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DESTINATION GREEN: THE NEXT CHAPTER



ICAO Assistance activities on environmental protection

Dr. Neil Dickson

Chief, Environmental Standards, ICAO





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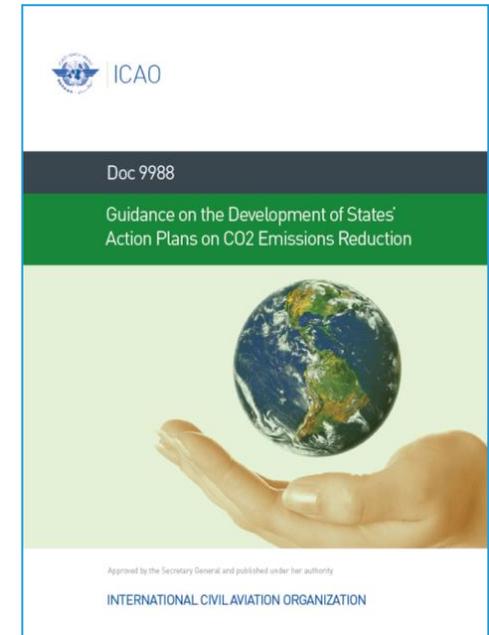


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Introduction to the State Action Plan initiative

- Background and history
- Purpose
- Minimum content of an Action Plan





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History

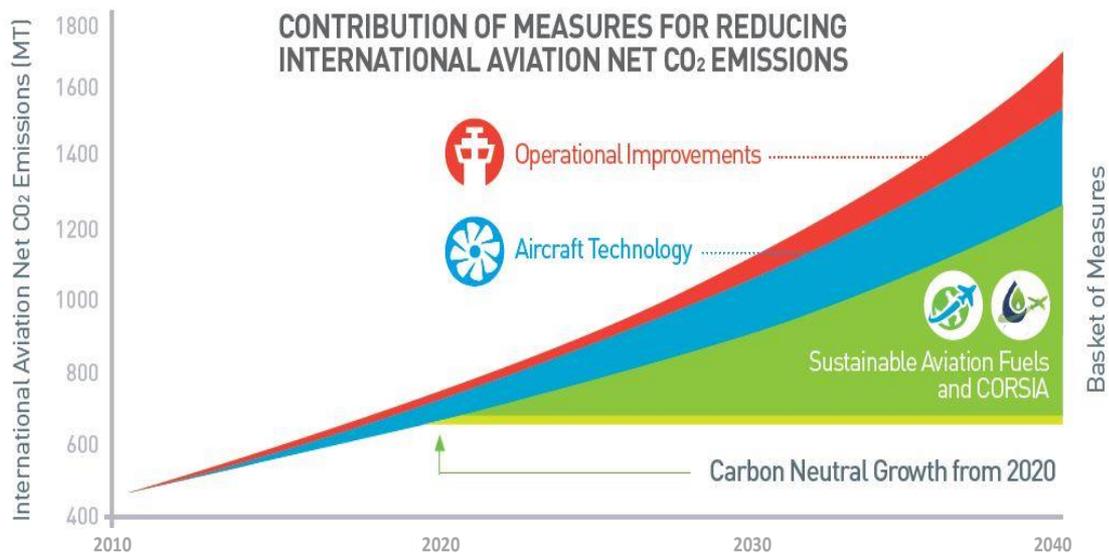
9. *Encourages* States to submit their action plans outlining their respective policies and actions, and annual reporting on international aviation CO₂ emissions to ICAO;

- Initiative established in 2010 with ICAO Assembly Resolution **A37-19**:
 - *Para 11: “action plans should include information on the basket of measures considered by States, reflecting their respective national capacities and circumstances, and information on any specific assistance needs”*
- Reaffirmed support in 2013 with A38-18 and in 2016 with **A39-2**:
 - *Para 11: “Invites those States that choose to prepare or update action plans to submit them to ICAO” and include “quantified information on the expected environmental benefits from the implementation of the measures chosen from the basket”*
 - *Para 12: “Encourages States that have already submitted action plans to share information contained in action plans and build partnerships with other member States in order to support those States that have not prepared action plans, and to make the submitted action plans available to the public, taking into account the commercial sensitivity of information contained in States’ action plans”*



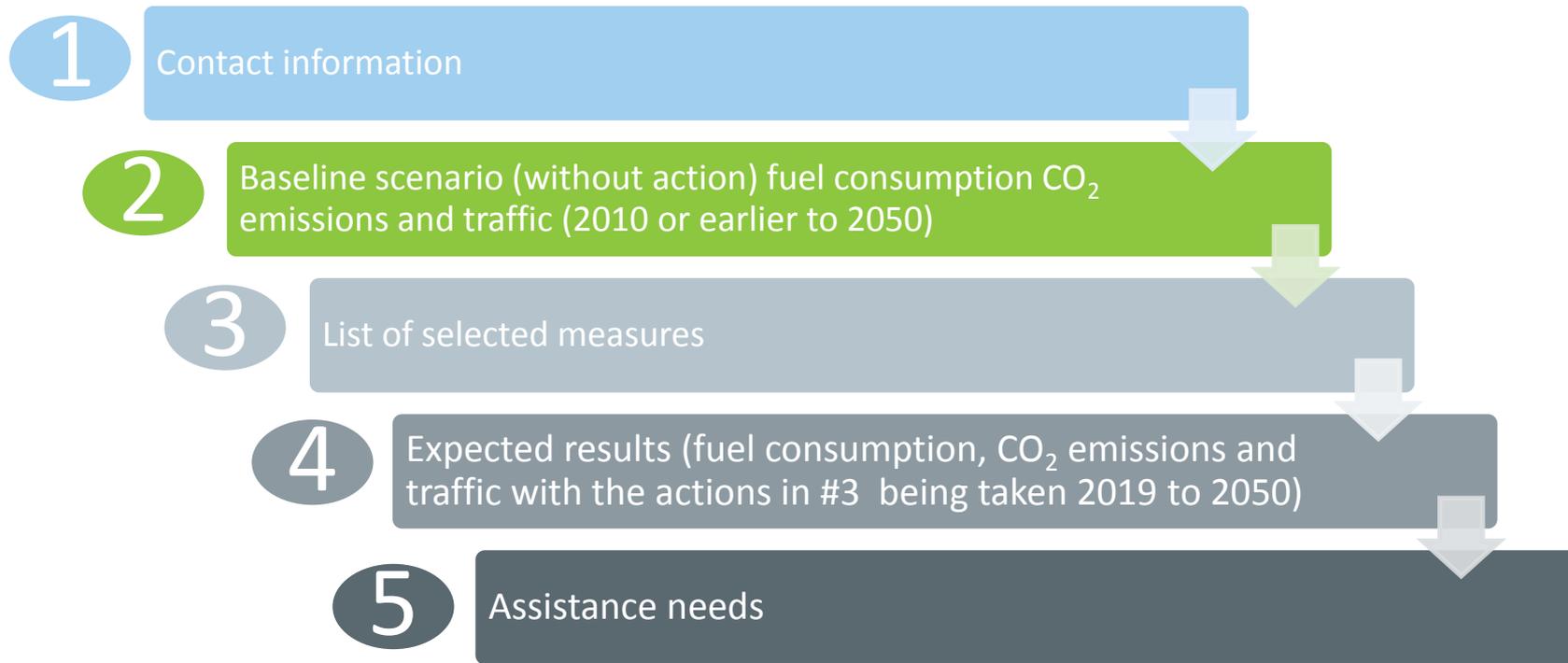
Purpose

- For States
 - Opportunity to identify measures that will improve fuel efficiency and reduce emissions
- For ICAO
 - Assess future progress toward the achievement of ICAO global aspirational goals





Minimum Content





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Map of State Action Plans Submitted to ICAO



111 States

representing **92.3%** of global RTK have voluntarily
submitted their State Action Plan to ICAO



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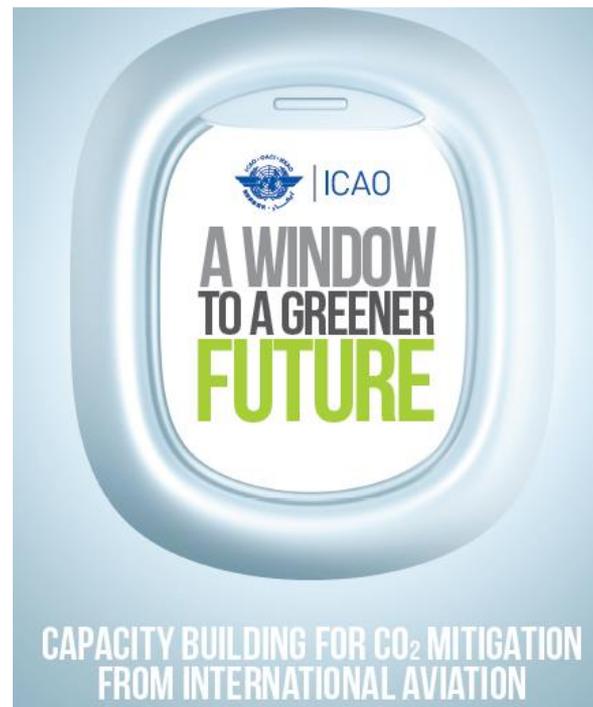
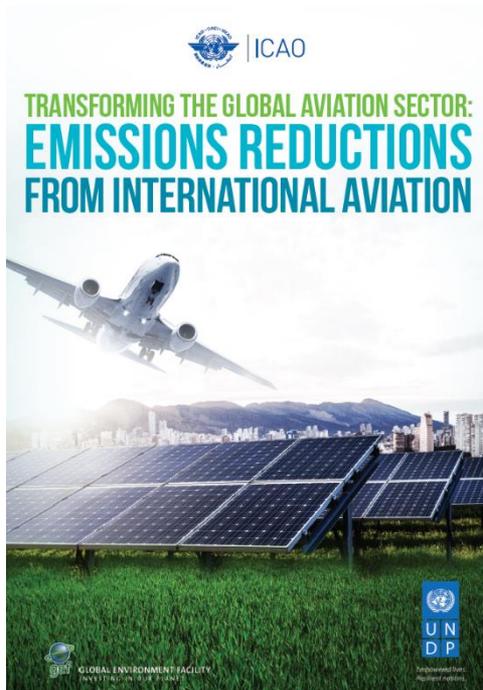


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ICAO capacity building projects





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GLOBAL ENVIRONMENT FACILITY
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United Nations
Development Programme

Transforming the Global Aviation Sector: Emissions Reduction from International Aviation



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OBJECTIVE:

Support developing States and Small Island Developing States strengthen their national capacities to reduce emissions from international civil aviation

- I. Implementing Aviation Low Emissions Measures: Costs and Environmental Benefits Assessment**
- II. Transforming Global Aviation Collection: Unique Guidance Material**
- III. ICAO Integrated Environmental Technical Platform**
- IV. Pilot Project in Jamaica**



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Component 1 of the project

1 IMPLEMENTING AVIATION LOW EMISSIONS MEASURES: COSTS AND ENVIRONMENTAL BENEFITS ASSESSMENT

A marginal abatement costs (MAC) curve has been developed to assess the **costs and benefits** associated with the implementation of the aviation low emissions measures in developing States and SIDS.

ICAO REPORT ON COSTS AND ENVIRONMENTAL BENEFITS (MAC CURVE ANALYSIS)



1. To support developing States and SIDS to obtain the necessary information on the financial costs and CO₂ emissions reduction benefits associated with the basket of mitigation measures selected in their State Action Plan
2. To provide technical support and practical guidance to developing States and SIDS to enable them to identify feasible emissions reduction measures
3. To make informed decisions relating to the implementation of CO₂ mitigation measures



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Component 2 of the project

2 DEVELOPMENT OF 4 GUIDANCE DOCUMENTS TO FACILITATE LOW EMISSIONS AVIATION IN DEVELOPING STATES AND SIDS

Enhancing States' **policy framework** and **strengthening their national capacities** through a series of guidance documents.

4 UNIQUE GUIDANCE MATERIALS FOR ICAO MEMBER STATES:



1. Renewable Energy for Aviation: Practical Applications to Achieve Carbon Reductions and Cost Savings
2. Financing Aviation Emissions Reductions
3. Regulatory and Organizational Framework to Address Aviation Emissions
4. Sustainable Aviation Fuels Guide



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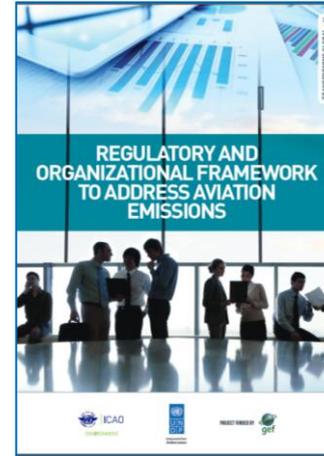
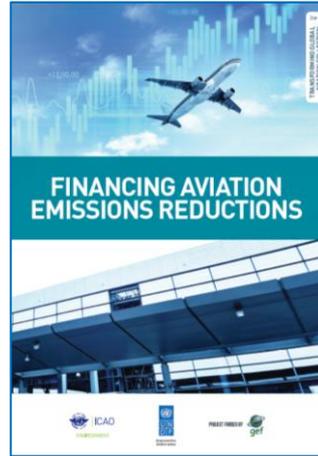
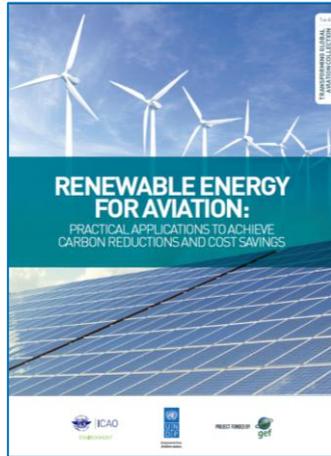
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II. GUIDANCE DOCUMENTS





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Component 3 of the project

3 ICAO INTEGRATED ENVIRONMENTAL TECHNICAL PLATFORM

A platform to support the implementation of low emissions measures in the aviation sector.

Sharing knowledge and resources, as well as other **outreach** initiatives through an integrated **environmental technical platform**.

LOW-CARBON AVIATION KNOWLEDGE-SHARING PLATFORM



This interactive “Low-carbon Aviation Knowledge-sharing Platform” provides informative resources and ICAO tools, as well as relevant guidance documents on aviation and environment to ICAO Member States. It will be accessible through the ICAO public website.



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III. PLATFORM PREVIEW



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LOW-CARBON AVIATION KNOWLEDGE-SHARING PLATFORM

Home | About | Expert Login |



Filter by Subject

- Airport improvements
- Alternative fuels
- Aircraft technology
- Improved ATM & infrastructure
- More efficient operations
- Economic measures/MBMs
- Regulatory measures/others

Filter by Format

- Energy & tech products
- Policies & regulations
- Web portals & publications
- Offset services
- Advisory, research & support tools
- Best practice examples



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Component 4 of the project

4 PILOT PROJECT ON AVIATION LOW EMISSIONS MEASURES

Implementation of a pilot project for emissions reduction in Jamaica

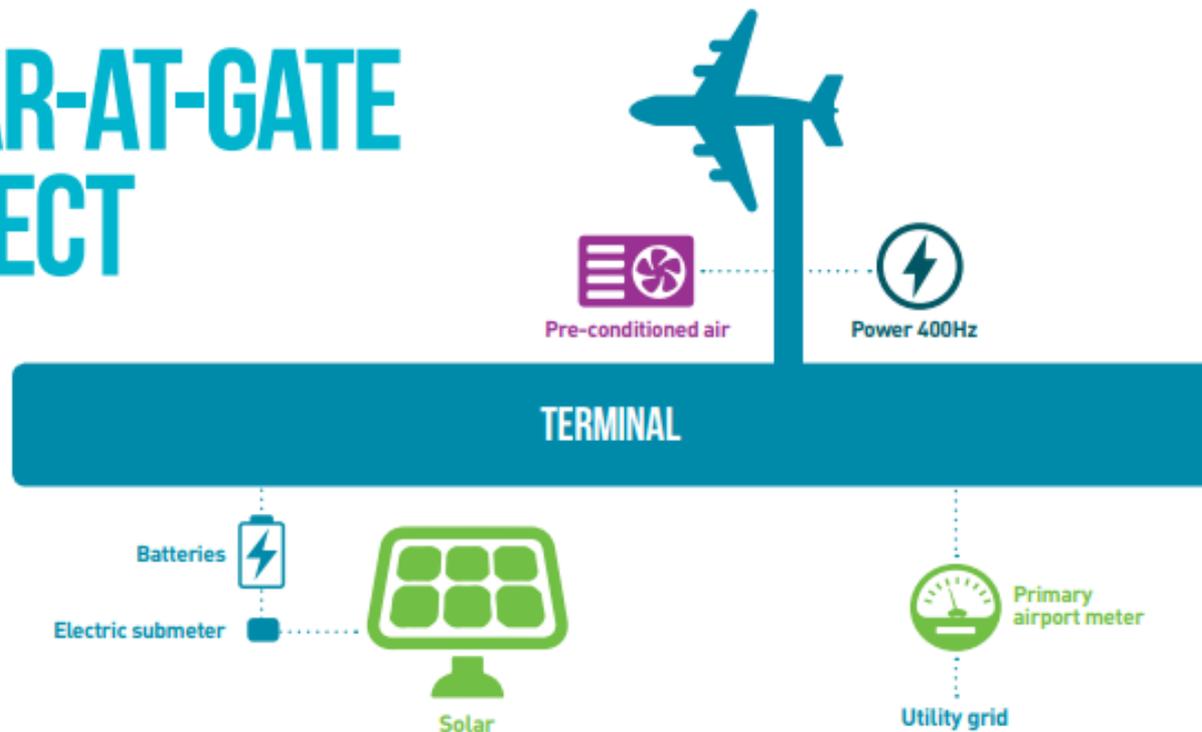


1. Installation of gate electrification equipment with energy supplied by solar power to replace jet fuel-powered Auxiliary Power Units (APUs) and diesel-fueled Ground Power Units (GPU) at two international airports in Jamaica
2. Facilitate the replicability of this solar technology at airports, thus equipping developing States and SIDS with tools to carry out similar projects



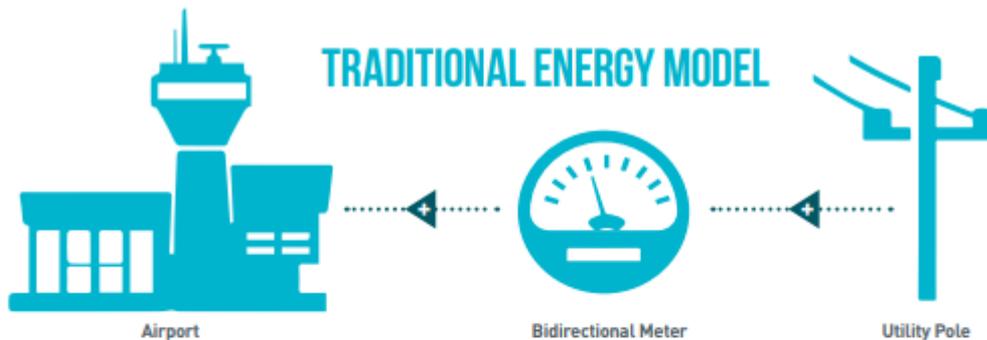
IV. PILOT PROJECT IN JAMAICA

SOLAR-AT-GATE PROJECT





IV. PILOT PROJECT IN JAMAICA



- ▶ Excess energy not used by airport that goes back to the grid
- ▶ Energy used by airport from the grid or battery





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Jamaica Solar at-Gate Pilot Project

Solar Canopy



PCA and 400 Hz GPU





Main Components

Electrification Gate 1

- Over 1,000 flights annually
- Large percentage of international flights



Solar Carpark

- Close to terminal
- Connect to electrical
- High visibility



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Solar Capacity

- Nameplate 106 kWdc / 100 kWac
- 324 solar panels
- 28 parking spaces covered
- Educational kiosk in terminal departure



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Gate Electrification

- Pre-conditioned Air Unit (PCA) and 400 Hz Ground Power Unit (GPU)
- PCA hose
- GPU cable
- Allows aircraft to plug-in to Terminal





IV. PILOT PROJECT IN JAMAICA

REPLICABLE PILOT PROJECT

- The “solar-at-gate” pilot project is easily replicable
- Through this pilot project, direct emissions reductions at the gate are demonstrated and documented
- The electrical gate units are retrofitted to existing jet bridges and the solar power system can be located on available airport-secured lands
- Documentation related to the pilot project will be shared with all ICAO Member States
- All States can implement similar projects using a variety of possible financing mechanisms, including through their own GEF national allocation



- A project combining solar and electric gate power is a unique solution
- The replacement of carbon intensive electricity from the use of jet fuel-powered APUs and diesel-fueled GPUs with a gate electrification retrofit project powered by solar energy is an effective, measurable and easily replicable way to reduce emissions



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Marginal Abatement Cost (MAC) Curve



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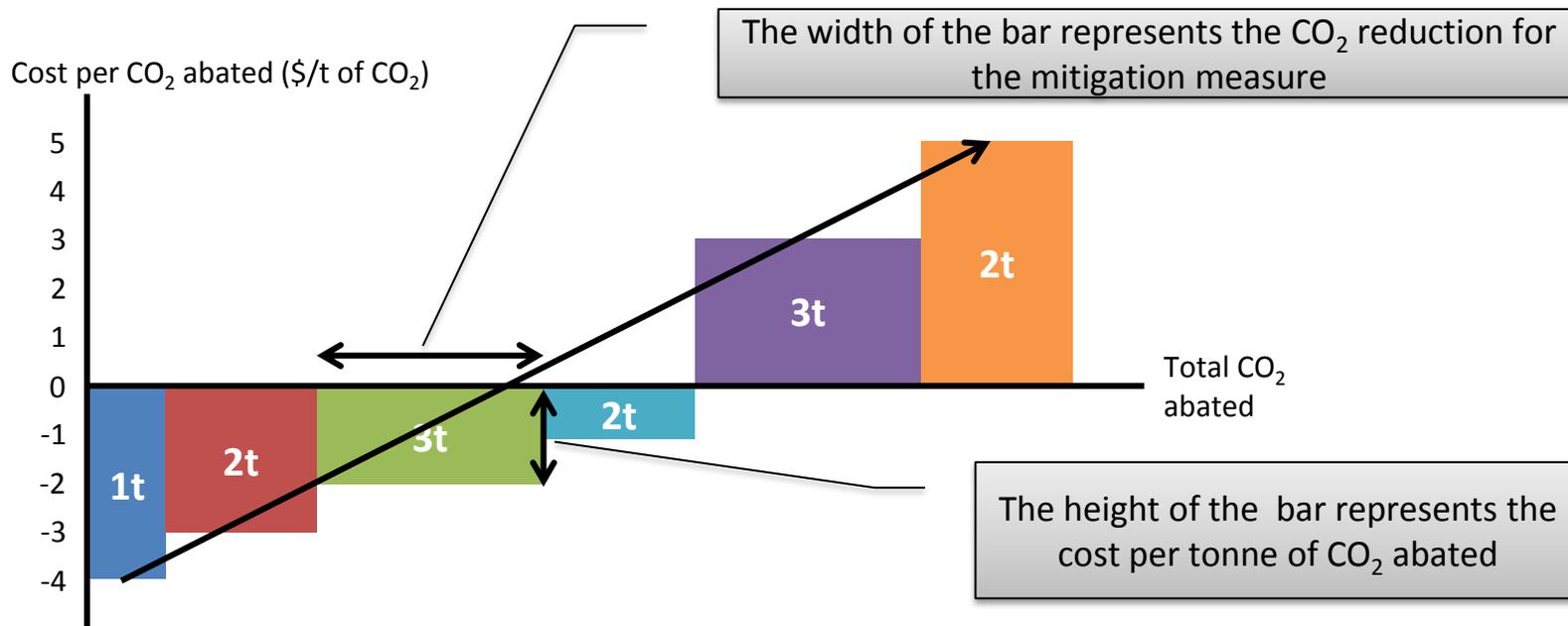
Functions of a Marginal Abatement Cost Curve

The main functions of a Marginal Abatement Cost (MAC) Curve are:

- The selection of mitigation measures
 - Top-down approach
 - Bottom-up approach
- The prioritization of mitigation measures
 - Emissions reductions criteria
 - Economic feasibility criteria



How to read a MAC curve?





The Marginal Abatement Cost Curve Tool

CARBON EMISSION REDUCTION

INTRODUCTION 20 MEASURES GLOBAL MAC CURVE **CUSTOMIZE MAC CURVES**

PROVIDE GENERAL STATE DATA SELECT AND CUSTOMIZE CREATE STATE-SPECIFIC MAC CURVES

EXPORT SCENARIO TO EXCEL

Generating the customized MAC curve might take time. During this time do not refresh the browser's window.

Cost of CO2 reduction, in USD / tonne | Reduction in CO2, in thousand tonnes

Measure Name	2020		2030		2040		2050	
	Cost	Reduction	Cost	Reduction	Cost	Reduction	Cost	Reduction
Airport infrastructure (runways, ta...	65.96	356.26	113.97	409.06	140.62	374.61	148.37	360.05
Development of biofuels	241.93	87.72	200.49	834.36	175.37	2505.44	175.37	5447.43
Improve fuel efficiency through mo...	-46.07	117.19	-62.13	73.83	-64.45	19.72	-97.27	0.87
Installation of fixed electrical grou...	-254.10	26.08	-254.10	83.30	-254.10	101.63	-254.10	106.06
Measures to improve collaborative...	-226.74	73.21	-275.38	131.79	-306.25	185.90	-321.16	228.88
Measures to increase fuel efficienc...	-166.69	964.29	-162.57	1550.62	-160.43	1556.44	-160.00	1551.28
Measures to introduce CCO and C...	-165.88	892.35	-165.88	1784.70	-165.88	1784.70	-165.88	1784.70
Minimizing weight	-45.51	124.52	-38.63	281.12	-31.42	397.64	-24.87	604.84
Use cleaner alternative sources of ...	131.76	1.13	131.76	5.02	131.76	9.41	131.76	19.95

BACK SAVE AS DRAFT & EXIT NEXT

CARBON EMISSION REDUCTION

INTRODUCTION 20 MEASURES GLOBAL MAC CURVE **CUSTOMIZE MAC CURVES**

PROVIDE GENERAL STATE DATA SELECT AND CUSTOMIZE CREATE STATE-SPECIFIC MAC CURVES

EXPORT SCENARIO TO EXCEL

Export as PNG | Export as PDF

MAC Curve 2020
Cost (USD/tCO₂) (in Log Scale)

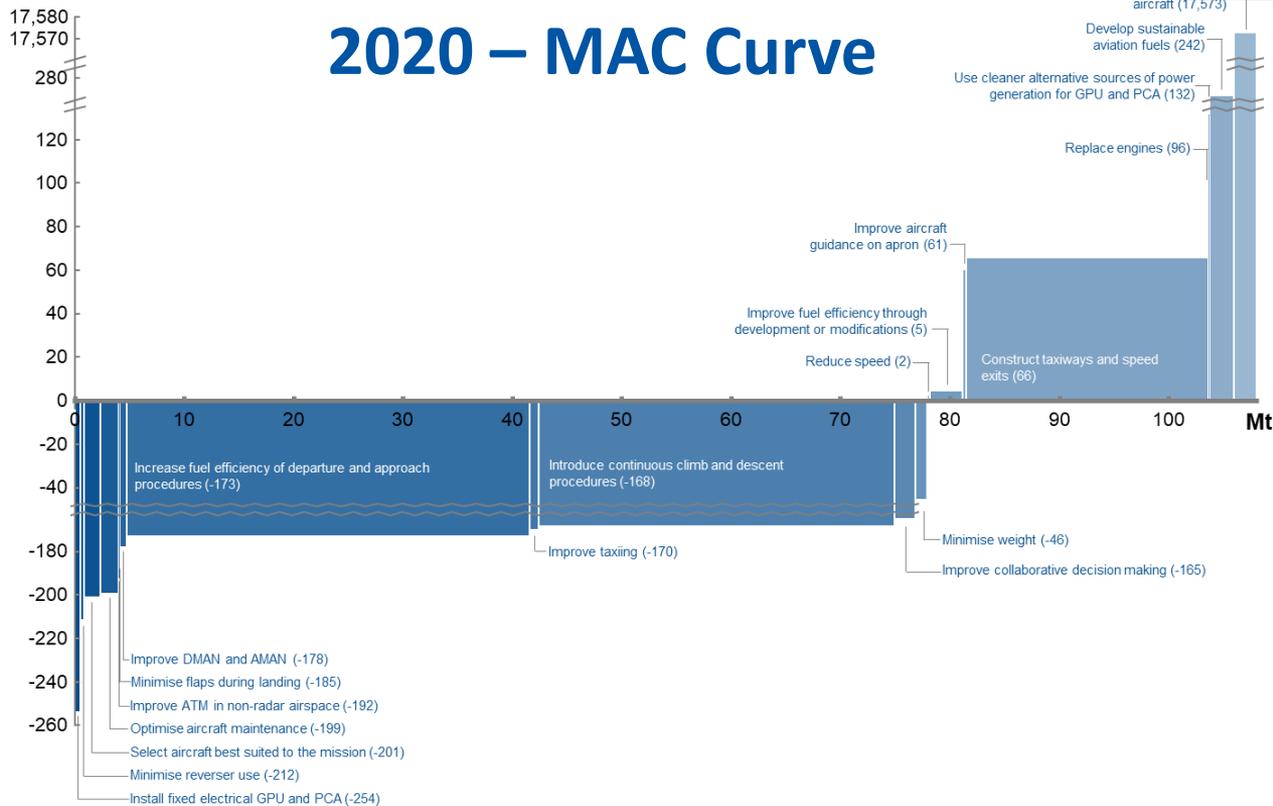
Reduction (tCO₂)

2,643M



USD/t CO₂

2020 – MAC Curve





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Conclusion

The main benefits of the MAC Curve tool:

1. Help to select the most appropriate mitigation measures based on local situation
2. User-friendly interface and Easy-to-use tool
3. Fully customizable tool
4. Available free of charge for all State Action Focal Points



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Summary

1. Marginal Abatement Cost (MAC) curve
2. Four unique publications



3. An online platform to enable knowledge-sharing
4. A pilot project for “solar-at-gate” at Kingston International Airport and a gate electrification project at Montego Bay International Airport.



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