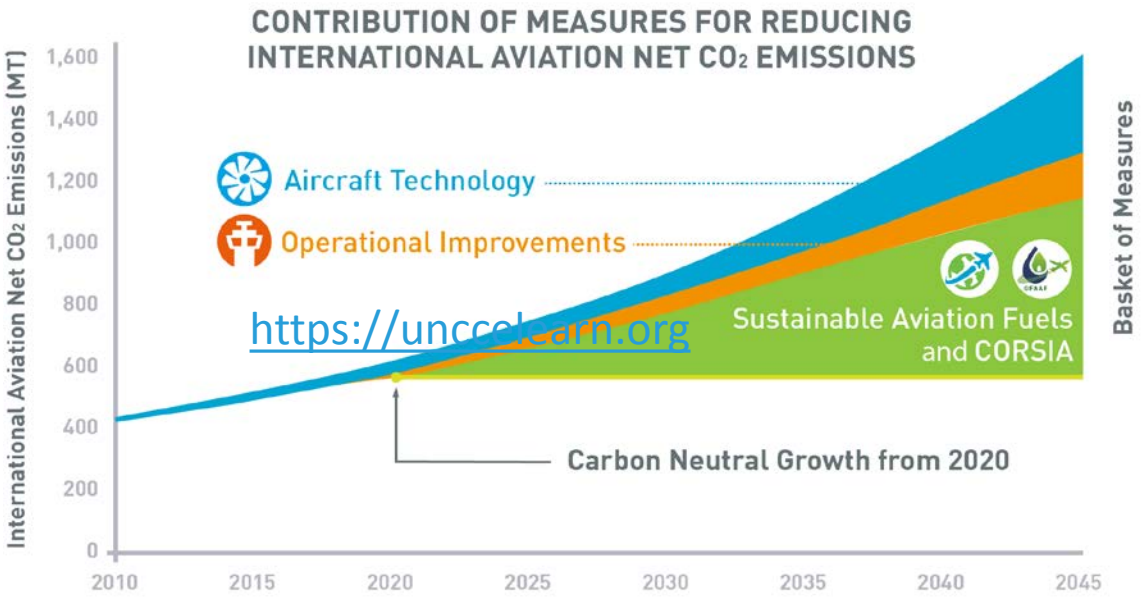
ICAO Supporting Tools - Publicly available

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.

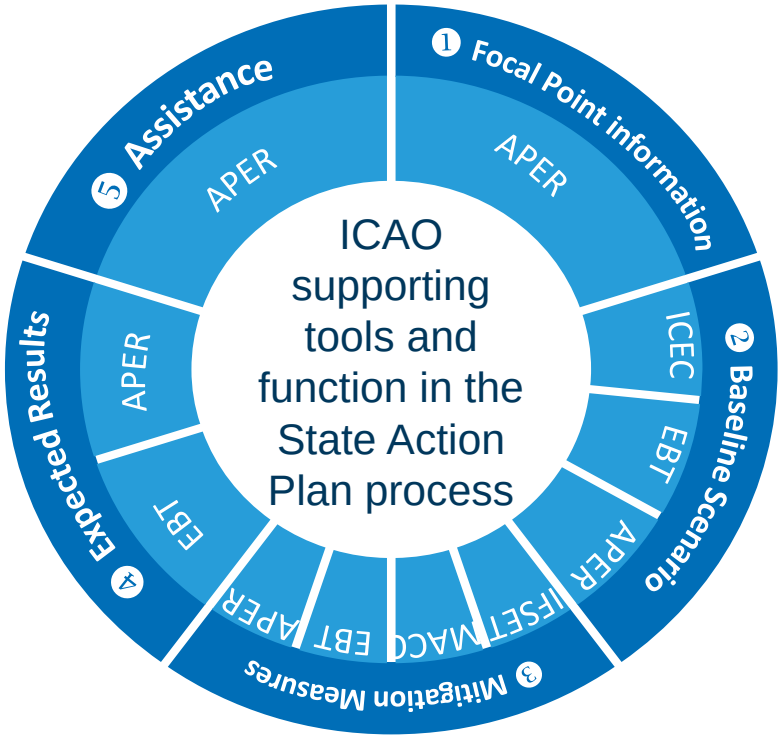
CO2 Emissions Trends



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 CO_2 emissions from their air travel

ICAO Fuel Savings Estimation Tool (IFSET)

To assist States in estimating fuel savings from operational improvements

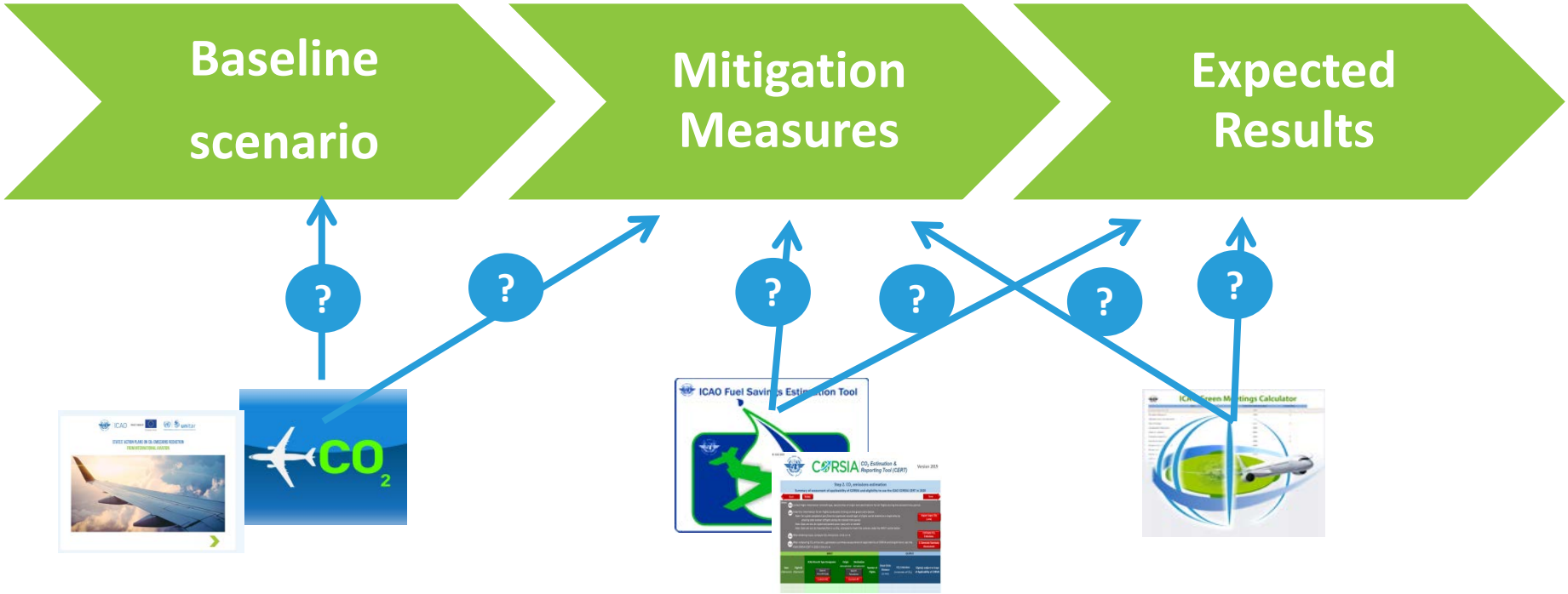
ICAO CORSIA CO2 Estimation and Reporting Tool (CERT)

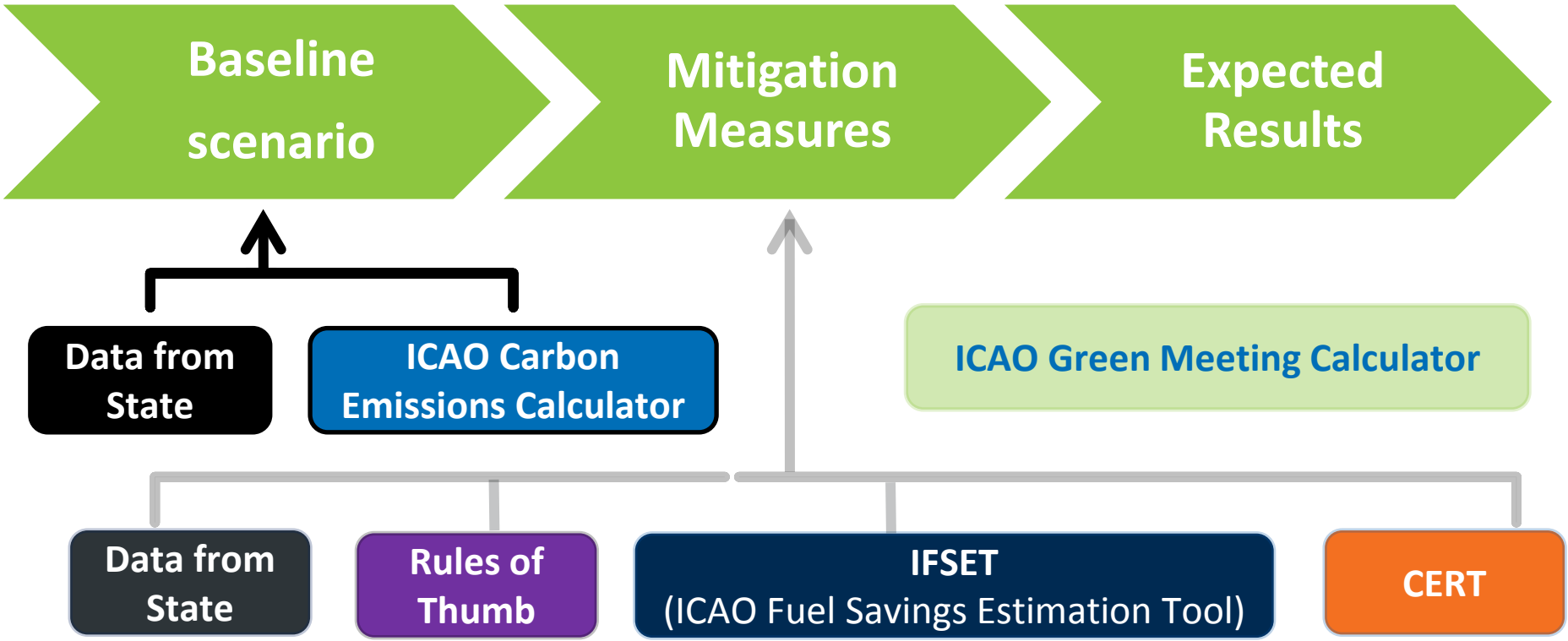
To assist States and aeroplanes operators - monitoring and reporting requirements

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

ICAO Green Meetings Calculator

To support decision making in minimizing CO_2 emissions from air travel to attend meetings


Baseline scenario
Mitigation Measures
Expected Results
?
?
?
?
?
?
CO2
ICAO Fuel Savings Estimation Tool
CORSIA CO2 Estimation & Reporting Tool (CERT)


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 CO_2 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

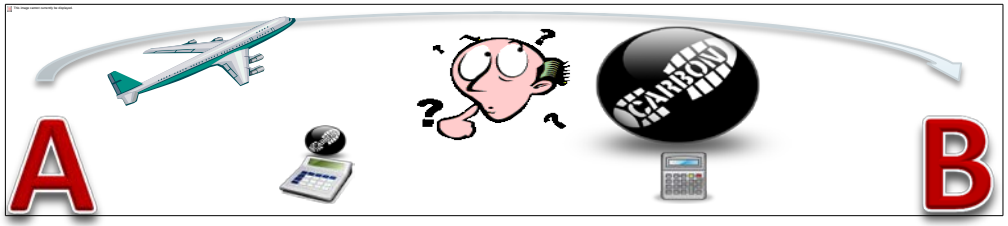
Dep Airport	Arr Airport	Number of passengers	Cabin Class	Trip	Aircraft Fuel Burn/journey (KG)[ab]	Total passengers' CO2/journey (KG)[c]
GVA	YUL	1	Economy	One Way	46048.4	318.2

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



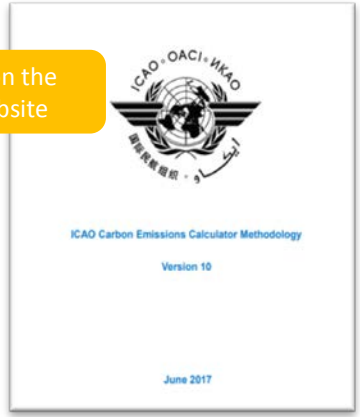
ICAO Carbon Emissions Calculator Methodology

- **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.)

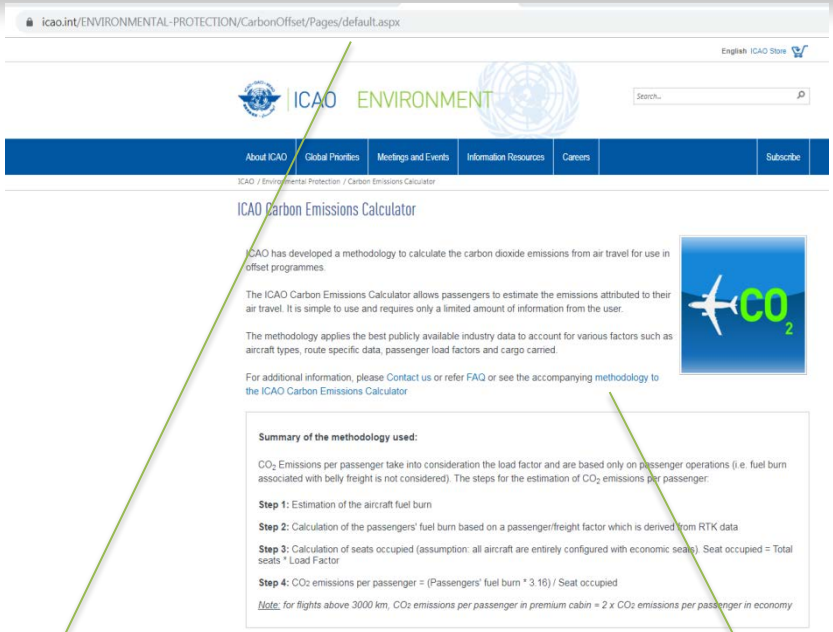
- **Methodology Developed through CAEP**
- **Expert input provided from**
  - ICAO Secretariat
  - ICAO Member States
  - Universities
  - NGOs
  - International Air Transport Association – IATA (Airlines)
  - International Coordinating Council of Aerospace Industries Associations – ICCAIA (Manufacturers)
- **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 CO_2 – suitable for use with offset programs
- Available since June 2008



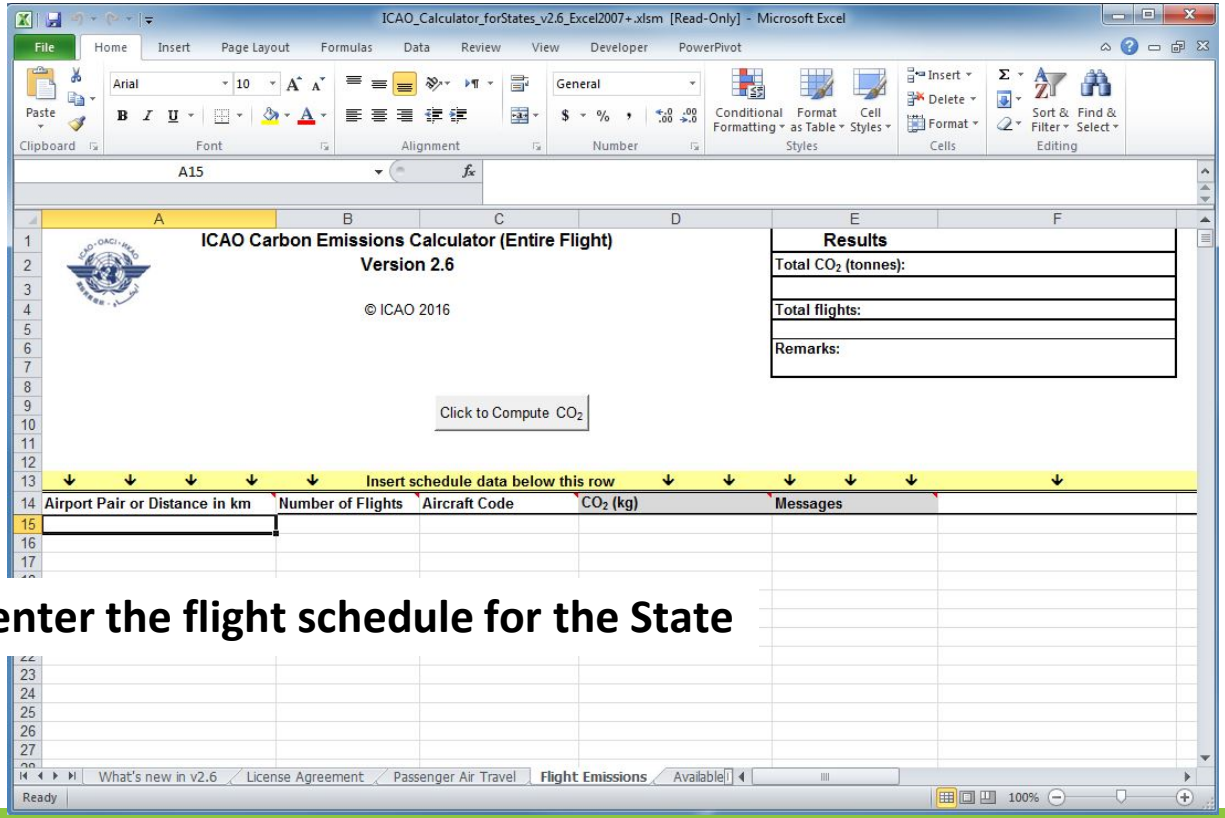
http://www.icao.int/ENVIRONMENTAL-PROTECTION/CarbonOffset/Pages/default.aspx

Link to Methodology

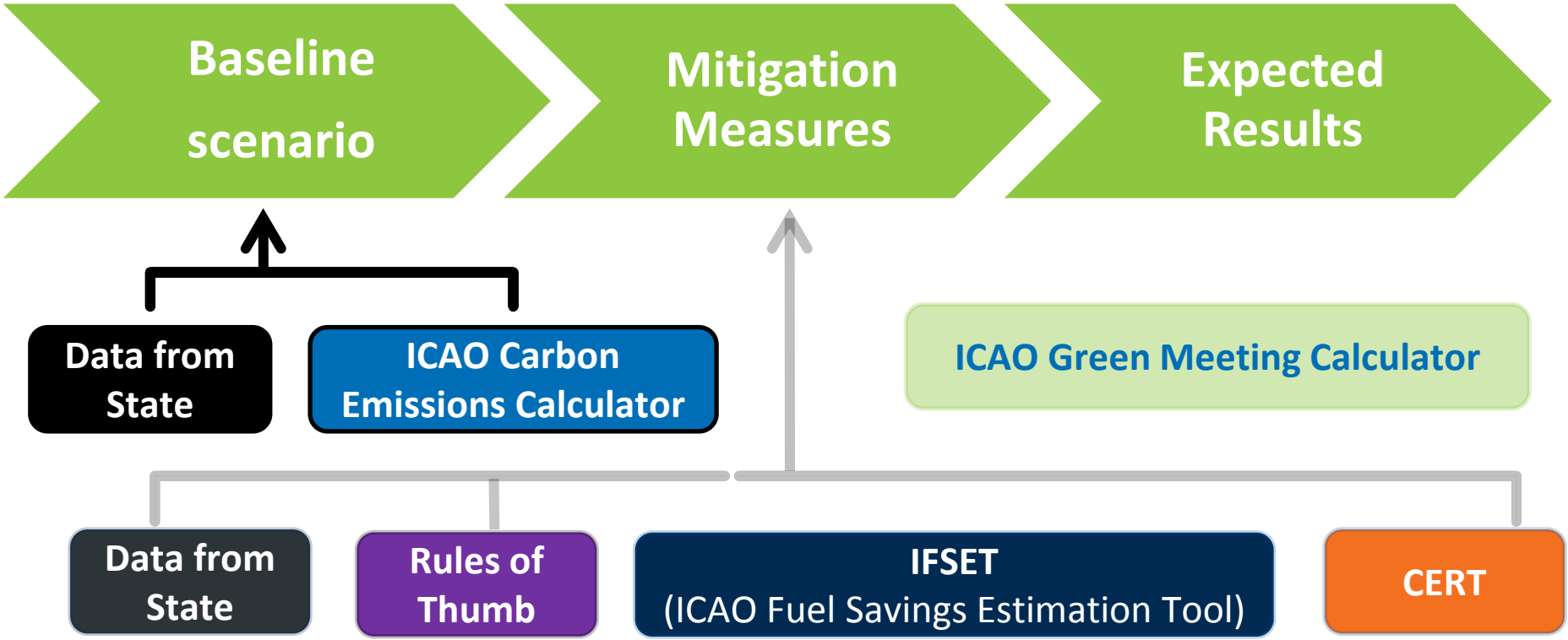
ICAO Carbon Emissions Calculator User Interface for Action Plans

Action Plan on Emissions Reduction

Available on the APER Website



Simply enter the flight schedule for the State


Baseline scenario
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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

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

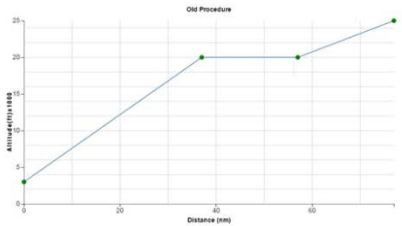
Scenario Name	Old Fuel Consumption (KG)	New Fuel Consumption (KG)	Savings (KG)	Savings (%)
Example	1337600	1283000	-54500	-4.10

Estimated Detailed Fuel Changes Report

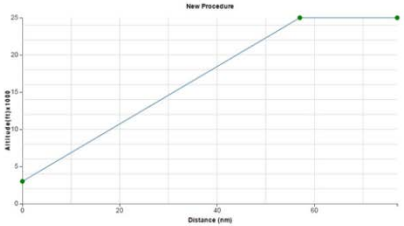
Old Climb Fuel (KG)	New Climb Fuel (KG)	Climb Savings (KG)
923000	921000	-2100
Old Descent Fuel (KG)	**New Descent Fuel (KG)**	**Descent Savings (KG)**
0	0	0
Old Level Fuel (KG)	**New Level Fuel (KG)**	**Level Savings (KG)**
155800	146400	-9400
Old Taxi Fuel (KG)	**New Taxi Fuel (KG)**	**Taxi Savings (KG)**
258800	215600	-43100

Graphics

Distance (nm)	Altitude (ft)
0	3000
37	20000
57	20000
77	25000



Distance (nm)	Altitude (ft)
0	3000
57	25000
77	25000



Description:

Operational measures are one of the instruments available to States to improve fuel efficiency and reduce CO_2 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 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 / CO_2 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

Example (cont.)

Step 1 - Define New Scenario

Scenario Name Example

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

Back | Aircraft Category Map | Add | Delete | Save | Next Step

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

Example (cont.)

Step 2 - Saved Old/New Procedure Definition

Scenario Name: Example

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

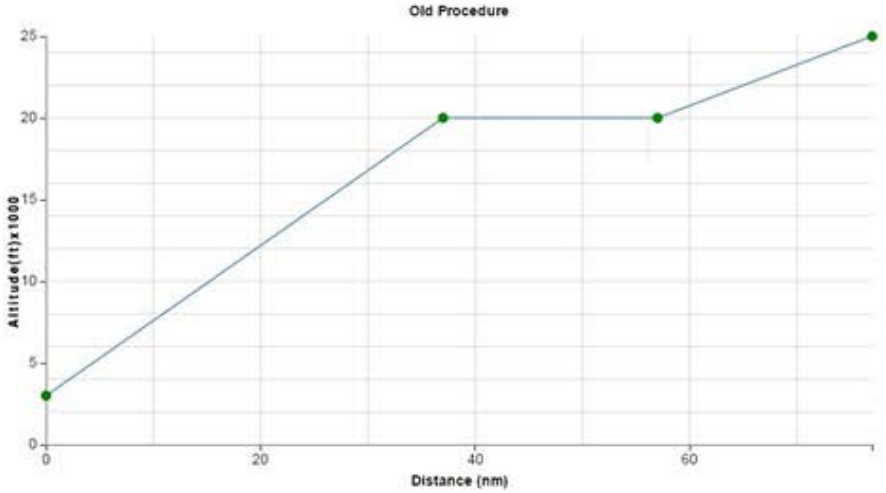
Sample Graphical View

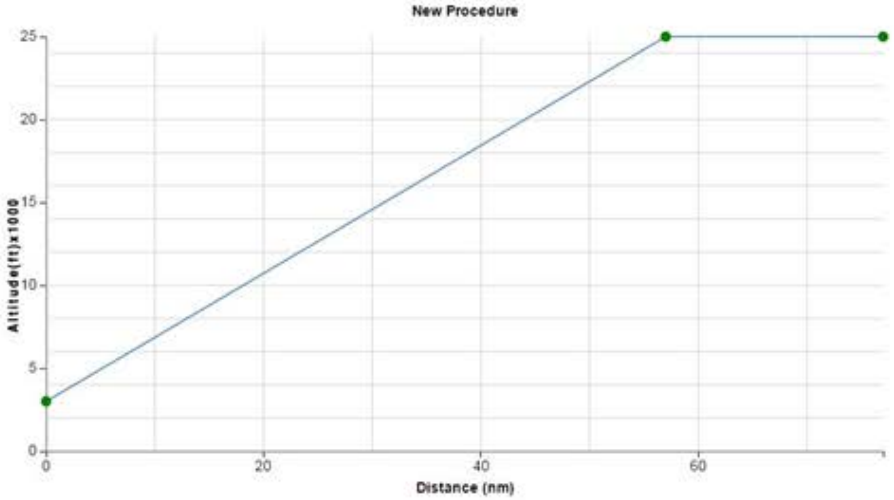
Step 3 - Estimated Fuel Changes Report

Scenario Name: Example

Distance (nm)	Altitude (ft)
0	3000
37	20000
57	20000
77	25000

Distance (nm)	Altitude (ft)
0	3000
57	25000
77	25000





Example Results

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

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

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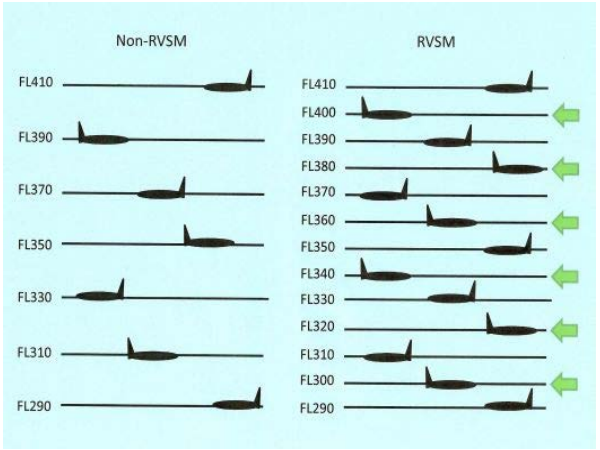
155800	146400	-9400

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

Back

Export to Excel

IFSET - In Summary



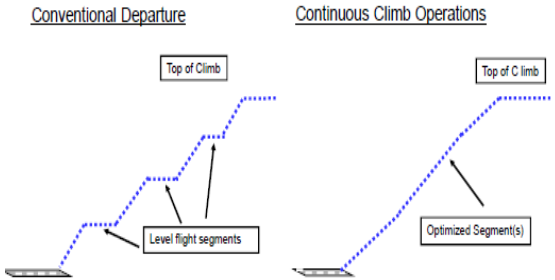
Operational Measure Implementation (planned or post)

+

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

=

USE IFSET



Baseline scenario

Mitigation 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

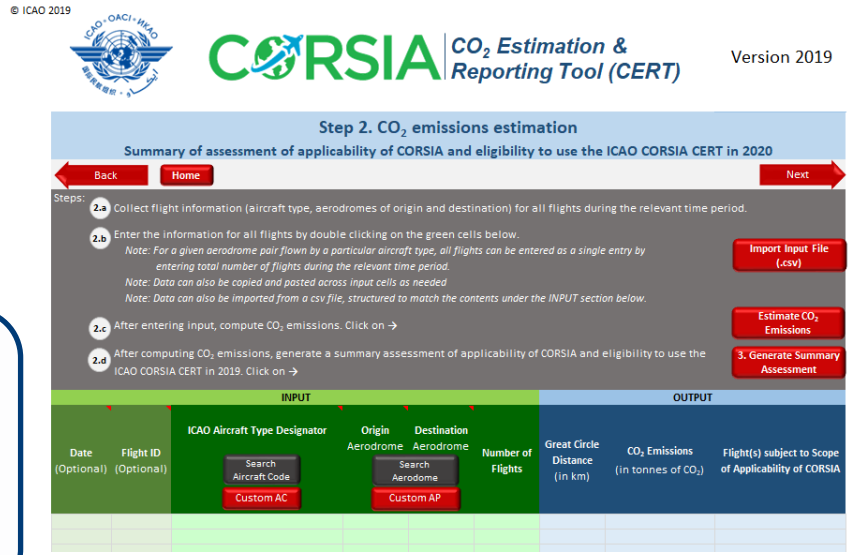
ICAO CO_2 Estimation and Reporting Tool CERT

ICAO CORSIA CO_2 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 CO_2 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 E-Learning Training Tutorial

ICAO UNITAR Online Training Tutorial

UN CC:e-Learn
Think, Talk, Act Climate

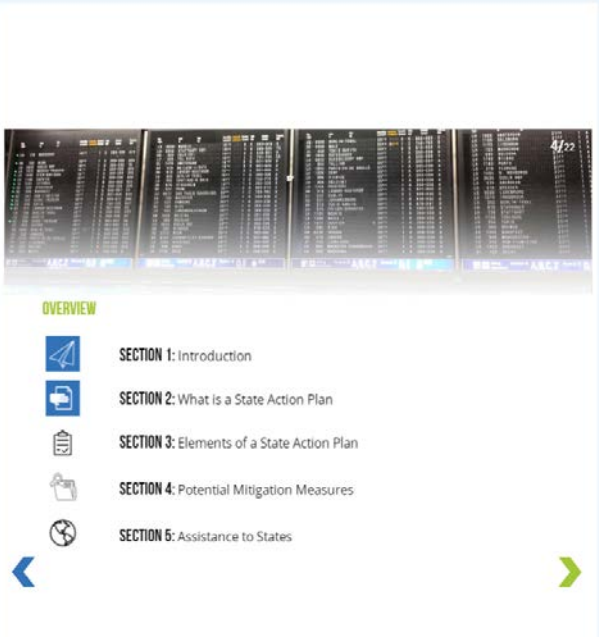
www.icao.int/environmental-protection

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 .

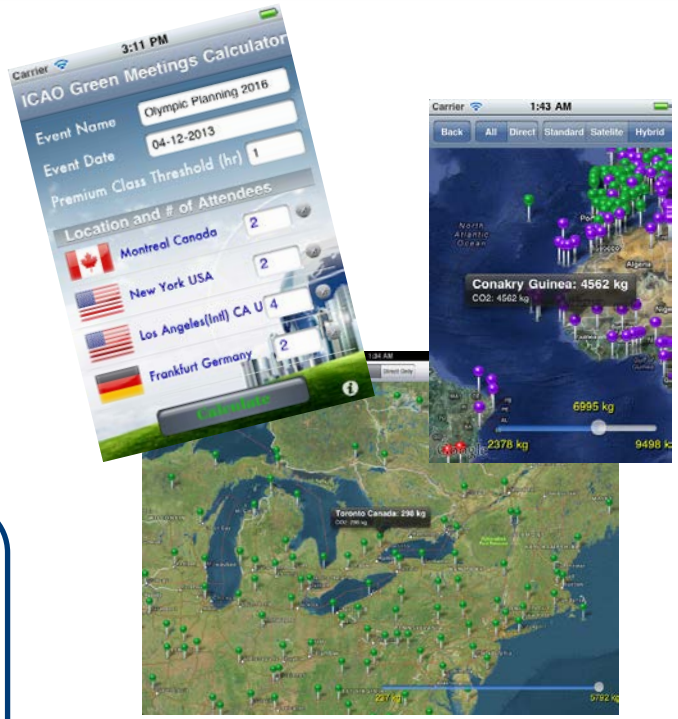
Tutorial

Tutorial



Planning Meeting Locations: ICAO Green Meetings Calculator

ICAO Green Meeting Calculator



(New interface and new functionalities under development)

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.

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

http://www.icao.int/env

Designed for Windows 7, Vista, XP

Available on the App Store

Available on the Android App Store

Designed for Windows 7, Vista, XP

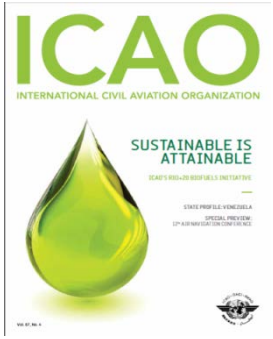
Designed for Windows 7, Vista, XP

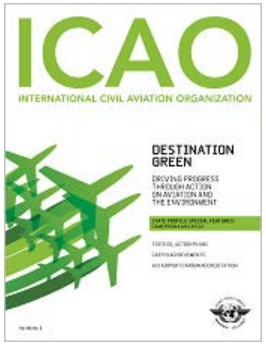
Available on the App Store

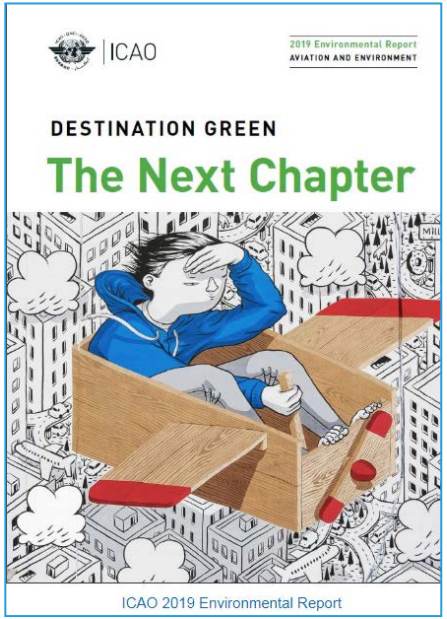
Available on the Android App Store

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

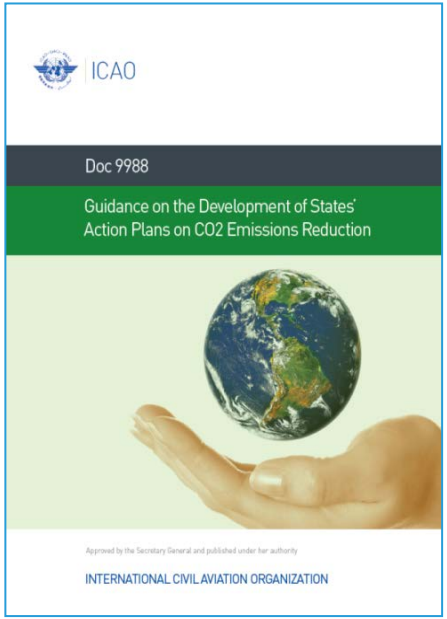
Additional Information







ICAO 2019 Environmental Report



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

ICAO