



CỤC HÀNG KHÔNG VIỆT NAM
CIVIL AVIATION AUTHORITY OF VIETNAM

**VIETNAM
STATE ACTION PLAN
TO REDUCE
CIVIL AVIATION
CO₂ EMISSIONS**

2022-2025



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ACRONYMS

ACI	Airports Council International
ACV	Airport Corporation of Vietnam
ANSP	Air navigation service provider
CAAV	Civil Aviation Authority of Vietnam
CAEP	Committee on Aviation Environmental Protection Civil Air Navigation Services Organization
CANSO	Civil Air Navigation Services Organization
CO ₂	Carbon dioxide
CO _{2e}	Carbon dioxide equivalent
GHG	Greenhouse gas
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFSET	Fuel Savings Estimation Tool
IPCC	Intergovernmental Panel on Climate Change
Kt	Kilotonne
MBM	Market-based measure
MoT	Ministry of Transport
PBN	Performance-based navigation
REDD	Reducing emissions from deforestation and forest degradation
RNP	Required navigation performance
RTK	Revenue tonne-kilometer
Tkm	Tonne-kilometer
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change
VATM	Vietnam Air Traffic Management Corporation

SECTION 1 BACKGROUND INFORMATION AND CONTACTS

1.1 Contact Information

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1.2 Overview of Vietnam Civil Aviation

Vietnam's civil aviation industry is an important sector of the country's economy.

Before 2020, Vietnam was the world's seventh fastest growing aviation market with double digit growth rate for both passengers and cargo for the historical baseline period considered in this report. However, in 2020, Vietnam's aviation industry has been severely impacted by the coronavirus pandemic.

1.2.1 Vietnam Aviation Development Master Plan

Under Decision No. 236 / QĐ-TTg dated February 23, 2018, Vietnam's Prime Minister approved the adjustment of the Vietnam Aviation Development Master Plan to 2020 with vision to 2030, setting a key priority for airport infrastructure investment by investing in the construction of six new airports and upgrading most tourism hub airports with a total investment of approximately USD 16 billion, increasing total airports to 28 (13 international and 15 domestic airports).

An overview of the Master Plan is provided here:

1.2.1.1 *Perspective*

a) The aviation industry in general and the aviation infrastructure in particular have high specificity and deep international integration, are an important part of the economic and social infrastructure system, determined as one of three strategic breakthroughs, priority should be given to investment in a synchronous, modern and sustainable direction, in line with the development trend of world aviation; creating a premise for economic and social development, associated with the task of ensuring national defence and security, and protecting the sovereignty of the airspace.

b) Developing the airport infrastructure system and the organization and management system to ensure synchronous, advanced, modern and safe flight operations according to the standards of the International Civil Aviation Organization. (ICAO); meet development needs taking into account the harmony between regions; effectively support emergency and relief work; synchronous connection with other modes of transport; develop multimodal transport and logistics service centres at airports with large demand for freight transport, especially airports that play a key role.

c) Concentrating investment resources in a few key airports, playing the key role, having spill over effect and having a strong impact on economic and social development and international integration. Maximize all resources to invest in the development of aviation infrastructure; ensure the harmonization of the interests of the State, people and businesses; prioritizing the State's resources to develop airports that play a central role in the political, economic and cultural centre of the country.

d) Actively approach and promote the transfer and application of advanced and modern science and technology, especially in construction investment management, exploitation, organization and provision of operational assurance services. Flight activities to limit

environmental pollution, save energy, effectively use natural resources, improve investment efficiency.

e) Strengthen and improve the quality of state management of the aviation industry in accordance with international standards.

1.2.1.2 *Targets to 2030*

To develop a reasonable airport system, in a synchronous and modern direction, to meet the needs of transport, and for extensive international integration; protect the environment, save natural resources; ensuring national defence and security; improving the competitiveness of the economy, contributing to basically turning our country into a developing country with modern industry, high middle income by 2030 with a number of specific goals as follows:

- Transport: the total passenger volume through the airports is about 275.9 million passengers (accounting for 1.5-2% of the transport market share and 3-4% of the total inter-provincial passenger transport volume). The total volume of goods through the airports is about 4.1 million tons (accounting for 0.05-0.1% of the transport market share).

- In terms of infrastructure: priority is to focus on investing in a number of large airports, playing a key role in the capital Hanoi (Noi Bai Airport) and Ho Chi Minh City (Tan Son Nhat and Long Thanh Airports) region. ; step by step upgrade and effectively exploit 22 existing airports, invest in 06 new airports to bring the total number of airports in the country into operation to 28, total designed capacity of the airport system to meet about 278 million passengers, ensuring that over 95% of the population can access the airport within 100km. Invest in a system of infrastructure and flight management equipment in a synchronous, modern and regional way to meet transport needs. Step by step invests in logistics centres, training centres, flight training, aircraft maintenance and repair and equipment systems to ensure flight operations.

1.2.2 Airlines

At present, there are 7 Vietnam-based carriers exploiting the market: Vietnam Airlines (VN), Pacific Airlines (BL), VASCO, VietJet Air (VJ), Bamboo Airways (QH), Vietravel Airlines (VU) and Hai Au. Amongst these BL, VJ, QH and VU are operating as low-cost carriers (LCC).

Vietnam Airlines, Bamboo Airways and VietJet Air operate 56 international routes to 32 destinations in 17 countries and territories

As of November 2021, Vietnam had 233 aircraft, the average age being 6.2 years old, of which 54 aircraft are owned (23%).

1.2.3 Airports

According to the airport network plan approved by the Prime Minister under Decision No. 236/QĐ-TTg, dated 23rd, February 2018, during the period up to 2030 there will be 28 airports commissioned. Currently, there are 22 civil aviation airports in operation. Among those there are 10 international airports and 12 domestic. The four major international airports are Noi Bai airport (Ha Noi), Da Nang airport (Da Nang), Tan Son Nhat airport (Ho Chi Minh), Cam Ranh airport (Nha Trang).

1.2.4 Air Traffic Management Infrastructure

With oversight by the Vietnam Air Traffic Management Corporation, The ATM system is organized as follows:

- Operation and management of the two Flight Information Regions (FIRs), Ho Chi Minh and Hanoi, covering all the territorial airspace of Vietnam and the airspace above international waters assigned by ICAO to Vietnam for navigation with 35 domestic routes, 36 international routes, 4 access control zones: Noi Bai, Da Nang and Tan Son Nhat and Cam Ranh, 22 airport controlling areas and 3 ground controlling areas at Noi Bai, Da Nang, and Tan Son Nhat airports;
- Operation of more than 300 equipment systems (with issued Operation Certificates) with 4 primary radar and 7 secondary radar, point-to-point ground communication network (AFTN, on-duty telephone), ground-to-air communication network, navigation systems (ILS, VOD, DME, NDB and lighting signalization), aviation weather systems, aeronautical information systems, and the Search and Rescue equipment. Among those, VATM has invested and developed CNS services with advanced modern technology solutions, particularly:
- Vietnam has recently deployed AMHS (Aeronautical Message Handling System).

SECTION 2 BASELINE AND EXPECTED RESULTS

In order to understand the benefits that can be expected from the implementation of a basket of measures, it is useful to quantify both the historic fuel consumption and traffic, as well as to project into the future what would happen in the absence of the action plan.

Summary results

For Vietnam aviation the ICAO definition for international flights is applied:

International flight is a flight stage with one or both terminals in the territory of a state, other than the state in which the air carrier has its principal place of business i.e. Vietnam.

This includes flights where the departure or destination state is Vietnam and flights between states outside of Vietnam.

Historical data used for calculations has been collected and provided by CAAV. The structure and units of measurement of data align with ICAO form M including fuel consumption, RTKs for international flights and Total Services (revenue and non-revenue for International and Domestic).

The aggregated data covers a 6-year period from 2014-2019 and includes all airlines undertaking international operations that have been operating during the period. It is used to calculate the baseline.

Because of some doubts about the RTK data for 2020, this data is put aside for the moment. In any case, 2020 was an exceptional year because of the COVID-19 pandemic.

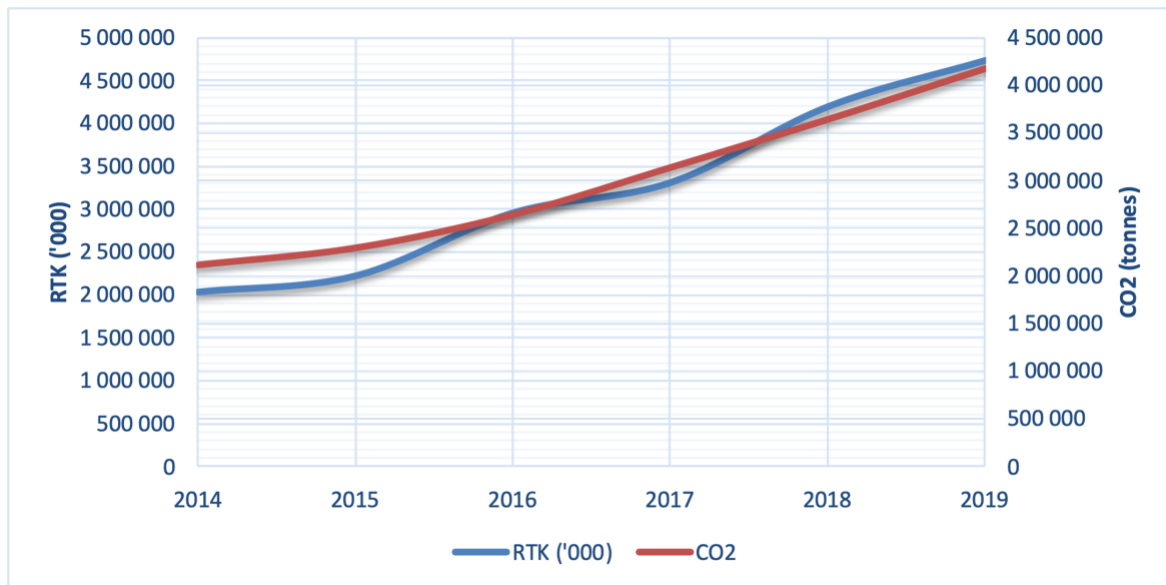
As per Document 9988, the formula for calculation of CO₂ as follow:

$$\text{CO}_2 \text{ Emission (tonnes)} = \text{Fuel Consumption (tonnes)} \times 3.16$$

Calculation of CO₂ Emission for period 2014-2019:

The following table summarises historical fuel consumption data, the CO₂ emissions and fuel efficiency (litres Fuel/RTK) for international flights for the period 2014-2019:

YEAR	Fuel Burn		RTK	FB/RTK		CO ₂ Emission
	litres	tonnes		thousand	litre/RTK	
2014	834 368 750	667495	2 037 607	0.41	0.33	2 109 284
2015	905 210 125	724168	2 226 282	0.41	0.33	2 288 371
2016	1 043 241 500	834593	2 960 593	0.35	0.28	2 637 315
2017	1 239 152 875	991322	3 313 297	0.37	0.30	3 132 578
2018	1 439 450 000	1151560	4 197 823	0.34	0.27	3 638 930
2019	1 650 647 061	1320518	4 737 504	0.35	0.28	4 172 836



The above figure shows how historical CO2 emissions have grown based on historical RTK growth.

The observation can be made that CO2 emissions have grown slightly less strongly compared to RTK growth over this period.

In order to develop this baseline and make a prediction of the “business as usual” (BAU) case, we need to make some forecasts about future RTK growth and also the fuel efficiency of the fleet in future.

Three future “business as usual” scenarios have been defined, taking into account the current situation which is still being impacted by the global coronavirus pandemic.

Even with moderate to ambitious RTK growth rates, future fuel consumption levels are not predicted to be anywhere near the levels previously seen in 2019 because of the significant drop (>70%) caused by the pandemic (starting in 2020).

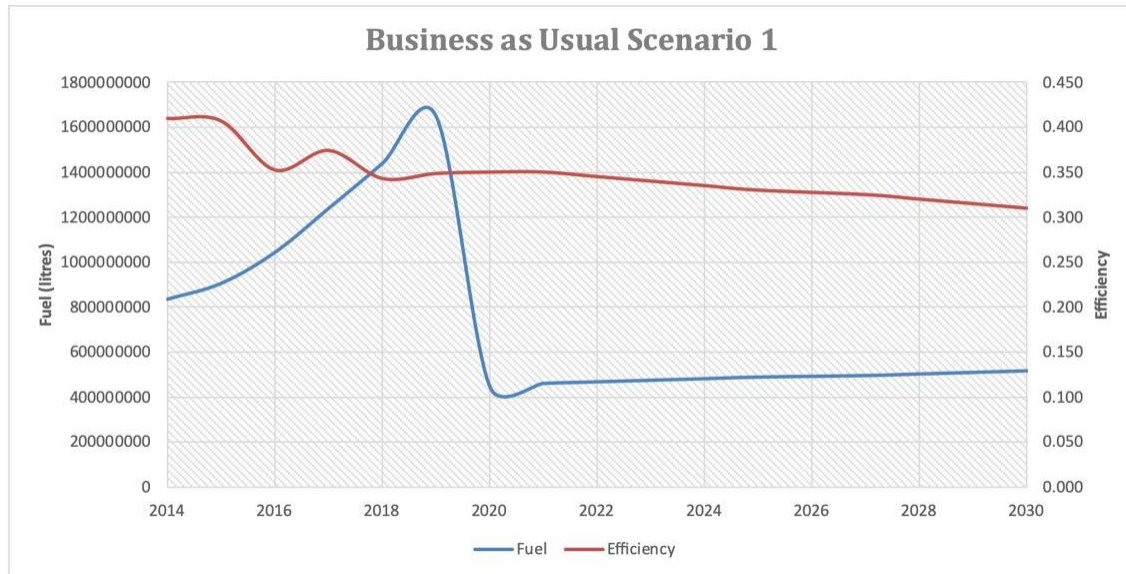
It may well be, that in the next few years there will be a rapid reversal of the decline in RTK seen since the onset of the global pandemic.

Current sentiment however is that it will take time to rebuild global airline operations back to pre-pandemic levels.

This section is only intended to be illustrative and cannot be expected to realistically predict the future.

Any future assessment of benefits accrued through the mitigation measures will of course be assessed and compared against the actual “business as usual” case that unfolds over the coming years.

Scenario 1: Historical and predicted baseline emissions for international flights from 2014 to 2030



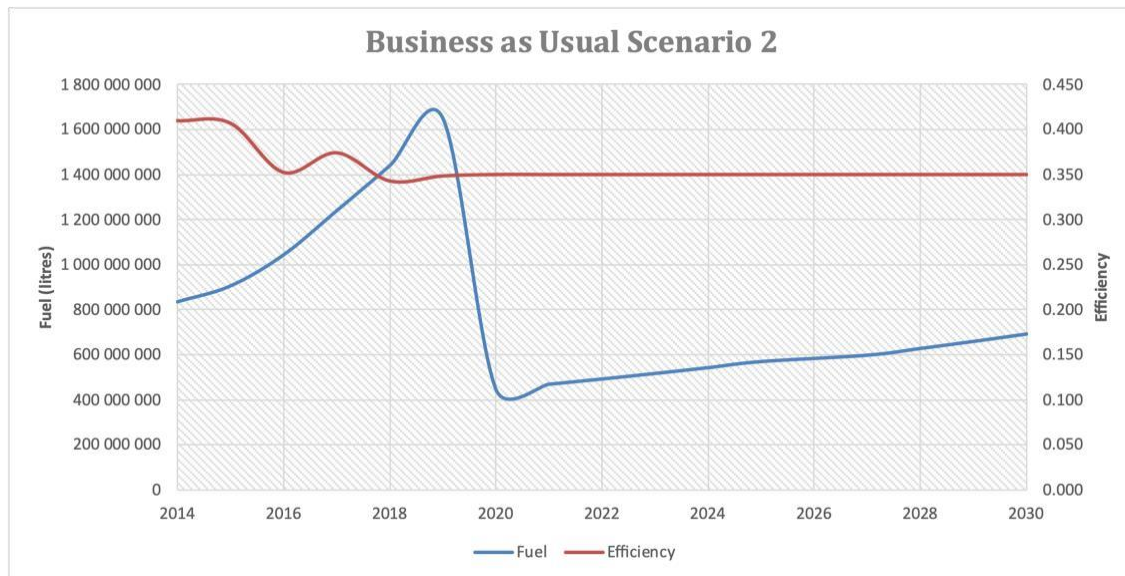
In this scenario, a very modest growth rate of 3% is applied to the RTK of 2020.

The fuel efficiency is assumed to improve year on year by 0.005 up to 2030 (by which time it is 0.31).

Total fuel consumption is around 515 million litres in 2030 which is less than a third of the 1650 million litres used in 2019.

Year	RTK ('000)	RTK % change	Fuel Consumed (litres)	Year on year Fuel % change	(Calculated) Efficiency
2014	2 037 607		834 368 750		0.409
2015	2 226 282	9%	905 210 125	8%	0.407
2016	2 960 593	33%	1 043 241 500	15%	0.352
2017	3 313 297	12%	1 239 152 875	19%	0.374
2018	4 197 823	27%	1 439 450 000	16%	0.343
2019	4 737 504	13%	1 650 647 061	15%	0.348
2020	1 273 021	-73%	445 557 480	-73%	0.350
2021	1 311 212	3%	458 924 205	3%	0.350
2022	1 350 548	3%	465 939 189	2%	0.345
2023	1 391 065	3%	472 962 040	2%	0.340
2024	1 432 797	3%	479 986 918	1%	0.335
2025	1 475 781	3%	487 007 622	1%	0.330
2027	1 520 054	3%	494 017 580	1%	0.325
2028	1 565 656	3%	501 009 829	1%	0.320
2029	1 612 625	3%	507 976 997	1%	0.315
2030	1 661 004	3%	514 911 286	1%	0.310

Scenario 2: Historical and predicted baseline emissions for international flights from 2014 to 2030

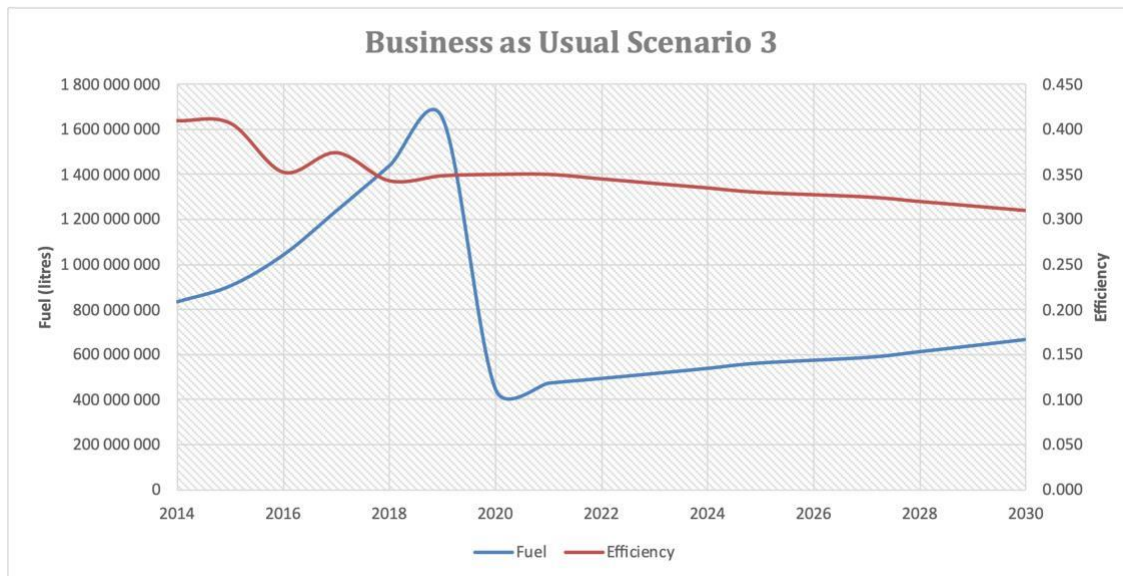


In this scenario, a more historically typical growth rate of 5% is applied to the RTK of 2020. The fuel efficiency in this case is assumed to stay the same year on year at 0.35.

In this scenario, total fuel consumption in 2030 is just below 700 million litres, still very much reduced compared to the 1650 million litres used in 2019.

Year	RTK ('000)	RTK % change	Fuel Consumed (litres)	Year on year Fuel % change	(Calculated) Efficiency
2014	2 037 607		834 368 750		0.409
2015	2 226 282	9%	905 210 125	8%	0.407
2016	2 960 593	33%	1 043 241 500	15%	0.352
2017	3 313 297	12%	1 239 152 875	19%	0.374
2018	4 197 823	27%	1 439 450 000	16%	0.343
2019	4 737 504	13%	1 650 647 061	15%	0.348
2020	1 273 021	-73%	445 557 480	-73%	0.350
2021	1 336 672	5%	467 835 354	5%	0.350
2022	1 403 506	5%	491 227 122	5%	0.350
2023	1 473 681	5%	515 788 478	5%	0.350
2024	1 547 365	5%	541 577 902	5%	0.350
2025	1 624 734	5%	568 656 797	5%	0.350
2027	1 705 970	5%	597 089 637	5%	0.350
2028	1 791 269	5%	626 944 119	5%	0.350
2029	1 880 832	5%	658 291 325	5%	0.350
2030	1 974 874	5%	691 205 891	5%	0.350

Scenario 3: Historical and predicted baseline emissions for international flights from 2014 to 2030



In this scenario, a more ambitious growth rate of 6% is applied to the RTK of 2020.

The fuel efficiency is assumed to improve year on year by 0.005 up to 2030 (by which time it is 0.31).

Total fuel consumption is around 666 million litres in 2030 which is around half the 1650 million litres used in 2019.

Year	RTK ('000)	RTK % change	Fuel Consumed (litres)	Year on year Fuel % change	(Calculated) Efficiency
2014	2 037 607		834 368 750		0.409
2015	2 226 282	9%	905 210 125	8%	0.407
2016	2 960 593	33%	1 043 241 500	15%	0.352
2017	3 313 297	12%	1 239 152 875	19%	0.374
2018	4 197 823	27%	1 439 450 000	16%	0.343
2019	4 737 504	13%	1 650 647 061	15%	0.348
2020	1 273 021	-73%	445 557 480	-73%	0.350
2021	1 349 403	6%	472 290 929	6%	0.350
2022	1 430 367	6%	493 476 551	4%	0.345
2023	1 516 189	6%	515 504 200	4%	0.340
2024	1 607 160	6%	538 398 651	4%	0.335
2025	1 703 590	6%	562 184 621	4%	0.330
2027	1 805 805	6%	586 886 673	4%	0.325
2028	1 914 153	6%	612 529 106	4%	0.320
2029	2 029 003	6%	639 135 839	4%	0.315
2030	2 150 743	6%	666 730 275	4%	0.310

SECTION 3 MITIGATION MEASURES

- a) a description of the action and an indication of its type (operational, technological, market-based, etc.);
- b) time horizon (start date and date of full implementation);
- c) anticipated change in fuel consumption and/or CO2 emissions;
- d) economic cost and how it will be covered (domestic sources, regional funding, international assistance, etc.);
- e) supplemental benefits for domestic sectors (mainly for domestic aviation, but others could also be reported, if appropriate);
- f) reference to any relevant legislation;
- g) identification of any barriers to implementation and any assistance needed; and
- h) list of stakeholders involved.

After discussions with CAAV operational stakeholders, including all internationally operating airlines and airports, as well as the ANSP, a number of mitigation measures have been identified that could be expected to deliver CO2 savings in the next few years.

The review cycle of the SAP is normally taken to be around every 3 years, however in the circumstances of the global pandemic, and fact that 2020 has been elected as the starting point for this edition of the SAP, the period from 2020-2025 is proposed to be the scope for this action plan.

Progress and monitoring should be conducted annually.

A summary of the mitigation measures is presented here and details follow in the pages after:

	Mitigation Measure	Basket of Measures Category	Stakeholder
1	Single Engine Taxiing	Operational Improvements	Airlines
2	New Airport Infrastructure	Operational Improvements	Airports
3	Reduced route extensions	Operational Improvements	ANSP
4	Taxi time reduction	Operational Improvements	Airports/Airlines
5	Reduce on-stand APU usage	Operational Improvements	Airports/Airlines

Title	Single Engine Taxiing
Description	Increase the uptake of single engine taxiing by all Vietnamese Airlines
Category:	Operational Improvements
Measure:	% increase in single engine taxiing (SET) compared with 2019 measure
Action:	Need to establish level of SET in 2019 as a % of all operations. Objective is to increase this % compared with 2019 metric.
Start Date	Jan 2023
Date of full implementation	Dec 2025
Implemented By:	All Vietnamese airlines
Economic cost	
Currency	
Reference to existing legislation	
Legislation is proposed	
Compliance	<ul style="list-style-type: none"> — voluntary — mandatory — N/A
Assistance needed	<ul style="list-style-type: none"> — finance — technology — technical support — education — research — other
Amount of assistance needed	
Currency for financial assistance	
List of stakeholders involved	<p>All airlines</p> <p>Note: Van Don airport – looking to mandate & implement single engine Taxiing to and from the runway with all local Vietnamese airlines.</p>

Title	New Airport Infrastructure
Description	Planned new infrastructure at some international airports in next 5 years will deliver high speed runway exits and new taxiways which will reduce the unimpeded taxi times
Category:	Operational Improvements
Measure:	% reduction in unimpeded (theoretical) taxi times for both taxi-in and taxi-out
Action:	Establish unimpeded taxi times for infrastructure in 2019. Compare with new times once new infrastructure is delivered
Start Date	2023
Date of full implementation	
Implemented By:	
Economic cost	
Currency	
Reference to existing legislation	
Legislation is proposed	
Compliance	<ul style="list-style-type: none"> — voluntary — mandatory — N/A
Assistance needed	<ul style="list-style-type: none"> — finance — technology — technical support — education — research — other
Amount of assistance needed	
Currency for financial assistance	
List of stakeholders involved	Da Nang Airport - Airport infrastructure must be upgraded including more parallel taxiways and more rapid taxiways to shorten the time the aircraft moves to the apron and taxi for departure.

Title	Reduced route extensions
Description	VATM, as a lead member of ASEAN Strategic Planning Group, one of the objectives is to reduce route extensions on international routes but also review route inefficiencies in domestic airspace
Category:	Operational Improvements
Measure:	% route extension
Action:	Objective is to monitor and reduce the average route extension that Vietnamese airlines international flights are subjected to
Start Date	Jan 2020
Date of full implementation	Ongoing
Implemented By:	
Economic cost	
Currency	
Reference to existing legislation	
Legislation is proposed	
Compliance	<ul style="list-style-type: none"> — voluntary — mandatory — N/A
Assistance needed	<ul style="list-style-type: none"> — finance — technology — technical support — education — research — other
Amount of assistance needed	
Currency for financial assistance	
List of stakeholders involved	VATM will be proactive and lead this action. Airlines will collaborate with VATM to share operational data that will help to monitor changes in performance.

Title	Taxi time reduction
Description	Implement performance measurement system at all international airports – based on goal of achieving optimum unimpeded taxi times (ie: without star-stops or delays)
Category:	Operational Improvements
Measure:	% above (based on minutes) unimpeded taxi time in and out (average)
Action:	Collaborative action between the airports/airlines and ANSP to reduce taxiing times – through improved coordination to minimize stop/starts during taxi in and out.
Start Date	Jan 2023
Date of full implementation	Ongoing
Implemented By:	Airports/ANSP/Airlines
Economic cost	
Currency	
Reference to existing legislation	
Legislation is proposed	
Compliance	<ul style="list-style-type: none"> – voluntary – mandatory – N/A
Assistance needed	<ul style="list-style-type: none"> – finance – technology – technical support – education – research – other
Amount of assistance needed	
Currency for financial assistance	
List of stakeholders involved	

Title	Reduce on-stand APU usage
Description	Where ground power and preconditioned air (PCA) is available on the stands this should be used rather than APU
Category:	Operational Improvements
Measure:	%reduction in aircraft using APU on stand
Action:	Establish the % of aircraft using APU on stand in 2019 (by airport and nationally) and monitor the increase in uptake of ground power and PCA
Start Date	Jan 2023
Date of full implementation	Ongoing
Implemented By:	
Economic cost	
Currency	
Reference to existing legislation	
Legislation is proposed	
Compliance	<ul style="list-style-type: none"> — voluntary — mandatory — N/A
Assistance needed	<ul style="list-style-type: none"> — finance — technology — technical support — education — research — other
Amount of assistance needed	
Currency for financial assistance	
List of stakeholders involved	Note: Van Don and Da Nang airports have mentioned this measure in their questionnaire feedback

The following table presents an example of a Co-benefit mitigation action

Many actions may be taken by stakeholders, particularly airports, which will lead to a reduction in the carbon footprint of their operation. All such actions should be encouraged. It is noted however that these will not have a direct influence in reducing the amount of international aviation fuel used, but nevertheless is extremely welcome in documenting the wider efforts the state is taking in reducing aviation carbon emissions.

Noi Bai Airport

Title	Solutions to reduce power consumption
Description	Gradually replace old lighting equipment to Led lighting technology
Classify:	Operational improvement
Measure:	Power consumption saved annually (KWh)
Work:	- Statistics on the number of LED bulbs to be replaced every year - Calculate the reduced power consumption compared to the old lighting equipment.
Start day	2019
Full implementation date	Statistics of the years from 2019-2030
Performed by:	Airport
Economic cost:	
Currency unit	
Current legal regulations	
Proposing legal regulations	
Compliance	- Voluntary
Support needed	- Finance
Amount of support needed	
Necessary source of support	
List of related parties	- Airport