



SESSION 6: AIRPORT IMPROVEMENTS USE OF **GREEN ENERGY AT AIRPORTS**



In-person Seminar

Second Phase of the ICAO Assistance Project
with the EU Funding : *“Capacity Building for CO₂
Mitigation from International Aviation –
Development of ICAO States’ Action Plans for 10
States”*

Praia, 28 & 29 July 2022
Cabo Verde

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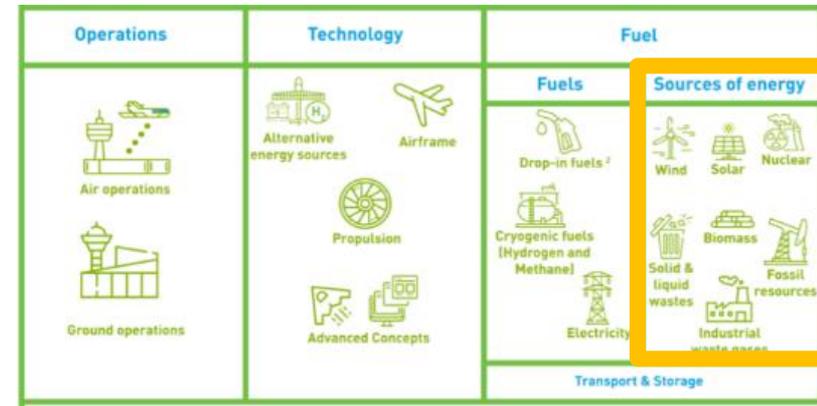
AIRPORTS

- Key to a States' national and international trade relations;
- Catalysts for tourism growth;
- Interface between ground and air;
- Interface with the public and surrounding community;
- Initial point of passenger experience: from pre-travel & check-in, to in-flight & arrivals.



AIRPORTS to play a lead role in reducing the aviation sector's emission

- Smart, **innovative** air and ground **operations**
- New breakthrough aircraft technologies
- Range of clean energy types of fuels
 - Drop-in fuels (sustainable Aviation Fuels / Lower carbon Aviation Fuels)
 - Non-drop-in aviation fuels (hydrogen/electricity)



Airports will play a lead role in clean energy production, transport and storage. Airports are “future clean energy hubs”.



AIRPORTS

What is “Green Airport”?

- The quietest?
- The least emitter of greenhouse gases?
- The least energy-demanding?

Thousands of Airports implementing social, environmental, and economic sustainability initiatives!

Still an evolving concept:

Many Ways of GOING GREEN!

GREEN ENERGY AT AIRPORTS

Some of the benefits of implementing renewable energy in an airport:

- Produces fewer life-cycle emissions than fossil fuels;
- Can supplement the purchase of non-renewable energy;
- Can reduce operating costs;
- Can reduce your airport’s carbon footprint;
- Can reduce uncertainty in power supply;
- Contributes to regulatory compliance;
- Offers potential for revenue generation;
- Offers potential local air quality benefit;
- Contributes toward climate resilience.



| ICAO ENVIRONMENT

NO COUNTRY LEFT BEHIND



| ICAO

HOW ICAO IS HELPING?



Assistance and Capacity Building





ICAO activities on Airports and Operations - Overview

- **Airport Planning Manual Part 2 (Doc 9184)**
- **Balanced Approach to Aircraft Noise (Doc 9829)**
- **Airport Air Quality Manual (Doc 9889)**
- **Community Engagement Circular (Circ 351)**
- **Climate Adaptation Synthesis Report**

- **Seminar on Green Airports,2017**
- **Seminar on Green Airports,2019**
- **Seminar on Green Airports,2021**

- **State Action Plans Guidance Document (Doc 9988)**
- **ICAO EU Project Phase I & Phase II**
- **ICAO-UNDP-GEF Project**
- **4 Guidance Documents (ICAO-UNDP- GEF project)**

- **ICAO-UNDP-GEF solar-at-gate pilot project in Jamaica (2018)**
- **ICAO-EU solar-at-gate project in Kenya (2018)**
- **ICAO-EU solar-at-gate project in Cameroon (2019)**





ICAO CAPACITY BUILDING INITIATIVE | ICAO Assistance Project with the European Union (EU) Funding, Phase I

- ✓ **Two “solar-at-gate” projects**, which consist of a solar farm and airport gate electric equipment, to power aircraft with solar energy during ground operations at the **international airports of Douala, Cameroon, and Mombasa, Kenya.**
- ✓ **Feasibility study** on the use of **solar energy** at **Piarco International Airport in Trinidad and Tobago** (in addition to four feasibility studies on the use of sustainable aviation fuels in Burkina Faso, Dominican Republic and Kenya).



Solar facility installed at Douala International Airport. Douala, Cameroon



Solar facility installed at Moi International Airport. Mombasa, Kenya

ICAO EU-Project Phase I



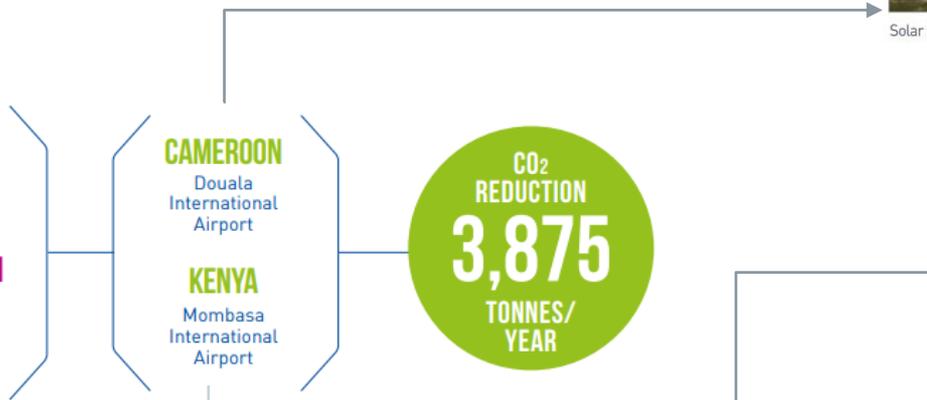
SOLAR PANELS

Provide clean power to the airport grid



GATE ELECTRIFICATION SYSTEM

Provide ground power and pre-conditioned air to the aircraft at the gate

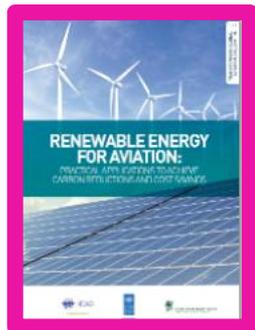




ICAO ASSISTANCE INITIATIVE

ICAO – UNDP – GEF: The Transforming the Global Aviation Sector: Emissions Reduction from International Aviation assistance project

✓ 4 Guidance Documents (ICAO-UNDP- GEF project)



- Energy and Climate Change
- Renewable Energy and Airports
- Project Conceptualization
- Project Financing
- Example of How to Plan an Airport Solar Project
- Airport Renewable Energy Case Studies

[Transforming Global Aviation Collection: Renewable Energy for Aviation](#)

[Transforming Global Aviation Collection: Financing Aviation Emissions Reductions](#)

[Transforming Global Aviation Collection: Regulatory and Organizational Framework to Address Aviation Emissions](#)

[Transforming Global Aviation Collection: Sustainable Aviation Fuels Guide \(Version 2\)](#)

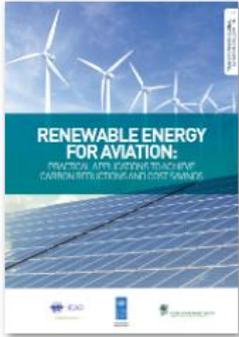
- **Renewable Energy**
- **Energy Efficiency**
- Electrification
- Sustainable Aviation Fuels





ICAO ASSISTANCE INITIATIVE

ICAO – UNDP – GEF: The Transforming the Global Aviation Sector: Emissions Reduction from International Aviation assistance project



[Transforming Global Aviation Collection: Renewable Energy for Aviation](#)

FIGURE 6-1
Seymour airport's wind turbines and solar panels atop walkway canopies (source: Ecogal S.A)



FIGURE 6-6
Palau international airport solar facility (source: Solar Feeds)

FIGURE 6-2
One of two wind turbine generators at East Midlands airport (source: Manchester Airports Group)



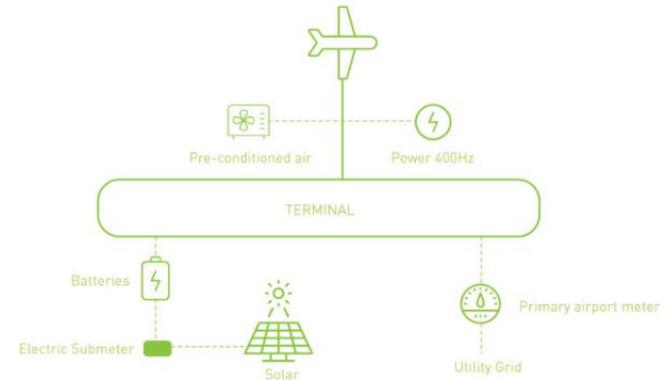


ICAO ASSISTANCE INITIATIVE

Solar-at-gate pilot project in Jamaica

- ✓ One of the main deliverables under the ICAO-UNDP-GEF project;
- ✓ A small-scale project (100kWp capacity) that could be easily replicated, and which would illustrate both the use of clean energy and the associated CO2 reductions;
- ✓ ICAO implemented this pilot project at two Jamaican airports to demonstrate how SIDS could use renewable energy at an airport to reduce CO2 emissions from international aircraft operations;
- ✓ A solar facility is installed on the airport premises, which supplies the power demand to operate an electric ground power unit and preconditioned air units (PCA)

ICAO – UNDP – GEF: The Transforming the Global Aviation Sector: Emissions Reduction from International Aviation assistance project



Norman Manley International Airport in Kingston



ICAO ASSISTANCE INITIATIVE

States Action Plans (SAPs)

- ✓ Stakeholders in States recognize the value in clearly **communicating a strategy** for achieving a specific objective;
- ✓ Many external organizations are creating **potential funding opportunities** for action on climate change from the aviation sector;
- ✓ States can build upon their action plan to **demonstrate their commitment** to the implementation of climate change policies and mitigation measures, **even if resources are not readily available**;
- ✓ The information requested for the development of State action plans bears the **potential to create a comprehensive business case** for States wishing to request implementation support.

133 States

representing **98.16%** of global RTK have voluntarily submitted their State Action Plan to ICAO

Map of State Action Plans Submitted to ICAO (click for details)





ICAO ASSISTANCE INITIATIVE

States Action Plans (SAPs)

The Royal Schiphol Group (responsible for over 90% of aviation activities in the Netherlands) is working on a 'Most sustainable airports' roadmap (Royal Schiphol Group, 2020; Royal Schiphol Group, 2021b; CBS, 2021). The roadmap states that:

- All new vehicles will be zero emissions, including Ground Support Equipment (GSE) on airside. The airports invest in additional charging facilities (RSG has currently 750 available on airside) for electrically powered equipment. KLM's ambition is to have zero emissions from ground operations by 2030. Therefore, KLM has invested in the electrification of ground equipment. Some 62 percent of KLM's ground equipment is now electric.
- The usage of fixed power units at the platform will be promoted when available.
- Single-Engine Taxiing (SET) and sustainable taxiing operations (using TaxiBot or WheelTug for instance) will be increased to reduce fuel consumption. Currently, feasibility studies are being undertaken (Royal Schiphol Group, 2021b).
- 'Older' buildings will be renovated and new buildings will be at least energy-neutral.
- Energy efficiency will be increased, more solar power produced and the power grid will be strengthened.
- Smart and clean mobility to and from the airport will be increased by investing in public transport, bike infrastructure and electric car-sharing.





ICAO ASSISTANCE INITIATIVE

States Action Plans (SAPs)



Aircraft Ground Power Supply (AC-GPS) - Incheon Airport



Cochin International Airport Solar Power Project is a 40 megawatt (MW) photovoltaic power station





CAEP Work

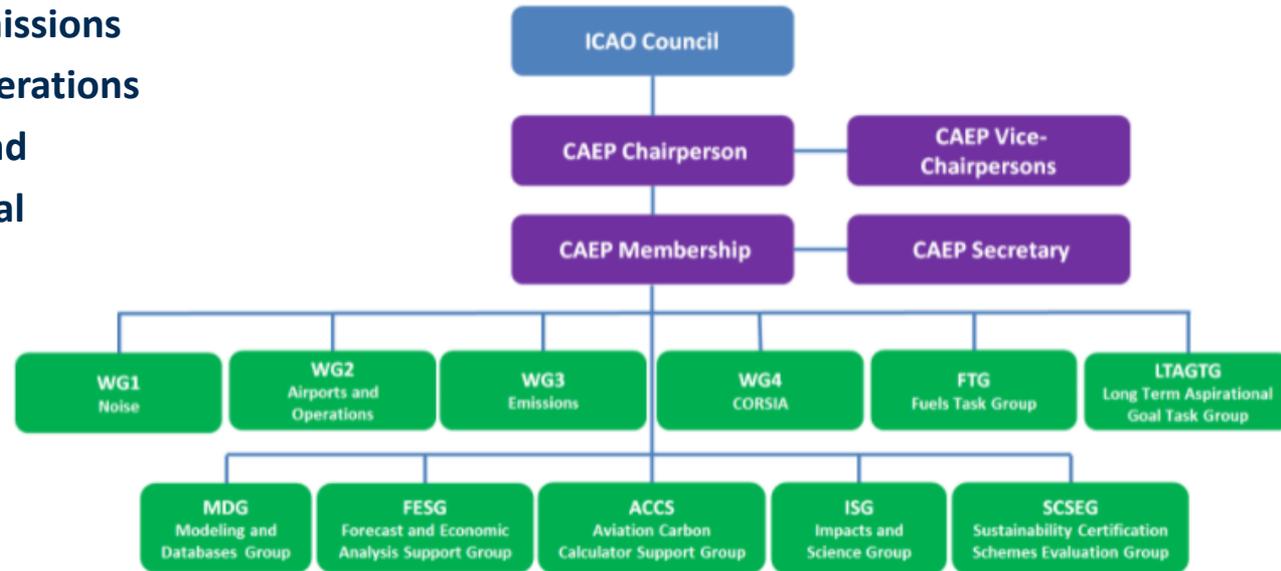




CAEP Work

ICAO's Committee on Aviation Environmental Protection (CAEP) Working Group 2 - Airports and Operations

CAEP Structure (Leading up to CAEP/12)



- ✓ addresses aircraft noise and emissions issues linked to airports and operations
- ✓ experts from Member States and International Non-Governmental Organizations



CAEP Work

ICAO's Committee on Aviation Environmental Protection (CAEP) Working Group 2 - Airports and Operations

- ✓ Eco-Airport Toolkit e-collection
 - Practical information
 - Ready-to-use
 - Concrete options / case studies
 - Free of charge on ICAO website



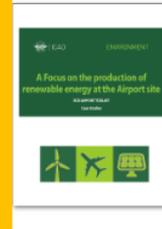
Waste Management at Airports



Waste Management at Airports - Case Studies



A Focus on the production of renewable energy at the Airport site



A Focus on the production of renewable energy at the Airport site - Case Studies

A Focus on the production of renewable energy at the Airport site

- ✓ ENERGY USE AT AN AIRPORT: A SNAPSHOT
- ✓ THE RATIONALE FOR INVESTING IN RENEWABLE ENERGY
- ✓ WHICH RENEWABLE ENERGIES, WHERE?
- ✓ BEFORE YOU START
- ✓ RENEWABLE ENERGY CASE STUDIES



Climate Resilient Airports



Air Quality Management at Airports



The Eco Design of Airport Buildings



The Eco Design of Airport Buildings - Case Studies



An Environmental Management System for Airports

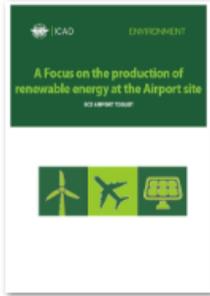


Water Management at Airports

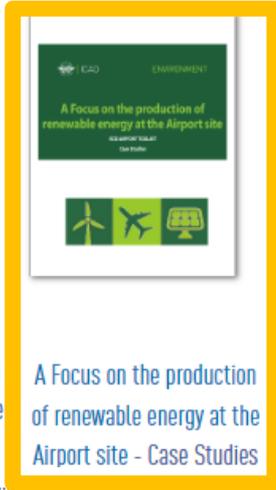


CAEP Work

ICAO's Committee on Aviation Environmental Protection (CAEP) Working Group 2 - Airports and Operations



A Focus on the production of renewable energy at the Airport site



A Focus on the production of renewable energy at the Airport site - Case Studies

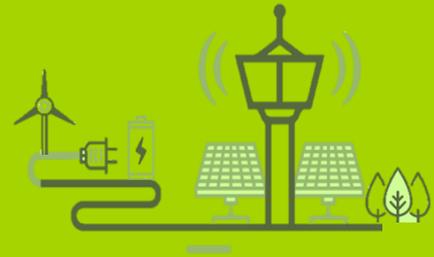


Darwin Airport Solar Project Stage 1



Implementation of 2 wind turbines to supply electricity to La Palma Airport.

Zurich Airport (ZRH).....	2
Kuala Lumpur International Airport (KUL).....	5
Cochin International Airport Limited (COK).....	9
Narita International Airport (NRT).....	13
Kansai International Airport (KIX).....	15
La Palma Airport (SPC).....	18
Montreal Pierre Elliott Trudeau International Airport (YUL).....	25
Mumbai International Airport (BOM).....	28
Vienna International Airport (VIE).....	32
San Diego International Airport (SAN).....	35
Darwin International Airport (DRW).....	38
East Midlands Airport (EMA).....	44
Stockholm Arlanda Airport (ARN).....	47



ICAO Environment Events





ICAO Environment Events

Seminar on Green Airports



100+ Speakers!



High speed aircraft undercarriage taxiing system driven by the pilot while taxiing with engines off

- 85% reduction of CO₂ emissions
- 85% jet fuel savings during taxiing
- 60% noise reduction during taxiing
- 50% FOD reduction
- 37% increase of gate efficiency




Taxibot/ENG-OFF by Smart Airport Systems

ICAO SEMINAR ON GREEN AIRPORTS

VIRTUAL EVENT, 29-30 NOVEMBER 2021



Bali Airport ISO 50001 CERTIFIED FOR ITS ENERGY MANAGEMENT SYSTEM

Energy management activities until December 2021 resulted potential energy savings up to 3.6 million Kwh or equivalent to **IDR 4.3 billion (US\$ 297,000)**

Energy management also contributes to the potential for reducing GHG emissions by 2,866 tonnes CO₂/Mwh.



ICAO Environment Events

Seminar on Green Airports

ICAO SEMINAR ON GREEN AIRPORTS

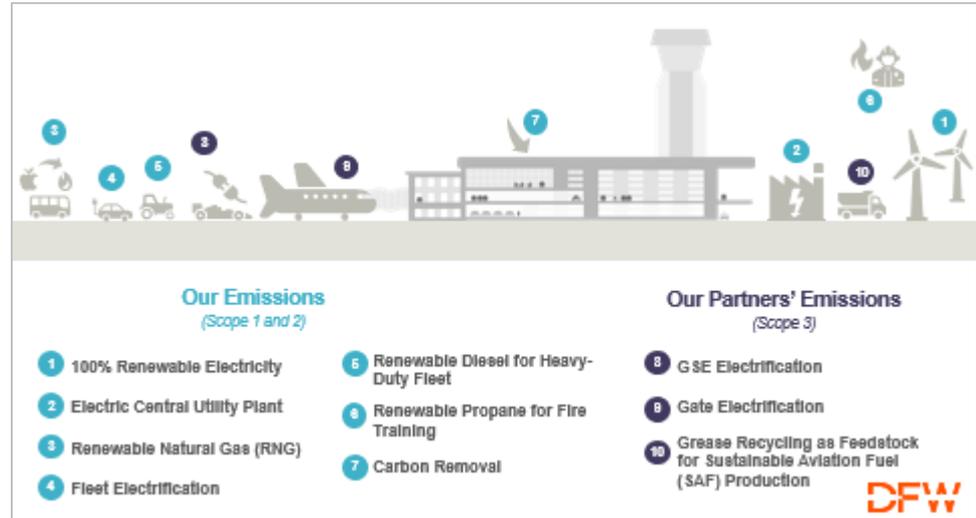
VIRTUAL EVENT, 29-30 NOVEMBER 2021



Solution deployed at airports by SAS providing Electrical Power and Air Conditioning to reduce the APU usage to the minimum



- Reduction of 92% of APU usage at gate or remote stands
- Importance of on-site and on-line supervision
- No investment & guaranteed savings





ICAO Environment Events

ICAO Stocktaking on aviation in-sector CO₂ emissions reductions



40+ Speakers!

Editions

- 2020
- 2021
- 2022

ON THE GROUND – SUMMARY There are four main solutions to cut carbon on the ground

<p>GOAL 5: NET ZERO SURFACE ACCESS</p> <p>Changes to surface access for passengers and colleagues, cutting carbon by 49% by 2030, through the switch to electric vehicles and new public transport links</p>		<p>GOAL 6: SUPPLY CHAIN</p> <p>Leveraging our procurement role to deliver a net zero supply chain, cutting carbon by 35% working with suppliers to set net zero targets</p>	
	<p>GOAL 7: AIRPORT VEHICLES</p> <p>Shifting airport vehicles to zero emissions, cutting carbon by 87%. By 2030, all airport vehicles will be zero emissions or use biofuels</p>		<p>GOAL 8: BUILDINGS AND INFRASTRUCTURE</p> <p>Energy efficiency and technology cutting carbon by 39% by 2030 from our buildings and infrastructure, including through starting to switch off gas</p>

Actions in the net zero plan will help cut local air pollution too, particularly those focused on surface access and airport vehicles

Heathrow's new net zero plan. By 2030 our goal is to cut carbon “on the ground” by 46% from 2019.



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THANK YOU