Capacity Building for CO_2 mitigation from international aviation - Fourth Seminar
Mombasa, Kenya
12-14 December, 2018

Renewable Energy for Aviation and Financing Aviation Emissions Reductions

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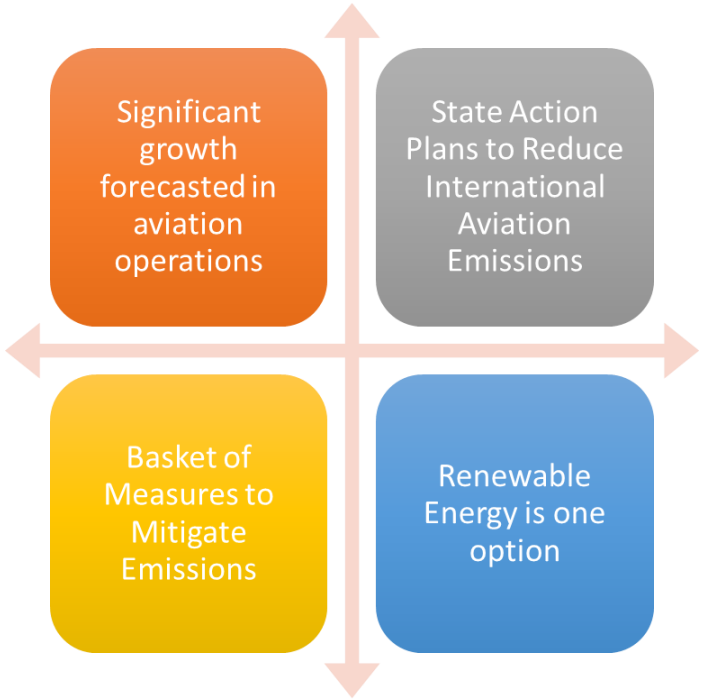
Presentation Topics

- Renewable Energy
  - Actors and Interests
  - Overview
  - ICAO Guidance
  - Solar At-Gate Concept
- Financing
  - Basics
  - Financial Instruments
  - Organizations and Programmes
  - Steps to Identify and Access Financing
  - Financing Specific Measures

Renewable Energy

ICAO Role



Civil Aviation Authority

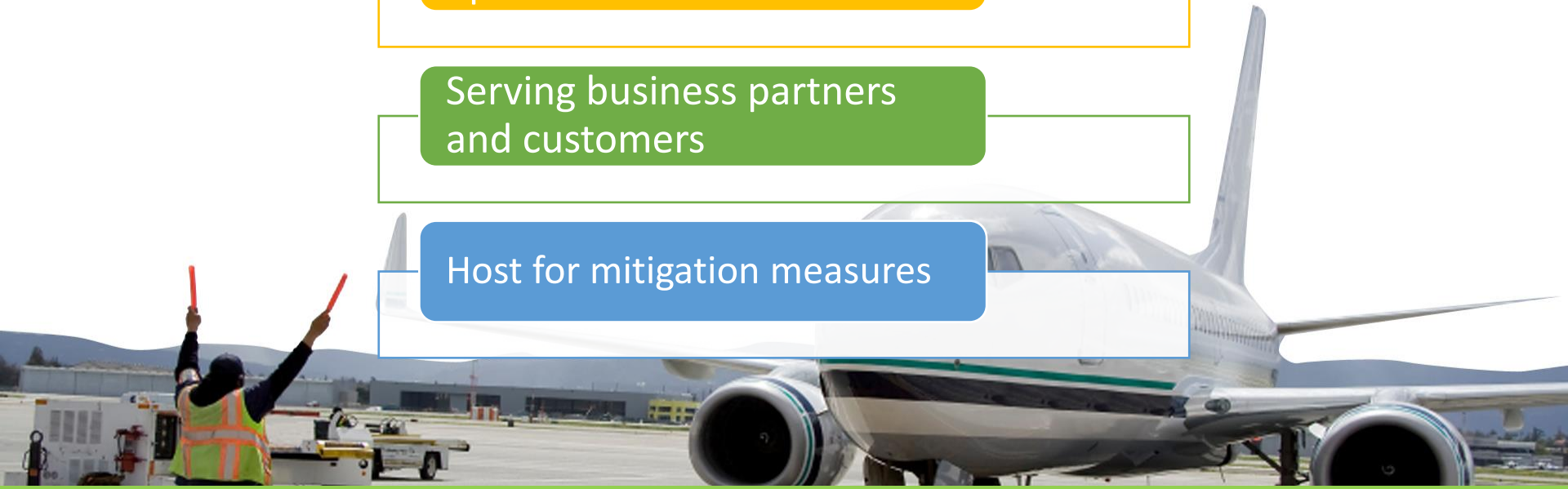
Responsible for National Aviation Policy

Focal point Action Plans

Over 100 Action Plans submitted

Airports

- Center of aviation operations
- Serving business partners and customers
- Host for mitigation measures





Renewable Energy

Naturally replenishing; flow limited

- Bioenergy
- Geothermal
- Hydropower
- Ocean
- Solar
- Wind

Energy

- Electricity
- Thermal power



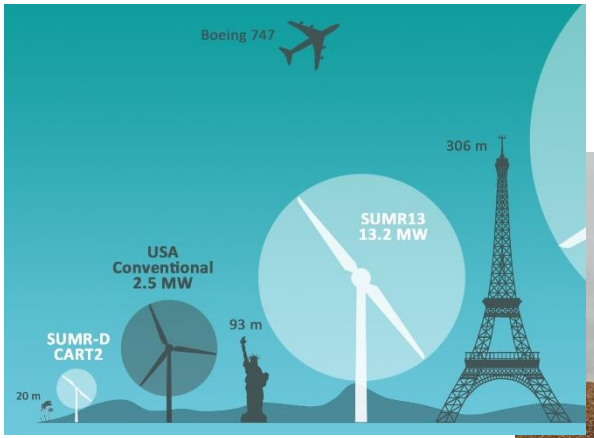
Compatibility

Airports

- Airspace
- Runways
- Terminal
- Ground Transport
- Supporting Infrastructure

Renewables

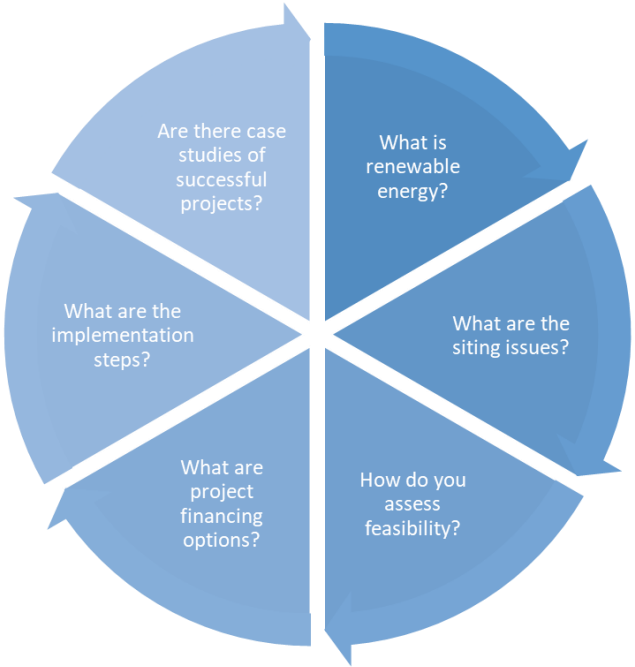
- Bioenergy – feedstock, processing
- Geothermal – unique geological features
- Hydropower – rivers
- Ocean – unique coastal features
- Solar – modular, ubiquitous
- Wind – requires tall structure



Economics

- Existing power costs
- Renewable energy costs
- Public policy incentives

Guidance on Renewable Energy for Aviation



Feasibility

- Review Energy Usage
- Assess Renewable Options
- Compare generation and consumption
- Evaluate Project Sizing
- Identify Siting Options
- Calculate Project Costs and Payback
- Prepare Steps and Schedule

Project Ownership

Government owned

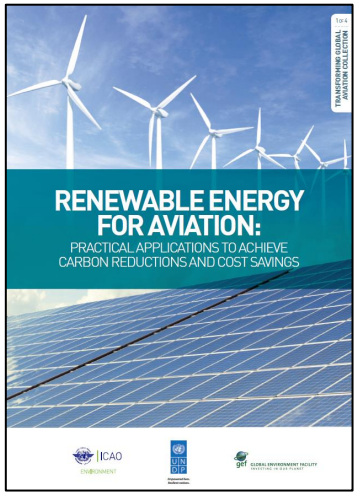
- Self Finance
- Contract with an Engineering, Procurement, Construction (EPC) company
- Self ownership, operations and maintenance

Privately owned

- Privately financed
- CAA/Airport serve as host
- CAA/Airport may receive lease payments or purchase the power generated

Benefits

- As fuel free energy, produces long-term savings
- Supports environmental goals and objectives
- Diversifies energy sources
- Investment in local businesses
- Facilitates sustainable growth
- Demonstrates leadership



Case Study Airports

Galapagos Ecological Airport

- three Wind Turbine Generators, rated at 750 kW each
- 35 per cent of its energy demand from solar PV panels installed on the terminal walkways
- 65 per cent from wind turbine generators (WTG)

George Airport, South Africa

The solar farm on 1.2 hectares of airport land.

The facility is comprised of 3,000 photovoltaic modules, with a nameplate capacity of 750 kW.

Project provides for 41% of airport's annual electricity

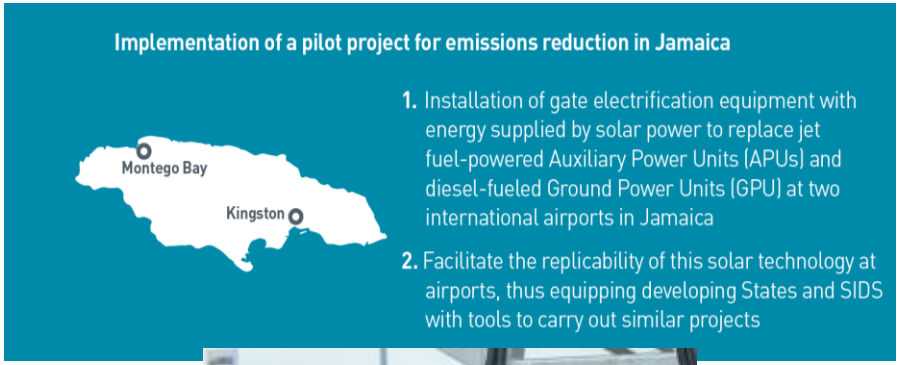
East Midlands Airport, United Kingdom

- Two Wind Turbine Generators
- 45 metres above ground
- Nameplate capacity of 250 kW each
- Approximately 6 per cent of the airport terminals needs
- Also has a biomass fired HVAC system with fuel grown on airport

San Diego USA

- 6 MW solar
- Terminal Roof and Carport Structures
- Component of proposed microgrid

Kingston and Montego Bay, Jamaica

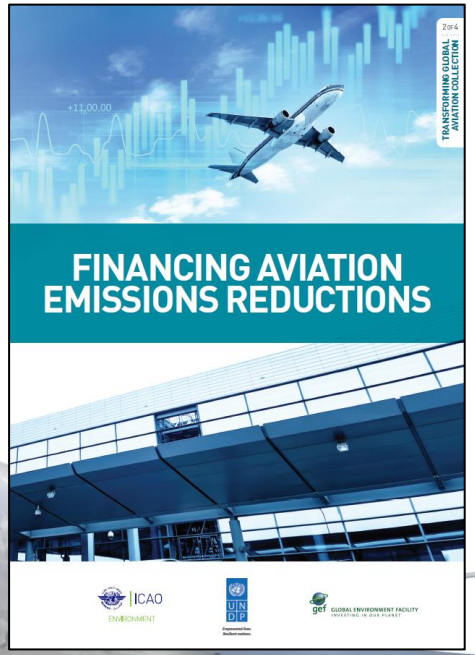


- 324 solar panels
- Capacity of 100kW
- Pre-conditioned air and 400hz ground power frequency converters for one gate at two international airports

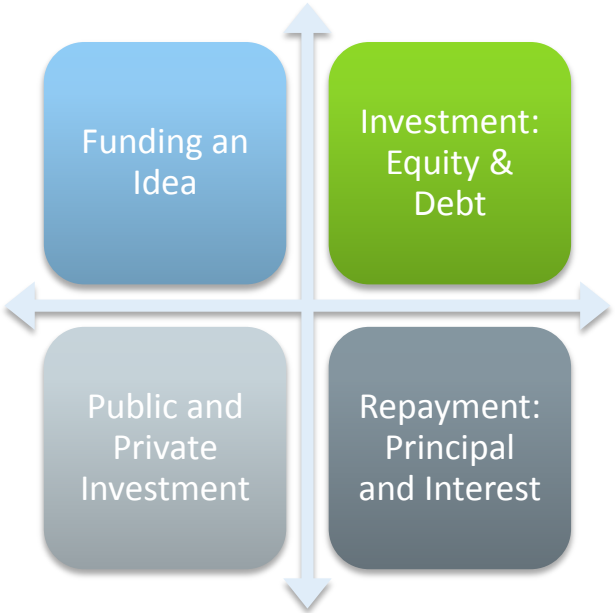
Moi International Airport, Kenya

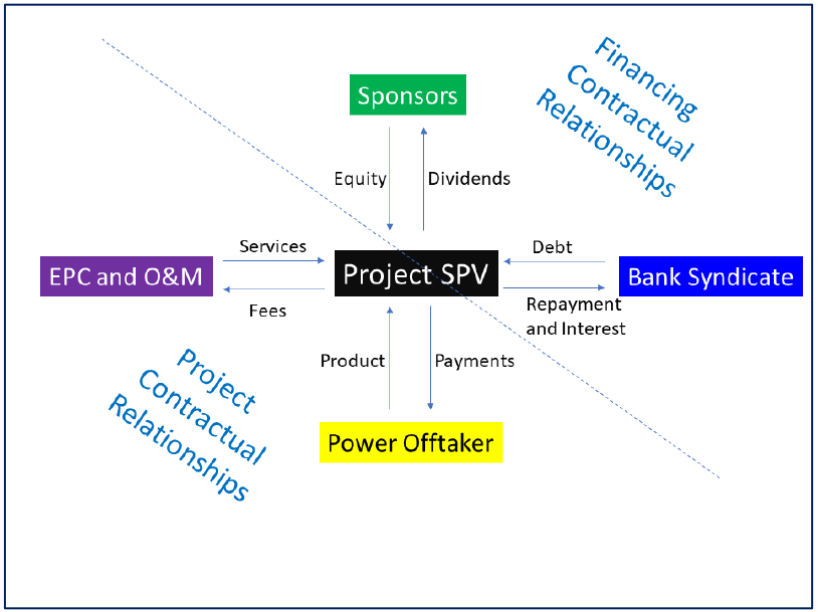
- 1,560 solar panels
- Capacity of 507 kW
- Battery Storage
- Pre-conditioned Air Unit (PCA) and 400 Hz Ground Power Unit (GPU)
- Mobile units able to serve all 6 gates as needed

Financing Aviation Emissions Reductions



Financing Basics





Barriers to Private Investment

Financial

- Lack of credit
- Lack of experience

Political

- Unstable Political Climate
- Unstable Regulatory Climate

Solutions

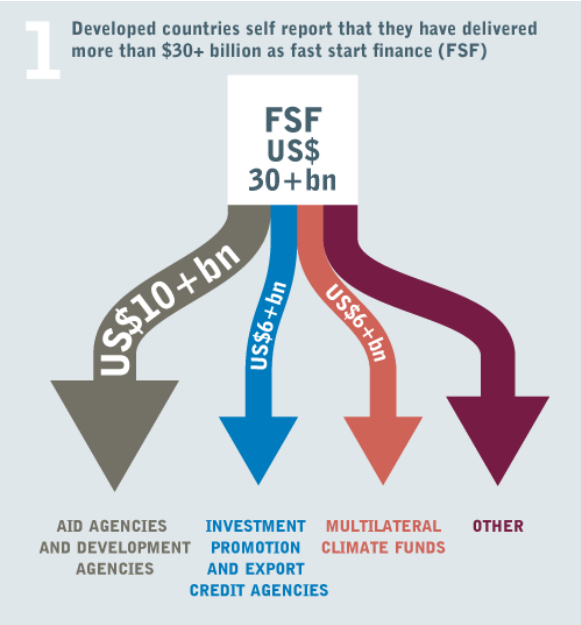
Financial

- Grants to decrease early stage investment risk
- Low interest loans to attract investment
- Long-term financial commitment (e.g., contract)

Political

- Support for economic development
- Support for incentive policy development
- Certainty in approval process

Financial Instruments



- **Grants**
  - Development, Capacity Building
- **Loans**
  - Contingent, Concessionary
- **Bonds**
  - Green, Infrastructure
- **Guarantees/Insurance**
  - Contracts
- **Direct Investment**
  - Government, Private Equity

Organizations and Programmes: Multilateral Climate Funds

Overseen by NGOs including the United Nations

- Open and transparent allocation process

Green Climate Fund

Name	Recipient	Class	Type / Amount
Building the Resilience of Wetlands	Peruvian Trust Fund for National Parks	Mitigation & Adaptation	Grant, USD 6.2m
Scaling Up of Modernized Climate Information and Early Warning System	Disaster Management Authority, Malawi	Adaptation	Grant, USD 12.3m
KawiSafi Ventures Fund, East Africa	Acumen Fund to 10-15 solar companies for off-grid solar in Kenya and Rwanda	Mitigation & Adaptation	Equity, USD 20m Grant, USD 5m

Organizations and Programmes: Bilateral Funds

Donor and Recipient

- Gives donor more control

UAE Pacific Partnership Fund

State Recipient	Project Description
Fiji	525 kW Solar on three remote islands of Kadevu, Lakeba, and Rotuma
Kiribati	500 kW solar for remote communities and water supply protection
Nauru	500 kW solar to improve energy resiliency
Samoa	550 kW wind project designed to be manually lowered to the ground in advance of a cyclone
Tonga	512 kW solar with battery bank used to supply peak energy loads and avoid increasing diesel
Tuvalu	500 kW solar canopy constructed over a public recreation space provided shade
Vanuatu	767 kW in Port Vila, a population of 44,000 including solar car ports providing shade

Organizations and Programmes: Multilateral Development Banks

Concessional Loans

- Act like other banks, but with more charitable terms

Operate on regional basis
African Development Bank (AfDB)
Asian Development Bank (ADB)
European Bank for Reconstruction and Development (EBRD)
European Investment Bank (EIB)
Inter-American Development Bank (IDB)
The World Bank Group

*Goal is to attract private capital from green investor funds, corporations, and commercial banks.

Steps to Identify and Access Financing

Prepare a Project Concept

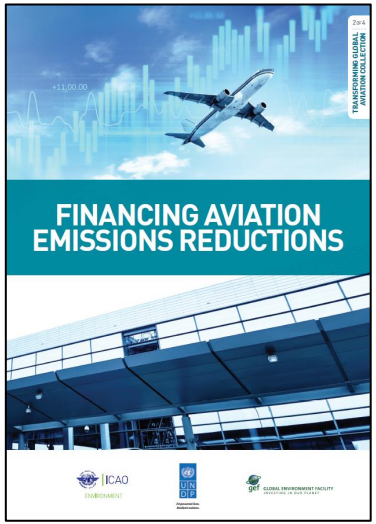
- Review Action Plans
- Define Objectives
- Identify Benefits
- Prepare Concept Plan

Build In-Country Support

- Identify Project Partners
- Prepare Communication Tools
- Specify Partner Roles

Public policy incentives

- Review funding Opportunities
- Coordinate with Partners
- Prepare an application



Case Study Airports

Financing Specific Measures

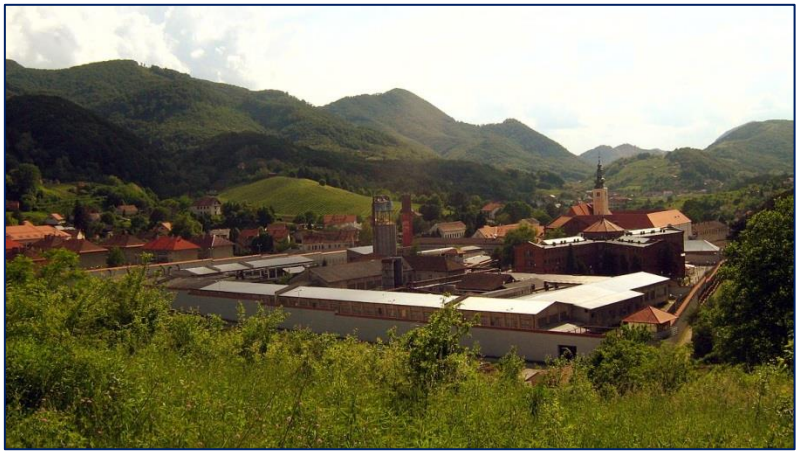
Renewable Energy

- Phase I has a capacity of 160 MW
- offsets approximately 250,000 tonnes of CO_2 emissions annually.
- The project was supported by loan guarantees and below market financing through the World Bank and African Development Bank, which significantly decreased the cost of the facility.

Noor Concentrating Solar Power Plant
Morocco

Financing Specific Measures

Energy Efficiency



Public Buildings in the City of Sisak, Croatia

Project: energy efficiency programme to reduce energy consumption in public buildings.

Partners: UNDP and GEF

Over two years, 24 projects cut energy consumption by 13% and saved the city budget USD 220,000 per year. CO_2 emissions were reduced by 780 tonnes.

Financing Specific Measures

Electrification

Seattle-Tacoma International Airport, USA

Alaska Airlines and Seattle-Tacoma International Airport (Sea-Tac) partnered to replace fossil-fuel-powered ground support equipment (GSE), including belt loaders and baggage tugs, with electric vehicles.

- the Port of Seattle constructed 296 charging stations with grant funding from the US Government.
- Alaska Airlines purchased 204 electrically-powered GSEs
- Result: a reduction of 2,000 metric tonnes of CO_2 annually.
- Funding provided by US Federal Aviation Administration

Financing Specific Measures

Drop-In Biofuels

Oslo International Airport, Norway

In January 2016, Oslo Airport started regular supply of a sustainable aviation fuel (SAF) blend through its existing common fuel distribution system.

This is the first time an airport has made SAF available to all refueling aircraft relying on existing infrastructure.

The fuel is produced under the Initiative Towards sustAinable Kerosene for Aviation (ITAKA) framework – a collaborative project for the development and use of sustainable biofuel in Europe funded by the EU's Seventh Framework Programme, a research and development initiative.

Funding Example: Global Environment Facility

- Cook Island Project
- 3 MW PV
- Battery Storage
- 1 MW Rarotonga Airport

Conclusions

- Renewable energy is one viable measure to reduce emissions from aviation
  - Can provide co-benefits to domestic aviation activities
- Various financial support instruments are available to support the implementation of measures
  - Grants, low interest loans, insurance/guarantees, and new policies to improve investment
- Funds could be deployed by airports for renewable energy, energy efficiency, electrification, and drop-in biofuels

For more information on this project, please visit ICAO's website:

https://www.icao.int/environmental-protection/Pages/ICAO_UNDP.aspx

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