CAAT
สำนักงานการบินพลเรือนแห่งประเทศไทย
The Civil Aviation Authority of Thailand

THAILAND's Action Plan

to Reduce Aviation Emissions

Version 2026

" SHAPE THE NEW FUTURE WITH THAILAND GREEN AVIATION "

CONTENTS

EXECUTIVE SUMMARY

Climate change is driven by rising greenhouse gas emissions. While the aviation sector contributes a relatively small portion, Thailand supports policies impacting international aviation, including its role as a host for the 2024 International Civil Aviation Organization (ICAO) APAC Regional Seminar on Environment.

Thailand first submitted its State Action Plan to ICAO in 2013, followed by updates in 2018, 2021, and now the fourth submission in 2026. The 2026 Action Plan is being updated to showcase progress in implementing previous mitigation measures while introducing new strategies to further reduce emissions. These efforts contribute to ICAO's goal of reducing CO_2 emissions under its Long-Term Global Aspirational Goal (LTAG) towards net-zero by 2050, and further support

The updated Action Plan reflects the collaborative efforts of various stakeholders and reinforces the commitment of Thailand's civil aviation industry to environmental sustainability. The Civil Aviation Authority of Thailand (CAAT) and industry partners continue to enhance mitigation measures and improve Monitoring, Reporting, and Verification (MRV) practices to drive further reductions in greenhouse gas (GHG) emissions. In accordance with the 40th ICAO Assembly Resolutions, Thailand will continue updating and submitting its State Action Plan to ICAO to ensure that ICAO can continue to compile the quantified information submitted.

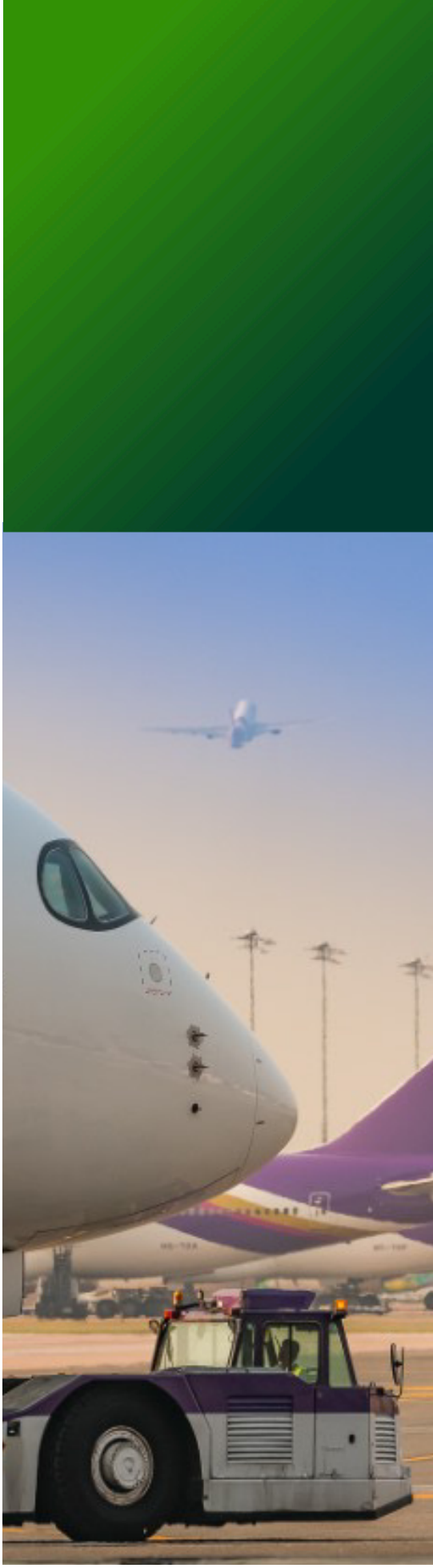

Photo by Pilots of Thai Airways (provided by Capt. Itt Sirisawat)

Photo by Mr. Nattanon Kanchak

Although Thailand's civil aviation industry has not yet fully recovered from the impacts of COVID-19, CAAT remains committed to reducing greenhouse gas (GHG) emissions by implementing mitigation measures across 4 key categories: Technology and Standards, Sustainable Aviation Fuels and Cleaner Energies, Operational Improvements, and Market-Based Measures (Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)). Despite ongoing challenges, the industry continues to prioritize sustainability, recognizing the importance of long-term environmental responsibility.

CAAT, alongside industry stakeholders, is dedicated to balancing aviation growth with environmental stewardship, reinforcing Thailand's commitment to sustainable aviation development.

CHAPTER 1

Introduction

1. INTRODUCTION

1.1 BACKGROUND

The increase in greenhouse gas (GHG) emissions, largely driven by human activities such as industrial fuel combustion, has significantly contributed to climate change. While the aviation sector aviation accounted for 2.5% of global energy-related CO_2 emissions, as noted by The International Energy Agency (IEA)[1] , it remains a key focus in global efforts to mitigate climate change. In alignment with the Paris Agreement's goal to limit global temperature rise to well below 2°C, with efforts to limit it to 1.5°C above pre-industrial levels, many countries are committed to reducing GHG emissions. The aviation industry plays an important role in these efforts by adopting technological advancements, operational improvements, and market-based measures to help achieve sustainability goals.

To support policies affecting the international aviation sector, ICAO has developed standards and recommendations for aviation environmental protection, as outlined in ICAO Annex 16. This includes environmental performance as one of the Key Performance Areas (KPA)[2] of the air navigation system, which requires a reduction in fuel consumption and GHG emissions resulting from aircraft operations. These metrics are essential in assessing the efficiency and sustainability of the air navigation system. Environmental performance is also monitored through performance reports, and ICAO Member States are required to submit a State Action Plan every three years to update the progress of GHG reduction measures.

Photo by Pilots of Thai Airways (provided by Capt. Itt Sirisawat)

The State Action Plan serves as a framework for climate action within the international aviation sector, involving national stakeholders in defining baselines, selecting emissions mitigation measures, and calculating expected results from these actions. Currently, 150 of the 193 ICAO Member States, representing 99.11% of global Revenue Tonne-Kilometers (RTK), have voluntarily submitted their State Action Plans to ICAO, which has been officially published on ICAO Website[3].

Thailand, as a member of ICAO, submitted its first State Action Plan in 2013 to demonstrate its aviation industry's commitment to emissions reduction. The plan was updated in 2018, 2021, and now in 2026 to reflect progress and ongoing commitment.

1.2 OBJECTIVE

The global outbreak of COVID-19 has had severe impacts on Thailand's aviation industry. In addition to the sharp decrease in air travel demand, it has prompted operators to rethink and reshape their business approaches and models from both strategic and operational perspectives. Despite the ongoing challenges and the fact that the aviation industry has not yet fully recovered from the pandemic, Thailand remains strongly committed to continuing its aviation emission reduction efforts. The experiences, practices, and data accumulated from past to present have been thoroughly reviewed and incorporated to determine baseline, mitigation measures, emission reduction targets, and expected results.

This commitment is clearly reflected in the updated version of Thailand's State Action Plan for 2026, which will guide and track the path of actions for managing Thailand's aviation GHG emissions from 2026 onward.

1.3 CONTACT INFORMATION

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CHAPTER 2

Thailand's Civil Aviation Information

2. THAILAND'S CIVIL AVIATION INFORMATION

2.1 CURRENT SITUATION

Overall, Thailand's aviation industry handled 836,517 flights in the fiscal year 2024, representing a 16% increase compared to the previous year[4]. The industry is targeting 1 million flights by 2025[5]. In 2024, the total number of passengers reached 140 million, marking a 15.12% year-on-year growth and a recovery to 85.14% of pre-pandemic levels. These figures indicate a positive recovery trend, suggesting that by 2025, the aviation industry is expected to return to growth levels comparable to those in 2019[6]

As of 2023[7], Thailand has a total of 39 public airports, serving both domestic and international flights. There are 235 certified repair stations providing both line and heavy maintenance services across the country. In addition, 29 aviation training institutes are operating nationwide. In 2025, the country is home to 25 Thai air operators holding valid Air Operator Certificates (AOC)[8], covering both scheduled and non-scheduled services, and operating nearly 600 Thai-registered aircraft[9]. Currently, in providing air transport services in a safely manner, it requires the collaboration of 3 main sectors which are Thai air operators, air navigation service providers, and airport operators.

2.1.1 Airport Operators

Thailand had a total of 39 public service airports in all regions of the country, operating by 4 airport operators (Figure 1). They are:

No.	Airport Operators	Logos
1	Department of Airports (DOA)	
2	Airports of Thailand Public Company Limited (AOT)	
3	Bangkok Airways Public Company Limited	
4	Royal Thai Navy (RTN)	

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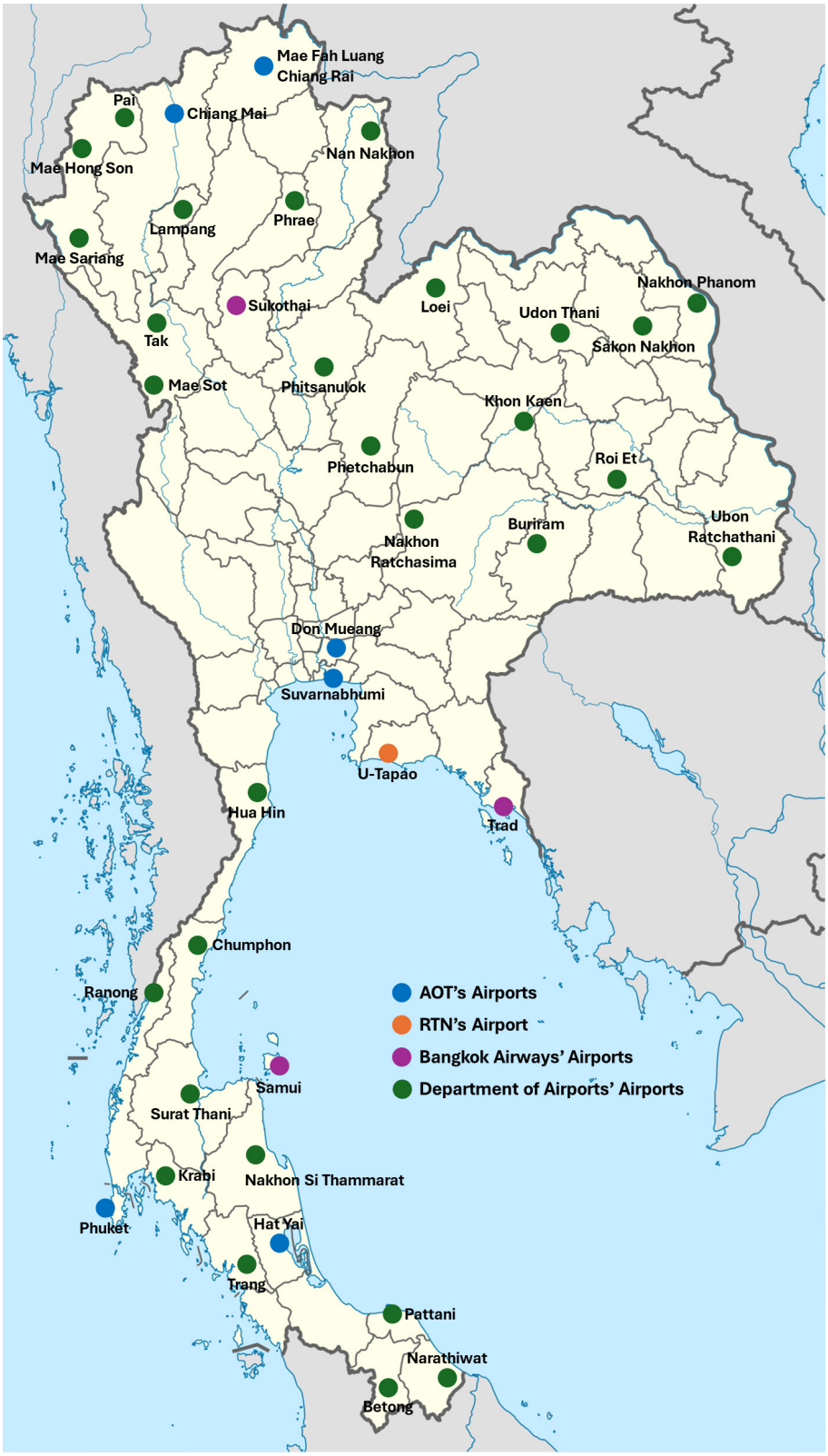

Figure 1: Public service airports in Thailand

2.1.2 Air Navigation Service Providers

Air navigation services provided in Thailand include Air Traffic Management (ATM); Communications, Navigation, and Surveillance (CNS), Meteorological Service (MET), Aeronautical Information Service (AIS), Instrument Flight Procedure Design (IFPD), and Search and Rescue (SAR). There are 5 operators involved as follows:

No.	Air Navigation Service Providers	Logos
1	Aeronautical Radio of Thailand Limited (AEROTHAI)	
2	Royal Thai Navy (RTN)	
3	Thai Meteorological Department (TMD)	
4	The Civil Aviation Authority of Thailand (CAAT)	
5	Office of the Search and Rescue Commission for Aircraft and Disaster	

2.1.3 Air Operators

There are 25 air operators which are approved for the Air Operator Certificate (AOC)[10]. They are as follows:

No.	Air Operators	Logos
1	AC Aviation Company Limited	
2	Advance Aviation Company Limited	
3	Advance Aviation Jet Company Limited	

No.	Air Navigation Service Providers	Logos
4	Air Inter Transport Company Limited	
5	Asian Aerospace Services Limited	
6	Bangkok Airways Public Company Limited	
7	Bangkok Helicopter Services Company Limited	
8	K-Mile Air Company Limited	
9	Mjets Limited	
10	Nok Airlines Public Company Limited	
11	Pattaya Airways Company Limited	
12	SFS Aviation Company Limited	
13	Siam Land Flying Company Limited	
14	Siam Land Flying Company Limited (Helicopter)	
15	Siam Seaplane Company Limited	
16	Thai Airasia Company Limited	

No.	Air Navigation Service Providers	Logos
17	Thai Airasia X Company Limited	
18	Thai Airways International Public Company Limited	
19	Thai Aviation Services Limited	
20	Thai Flying Service Company Limited	
21	Thai Lion Mentari Company Limited	
22	Thai VietJet Air Joint Stock Company Limited	
23	Thai Seaplane Company Limited	
24	United Offshore Aviation Company Limited	
25	VIP Jets Limited	

In addition to the three main providers in the aviation industry mentioned above, there are other related providers that support Thailand's aviation industry. These include aviation training institutes which produce aviation personnel in various areas. Ground handling service providers support ground operations in airports and prepare aircraft for the safe operation. These services also cover maintenance repair stations which provide maintenance, repair and overhaul services to ensure safety and airworthiness of aircraft.

The continued growth of the aviation industry has significantly impacted the environment at both community and international levels. These environmental effects stem from various factors, including travel to and from airports, electricity consumption in terminals, wastewater treatment, and the continued reliance on jet fuel. As a leading industry, the aviation sector continually seeks ways to manage these environmental impacts in line with international standards. One of its primary operational goals is reducing jet fuel consumption, which accounts for more than 50% of greenhouse gas (GHG) emissions. The sector's emissions reduction efforts must align with the continued growth in air traffic volume.

Recognizing the need for long-term sustainability, the International Civil Aviation Organization (ICAO) established the Long-Term Global Aspirational Goal (LTAG) in 2022, aiming for net-zero carbon emissions from international aviation by 2050. This target builds upon previous commitments and encourages all ICAO Member States and stakeholders to work collaboratively in reducing aviation-related emissions through technological advancements, operational improvements, and sustainable aviation fuels (SAF).

To contribute to reducing CO_2 emissions in line with national circumstances, Thailand's aviation industry has actively enhanced operational measures through the development of technology and procedures. Airlines are adopting more fuel-efficient aircraft, airport operators are optimizing their infrastructure to improve turnaround times, and air navigation service providers are advancing airspace management to enhance efficiency and reduce emissions. However, technological improvements alone are not enough. Effective collaboration among all stakeholders—airlines, airports, air navigation service providers, and regulatory bodies such as The Civil Aviation Authority of Thailand (CAAT)—is crucial. A well-structured operational framework, aligned with international aviation development plans and Thailand's strategic policies, will enable different agencies to coordinate their efforts toward achieving sustainability goals.

Despite these advancements, several challenges hinder efficient operations and emissions reductions. Increasing air traffic volume, especially from business travelers and air freight, makes it difficult to achieve fuel efficiency targets. Additionally, factors such as limited government support, inadequate data collection and analysis for informed decision-making, and unpredictable external crises-including global pandemics or economic downturns—pose significant risks to the aviation industry. These challenges can threaten airlines' competitiveness and market stability, potentially impeding progress toward emissions reduction targets.

Therefore, it is imperative that all sectors work together to address these obstacles and minimize their impact. By fostering greater collaboration, improving policy support, and advancing technological and operational measures, Thailand can strengthen its commitment to aviation sustainability. Through these collective efforts, the country will be better positioned to reduce jet fuel consumption and lower greenhouse gas emissions.

Photo by Pilots of Thai Airways (provided by Capt. Itt Sirisawat)

CHAPTER 3

BASELINE SCENARIO

3. BASELINE

3.1 CONCEPTUAL FRAMEWORK

In the preparation of baseline data on fuel consumption and CO_2 emissions, the conceptual framework recommended by ICAO is deployed to ensure the reliability for creating baseline data on fuel consumption and CO_2 emissions in the aviation sector.

Among the 3 methods[11], Method B seems to be fit well with the current situation of Thailand aviation industry which has more than 10 aircraft currently operating and at least 2 years of the historical data available. Thailand's baseline is developed from the following factors:

- The number of Thai-registered aircraft: there were nearly 600 Thai-registered aircraft[12].
- Availability of fuel consumption data and RTK: It was found that, until now, Thailand has 10-year statistical records of fuel consumption and RTK.

Moreover, those data to be used for baseline calculation have been proved its accuracy and completeness by the Aviation Climate Change Committee.

Figure 2 shows the process of creating baseline data using method B[13] which is comprised of the 6 following steps:

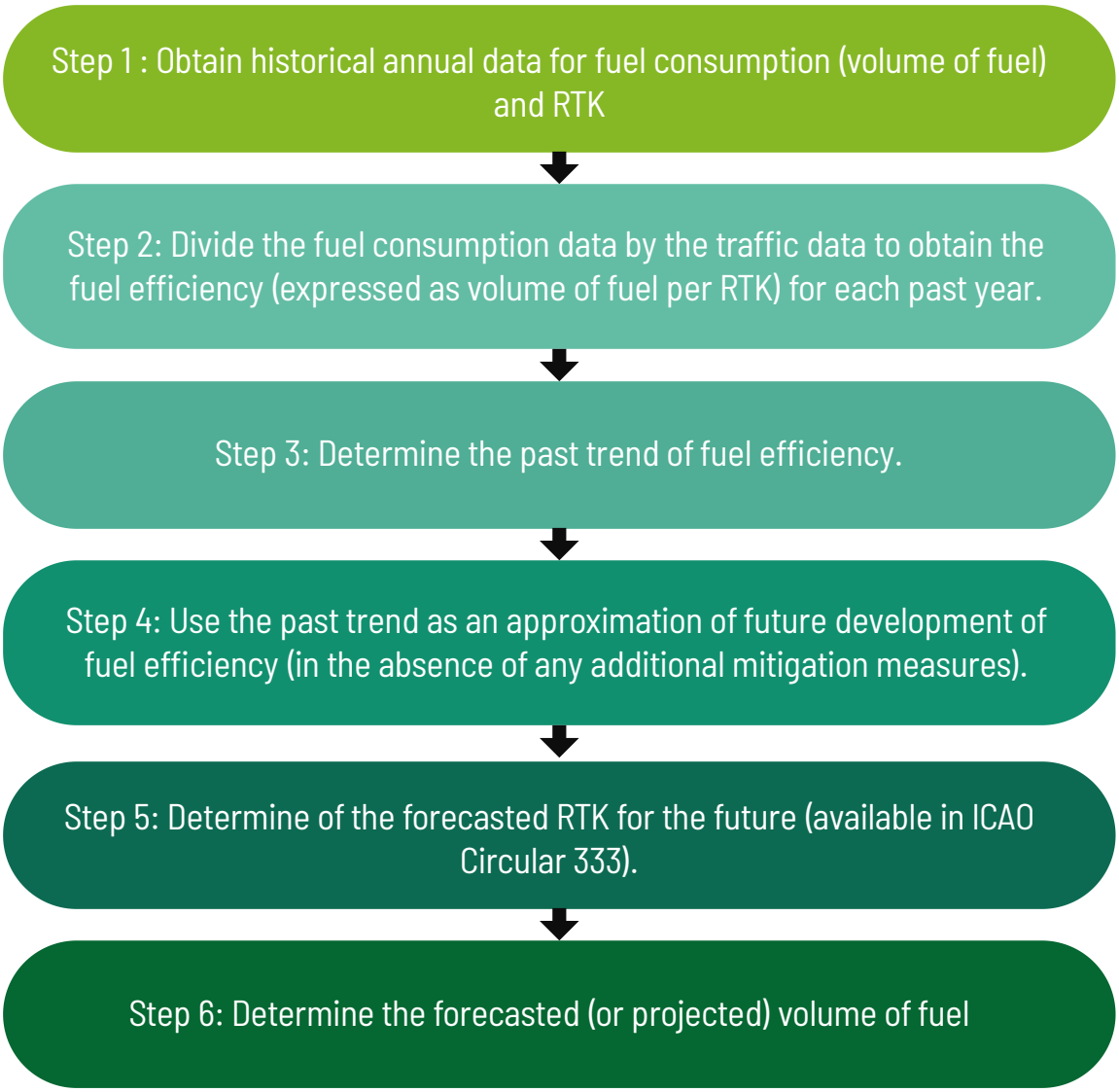

Figure 2: Preparation of Baseline Data: Method B

Thailand's historical annual data of fuel consumption and RTK in 2010 - 2023 are collected and evaluated that data to be fuel efficiency. To analyze historical trends in fuel efficiency through curve fitting and to project future fuel efficiency up to the year 2050. Additionally, to develop RTK (Revenue Ton Kilometers) forecasts based on the base case scenario. However, the data used to calculate fuel efficiency will cover the years 2010 - 2019 and 2023. The period from 2020 to 2022 has been excluded due to the significant impact of the COVID-19 pandemic on aviation fuel consumption and air transport volumes, which introduced high levels of volatility and would substantially distort the baseline calculation. Then, the forecasted volume of fuel consumption as equation:

$$\text{projected volume of fuel} = \text{projected fuel efficiency} \times \text{forecasted RTK}$$

3.2 MRV SYSTEMS

MRV systems are key mechanisms for tracking fuel consumption and CO_2 emissions. This is done to prove the success of implemented projects and measures under the Energy Conservation Policy to reduce GHG emissions at the national, organizational, and product levels. Therefore, in the development of MRV systems the following 5 basic principles must be taken into consideration.

- Relevance of data which concerns the appropriateness of the measurement and computational methods to the goals of MRV system
- Completeness of the data used for measurement
- Consistency which concerns the same principle on which the methods of measurement, data collection and the calculations are based, so that the amounts of GHG emissions can be compared
- Transparency which concerns full disclosure and honesty of measurement, data collection, and calculation methods
- Accuracy which concerns the closeness of measuring methods, data collection and the amount of GHG emissions to the actual amount of GHG emissions

From MRV systems of the international aviation sector, the institutional structure of operation of such systems can be established (as shown in Table 1).

Table 1: Institutional Structure of MRV of the International Aviation Sector

Organizations	Roles and Responsibilities
The International Civil Aviation Organizatio (ICAO)	Collect data
The Civil Aviation Authority of Thailand (CAAT)	Calculate and report the amount of greenhouse gas emissions. Collect and review the aviation fuel consumption data together with the traffic volume.
Air Operators	Report jet fuel consumption and RTK transport volumes. Monitor jet fuel consumption and RTK transport volumes.

Every year, Thai air operators will monitor and report aircraft utilization data, jet fuel consumption data, and traffic volume data such as RTK in CAAT-M Form through the aviation emissions database of CAAT[14]. Before reporting, air operators must verify the accuracy and completeness of all 3 types of information. Then, CAAT[14] will be the agency that collects information from Thai air operators and performs a verification of energy use and GHG emissions (Inventory) in the international aviation sector. This is done to calculate the amount of greenhouse gases before compiling and reporting to ICAO.

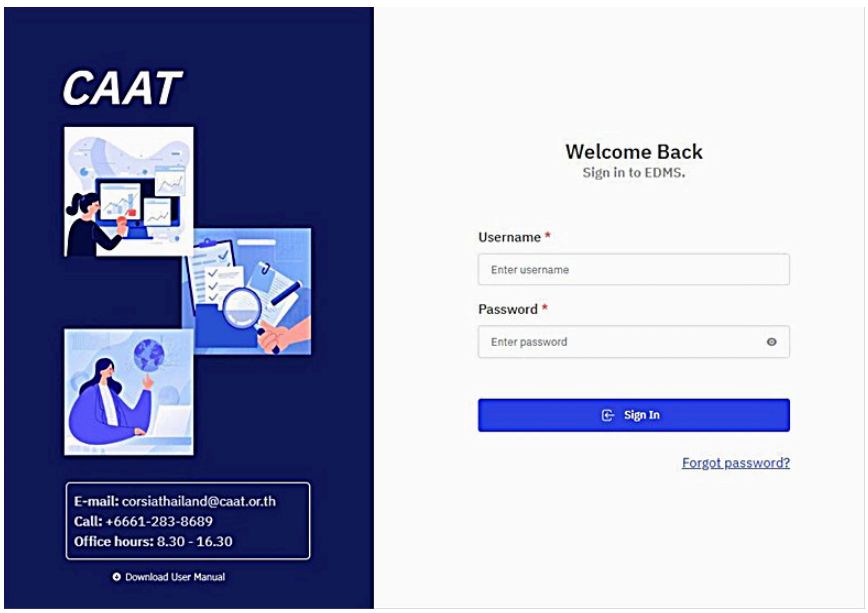

Figure 3 CAAT's Emissions Data Management System (EDMS)

3.3 HISTORICAL INTERNATIONAL RTK, FUEL CONSUMPTION AND CO_2 EMISSIONS DATA

Table 2 provides the historical international RTK, fuel consumption and CO_2 emissions data used for baseline estimations up to the year that the most recent data is available.

Table 2 Historical International RTK, Fuel Consumption and CO_2 emissions data

Year	Fuel Consumption (Tonne)	Fuel Consumption (Litre)	CO_2 Emissions (Tonnes)	RTK (Tonne-Kilometers)
2010	2,752,794	3,440,992,500	8,698,829	7,574,912
2011	2,865,630	3,582,037,500	9,055,391	8,511,965
2012	2,860,436	3,575,545,000	9,038,978	8,766,787
2013	2,765,585	3,456,981,250	8,739,249	9,686,980
2014	2,601,010	3,251,262,500	8,219,192	9,424,065
2015	3,033,999	3,792,498,750	9,587,437	10,034,051
2016	2,909,312	3,636,640,000	9,193,426	10,822,393
2017	3,317,123	4,146,403,146	10,482,107	12,728,696
2018	3,400,251	4,250,313,865	10,744,793	13,340,928
2019	3,633,404	4,541,754,750	11,481,556	13,990,091
2020	812,383	1,015,479,200	2,567,131	2,880,107
2021	320,825	401,031,763	1,013,808	1,075,957
2022	1,081,176	1,351,469,988	3,416,516	4,389,200
2023	1,929,849	2,412,311,113	6,098,322	7,893,494

Remarks: 1. The figures that are shown in the table are rounded results.
2. The data from 2020 to 2022 is not considered in the calculation as it represents abnormal data.
3. Jet fuel density = 0.8 kg/litre[15]

3.4 BASELINE ESTIMATION METHODOLOGY

In the table below, provide the following information related to baseline estimation methodology.

Table 3 Baseline estimation methodology

Definition used for international flights in the Action Plan	Annex 16, Vol IV definition
Does Your State have registered aeroplane operators?	Yes
Which methodology used to account for the CO_2 emissions attributed to international flights?	All international flights operated by all aeroplane operators registered in State (ICAO methodology)
Brief explanation of the data collection methodology used including the origin of the fuel consumption and air traffic data.	The data collection methodology involves gathering fuel consumption data and air traffic data from air operators via FORM CAAT-M
Timeframe Historical Data Provided	2010 - 2023
If EBT tool used for the baseline estimations please indicate the method selected from the EBT Tool	Method B
Density of fuel used	0.8 kg/litre
CO_2 conversion factor used	3.16 kg of CO_2/ kg of Jet fuel
Air Traffic Growth Factor used for estimations (%)	CAGR 3%
Please list any other assumptions made for baseline calculations, if applicable	The data from 2020 to 2022 is not considered in the calculation as it represents abnormal data.

3.5 THAILAND'S BASELINE

The preparation of baseline data is the result of forecasting fuel consumption of the international aviation sector without the implementation of mitigation measure (fuel consumption reduction and CO_2 emissions reduction) (Do-Nothing Additional) as far in the future as 2050. For Thailand, the baseline data on fuel consumption and CO_2 emissions in the Thai aviation sector is designed for the period of 2024 - 2050.

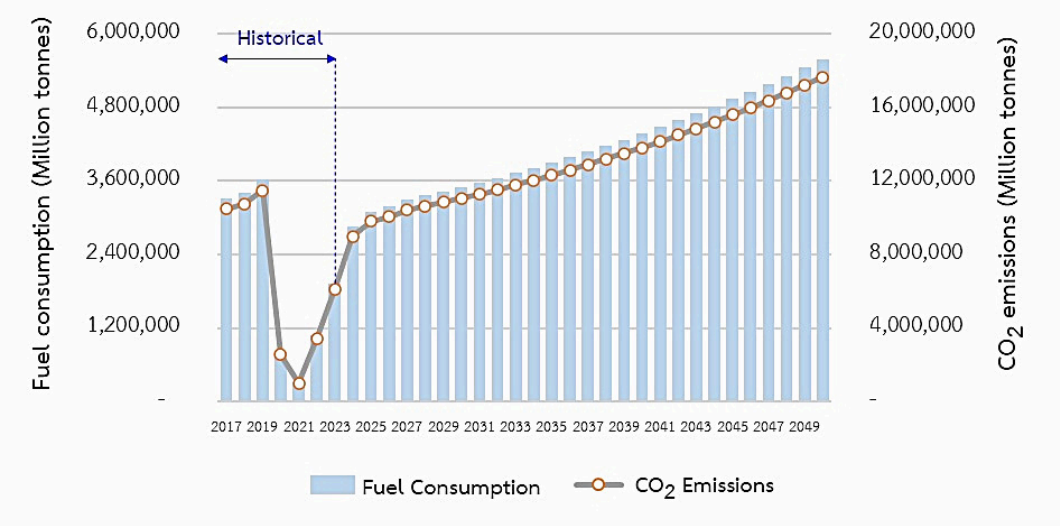

Figure 4 Baseline of international aviation fuel consumption and CO_2 emissions in 2024 - 2050

When viewed from at 30-year perspective, it was found that in 2050, fuel consumption will be at 5.5 million tonnes, CO_2 emissions will be at 17.6 million tCO_2 as shown in Figure 4 and as details shown in Table 4.

Table 4 Baseline of international aviation fuel consumption, CO_2 emissions and RTK in 2024 - 2050

Year	Fuel Consumption (Tonne)	Fuel Consumption (Litre)	CO_2 Emissions (Tonnes)	RTK (Tonne-Kilometers)
2024	2,848,145	3,560,180,765	9,000,137	11,518,186
2025	3,007,531	3,759,413,353	9,503,797	12,324,459
2026	3,178,948	3,973,684,521	10,045,474	13,187,171
2027	3,300,112	4,125,140,565	10,428,355	13,846,530
2028	3,363,111	4,203,888,969	10,627,431	14,261,926

Year	Fuel Consumption (Tonne)	Fuel Consumption (Litre)	CO_2 Emissions (Tonnes)	RTK (Tonne-Kilometers)
2029	3,429,527	4,286,908,233	10,837,304	14,689,784
2030	3,499,254	4,374,067,899	11,057,644	15,130,477
2031	3,572,221	4,465,276,579	11,288,219	15,584,391
2032	3,648,379	4,560,473,997	11,528,878	16,051,923
2033	3,727,700	4,659,625,080	11,779,532	16,533,481
2034	3,810,172	4,762,715,504	12,040,145	17,029,485
2035	3,895,799	4,869,748,295	12,310,724	17,540,370
2036	3,984,593	4,980,741,208	12,591,314	18,066,581
2037	4,076,580	5,095,724,679	12,881,992	18,608,578
2038	4,171,792	5,214,740,227	13,182,863	19,166,836
2039	4,270,271	5,337,839,178	13,494,057	19,741,841
2040	4,372,065	5,465,081,659	13,815,726	20,334,096
2041	4,477,229	5,596,535,794	14,148,042	20,944,119
2042	4,585,822	5,732,277,059	14,491,196	21,572,442
2043	4,697,910	5,872,387,767	14,845,396	22,219,616
2044	4,813,565	6,016,956,657	15,210,866	22,886,204
2045	4,932,863	6,166,078,567	15,587,847	23,572,790
2046	5,055,883	6,319,854,178	15,976,591	24,279,974
2047	5,182,712	6,478,389,810	16,377,369	25,008,373
2048	5,313,438	6,641,797,276	16,790,464	25,758,624
2049	5,448,155	6,810,193,763	17,216,170	26,531,383
2050	5,586,961	6,983,701,757	17,654,798	27,327,325

Remarks: 1. The figures that are shown in the table are rounded results.
2. Jet fuel density = 0.8 kg/litre[16]

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CHAPTER 4

MEASURES TO MITIGATE CO_2 EMISSIONS

4. MEASURES TO MITIGATE CO_2 EMISSIONS

There are 4 groups of emissions mitigation measures implemented by Thailand's aviation industry. According to Technology and Standards, Sustainable Aviation Fuels and Cleaner Energies, Operational Improvements, and Market-Based Measures (CORSIA), as follows.

Technology and Standards

Aircraft technology development measures are those measures using advanced technology for modifying aircraft or improving aircraft efficiency per unit, resulting in decreasing CO_2 emissions

The aircraft technology development measure group consists of one measure: purchase of new aircraft (expansion aircraft fleet with new aircraft and/or replace the old aircraft.)

Sustainable Aviation Fuels and Cleaner Energies

Sustainable aviation fuel/Lower carbon aviation fuel (SAF/LCAF) are initiatives designed to reduce aviation's environmental impact by promoting the use of alternative fuels and energy sources.

This group consists of one measure: Sustainable aviation fuels

Operational Improvements

Air traffic management can be made more efficient through improved ATM planning, optimized ground and terminal operations (including departure, approach, and arrival), enhanced en-route operations, better airspace design and utilization, and the effective use of advanced aircraft capabilities. Measures to improve collaborative decision making (Airport Collaborative Decision Making (A-CDM)) is the measure to improve the efficiency of air transport.

Aircraft operational improvements focus on enhancing aircraft efficiency to reduce jet fuel consumption on each flight, ultimately leading to lower CO_2 emissions. These measures include minimizing weight, conducting regular engine washes, using PACK OFF during the takeoff phase, implementing single-engine taxiing, minimizing flaps (optimizing flap settings), and minimizing reversers use (reducing reverse or idle reverse thrust). By refining these operational procedures, airlines can improve fuel efficiency while maintaining safety and performance standards.

Airport improvements involve infrastructure investments aimed at enhancing aircraft movement on the ground. This includes construction of runways, taxiways, high-speed exits, or optimized taxiway layouts to reduce taxiing time. By minimizing aircraft delays and unnecessary fuel burning during ground operations, these improvements contribute to lower CO_2 emissions and increased overall airport efficiency.

Market-Based Measures (CORSIA)

The Market-Based Measure (MBM) is a policy measure designed to achieve environmental goals at a low cost and is more flexible in terms of implementation than normal measures.

The MBM group consists of one measure: Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Table 5 List of mitigation measures selected for implementation

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start - end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
1	Technology and Standards	Purchase of new aircraft (Expansion Aircraft Fleet with New Aircraft and/or Replace the Old Aircraft)	Purchase of new aircraft (expansion aircraft fleet with new aircraft and/or replace the old aircraft is the measure related to purchase of new aircraft) with improved combustion efficiency. As a result, the rate of jet fuel consumption per unit of output or Specific Fuel Consumption (SFC) is decreased, resulting in the reduction of overall use of jet fuel in the fleet.	**Start Date**: Within 2029 **End Date**: -	379,567.78 (5-year average: 2026-2030)	- Thai Airways International Public Company Limited	No
	Detail on quantification	$ER_y = \sum_i RTK_{i,y} \times (SFC_{i,BL} - SFC_{i,y}) \times EF_{CO2}$ Remark: According to Thai Airways plan, 144 aircrafts are expected to be in Thai Airways fleet in 2030 which could reduce the SFC from 0.267 in 2019 to 0.243.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start - end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
2	Sustainable Aviation Fuels and Cleaner Energies	Sustainable Aviation Fuels (SAF) / Lower Carbon Aviation Fuels (LCAF)	SAF/LCAF measures help reduce CO_2 emissions and fuel consumption by replacing conventional jet fuel with renewable, lower-carbon alternatives.	**Start Date**: Within 2026 **End Date**: N/A	89,438.55 (5-year average: 2026-2030)	- K-Mile Air Company Limited - Thai AirAsia Company Limited - Nok Airlines Public Company Limited - Bangkok Airways Public Company Limited - Thai Lion Mentari Company Limited - Thai Airways International Public Company Limited - Thai VietJet Air Joint Stock Company Limited - Thai AirAsia X Company Limited	No
	Detail on quantification	$ER_y = FC_{SAF,y} \times \left(1 - \frac{L_{f,y}}{89}\right) \times EF_{CO2}$ Remark: The reduction is calculated based on a 1% SAF blend of total fuel consumption, with feedstock primarily derived from used cooking oil via the Hydro-processed Esters and Fatty Acids (HEFA), which has a Life Cycle Assessment (L) value of 13.9.						

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start - end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
3	Operational Improvements	Construction of Runways and/or Taxiways	Construction of runways and/or taxiways is a measure related to infrastructure within the airside, resulting in a change in taxi routes. This has also lead to a decrease in the average time spent during taxi phase and a decrease in the consumption of jet fuel.	**Start Date**: Within 2025 **End Date**: N/A	34,608.85 (5-year average: 2026-2030)	- Airports of Thailand Public Company Limited (BKK) - K-Mile Air Company Limited - Bangkok Airways Public Company Limited - Thai Airways International Public Company Limited - Thai VietJet Air Joint Stock Company Limited	No
	Detail on quantification:	$ER_y = \sum_{ap}\sum_{i}\sum_{k} NFL_{k,i,ap,y} \times ATS_{k,\,i,ap} \times AFF_{k,i} \times EF_{CO2}$ Remark: The reduction is attributed to the construction of the third runway at Suvarnabhumi Airport, which commenced operations in late 2024. The time savings (ATS) amount to 3 minutes per flight for taxi-in and 5 minutes per flight for taxi-out.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start - end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
4	Operational Improvements	Minimizing Weight	The minimizing weight measure is designed to reduce load weight, such as: • Reduce fuel uplift by planning the aircraft's payload close to actual usage or using accurate systems or information to prepare flight plan • Reduce potable water quantity in aircraft • Reduce the weight of the aircraft by replacing manuals and charts with Electronic Flight Bags (EFB).	**Start Date**: N/A **End Date**: N/A	1,466.95 (5-year average: 2026-2030)	- Thai AirAsia Company Limited - Bangkok Airways Public Company Limited - Thai Airways International Public Company Limited	No

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start – end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
			When the overall load weight decreases, the amount of jet fuel consumed will also decrease. As a result, the amount of jet fuel used in transportation will also decrease, resulting in lower greenhouse gas emissions.				
	Detail on quantification:	$ER_y = \sum_i AWR_{i,y} \times FP_{i,y} \times EF_{CO2}$ Remark: The reduction calculation was based on the data presented in the table below. The table lists the average weight reduction per flight for each implemented measure: • Electronic Flight Bag (EFB): reduces paper documentation weight by 20 kg per flight. • Reduced Potable Water Quantity: accounts for a 1% reduction applied to 60% of the total potable water carried. • Reduced Extra Fuel Uplift: reduces unnecessary fuel load by 500 kg per flight. Assumed that this measure is implemented for an additional 5% of all flights.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start – end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
5	Operational Improvements	Engine Wash	The engine wash measure is implemented to increase aircraft engine performance due to the accumulation of stains on the engine's turbines. This reduces engine performance and results in a higher Exhaust Gas Temperature (EGT). Regular engine wash can help remove stains on the engine's turbines, thus improving the engine's performance.	**Start Date**: N/A **End Date**: N/A	986.70 (5-year average: 2026-2030)	- Thai AirAsia Company Limited - Thai AirAsia X Company Limited	No
	Detail on quantification:	$ER_y = \sum 0.01 \times FC_{i,y} \times EF_{CO2}$ Remark: The reduction from this measure is calculated as 1% of fuel consumed, according to ICAO Doc 9988. Assumed that this measure is implemented for 5% of all flights.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start – end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
6	Operational Improvements	PACK OFF - Take Off Phase	The pack OFF during take-off phase involves the operation procedures for shutting down air conditions during take-off to reduce engine load while taking off, resulting in a decrease in jet fuel consumption	**Start Date**: N/A **End Date**: N/A	89.73 (5-year average: 2026-2030)	- Thai AirAsia Company Limited - Thai VietJet Air Joint Stock Company Limited - Thai Airways International Public Company Limited - Thai AirAsia X Company Limited	No
	Detail on quantification:	$ER_y = \sum_i NFL_{i,y} \times AFCS_{k,i} \times EF_{CO2}$ Remark: The reduction from this measure is calculated based on each aircraft's average fuel consumption (AFCS). Assumed that this measure is implemented for 5% of all flights.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start - end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
7	Operational Improvements	Single Engine Taxi	The single engine taxi measure is performed during taxi procedures based on using half of the installed number of engines for the taxi duration: single-engine power for the aircraft with 2 engines and two-engine power for the aircraft with 4 engines, resulting in a decrease in aircraft fuel consumption.	**Start Date**: N/A **End Date**: N/A	2,105.94 (5-year average: 2026-2030)	- Thai AirAsia Company Limited - Nok Airlines Public Company Limited - Bangkok Airways Public Company Limited - Thai Lion Mentari Company Limited - Thai Airways International Public Company Limited - Thai VietJet Air Joint Stock Company Limited	No
	Detail on quantification:	$ER_y = \sum_{ap}\sum_{i} NFL_{i,ap,y} \times (AEOT_{k,i,ap}) \times AFFS_{k,i} \times EF_{CO2}$ Remark: The reduction from this measure is calculated based on an average engine-off time (AEOT) of 20 minutes during the taxi phase, and the average fuel flow savings (AFFS) is calculated as 28% of fuel consumed, according to ICAO Doc 9988. Assumed that this measure is implemented for 5% of all flights.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start – end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
8	Operational Improvements	Minimizing Flaps (Optimum Flap/ Reduce Flap)	The minimizing flaps (optimum flap/ reduce flap) measure relates to adjusting flap level in an appropriate position responding to phase of flight, known as Flap 3, to reduce resistance during approach phase. This contributes to reduced jet fuel consumption.	**Start Date**: N/A **End Date**: N/A	453.27 (5-year average: 2026-2030)	- Thai AirAsia Company Limited - Thai AirAsia X Company Limited - Bangkok Airways Public Company Limited - Thai Airways International Public Company Limited - Thai VietJet Air Joint Stock Company Limited	No
	Detail on quantification:	$ER_y = \sum_i NFL_{i,y} \times AFCS_{k,i} \times EF_{CO2}$ Remark: The reduction is calculated based on the average fuel consumption savings (AFCS) estimated by Airbus in Getting to Grips with Fuel Economy for Airbus aircraft and based on ICAO Doc 9988 for other aircraft. Assumed that this measure is implemented for 5% of all flights.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start – end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
9	Operational Improvements	Minimizing Reversers Use (Reduce Reverse / Idle Reverse Thrust)	Minimizing reversers use (reduce reverse/ idle reverse thrust) measure is a flight operation designed to reduce the use of thrust reverser or use the reverse thrust idle during landing phase. This contributes to reduced consumption of jet fuel during landing.	**Start Date**: N/A **End Date**: N/A	1,248.36 (5-year average: 2026-2030)	- Thai AirAsia Company Limited - Bangkok Airways Public Company Limited - Thai Airways International Public Company Limited - Thai AirAsia X Company Limited	No
	Detail on quantification:	$ER_y = \sum_i NFL_{i,y} \times AFCS_{k,i} \times EF_{CO2}$ Remark: The reduction is calculated based on the average fuel consumption savings (AFCS), according to ICAO Doc 9988, with estimated values for narrow-body and wide-body aircraft. Assumed that this measure is implemented for 5% of all flights.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start – end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
10	Operational Improvements	Measures to Improve Collaborative Decision Making (Airport Collaborative Decision Making (A-CDM))	Airport Collaborative Decision Making (A-CDM) reduces CO_2 emissions and fuel consumption by providing more accurate real-time information, allowing for better planning of aircraft taxiing times. This minimizes unnecessary engine running on the ground, reducing fuel burn and environmental impact.	**Start Date**: N/A **End Date**: N/A	3,794.83 (5-year average: 2026-2030)	- Airports of Thailand Public Company Limited - Aeronautical Radio of Thailand Limited - K-Mile Air Company Limited - Bangkok Airways Public Company Limited - Thai Airways International Public Company Limited - Thai VietJet Air Joint Stock Company Limited	No
	Detail on quantification:	$ER_y = \sum_{ap}\sum_{k} TS_{k,ap,y} \times NFL_{k,ap,y} \times AFF_{k,i} \times EF_{CO2}$ Remark: The reduction is calculated based on the average fuel flow at idle power (AFF) of aircraft operating at Suvarnabhumi Airport, with a time saving (TS) of 1 minute, according to ICAO Doc 9988.					

#	Category of the Measure (s)	Name of the measure(s) selected	Description of the measure(s)	Implementation time horizon (start - end date implementation)	CO_2 Savings per year (tonnes of CO_2/year)	Stakeholder(s) involved in implementing the measure(s)	Assistance needed for implementation
11	MBMs	Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)	CORSIA is a compensation and reduction program for carbon dioxide emissions in the international aviation sector.	**2019-2020**: Baseline Period **2021-2023**: Pilot Phase **2024-2026**: First Phase **2027-2035**: Second Phase	N/A	- K-Mile Air Company Limited - Thai AirAsia Company Limited - Nok Airlines Public Company Limited - Bangkok Airways Public Company Limited - Thai Lion Mentari Company Limited - Thai Airways International Public Company Limited - Thai VietJet Air Joint Stock Company Limited - Thai AirAsia X Company Limited	No
	Detail on quantification:	The results of the implementation align with the CORSIA calculation methodology from ICAO.					

CHAPTER 5

EXPECTED RESULTS

5. EXPECTED RESULTS

5.1 QUALITY OF DATA

MRV system of emissions mitigation measures (MRV of Mitigation Actions) in the Thai aviation sector was developed to track and report on the success of measures taken under the emissions reduction policy. This has been carried out through calculating the amount of CO_2 emission reductions, based on the principle known as "SMART". This means that the indicator must be Specific, Measurable Accurate, Realistic, Time-bound. Besides, the balance between measurement costs such as human resources, time, complexity of data collection, and the accuracy of the calculated results are also taken into consideration so as to maximize the benefits of operations.

Unlike the system for monitoring the performance of individual measures for energy conservation and greenhouse gas emissions, which is primarily based on the bottom-up method, the overall measurement of greenhouse gas emissions from the aviation sector is based on the top-down method. This is - because such methods are a standard tool for measuring the amount of greenhouse gas emissions at the largest level.They are suitable for measurement to track and report greenhouse gas emissions of the national inventory sector. The bottom-up method, on the other hand, marks the measurement of individual details which is appropriate for the analysis of technological or policy change[17].

Therefore, to collect information that will be useful in formulating policies and tracking the success of implementing various measures, the bottom-up method has been selected to monitor the performance of individual energy conservation and greenhouse gas reduction measures. As for the top-down method, it has been selected to monitor overall performance of energy conservation and greenhouse gas reduction in the aviation industry in Thailand. Both methods contain the same five basic goals, especially completeness and transparency that can compare the performance of activities to provide feedback on improving the quality of data used to assess greenhouse gas emissions.

Photo by กัปตัน หม่อมหลวง บวรชัย วรวรรณ

Air operators, air navigation service providers, and airport operators will monitor, store and report energy conservation and emission reduction in aviation emissions on each measure every year by May 31st. This will be done through the CAAT ENVI form or through central email of the Aviation Environment Division, Aviation Industry Development and Promotion Department, CAAT or through the Emissions Data Management of CAAT. Before reporting, air operators, air navigation service providers and airport operators shall ensure the accuracy and completeness of the data. Subsequently, CAAT, as the competent authority, receives and aggregates these submissions to verify energy consumption and emissions reduction data. The consolidated results are then reported to ICAO through the State Action Plan.

5.2 THAILAND'S NEXT STEP

In the potential assessment, the measures already in operation will be double counting with the assessment in the preparation of baseline data, which will result in a higher reduction in fuel consumption and CO_2 emissions than it should be. Therefore, the potential assessment will only be based on the number of flights expected to be carried out in addition to the current one. This is based on the assessment in conjunction with the ability to take additional measures from the present and the growth rate of flight volume during the year. The likelihood of these measures being implemented is expected to increase up to 5 percent from the current level.

As for air traffic management improvement measures and route improvements by Extended-range Twin-engine Operations Performance Standards (ETOPS), no stakeholder was found to have any plans to extend or further implement measures to airports or other routes by 203018. Therefore, the measures in this group will not affect the future consumption of jet fuel, including the measures related to Airspace restructure (Airways and Flight Procedures) (Uni-Directional Route/ Parallel Route / Conditional Route (CDR)), Intelligent Departure Enhancement Program as a component of the A-CDM framework, Air Traffic Flow Management (ATFM) (Ground Delay Program (GDP)), and Route Improvement by Extended-range Twin-engine Operations Performance Standards (ETOPS).

The assessment of measures with the potential to reduce jet fuel consumption and aviation emissions during 2026 - 2030 can be shown in Table 6

Table 6 Assessment results of measures with the potential to reduce jet fuel consumption and CO_2 emissions during 2026 - 2030

Groups	Mitigation Measures	Current execution status before 2026	Inclusion of measures in assessment	Measure execution potential, Year 2026 - 2030
I (New Measures)	Purchase of New Aircraft (Expansion Aircraft Fleet with New Aircraft and/or Replace the Old Aircraft)	0%	✕	100%
	Construction of Runways and/or Taxiways	0%	✕	100%
	Sustainable Aviation Fuels (SAF) / LCAF	0%	✕	1%
	Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)	0%	✕	∝
	Measures to improve collaborative decision making (Airport Collaboration Decision Making (A-CDM))	0%	✕	100%
II (Already Implemented but not Completed Measures)	PACK OFF - Take Off Phase	<100%	○	5%
	Minimizing Flaps (Optimum Flap/ Reduce Flap)	<100%	○	5%
	Minimizing Reversers Use (Reduce Reverse / Idle Reverse Thrust)	<100%	○	5%
	Single Engine Taxi	<100%	○	5%
	Minimizing Weight	<100%	○	5%
	Engine Wash	<100%	○	5%

Groups	Mitigation Measures	Current execution status before 2026	Inclusion of measures in assessment	Measure execution potential, Year 2026 - 2030
III (Completed Measures)	Measures to improve collaborative decision making (Intelligent Departure Enhancement Program as a component of the A-CDM framework)	100%	✓	0%
	Measures to improve fuel efficient departure and approach procedures (Air Traffic Flow Management (ATFM) (Ground delay program (GDP)))	100%	✓	0%
	Measures to improve the use of optimum routings (Airspace restructure (Airways and Flight Procedures) (Parallel Route/ Uni-directional Route/ CDR Route))	100%	✓	0%
	Measures to improve the use of optimum routings (Route Improvements by ETOPS)	100%	✓	0%

Remark:		
	✕	The results of the implementation of the measures were not included in the evaluation of the baseline data.
	O	Some of the results from the implementation of the measures were included in the evaluation of baseline data.
	✓	The results from the measure implementation were included in the evaluation of baseline data.
	∝	The results of the implementation align with the CORSIA calculation methodology from ICAO[19].

Photo by Pilots of Thai Airways (provided by Capt. Itt Sirisawat)

From the table above, the measures in Group I (new measures) and Group II (already implemented but not completed measures) are the measure groups which have the potential to reduce the use of fuel consumption and CO_2 emissions. During 2026 - 2030, they will be used to assess the fuel consumption that has changed or decreased from the baseline. This helps to reduce CO_2 emissions in the international aviation sector during 2026 - 2030 which concerns the improvement of fuel consumption potential from international aviation at the rate of 0.3 percent compared to the baseline.

5.3 THAILAND'S EXPECTED RESULTS

The evaluation of energy conservation potential and reduction of greenhouse gases in the Thailand's aviation sector during 2026 - 2050 is based on potential assessments from 2026 to 2030. Regarding to this, the information or details of the implementation of the measures of stakeholders during such periods must be considered. After 2030, there is a relatively high level of uncertainty in the implementation of the measures. Moreover, there is a chance that the potential for measures to significantly reduce the use of fuel or CO_2 emissions than current measures are introduced to reduce the likelihood of discrepancies. The potential assessment during this period will be based on Thailand's aviation energy conservation and greenhouse gas reduction targets for 2026 - 2030.

In the potential assessment of energy conservation and greenhouse gas reduction of the international aviation sector during 2026 - 2050, the fuel consumption reduction target of 4.0% and the CO_2 reduction target of 4.8% for the international aviation sector during 2026 - 2030 were applied. These targets were established based on the reduction potential from the purchase of new aircraft (expansion of the aircraft fleet with new aircraft and/or the replacement of older aircraft) by Thai Airways, which was identified as a major contributor to the national reduction potential. This measure aligns with Thai Airways' business plan. By 2050, the maximum potential to reduce fuel consumption and CO_2 emissions is estimated to reach approximately 4,259,343 tonnes and 16,296,520 tCO_2, respectively, as shown in Table 7.

However, the implementation of the purchase of new aircraft (aircraft fleet expansion and replacement) measure will depend on both internal and external variables, particularly war-related disruptions and jet fuel costs. Nonetheless, Thailand remains committed to achieving its established target of reducing fuel consumption and greenhouse gas emissions around 0.3%.

Table 7: Summary of potential for reducing jet fuel consumption and greenhouse gas emissions of International Aviation Sector as of 2050

Summary of International Aviation Potential Assessment as of 2050	Target Range	
	Minimum	Maximum
Jet fuel Consumption (tonnes)		
- Before implementing the baseline measures	106,395,063	
- After implementing the measures	105,979,498	102,135,720
- Reduced jet fuel consumption	415,565.30	4,259,343
- Reduced jet fuel consumption (%)*	0.3%	Up to 4.0%**
Greenhouse gas emissions (tonnes of carbon dioxide)		
- Before implementing the baseline measures	336,208,400	
- After implementing the measures	334,895,214	319,911,881
- Reduced greenhouse gas emissions	1,313,186	16,296,520
- Reduced greenhouse gas emissions (%)*	0.3%	Up to 4.8%

Remarks: The figures that are shown in the table are rounded results.

* Figures are shown to one decimal place.

** Strongly depends on success of the Purchase of new aircraft (Aircraft Fleet Expansion) which is affected by internal and external situation.

Figure 5 and Figure 6 represent the expected results of the international aviation fuel consumption with 0.3 % reduction in 2026 - 2050 compared to the baseline and the expected results of the international aviation CO_2 emissions with 0.3% reduction in 2026 - 2050, compared to the baseline respectively.

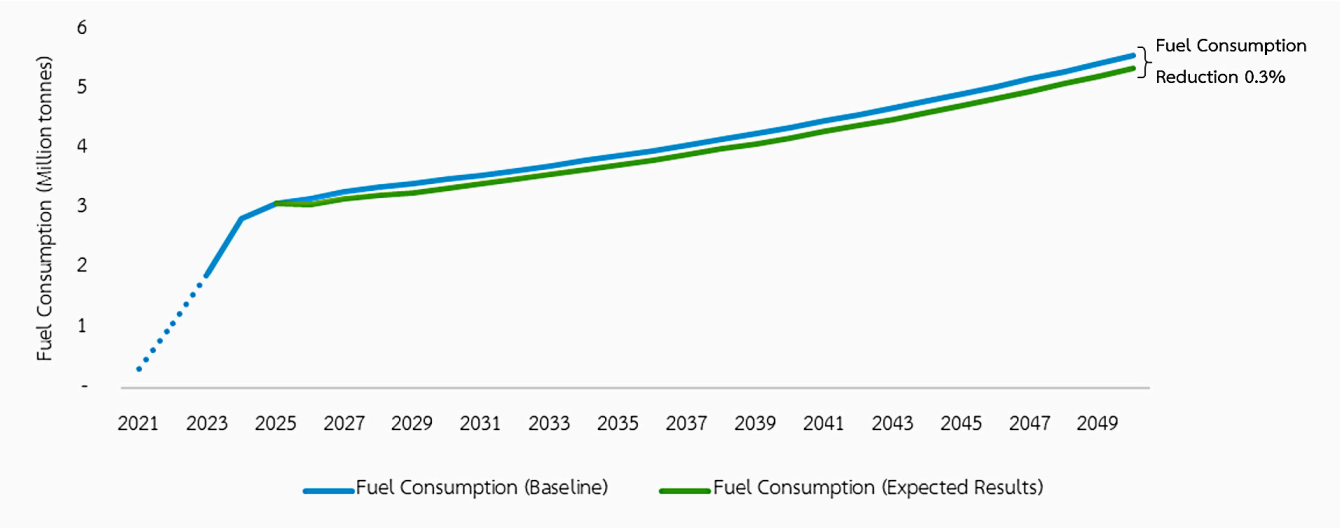

Figure 5 Expected results of international aviation fuel consumption in 2026 - 2050, compared to the baseline

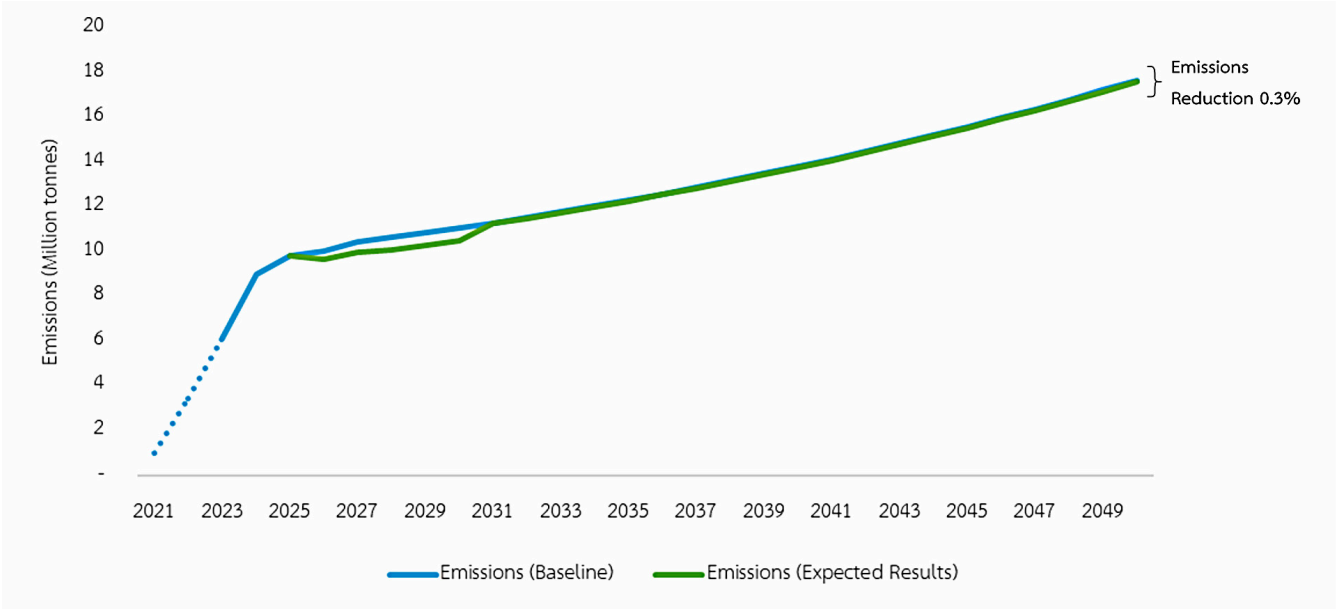

Figure 6 Expected results of international aviation CO_2 emissions in 2026 - 2050, compared to the baseline

Table 8 represents the expected results on energy consumption and greenhouse gas emissions in the international aviation sector from 2024 to 2050 after the implementation of measures by stakeholders.

Table 8 Expected Results data on energy consumption and greenhouse gas emissions in the international aviation sector for 2024 - 2050

Year	Fuel Consumption (Tonne)	Fuel Consumption (Litre)	CO_2 Emissions (Tonnes)	RTK (Tonne-Kilometers)
2024	2,837,020	3,546,275,162	8,964,984	11,518,186
2025	2,995,784	3,744,729,573	9,466,676	12,324,459
2026	3,166,531	3,958,163,825	10,006,238	13,187,171
2027	3,287,223	4,109,028,302	10,387,624	13,846,530
2028	3,349,975	4,187,469,124	10,585,922	14,261,926
2029	3,416,131	4,270,164,126	10,794,975	14,689,784
2030	3,485,587	4,356,983,358	11,014,454	15,130,477
2031	3,558,269	4,447,835,788	11,244,129	15,584,391
2032	3,634,129	4,542,661,378	11,483,848	16,051,923
2033	3,713,140	4,641,425,189	11,733,523	16,533,481
2034	3,795,290	4,744,112,956	11,993,118	17,029,485
2035	3,880,582	4,850,727,691	12,262,640	17,540,370
2036	3,969,030	4,961,287,080	12,542,134	18,066,581
2037	4,060,657	5,075,821,441	12,831,677	18,608,578
2038	4,155,498	5,194,372,129	13,131,373	19,166,836
2039	4,253,592	5,316,990,271	13,441,351	19,741,841
2040	4,354,989	5,443,735,760	13,761,764	20,334,096

Year	Fuel Consumption (Tonne)	Fuel Consumption (Litre)	CO_2 Emissions (Tonnes)	RTK (Tonne-Kilometers)
2041	4,459,741	5,574,676,452	14,092,782	20,944,119
2042	4,567,910	5,709,887,530	14,434,596	21,572,442
2043	4,679,561	5,849,450,984	14,787,412	22,219,616
2044	4,794,764	5,993,455,206	15,151,455	22,886,204
2045	4,913,596	6,141,994,665	15,526,963	23,572,790
2046	5,036,136	6,295,169,648	15,914,189	24,279,974
2047	5,162,469	6,453,086,061	16,313,402	25,008,373
2048	5,292,684	6,615,855,278	16,724,882	25,758,624
2049	5,426,875	6,783,594,030	17,148,926	26,531,383
2050	5,565,139	6,956,424,325	17,585,841	27,327,325
Remarks: 1. The figures that are shown in the table are rounded results 2. Jet fuel density = 0.8 kg/litre[20]				

In summary, the 0.3% target reduction represents an ambitious but technically feasible potential for the country. It should be noted that this target does not account for possible economic fluctuations or other uncertainties. The Civil Aviation Authority of Thailand (CAAT) will continue to monitor the implementation of reduction measures and make necessary adjustments in future baseline years.

5.4 ASSISTANCE NEEDS

Thailand has not identified any assistance requirements as of 2026.

5.5 THAILAND'S STAKEHOLDER ENGAGEMENT

The Civil Aviation Authority of Thailand (CAAT), as the regulatory body overseeing civil aviation in the country, plays a key role in driving and supporting industry stakeholders in reducing aviation fuel consumption and greenhouse gas emissions. To ensure effective implementation, CAAT develops participatory action guidelines to address any deviations from planned targets. This includes organizing an annual engagement meeting to present progress, disseminate information, and clarify key aspects to stakeholders. These meetings not only highlight collective achievements but also serve as an incentive for stakeholders to recognize the importance of the action plan and remain committed to achieving future targets. Additionally, CAAT conducts targeted discussions with aviation stakeholders to assess challenges, identify operational constraints, and address environmental factors that may hinder progress. These meetings can also serve as a platform for reaching agreements on implementing additional measures to enhance sustainability efforts within Thailand's aviation sector. To ensure transparency and accountability, CAAT will closely monitor the implementation of reduction measures and regularly review progress against the established targets.

Photo by ThePhugetNews

APPENDIX

Appendix A Updates on Mitigation Measures in the Action Plan

No	Mitigation Measures	Year 2013		Year 2018		Year 2021	
		Details	Status in 2025	Details	Status in 2025	Details	Status in 2025
Technology and standards							
1	Retrofitting and upgrade improvements on existing aircraft (Modification of aircrafts)	Modification of B777 aircraft **Stakeholder**: TG	Execution Accomplished	Seat retrofit **Stakeholder**: PG	Execution Canceled		
2	Purchase of new aircraft	Buy new Airbus 320-200 NEO **Stakeholder**: FD	Execution Accomplished	Purchase of Airbus A350 **Stakeholder**: TG	Execution Accomplished	Additional purchase of B737-800BCF aircraft **Stakeholder**: 8K	Execution Accomplished
3	Purchase of new aircraft (Replace aircraft with new aircraft)					Replacement of A320 with A320NEO **Stakeholder**: FD	Execution Accomplished
4	Construction of runways				Execution Accomplished	Construction of a new runway (3rd runway) at Suvarnabhumi Airport **Stakeholder**: AOT	Execution Accomplished

No	Mitigation Measures	Year 2013		Year 2018		Year 2021	
		Details	Status in 2025	Details	Status in 2025	Details	Status in 2025
5	Construction of additional taxiway-exits and/or speed-exit					Construction of parallel taxiways and express exits at KBV Airport Execution Accomplished **Stakeholder**: DOA	Execution Accomplished
6	Construction of taxiways					Construction of additional taxiways at UTP Airport **Stakeholder**: U-Tapao Airport Authority	Currently in Progress
Sustainable Aviation Fuels and cleaner energies							
-	N/A						
Operational improvement							
1	Measures to improve collaborative decision making (Gate hold procedure)	Gate hold procedure **Stakeholder**: AEROTHAI	Developed into an iDEP system. It was incorporated into an iDEP system as part of A-CDM operated at Suvarnabhumi Airport and Don Mueang Airport.				

No	Mitigation Measures	Year 2013		Year 2018		Year 2021	
		Details	Status in 2025	Details	Status in 2025	Details	Status in 2025
2	Measures to improve the use of optimum routings (Parallel route / uni-directional route / CDR Route)	Parallel route/uni-directional route/CDR Route **Stakeholder**: AOT	Currently in Progress		Currently in Progress		Currently in Progress
3	Measures to improve fuel efficient departure and approach procedures (Ground delay program)			Ground Delay Program **Stakeholder**: AEROTHAI	Currently in Progress		Currently in Progress
4	Minimizing weight (Retune flight planning system)	Minimizing weight: Retune flight planning system **Stakeholder**: TG	Currently in Progress		Currently in Progress		Currently in Progress
5	Minimizing weight (reduce fuel uplift)					Reduce fuel uplift **Stakeholders**: VZ, PG, TG, WE, SL, 8K, FD, XJ	Currently in Progress
6	Minimizing weight (reduce potable water)	Minimizing weight: Reduce potable water quantity in aircraft **Stakeholders**: PG, TG	Currently in Progress		Currently in Progress	Reduce potable water **Stakeholders**: VZ, PG, TG, WE, SL, 8K, FD, XJ	Currently in Progress

No	Mitigation Measures	Year 2013		Year 2018		Year 2021	
		Details	Status in 2025	Details	Status in 2025	Details	Status in 2025
7	Minimizing weight (replacing flight manuals with electronic flight bags)			Electronic Flight Bag (EFB) **Stakeholder**: PG	Currently in Progress	Electronic flight bags (EFB) **Stakeholders**: PG, VZ, TG, WE, SL, 8K, FD, XJ	Currently in Progress
8	Engine wash (Aircraft wash and engine wash)	Aircraft wash and engine wash **Stakeholders**: TG, FD	Currently in Progress (discontinued by TG)		Currently in Progress	Engine wash **Stakeholders**: FD, TG, WE	Currently in Progress (discontinued by TG, WE)
9	Single engine taxi	Single engine taxi **Stakeholders**: PG, FD	Currently in Progress		Currently in Progress	Single engine taxi **Stakeholders**: FD, PG, SL, VZ, DD, WE	Currently in Progress (discontinued by DD, WE)
10	Minimizing flaps (Flap setting)			Reduce flap landing **Stakeholders**: PG, FD	Currently in Progress	Optimum flap position **Stakeholders**: FD, VZ, PG, WE	Currently in Progress (discontinued by WE)
11	Measures to fully utilize RNAV/RNP capabilities (Using RNAV and RNP APP to cut tracks)	**Stakeholder**: FD	Currently in Progress		Currently in Progress		Currently in Progress

No	Mitigation Measures	Year 2013		Year 2018		Year 2021	
		Details	Status in 2025	Details	Status in 2025	Details	Status in 2025
12	Minimizing reversers use (Reduce reverse / idle reverse thrust)					**Stakeholders**: FD, WE	Currently in Progress (discontinued by WE)
13	Measures to improve the use of optimum routings (Use of ETOPS operations)	**Stakeholder**: FD	Currently in Progress		Currently in Progress		Currently in Progress
14	Measures to improve fuel-efficient departure and approach procedures (Continuous Descents Operation (CDO))	**Stakeholder**: AEROTHAI	Currently under Revision		Currently in Progress		Currently in Progress
15	Measures to improve collaborative decision making (Airport Collaboration Decision Making (A-CDM))	**Stakeholder**: AOT	Execution Accomplished Fully deployed and operational at Suvarnabhumi Airport as of March 2023		Currently in Progress		Currently in Progress
Market-based measures (CORSIA)							
1				CORSIA **Stakeholder**: CAAT	Currently in Progress	CORSIA **Stakeholders**: CAAT and air operators	Currently in Progress

No	Mitigation Measures	Year 2013		Year 2018		Year 2021	
		Details	Status in 2025	Details	Status in 2025	Details	Status in 2025
Others							
1	Measures to improve ground operations (Use of GPU during light maintenance and overnight maintenance[21])	**Stakeholder**: FD	No Further Update Since 2020				
2	Reduced energy demand (Set the air temperature at 25°C at the airports)	**Stakeholder**: AOT	Execution Accomplished				
3	Reduced energy demand (Lighting control system)	**Stakeholder**: AOT	Execution Accomplished				

Remarks: The table uses abbreviations for organizations. The corresponding full names are:

- AEROTHAI – Aeronautical Radio of Thailand Ltd.
- AOT – Airports of Thailand Public Co., Ltd.
- CAAT – The Civil Aviation Authority of Thailand
- DOA – Department of Airports (Thailand)

The table uses airline codes assigned by the International Air Transport Association (IATA). The corresponding full airline names are as follows

- 8K – K-Mile Air Co., Ltd.
- DD – Nok Airlines Public Co., Ltd.
- FD – Thai AirAsia Co., Ltd.
- PG – Bangkok Airways Public Co., Ltd.
- SL – Thai Lion Mentari Co., Ltd.
- TG – Thai Airways International Public Co., Ltd.
- VZ – Thai VietJet Air Joint Stock Co., Ltd.
- WE[22] – Thai Smile Airways Co., Ltd
- XJ – Thai Air Asia X Co., Ltd.

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[21] The number of Auxiliary Power Unit (APU) usage hours increased due to insufficient parking holes at Don Mueang Airport. Night-time parking is required to park at a remote bay and then the aircraft is towed to the aerobridge, so the APU is used to enable communication with the aircraft control tower.
[22] Thai Smile Airways Co. ceased operations and was fully merged into Thai Airways International Public Co., Ltd. in 2023

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CAAT
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