



REPUBLIC OF UGANDA



UGANDA'S UPDATED ACTION PLAN FOR CARBON EMISSION REDUCTION FROM INTERNATIONAL CIVIL AVIATION



Entebbe International Airport

Second Edition

MAY 2026

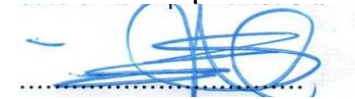
FOREWORD

The aviation sector plays a critical role in global commerce and air transport in Uganda has continued to grow and contribute to national development, job creation and increased trade with other countries. The Ugandan aviation industry has been expanding steadily over the past years as a result of increased demand for air transport services. Indeed, air transport itself has acted as a key cause and facilitator of economic growth by facilitating the country's integration into the global economy, providing direct benefits for users and wider economic benefits through its positive impact on productivity and economic performance.

It is also critical to understand that air transport contributes to greenhouse gas emissions, therefore, Uganda Civil Aviation Authority (UCAA) in coordination with other aviation stakeholders have developed this Action plan and submitted to ICAO as a national strategy to address Carbon (CO₂) emissions and environmental sustainability in the aviation industry.

In this Second Edition of the Action Plan, the objectives will be achieved through the selected mitigation actions and specific activities in the short, medium and long term. This Plan has incorporated all the relevant stakeholders' views and comments for adoption and implementation.

The implementation of this plan will be achieved through a three (3) year period from 2027 to 2030. For this plan to be effectively implemented, Uganda will build capacity on environmental issues, data collection and continuously monitor the impact of environmental issues on the aviation industry. This plan will be reviewed after every three years from the date of its implementation.



Fred K. Bamwesigye
Director General

Acknowledgements

Uganda Civil Aviation Authority (UCAA) would wish to express our gratitude for the valuable contributions of Organisations, Government Ministries, Departments, Agencies and individual aviation stakeholders towards the final production of this updated State Action Plan (SAP). We wish to acknowledge the significant role and leadership SAP Stakeholders Committee (SAPSC) towards actualization of this strategy.

We also wish to thank UCAA Director General Mr. Fred K. Bamwesigye, Director Safety, Security and Economic Regulations, Eng. Barongo Ronny and Manager ANS and Aerodrome Standards Ms. Atto Irene. L for your leadership throughout the process of updating this SAP.

Our sincere appreciation for the technical support from ICAO-UK Assistance project on Capacity Building for CO₂ Mitigation under the UK ACT-CORSIA assistance project. This provided Uganda CAA with the technical guidance that enabled the update of Uganda's Action Plan, establish robust emissions monitoring system and implementation of selected mitigation measures to reduce fuel burn and CO₂ emissions. The support of the ICAO-UK Project has been essential for the Government of Uganda to Update and submit this Second Edition of State Action Plan for Emissions Reduction.

Special thanks to Uganda Airlines team, who not only provided the baseline data for this process but also actively participated in the selection of the mitigation measures that will guide this Action Plan to its full implementation.

Furthermore, we appreciate the vital contribution of the ICAO Regional Office for Eastern and Southern Africa (ESAF), The Environment Offices of EAC CASSOA and AFCAC for the expert guidance you provided our technical team at various stages, as well as your thorough review and inputs into the development of this Action Plan.

Finally, the steadfastness and commitment of UCAA staff on the committee who continuously engaged with the SAP focal point throughout this process. We also acknowledge the entire DSSER team for your moral and technical support during the update and development of the action plan.

You are all much appreciated !

List of Abbreviations

AFTN	Aeronautical Fixed Telecommunications Network
AFS	Aeronautical Fixed service
AIM	Aeronautical Information Management
ANS	Air Navigation Service
ANSP	Air Navigation Service Provider
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Service
ATK	Available Tonne Kilometres
AVSEC	Aviation Security
ASBU	Aviation System Block Upgrades
AWOS	Automatic Weather Observing System
BASA	Bilateral Air Services Agreement
CAEP	Committee on Aviation Environmental Protection
CAMP	Civil Aviation Master Plan
CNS	Communication Navigation Surveillance
CO2	Carbon dioxide
CTA	Controlled Airspace
DAAS	Directorate of Airports and Aviation Security
DANS	Directorate of Air Navigation Services
DHRA	Directorate of Human Resources and Administration
DSSER	Directorate of Safety, Security and Economic Regulations
EIA	Entebbe International Airport
FIR	Flight Information Region
GHG	Greenhouse Gas
GNSS	Global Navigation Satellite System
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IPCC	Inter-governmental Panel on Climate Change
MET	Meteorological service for air navigation
NDP	National Development Plan
NMC	National Meteorological Centre
NOTAM	Notice to AirMen
NTMP	National Transport Master Plan
SAP	State Action Plan
SARP	Standard and Recommended Practices
SMS	Safety Management System
UCAA	Uganda Civil Aviation Authority

Executive Summary

Recognizing the challenges of the global warming, Uganda has been making progressive efforts to address Greenhouse Gas (GHG) Emissions from the national aviation activities through a wide range of possible measures in various fields in aviation, including air traffic management improvements and airport initiatives as well as aircraft emission reduction measures.

Over the years, UCAA has been upgrading its Air Navigation Systems, Airports facilities and operational procedures to meet the dynamic changing aviation industry and global challenges. These upgrades include the installation of new and modern air navigation equipment, fleet renewal, implementation of performance-based navigation, air traffic transitioning to radar surveillance and upgrade of Airports infrastructures.

Building on the success of the voluntary agreement to address greenhouse gas (GHG) emissions from aviation under the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), UCAA and the Ugandan aviation industry have developed this Action Plan as a strategy to mitigate greenhouse gas emissions from aviation activities.

In line with the broad international consensus, the Action Plan sets an aspirational goal to improve fuel efficiency from a 2022 baseline by an average annual rate of at least 2 percent per year until 2030. To help ensure attainment of this goal, the Action Plan identifies five key measures that are expected to have the greatest environmental impact:

- Aircraft Related Technology Development
- Improved ATM and infrastructure use
- More efficient Air operations
- Regulatory measures
- Airport Improvements
- Future deployment of sustainable aviation fuels (SAF)

The Action Plan also highlights a secondary set of measures with beneficial environmental results, but these results may not be expressed in quantitative terms due to the nature and current stage of the activity. The Uganda government through coordination of UCAA will introduce the following initiatives:

- Encourage investment in aircraft efficiency improvements and the development of sustainable biofuels policy;
- Monitoring and reporting Uganda's aviation carbon footprint;
- Working towards a multilateral approach through ICAO for managing the climate change impacts of international aviation;
- Establishment of an annual forum involving relevant government agencies and industry to facilitate the exchange of information and ideas on mitigating actions and to discuss any obstacles to implementation.

The Action Plan is a living document that will evolve through:

- Quarterly meetings between UCAA officials and the State Action Plan Stakeholders Committee.
- Annual reporting on the progress towards achievement of the Action Plan's fuel efficiency target.
- A review of the Action Plan, that will occur within three years (by 2030); and
- An audit that will occur at least once over the next three years.

This Plan is focused on International civil aviation activities and is being supported by the ICAO-UK Assistance Project on Capacity Building for CO₂ Mitigation from International Aviation. The Government of Uganda is committed to continue the implementation of concrete actions stipulated in this plan to achieve a greener and environmentally sustainable national aviation system.



Fred K. Bamwesigye
Director General

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Chapter One

Introduction

1.1 Background

Uganda is a landlocked country in the East African region and air Transport is therefore of strategic importance to the nation as it guarantees an alternative gateway to the rest of the world. Travel by air provides the most efficient and quickest transport means to Uganda and from the country to the rest of the world. Uganda's aviation industry is the nucleus of the country's development and is a pivotal link between Uganda and other countries. The country's perishable high value commodities are also exported by air. Much of the sensitive drugs, vaccines are transported by air. The development of a safe, efficient, reliable and environmentally sustainable air transport industry is thus among government's priority programmes.

Uganda also boasts of great natural tourism sites and a great deal of tourists are transported by air into the country especially by foreign registered international carriers and internally by private charters.

Uganda currently operates one International Airport at Entebbe which is under expansion and upgrade to accommodate the demand of increasing passengers and cargo traffic. Additionally, government is constructing a new international airport at Kabaale in Hoima district, to serve demands of the oil industry. Regarding regional and local transport, there are thirteen (13) regional aerodromes under management of the Uganda Civil Aviation Authority (UCAA). These include; Arua, Gulu, Soroti, Kasese, Kisoro, Jinja, Kidepo, Lira, Pakuba, Tororo, Masindi, Mbarara and Moroto. Government intends to upgrade five (Arua, Gulu, Pakuba, Kidepo and Kasese) regional aerodromes to promote trade and tourism. Furthermore, there are 20 airports and airstrips that are privately managed.

1.2 State of the Aviation Industry in Uganda

Like in the rest of the world, Uganda's Aviation Industry is struggling with a lot of challenges which include among others; Pandemics, regional/international conflicts, irregular and weak recovery from the global economic crisis and erratic aviation fuel prices. In Uganda the above challenges are further manifested in the following ways:

- i) Attacks and threats by terrorist groups in the region which discourage tourists movements.
- ii) Low demand for our perishable exports (Fish, flowers, fruits and vegetables)
- iii) High and unstable aviation fuel prices which have raised the cost of air travel.

Notwithstanding the challenges listed above, priority issues on Uganda's aviation agenda include:

- i) Expansion and upgrade of Entebbe International Airport (EIA)
- ii) Revival of the National Airline
- iii) Establishment of a new airport at Kabaale, Hoima to serve the Albertine region for oil-related businesses and strategies
- iv) Improvement and upgrade of the aviation security system at EIA
- v) Adoption of Next Generation Technologies - Aviation System Block Upgrades (ASBUs)
- vi) Development and Upgrade of Arua, Kisoro, Kasese, Jinja and Kidepo aerodromes to support domestic travel of tourists in the country.

1.3 Medium Term Development Goals of Uganda's aviation industry

In the medium term, in line with Vision 2040, National Development Plan (NDP), National Transport Master Plan (NTMP) and the Civil Aviation Master Plan (CAMP), the air transport sub-sector will continue to pursue the following main sector policy objectives:

- i) To facilitate and promote tourism development.
- ii) To provide adequate and suitable infrastructure to facilitate and promote export of perishable fresh agricultural produce and light industrial goods.
- iii) To provide linkages with other modes of transport as part of the national and regional inter-modal transport network.
- iv) To promote and attract investments in key facilities which support the air transport industry.
- v) Improve the human resource and institutional capacity of the Air Transport sub-sector to efficiently execute the planned interventions.
- vi) To facilitate humanitarian and relief services in the country and the region as a whole
- vii) Promote and support environment protection.

1.4 Critical Success Factors of Uganda Civil Aviation Authority

The Uganda Civil Aviation Authority (UCAA) is firmly committed to realizing its strategic objectives for the next five (5) years. To support this ambition, several Critical Success Factors (CSFs) have been identified through comprehensive stakeholder consultations and in-depth analysis of core operational domains. These CSFs are strategically aligned with UCAA's vision, mission, and core values, as well as with national priorities and international aviation standards and policies. They serve as foundational pillars for achieving organizational excellence and driving sustainable growth within Uganda's aviation sector.



Figure: The Critical Success Factor for UCAA

1.5 Uganda Civil Aviation Authority

The Uganda Civil Aviation Authority (UCAA) was established by an Act of parliament (Cap 354) in 1991, later amended in 2019 and 2024; with the main objective of promoting the safe, regular, secure and efficient use and development of civil aviation inside and outside Uganda. The Authority is mandated to carry out the following functions:

- i) Advisory role to Government in relation to civil aviation policy matters and international conventions and other functions as deemed necessary by the Minister responsible for aviation.
- ii) Regulation of safety, security and doing business in air transport
- iii) Management and development of major airports in the country.
- iv) Provision of air traffic and navigation services.

1.6 The Institutional Setup of UCAA

The Uganda Civil Aviation Authority (UCAA) is a State Corporation, established to regulate the Civil Aviation industry and provide Civil Aviation services on behalf of the Government of Uganda. The Board of Directors is the governing body of the Authority and is appointed by the Minister responsible for Transport. For Administrative and operational purposes, UCAA is headed by a Director General, who is the Accountable Officer of the Authority and oversees the operations of other the six (6) Directorates. Three (3) are Technical Directorates and three (3) non-technical directorates providing support services. These include:

- i) Directorate of Safety, Security and Economic Regulations (DSSER),
- ii) Directorate of Airports and Aviation Security (DAAS)
- iii) Directorate of Air Navigation Services (DANS),
- iv) Directorate of Finance,
- v) Directorate of Human Resources and Administration (DHRA), and
- vi) Corporate Affairs.

1.6.1 The Directorate of Safety, Security and Economic Regulations (DSSER)

The Directorate of Safety, Security and Economic Regulation (DSSER) is one of the six UCAA directorates. The overall function of this Directorate is to ensure Safety and Security of the aviation industry and compliance with the ICAO Standards and Recommended Practices (SARPs) through national regulations, aviation policies and directives issued from time to time. It is comprised of four main departments: *Flight Safety Standards, Air Navigation Services and Aerodromes Standards, Economic Regulation and Aviation Security, Facilitation, Policy and Regulation*. The Directorate of Safety, Security and Economic Regulation is responsible for the following:

- i) Licensing of airlines
- ii) Formulation and enforcement of air transport regulations
- iii) Monitoring of airlines performance
- iv) Provision of guidelines to airlines and user-groups
- v) Investigation of complaints by various users in the aviation industry
- vi) Advising government on the negotiation of Bilateral Air Services Agreements (BASA) and formulation of both domestic & international air transport policies
- vii) Aircraft clearance
- viii) Administer competence exams to flight crew and aircraft maintenance engineers prior to licensing them.
- ix) Inspect and certify aircraft and air operators.

- x) Inspect and license aerodromes.
- xi) Enforce national air navigation regulations in conformity with international standards and procedures through surveillance.

1.6.2 The Directorate of Airports and Aviation Security

The Directorate is headed by a Director and exists to provide efficient and effective airport operation services and to contribute to the revenue generation of UCAA. The Directorate ensures that the airports and aerodromes operate as commercially viable entities. Under the Director is the General Manager, Entebbe International Airport who manages the operations of Entebbe International Airport (EIA). The thirteen regional aerodromes are supervised by General Manager, Regional Airports. Furthermore:

- i) The Directorate is charged with the responsibility to *develop, operate and maintain* aerodromes as commercially viable entities.
- ii) Operational responsibilities include *Crash Fire & Rescue Services, Security, Passenger facilitation, bird hard & wildlife control services and airside services.*
- iii) The engineering section takes charge of routine maintenance and capital development projects while the commercial section is responsible for property rentals, concessions and non-aeronautical revenue development in general.
- iv) The gazetted aerodromes under the Directorate of Airports are Entebbe International Airport and thirteen (13) domestic airports located at Arua, Gulu, Kasese, Lira and Masindi, Mbarara, Moroto, Pakuba, Soroti, Tororo, Kabale, Kisoro and Jinja as indicated on the map below.



Map: Map of Uganda Map of Uganda showing location of al UCAA Managed international and domestic airports

1.6.3 The Directorate of Air Navigation Services (DANS)

The Directorate is responsible for providing services, infrastructure and systems that ensure a safe, orderly and expeditious flow of aircraft within the Uganda airspace. The Directorate delivers a range of air navigation services under four departments and one unit:

- i) Air Traffic Management (ATM)
- ii) Aeronautical Information Management (AIM)
- iii) Communication, Navigation, Surveillance (CNS)
- iv) ANS Safety Management Systems (SMS)
- v) Research and Development Unit
- vi) National Meteorological Centre

Associated with the Directorate is the National Meteorological Centre that provides aeronautical meteorological services for international and domestic air navigation.

1.6.4 The Directorate of Finance

The finance directorate is responsible for financial accounting and management, revenue and debt collection, billing, cash management, costing, budgeting and budgetary control. It is comprised of three departments: Accounting, Finance and Management Accounting.

1.6.5 The Directorate of Human Resources and Administration

The Directorate of Human Resource and Administration is responsible for the effective management and development of Human Resource towards realization of the Authority's objectives. It is also responsible for provision of logistics to enable and facilitate UCAA staff carry out their duties. The DHRA comprises of the following Departments;

- I) Human Resource Department
- II) Human Resource Training & Development Department
- III) Administration and Transport Department

1.6.6 The Corporate Directorate

All the Directorates in Uganda Civil Aviation Authority are under the stewardship of the office of the Director General. In addition, the DG heads Corporate Directorate, which comprises of support departments including Legal, Internal Audit & Risk Management, Strategic Planning, Quality Assurance, Marketing and Commercial Services, Procurement and Disposal Unit, Information Technology and Public Affairs. The DG also directs the profitable operation and development of UCAA within the legal and policy framework and as determined and agreed by the Board.

1.7 The ICAO Initiative of State Action Plans (SAP)

In the Fourth Assessment Report of The Intergovernmental Panel on Climate Change (*IPCC*), it was concluded that aviation (domestic and international) accounts for approximately 2 per cent of global Green House Gases (GHG) emissions produced by human activity. Based on that IPCC report, ICAO in Assembly Resolution A37-19 and reaffirmed by Resolution A38-18 and A39-2; set development policy and standards to limit and reduce the impact of aviation CO₂ emissions on the global climate and urged Member States to take action and advance initiatives on environmental sustainability. In undertaking to reduce the impacts of aviation CO₂ emissions on global climate, ICAO launched the State Action Plan (SAP) initiative in 2010 as a means for States to develop national strategies for reducing aviation CO₂ emissions.

The SAP initiative enables all ICAO Member States to establish a long-term strategy on climate change for the international aviation sector, involving all interested parties at national level. These parties are encouraged to work together to define a quantified baseline scenario, select appropriate emissions mitigation measures from ICAO's basket of measures, and calculate the expected results of implementing those measures. In Assembly Resolution A37-19, and reaffirmed by A38-18, A39-2, and A40-18; States are invited to update their State Action Plans every three years, so that ICAO can continue to compile the quantified information submitted. It is imperative for States to develop State Action Plans for CO₂ emissions reduction and ICAO has been able to identify several reasons to justify the development and submission of State Action Plans as indicated below:

- (i) Develop a better understanding of the shared and projected international aviation CO₂ emissions.
- (ii) Enhance cooperation between all aviation stakeholders that can positively reflect on their operational areas.
- (iii) Identify the most relevant mitigation actions that can be collectively implemented by different national stakeholders.
- (iv) Streamline policies among different stakeholders in the national aviation industry.
- (v) Enhancing stakeholders' support and understanding for policy decisions and establishment of cross-sectoral partnerships.
- (vi) Promote capacity building; and multiply environmental benefits that are realized from activities that are implemented as carbon emission mitigation measures.
- (vii) Facilitate aviation technology transfer; and identify assistance needs to support implementation of CO₂ emission reduction activities.

In line with the justifications stipulated above, Uganda will update its Action Plan as a tool that will be used to outline the national strategy to communicate both at the national and international levels, the efforts to address CO₂ emissions from aviation activities. Through the Action Plan, Uganda will also identify, quantify and implement the environmental mitigation measures that can contribute to the ICAO global long-term aspirational goals.

The updated Action Plan will further identify appropriate future mitigation measures and activities, barriers and constraints in the implementation of actions to mitigate CO₂ emissions. These may include but not limited to; access to financial resources, building national capacities and technology transfer as well as developing options to track the implementation of selected mitigation measures. The updating of this action plan has followed an inclusive process that has brought together all national stakeholders and their strategic contributions towards the effective implementation of the mitigation measures.

1.8 State Action Plan Stakeholders Committee (SAPSC)

Uganda's SAP Stakeholders Committee (SAPSC) was set up to oversee the development and implementation of selected measures to mitigate CO₂ emission from Uganda's aviation activities outlined in this State Action Plan. The SAPSC is composed of representatives from the following institutions and Directorates of Uganda Civil Aviation Authority:

- (i) Directorate of Safety Security and Economic Regulations (SAP Focal Point)
- (ii) Directorate of Air navigation Services
- (iii) Directorate of Airports and Aviation Security
- (iv) Ministry Works and Transport
- (v) Ministry of Energy and Mineral Resources
- (vi) Uganda National Oil Company

- (vii) Ministry of Water and Environment
- (viii) Ministry of Agriculture
- (ix) Uganda National Airlines Ltd
- (x) Total Energies Ltd and Tristar Energies Ltd
- (xi) Menzies Handling Services.

1.8.1 The Process of Updating the State Action Plan

The SAPSC was established for purposes of developing the State Action Plan with representation from relevant stakeholders (from the public and private sectors). The committee deliberated regularly to among others discuss progress of the SAP development, starting with data collection for generation of a baseline scenario. This baseline scenario is envisioned to serve as a reference scenario for CO₂ emissions of Ugandan aviation industry in line with the mitigation actions described in Chapter 3 of this Action Plan. The team collected and used fuel burn data and forecasted actions up to 2050.

Thereafter, the NSC developed the process of identifying and selecting mitigation measures from the ICAO basket of measures to mitigate CO₂ emissions from Uganda's aviation activities. While selecting the feasibility of measures, the committee considered the practical implications of implementation, such as understanding the steps required, the resources needed, the timing of measure implementation and the entity responsible for carrying out appropriate tasks in order to implement those measures.

Expected results in chapter 4 represent the projected fuel consumption and CO₂ emissions after the implementation of the measures selected. The quantification of expected results from the implementation of an action plan is a crucial element, as it is the means by which ICAO can understand the expected global advancement that can be achieved in respect to the environmental aspirational goals established by the ICAO Assembly.

Finally, the NSC identified assistance needed in the implementation of the measures selected which included financing, technical and training/capacity building. This will allow ICAO to address the States' specific needs in terms of facilitating access to the required assistance. The details of representatives of institutions are given in table below.

No	Name	Institution	Designation/Contact
1.	Mr. Khalid Y. Muwembe	Directorate of Safety, security and Economic Regulations (UCAA)	Principal ANS Inspector -MET/ENV State Action Plan Focal Point and Chair of National Stakeholders Committee (NSC) kmuwembe@caa.co.ug ; +256703829013
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3.	Ms. Gloria Kirabo	Directorate of Airports and Aviation Security (UCAA)	Principal Wildlife Hazard Control Officer gkirabo@caa.co.ug ; +256756543297
4.	Mr. Jonathan Olipan	Department of Strategic Planning (UCAA)	Senior Strategic Planning Officer jolipan@caa.co.ug ; +256752222702
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17.	Gulan Murugesan	Tristar Energies Ltd	Operations Manager murugesan@tristar-transport.com

1.8.2 Roles and Responsibilities of major stake holders.

Stakeholder	Primary Responsibility
Directorate of Safety, Security and Economic Regulations (UCAA)	In addition to the Directorate's overall function of Safety and Security oversight of the aviation industry; DSSER is the focal point for aviation environmental sustainability. In this project, Directorate is responsible for coordination of the development and implementation of Uganda's State Action Plan.
Directorate of Air Navigation Service Directorate (UCAA)	The Directorate guided the SAP committee with information regarding implementation of ATM improvements as well as the Aviation System Block Upgrade (ASBU) methodology adopted by Uganda. This assisted the team in estimation of fuel and CO2 emissions reduction resulting from the implementation of ATM operational improvements.
Directorate of Airports and Aviation Security (UCAA)	The directorate guided on sustainable airport improvements that result in reduced fuel consumption by aircraft main engines, and improvements that result in reduced taxi time and auxiliary power unit (APU) use that lower aircraft fuel use and CO2 emissions. They also guided on the proposition of green airport measure considered at national airports.
The National Airline	Uganda Airlines was represented on the committee to guide on the plans and implementation of fuel efficiency measures that are planned by the operator in the medium and long term.
Aviation Fuel Suppliers	The fuel suppliers are key to SAP development and implementation. They guided the committee on the future plans for supply of sustainable aviation fuel blends as well as fuel storage capabilities that enhances sustainable supplies.

Academia	Kyambogo, Gulu and Busitema university representatives guided the committee on the prospects on technological innovation, analysis, and research in sustainable bio-fuels.
Ministry of Works and Transport (MoWT)	Guided the committee on policy and long-term national air transport strategy and planning.
Ministry of Energy and Mineral Development	Guided on sustainable and efficient management of aviation fuel imports, storage and in partnership with private aviation fuel suppliers, explores energy-transition initiatives and low-carbon fuel pathways.
Uganda National Oil Company (UNOC)	
Ministry of Water and Environment (MWE)	Uganda's Focal Point for United Nations Convention on Climate Change (UNFCCC). The Ministry guided on Uganda's transition toward climate resilience by coordinating national climate response actions and support sustainable environmental management. The ministry also guided on the civil aviation sustainability actions in line with UNFCCC and its implementation frameworks under the Paris Agreement Article 6.
Ministry of Finance	Guided the committee on implementation of economic policy supporting national emission reduction efforts.
Ministry of Agriculture	Guided on sustainable production and supply of feedstocks for Bio-jet fuel/SAF production.
National Environment Management Authority (NEMA)	Guided the team on environment sustainability project verification and setting of criteria for carbon offset projects as well as monitoring of environmental impacts.

1.8.3 Terms of Reference for the State Action Plan Stakeholders Committee

Overall, the Terms of Reference (TOR) for the National Stakeholders Committee (NSC) included but not limited to the following;

- ❖ Conducted literature review in respect to Uganda's aviation activities.
- ❖ Collected and analyzed necessary baseline data on aviation activities in Uganda including fuel consumption and estimated carbon emissions for inclusion in the updated SAP.
- ❖ Analyzed the carbon emission mitigation measures from ICAO basket of measures under the options of technological advancements, operational improvements and use of sustainable aviation fuels, that can be implemented given the size and complexity of the aviation industry in Uganda.
- ❖ Recommended the medium term and long-term carbon emission measures/strategies that were adopted and included in Uganda's updated SAP.
- ❖ Estimated the expected results of implementing the medium and long-term measures proposed to reduce aviation carbon emissions from Uganda's aviation activities.
- ❖ Compiled the final SAP report for Uganda that will be considered as Uganda's strategy for reducing carbon emissions from the aviation industry.

Chapter Two

ESTABLISHMENT OF THE BASELINE FOR CO₂ EMISSIONS

The baseline scenario is intended to reasonably represent the fuel consumption and traffic that would occur in the absence of action to reduce CO₂ emissions. It was calculated according to the methodology given in the ICAO Doc 9988.

2.1 Data collection

Historical data on fuel burnt and RTK for the years 2022 to 2024 (three years) were obtained from the main national airline, the Uganda Airlines which represents around 95% of the international traffic for Ugandan registered carriers. Due to the challenges met by other national airlines to provide similar historical data, the baseline was calculated based on Uganda Airlines data. The historical data that was used to calculate the baseline is detailed in the following table.

Year	Fuel Burn (tonnes)	RTK (tonnes)
2022	89,207	41,667
2023	115,679	54,032
2024	185,823	86,795

2.2 Baseline Estimation Methodology

Table below, provides the following information related to baseline estimation methodology.

Table: *Baseline estimation methodology*

Definition used for international flights in action plan	☒ Annex 16, Vol IV definition ☐ Other (please specify)
Does the State have registered aeroplane operators?	☒ Yes ☐ No
Which methodology is used to account for the CO ₂ emissions attributed to international flights?	☒ All international flights operated by all aeroplane operators registered in the State (ICAO methodology) ☐ All international flights that depart from the State (IPCC methodology)
Brief explanation of the data collection methodology used, including the origin of the fuel consumption and air traffic data.	The data used in the study was fuel burn data from Uganda airlines for the years 2022, 2023 and 2024. The RTK was obtained from ICAO.
Time frame historical data provided	[From n- T ₀]
If EBT is used for the baseline estimations, please indicate the method selected from the EBT	☐ Method A ☐ Method B ☒ Method C (2022 data)
If Method A is selected from the EBT, please indicate the number of aircraft	6 Aircrafts
If other tools or methods are used to estimate baseline, please provide a brief explanation	None
Density of fuel used	☒ 0.8 kg/litres ☐ Other (please specify)
CO ₂ conversion factor used	For Jet-A fuel, Jet-A1 fuel, TS-1 fuel, or No. 3 Jet fuel ☒ 3.16 kg of CO₂/ kg of Jet fuel ☐ Other (please specify) For AvGas or Jet-B fuel ☒ 3.10 kg of CO₂/ kg of Jet fuel ☐ Other (please specify)
Air traffic growth factor used for estimations (%)	5 % per year
Please list any other assumptions made for baseline calculations, if applicable	N/A

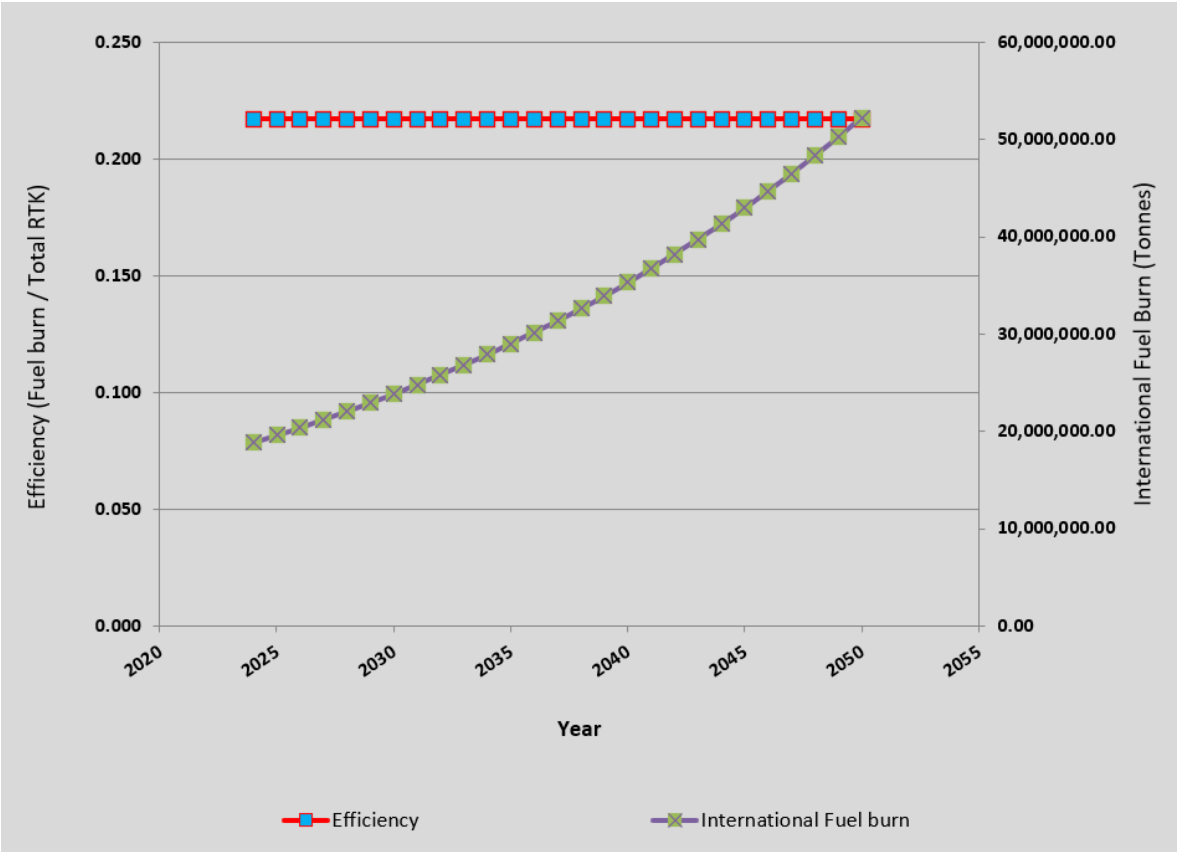
2.3 Calculation method

The ICAO Environmental Benefit Tool (EBT) designed to assist States determine environmental benefits was used to calculate the baseline value for Uganda and since Uganda airlines who are the biggest international operator currently operates less than 10 aircraft in its fleet, Method C of the EBT was used. The calculation was based on Uganda Airlines complete RTK and annual fuel burn (tonnes) baseline data for the year 2022. Given that Uganda Airlines run a fleet of six (6) aircrafts, the available fuel data as specified under 2.1 was used to calculate the baseline carbon emissions using Method C.

Year	International RTK (tonnes)	International Fuel Burn (Litres) '000	International Fuel Burn (metric tonnes)	Efficiency (fuel burn/RTK)	International Carbon emission (tonnes)
2022	89,207.00	41,667.00	13,185.75	0.467	131,667.72
2023	92,775.28	43,333.68	14,261.71	0.467	136,934.43
2024	96,486.29	45,067.03	18,855.82	0.467	142,411.81
2025	100,345.74	46,869.71	19,610.06	0.467	148,108.28
2026	104,359.57	48,744.50	20,394.46	0.467	154,032.61
2027	108,533.96	50,694.28	21,210.24	0.467	160,193.91
2028	112,875.31	52,722.05	22,058.65	0.467	166,601.67
2029	117,390.33	54,830.93	22,940.99	0.467	173,265.74
2030	122,085.94	57,024.17	23,858.63	0.467	180,196.37
2031	126,969.38	59,305.13	24,812.98	0.467	187,404.22
2032	132,048.15	61,677.34	25,805.50	0.467	194,900.39
2033	137,330.08	64,144.43	26,837.80	0.467	202,696.41
2034	142,823.28	66,710.21	27,911.24	0.467	210,804.26
2035	148,536.21	69,378.62	29,027.67	0.467	219,236.43
2036	154,477.66	72,153.76	30,188.78	0.467	228,005.89
2037	160,656.77	75,039.91	31,396.33	0.467	237,126.13
2038	167,083.04	78,041.51	32,652.18	0.467	246,611.17
2039	173,766.36	81,163.17	33,958.27	0.467	256,475.62
2040	180,717.01	84,409.70	35,316.60	0.467	266,734.64
2041	187,945.69	87,786.08	36,729.27	0.467	277,404.03
2042	195,463.52	91,297.53	38,198.44	0.467	288,500.19
2043	203,282.06	94,949.43	39,726.38	0.467	300,040.20
2044	211,413.35	98,747.41	41,315.43	0.467	312,041.80
2045	219,869.88	102,697.30	42,968.05	0.467	324,523.48
2046	228,664.67	106,805.19	44,686.77	0.467	337,504.42
2047	237,811.26	111,077.40	46,474.24	0.467	351,004.59
2048	247,323.71	115,520.50	48,333.21	0.467	365,044.78
2049	257,216.66	120,141.32	50,266.54	0.467	379,646.57
2050	267,505.33	124,946.97	52,277.20	0.467	394,832.43

The baseline CO₂ emissions for the period from 2022 running up to 2050 is as shown in the graphics below. The analysis from the table 2 above and Graph 1 below shows that in the absence of mitigating measures, CO₂ emissions from international aviation will grow from around 131,667 tonnes in 2022 to 394,832 tonnes of CO₂ emissions by 2050, which represents an increase of 177% in 25 years.

Graph: Total Annual Fuel Burn Vs Fuel Efficiency Graph



Although Uganda had complete RTK and annual fuel burn (tonnes) data for the years 2022, 2023 and 2024; data for the year 2022 was used to calculate the baseline carbon emissions using Method C of the ICAO EBT tool.

Chapter Three

MITIGATION MEASURES FOR CO₂ EMISSIONS REDUCTION IN UGANDA

3.1 Selected mitigation measures for the Action Plan

In this section, mitigation measures selected for the Action Plan are presented in accordance with the basket of measures defined by ICAO in Doc 9988. The Action Plan takes a sustainable development approach by considering the environmental, social and economic impacts of each measure. The plan has adopted the six (6) categories of the basket of measures that include:

- i) Improvements in aircraft technology and standards.
- ii) Improvements in Air Traffic Management (ATM) and Infrastructure use
- iii) Operational improvements.
- iv) Airport Improvements
- v) Market-based measures; and
- vi) Sustainable aviation fuels.

3.2 Improvements in Aircraft Technology and Standards.

Uganda has selected this measure of improving aircraft technology and standards because once this measure is effectively implemented. ICAO has envisioned that once States adopt this measure, they can reduce the amount of CO₂ that is emitted during flights by adopting a policy to encourage aircraft operators to replace their fleet with newer and more modern aircraft. Modern technologies which are fuel efficient are utilized in the construction of newer aircraft. For example, latest models of turbine engines have a higher by-pass ratio when compared to older models which have a low by-pass ratio if any. The airframe construction is relatively lighter since the introduction of composite materials in aircraft construction. The newer aircraft have been retrofitted with computerized avionics systems which are compact and much lighter in weight when compared to the older systems. The resultant is reduced fuel consumption per the same routes and while passenger and cargo loads are increased.

The Uganda Airlines will adopt this measure by purchasing newer and more modern aircraft aircrafts to reduce the amount of CO₂ that is emitted during flights. Implementing this measure includes medium-term and long-term considerations. Medium-term measures include retrofits and upgrade improvements on existing aircraft, optimizing improvements in aircraft performance and fuel efficiency in the near to mid-term. Uganda airline plan to purchase ten (10) new aircrafts in the next ten years with initial five (5) new aircrafts expected by 2030. The operator expects that the fleet renewal efficiency gains are based on the more technologically advanced engines and systems that are more fuel efficient than the current fleet.

Furthermore, acquisition of new aircrafts may lead to additional impacts on the overall fuel efficiency of Uganda airlines fleet that will be reflected in the CO₂ emissions monitoring conducted during the implementation of the Action Plan. These developments will also be taken into account in future in the subsequent updates of the Action Plan.

3.3 Improvements in Air Traffic Management (ATM) and Infrastructure use

The Directorate of Air Navigation Services (DANS) has implemented Performance Based Navigation (PBN) operations on all the routes in Uganda. Implementation of PBN routing in the whole airspace will permit flexible routes and increased fuel savings by the operators.

Uganda has also adopted an integrated air navigation planning tool which addresses required solutions by introducing the Aviation System Block Upgrades (ASBUs) initiative. Implementation of the ASBUs initiatives enhances harmonization of air traffic flow efficiency, increased capacity, as well as airspace planning and sustainable utilization. This aspect forms the basis for selection of mitigation measures and initiatives related to ATM improvement and infrastructure use. In the implementation of State actions, Uganda will implement the following initiatives:

- a) Improved fuel-efficient departure and approach procedures.
- b) Full utilization of RNAV/RNP capabilities
- c) Performance-Based Navigation (PBN)
- d) Pre-departure planning (DMAN) and arrival planning (AMAN)
- e) Improvement of Collaborative decision making (A-CDM);
- f) Improved flexible use of civil-military airspace;

a) Improved Fuel-efficient departure and approach procedures.

i) Continuous Descent Operations (CDO)

The Continuous Descent Operations (CDO) has been implemented for Entebbe International Airport and is an operational technique that is enabled by airspace design, procedure design and facilitated by Air Traffic Control (ATC). The concept allows aircraft to follow a flexible and optimum flight profile, with optimal fuel flow and in low drag configuration, they minimize fuel burn and fuel usage, while simultaneously reducing GHG emission.

ii) Continuous Climb Operations (CCO)

Like the CDO, the Continuous Climb Operations (CCO) implementation in the Entebbe FIR has resulted into minimized fuel burn and fuel usage, that reduce on GHG emission during the climb phase of flights out of Entebbe International Airport.

b) Full utilization of Area Navigation (RNAV) Capabilities

Uganda will fully utilise the Area navigation (RNAV) that permits aircraft operation on any desired flight path within the coverage of ground- or space-based navigation aids or within the limits of the capability of self-contained aids to conserve flight distance and reduce congestion. This can be done through the free route airspace, flight planned direct routes and performance-based navigation (PBN).

i) Free Route Airspace (FRA)

In this concept of Free Route operations, Uganda will enable airspace users to fly as closely as possible to their preferred trajectory without being constrained by fixed airspace structures or fixed route networks. FRA permits freely flight planning the route from a defined entry point to a defined exit point subject to airspace availability. The users of the FRA route will benefit through:

- Reduced flight distances;
- Reduced flight duration;
- Reduce fuel burn and CO₂ emission;

- Improved capacity; and
- Flight flexibility and efficiency.

ii) Flight Plannable Direct Routes

Uganda plans to further implement flight plannable direct routes within Entebbe FIR to increase flight efficiency as well as minimize fuel burn and CO₂ emission.

c) Performance-Based Navigation (PBN)

Uganda has also developed the PBN implementation plan, providing the framework for proper guidance and direction to the air navigation service, airspace operators and users as well as foreign operators who operate or plan to operate in the airspace. The primary driver for this plan is to maintain and increase safety, accommodate the increasing air traffic demand and capacity. Further PBN will also facilitate implementation of new technology in consultation with relevant stakeholders and hence reducing fuel burned and CO₂ emissions.

d) Pre-departure planning (DMAN) and arrival planning (AMAN)

Uganda plans to install a pre-departure planning (DMAN) and arrival planning (AMAN) systems and once the system is fully implemented, it will benefit the aviation industry in the following ways:

- ❖ Improved efficiency by balancing arrivals and departures;
- ❖ Optimized planning for inbound and outbound flights;
- ❖ Reduced costs and environmental impacts caused by capacity imbalances;
- ❖ Support future air traffic flow management (ATFM)

e) Airport Collaborative Decision Making (A-CDM)

A-CDM has been implemented at Entebbe International airport and aims to improve the efficiency of airport operations by optimising the use of resources and improving the predictability of air traffic. The A-CDM encourage the airport stakeholders to collaborate and exchange accurate and timely information.

When integrated with AMAN/DMAN the system will continue to improve en-route and sectoral planning which will in turn, reduce the fuel burn, as it will focus on aircraft turn-round time as well as the pre-departure and pre-arrival process.

f) Improved flexible use of civil-military airspace.

Uganda has enhanced civil/military coordination through establishment of the Civil- Civil Military Advisory Board at national level and Committee for airspace organisation and management at operational level. In addition, UCAA has established an MOU with the military on civil-military cooperation that has enhanced engagement with the military on ways to manage available airspace in a flexible manner. This is in line with ICAO recommendations on the implementation of the Flexible Use of Airspace (FUA) concept that has benefits for both civil and military aviation.

3.4 Airport Improvements

3.4.1 Enhance Apron Control System

Uganda will implement improvements in airport apron operations activating the Apron Control System (ACS) at Entebbe International Airport (EIA). The ACS shall manage and coordinate the movement of aircraft, vehicles, and personnel on the apron (the area where

aircraft are parked, loaded, and unloaded) to ensure safety and efficiency. The system will be implemented to handle tasks like allocating parking stands, coordinating pushbacks and relaying real-time operational data to facilitate smooth transitions between the apron and air traffic control in order to maintain the declared surface movement rate under all weather conditions while maintaining the required level of safety and efficiency including delivering of improved situational awareness to controllers. The ACS will provide benefits in terms of safety, efficient fuel burn on the apron, increased runway and taxiway usage and overall reduction in CO2 emissions.

3.4.2 Aerodrome upgrades

For long-term planning, EIA has improved the aerodrome taxiways through redevelopment, enhance markings and lighting to minimise taxiing time and reduce congestion. This, in turn, facilitates more efficient ground movements. This reduces congestion and delay in bad weather and can reduce the need for diversions to other airfields.

In future, EIA envisions construction of additional taxiways to facilitate speedy taxiing and exits to reduce aircraft fuel burn and subsequently reduce CO2 emissions from taxiing operations.

The upgrades of lighting system at the airport that include installation of LED in the offices and parts of the runway. In addition, the airport terminal building expansion and upgrades have been designed with larger glass windows which take advantage of the ever-available natural sunlight to enhance clear lightings during daylight hours and save on the costs of lighting the buildings. In this scenario, the airport electrical system feeding the energy needs of the aircraft and flight operations would be powered by both solar power and electricity from national grid to generate co-benefit to the initiative of greening the airport.

3.5 Ground Handling Initiatives

3.5.1 Enhanced Ground Support Equipment (GSE) Management

The Ground Handling companies at EIA have enhanced their operations through the use of new Ground Handling Support Equipment (GSE) with engines that minimize exhaust emissions. The ground handlers further propose to implement measures that include replacement of diesel-powered tractors, buses and tugs by those that use cleaner energy fuel or electricity.

The ground handlers will also improve GSE management by minimizing the distances travelled by vehicles through the designation of parking areas that are close to the aircraft parking, and this is intended to achieve reduction in CO2 emissions using new GSE.

3.5.2 Replacement of diesel-powered equipment

The ground handling companies propose to implement measures to enhance Ground supporting Equipment (GSE) management. These measures will include replacement of diesel-powered tractors, buses and tugs by those that use cleaner energy fuel or electricity. They are also encouraged to avoid unnecessary idling of equipment during hold-out periods.

3.5.3 Preventive maintenance

Other areas of efficiency are the preventive maintenance schedules taken by Ground Handlers that include adherence to original equipment manufacturer (OEM) directed

preventive maintenance schedules, and use of correct filters as per the OEM operational manuals. Both practices guarantee reduced CO₂ emissions resulting from ground operations.

3.5.4 Environmental Sustainability Measures

The ground handlers should implement initiatives to carry out other environmental sustainability measures which include:

- ❖ Introduction of the use of electric forklifts within the warehouses
- ❖ Conversion of GSE to cleaner fuels by introduction of electric operated ground equipment and gas/biofuel operated ground equipment.
- ❖ GSE standard operating procedure that requires that ground support equipment must never be left running when not in use (avoid unnecessary idling of equipment).
- ❖ Regular maintenance of the generators with genuine service parts from the original manufacturers.

3.6 Aviation Fuel Supply Chain

To enhance efficiency and sustainability of aviation fuel supply, Uganda engaged Tristar Energies Limited to construct and operate a fuel storage facility and fuel hydrant pipeline system. To improve the jet fuel supply at Entebbe Int. airport, Tristar has constructed 12 million litres of fuel storage tanks and laid an underground fuel pipeline to supply fuel directly to aircraft. This newly built facility provides additional fuel storage at the airport, enhances safety, and facilitates quicker aircraft turnaround, consequently enhancing fuel supply efficiency at the airport. The newly installed fuel supply system is also expected to support the increasing number of operators at the airport.

Tristar has future expansion plans to address long-term demand. Once fully completed, the Fuel Farm will reach 22 million-litre storage capacity and a 7-kilometre fuel hydrant pipeline with 43 hydrant pits, covering the entire airport. The storage facility and fuel hydrant pipeline have been constructed to meet the latest industry standards, including a leak detection system and a 24/7 control and monitoring system. This system is expected to improve environment sustainability of jet fuel supply system at Entebbe international airport.

3.7 Sustainable Aviation Fuel (SAF)

By 2030 to 2035, the Aviation industry in Uganda will consider development of sustainable alternative aviation fuels as a key initiative to meet the global aspirational goal of net-zero carbon emissions pathway for the aviation sector by 2050. The SAF feasibility study for Uganda was completed in December 2025 and the study found that Uganda has a unique combination of biomass abundance, substantial agricultural productivity and strategic location that makes it well suited for Sustainable Aviation Fuel (SAF) development. The development of the sustainable aviation fuels will strategically look at reducing CO₂ emissions through:

- i) Establishing zero CO₂ emission biofuels content for blending with jet fuel.
- ii) Initiatives to support next generation technologies for alternative fuels.
- iii) Continued assessment of the effectiveness of the sustainable aviation fuels.

The study concluded that Uganda's combination of biomass availability, waste management needs, and strategic infrastructure provides a strong foundation for SAF deployment. With quantified technical potential exceeding 300–850 million liters per year, certified pathways, and airport readiness, Uganda is positioned to progress from feasibility to first-generation

production by 2030 – 2035. A robust policy framework, blended-finance support, and coordinated leadership through a national SAF Council will enable Uganda to become a regional SAF pioneer, advancing energy security, economic diversification and climate-aligned growth.

In the next phase, Uganda will proceed to develop a comprehensive sustainable aviation fuel (SAF) business implementation study that will assist producers to create SAF from renewable sources, such as waste oils, municipal wastes and other sources. The blend of SAF and normal jet fuel will eventually be made available to aircraft operators who can use it as a drop-in fuel as one of the measures to mitigate CO₂ emissions from aviation activities.

3.7.1 Importation of Blended Aviation Fuel

The ministry of Energy in coordination with Uganda National Oil Company (UNOC) are working with Uganda Airlines to ensure commencement of importation of SAF blended fuels by 2028. Once the imported blended fuels are deployed, this will greatly reduce the CO₂ emissions from all international operations of Uganda airlines.

3.7.2 The National Oil Refinery

Uganda in committing to support the ICAO standards, policies and strategies set to limit and mitigate the impact of aviation carbon emissions on the global climate, the Uganda national oil refinery will prioritize the production and deployment of Low Carbon Aviation Fuels (LCAF) as an alternative strategy for mitigation of emissions from aviation activities. Prioritizing the early development and production of the low carbon aviation fuel (LCAF) would fast track use of cleaner aviation fuels in Uganda.

Furthermore, the Uganda's National Oil and Gas Policy supports energy diversification and downstream infrastructure, which lays a foundation for SAF integration and national oil refinery project could provide infrastructure (pipelines, storage, blending facilities) that could later accommodate bio-refineries or SAF blending plants. Once Uganda begins SAF production, the refinery's logistics network (tanks, jet fuel pipelines to Entebbe plus supporting hydrant system) could be adapted to distribute SAF and the associated LCAF.

3.8 Enhancing Weather Observation/Forecasting Services

The Department of Meteorological Services in the Ministry of Water and Environment have enhanced the aeronautical meteorological observation and forecasting services by implementing the following items;

- (a) Installed three (3) weather radars covering the entire Ugandan airspace with an objective of enhancing the weather monitoring capacity in support of both aeronautical meteorological services and other meteorological applications.
- (b) Upgraded the OPMET system that has enhanced the collection, processing and dissemination of Operational Meteorological Information for aviation, primarily for flight planning and safety. The system involves various components and procedures for data exchange, including Regional OPMET Databanks (RODBs), monitoring software and the transition to digital IWXXM data formats within a System Wide Information Management (SWIM) environment.
- (c) Installed the Low-level Wind shear Alert System (LLWAS) with eight (8) wind profiler stations around Entebbe International Airport. This installation will improve wind

shear detection and enhance early warnings to ensure aircraft operational efficiency for approaching and take-off flights from Entebbe.

- (d) Upgrading of forecasters systems to improve aeronautical meteorological forecasts of weather phenomena that are hazardous to aircraft operations.
- (e) Training and capacity enhancement of aeronautical meteorology personnel especially refresher training on new systems and innovations in aviation weather forecasting and observation to enhance accuracy of aeronautical meteorological information that supports air navigation.

3.9 Other Environmental Actions that Mitigate CO2 Emissions at Entebbe International Airport and Aerodromes

In addition to the measures established under ICAO guidance for development of the State Action Plans, Uganda has proposed additional initiatives to mitigate CO2 emissions and ensure environmentally sound airport operational practices. These measures have been captured in the UCAA strategic plan and implemented in the annual workplans. Among others, these include;

- i) Implement an Environmental Management System (EMS) that will help UCAA manage its environmental impact related to aviation activities in and around the aerodromes. This will include undertaking periodic environmental impact assessments which involved evaluation of airport activities and processes of ongoing projects to determine how far they conform to sound environmental practices.
- ii) Use of alternate cleaner energy sources through reducing demand for electrical use (switching off unnecessary lights, encourage use of stairs other than lifts). In addition, installation of solar lighting system for the entire airport perimeter fence was implemented since 2022 as part of an initiative to “Green” Entebbe International airport. Furthermore, the lighting system on both the airside and landside shall be provided from renewable sources, mainly by use of solar panels to power the lights.
- iii) Conduct employee training to raise awareness on airport environmental sustainability.
- iv) Collaborate with airport stakeholders to promote responsibility and sustainable practices that will reduce environmental impact of aviation.
- v) Green procurement - prioritize the purchase of eco-friendly products and services for Entebbe airport and upcountry aerodromes.
- vi) Implement air quality monitoring: implement air quality monitoring systems to track air pollution levels and identify sources of pollution. This will help UCAA take appropriate actions to reduce pollution levels.
- vii) Use alternative energy sources: UCAA will use alternative energy sources such as solar and wind energy to reduce their reliance on fossil fuels and reduce air pollution. UCAA has installed solar security lighting system for the entire Entebbe airport perimeter fence and similar initiative will be replicated for all the thirteen (13) other UCAA managed aerodromes across the country.
- viii) Promote sustainable transportation: UCAA is promoting and will continue to support sustainable transportation options such as public transport of staff and operators at the airport, electric vehicles especially mass transportation buses and other cleaner transportation modes to reduce emissions from vehicles.

- ix) Use low-emission vehicles: UCAA will promote use of low-emission vehicles such as electric and hybrid vehicles for ground transportation, reducing emissions from traditional gasoline and diesel vehicles.
- x) Promote recycling and efficient waste management systems especially for airport.
- xi) Improved transportation to and from the airport through improved public transport access and employee transportation.

Chapter Four

QUANTIFICATION OF EXPECTED RESULTS

4.1 Expected Fuel Savings after implementation of Mitigation Measures

The implementation of the selected mitigation measures presented under Chapter 3 are expected to lead to reduction in fuel burn on average of between 500 to 560 tonnes per year between 2026 and 2029. By 2030, as Uganda anticipates to commence production and deployment of Sustainable aviation fuels (SAF) and purchase of at least five (05) new aircrafts by Uganda Airlines; these measures are expected to enhance reduction in annual fuel burn to an average of around 3,800 tonnes from the year 2030 to 2050.

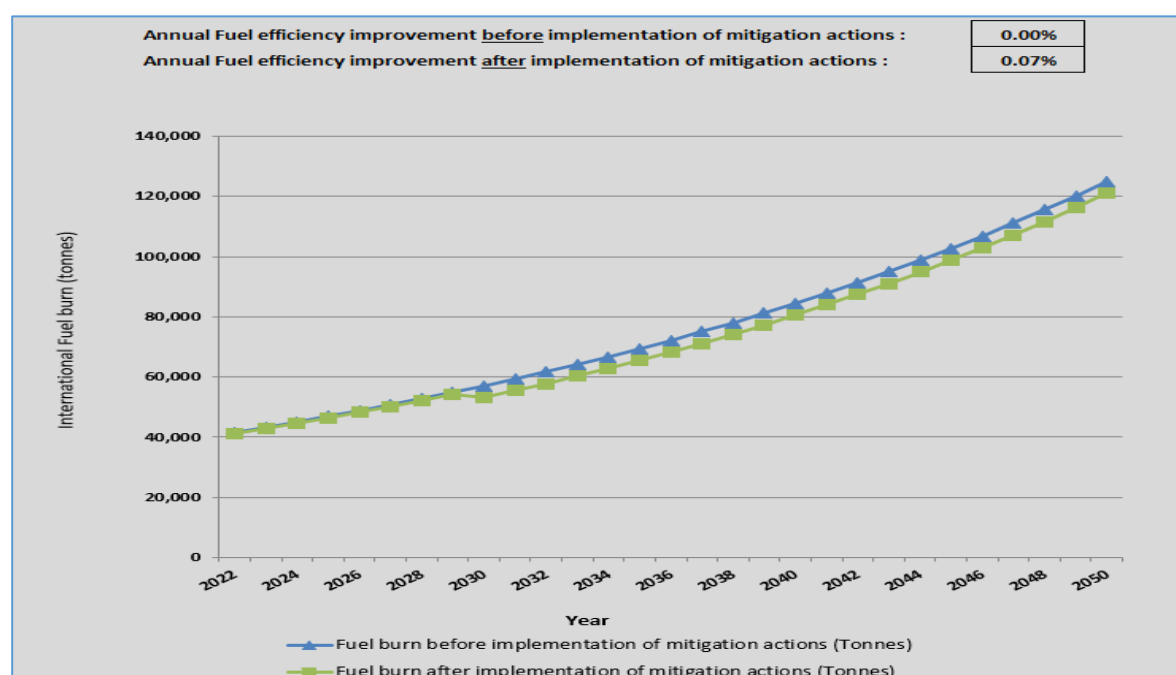
The quantification of these expected results was performed using both the ICAO methodology in the Environmental Benefits Tool (EBT) and ICAO's rule of thumb. The success of realising the quantified results is dependant of the effective implementation of the mitigation measures selected under Chapter 3 and UCAA will continuously monitor progress of implementation of mitigation measures through the office of SAP Focal Point.

The expected results over the baseline horizon are depicted in the table below. The following figure provides a graphical representation of these results and compares the fuel burn before implementation of mitigation measures to the fuel burn after the implementation of the mitigation measures. The methodology also calculated the annual fuel savings and fuel burn efficiency are presented below.

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 (%)
2022	41,667.00	41,167.00	500.00	-1.20
2023	43,333.68	42,833.68	500.00	-1.15
2024	45,067.03	44,567.03	500.00	-1.11
2025	46,869.71	46,369.71	500.00	-1.07
2026	48,744.50	48,244.50	500.00	-1.03
2027	50,694.28	50,133.53	560.75	-1.11
2028	52,722.05	52,161.30	560.75	-1.06
2029	54,830.93	54,270.18	560.75	-1.02
2030	57,024.17	53,145.12	3,879.05	-6.80
2031	59,305.13	55,426.08	3,879.05	-6.54
2032	61,677.34	57,798.29	3,879.05	-6.29
2033	64,144.43	60,265.38	3,879.05	-6.05
2034	66,710.21	62,831.16	3,879.05	-5.81

2035	69,378.62	65,499.57	3,879.05	-5.59
2036	72,153.76	68,274.71	3,879.05	-5.38
2037	75,039.91	71,160.86	3,879.05	-5.17
2038	78,041.51	74,162.46	3,879.05	-4.97
2039	81,163.17	77,284.12	3,879.05	-4.78
2040	84,409.70	80,530.65	3,879.05	-4.60
2041	87,786.08	83,907.03	3,879.05	-4.42
2042	91,297.53	87,418.48	3,879.05	-4.25
2043	94,949.43	91,070.38	3,879.05	-4.09
2044	98,747.41	94,868.36	3,879.05	-3.93
2045	102,697.30	98,818.25	3,879.05	-3.78
2046	106,805.19	102,926.14	3,879.05	-3.63
2047	111,077.40	107,198.35	3,879.05	-3.49
2048	115,520.50	111,641.45	3,879.05	-3.36
2049	120,141.32	116,262.27	3,879.05	-3.23
2050	124,946.97	121,067.92	3,879.05	-3.10

The graph depicts comparison of fuel burn from international aviation activities before and after implementation of the mitigation measures. Overall, the total fuel savings for the period from 2026 to 2050 is expected to be 0.07% per year.



Graph 1: Comparison of fuel burn before and after implementation of mitigation measures.

4.2 Expected CO₂ emissions Savings after implementation of Mitigation Measures

The implementation of the selected mitigation measures presented under Chapter 3 are expected to lead to reduction in CO₂ emissions from international aviation of between 1,580 to 1770 tonnes (on average) per year between the years 2026 and 2029. Thereafter,

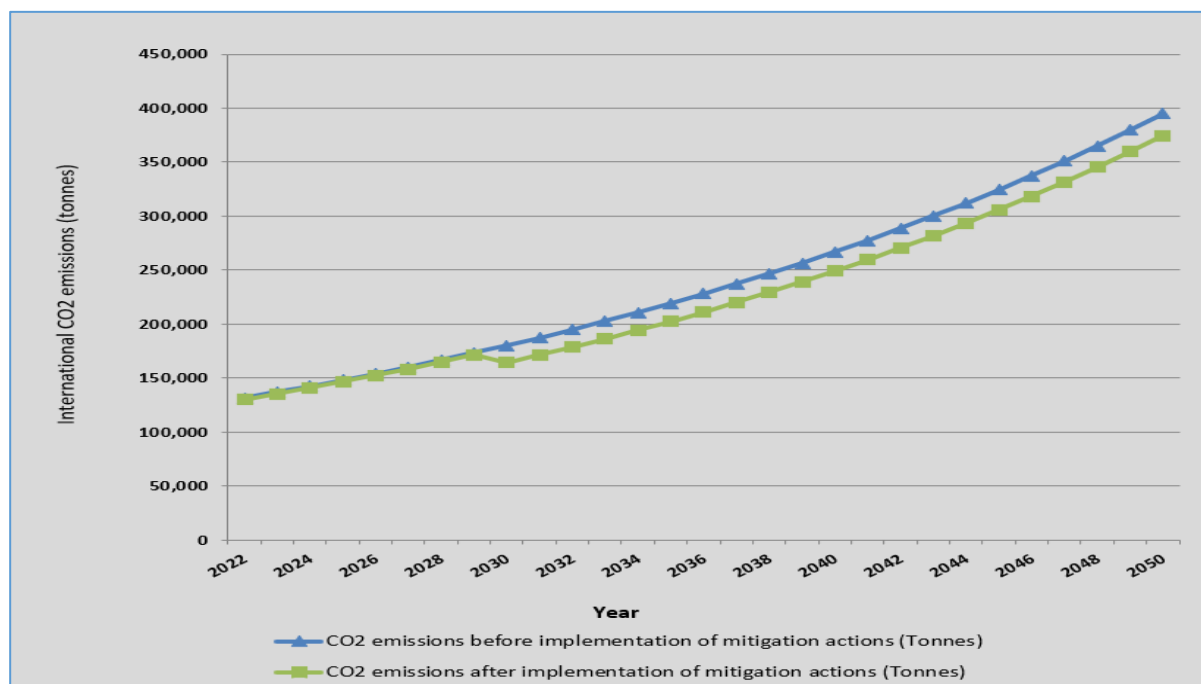
by 2030, the expected deployment of Sustainable aviation fuels (SAF) and purchase of at least 3 new aircrafts by Uganda Airlines is expected to enhance reduction in annual CO₂ emissions would to an average of around 15,860 tonnes in the year 2030. The subsequent years are expected to register a steady increase in reduction in annual emissions reaching peak CO₂ reduction levels of approximately 20,150 tonnes by 2050.

The table and graph below present the results providing comparison of CO₂ emissions before and after the implementation of the mitigation measures. The methodology also calculates the annual CO₂ savings and saving efficiency as presented below. The projected reduction in CO₂ emissions will be 1,580 tonnes in 2024 to 20,154 tonnes in 2050.

<u>EXPECTED RESULTS: CO₂ SAVINGS</u>				
Year	Annual CO₂ emissions before implementation of mitigation actions (Tonnes)	Annual CO₂ emissions after implementation of mitigation actions (Tonnes)	Annual CO₂ savings (Tonnes)	Change CO₂ savings (%)
2022	131,667.72	130,087.72	1,580.00	-1.20
2023	136,934.43	135,354.43	1,580.00	-1.15
2024	142,411.81	140,831.81	1,580.00	-1.11
2025	148,108.28	146,528.28	1,580.00	-1.07
2026	154,032.61	152,452.61	1,580.00	-1.03
2027	160,193.91	158,421.94	1,771.97	-1.11
2028	166,601.67	164,829.70	1,771.97	-1.06
2029	173,265.74	171,493.77	1,771.97	-1.02
2030	180,196.37	164,334.64	15,861.73	-8.80
2031	187,402.22	171,398.34	16,003.88	-8.54
2032	194,900.39	178,744.58	16,155.81	-8.29
2033	202,696.41	186,384.68	16,311.73	-8.05
2034	210,804.25	194,330.38	16,473.87	-7.81
2035	219,236.43	202,593.91	16,642.52	-7.59
2036	228,005.89	211,187.97	16,817.92	-7.38
2037	237,126.13	220,125.80	17,000.33	-7.17
2038	246,611.17	229,421.15	17,190.02	-6.97
2039	256,475.62	239,088.31	17,387.31	-6.78
2040	266,734.64	249,142.15	17,592.49	-6.60
2041	277,404.03	259,598.15	17,805.88	-6.42
2042	288,500.19	270,472.39	18,027.80	-6.25
2043	300,004.20	281,781.59	18,222.61	-6.09
2044	312,041.80	293,543.17	18,498.63	-5.93
2045	324,523.48	305,775.21	18,748.27	-5.78

2046	337,504.42	318,496.53	19,007.89	-5.63
2047	351,004.59	331,726.70	19,277.89	-5.49
2048	365,044.78	345,486.08	19,558.70	-5.36
2049	379,646.57	359,795.84	19,850.73	-5.23
2050	394,832.43	374,677.98	20,154.45	-5.10

Below is graphic representation of the comparison of CO₂ emissions from international aviation activities before and after implementation of the mitigation measures. Overall, the total CO₂ savings expected to start from 2026 with significant CO₂ savings that steadily increase up to the year 2050 as depicted in the graph.



Graph 2: Comparison of CO₂ emissions before and after implementation of mitigation measures.

4.3 Uganda's Environmental Aspirational Goals for Aviation

Uganda's Action Plan to reduce CO₂ emissions from aviation describes ongoing and planned activities to reduce CO₂ emissions from Uganda's national and international aviation activities. The various mitigation measures outlined in the action plan contribute towards global climate ambitions as defined in the 2015 Paris Climate Agreement. Uganda will reduce its GHG emissions by at least 5% by 2030 relative to the business as usual (BAU) scenario and in line with its sustainable development goal agenda.

Through the implementation of these measures, the aviation sector, has set a target to achieve an annual average fuel efficiency improvement of at least 2 per cent equivalent to until 2030 and an aspirational fuel efficiency improvement rate of at least 5 per cent per annum from 2031 to 2050 through proposed deployment of sustainable aviation fuel. This projected fuel efficiency is calculated on the basis of volume of fuel consumed per Revenue Tonne Kilometre (RTK). The national goals, as well as the specific objectives were set with involvement of a broad range of aviation stakeholders.

4.3.1 The short-term and medium-term actions planned to achieve environmental goals;

Uganda will have;

- (a) To periodically report on international aviation CO₂ emissions to ICAO;
- (b) To review and update baseline emission data to reflect the current status of CO₂ emissions.
- (c) To outline respective policies and actions to mitigate emissions from aviation activities.
- (d) To provide information on the basket of measures considered, reflecting their respective national capacities and circumstances as well as information on any specific assistance needs.

4.3.2 The long-term actions planned to achieve environmental goals,

Uganda will;

- (a) Identify barriers and constraints in the implementation of future actions and how they could be overcome, including through access to financial resources, building national capacities and technology transfer.
- (b) Identify and implement appropriate future mitigation measures and activities.
- (c) Track the implementation of actions with an aim of continuous improvement.
- (d) Maintain a national inventory of CO₂ emissions from aviation activities.

4.4 Roadmap for the Implementation of Mitigation Measures

No.	Details	2026	2027	2028	2029	2030			2050
1.	Improved fuel-efficient departure and approach procedures								
2.	Full utilization of RNAV (area navigation) and RNP (Required Navigation performance) capabilities								
3.	Pre-departure planning (DMAN) and arrival planning (AMAN)								
4.	Improvement of Collaborative decision making (A-CDM)								
5.	Plan and use a flexible way on a day-to-day basis by all categories of airspace users								
6.	Implement Continuous Climb Operations (CCO) at Entebbe international airport								
7.	Implement Continuous Descent Operations (CDO) at Entebbe international airport								
8.	Implementing PBN procedures and requiring aircraft to be retrofitted with conforming systems								
9.	Improved flexible use of civil-military airspace								
10.	Improve taxing procedures								
11.	Improved apron management to park aircraft nose-in								
12.	Replace facilities at the terminal that use fuel with those that use solar, electrical, or other green energy								
13.	Increase parking capacity at the apron								
14.	Provision of enhanced weather information								
15.	Review aircraft fuel efficiency								
16.	Improve Apron Management (Reduced movements and distance by GSE)								
17.	Reduce turnaround times at the airport (all stakeholders collectively working together)								

18.	Efficient use of flight levels, which reduces unnecessary descents and climbs.								
19.	Conduct SAF business case study to assess the potential of production and deployment of SAF in Uganda								
20.	Other Environmental Actions that Mitigate CO2 Emissions								

Chapter Five:

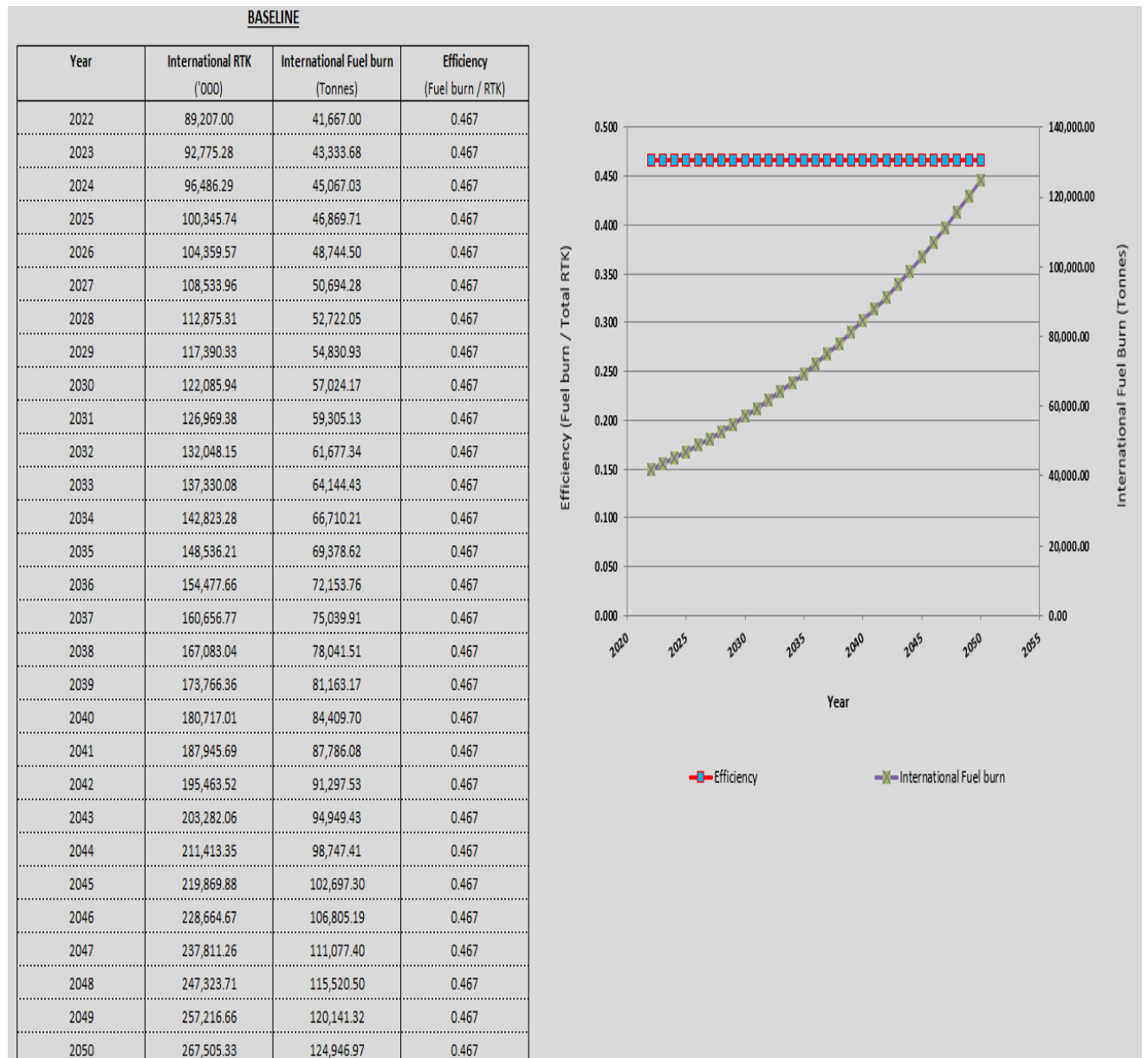
IMPLEMENTATION AND ASSISTANCE NEEDS

Uganda will require assistance from ICAO and relevant partnerships to implement some of the listed mitigation measures in this State Action Plan. The assistance needed to implement the Action Plan includes technical and financial support from external stakeholders and capacity building. The assistance is therefore needed in the following areas:

- i) Technical support to build an optimal human capacity on matters of aviation in environment protection in general and in particular on the area of State Action Plan development and implementation.
- ii) There is need for support to acquire and implement appropriate systems for the monitoring of CO₂ emissions in the Entebbe FIR, the national airlines and around the national airports.
- iii) Support to develop training programs in line with ICAO environmental sustainability initiatives to ensure that Uganda has technical capacity to sustain its environment programs designed to ensure reduction in CO₂ emissions.
- iv) Further support is need in form of in financial resources for effective implementation of selected mitigation measures in the State Action plan.
- v) Support towards installation of fuel monitoring and management systems for national airlines to ensure accurate and reliable CO₂ emissions data is captured.
- vi) Support to Implement innovation through collaborative research and development in areas like sustainable aviation fuels (SAF) and other CO₂ emission reduction initiatives.
- vii) Financial support to upgrade and modernise aviation weather observations and forecasting capabilities as well as human capacity development.
- viii) Support to develop and implement cleaner energy sources at the airports such as heavy-duty solar energy systems for lighting inside the terminal buildings, the airside and landside installations.

APPENDICES

Appendix 1: Calculated Baseline



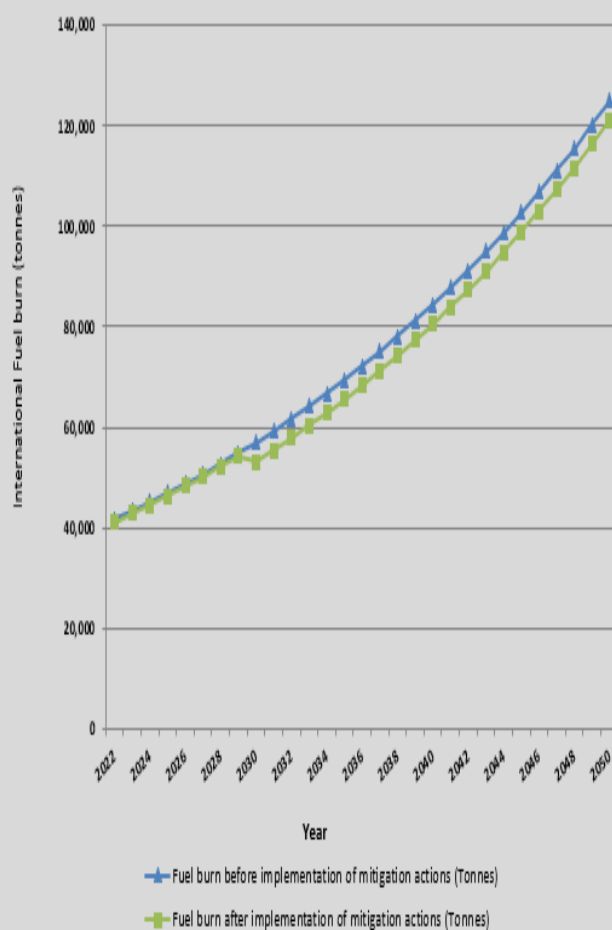
Appendix 2: Expected Results on Fuel Savings

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 (%)
2022	41,667.00	41,167.00	500.00	-1.20
2023	43,333.68	42,833.68	500.00	-1.15
2024	45,067.03	44,567.03	500.00	-1.11
2025	46,869.71	46,369.71	500.00	-1.07
2026	48,744.50	48,244.50	500.00	-1.03
2027	50,694.28	50,133.53	560.75	-1.11
2028	52,722.05	52,161.30	560.75	-1.06
2029	54,830.93	54,270.18	560.75	-1.02
2030	57,024.17	53,145.12	3,879.05	-6.80
2031	59,305.13	55,426.08	3,879.05	-6.54
2032	61,677.34	57,798.29	3,879.05	-6.29
2033	64,144.43	60,265.38	3,879.05	-6.05
2034	66,710.21	62,831.16	3,879.05	-5.81
2035	69,378.62	65,499.57	3,879.05	-5.59
2036	72,153.76	68,274.71	3,879.05	-5.38
2037	75,039.91	71,160.86	3,879.05	-5.17
2038	78,041.51	74,162.46	3,879.05	-4.97
2039	81,163.17	77,284.12	3,879.05	-4.78
2040	84,409.70	80,530.65	3,879.05	-4.60
2041	87,786.08	83,907.03	3,879.05	-4.42
2042	91,297.53	87,418.48	3,879.05	-4.25
2043	94,949.43	91,070.38	3,879.05	-4.09
2044	98,747.41	94,868.36	3,879.05	-3.93
2045	102,697.30	98,818.25	3,879.05	-3.78
2046	106,805.19	102,926.14	3,879.05	-3.63
2047	111,077.40	107,198.35	3,879.05	-3.49
2048	115,520.50	111,641.45	3,879.05	-3.36
2049	120,141.32	116,262.27	3,879.05	-3.23
2050	124,946.97	121,067.92	3,879.05	-3.10

Annual Fuel efficiency improvement before implementation of mitigation 0.00%

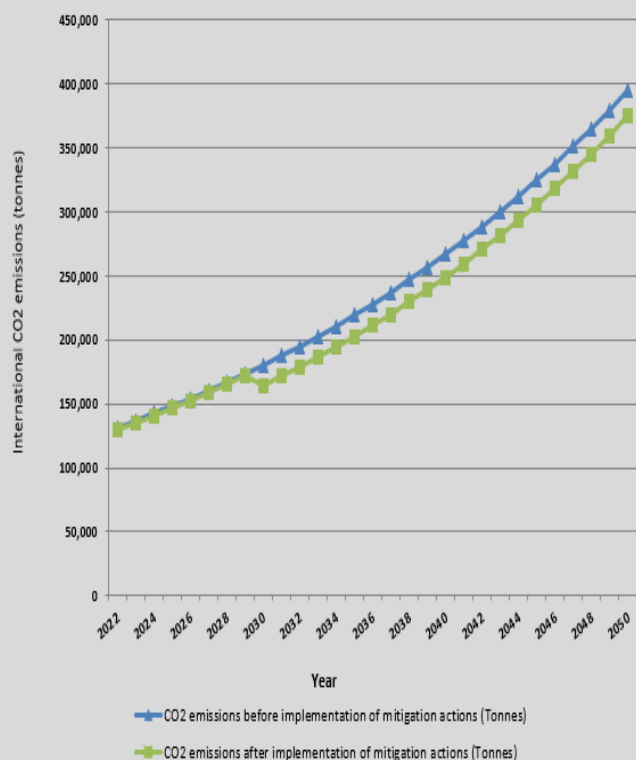
Annual Fuel efficiency improvement after implementation of mitigation 0.07%



Appendix 3: Expected Results on CO2 Savings

EXPECTED RESULTS : CO₂ SAVINGS

Year	Annual CO ₂ emissions before implementation of mitigation actions	Annual CO ₂ emissions after implementation of mitigation actions	Annual CO ₂ savings (Tonnes)	Change CO ₂ savings (%)
2022	131,667.72	130,087.72	1,580.00	-1.20
2023	136,934.43	135,354.43	1,580.00	-1.15
2024	142,411.81	140,831.81	1,580.00	-1.11
2025	148,108.28	146,528.28	1,580.00	-1.07
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2048	365,044.78	345,486.08	19,558.69	-5.36
2049	379,646.57	359,795.84	19,850.73	-5.23
2050	394,832.43	374,677.98	20,154.45	-5.10



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