).

CAAB has implemented performance PBN through optimal routing. PBN introduces shorter routing procedures within the Gaborone FIR for en route, in the terminal area and in the vicinity of the airport. This is an ongoing project funded by MTC and CAAB.

CAAB has started implementation of improved access to optimum flight levels through climb/descent procedures using ADS-B. This project aims to implement WAM (with ADS-B) system to provide surveillance coverage in the Gaborone FIR, capable of processing MSSR mode a/c/s and ADS-B data from aircraft. This project has not taken off due to lack of funds and was therefore deferred.

#### ❖ **Arrival/departure management**

The CAAB is working on improving runway traffic flow through sequencing and AMAN/DAMAN is required especially at Maun airport, but this has not been fully implemented. This will lead to fully synchronized network management between departures/arrivals in Maun for all aircraft in the air traffic system at any given point in time.

Ground/surface movement- surface movement guidance and control systems (A-SMGCS) is required for taxi routing and guidance evolving to trajectory based with ground/cockpit monitoring and data link in delivery of clearances and information as well as runway safety alerting logic. Cockpit synthetic vision systems.

#### ❖ **More Efficient Operations**

Air Botswana will implement measures to improve the efficiency of its operations, such as reducing load factors for efficient use of aircraft seat capacity and short-term taxi distances. For optimum speed a software has been acquired and implemented that will assist in selecting flight levels and flight routes for fuel efficient operations. The ground handler, AGH is planning to put in place measures to enhance ground support equipment (GSE) management by minimizing distances travelled by GSE.

Air Botswana is planning on reducing use of thrust reversers upon landing. Since the runway is long this will allow the pilot to bring the aircraft to a halt without depending on the thrust reversers which accelerate the engine to maximum power to reduce speed. The flaps and spoilers will be used to reduce the aircraft speed on landing.

At present Botswana's energy sources consist primarily of electricity, fuel, and aviation gas. Solar, biogas, and biodiesel constitute only about 1 % of current national consumption. CAAB places increased emphasis on sustainable utilization of renewable energy (primarily solar and biogas) to respond to the country's abundance of solar resources and agro-waste by-products/cow-dung. The installation of biogas plants at airports can provide a renewable source of energy for cooking and heating needs within the airport. In this regard, there is need for further studies on the prospects of implementing biogas in the aviation sector.

## 6.2. Sustainable Aviation Fuels

The development of sustainable aviation fuels will be a key initiative that is required by the aviation industry. This is in line with Botswana's contribution to ICAO's global aspirational goals of carbon neutral growth from 2022. It is necessary to conduct a feasibility study to evaluate the potential of alternative fuels in the civil aviation sector of Botswana.

## 6.3. Airport Improvements

The Civil Aviation Authority of Botswana is planning to construct parallel taxiways at Kasane International Airport that will allow aircraft to leave runways at higher speed to reduce fuel consumption and delays. Currently when aircraft lands, it rolls to the end of the runway then backtrack to exit. With the construction of the parallel taxiways there is no need for aircraft landing to proceed to the end of the runway and back track. This reduces the runway occupancy time thereby decreasing holding time of aircraft in the air and holding time of departure.

CAAB plays a major role in establishing guidelines and recommendations for emission reductions that will be adopted by all stakeholders. CAAB has identified innovative mitigation measures to reduce carbon emissions:

- Installation of floor tile that converts kinetic energy from footsteps into electricity in all four international airports
- Installation of solar panel farm in all four international airports to generate power to save on revenue expenditure of electricity with no emissions.



Each step generates about five watts of energy enough to power a night light. The electricity generated from one step might sound tiny, but this technology's ingenuity is being able to harness energy from the masses. When deployed in high-trafficked areas like airports, the energy created from thousands of people's collective steps can be substantial.

The CAAB is also planning on replacing halogen lights which attract huge currents. LED lights have already been installed at Sir Seretse Khama International airport. CAAB is planning on installing LED lights at the remaining three international airport. This will greatly reduce electrical consumption attributed to the runway lights.



Phillip G. Matante International Airport



Kasane International Airport



Maun International Airport



Sir Seretse Khama International Airport



## VII. EXPECTED RESULTS

The quantification of mitigation measures selected was performed using ICAO EBT tool with information available. The table 2 below presents annual fuel burn before and after implementation of mitigation measures. It appears that the highest annual CO2 savings is **2 909 tCO2** emissions from international aviation per year.

Year	Annual Fuel burn <u>before</u> implementation of mitigation actions (Tonnes)	Annual Fuel burn <u>after</u> implementation of mitigation actions (Tonnes)	Annual CO2 savings (Tonnes)	CO2 Saving (%)
2019	3 170,95	3 170,95	0	0,00
2020	3 170,95	3 170,95	0	0,00
2021	3 170,95	3 170,95	0	0,00
2022	3 170,95	3 170,95	0	0,00
2023	3 567,32	3 275,85	921	-8,17
2024	3 567,32	3 139,61	1 352	-11,99
2025	3 963,69	3 043,55	2 908	-23,21
2026	3 963,69	3 043,20	2 909	-23,22
2027	3 963,69	3 043,20	2 909	-23,22
2028	4 360,06	3 439,57	2 909	-21,11
2029	4 360,06	3 439,57	2 909	-21,11
2030	4 756,43	3 835,94	2 909	-19,35
2031	4 756,43	3 835,94	2 909	-19,35
2032	5 152,79	4 232,31	2 909	-17,86
2033	5 152,79	4 232,31	2 909	-17,86
2034	5 549,16	4 628,68	2 909	-16,59
2035	5 549,16	4 628,68	2 909	-16,59
2036	5 945,53	5 025,05	2 909	-15,48
2037	6 341,90	5 421,42	2 909	-14,51
2038	6 341,90	5 421,42	2 909	-14,51
2039	6 738,27	5 817,79	2 909	-13,66
2040	7 134,64	6 214,15	2 909	-12,90
2041	7 134,64	6 214,15	2 909	-12,90
2042	7 531,01	6 610,52	2 909	-12,22
2043	7 927,38	7 006,89	2 909	-11,61
2044	8 323,74	7 403,26	2 909	-11,06
2045	8 720,11	7 799,63	2 909	-10,56
2046	9 116,48	8 196,00	2 909	-10,10
2047	9 116,48	8 196,00	2 909	-10,10
2048	9 512,85	8 592,37	2 909	-9,68
2049	9 909,22	8 988,74	2 909	-9,29
2050	10 305,59	9 385,10	2 909	-8,93

Table 4: Expected results after implementation of mitigation measures



The figure below shows the baseline and the expected results following implementation of the mitigation measures selected by Botswana. It provides a graphical representation of these results and confront them with the CO2 emissions and fuel efficiency expected in the baseline scenario.

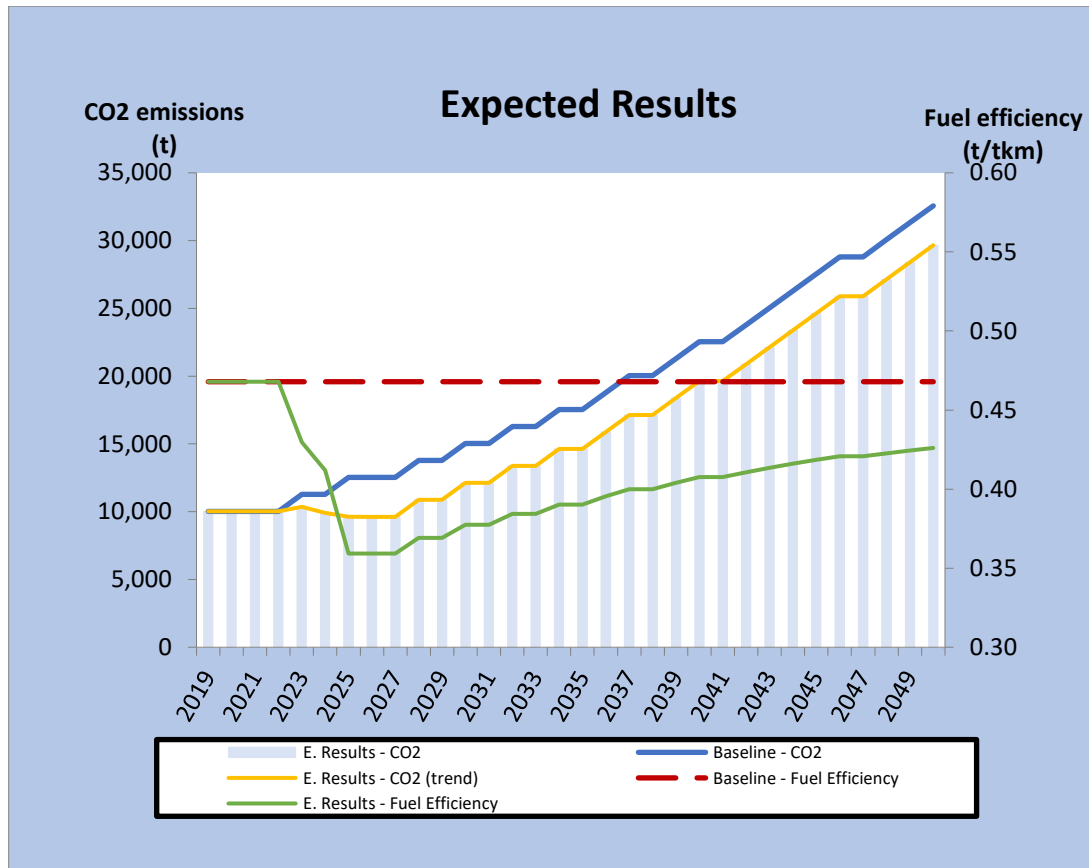


Figure 2: Expected results after implementation of mitigation measures

## VIII. ROADMAP FOR THE IMPLEMENTATION OF MITIGATION MEASURES

No	Description	2019	2020	2021	2022	2023	2024	2025
1	Conduct a feasibility study to evaluate potential of alternative fuel promote their use							
2	Improve Runway traffic flow through sequencing (AMAN/DMAN) especially in Maun airport							
3	Improve ground surface operations							
4	implement airport Operations through ACDM							
5	Improve access to Optimum Flight Levels through Climb/Descent Procedures using ADS-B							
6	Use of optimum routings							
7	Implement en-route PBN using flexible tracks							
8	Implement CCO in all Botswana international airports							
9	Implement CDO in all Botswana international airports							
10	Implement PBN using RNAV and RNP procedures							
11	Coordinate flexible use of civil-military airspace							
12	Construction of Parallel taxiway established at Kasane International Airport							
13	Minimize weight through the aircraft loading							
14	Strive for On-Time Performance							
15	Conservative use of thrust reversers							
16	Efficient use of aircraft seat capacity							
17	Implement the optimum speeds for efficient operations							
18	Shorter taxi distances and limited use of fuel on the ground							
19	Training of personnel in fuel efficiency and conservation procedures							
20	Voluntary inclusion of a State in the CORSIA							
21	Incorporation of emissions from international aviation into regional or national MBM							
22	Participation in offsetting schemes when they become available							
23	Installation of LED instead of classic light							
24	Installation of solar panel farm in all four international airports							
25	Installation of floor tile that converts kinetic energy from footsteps into electricity in airport							

## **IX. ASSISTANCE REQUIRED**


The assistance sought is mostly aimed at better coordination between all relevant stakeholders through seminars, awareness programs on the importance of fuel management, i.e., airlines, ground handlers and fuel providers. Financial assistance is also required to be able to implement the identified measures that will assist in reduction of carbon dioxide emissions.

Botswana will require assistance in the form of financial support to implement the planned procedures for better air traffic management, procedures for reduction of thrust reversers, replacement of halogen runway lights.

Financial support for capacity building, training of Air crews, air traffic ATC personnel, airport operators, airlines, ground handlers, fuel providers and officers responsible for CORSIA (developing organizations procedures and document and report emissions as required by ICAO). Conduct awareness seminars to sensitize staff on energy conservation. Training of airport and ground handling staff.

## ANNEX

### 1- Decision creating the Committee in charge for the development of the Action Plan on CO2 emissions reduction for Botswana



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**DECISION N° 1/CAAB 13/1/22 I OF 2021 ON THE CREATION OF THE  
COMMITTEE IN CHARGE FOR THE DEVELOPMENT OF THE ACTION PLAN ON  
CO2 EMISSIONS REDUCTION FOR BOTSWANA**

**5 February 2021**

**THE CHIEF EXECUTIVE OFFICER**

- Given the Convention relating to International Civil Aviation signed on December 7, 1944 in Chicago, in its its annex particularly on the 16 on environmental protection
- Given the Act no 11 of 09 September 2011 on the civil aviation regime in Botswana
- Given the Act of 01 August 2009 on the organization and functioning of the Aeronautical Authority, together with its subsequent amendment
- Given the Decree n°2010/022 of the 15 December 2018 appointing the Acting Chief Executive Officer of Botswana Civil Aviation Authority
- Given the Resolution n° A37-19 of ICAO asking member states to draw up an action plan for activities to reduce CO2 emissions
- Given the letter n° REF.:ENV 8/1.1 of 13 November 2020

Considering the service requirements,

**DECIDES**

Section 1: The present decision relates to the creation of the Committee in charge of developing the Action Plan on CO2 emissions reduction for Botswana, in short "the Committee"

Section 2: The Committee is responsible for:

- Raising awareness all stakeholders (Air Operators, Ground Handlers, Fuel Provider, Ministry of the Environment and Nature Protection) on activities to reduce CO2 emissions
- Developing the 2021-2023 three-year Plan for CO2 emissions reduction in accordance with the Standards and Recommended Practices (SARP) of Annex 16 to the afore mentioned Chicago Convention.

Section 3: Assisted by a Technical Secretariat, the Committee is made up of the statutory members designated below:

- President: Chief Executive Officer of the CAAB
- Vice-president: Director Flight Safety CAAB

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ALL CORRESPONDENCE TO BE ADDRESSED TO THE CHIEF EXECUTIVE OFFICER

• Members:

- a representative of the Ministry of Transport and Communication
- a representative of the Ministry of Environment, Wildlife Nature Conservation and Tourism
- Director of Airport Services CAAB
- Director of Air Navigation Services CAAB
- a representative of the Fuel Provider
- a representative of the Ground Handling Company
- a representative of Air Botswana
- a representative of Major Blue Air
- a representative of Kalahari Air Services

Section 4: Headed by a Coordinator, the Technical Secretariat is responsible for:

- the organization of committee meetings
- the keeping of documents and archives of the committees; and
- All other missions entrusted to him by the President of the committee.

The constitution of the committee and the technical secretariat is established by a decision of the Chief Executive Officer.

Section 5: The Chairperson of the committee may call on any person depending on his or her skills on the issues on the agenda to take part in the work of the committee and the technical secretariat in an advisory capacity.

Section 6: The Committee's operating expenses are borne by the budget of the Civil Aviation Authority of Botswana (CAAB).

Section 7: The Committee has until 31 March 2022 to submit the Action Plan for CO2 emissions for transmission to the ICAO.

Section 8: The Director of Finance and Procurement at the CAAB is responsible for the availability of the budget of this committee to allow it to fulfil its mandate.



Kabo Phutietsile  
Acting Chief Executive Officer



## 2- List of selected mitigation measures

Keyword	Measure	Start date	End date	CO2 savings	Stakeholders	Cost	Assistance needs	Required action
<b>1. Sustainable aviation fuels</b>								
Development of aviation alternative fuels	Conduct a feasibility study to evaluate the potential of alternative fuel and encourage and promote their use of in civil aviation sector	2022	2023	TBD		TBD	Yes	Technical assistance and funding
<u>Detail on quantification:</u> NA								
<b>2. Operational improvements</b>								
Improve pre-departure and arrival planning (AMAN/DMAN)	Implement improved runway traffic flow through sequencing required especially in Maun. Fully synchronized network management between departures and arrivals in Maun for all aircraft in the air traffic system at any given point in time	2022	2023	<b>39,97 tCO2</b>	CAAB MTC	P350 000	Yes	Funding to implement AMAN and DMAN. Survey and specifications, workshops and Training
<b><u>Detail on quantification:</u></b> EBT methodology used								
Type of measure AMAN - Total number of movements per year: 562. - % of implementation: 30								
Fuel savings per movement: 75 Kg - Annual fuel savings: 12,65 tonnes. - Annual CO2 savings: 12,65 x 3,16 = <b>39,97 tCO2</b>								
Ground surface operations	Implement surface movement guidance and control systems for taxi routing and guidance evolving to trajectory based with ground/cockpit monitoring and data link delivery of clearances and information as well as runway safety alerting logic. Cockpit synthetic vision systems	2022	2024	<b>322,79 tCO2</b>	CAAB MTC	P2 500 000	Yes	Funding to Implement A-SMCGS, Statement of User requirements, Technical specification, workshops and Training.
<b><u>Detail on quantification:</u></b> EBT methodology used								
Type of procedure Surf-peak period - Total number of movements per year: 3405 - % of implementation: 50								
Time savings per movement: 60 min - Average fuel burn (idle): 1,00 (kg/min)								
Annual fuel savings: 102,15 tonnes. - Annual CO2 savings: 102,15 x 3,16 = <b>322,79 tCO2</b>								

Keyword	Measure	Start date	End date	CO2 savings	Stakeholders	Cost	Assistance needs	Required action
Implement airport operations through ACDM	Improved access to optimum flight levels through climb or descent Procedures using ADS-B. Project is ongoing, funding differed. The project aims to implement WAM (with ADS-B) system to provide improved surveillance coverage in the Gaborone FIR. Capable of processing MSSR Mode A/C/S and ADS-B data from aircraft.	2022	2024	<b>1549,41 tCO2</b>	CAAB MTC	P500 000	Yes	Financial assistance for Workshops and/or Training
<b>Detail on quantification:</b> EBT methodology used Total number of aircraft per year: 8      - Total number of movements per aircraft per year: 3405      - % of implementation: 30 Time savings per movement: 60 min      - Average fuel burn (idle): 1,00 (kg/min) Annual fuel savings: 490,32 tonnes.      - Annual CO2 savings: 490,32 x 3,16 = <b>1549,41 tCO2</b>								
Improve the use of optimum flight levels	Improve access to optimum flight levels through climb/descent Procedures using ADS-B	2022	2024	TBD	CAAB MTC	P500 000	Yes	Financial assistance to Implement A-CDM, workshops and Training
<b>Detail on quantification:</b> TBD								
Improve the use of optimum routings	Implementation of PBN concept through optimum routing is implemented. It introduces shorter routing procedures within the Gaborone FIR for en-route, in the terminal area and in the vicinity of the airport.	2018	2024		CAAB MTC	P500 000	Yes	Financial assistance for Workshops and / or Training
<b>Detail on quantification:</b> TBD								

Keyword	Measure	Start date	End date	CO2 savings	Stakeholders	Cost	Assistance needs	Required action
Improve flexible track	Implement PBN concept using flexible tracks	2018	2024		CAAB MTC	P500 000	Yes	Financial assistance for Workshops and/or Training.
<u>Detail on quantification:</u> TBD								
Implement CCO	Implement CCO in all Botswana international airports. CCO fully synchronized routing network between major Airports SSKIA-Maun-PGM-Kasane for all aircraft in the air traffic system at any given point in time	2022	2024	269,07 tCO2	CAAB MTC	P1 000 000	Yes	Funding for Workshops and/or Training. stakeholders engagement meeting. Development plan of CCO
<u>Detail on quantification:</u> EBT methodology used Total number of movements per aircraft per year: 1703 - % of implementation: 50 Fuel savings per operation: 100 Kg - Annual fuel savings: 85,15 tonnes. - Annual CO2 savings: $85,15 \times 3,16 = 269,07$ tCO2								
Implement CDO in all Botswana international airports	Implement CDO in all Botswana international airports. CDO fully synchronized routing network between major Airports SSKIA-Maun-PGM-Kasane for all aircraft in the air traffic system at any given point in time.	2022	2024	161,44 tCO2	CAAB MTC	P1 000 000	Yes	Financial assistance for Workshops and/or Training. Stakeholders' engagement meeting. Develop a plan of CDO
<u>Detail on quantification:</u> EBT methodology used Total number of movements per aircraft per year: 1703 - % of implementation: 50 Fuel savings per operation: 60 Kg - Annual fuel savings: 51,09 tonnes. - Annual CO2 savings: $51,09 \times 3,16 = 161,44$ tCO2								
Implement PBN using RNAV and RNP procedures	Performance-based navigation through the use of RNAV and RNP procedures is in place. Implemented 2019.	2019	2024	TBD	CAAB MTC	P500 000	Yes	Funding for workshops and/or training
<u>Detail on quantification:</u> TBD								

Keyword	Measure	Start date	End date	CO2 savings	Stakeholders	Cost	Assistance needs	Required action
Improve flexible use of civil-military airspace	Flexible use of civil-military airspace measures is in place through civil-military committee. Put in place an agreement between CAAB and Military for flexible use of airspace.	2022	2023	TBD	CAAB	P50 000	Yes	Civil-Military committee to meet and make a memorandum/Letter of agreement. Coordination.
<u>Detail on quantification:</u> TBD								
Improve taxiing	Proceed to the construction of Parallel taxiway established at Kasane International Airport	2023	2025	1,10 tCO2	CAAB & MTC	TBD	Yes	Financial assistance
<u>Detail on quantification:</u> EBT methodology used Total number of aircraft per year: 8 - Total number of movements per aircraft per year: 72 - % of implementation: 30 Time savings per movement: 2 min - Average fuel burn (idle): 1,00 (kg/min) Annual fuel savings: 0,35 tonnes - Annual CO2 savings: $0,35 \times 3,16 = 1,10$ tCO2								
Minimize weight	Minimize weight through aircraft loading. Advise clients accordingly on dangers of overloading baggage and excess portable water which requires burning off more fuel and compromise safety Accurate computation of estimated weights for effective fuel planning	2022	2025	6,66 tCO2	AGH	No cost	No	
<u>Detail on quantification:</u> EBT methodology used Total number of aircraft per year: 4 - Annual flight time per aircraft: 3000 hr. - % of implementation: 90 Weight reduction per aircraft: 10 Kg. - Weight reduction factor: 1,95% Annual fuel savings: 2,11 tonnes. - Annual CO2 savings: $2,11 \times 3,16 = 6,66$ tCO2								
Strive for On-Time Performance	Strive for on-time performance Ensure a quick turnaround time in our operations to ensure that all vehicles, GSE and aircraft involved in the process do not run idle	2022	2024	TBD	AGH	TBD	No	

Keyword	Measure	Start date	End date	CO2 savings	Stakeholders	Cost	Assistance needs	Required action
Minimizing reversers use	Conservative use of thrust reversers	2021	2022	<b>558,30 tCO2</b>	Operators	TBD	No	
<b>Detail on quantification:</b> EBT methodology used Total number of aircraft per year: 1 - Total number of movements per aircraft per year: 2684 - % of implementation: 90 Fuel savings per landing: 73,14 Kg Annual fuel savings: 176,68 tonnes. - Annual CO2 savings: 176,68 x 3,16 = <b>558,30 tCO2</b>								
Improve load factors	Improve efficient use of aircraft seat capacity	2021	2022	TBD	Operators	TBD		
<b>Detail on quantification:</b> TBD								
Implement the optimum speeds for efficient operations	Optimum speeds for efficient operations, a software has been acquired and implemented which will assist in quantifying data	2021	2022	TBD	Operators	TBD		
<b>Detail on quantification:</b> TBD								
Shorter taxi distances and limited use of fuel on the ground	Shorter taxi distances and limited use of fuel on the ground	2021	2022	TBD	Operators	TBD		
<b>3. Market Based Measures</b>								
Voluntary inclusion in CORSIA	Voluntary inclusion of Botswana in the CORSIA	2022	2024	TBD	CAAB MTC	P300 000	Yes	Training in environmental issues / seminars, workshops for stakeholders
Incorporation of emissions from international aviation into regional or national MBM	Incorporation of emissions from international aviation into regional or national MBM, in accordance with relevant international Standards and instruments	2022	2025	TBD	AEWG CAAB MTC	TBD	Yes	Capacity building Financial backing



Keyword	Measure	Start date	End date	CO2 savings	Stakeholders	Cost	Assistance needs	Required action
Participation in offsetting schemes when they become available	Accredited offsetting schemes Participation in offsetting schemes when they become available	2022	2024	TBD	AEWG CAAB MTC	TBD	Yes	Capacity building, financial backing
<b>4. Airport improvements</b>								
Installation of LED instead of classic light	Changing Halogen to LED lights - 40% at Sir Seretse Khama International Airport. Project stopped due to lack of funds. Also install LED lights at the other three international airports, Maun, Kasane and Francistown international airports respectively	2023	2025	TBD	CAAB MTC	P5 000 000	Yes	Infrastructure development
<u>Detail on quantification:</u> TBD								
Cleaner energy sources	Installation of solar panel farm in all four international airports to generate power to save on revenue expenditure of electricity with no emissions	2023	2025	TBD	CAAB MTC	TBD	Yes	Conduct a feasibility study Technical assistance Financial backing
<u>Detail on quantification:</u> TBD								
Cleaner energy sources	Installation of floor tile that converts kinetic energy from footsteps into electricity in all four international airports	2023	2025	TBD	CAAB MTC	TBD	Yes	Conduct a feasibility study Technical assistance Financial backing
<u>Detail on quantification:</u> TBD								