2024 ICAO REGIONAL SEMINAR ON ENVIRONMENT

In collaboration with

CAAT
สำนักงานการบินพลเรือนแห่งประเทศไทย
The Civil Aviation Authority of Thailand

APAC Region

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Bangkok, Thailand

ICAO
ENVIRONMENT

ACT SAF

CORSIA

Singapore Sustainable Air Hub Blueprint

Civil Aviation Authority of Singapore (CAAS)

Sustainability Office

Ms Chua Sin Ying

Singapore aviation sector must play its part in drive towards sustainability

In 2019, Singapore's airports contributed to around 0.7% of Singapore's domestic emissions and Singapore's aircraft operators contributed 1.9% of global aviation emissions

- In Feb 2022, the Civil Aviation Authority of Singapore (CAAS) convened the International Advisory Panel (IAP) on Sustainable Air Hub to discuss how international aviation can be made more sustainable and accessible for all, and how Singapore can contribute to this international effort
  - Held four meetings and six deep dives across three key domains from Feb to Jul 2022
  - Engaged more than 120 representatives from 40 local and international partners
  - Published recommendations in Sep 2022, with 15 initiatives
  - CAAS studied the IAP's recommendations and did further consultations

Singapore Sustainable Aviation Fuel (SAF) Pilot

- **CAAS also conducted a 20-month Sustainable Aviation Fuel (SAF) pilot with Singapore Airlines, GenZero, Changi Airport Group, ExxonMobil and Neste**

- Key objectives:
  - Validate supply chain readiness
  - Understand demand for SAF credits
  - Understand end-to-end cost components of SAF deployment

- SAF was first uplifted onto Singapore Airlines flight at Changi Airport on 7 Jul 2022, via the airport's fuel hydrant system

- Sale of SAF credits launched in Jul 2022 to customers such as corporate and individual travellers

Pilot found that Singapore is operationally ready to supply SAF but more is needed to support adoption

Singapore Sustainable Air Hub Blueprint

- **Launched the Singapore Sustainable Air Hub Blueprint on 19 Feb 2024**
- Singapore's State Action Plan for the decarbonisation of its aviation sector
- Incorporates and builds upon the recommendations by the International Advisory Panel on Sustainable Air Hub
- Adopts a balanced approach to the long term, sustainable growth of Singapore's aviation sector, taking into account the need for environmental sustainability while ensuring that the Singapore air hub remains competitive
- Sets out Singapore's medium-term and long-term targets, as well as concrete steps that CAAS and the aviation stakeholders will take to decarbonise Singapore aviation

Overview of the Singapore Sustainable Air Hub Blueprint

Singapore Sustainable Air Hub Blueprint

Reduce domestic aviation emissions from airport operations by 20% from 2019 levels in 2030 and achieve net zero domestic and international aviation emissions by 2050

Airport domain
Maximal efforts to reduce energy use and deploy renewables

- Solar power deployment
- Clean energy airside vehicles
- Building energy efficiency
- Low-carbon electricity imports
- Resource circularity through waste-to-energy

Airline domain
Build ecosystem to support the use of Sustainable Aviation Fuel (SAF) in Singapore

- National SAF target and SAF levy
- Central SAF procurement
- SAF production in Singapore and the region
- Airline fleet renewal and operational improvements

Air Traffic Management (ATM) domain
Operational improvements to increase efficiency and reduce fuel burn

- Advanced demand-capacity balancing implementation
- Performance-based navigation enhancement
- Gate-to-gate trajectory optimisation

Critical enablers
Build coalitions for action

- Policy and regulation
- Industry development
- Infrastructure planning and provision
- Workforce transformation
- International partnerships and collaborations

Domestic and international aviation emissions reduction targets

Domestic emissions target

- Domestic emissions come from operations of vehicles, facilities, and buildings for aircraft, passenger, baggage, and cargo handling at Changi and Seletar Airports
- In 2019, domestic emissions were 404 kilotonnes of CO_2
- **CAAS will work with aviation stakeholders to reduce domestic aviation emissions from Changi and Seletar Airports operations by 20% from 2019 levels in 2030**
- In the longer term, the aviation sector will target to achieve **net zero emissions by 2050,** in line with national commitment

International emissions target

- International aviation emissions come from international flights operated by Singapore-based operators
- In 2019, international emissions from Singapore-based airlines was at 17.5 million tonnes of CO_2
- **CAAS will contribute to ICAO's goals of carbon neutral growth from 2019 and the long term global aspirational goal of net zero carbon emissions by 2050 for international aviation**

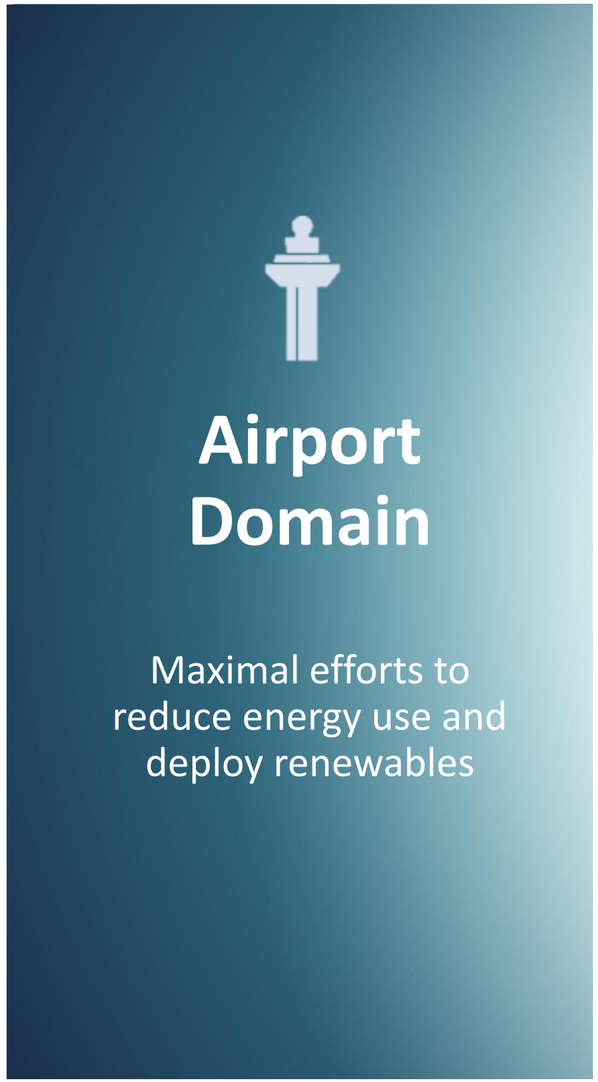
Airport Domain

Maximal efforts to reduce energy use and deploy renewables

Increasing solar power deployment

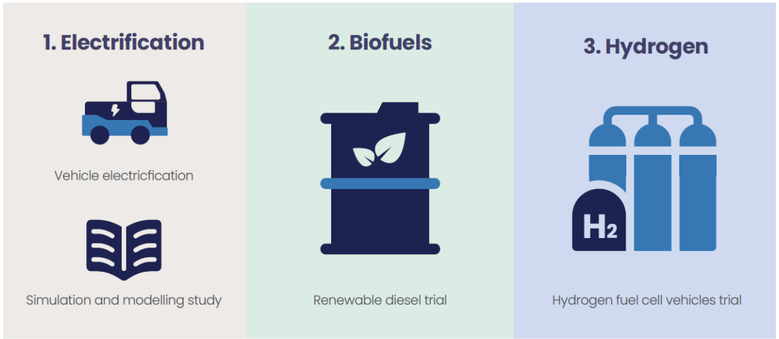
- **CAAS will work with Changi Airport Group to increase solar power deployment at Changi and Seletar Airports, by installing more solar panels on available rooftop spaces of airport buildings**
  - As of end-2023, Changi Airport has more than 20MWp of installed solar capacity, generating close to 4% of its 2019 electricity consumption of about 700GWh
  - Ongoing plans to install more solar panels on available rooftop will further generate 6%
  - Solar panels will be deployed at Seletar Airport as well

- **Changi Airport will commence feasibility study on solar panel deployment on airfield,** without compromising the safety and efficiency of airport operations



Expanding cleaner energy use for airside vehicles

- **CAAS will work with the Changi Airport community to expand the use of cleaner energy for airside vehicles,** to have the entire fleet operate on cleaner energy by 2040, and for all new light vehicles and certain new heavy vehicles registered from 2025 to be cleaner energy vehicles
- Working with stakeholders to advance three main pathways:
  - Electrification: 20% of around 2,500 airside vehicles at Changi Airport are electric. There are over 100 electric vehicle charging stations across the four terminals, increasing to over 300 chargers in the next few years
  - Biofuels: In 2024, to trial the use of renewable diesel for heavy and specialised vehicles to study feasibility, cost, and operational impact
  - Hydrogen-powered airside vehicles: Work with stakeholders to conduct hydrogen fuel cell vehicle (HFCV) trials to understand the regulatory challenges, operational impact, and infrastructural changes required to support HFCV adoption



Requiring use of SAF and introducing a SAF levy

- Use of SAF is a critical pathway for the decarbonisation of aviation and is expected to contribute around 65% of the carbon emission reduction needed to achieve net zero by 2050
  - Experience around the world and the SAF pilot at Changi Airport have shown that SAF adoption cannot depend on voluntary use alone

- **To kickstart SAF adoption in Singapore, flights departing Singapore will be required to use SAF from 2026. We will aim for a 1% SAF target for a start, to encourage investment in SAF production and develop an ecosystem for more resilient and affordable supply**

- **Goal is to raise the SAF target beyond 1% in 2026 to 3 – 5% by 2030, subject to global developments and the wider availability and adoption of SAF**

SAF levy

- **CAAS will introduce a SAF levy for the purchase of SAF to achieve the uplift target**

- As the market for the supply of SAF is still nascent and the price of SAF can be volatile, we will adopt a fixed cost envelope approach to provide cost certainty to airlines and travellers

- Levy will vary based on factors such as distance travelled and class of travel
  - As an indication, we estimate that the levy to support a 1% SAF uplift in 2026 could increase ticket price for an economy class passenger on a direct flight from Singapore to Bangkok, Tokyo and London by around S$3, S$6 and S$16 respectively
  - Passengers in premium classes will pay higher levies

- Continue close consultation with stakeholders on the implementation of the SAF levy, before announcing more details in 2025 nearer the date of implementation

Centralising procurement of SAF

- **To further manage the cost of using SAF, the procurement of SAF will be centralised for the Singapore air hub, using the levies collected to aggregate demand and reap economies of scale**

- Businesses and organisations will also be invited to use the central procurement mechanism for their respective voluntary SAF purchases to reduce their carbon emissions from air travel

- Central procurement function can also take on the management and allocation of SAF credits generated from SAF use through central purchases
  - For SAF procured under the national SAF target, SAF credits will be allocated back to the airlines based on the share of SAF levies collected
  - Credits generated from SAF procured voluntarily by businesses and organisations will be allocated based on the amount of SAF bought

Anchoring SAF production in Singapore and the region

- **Work closely with industry partners to increase SAF production capacity in Singapore and the region**
- Given the tremendous increase in SAF production capacity required globally, there is scope for more local and regional SAF production
- We can tap on the wide availability of potential feedstocks in the region and the presence of an existing petrochemical sector in Singapore
- This will support the increasing demand for SAF in Singapore and the wider region

ATM Domain

Operational improvements to increase efficiency and reduce fuel burn

- **Advanced Demand-Capacity Balancing**
  - Expand suite of Air Traffic Flow Management (ATFM) solutions to include Long Range ATFM and improve coordination and management of longer-haul flights
  - Strengthen the integration between meteorology and ATM to improve reliability, timeliness and accuracy of weather forecast information for air traffic controllers
- **Performance-Based Navigation**
  - Collaborate with partner air navigation service providers to implement more direct routings on a wider scale
  - Develop smart tools to facilitate the optimisation of descent flight profiles within Changi Airport to help reduce fuel burn and emissions
- **Gate-to-Gate Trajectory Optimisation**
  - Implement a decision support tool for air traffic controllers to optimise the departure intervals between aircraft, which will enhance runway efficiency and increase fuel savings
  - Collaborate with stakeholders and partner air navigation service providers to work towards Trajectory-Based Operations

Five critical enablers to build coalitions for action

Policy and Regulation

- CAAS will introduce several policies to drive tangible actions, including setting domestic aviation emissions reduction targets to spur collective action and introducing a national SAF target to drive more SAF production and adoption

Industry Development

- CAAS has set up S$50 million Aviation Sustainability Programme to fund sustainable aviation projects, such as feasibility study for the deployment of solar panels on the airfield, a simulation and modelling study for the electrification of airside vehicles, and trials on the use of renewable diesel for ground handling equipment and vehicles
- CAAS has set up the International Centre for Aviation Innovation (ICAI) to drive innovation initiatives across all aspects of aviation including air traffic management, airport operations, advanced air mobility, and aviation sustainability

Infrastructure Planning and Provision

- New Changi Airport Terminal 5 is being designed and developed to achieve the Building and Construction Authority’s Green Mark Platinum Super Low Energy standard
- Working with partners to study technical feasibility of hydrogen adoption and infrastructure requirements

Five critical enablers to build coalitions for action

Workforce Transformation

- Identify new and emerging sustainability-related job roles through a tripartite effort involving the government, companies and unions
- Accompanied by upskilling and job redesign efforts, relevant lifelong learning and skills-upgrading initiatives
- Work with Institutes of Higher Learning to embed aviation sustainability resources and content into the curriculum and stimulate interest through sustainability-linked internships and learning journeys

International Partnerships

- Work with partners to establish the Asia-Pacific sustainable aviation centre to develop capabilities for sustainable aviation policy research specific to the needs of the Asia-Pacific region
    - Includes building deeper scientific understanding of regional SAF feedstocks, validating prevailing policy recommendations against the region's context to value-add perspectives, and providing capacity-building activities
- Continue to advance multilateral and bilateral partnerships to drive sustainable aviation, e.g. Aviation Green Lane with Japan and the US, ASEAN Sustainable Aviation Action Plan

Thank You

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