



Capital A's environmental initiatives are guided by the Group's Environmental Policy, outlined in 2019, which articulates a clear commitment to the protection of the environment and the prevention of pollution. While our environmental concerns stretch across our Group endeavours, our reporting focus will be on the impact of our aviation business as it generates the bulk of our emissions. In line with the policy, we will endeavour to minimise our operational impacts by reducing our carbon footprint from fuel and energy consumption while promoting the sustainable use of natural resources, including water. By minimising our greenhouse gas emissions, we aim to contribute to climate change mitigation. Through the practice of waste elimination, reduction, reuse and recycling, meanwhile, we will reduce our waste-to-landfill. For more information on our environmental commitment, please refer to [https://capitala.airasia.com/misc/CapitalA\\_GroupEnvironmentalPolicy2022.pdf](https://capitala.airasia.com/misc/CapitalA_GroupEnvironmentalPolicy2022.pdf)

In addition, we have established an Occupational Safety, Health & Environment (OSHE) manual that ensures we implement sustainable environmental practices in addition to complying with safety and health principles.

In 2021, no sanctions were recorded arising from any non-compliance with environmental legal requirements.

## **CLIMATE STRATEGY**

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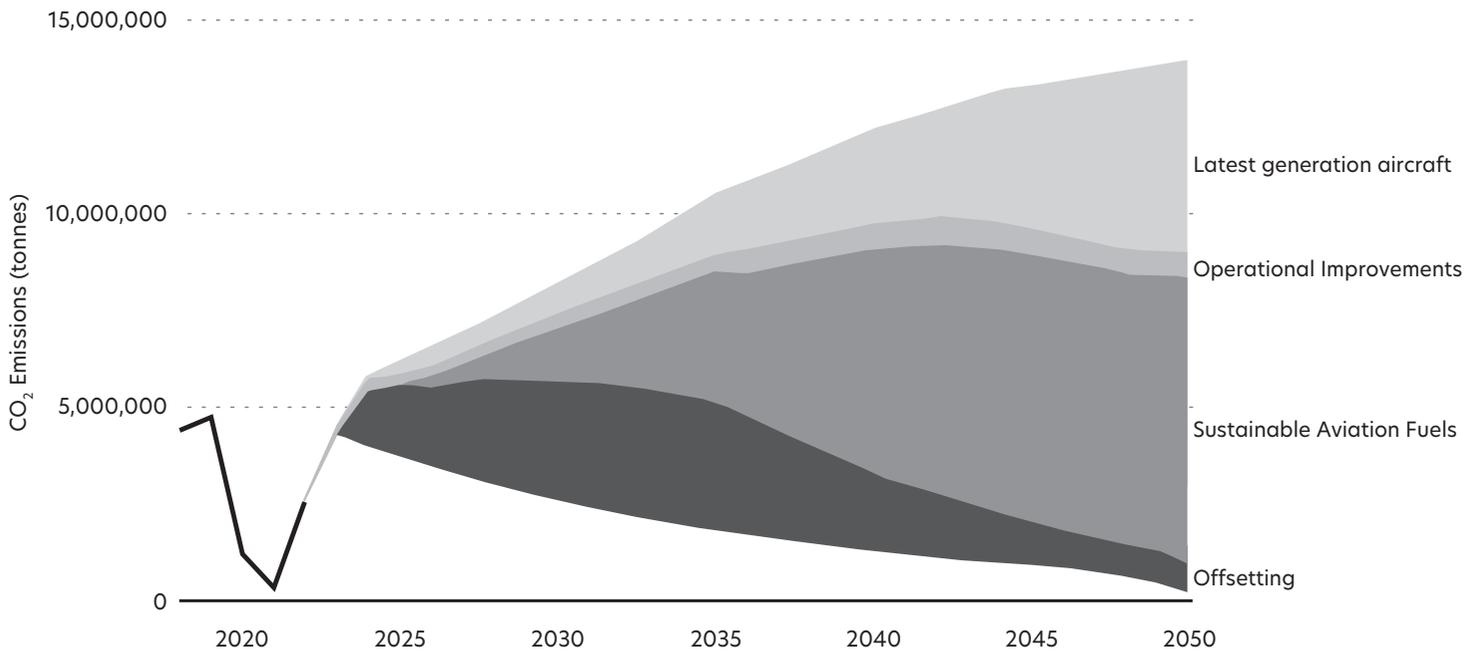
As climate change gains prominence as one of the most important issues on the global agenda, the aviation industry will continue to face increasing scrutiny on actions to mitigate its environmental footprint. This is compounded by the fact that, in 2021 alone, three out of four countries where AirAsia airlines are based suffered extreme weather events which impacted millions of people.

We conducted a robust reassessment of our climate strategy to strengthen AirAsia's commitment to climate responsibility and to align ourselves with the aviation industry's ambitious goal to reach net zero by 2050. Led by the International Civil Aviation Organization (ICAO), the industry aspires to meet a series of progressive targets starting with ensuring carbon neutral growth (measured against 2019 emissions) from 2021 onwards.

Based on existing technologies, there are four main approaches for AirAsia to converge towards net zero by 2050. These are: fleet management, operational eco-efficiencies, carbon offsetting and utilisation of sustainable aviation fuel (SAF). The year 2035 will mark a turning point for the Group's emissions initiatives as this is when we expect zero-emission aircraft to be available commercially. Once this happens, we will review our investment strategies to meet our climate goals. Our climate strategy is reviewed annually to incorporate new developments.

In this year's report, we will focus on providing updates on the four above-mentioned areas. We are also improving our statistical disclosures so that our stakeholders can better understand the impact of our climate-related actions and compare them with industry best practice.

### Roadmap Towards CO<sub>2</sub> Reduction



Note: CO<sub>2</sub> emissions for years 2018-2021 are based on actual data. Figures for 2022 onwards are based on AirAsia's projections.

Another major addition this year is alignment with recommendations of the Task Force for Climate-Related Financial Disclosures (TCFD). We began by identifying the risks and opportunities associated with climate change to our business. This was supported by the development of models to assess the financial impact of two key measures to manage our carbon emissions, namely adding carbon offset costs into airfares; and switching to sustainable aviation fuels. A summary of our climate-related risks and opportunities is presented on pages 133-136 of this report.

Unless otherwise stated, all data presented cover AirAsia Malaysia, AirAsia Indonesia and AirAsia Philippines in line with Capital A's financial disclosures in this annual report. Data for AirAsia Thailand are available in the listed entity's Annual and Sustainability Reports.

## (i) Fleet Management

AirAsia's fleet comprises three models of the Airbus A320 family, which are acknowledged to be the most efficient among narrow-body commercial jet aircraft; and one Airbus A330 as our widebody aircraft. Our fleet remains relatively young at an average age of 8.9 years.

### Fleet size

Model	Units	Average age of type (years)	Passenger Capacity
A320	121	10.02	180/186
A320neo	29	4.5	186
A321neo	2	3	236
A330	1	7	377

Fleet age (years)	% of total fleet	% of planes upgraded in past 2 years
< 7 years	34%	0%
7 - 13 years	44%	0%
> 13 years	21%	0%

Planning ahead for our medium and long-term needs, AirAsia has reaffirmed our commitment to upgrade our fleet to the higher capacity and more fuel-efficient A321neo with the signing of an amendment agreement with Airbus in October 2021. The agreement covers a total order of 362 A321neo aircraft, which includes the conversion of 13 orders for the A320 that have yet to be delivered to Airbus' latest iteration.

In keeping with AirAsia's practice of maintaining a single-class seating layout, each A321neo will be fitted with 236 seats, increasing its capacity while lowering per seat costs. As the A321neo aircraft replace the older A320 fleet, we expect to benefit from significant sustainability gains. With 30% more seating capacity, each A321neo will result in a 20% fuel savings per seat compared with the legacy A320ceo model. The A321neo also delivers a double-digit reduction in nitrogen oxide emissions and reduced engine noise.

The new aircraft are scheduled for delivery through to 2035. Adjusting for post-Covid recovery, AirAsia is to take delivery of our fifth A321neo aircraft (and the first from this order reaffirmation) in 2024.

Beyond 2035, AirAsia is monitoring developments in the zero-emission aircraft industry. We have signed a letter of support with UK-based ZeAero%, which is developing a new hydrogen-powered aircraft that produces no polluting emissions during flight. AirAsia will provide feedback and inputs to help ZeAero% optimise its design in the run-up to production targeted for 2030.

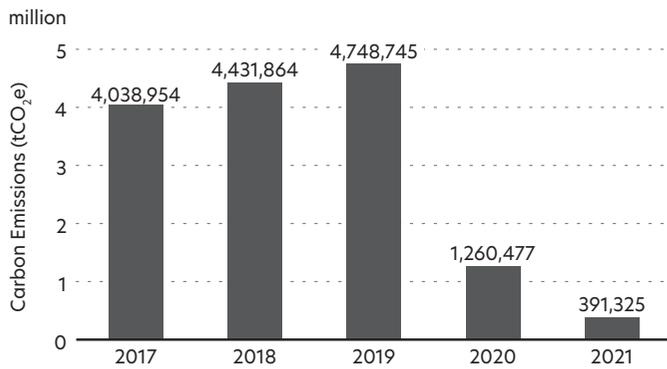
**(ii) Operational Eco-efficiency**

Fuel efficiency has long underpinned AirAsia’s drive towards cost minimisation. To complement our fleet strategy, AirAsia maintains an industry-leading fuel efficiency programme that sees the airline emit the lowest carbon emissions per passenger in Asia. Based on publicly available data, where disclosed, AirAsia also features among operators with the lowest carbon emissions per available seat kilometre (ASK) in the world.

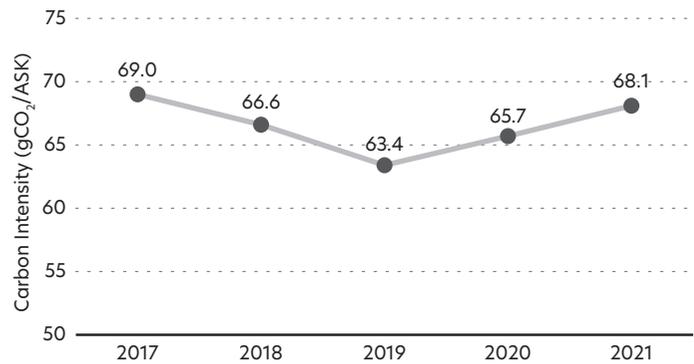
Despite prioritising the use of more efficient A320/A321neo aircraft, AirAsia’s emissions intensity increased in 2021 because we were largely restricted to operating domestic flights, with only a limited number of international cargo flights. Domestic flights generally have shorter stage lengths which equate to higher fuel burn rates as the cruise segments of the flights are shorter than in longer stage lengths. Typically, aircraft burn more fuel during take off and when ascending than when in cruise or descend mode. On shorter flight legs, the aircraft spends a higher percentage of total flight time in this phase, resulting in higher block burn.

Nevertheless, we expect our emissions intensity to revert to pre-Covid levels as the pandemic becomes endemic and more countries in Asean begin easing international travel restrictions. The chart below summarises AirAsia’s carbon emissions trend from 2017 (pre-Covid) to 2021.

**AirAsia Carbon Emissions (tCO<sub>2</sub>e)**



**AirAsia Carbon Intensity (gCO<sub>2</sub>/ASK)**



AirAsia’s fuel efficiency improvements are driven by the Flight Operations department which is tasked with initiating innovative fuel saving projects and tracking their outcomes using an extensive fuel monitoring system. In 2021, the department managed over 27 efficiency projects to reduce fuel consumption and carbon emissions. Below are the highlights:

Initiative	Description	Result/Total CO <sub>2</sub> avoided in 2021
SafetyLine OptiClimb	Software that reduces fuel consumption during climb, which is the most fuel-intensive phase of a flight. OptiClimb leverages digital data to accurately determine and analyse an aircraft’s aerodynamic characteristics.	Group compliance rate rose to 63% from 58% in 2020.  CO <sub>2</sub> avoided = 4,892 tonnes
Reduced Flaps Landing	Procedure that uses a reduced flap configuration during landing to cut aerodynamic drag and fuel burn.	Group compliance rate dropped slightly from 91% in 2020 to 88% due to operational variances.  CO <sub>2</sub> avoided = 1,069 tonnes
One Engine Taxi on Arrival	Procedure to operate one engine (instead of two) during aircraft taxi-in to the arrival gate.	Group compliance rate dropped slightly from 86% in 2020 to 83% due to operational variances.  CO <sub>2</sub> avoided = 1,020 tonnes
Idle Fuel Flow Factor	Updates to the Flight Management System that enable optimisation of the flight’s descent and approach.	Implemented on all aircraft.  CO <sub>2</sub> avoided = 557 tonnes

Initiative	Description	Result/Total CO <sub>2</sub> avoided in 2021
Idle Reverse Landing	Procedure that uses idle thrust (instead of full reverse engine thrust) upon landing to reduce noise and fuel burn.	Group compliance rate for 2021 was 92%. CO <sub>2</sub> avoided = 568 tonnes
Required Navigation Performance-Authorisation Required (RNP-AR) approach	Procedure that uses an aircraft's navigation functions instead of ground-based equipment for the shortest landing approach.	In 2021, 14 out of 16 airports in Malaysia were approved to implement RNP-AR. A total of 37.7% of AirAsia's flights in Malaysia landed using this procedure. AirAsia Indonesia and AirAsia Philippines are still awaiting regulatory approval for RNP-AR implementation. CO <sub>2</sub> avoided = 517 tonnes

In total, AirAsia's operational eco-efficiency measures avoided the emission of 11,175 tonnes of CO<sub>2</sub> for the year. The return on investment of these measures is immediate, as evident from the cost savings achieved (see table). Using the US EPA's Greenhouse Gas Equivalencies Calculation of 0.06 tonnes of CO<sub>2</sub> per urban tree planted, the environmental benefit is comparable to the impact of planting 186,250 trees.

New investments in 2022 will see AirAsia add at least six new fuel-saving initiatives including performance monitoring analysis to identify aircraft that require maintenance tasks, and publishing enhanced fuel efficiency training material to improve overall compliance with these measures.

Estimated annual CO <sub>2</sub> savings (tonnes)	Total annual investment required (RM)	Total anticipated annual cost savings (RM)
11,175	2,510,900	11,680,628



In addition, AirAsia is engaging with civil aviation authorities on joint initiatives to support ICAO's State Action Plan (SAP) to mitigate climate change. Launched in 2010, the initiative calls for ICAO member states to identify and track emissions reduction measures on a tri-annual basis.

In 2021, AirAsia participated in five bilateral discussions with the Civil Aviation Authority of Malaysia (CAAM) to update Malaysia's SAP by Q1 2022. Among measures proposed for inclusion is enhanced air navigation. According to industry estimates, effective air traffic management has the potential to save up to 15% of fuel consumed by airlines. Pending the maturity of low-carbon technologies such as sustainable aviation fuel and zero-emission aircraft, improvements in air navigation will form an important aspect of our engagement with the regulators.

Concurrently, similar engagements have or are taking place between our airlines in Indonesia and the Philippines with their respective state regulators. Indonesia's Directorate General of Civil Aviation (DGCA) called for a first engagement in April 2021 requesting AirAsia Indonesia to provide input on initiatives to be included in the republic's SAP. The plan was published in December 2021 with emphasis on emissions reduction through measures such as improving airspace design and prioritising sustainable airport development. Philippines commenced its SAP review process in December 2021 and, at the time of writing, engagements are ongoing between the Philippines' civil aviation authority and AirAsia Philippines.

### **(iii) Carbon Offsetting**

The aviation industry marked CORSIA's fifth anniversary in 2021 with the coming into force of the carbon neutral growth commitment of participating countries. CORSIA is the first industry-wide initiative to self-regulate carbon emissions, and as of 31 December 2021, a total 104 states have voluntarily signed on to participate including Malaysia, Thailand, Indonesia and the Philippines. Participation imposes a mandatory requirement on all airlines registered within the state to comply with CORSIA and its progressively ambitious targets to tackle CO<sub>2</sub> emissions from international aviation.

AirAsia has met two key CORSIA requirements to date. In May 2021, all our airlines submitted independently verified carbon emission reports for the year 2020 to their respective civil aviation authorities. To improve the reporting process, we enhanced our carbon dashboards to reduce data gaps. This has enabled the airlines to cut down the number of man-hours needed to track missing or incorrect data. It is also expected to increase the efficiency of the data verification process and enable AirAsia to meet the new CORSIA deadline for reporting by 30 April of each year from 2022 onwards. At the time of preparing this report, AirAsia is verifying our 2021 emissions from international flights with ICAO-accredited third-party verification body, Verifavia.

Airlines in CORSIA participating countries are also required to cap carbon emissions from international flights so that global CO<sub>2</sub> emissions from international aviation do not exceed 2019 levels. According to 2021 data, carbon emissions from AirAsia's international flights fell by 98.8% in comparison with 2019 emissions, thereby requiring no offsetting measures. Based on current recovery projections, our airlines are not expected to have to undertake mandatory emissions offsetting before 2024.

However, in line with industry best practice, we are in the process of putting in place a scheme to enable voluntary offsetting by travellers by the second half of 2022. This early implementation will enable us to build internal capacity to navigate carbon markets to procure CORSIA eligible credits. As part of our alignment with TCFD reporting requirements, we developed a model to analyse the financial impact of adding tiered offset fees to airfares. We met with representatives of emissions unit programmes, carbon trading platforms and carbon offset providers to gain a better understanding of the pricing and availability of CORSIA eligible carbon offsets. This exercise enabled us to compare multiple scenarios, from CORSIA compliant offsetting (carbon neutral growth for international flights from a 2019 baseline) to full offsetting of all carbon emissions from international and domestic flights.

AirAsia will be closely following developments at the 41<sup>st</sup> ICAO General Assembly, scheduled to take place in September 2022, for CORSIA updates that may impact compliance obligations. Among key issues that are expected to be discussed are the setting of the industry's CO<sub>2</sub> baseline for the period between 2024-2027, new aspects to CORSIA, as well as policies to address other pollutants such as NO<sub>x</sub> emissions and noise.

### **(iv) SAF Strategy**

A fourth approach to addressing our carbon emissions is through the utilisation of SAF which can cut lifecycle emissions by up to 80%. SAF is identified as the most effective medium- to long-term solution for the industry's in-sector emissions reduction ambitions. Although the fuel is currently not available in Asean, this is expected to change in 2022 as two major fuel producers have announced the expansion of refinery capacities in Singapore to supply up to three million tonnes of SAF.

To pave the way for SAF introduction, we formed an SAF Committee comprising representatives from our Flight Operations, Engineering, Sustainability and Finance departments to assess the operational and financial feasibility of SAF implementation. The committee confirmed the absence of any technological barrier to SAF utilisation as we operate a full Airbus A320 family of aircraft which has been certified by the aircraft and engine manufacturer as being able to fly with a blend of up to 50% SAF. Furthermore, as the commercially available SAF at present is a drop-in fuel, or fuel that can be blended with jet fuel, we are not required to invest in any new infrastructure or equipment for supply of the new fuel blend.

At present, the main obstacles to SAF utilisation is the low volume of fuel available globally and its high price. In assessing our position, the committee has engaged with fuel producers to obtain a clearer timeline on SAF availability at key Asean airports. It has also carried out a volume and cost projection for SAF utilisation in accordance with a broad industry target of 10% of total fuel consumption by 2030. The findings of this exercise will inform the development of Capital A's Sustainability Blueprint which is scheduled for completion by Q3 2022.

In 2022, the SAF Committee will be expanded to include representatives from our Government Relations department to initiate discussions with legislators on SAF policies that can help advance the use of the renewable fuel in the region. These discussions will be guided by developments in the EU and US which present a mix of fuel mandates and tax credits for SAF utilisation.

## Emissions Data

In this section, we report only Scope 1 emissions for our airline operations as they constitute the bulk of our direct emissions. However, we cover the Capital A Group in entirety for disclosures of Scope 2 and Scope 3 emissions as these cover emissions from all our offices and entities.

Scope	Category	Indicator Measured	Emissions Sourced
Scope 1	Direct GHG Emissions	Fuel consumption	Flight operations, ground operations
Scope 2	Indirect GHG Emissions	Electricity consumption (offices/buildings)	Purchased energy

### Scope 1 Emissions (from flight operations)

Scope 1 Emissions from flight operations	2019 (restated) <sup>1</sup>	2020 (restated) <sup>1</sup>	2021
Fuel consumption (tonnes)	1,497,331	397,442	123,389
Total Scope 1 emissions (tCO <sub>2</sub> e)	4,748,745	1,260,477	391,325
Carbon intensity ratio (gCO <sub>2</sub> /RPK)	74.7	88.0	94.0
Carbon intensity ratio (gCO <sub>2</sub> /ASK)	63.4	65.7	68.1
Specific fuel consumption (litres/100RPK)	3.01	3.55	3.79

<sup>1</sup> Restated to include only AirAsia Malaysia, AirAsia Indonesia and AirAsia Philippines, in line with the financial disclosures, and to include the CO<sub>2</sub> equivalents of methane (CH<sub>4</sub>) and nitrogen oxide (N<sub>2</sub>O) emissions. AirAsia does not emit hydrofluorocarbons, perfluorocarbons or sulphur hexafluoride from flight operations.

### Scope 1 Emissions (from ground operations)

To improve our environmental reporting, our disclosures this year include Scope 1 emissions from ground operations at home base airports handled by Ground Team Red (GTR), a 50%-owned associate which provides group handling services to AirAsia at all Malaysia and Indonesia airports. Ground handling in the Philippines operates on a hybrid model with selected stations managed by GTR and others by third-party agents.

Initiatives to reduce carbon emissions include electronic filing of flight documents. Since 2019, the Ground Operations team has been filing passenger manifests and crew's general declaration forms online, as approved by the relevant regulations. The initiative saves approximately 8.8 million sheets of A4-sized paper annually, equivalent to 750 trees. Moving forward, the Ground Operations team will endeavour to further expand the scope of electronic filing.

Additionally, since 2020, GTR has enhanced its maintenance programme for ground vehicles and equipment as well as planning to avoid unnecessary idling. From 2022 onwards, all new ground handling agreements will include a clause recommending that green vehicles be used to service AirAsia flights where possible.



e-filing of flight documents saves approximately 8.8 million sheets of A4-sized paper annually

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750 trees

Scope 1 emissions from ground support equipment	2019	2020	2021
Fuel consumption (tonnes)	1,894	795	521
Total Scope 1 emissions (tCO <sub>2</sub> e)	5,880	2,469	1,617

## Noise and Air Pollutants

As of 2021, all AirAsia aircraft are compliant with ICAO Annex 16 Chapter 4 noise standards while 85.6% of the fleet meets with the most stringent ICAO CAEP/8 NOx emissions standards<sup>1</sup>. As we phase out older aircraft in exchange for new Airbus A321neo models, we aim for 100% compliance with ICAO CAEP/8 NOx standards.

Indicators	2019	2020	2021
NOx emissions (tonnes) <sup>1</sup>	2,474	725	261
NOx emissions intensity (gNOx/RPK) <sup>1</sup>	0.0390	0.0508	0.0629
SOx emissions (tonnes) <sup>2</sup>	271	79	29
Volatile Organic Compounds (VOC) emissions (kg) <sup>2</sup>	936,957	274,492	98,752

<sup>1</sup> NOx emissions and compliance data are obtained from the ICAO Emissions Bank issue 28C dated 20 July 2021. The NOx emissions value per landing and takeoff (LTO) cycle is based on the weighted average of AirAsia's fleet composition as of FY2021.

<sup>2</sup> According to the US EPA, SO<sub>2</sub> represents the highest composition of SOx emissions, hence SO<sub>2</sub> is considered as SOx for the purpose of calculations. SO<sub>2</sub> and VOC emissions data are sourced from US EPA's Generic Aircraft Type Emission Factors table.

## Scope 2 Emissions

Capital A's Scope 2 disclosures cover emissions associated with energy consumption at all our facilities and offices.

Location	2019 (restated) <sup>1</sup>		2020 (restated) <sup>1</sup>		2021	
	Emissions (tCO <sub>2</sub> e)	Carbon Intensity (tCO <sub>2</sub> e/m <sup>2</sup> )	Emissions (tCO <sub>2</sub> e)	Carbon Intensity (tCO <sub>2</sub> e/m <sup>2</sup> )	Emissions (tCO <sub>2</sub> e)	Carbon Intensity (tCO <sub>2</sub> e/m <sup>2</sup> )
Malaysia <sup>2 3</sup> (tCO <sub>2</sub> e)	2,817	0.109	2,517	0.065	2,261	0.055
Indonesia <sup>4</sup> (tCO <sub>2</sub> e)	1,029	0.107	839	0.087	679	0.071
Philippines <sup>5</sup> (tCO <sub>2</sub> e)	8	0.003	N/A <sup>6</sup>	N/A	40	0.012
Total (tCO <sub>2</sub> e)	3,855	0.073	3,356	0.076	2,979	0.046

<sup>1</sup> Restated to include only AirAsia Malaysia, AirAsia Indonesia and AirAsia Philippines, in line with the financial disclosures.

<sup>2</sup> Latest emission factor (combined margin dated 2017) for Peninsular Malaysia, where AirAsia Malaysia is based, is obtained from the 2017 CDM Electricity Baseline for Malaysia, published by Malaysian Green Technology Corporation, for Malaysia's Ministry of Energy, Science, Technology, Environment and Climate Change.

<sup>3</sup> Malaysia's electricity consumption data includes RedQ (head office), RedChain (Engineering Warehouse, 2020 onwards) and RedStation (KL Sentral office, 2021 onwards).

<sup>4</sup> Latest emission factor (combined margin dated 2019) for Jakarta, where AirAsia Indonesia is based, is obtained from the Joint Crediting Mechanism, Indonesia Secretariat.

<sup>5</sup> Latest emission factor (combined margin dated 2015-2017) for Luzon-Visayas Grid, where AirAsia Philippines is based, is obtained from the Philippines' Department of Energy.

<sup>6</sup> No data is available in 2020 for the Philippines as the airline moved its office to new premises and utility invoices have not been issued by the building owner.

## Energy Consumption

Energy Consumption	2019	2020	2021
Non-renewable fuels purchased and consumed (MWh) <sup>1</sup>	19,936,614	5,295,262	1,647,153
Non-renewable electricity purchased (MWh)	6,012	5,266	4,711
Total non-renewable energy consumption (MWh)	19,942,626	5,300,528	1,651,864

<sup>1</sup> Non-renewable fuels purchased and consumed include jet fuel for flight operations and diesel for ground operations.

Electricity Use Intensity (kWh/m <sup>2</sup> )			
Location	2019	2020	2021
Malaysia	186.8	115.7	100.0
Indonesia	123.0	100.2	81.1
Philippines	4.3	N/A	20.7

Various initiatives launched in 2020 to reduce our electricity consumption continued into 2021. These include:

- Staggered switching on of major equipment that are power-intense
- Scheduled light usage by zone, based on the occupancy of the area
- Establishing designated areas where Allstars can continue to work after regular working hours when lights and air-conditioning are switched off in most parts of the building

## Scope 3 Emissions

Capital A's Scope 3 emissions are generated from three main activities: the production of fuel and energy, employee business travel, and subsidiary businesses using third-party transportation service providers, namely Teleport, airasia xpress and airasia ride. Capital A plans to begin tracking Scope 3 emissions from 2022 onwards from these three sources. We expect the main source of these emissions to be from fuel and energy production. Emissions from employee business travel is negligible due to the suspension of non-essential travel due to the pandemic. Teleport, airasia express and airasia ride are relatively new lines of business established in the last two years and, therefore, are in the process of capacity building to begin monitoring their respective carbon emissions. We will work closely with our vendors and business partners to track, minimise and drive Scope 3 emissions reduction.

## WASTE MANAGEMENT

Our policy is to reduce as far as possible all waste generated by our operations, and to increase our recycling rate.

### Scheduled Waste

Most of the scheduled waste produced relate to the engineering aspects of our airline operations and comprise spent oils/fluids, absorbents, containers, gloves, rags and filters. These are disposed of by licensed contractors in accordance with the relevant environmental acts and regulations in the respective countries.

In 2021, we generated 45% less solid scheduled waste as the number of aircraft in active operation was greatly reduced. On the other hand, more liquid scheduled waste was generated due to aircraft parking and storage maintenance activities which involve draining of aircraft fuel/fluid.

### Scheduled waste generated Group-wide

Type	2019 (restated) <sup>1</sup>	2020 (restated) <sup>1</sup>	2021
Solid Waste (tonnes)	53.6	31.8	17.5
Liquid Waste (litres)	42,004	25,792	42,746

<sup>1</sup> Restated 2019 and 2020 data to include scheduled waste data for Indonesia and Philippines.

### Non-Scheduled Waste

Non-scheduled waste includes waste produced at our office premises. We started to track waste disposal at RedQ (Malaysia) from March 2019, RedChain (engineering warehouse in Malaysia) and RedPoint (Philippines) from 2020 and RedHouse (Indonesia) from 2021. A decrease can be seen in the volume of waste generated in 2021 due to Allstars working from home as a result of Covid-19.

### Non-scheduled waste generated, and percentage recycled

Location	Indicators	2019 (tonnes)	2020 (tonnes)	2021 (tonnes)
Malaysia	Total weight of non-hazardous waste generated	-	64.11	69.32
	Total weight of non-hazardous waste disposed	347,650	53.46	67.03
	% of non-hazardous waste recycled (diverted from disposal)	7.6%	17%	3.3%
Indonesia	Total weight of non-hazardous waste generated	N/A	N/A	35
	Total weight of non-hazardous waste disposed	N/A	N/A	35
	% of non-hazardous waste recycled (diverted from disposal)	N/A	N/A	0%
Philippines	Total weight of non-hazardous waste generated	N/A	88 <sup>1</sup>	63
	Total weight of non-hazardous waste disposed	N/A	81	57.93
	% of non-hazardous waste recycled (diverted from disposal)	N/A	7% <sup>1</sup>	8%

<sup>1</sup> Restated Philippines data for 2020 due to corrections in units used and in recyclable percentage.

## Recycling Programme in Office

To reduce waste to landfill, the Group actively promotes recycling. Recycling bins are provided in our premises for the collection of paper, plastic and aluminium items. In 2021, however, the volume of recyclable waste collected dropped as most Allstars were working from home.

We also implemented e-waste recycling at RedQ in 2019, when 60kg of e-waste was collected and recycled. In 2020, we set up three e-waste bins at RedQ for broken handphoned, tablets, laptops, media storage devices and small electronic items. Due to the negligible volume of e-waste collected in 2021 (with most Allstars working from home), these items were not sent for recycling during the year. Once a sufficient volume is achieved, this e-waste will be picked up and recycled by a licensed contractor.

Location	Types of Recyclables	Recyclable Waste (kg)		
		FY2019	FY2020	FY2021
Malaysia	E-Waste	60 <sup>1</sup>	0	0
	Plastic	128 <sup>1</sup>	0	25
	Paper	25,991	10,076 <sup>1</sup>	1,968
	Metal	3,931	579	294
	Total	30,110	10,655	2,287
Indonesia (RedHouse)	E-Waste	N/A	N/A	0
	Plastic	79	12	0
	Paper	993	123	0
	Metal	N/A	N/A	0
	Total	1,072	135	0 <sup>2</sup>
Philippines (RedPoint)	E-Waste	N/A	N/A	N/A
	Plastic	14,819	5,316	4,543
	Paper	592	332	531
	Metal	5,463	879	0
	Total	20,874	6,527	5,074

<sup>1</sup> Restated data for e-waste and plastic collection in 2019, and paper collection in 2020 to reflect the final billing figures

<sup>2</sup> No data available for Indonesia in 2021 as the recyclable waste was collected by the local government agency

## Cabin Waste Management

AirAsia has been collecting recyclable items such as plastic bottles, aluminium cans, glass, paper and metal from the cabin since 2017 for AirAsia Malaysia and 2018 for AirAsia Indonesia and AirAsia Philippines. However, this initiative was put on hold in 2021 due to pandemic-related restrictions on cabin waste disposal.

## Food Waste

AirAsia began to track our aircraft food waste in 2019. However, food waste data and trends are not available for 2020 and 2021 due to greatly reduced flight activities as well as Covid-driven restrictions on inflight services. Tracking of food waste data has resumed as of 2022.

### Food waste generated

AOC	2019	2020	2021	Target for 2022 <sup>1</sup>
MAA (kg)	304,332	N/A	N/A	166,400
IAA (kg)	50,689	N/A	N/A	32,000
PAA (kg)	45,977	N/A	N/A	38,400
Total (kg)	400,998	N/A	N/A	236,800

<sup>1</sup> Estimated food waste based on 2022 passenger forecasts.

### The 2022 target is to cap food wastage at 25% of total consumption

Based on 2019 data, food waste across the AirAsia averaged at 30% of total perishable meals inventory. To reduce food waste, an initiative was introduced to improve meal forecasts through analysis of passenger loads and inventory take-up rates. This initiative was temporarily halted in 2020 and 2021 due to Covid-19-related restrictions on sale of inflight meal products.

In 2022, we target to cut food waste to 25% of perishable meals through a new demand planning tool utilising AI technologies to better control wastage. Our priority is to continue to promote pre-book meals. The inflight department is also exploring the option of providing discounts on onboard sales at the end of each day.

## Water Management

The Group recognises that water is becoming increasingly scarce, hence has put in place various initiatives to minimise waste. Given that most Allstars are still working remotely, our water consumption has been reducing. Meanwhile, no industrial effluents were generated from our office activities, and all waste water from sanitary and washing were discharged to government-operated centralised water treatment plants for treatment.

### Water consumption

Location	2019	2020	2021
Malaysia (m <sup>3</sup> ) <sup>1</sup>	64,133	43,668	33,669
Indonesia (m <sup>3</sup> )	5,401	2,618	2,253
Philippines (m <sup>3</sup> )	1,316	N/A <sup>2</sup>	3,021
Total (m <sup>3</sup> )	70,850	46,286	38,943

<sup>1</sup> Malaysia's water consumption data includes RedQ (head office), RedChain (engineering warehouse, 2021 onwards) and RedStation (KL Sentral office, 2021 onwards).

<sup>2</sup> No 2020 data is available for the Philippines as the airline moved its office to new premises in late 2019 and utility invoices had not been issued by the building owner.

## Environmental Data Summary

### Energy Consumption

Indicators	2019	2020	2021
Fuel Consumption (tonnes) (Flight Operations)	1,497,331	397,442	123,389
Fuel Consumption (tonnes) (Ground Operations)	1,894	795	521
Total Fuel Consumption (tonnes)	1,499,225	398,237	123,910
Non-renewable fuels purchased and consumed (MWh)	19,936,614	5,295,262	1,647,153
Non-renewable electricity purchased (MWh)	6,012	5,266	4,711
Total non-renewable energy consumption (MWh)	19,942,626	5,300,528	1,651,864
<b>Energy Intensity</b>			
Specific Fuel Consumption (litres/100RPK)	3.01	3.55	3.79
Electricity Intensity (kWh/m <sup>2</sup> )	155.78	108.61	87.65

### Emissions

Indicators	2019	2020	2021
Scope 1 (Flight operations) (tCO <sub>2</sub> e)	4,748,745	1,260,477	391,325
Scope 1 (Ground operations) (tCO <sub>2</sub> e)	5,880	2,469	1,617
Scope 1 total (tCO <sub>2</sub> e)	4,754,625	1,262,946	392,942
Scope 2 (tCO <sub>2</sub> e)	3,855	3,356	2,979
Scope 1&2 total (tCO <sub>2</sub> e)	4,758,480	1,266,302	395,921
<b>Emissions Intensity</b>			
Scope 1 (gCO <sub>2</sub> /RPK)	74.7	88.0	94.0
Scope 1 (gCO <sub>2</sub> /ASK)	63.4	65.7	68.1
Scope 2 (tCO <sub>2</sub> e/m <sup>2</sup> )	0.073	0.076	0.046
<b>NOx, SOx and Other Significant Air Emissions</b>			
NOx emissions (tonnes)	2,474	725	261
SOx emissions (tonnes)	271	79	29
Volatile Organic Compounds (tonnes)	937	275	98

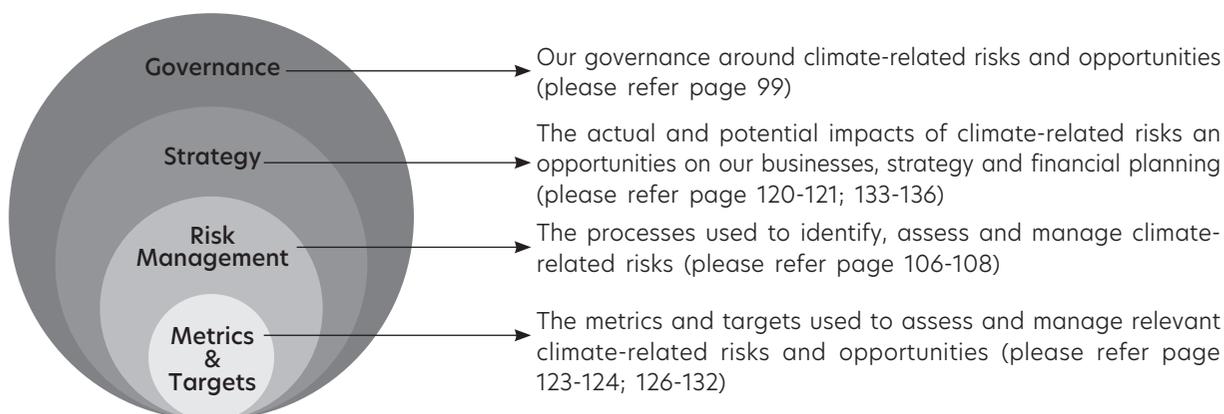
### Resource Management

Indicators	2019	2020	2021
<b>Water Consumption</b>			
Total Water Consumption (m <sup>3</sup> )	70,850	46,286	38,943
<b>Waste Management</b>			
Solid Hazardous Waste (tonnes)	53.6	31.8	17.5
Liquid Hazardous Waste (litres)	42,004	25,792	42,746
Non-Hazardous Waste disposed (tonnes)	347,650	135	160
Non-Hazardous Waste recycled (tonnes)	52.1	17.3	7.4

## Alignment with Task Force on Climate-related Financial Disclosures (TCFD)

TCFD recommendations have provided further direction for our climate strategy, especially the Group's foresight when considering climate issues. This year, we have identified our business risks and opportunities, the potential financial impact of climate change, and our mitigation strategy.

As we become more conversant with TCFD, we recognise the need to strengthen our disclosure in various areas of our reporting; and plan to do so in the next couple of years.



Risk Type	Climate-related Risk Description	Potential Financial Impact	Mitigation Strategy
Transition Risks Policy and Legal	Risk from new regulations:	New carbon taxes could increase the price of fuel, thereby raising operating costs and fares while dampening travel demand.	We are developing a long-term strategy to reach the industry's net zero aspiration ahead of the 2050 goal. In the immediate horizon, we will strengthen our fuel efficiency programme and work with regulators on improvements to air traffic management to cut flight distances and fuel consumption.
	(i) Imposition of carbon taxes, emissions quotas or renewable fuel mandates	Carbon taxes will increase the company's tax liability while emissions quotas or sustainable fuel mandates will lead to a significant increase in fuel and operating costs. An increased cost burden will reduce the company's profitability or depress demand if passed on to travellers.	We have commenced discussions with several fuel suppliers on making available SAF in Malaysian airports and on the development of SAF from locally available feedstock such as agricultural waste. A purchase commitment by AirAsia will strongly incentivise fuel suppliers to invest and lower the long-term cost of SAF.
	(ii) Emissions testing regulations	Emissions testing regulations will add to the cost of aircraft maintenance and require increased downtime for aircraft, leading to rescheduling costs or loss of revenue due to flight cancellations.	Emissions testing regulation will only impact a limited number of our older planes. All of our planned capacity expansion from 2024 onwards will be achieved with the new Airbus 321neo model, currently the most fuel- and emissions-efficient narrowbody commercial aircraft in the market.
	(iii) New emissions (eg NOx)/ waste reporting requirements	New reporting requirements increase manpower/consultancy costs as well as audit or verification fees.	Our carbon dashboard can be enhanced to track our NOx emissions while verification of these emissions can be tagged to our existing carbon emissions verification at minimal additional cost.

Risk Type		Climate-related Risk Description	Potential Financial Impact	Mitigation Strategy
Transition Risks	Technology	Risk from new technologies aimed at supporting global low-carbon transition	AirAsia has confirmed its order for 362 Airbus 321neo aircraft that will be delivered up until 2035. The introduction of zero emission aircraft could significantly reduce asset value of AirAsia's 321neo fleet and render its fleet technology obsolete. Investment in new fleet type or adaptive green technologies will require significant capital investments.	AirAsia's last A321neo is scheduled to be delivered in 2035, coinciding with the expected introduction of Airbus' zero emission aircraft. AirAsia can consider purchasing this new aircraft type as part of our fleet replacement strategy beyond 2035. Should the zero emission aircraft be available earlier, AirAsia can initiate negotiations with Airbus to convert A321neo yet to be delivered to the new fleet type.
	Market	Risk from market fluctuations as travellers and businesses respond to climate change	More companies may opt to cut business travel, in favour of virtual meetings.	We believe that business travel will resume as Covid-19 enters an endemic phase. In 2022, we will be introducing voluntary carbon offsetting on all AirAsia flights to enable travellers to choose to reduce their carbon footprint. We intend to make this a mandatory commitment later, once guests are comfortable with the idea of accounting for their own carbon footprint.
		(i) Changing travel patterns	Expansion of China's Belt and Road initiative to high-speed rail connections may also offer guests a lower-carbon travel alternative.	We believe that air travel will remain essential to connect Asean as two major countries - Indonesia and the Philippines - are archipelagos where road and rail infrastructure are not well developed. In addition, the Belt and Road initiative has stalled in many countries, leaving cross-border connectivity still a hurdle.
		(ii) Growing demand for carbon credits	With CORSIA coming into effect in 2021, an increasing number of airlines and other businesses will purchase carbon credits, causing prices to rise in the short term before more credits become available in the international carbon market. Any unanticipated increase in carbon credit price could result in AirAsia having to bear the additional cost of offsetting from top-line revenue.	We are introducing an option for guests to add an offset fee to their fares in 2022. This will enable us to build internal capacity on carbon trading, including exploring options for forward purchase of available credits. In addition, we are also exploring options for AirAsia Foundation to help some of its environmental social enterprises accredit their programmes to be eligible for CORSIA offsetting. This will enable the social enterprises to benefit from sustainable funding while helping to secure AirAsia's supply of carbon credits in Asean.
	Reputation	Risk of negative brand impact if AirAsia is seen as not responding sufficiently to climate crisis, resulting in:	Guests may choose a competitor that is seen to be doing more and investors may divest. Financial institutions may also impose a premium on lending.	We are undertaking a brand campaign to highlight our environmental credentials as the airline with the lowest CO <sub>2</sub> /ASK in Asia. By claiming our 'greenest airline' position, we address our climate critics and potentially stand to gain from increased market share among environmentally-conscious travellers.
		(i) Shifts in guest preferences		An option for guests to offset their travel will assuage some travellers' concerns on their impact on the environment.
		(ii) Being targeted by flight shame movement		We believe the risks from reputational damage due to this movement will be limited as air travel is not a luxury in many places that we serve due to underdeveloped road and rail infrastructure. This can be mitigated with a consistent awareness campaign highlighting our sustainability efforts and providing carbon offset options to guests.

Risk Type		Climate-related Risk Description	Potential Financial Impact	Mitigation Strategy
Transition Risks	Reputation	(iii) Increased stakeholder concern or negative stakeholder feedback		We are taking a targeted approach to increasing our scores in the FTSE4Good and Corporate Sustainability Assessment (CSA) ratings. This will affirm our sustainability attainments and enable AirAsia's shares to be listed in reputable sustainability indexes that make us eligible for investments by green funds.
Physical Risks	Acute	Risk of extreme temperatures	At extremely high or low temperatures, aircraft may become inoperable or rendered uncertified to operate. On extremely hot days, aircraft may not be able to take off due to reduced engine performance, resulting in delays or revenue loss from offloading pax/cargo.	We may operate reasonable schedules to minimise exposure to disruptions caused by extreme high temperatures.
			Increases in hot days can also cause heat buckling on runways and taxiways and other infrastructure damage. Such damage could increase operational and repair costs for airports which would eventually be passed on to airlines and travellers.	To avoid aircraft being stranded at airports experiencing extreme temperatures, we may undertake pre-emptive cancellations by expanding coverage of weather forecasting services.
		Risk of increasing frequency and severity of weather events	Weather events such as floods and typhoons put at risk operations and infrastructure at affected airports, including three of our four major hubs. Bangkok and Jakarta are increasingly vulnerable to flood risk while Manila to typhoon disruption. Other than asset damage, these weather events can result in revenue losses and substantial costs relating to cancelled flights and airport closures.	We maintain up-to-date business continuity plans for weather risk affecting all four major hubs. We are also planning a climate-related disaster scenario exercise to test and improve our disaster management and recovery processes.
	Chronic	Risk of longer-term changes in weather patterns	Rising sea levels will render some coastal airports inoperable, forcing cities to build new airports further inland. AirAsia will have to bear the cost of informing booked guests and communicating changes for future bookings. Demand may be impacted if the airport is far from the city centre. New airport construction costs may also result in higher airport taxes and other fees.	We recognise that rising sea levels may be inevitable. Our Government Relations department is liaising regularly with the ministries of transport of all AOC countries to keep abreast of any plans to move major airports.
			Jakarta is one of the most vulnerable cities to rising sea levels. It is also documented to be sinking fast, prompting the Indonesian Government in 2019 to announce the relocation of its administrative capital to East Kalimantan. This could affect growth projections, and result in increased costs as regulatory staff will either need to relocate or travel frequently to Balikpapan for meetings with regulators.	Our strategy team will incorporate the projected impact of climate change into our fleet and routes strategy.

The following are examples of specific climate-related opportunities we have identified.

<b>Climate-related Opportunities</b>	<b>Potential Financial Impact</b>	<b>Mitigation Strategy</b>
Administrative efficiency	Digitalisation strategy reduces manual paperwork and cost of paper, printing and storage of documents.	Our ongoing digitalisation programme has minimised all paper documentation on board and in our office processes. Of the remaining ones, we continue to work with regulators to move towards e-documentation for regulatory records-keeping and submissions such as e-Voyage Reports.
Resource diversification	Shift to SAF utilisation diversifies fuel supply and reduces exposure to rising energy costs and growing carbon regulation.	We have commenced discussions with several fuel suppliers to supply SAF at Malaysian airports and/or to develop SAF using locally available feedstock.
Resource efficiency	Reduction of fuel utilisation via improvements in air traffic management and A321neo fleet conversion will further reduce operating costs and ensure that AirAsia maintains our commercial advantage as the airline with the lowest cost/ASK and CO <sub>2</sub> /ASK in the industry.	We engage in regular consultations with civil aviation authorities to implement new fuel efficiency and emissions reduction measures. This includes proposing measures to be included for monitoring and tracking emissions reductions in State Action Plans.
Products and Services	Attract travellers keen to minimise their carbon footprint and experience sustainable travel activities. AirAsia potentially gains from increased market share among responsible travellers and earns ancillary income from sale of sustainable travel activities.	In 2022, we are initiating a brand campaign to highlight AirAsia's greenest airline in the world achievements and our climate change management strategy.
		We are also implementing a voluntary offset programme to enable travellers to contribute to their carbon offsetting.
		AirAsia Foundation is working with sustainable travel social enterprises to make accessible sustainable travel activities on its DestinationGOOD.com platform.
Markets	Recognise that climate impact prone destinations may also be strong revenue generators in the recovery and rehabilitation phase.	Resume commercial flights to affected destinations as soon as it is safe to do so to support rebuilding programmes.
Resilience	Continue to strengthen our network connectivity in hubs such as klia2 with reduced climate risk.	Invest in climate forecasting tools and services to inform fleet planning and route planning strategies.