ACTION PLAN FOR CO_2 EMISSON REDUCTION FROM INTERNATONAL CIVIL AVIATION IN THE BAHAMAS

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Civil Aviation Authority Bahamas

Unit 202, 2nd Floor, British Colonial Centre of Commerce, #1 Bay Street, P.O. Box N-975, Nassau, N.P., Bahamas.

Tel: (242) 397-4700

Contact person:

Zanda Bonamy
Focal point
Mobile: +1 (242) 826-8588/+1 (242) 397-4700
Email: zanda.bonamy@caabahamas.com

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1. Overview of The Bahamas' Aviation System

The Bahamas Government formed the Civil Aviation Department in May 1946 and Wing Commander E.H. Coleman, Air Force Commander, a former Airline Captain with Imperial Airways, was appointed Director. On June 1, 1946, the Royal Air Force (R.A.F.) withdrew from The Bahamas and Windsor Field, their base of operation, was closed to all traffic. At the same time The Bahamas Government assumed control of the Oakes Field Airport and the airport was transformed from a military into a civil airport. In July 1946, the airport was administered and controlled entirely by civil personnel and the CAD was organized in sub- sections, consisting of Administration, Accounts, Air Traffic, Fire Fighting and Airport Maintenance. At the Regional Caribbean Conference of the International Civil Aviation Organization (ICAO) held in Washington in September 1946, which the Director of Civil Aviation, Bahamas attended as a delegate, Oakes Field was recommended for designation as a long-range regular airport. On July 10, 1973, the Commonwealth of The Bahamas became an independent county, and on June 26, 1973, became a Contracting/Signatory State of the International Civil Aviation Organization (ICAO).

On October 3, 2016, with the enactment of the Civil Aviation Act, 2016, the Civil Aviation Department (CAD) transitioned to Bahamas Civil Aviation Authority (BCAA), effecting separation of the regulatory and safety and security oversight functions from the service provider (airport operations and air navigation services), ensuring that The Bahamas is better poised to meet ICAO Standards and Recommended Practices (SARPs). In 2021, the Bahamas Civil Aviation Authority went through a rebranding exercise under Director General Michael Allen and became the Civil Aviation Authority Bahamas (CAA-B). Two new acts were created, the Civil Aviation Act, 2021, and the Civil Aviation Authority Act, 2021. Civil Aviation Authority Bahamas (CAA-B) is presently an arm of the Ministry of Tourism and Aviation and governed by a Board. Presently, the Director General is Mr. Alexander B. Ferguson.

1.1. Structure of Aviation Industry in The Bahamas

In a few countries, institutional organizations in civil aviation are usually divided into the regulators, and the operators/service providers. Civil Aviation Authority Bahamas (CAA-B) is the primary regulator for civil aviation. In relation to the operators, they are divided into airlines operators, air traffic services providers, and aerodrome operators.

There are 159 registered aircraft in The Bahamas in which they mostly are private aircraft. Others are major airlines, or the ones used for company's business. There are both scheduled and non-scheduled airlines in The Bahamas. Major schedule airlines in The Bahamas include

Bahamasair, and Westernair and the non-scheduled ones include Air Charter Bahamas, Air Flight Charters, Golden Wings Charters, Trans Island Airways, and Southern Air Charter.

There are 30 government registered airports for civil aviation, of which 20 are international airports. There are 15 registered privately owned aerodromes for commercial use. Airport Authority (AA) is responsible for the management of 28 Family Island Airports, security, and fire and crash rescue services at the Lynden Pindling Airport (LPIA). Nassau Airport Development Company (NAD) is responsible for the management of all aspects of LPIA except for security and fire crash rescue services. Freeport Airport Development is responsible for the management of Grand Bahama International Airport. There is one air navigation service in The Bahamas, Bahamas Air Navigational Services Authority (BANSA), which provides air navigation services covering area, approach, and aerodrome control service. In the area of meteorological services, the Department of Meteorology is responsible for providing these services. There are no registered maintenance and repair stations or flying schools in The Bahamas.

1.2. Statistics and growth trends of aviation sector in The Bahamas

Air transport is a fast-growing industry, and it is often affected by global trends including the world economy, societal issues, and environmental problems. In the past, The Bahamas' aviation industry was affected by various factors such as the world economy, hurricanes, and the COVID-19 Pandemic. Although numbers of passengers and cargo dropped over some period, the aviation industry in The Bahamas has continued to grow afterwards.

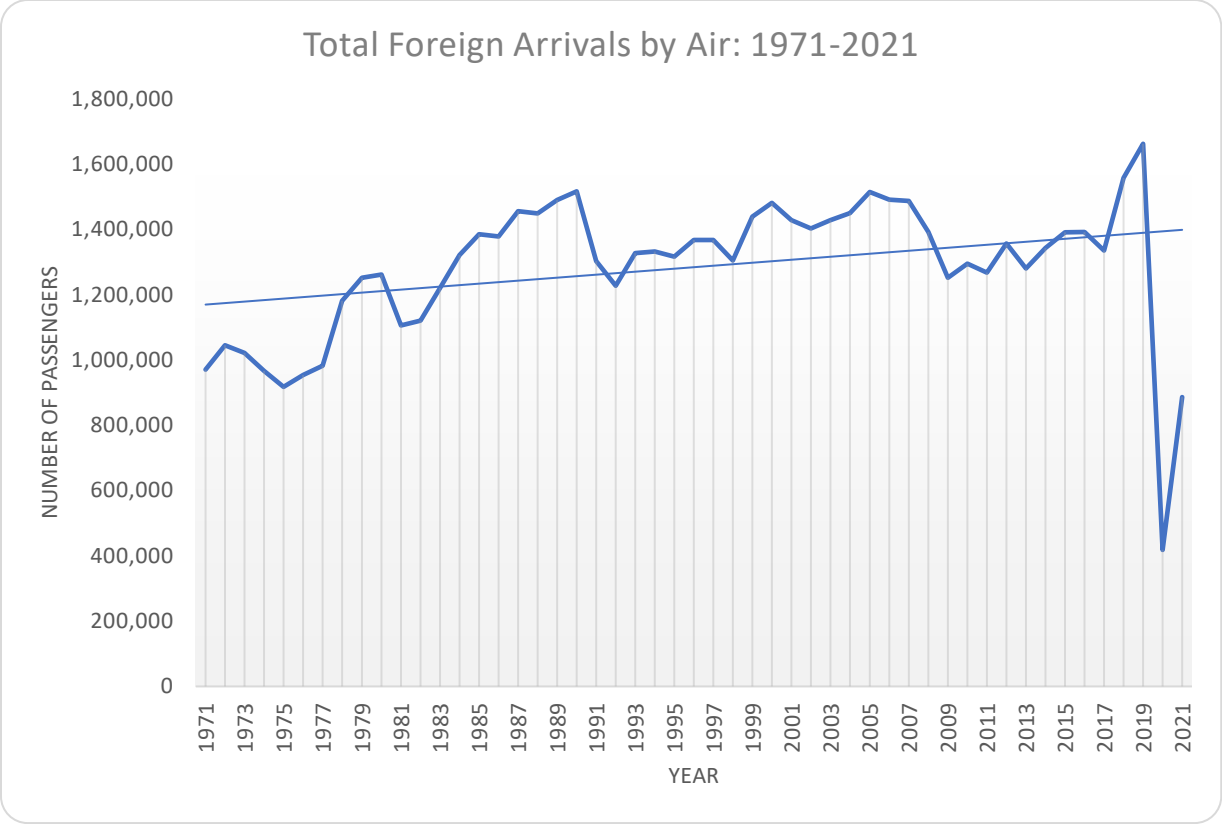

Figure 1: Number of Foreign Arrivals during 1971 – 2021

Figure 1 illustrates statistics of passengers from 1971 to 2021. During the 2008 – 2009, the economic crisis in the US caused the number of air passengers travelling to The Bahamas to decline. In 2019, it rose to 1,662,419 passengers. However, the COVID-19 Pandemic caused the entire airline industry to halt resulting in a decline of air passengers by 74.83%.

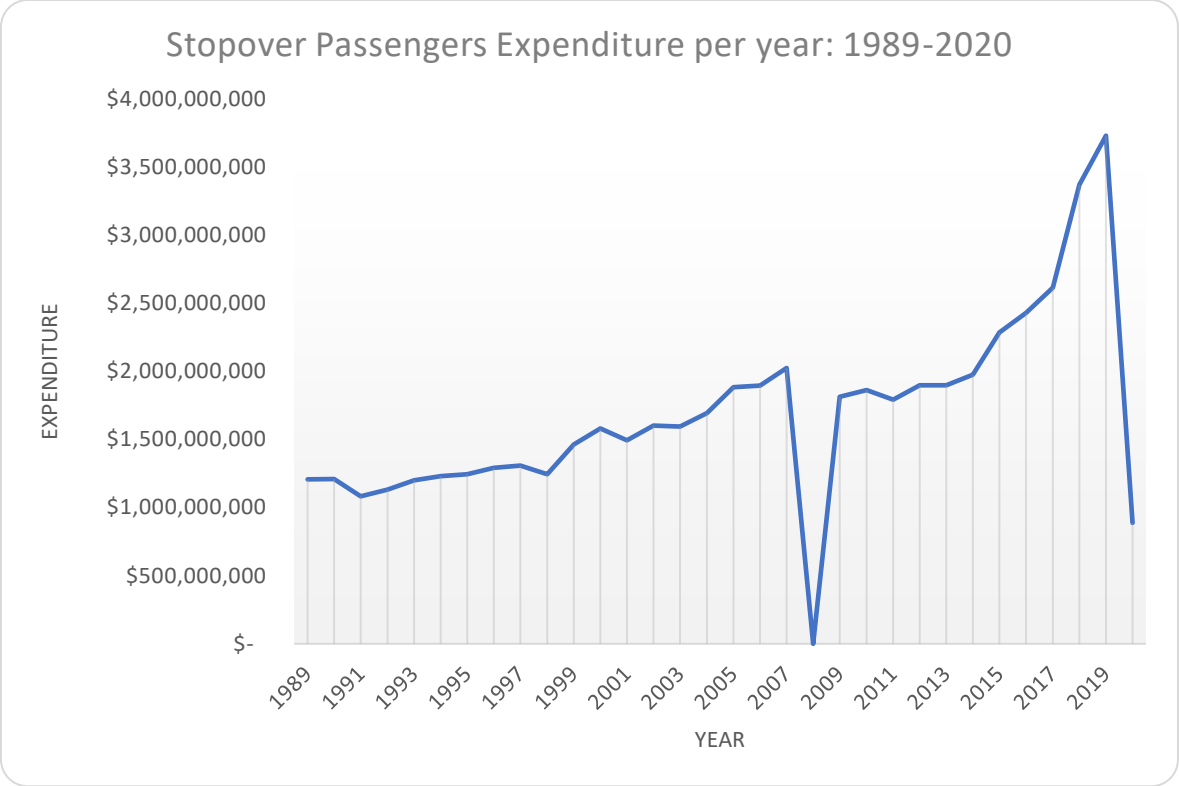

Figure 2: Stopover Passengers Expenditure per year 1989 – 2020

From 1989, the expenditure steadily increased and peaked tremendously in 2019 with revenue of $3,729,872,167. However, after the COVID-19 Pandemic, in 2020, the revenue decreased by 76.18%, which was a considerable loss to the economy.

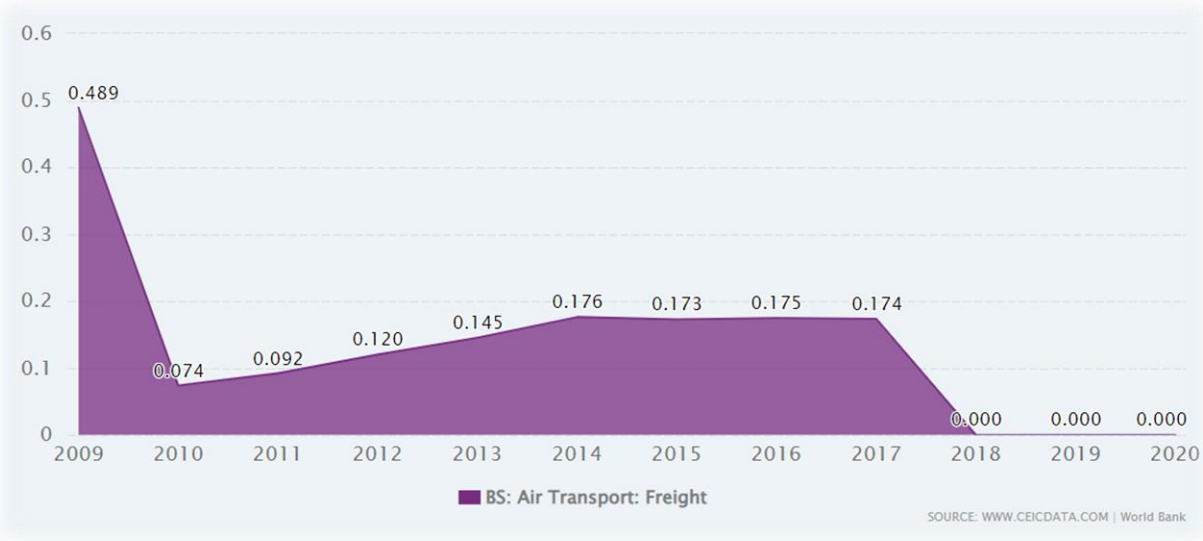

Figure 3: Bahamas BS: Air Transport - Freight from 1975 to 2020

From 2009 in Figure 3, according to CEICDATA.com, air transport freight declined drastically but stabilized until 2017. No data is recorded between 2018 and 2020.

1.3. Emissions Reduction in The Bahamas' Aviation Sector

In respect of emission reduction in the aviation sector, the roles and responsibilities of CAA-B have been distinguished when the Resolution A37-19 adopted by ICAO's 37th Assembly in 2010. This was an important step towards a sustainable air transport future and made international aviation the first sector with global aspirational goals of improving annual fuel efficiency by 2 per cent and stabilizing its global $C0_2$ emissions at 2020 levels. The Assembly consequently encouraged action plans by States and other parties involved to limit or reduce international aviation emissions.

In order to support ICAO's ongoing efforts to address international aviation's contribution to climate change, Civil Aviation Regulations (CAR) ENV was passed in 2021 to address the CO_2 emissions of international flights.

2. Baseline of CO2 emissions in International Aviation

2.1 Report on Historical aircraft fuel consumption and greenhouse gas emission in The Bahamas

- Based on annual fuel consumptions from 'Fuel Burn and RTK – ICAO-IPCC' document for The Bahamas

Calculation of greenhouse gas emissions

- CO_2 emissions = Amount of Fuel Burnt x Emissions factor
- Emissions factor = 3.16

Year	Fuel Burnt - ICAO	Carbon (Tonnes)
2010	**15,123.68**	**47,790.84**
2011	**17,531.39**	**55,399.19**
2012	**16,813.94**	**53,132.05**
2013	**24,484.78**	**77,371.89**
2014	**30,376.75**	**95,990.54**
2015	**22,600.30**	**71,416.96**

Table 1: Historical Fuel Burn and Carbon (Tonnes)

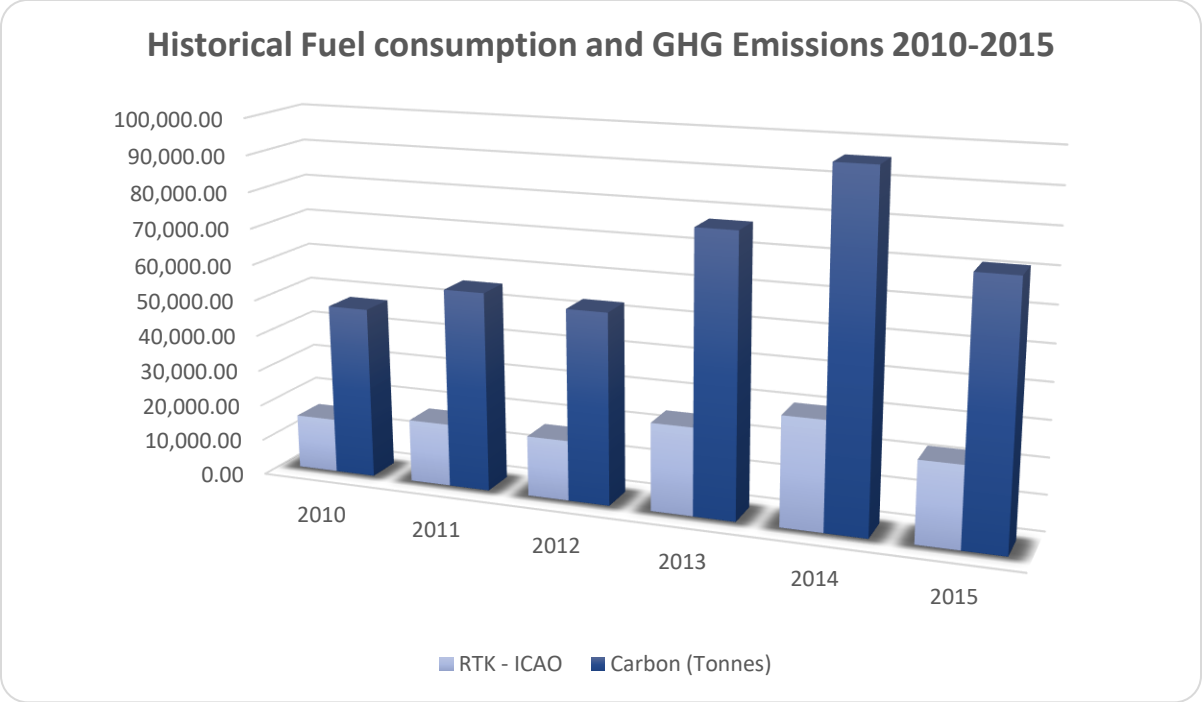

Figure 4: Historical Fuel consumption and GHG Emissions 2010-2015

The baseline for CO2 emissions in international aviation represents the evolution of CO_2 emissions from international aviation in the next 35 years (up to 2050) in the absence of mitigation measures (*business as usual* (BAU) scenario). In the case of The Bahamas, it was calculated using one year of historical data (2015), provided by the national airline ICAO. Only international flights according to ICAO definition were considered for the baseline calculation.

Following ICAO's methodology described in ICAO Doc 9988 and the EBT v 2.7, the fuel efficiency calculated for 2015 (0.0.736 L/tkm) was assumed to remain constant until the baseline horizon (2050). On the other hand, the air traffic increase in the coming years was estimated using ICAO Circular 313, which forecasts a traffic (RTK) growth of 4.8% per year in the Latin American/Caribbean region.

2.2 Calculation and prediction of aircraft fuel consumption and greenhouse gas emission by airline operators in The Bahamas

The baseline obtained for CO_2 emissions up to 2050 is depicted in tabular and graphical formats on Table 2 and Figure 1 respectively. According to these results, in the absence of mitigation measures, CO2 emissions from international aviation will grow from 52,576 tonnes of CO2 (tCO2) in 2015 to 271,289.57 tCO2 in 2050, which represents an increase of 416% in thirty-five years.

Year	International RTK ('000)	International Fuel burn (Tonnes)	Carbon (Tonnes)	Efficiency (Fuel burn/RTK)
2015	22,601.00	16,638.00	52,576.08	0.736
2016	23,684.80	17,436.62	55,099.72	0.736
2017	24,821.67	18,273.58	57,744.51	0.736
2018	26,013.11	19,150.71	60,516.24	0.736
2019	27,261.74	20,069.95	63,421.04	0.736
2020	28,570.30	21,033.31	66,465.26	0.736
2021	29,941.68	22,042.90	69,655.56	0.736
2022	31,378.88	23,100.96	72,999.03	0.736
2023	32,885.06	24,209.81	76,503.00	0.736
2024	34,463.55	25,371.88	80,175.14	0.736
2025	36,117.80	26,589.73	84,023.55	0.736
2026	37,851.45	27,866.04	88,056.69	0.736
2027	39,668.32	29,203.61	92,283.41	0.736
2028	41,572.40	30,605.38	96,713.00	0.736
2029	43,567.88	32,074.44	101,355.23	0.736
2030	45,659.13	33,614.01	106,220.27	0.736
2031	47,850.77	35,227.49	111,318.87	0.736
2032	50,147.61	36,918.40	116,662.14	0.736

2033	52,554.70	38,690.49	122,261.95	0.736
2034	55,077.32	40,547.63	128,130.51	0.736
2035	57,721.03	42,493.92	134,280.79	0.736
2036	60,491.64	44,533.63	140,726.27	0.736
2037	63,395.24	46,671.24	147,481.12	0.736
2038	66,438.21	48,911.46	154,560.21	0.736
2039	69,627.25	51,259.21	161,979.10	0.736
2040	72,969.35	53,719.65	169,754.09	0.736
2041	76,741.88	56,298.19	177,902.28	0.736
2042	80,142.53	59,000.51	186,441.61	0.736
2043	83,989.38	61,832.53	195,390.79	0.736
2044	88,020.87	64,800.49	204,769.55	0.736
2045	92,245.87	67,910.92	214,598.51	0.736
2046	96,673.67	71,170.64	224,899.22	0.736
2047	101,314.01	74,586.83	235,694.38	0.736
2048	106,177.08	78,167.00	247,007.72	0.736
2049	111,273.58	81,919.02	258,864.10	0.736
2050	116,614.71	85,851.13	271,289.57	0.736

Table 2 Baseline results

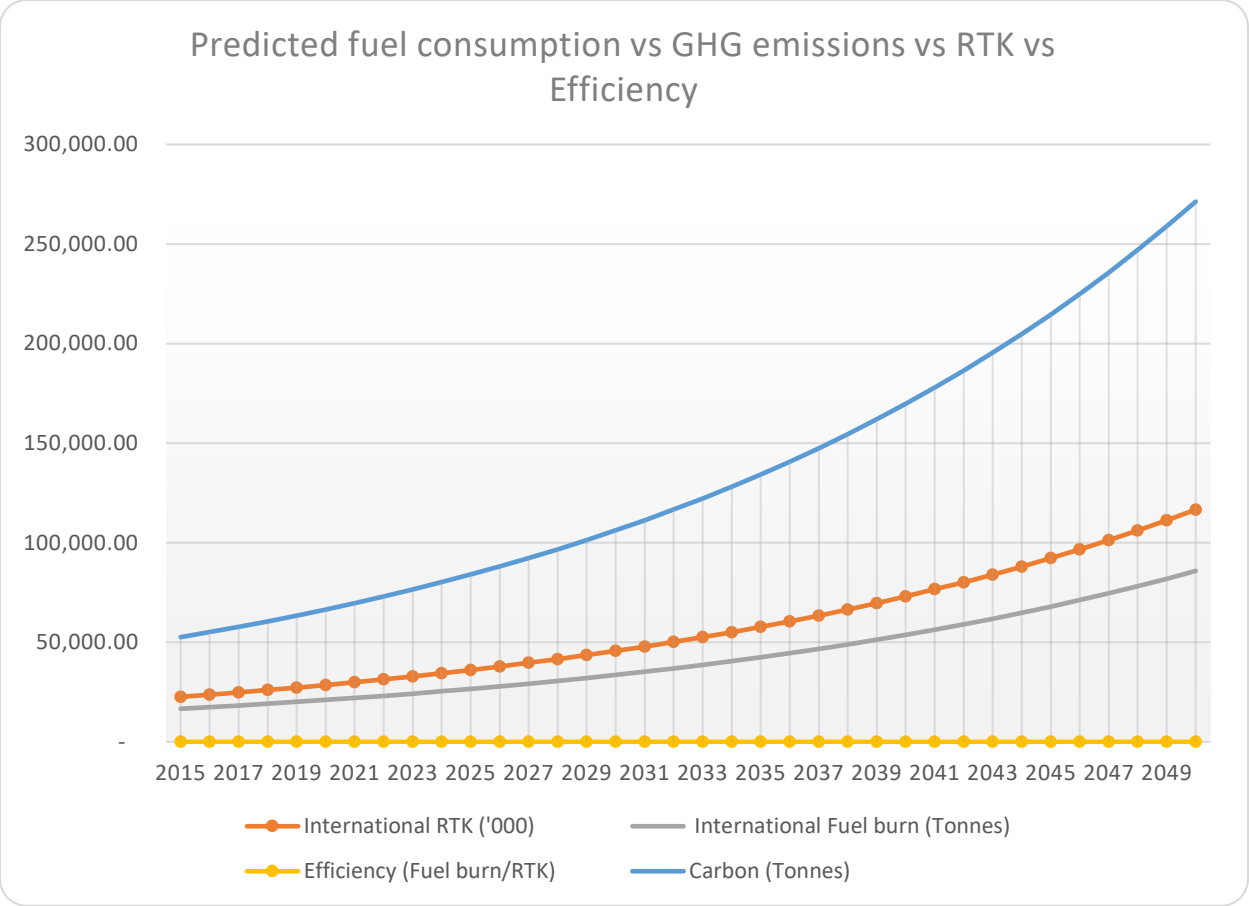

Figure 5 Baseline Results 2015 to 2050

The fuel consumption efficiency was estimated to be 0.736.

3. Basket of Measures for The Bahamas

The following is a description of basket of measures to limit or reduce CO_2 emissions from international civil aviation:

1) **Aircraft – related Technology Development**
    a. Aircraft minimum fuel efficiency standards
    b. Aggressive aircraft fuel efficiency standards, setting standards for the future.

    Future

    c. Purchase of new aircraft
    d. Retrofitting and upgrade improvements on existing aircraft
    e. Optimizing improvements in aircraft produced in the near to mid-term future.
    f. Avionics
    g. Adoption of revolutionary new designs in aircraft/engines.

2) **Alternative Fuels**
    a. Development of biofuels
    b. Development of other fuels with lower lifecycle CO_2 emissions
    c. Standards/requirements for alternative fuel use

3) **Improved Air Traffic Management and Infrastructure Use**

    a. More efficient ATM planning, ground operations, terminal operations (departure, approach and arrivals) en route operations, airspace design and usage, aircraft capabilities.
    b. More efficient use and planning of airport capacities.
    c. Installation of airport infrastructure such as Fixed Electrical Ground Power and Pre-Conditioned Air to allow aircraft APU (Auxiliary Power Unit) switch-off
    d. Construction of additional runways and taxiways if used solely to relieve traffic congestion.
    e. Collaborative research endeavours.

4) **More efficient operations**
    a. Best practices in operations
    b. Optimized aircraft maintenance (including jet engine cleaning/washing)
    c. Selecting aircraft best suited to mission

1 Aircraft-related technology development

Category:-	Aircraft-related technology development
Measure:-	**Replacement of aging aircraft with more modern aircrafts**
Action:-	**Buy new/used Boeing 737-700s and ATRs**
Start Date	2015
End Date	Onward to replace aged fleet
Title	Purchase of modern aircraft
Description	Replaced Bombardier Dash 8s with ATR 42 and ATR 72. Presently, replacing 737-500s with 737-700s
Action	
Start Date	2015
Date of full implementation	Onward until replace all aircraft fleet
Economic cost	TBD
Currency	BSD
Reference to existing legislation	CORSIA adapted into the CAR ENV in March 2021
Legislation is proposed	Yes
Compliance	
Assistance needed	Funding and Training
Assistance needed (check one or more)	
Other assistance	No
Amount of assistance needed	
Currency for financial assistance	BSD
List of stakeholders involved	Bahamasair Holdings Ltd.

3 Improved Air Traffic Management and Infrastructure Use

Category:-	Improved Air Traffic Management and Infrastructure Use
Measure:-	**More efficient ATM planning, ground operations, terminal operations (departure and arrivals), en-route operations, airspace design and usage, aircraft air navigation capabilities**
	En-route operations, airspace design and usage, aircraft air navigation capabilities
Action:-	**Measures to improve ground operations**
Start Date	2024
End Date	TBD
Title	Gate Hold Procedure
Description	Gate Hold Procedure is developed to reduce taxi-out time and fuel consumption of departing aircrafts at Suvarnabhumi Airport due to delay at holding points. The procedure is expected to reduce carbon emission in the taxi-out phase of flight. During peak periods or when it is anticipated that there are more than four departure aircrafts at holding points, Ground Controller will assign a proper expected pushback time when an outbound aircraft is ready for pushback. In calculation of the expected pushback time, parking stand and variable taxi-out time is considered. Additionally, the optimisation of airport traffic flow by dynamically allocating appropriate ratio of arriving and departing aircrafts to traffic patterns is supported by Gate Hold Procedure.
Economic cost	TBD
Currency	BSD
Reference to existing legislation	none
Legislation is proposed	Yes
Compliance	
Assistance needed	Creating Legislation
Assistance needed (check one or more)	
Other assistance	No
Amount of assistance needed	
Currency for financial assistance	
List of stakeholders involved	BANSA and CAA-B

Improved Air Traffic Management and Infrastructure Use

Category:-	**Installation of airport infrastructure such as Fixed Electrical Ground Power and Pre-Conditioned Air to allow aircraft APU (Auxiliary Power Unit) switch-off**
Measure:-	**Fixed Electrical Ground Power and Pre-Conditioned Air**
Action:-	**Install Fixed Electrical Ground Power and Pre-Conditioned Air**
Start Date	January 2025
End Date	January 2027
Title	Fixed Electrical Ground Power and Pre-Conditioned Air
Description	Start to buy and install Fixed Electrical Ground Power and Pre-Conditioned Air.
Economic cost	TBD
Currency	BSD
Reference to existing legislation	None
Legislation is proposed	Yes
Compliance	
Assistance needed	Funding through Grants
Assistance needed (check one or more)	
Other assistance	No
Amount of assistance needed	
Currency for financial assistance	BSD
List of stakeholders involved	Nassau Airport Development (NAD), Airport Authority (AA), and Freeport Airport Development (FAD)

3 Improved Air Traffic Management and Infrastructure Use

Category:-	**More efficient operations**
Measure:-	**Energy Conservation (Measure of Electricity**
Action:-	**Lighting system control** - **Baggage Claim areas** - **Airside lights**
Start Date	January 2026
End Date	January 2031
Title	
Description	All lights assessed
Economic cost	TBD
Currency	BSD
Reference to existing legislation	None
Legislation is proposed	No
Compliance	
Assistance needed	None
Assistance needed (check one or more)	Technical Support
Other assistance	No
Amount of assistance needed	
Currency for financial assistance	BSD
List of stakeholders involved	Nassau Airport Development (NAD), Airport Authority (AA), and Freeport Airport Development (FAD)