



ICAO

ENVIRONMENT

NO COUNTRY LEFT BEHIND



ICAO Supporting Tools - Publicly available



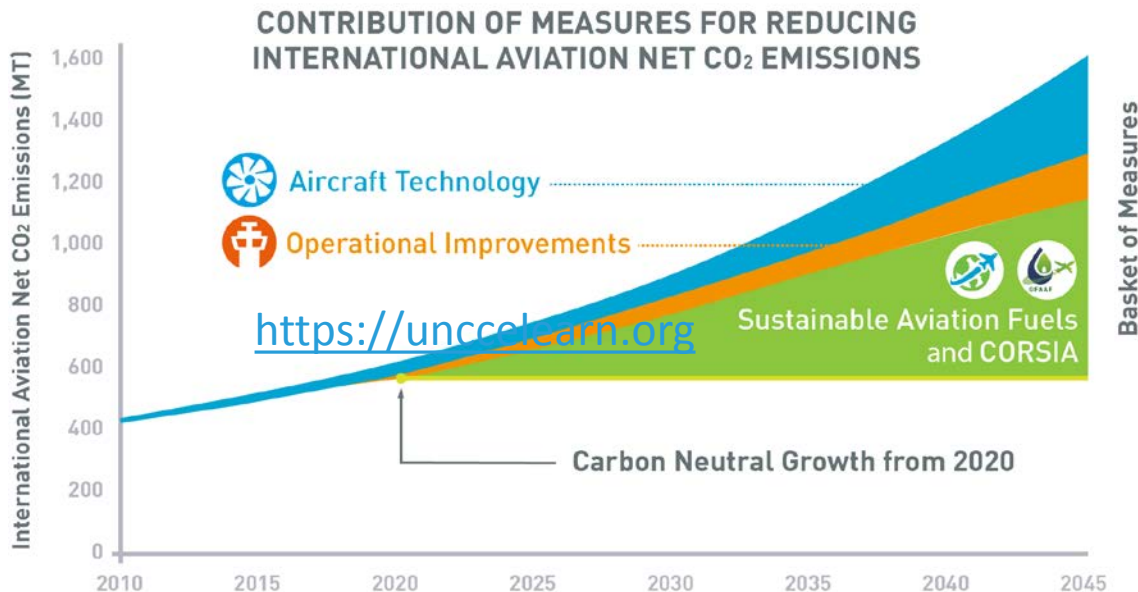


Environmental Trends Assessment

- The sustainable growth of aviation is important for future economic growth and development, trade and commerce, cultural exchange and understanding among peoples and nations. It is therefore crucial to understand the future global trends in growth and the associated environmental implications in terms of aircraft noise and emissions.
- The first ICAO Global Environmental Trends were presented and endorsed at the 37th Session of the Assembly, and since then the updated global environment trends have been developed and presented to every Assembly Session to form the basis for their considerations and decisions.



CO₂ Emissions Trends

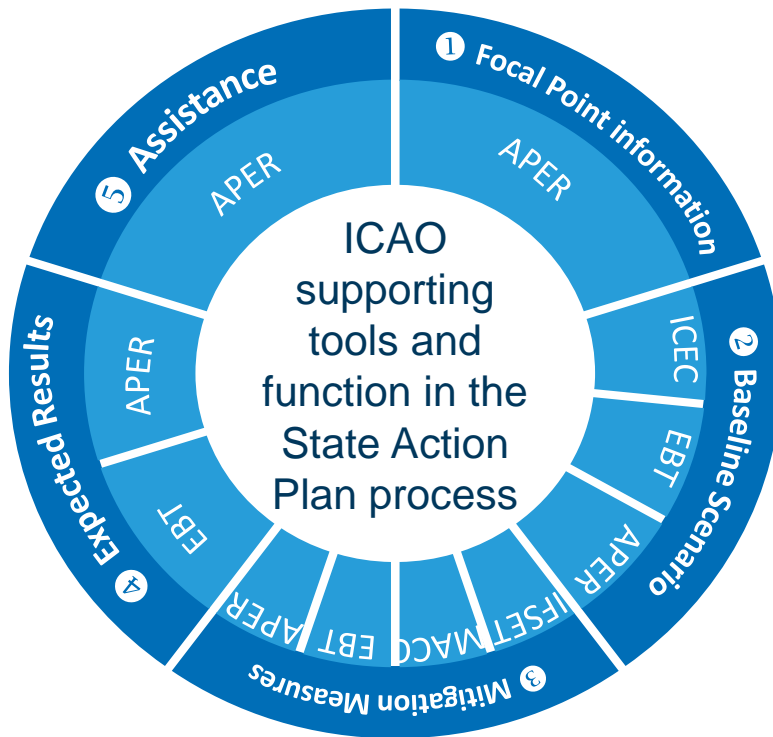


International aviation consumed approximately 160 Mt of fuel in 2015.

By 2045, compared with an anticipated increase of 3.3 times growth in international air traffic (expressed in revenue tonne kilometres), fuel consumption is projected to increase by 2.2 to 3.1 times compared to 2015.



ICAO Environmental Tools





ICAO Environmental - Public Tools Suite



ICAO Carbon Emissions Calculator

Allows passengers to estimate CO₂ emissions from their air travel



ICAO Fuel Savings Estimation Tool (IFSET)

To assist States in estimating fuel savings from operational improvements



ICAO CORSIA CO₂ Estimation and Reporting Tool (CERT)

To assist States and aeroplanes operators - monitoring and reporting requirements



ICAO E-Learning Course – Module 1. State Action Plan



ICAO Green Meetings Calculator

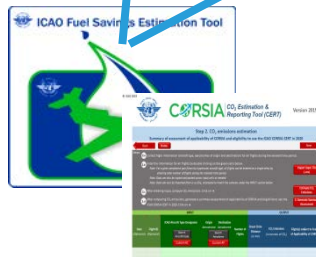
To support decision making in minimizing CO₂ emissions from air travel to attend meetings



Baseline
scenario

Mitigation
Measures

Expected
Results





**Baseline
scenario**

**Mitigation
Measures**

**Expected
Results**

**Data from
State**

**ICAO Carbon
Emissions Calculator**

ICAO Green Meeting Calculator

**Data from
State**

**Rules of
Thumb**

**IFSET
(ICAO Fuel Savings Estimation Tool)**

CERT



Estimating aircraft fuel burn and CO₂ emissions:

ICAO Carbon Emissions Calculator





ICAO Carbon Emissions Calculator

Description:

ICAO has developed a methodology to calculate the carbon dioxide emissions from air travel for use in offset programmes.



One Way/Round Trip	Cabin Class	Number of Passengers
One Way	Economy	1

Leg	From City/Airport	To City/Airport
1	GVA	YUL

Delete All Location(s)	Delete Leg	Add New Leg
------------------------	------------	-------------

Reset	Compute
-------	---------

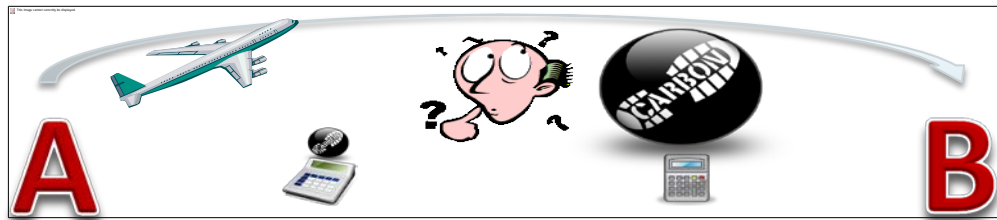
Metric (KG / KM)		Standard (LBS / MI)				
Total						
Dep Airport	Arr Airport	Number of passengers	Cabin Class	Trip	Aircraft Fuel Burn/Journey (KG) ^{ab}	Total passengers' CO2/Journey (KG) ^c
GVA	YUL	1	Economy	One Way	46048.4	318.2

Flight Stage Detail					
Dep Airport	Arr Airport	Distance (KM)	Aircraft	Aircraft Fuel Burn/leg (KG) ^a	Passenger CO ₂ /pax/leg (KG)
GVA	YUL	5901.0	333	46048.4	318.2



ICAO Carbon Emissions Calculator Background

- Proliferation of tools for calculating “carbon footprint” from aviation
 - Results differ by factor of 4 or more!
 - Unknown data sources and methodologies (black box)
 - Inconsistent basis for offsetting





ICAO Carbon Emissions Calculator Methodology

- **Objectives**

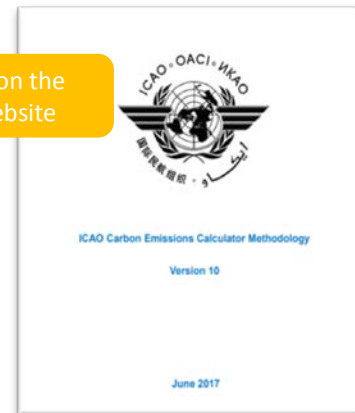
- User-friendly, unbiased, tool to compute carbon emissions from air travel
- Suitable for use with voluntary offsetting programmes
- Best publicly available data (**transparency**)
- Fully documented



ICAO Carbon Emissions Calculator Methodology (cont.)

- **Methodology Developed through CAEP**
- **Expert input provided from**
 - ICAO Secretariat
 - ICAO Member States
 - Universities
 - NGOs
 - International Air Transport Association – IATA (Airlines)
 - International Coordinating Council of Aerospace Industries Associations – ICCAIA (Manufacturers)
- **Methodology is internationally recognized and accepted**
- **All UN air travel GHG inventories are prepared using the ICAO Calculator**

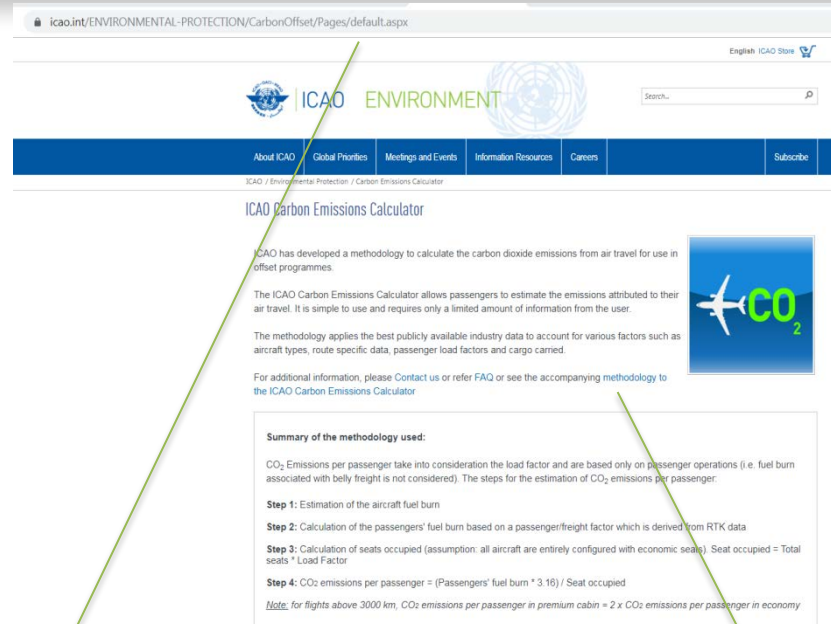
Available on the
public website





ICAO Carbon Emissions Calculator - Public Interface

- Transparent
- Easy-to-use
- Publicly available
- Delivers consistent estimates of CO₂ – suitable for use with offset programs
- Available since June 2008



<http://www.icao.int/ENVIRONMENTAL-PROTECTION/CarbonOffset/Pages/default.aspx>

[Link to Methodology](#)

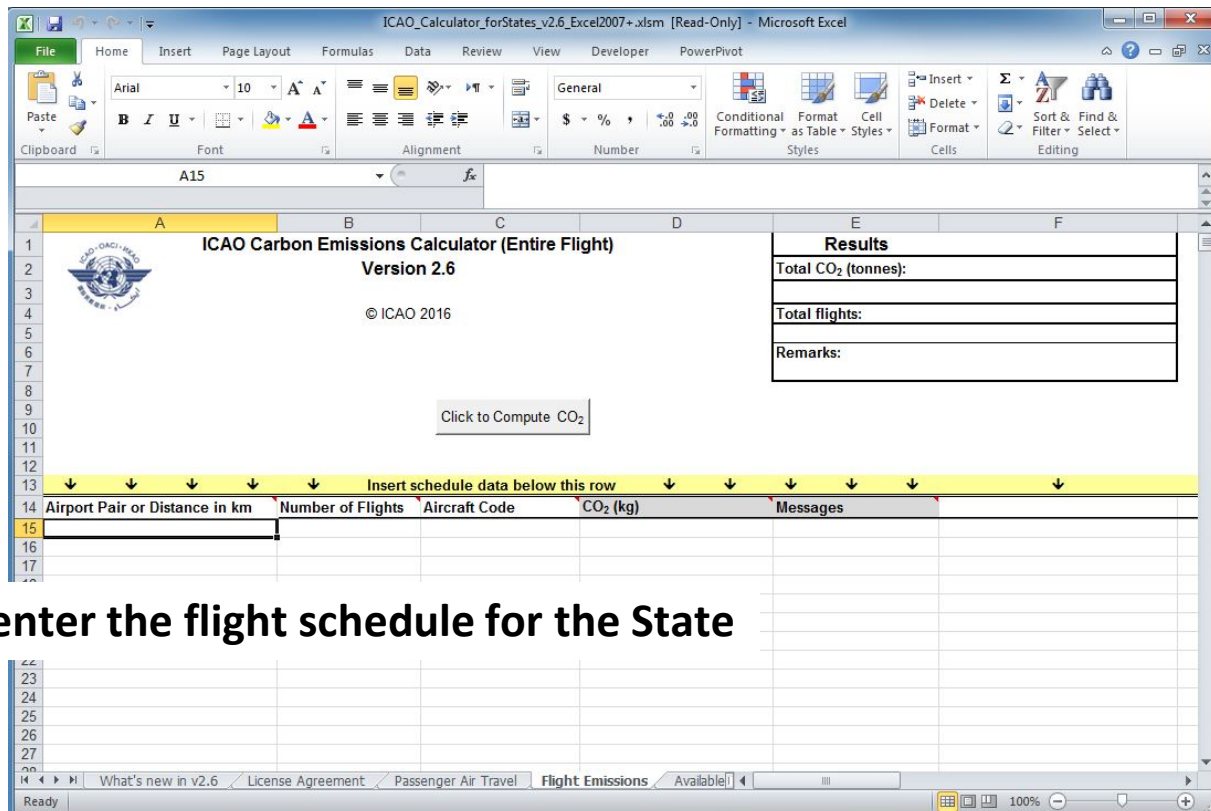


ICAO Carbon Emissions Calculator User Interface for Action Plans

Action Plan on Emissions Reduction



Available on the APER Website



1	ICAO Carbon Emissions Calculator (Entire Flight)				Results	
2	Version 2.6				Total CO ₂ (tonnes):	
3	© ICAO 2016				Total flights:	
4					Remarks:	
5						
6						
7						
8						
9						
10						
11						
12						
13	Insert schedule data below this row					
14	Airport Pair or Distance in km	Number of Flights	Aircraft Code	CO ₂ (kg)	Messages	
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						

Simply enter the flight schedule for the State



**Baseline
scenario**

**Mitigation
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**ICAO Carbon
Emissions Calculator**

ICAO Green Meeting Calculator

**Data from
State**

**Rules of
Thumb**

**IFSET
(ICAO Fuel Savings Estimation Tool)**

CERT



Estimating Fuel Savings from Operational Changes:

ICAO Fuel Savings Estimation Tool (IFSET)





ICAO Fuel Savings Estimation Tool

Description:

Operational measures are one of the instruments available to States to improve fuel efficiency and reduce CO₂ emissions.

The ICAO Fuel Savings Estimation Tool (IFSET) has been developed by the Secretariat with support from States and international organizations to assist the States to estimate fuel savings in a manner consistent with the models approved by CAEP and aligned with the Global Air Navigation Plan.

Input

ID	Action	From Alt (ft)	To Alt (ft)	Distance (nm)	Time (sec)
1	Taxi				1200
2	Climb	3000	20000	37	
3	Level	20000	20000	20	
4	Climb	20000	25000	20	

Add Delete

New Procedure Definition

ID	Action	From Alt (ft)	To Alt (ft)	Distance (nm)	Time (sec)
1	Taxi				1000
2	Climb	3000	25000	57	
3	Level	25000	25000	20	

Add Delete

Output

Estimated Fuel Changes Report				
Scenario Name	Old Fuel Consumption (KG)	New Fuel Consumption (KG)	Savings (KG)	Savings (%)
Example	1337600	1293000	-54500	-4.10

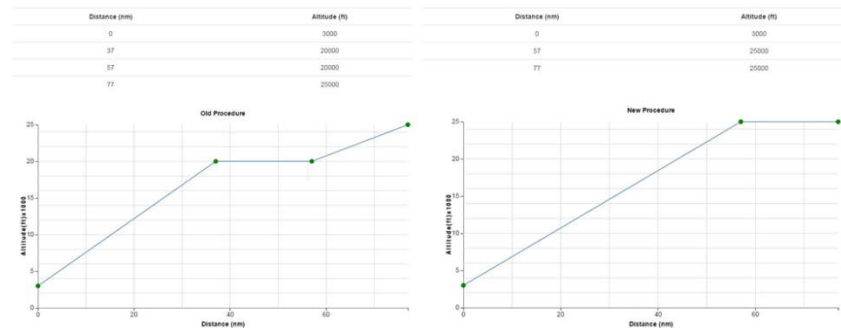
Estimated Detailed Fuel Changes Report		
Old Climb Fuel (KG)	New Climb Fuel (KG)	Climb Savings (KG)
923000	921000	-2100

Old Descent Fuel (KG)	New Descent Fuel (KG)	Descent Savings (KG)
0	0	0

Old Level Fuel (KG)	New Level Fuel (KG)	Level Savings (KG)
155800	146400	-9400

Old Taxi Fuel (KG)	New Taxi Fuel (KG)	Taxi Savings (KG)
258800	215600	-43100

Graphics





The tool can estimate:

- Effects of shortening / eliminating level segments on departure and approach
- Effects of shorter routes (either in time or distance)
- Effects of cruising at different altitudes
- Effects of reduced taxi times





- The tool **does not**:
 - Replace detailed modelling or measurement of fuel consumption
 - Estimate fuel consumption from airborne holding
 - Compute other elements than fuel consumption / CO₂ emissions



IFSET

How it Works: User Input

- Fleet mix defined for baseline and post-implementation scenario
 - Aircraft category
 - Aircraft remaining trip distance (optional parameter that will increase accuracy for departures)
- User selects “elements” to define the baseline and “new” procedure
- Tool estimates the change in total fuel consumption between the 2 scenarios



IFSET Example

Objective

Operational measures are one of the instruments available to States to improve fuel efficiency and reduce CO₂ emissions. The ICAO Fuel Savings Estimation Tool (IFSET) has been developed by the Secretariat with support from States and international organizations to assist the States to estimate fuel savings in a manner consistent with the models approved by CAEP and aligned with the Global Air Navigation Plan.

The ICAO Fuel Savings Estimation Tool (IFSET) is not intended to replace the use of detailed measurement or modelling of fuel savings, where those capabilities exist. Rather, it is provided to assist those States without such facilities to estimate the benefits from operational improvements in a harmonized way.

User Guide: [IFSET Ver 2.1 User Guide](#)

Please note that all the information saved in this web tool can be seen by the public. Therefore you should delete the event when you have finished using the tool.

New Scenario

Saved Scenario

Copyright 2011-2016 ICAO.

Step 1 - Define New Scenario

Scenario Name

ID	Aircraft	Base Flights	New Flights	Continuing Old Flights	Remaining Trip (nm)
1	Single Aisle Jet ▼	1000	1000	0	1160
2	Turboprop ▼	500	500	0	740
<div><div>Back</div><div>Aircraft Category Map</div><div>Add</div><div>Delete</div><div>Save</div><div>Next Step</div></div>					

Save any change on the page by clicking "Save" before clicking "Next Step".

Step 2 - Saved Old/New Procedure Definition

Scenario Name:

Old Procedure Definition

ID	Action	From Alt (ft)	To Alt (ft)	Distance (nm)	Time (sec)
1	Taxi				1200
2	Climb	3000	20000	37	
3	Level	20000	20000	20	
4	Climb	20000	25000	20	
				Add	Delete

New Procedure Definition

ID	Action	From Alt (ft)	To Alt (ft)	Distance (nm)	Time (sec)
1	Taxi				1000
2	Climb	3000	25000	57	
3	Level	25000	25000	20	
				Add	Delete

Back

Reset

Save

Calculate

Step 3 - Estimated Fuel Changes Report

Scenario Name:

Distance (nm)

0

37

57

77

Altitude (ft)

3000

20000

20000

25000

Distance (nm)

0

57

77

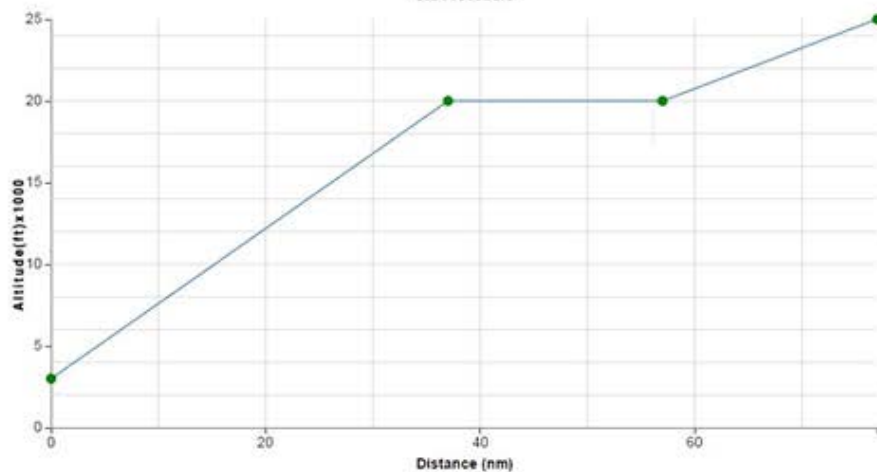
Altitude (ft)

3000

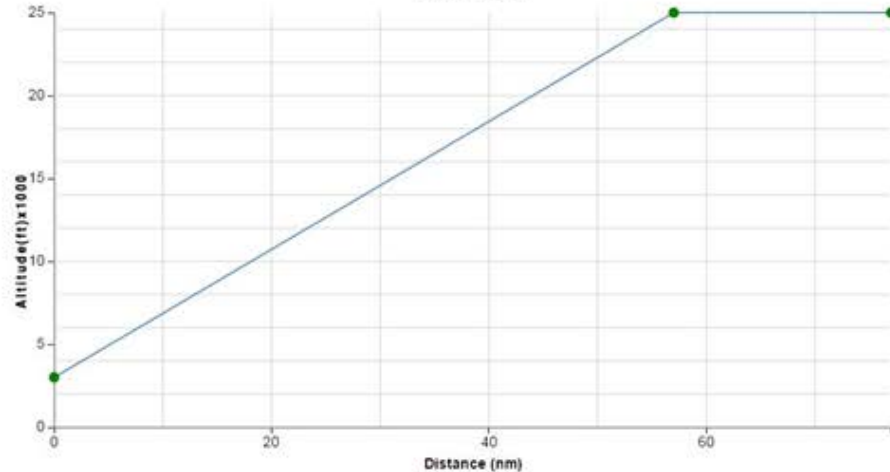
25000

25000

Old Procedure



New Procedure





Estimated Fuel Changes Report

Scenario Name	Old Fuel Consumption (KG)	New Fuel Consumption (KG)	Savings (KG)	Savings (%)
Example	1337600	1283000	-54500	-4.10

Estimated Detailed Fuel Changes Report

Old Climb Fuel (KG)	New Climb Fuel (KG)	Climb Savings (KG)
923000	921000	-2100

Old Descent Fuel (KG)	New Descent Fuel (KG)	Descent Savings (KG)
0	0	0

Old Level Fuel (KG)	New Level Fuel (KG)	Level Savings (KG)
155800	146400	-9400

Old Taxi Fuel (KG)	New Taxi Fuel (KG)	Taxi Savings (KG)
258800	215600	-43100

Back

Export to Excel



IFSET - In Summary

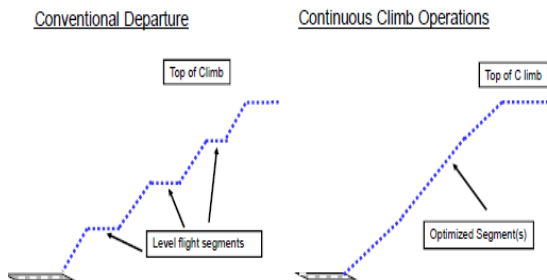
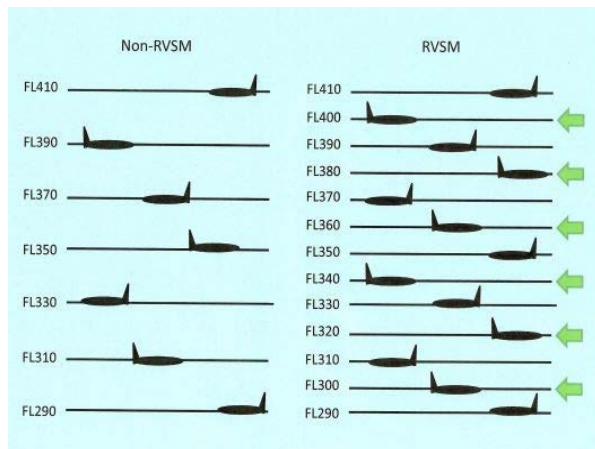
Operational Measure
Implementation (planned or
post)

+

Need to quantify change in
fuel consumption, but don't
have the tools?

=

USE
IFSET





**Baseline
scenario**

**Mitigation
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**Expected
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**ICAO Carbon
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ICAO Green Meeting Calculator

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(ICAO Fuel Savings Estimation Tool)**

CERT



ICAO CO₂ Estimation and Reporting Tool CERT





CO₂ Estimation & Reporting Tool (CERT)

Version 2019

Step 2. CO₂ emissions estimation

Summary of assessment of applicability of CORSIA and eligibility to use the ICAO CORSIA CERT in 2020

Back
Home
Next

Steps:

- 2.1 Collect flight information (aircraft type, aerodromes of origin and destination) for all flights during the relevant time period.
- 2.2 Enter the information for all flights by double clicking on the green cells below.
Note: For a given aerodrome pair flown by a particular aircraft type, all flights can be entered as a single entry by entering total number of flights during the relevant time period.
Note: Data can also be copied and pasted across input cells as needed
Note: Data can also be imported from a csv file, structured to match the contents under the INPUT section below.
- 2.3 After entering input, compute CO₂ emissions. Click on →
- 2.4 After computing CO₂ emissions, generate a summary assessment of applicability of CORSIA and eligibility to use the ICAO CORSIA CERT in 2019. Click on →

Import Input File (.csv)

Estimate CO₂ Emissions

3. Generate Summary Assessment

INPUT					OUTPUT			
Date (Optional)	Flight ID (Optional)	ICAO Aircraft Type Designator Search Aircraft Code Custom AC	Origin Aerodrome Search Aerodrome Custom AP	Destination Aerodrome Search Aerodrome Custom AP	Number of Flights	Great Circle Distance (in km)	CO ₂ Emissions (in tonnes of CO ₂)	Flight(s) subject to Scope of Applicability of CORSIA



ICAO CORSIA CO₂ Estimation and Reporting Tool (CERT)

Description:

The ICAO CORSIA CERT is one of the five ICAO CORSIA Implementation Elements and is reflected in the ICAO document entitled "ICAO CORSIA CO₂ Estimation and Reporting Tool", referenced in Annex 16, Volume IV.

The ICAO CORSIA CERT supports aeroplane operators in fulfilling their monitoring and reporting requirements in CORSIA by populating the standardized Emissions Monitoring Plan and Emissions Report templates.

© ICAO 2019



CORSIA CO₂ Estimation & Reporting Tool (CERT)

Version 2019

Step 2. CO₂ emissions estimation
Summary of assessment of applicability of CORSIA and eligibility to use the ICAO CORSIA CERT in 2020

Back Home Next

Steps:

- 2.a Collect flight information (aircraft type, aerodromes of origin and destination) for all flights during the relevant time period.
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Note: Data can also be copied and pasted across input cells as needed.
Note: Data can also be imported from a csv file, structured to match the contents under the INPUT section below.
- 2.c After entering input, compute CO₂ emissions. Click on →
- 2.d After computing CO₂ emissions, generate a summary assessment of applicability of CORSIA and eligibility to use the ICAO CORSIA CERT in 2019. Click on →

Import Input File (.csv)

Estimate CO₂ Emissions

3. Generate Summary Assessment

INPUT					OUTPUT		
Date (Optional)	Flight ID (Optional)	ICAO Aircraft Type Designator Search Aircraft Code Custom AC	Origin Aerodrome Search Aerodrome Custom AP	Destination Aerodrome Number of Flights	Great Circle Distance (in km)	CO ₂ Emissions (in tonnes of CO ₂)	Flight(s) subject to Scope of Applicability of CORSIA



ICAO E-Learning Training Tutorial





ICAO UNITAR Online Training Tutorial



UN CC:e-Learn

Think, Talk, Act Climate

www.icao.int/environmental-protection

<https://unccelearn.org>



This e-tutorial aims to build an understanding of the importance of States' Action Plans in the civil aviation sector.

It shows how, by adopting the right "basket of measures" in the aviation sector, according to their own contexts, States can mitigate the Greenhouse Gas Emissions from international aviation .



Tutorial



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PROJECT FUNDED BY




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United Nations Institute for Training and Research

2/22



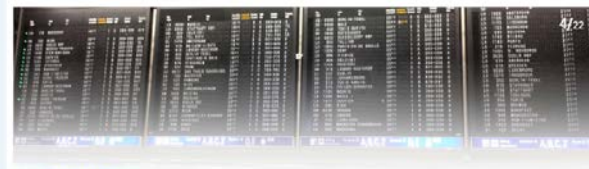
WELCOME!

This e-tutorial aims to familiarize you with States' Action Plans on CO₂ Emissions Reduction from International Aviation. By the end of the tutorial, you should be able to:

1. Define the activities related to the development of a State Action Plan
2. Explain why it is important to develop a State Action Plan
3. Describe the main information which should be included in a State Action Plan

This e-tutorial was produced with the financial assistance of the European Union. The views expressed herein can in no way be taken to reflect the official opinion of the European Union.

Tutorial



OVERVIEW



SECTION 1: Introduction



SECTION 2: What is a State Action Plan



SECTION 3: Elements of a State Action Plan



SECTION 4: Potential Mitigation Measures

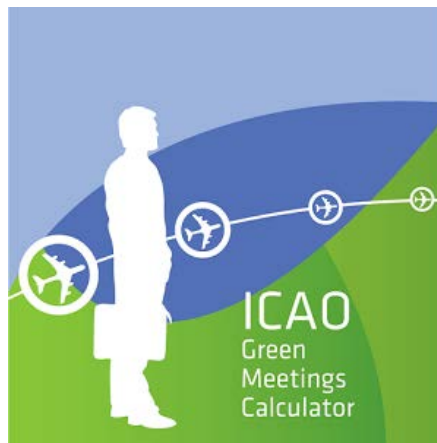


SECTION 5: Assistance to States





Planning Meeting Locations: ICAO Green Meetings Calculator



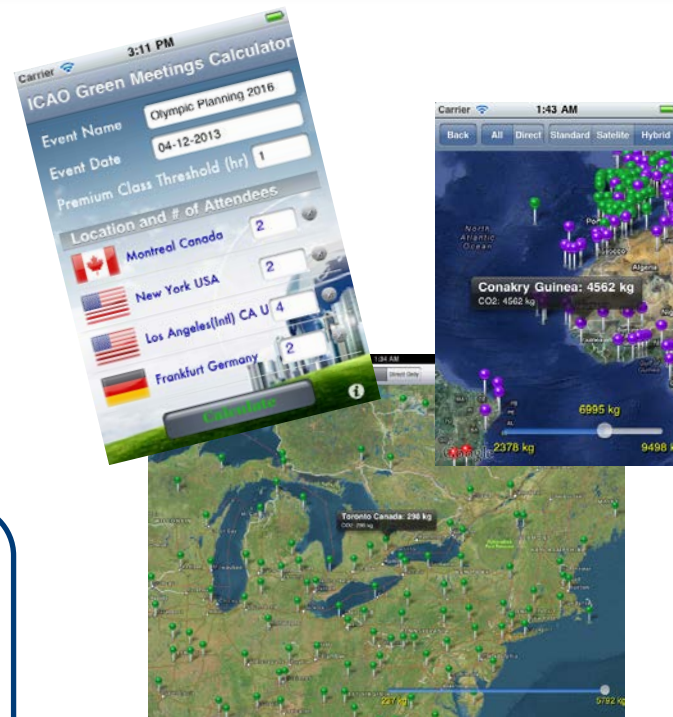


ICAO Green Meeting Calculator

Description:

The ICAO Green Meetings Calculator (IGMC) is a tool developed in response to request from UN Travel Offices designed to support decision-making in reducing the carbon emissions from air travel to attend meetings.

The software generates an optimal location for a meeting in terms of CO₂ emissions, taking into consideration the city of origin and the number of participants, as well as other parameters. While many factors may affect the decision for where a meeting should be held, the calculator helps facilitate the planning process.

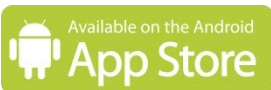


(New interface and new functionalities under development)



All of ICAO's environmental tools are available
free of charge from:

<http://www.icao.int/env>



**The special interface to the ICAO Carbon Emissions Calculator is available through the APER portal.*



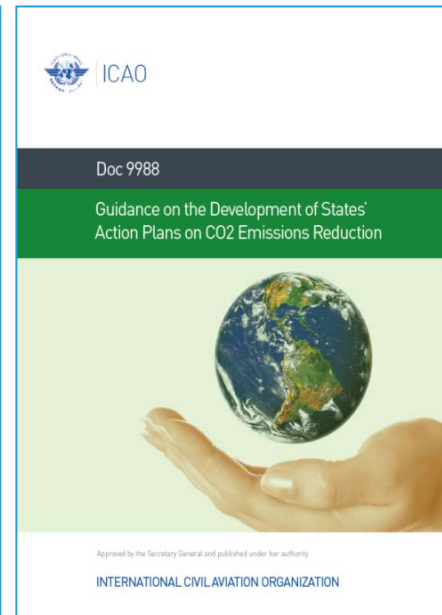
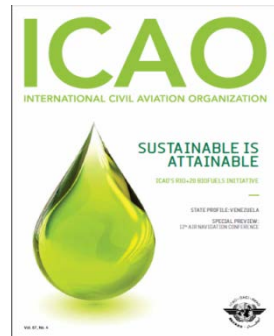
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Additional Information



For more information, please visit our website: <http://www.icao.int/env>



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South American
(SAM) Office
Lima

ICAO
Headquarters
Montréal

Western and
Central African
(WACAF) Office
Dakar

European and
North Atlantic
(EUR/NAT) Office
Paris

Middle East
(MID) Office
Cairo

Eastern and
Southern African
(ESAF) Office
Nairobi

Asia and Pacific
(APAC) Sub-office
Beijing

Asia and Pacific
(APAC) Office
Bangkok



THANK YOU