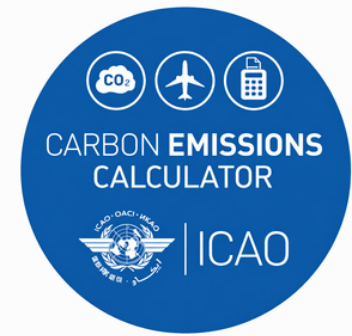




| ICAO



UNITED NATIONS INTERFACE TO THE ICAO CARBON EMISSIONS CALCULATOR

USER GUIDE

VERSION 6.0

INTERNATIONAL CIVIL AVIATION ORGANIZATION
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1. INTRODUCTION

Welcome to the **United Nations Interface to the ICAO Carbon Emissions Calculator (UN ICEC)**. This impartial, peer-reviewed ICAO Calculator estimates carbon dioxide (CO₂) emissions from air travel. This interface allows UN agencies to estimate the CO₂ emissions attributed to their organization's air travel through a simple interface that only requires inputs on the origin and destination airports and the cabin class. The UN ICEC methodology applies the best publicly available industry data to account for various parameters, such as aircraft type, route-specific information, passenger load factor, and cargo carried.

The following sections describe how to use the UN interface for the ICAO Carbon Emissions Calculator (in MS Excel and API – Application Programming Interface versions) to support the preparation of inventories under the Climate Neutral UN initiative. A public interface to the ICAO Calculator, along with detailed information on the methodology used, is available on the ICAO Carbon Emissions Calculator website.¹

2. SYSTEM REQUIREMENTS

The UN ICEC requires at least Microsoft Windows XP with Service Pack 2 and Microsoft Excel 2003. Devices (desktops, laptops, or tablets) that do not meet these requirements cannot run the interface.

3. DATA REQUIREMENTS

To generate an inventory of air travel CO₂ emissions, the following information is required:

- i. The complete routing for each trip, using the 3-letter IATA airport codes² (for example, a trip from Geneva to Nairobi that connects in Amsterdam would be specified as GVA/AMS/NBO).
- ii. The class of service used: Economy, Premium Economy, Business, and First.

This information is typically available directly from your Enterprise Resource Planning (ERP) system, such as ATLAS, IMIS, etc. or from your travel agency.



The UN ICEC does not support train station codes or city codes.

¹ ICAO Carbon Emissions Calculator website: <https://www.icao.int/environmental-protection/environmental-tools/icec>

² IATA Airport codes: <https://www.iata.org/en/publications/directories/code-search/>

4. INSTALLATION

The zipped file you received from the Sustainable UN (SUN) Team includes the two files needed to run the Calculator.

- i. Extract the files
 - Right-click on the .zip file
 - Select “Extract All...”
 - Choose the folder on your computer and click Extract.
- ii. Open the calculator
 - Open the extracted folder
 - Double-click in the Excel file (.xlsm) to launch the calculator



Keep the files together

- ✓ *The Excel (.xlsm) file and the Access database (.db) file must stay in the same folder for the Calculator to work correctly.*
-
-



Important – Save and run locally

- ✓ *Make sure the folder is on your **local computer** (for example: C:\Downloads\ICAO_Calculator)*
 - ✓ ***Do not run or save the files directly from OneDrive, SharePoint, Teams, or other cloud drives.***
 - ✓ *Running the Calculator from cloud locations may cause errors or prevent it from working.*
-
-

5. GETTING STARTED

Double-click the Excel file **UN_ICAO_Calculator_v6.0.xlsm** to start working. Once the spreadsheet has been opened, depending on the security settings you have specified in Excel, you will be prompted to “*Enable Content*” (see Figure 1) to run the Calculator.

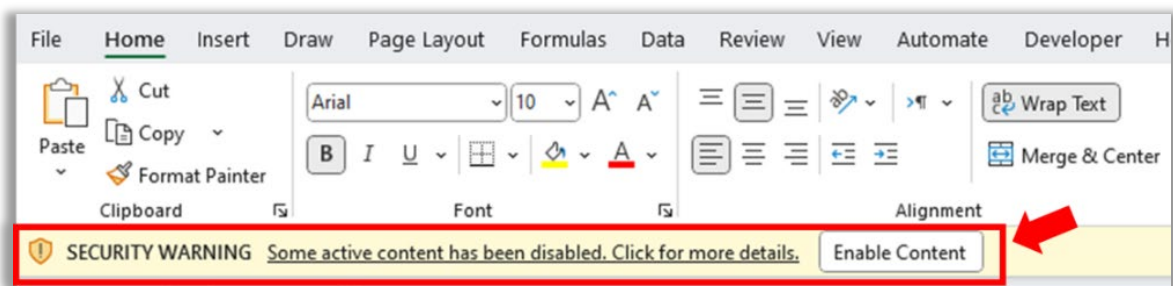


Figure 1. Excel Security warning to “Enable Content”.



If you are not given the option to Enable Macros or do not see any additional tabs after accepting the license agreement (see below), follow these instructions: Instructions for Office 2010 and later (including Microsoft 365)

- ✓ When opening the document, you may see a security warning in the left-hand corner of the screen (just below the toolbar), stating: “Some active content has been disabled”.
- ✓ Click the “Enable Content” button.

5.1. What is new in v6.0

The release notes (see Figure 2) provide an overview of the key enhancements and updates introduced in Version 6.0 of the UN-ICEC, compared with the previous version. These include methodological improvements, updated datasets, and new functionalities aimed at increasing the accuracy, consistency, and usability of the emissions calculations.

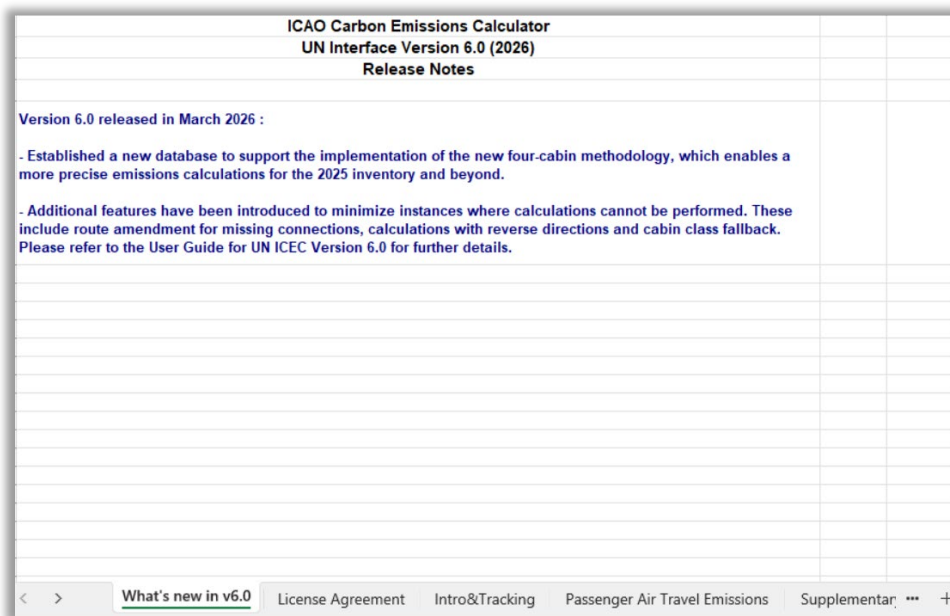


Figure 2. Release notes UN ICEC v6.0.

5.2. License agreement

After opening the UN ICEC in MS Excel, please read the license agreement (see Figure 3) and check the box indicating that you accept the terms of the agreement. This interface is for the exclusive use by UN bodies in support of the UN Climate Neutral.

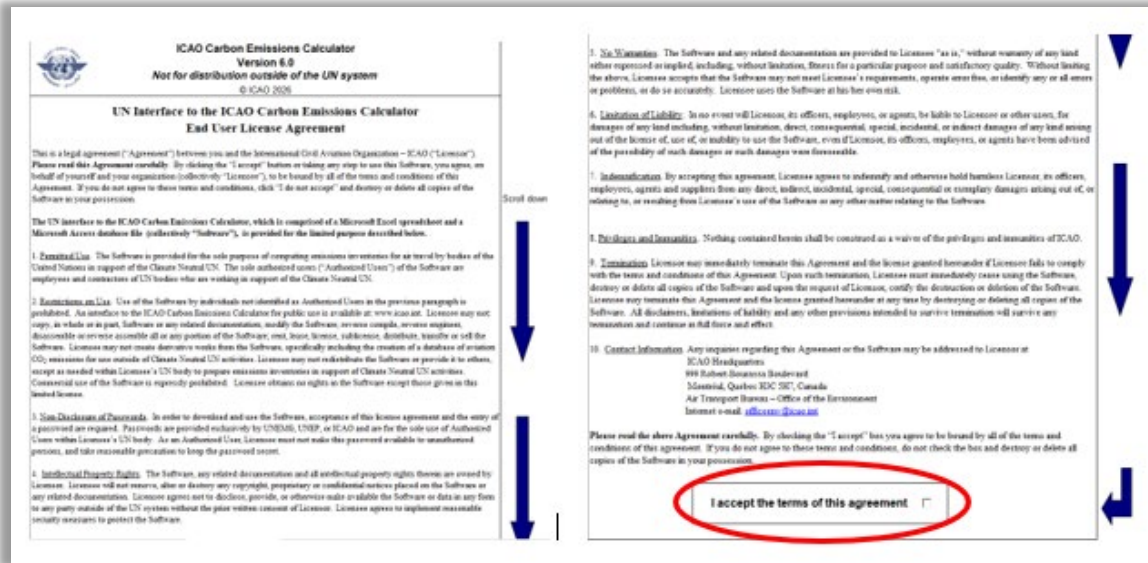


Figure 3. UN ICEC End User License Agreement.

6. INTRODUCTION AND TRACKING

After accepting the terms of the license agreement, a new tab will open in the spreadsheet called “Intro&Tracking” (see Figure 4).

Figure 4. Contact information and reporting period in the Intro&Tracking Tab.



- ✓ You must select the correct reporting period on this tab, as that will determine which emissions are generated.
- ✓ UN ICEC version 6.0 is meant for the 2025 inventory and should not be used to recalculate prior inventories.

This tab also allows you to enter contact information for the inventory that you are preparing. After entering the required information on the “Intro&Tracking” tab:

- Select File.
- Click “Save As...” to save your information using your preferred convention, for example:
 - AIR-[Agency Name]-[Loc]-[ReportingYear].xls, for example, AIR-UNDP-NY-2025.xls

7. CALCULATING THE INVENTORY

To generate an inventory of air travel CO₂ emissions, the following information is required:

- i. The complete routing for each trip, using the 3-letter IATA airport codes³ (for example, a trip from Geneva to Nairobi that connects in Amsterdam would be specified as GVA/AMS/NBO). The calculator does not support train station codes or city codes. For reference, official airport codes are listed in ICAO Doc 7910 (Location Indicators by State).
- ii. ⁴
- iii. The class of service used: Economy, Premium Economy, Business, and First. To split the routing, such as GVA/AMS and AMS/NBO, to obtain the most accurate results.

This information is typically available directly from your Enterprise Resource Planning (ERP) system, such as ATLAS, IMIS, etc. or from your travel agency.



To facilitate the input of this information into the Calculator, it is generally possible to copy and paste an entire set of travel records from the ERP directly into the spreadsheet.

7.1. Generate an inventory

- i. Open the Tab titled “Passenger Air Travel Emissions” (see Figure 5).

³ IATA airport codes: <https://www.iata.org/en/publications/directories/code-search/>

⁴ ICAO Document 7910 (Location indicators): <https://store.icao.int/en/catalogsearch/result/?q=7910>

- ii. Starting from row 14, enter your route pairs (see [1] area in Figure 5) and cabin class (see [2] area in Figure 5), using the following cabin class codes:
 - **Y** — Economy
 - **W** — Premium Economy
 - **C** — Business
 - **F** — First.

Specify the separator used to separate airport codes (for example, “/” or “-”).

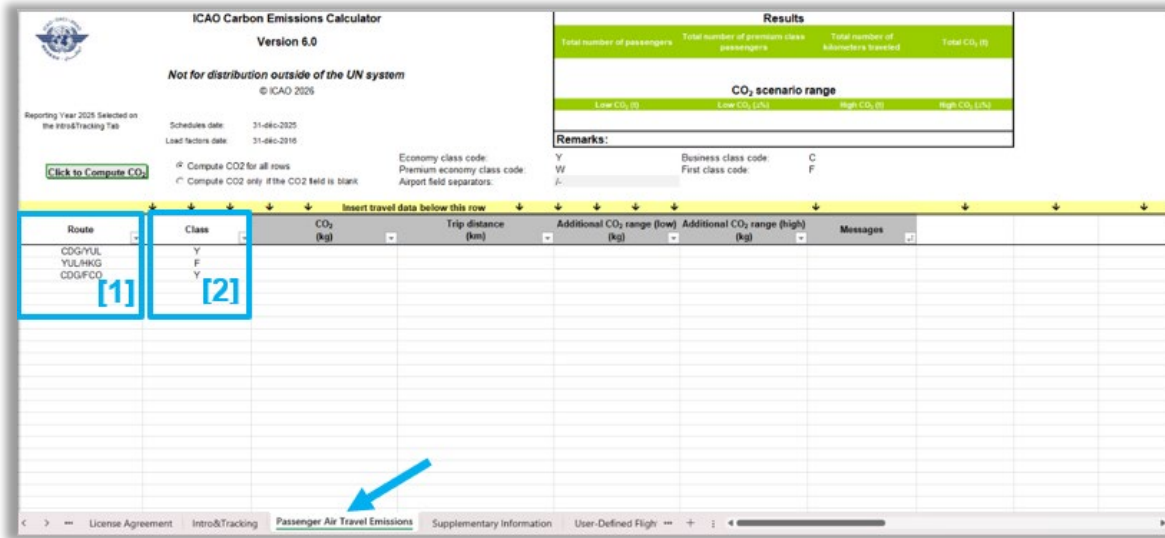


Figure 5. Passenger Air Travel Emissions Tab.



Using the wrong separator may result in **unrecognized route pairs** and **incorrect carbon emissions estimates**.

Please ensure that there are no typos in the inputs to prevent processing errors.

- iii. Save your file.
- iv. Click the “Click to Compute CO₂” button to calculate carbon emissions based on selected route pairs and cabin classes.



✓ If one of the two following separators // or /- is used, then this route pair will not be considered. i.e., if the flight YUL-GVA//ZRH-NBO is entered, the leg GVA/ZRH is not considered.

✓ If a “.” is used all legs after are not considered. i.e. if flight YUL-GVA.ZRH-NBO is entered, only the leg YUL-GVA is considered.

8. UNDERSTANDING THE RESULTS

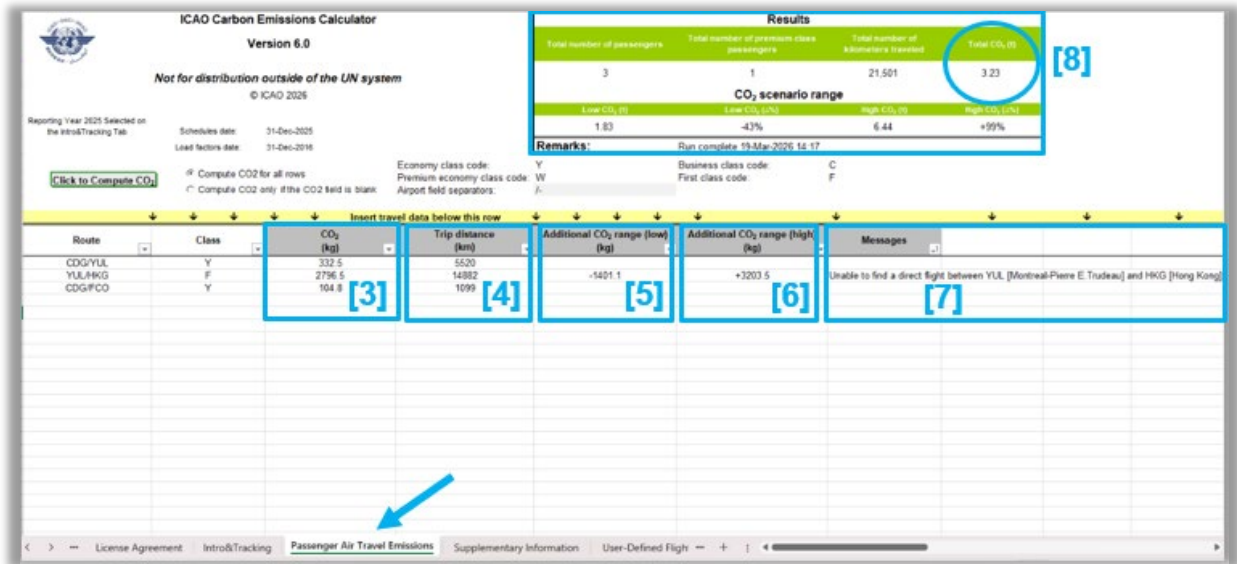


Figure 6. Summary of results in the Passenger Air Travel Emissions.

8.1. CO₂ emissions (kg)

The CO₂ (kg) value (see [3] in Figure 6) shows the estimated carbon dioxide emissions generated by the flight, expressed in kilograms. This value represents the calculated emissions associated with the passenger's air travel based on the flight information entered in the calculator.

8.2. Trip distance (km)

The Trip distance (km) value (see [4] area in Figure 6) indicates the total flight distance used for the calculation, expressed in kilometres. This distance corresponds to the great-circle distance between the selected airports and may include adjustments applied by the calculator methodology.



- ✓ *Some great-circle distances may appear longer than expected when one or more connections are involved. If unsure, please review the inputs and accompanying messages.*

8.3. Additional CO₂ range (low) (kg)

The Additional CO₂ Range (low) (kg) value (see [5] area in Figure 6) represents the lower bound of the emissions scenario range. This result shows how much the reported CO₂ value could vary around the baseline estimate under realistic schedule-based alternatives: the low value is a possible downward adjustment.

Note: this is a scenario range, not a statistical confidence interval.

8.4. Additional CO₂ range (high) (kg)

The Additional CO₂ Range (high) (kg) value (see [6] area in Figure 6) represents the upper bound of the emissions scenario range. This result shows how much the reported CO₂ value could vary around the baseline estimate under realistic schedule-based alternatives: the high value is a possible upward adjustment.

Note: this is a scenario range, not a statistical confidence interval.

8.5. Messages

The Messages section (see [7] area in Figure 6) displays additional information related to the calculation. This may include warnings, notes, or explanations regarding the selected flight, airport availability, or other factors that may influence the results. Table 1 presents a list of messages and a complete explanation.

Table 1: Description of warning messages inside the UN ICEC.

	Warning message	Explanation
1.	<i>Average value computed due to a missing connecting airport between: ADD and CPH. There are 28 possible connecting airports for this route. 1-stop estimate symmetrized using reverse direction CPH/ADD. Reverse direction has 34 possible connecting airports. Median connections averaged for estimate: ARN and MXP.</i>	<p>This concerns missing information on connecting airports for routings with no direct flights.</p> <p>An average value was computed because no direct data was available for either ADD–CPH or CPH–ADD. A 1-stop estimate was therefore built independently for both directions (28 possible connections for ADD–CPH and 34 for CPH–ADD), and the final CO₂ and/distance value is the average of those two directional estimates, meaning “symmetrized using the reverse direction” does not imply that only reverse data existed.</p> <p>Please specify the exact connecting airport if applicable to generate a more accurate result.</p>
2.	<i>Unable to find a direct flight or a 1-stop connection between CKY and DKR.</i>	<p>This message occurs where there are no direct or 1-stop connection for the routing, i.e. the routing involves 2 or more connecting airports.</p> <p>Please specify the connecting airports to generate a result.</p>
3.	<i>Route amended to include KSA/PNI/TKK due to missing connecting airport PNI.</i>	<p>This message arises when there is no direct connection for the route, but a 1-stop connection is available. The Calculator will automatically amend the route to include the possible connecting airport.</p> <p>Please specify the exact connecting airport if applicable to generate a more accurate result.</p>
4.	<i>Direct value not available for COO/DSS. Emissions computed using reverse direction DSS/COO.</i>	<p>In this case, the routing is available only one-way in the flight database. This can occur when a direct or one-stop flight exists in one direction, but the return trip requires</p>

		<p>multiple connections. The Calculator will generate a result based on the available flight information (i.e. the reverse direction).</p> <p>Please specify the exact connecting airport if applicable to generate a more accurate result.</p>
5.	<p><i>Requested cabin class not available - emissions computed using Economy class</i></p> <p><i>Requested cabin class not available - emissions computed using Premium Economy class</i></p>	<p>Premium cabin classes (premium economy, business, and first class) may not be available on some routes, in which case the nearest available cabin class is selected.</p> <p>This can result from differences in aircraft configurations or airline business models. For example, some fares marketed as premium economy or business class may use enhanced economy seating rather than a distinct premium cabin.</p> <p>Please check the inputs for possible errors to ensure the best results.</p>
6.	<i>Unknown airport: XXX</i>	<p>This message occurs when the input airport code is incorrect or no longer available. This could happen when railway codes or outdated airport codes are provided.</p>
7.	<i>Airport of origin = airport of destination (XXX/YYYY). Distance forced and CO₂ forced to 0</i>	<p>Routes with identical origin and destination airport codes will return zero.</p> <p>Please check the inputs for possible errors or missing connections.</p>

8.6. Summary of results

The Summary of results section (see [8] area in Figure 6) provides a consolidated overview of the calculation outputs, including the total air travel CO₂ emissions. This summary is displayed at the top of the page to allow users to quickly view the overall result of the calculation.



- ✓ *If connecting airport information was not provided in the calculator, the emissions from possible connecting airports will be computed. This will result in a range of uncertainty in the inventory being displayed in the form of the lower and upper bounds of possible connections. For the purpose of generating inventories, the calculator assumes the median CO₂ value in these cases and presents the uncertainties relative to this value. The user must then decide if the level of uncertainty in the inventory is acceptable.*
- ✓ *The total air travel CO₂ emissions will not be generated if there are errors in the data, for example, incorrect or outdated airport codes.*

9. SUPPLEMENTARY INFORMATION TAB

In addition to calculating air travel CO₂ emissions by passengers, this tool provides supplementary data (see Figure 7) relevant for users interested in understanding how these emissions are related to the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)⁵.

CORSIA was adopted by the ICAO Assembly in 2016 as the only global market-based measure applying to CO₂ emissions from international aviation. Robust and transparent data collection, as well as comprehensive monitoring and verification processes, are in place under CORSIA, which, covers all CO₂ emissions from international aviation. Given the global role of CORSIA and the limited information available on other market-based measures, only information related to CORSIA is provided in the ICAO Calculator.

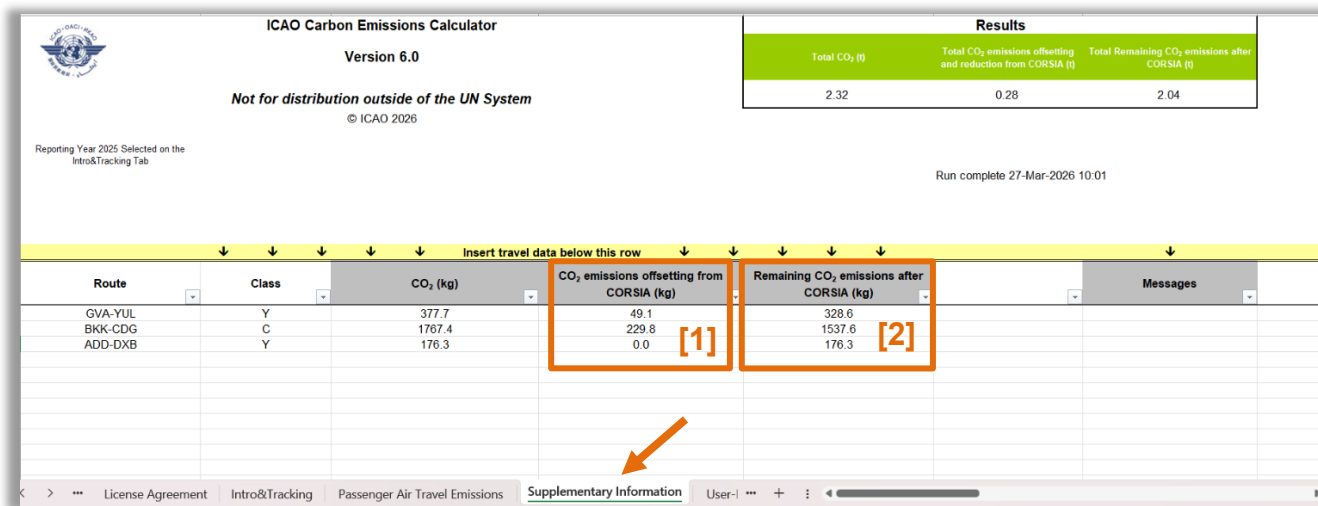


Figure 7. Supplementary Information Tab.

The Supplementary Information in UN ICEC is included for reference only, as the calculator's primary purpose is to estimate air travel CO₂ emissions. The UN ICEC is not intended to inform offsetting policies; any decision to offset air travel CO₂ emissions based on the Supplementary Information is solely at the user's discretion.

After the Passenger Air Travel Emissions spreadsheet is computed, this Supplementary Information on CORSIA will be automatically generated in a separate spreadsheet. The CO₂ emissions offsetting from CORSIA (kg) (see [1] area in Figure 7) indicates the estimated CO₂ emissions associated with CORSIA,

⁵ ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) website: <https://www.icao.int/CORSIA>

expressed in kilograms. Remaining CO₂ emissions after CORSIA (kg) (see [2] area in Figure 7) indicates the portion of CO₂ emissions that remains after CORSIA offsetting has been applied, expressed in kilograms.

10. USER-DEFINED FLIGHTS

Recognizing that for some UN offices, a significant portion of mission travel is through chartered flights, two tabs are available to compute CO₂ emissions from “user-defined” flights based on the following parameters:

- Aircraft Type
- Airport pair or flight distance length in kilometres
- Load factor/percentage of passenger seats occupied (if emissions at the passenger level are required)

10.1. User-Defined Flights (Aircraft) Tab

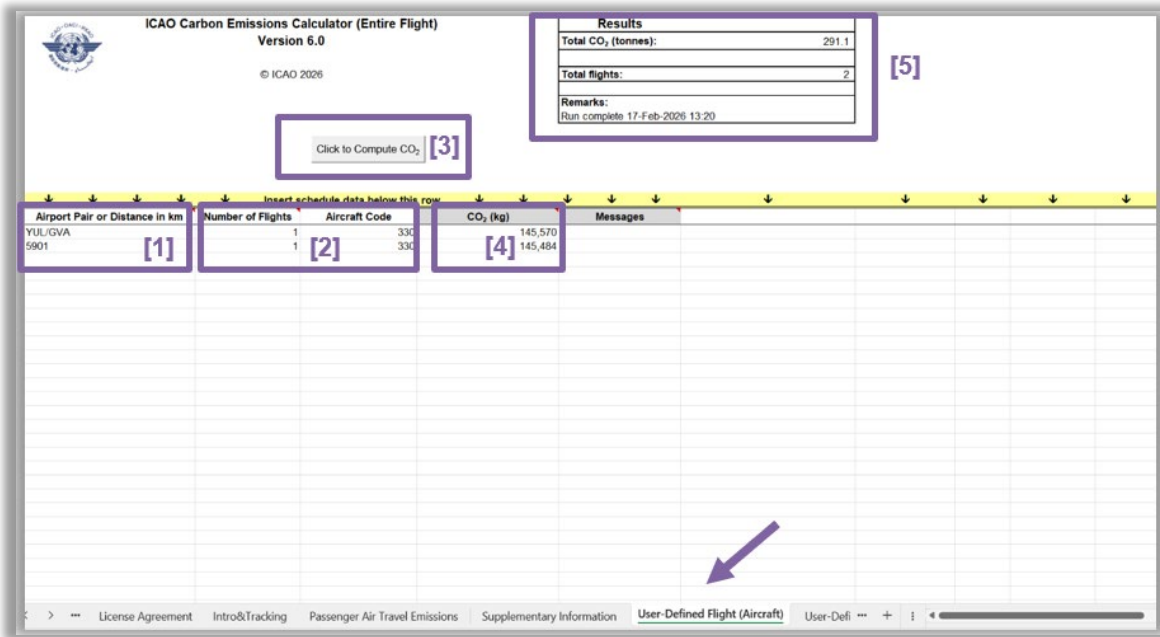


Figure 8: User Defined Flight (Aircraft) Tab.

The User Defined Flight (Aircraft) tab can be used to calculate CO₂ emissions for the whole aircraft. In the User Defined Flight (Aircraft) tab (see Figure 8), follow the steps below:

- i. Enter either a valid airport pair (for example, YUL/GVA) or the trip distance in kilometres (for example, 5901 km) starting in cell A15 (see [1] area in Figure 8).

- ii. Enter the number of flights and aircraft codes in cells B15 and C15, respectively (see area [2] in Figure 8).
- iii. If needed, consult the tab titled “Available Aircraft Types”, which provides the list of available aircraft codes.
- iv. Click the “Click to Compute CO₂” button to calculate the CO₂ emissions for the entire flight (see area [3] in Figure 8).
- v. The CO₂ emissions results are then displayed in column D (see area [4] in Figure 8).
- vi. The Summary of the Results, in terms of generated inventories, is displayed at the top of the page (see area [5] in Figure 8).

10.2. User-Defined Flights (Passenger) Tab

The User Defined Flights (Passenger) tab (see Figure 9) works similarly to the User Defined Flight (Aircraft) tab described above (see Figure 8), with one key difference: the user can enter the percentage of seats occupied (Load factor) in column C (see [1] area in Figure 9). The CO₂ emissions results, calculated for one passenger on the flight, are displayed in the results column (see [2] area in Figure 9). The Summary of the Results in terms of inventories generated is displayed at the top of the Page (see [3] area in Figure 9).

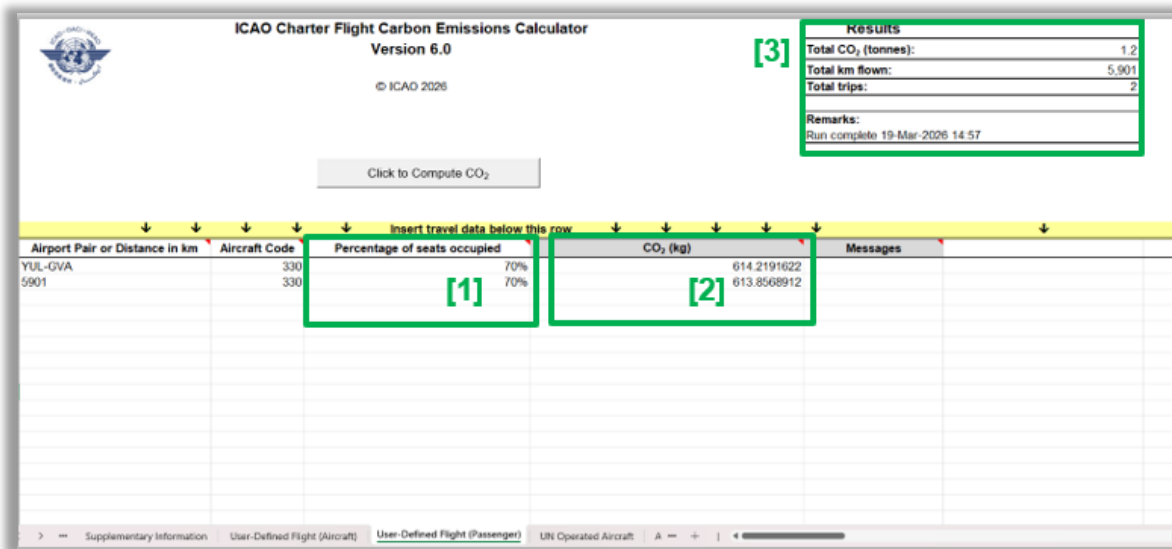


Figure 9. User Defined Flight (Passenger) Tab.

11. UN OPERATED AIRCRAFT

The UN Operated Aircraft tab (see Figure 10) allows users to calculate CO₂ emissions from fuel consumption data for the UN-operated fleet. The following information can be entered:

- **Location (optional)** – Starting in cell A9, enter the location where the fuel was consumed. This entry is optional.
- **Fuel Type** – Starting in cell B9, enter the fuel type: Jet-A or AvGas.
- **Quantity** – Starting in cell C9, enter the amount of fuel, in either litres or kilograms.
- **Units** – Starting in cell D9, enter the units for the fuel quantity provided in the previous column: either litres (l) or kg.
- **Density (kg/l)** – Starting in cell E9, if the fuel quantity is specified in litres, enter the fuel density here. The average density under standard conditions is 0.8 kg/l for Jet-A and 0.721 for AvGas (required if fuel provided in litres).
- Click “*Compute CO₂*” button to calculate the CO₂ emissions for the entered parameters. The results are displayed under column F8 in kilograms (kg).

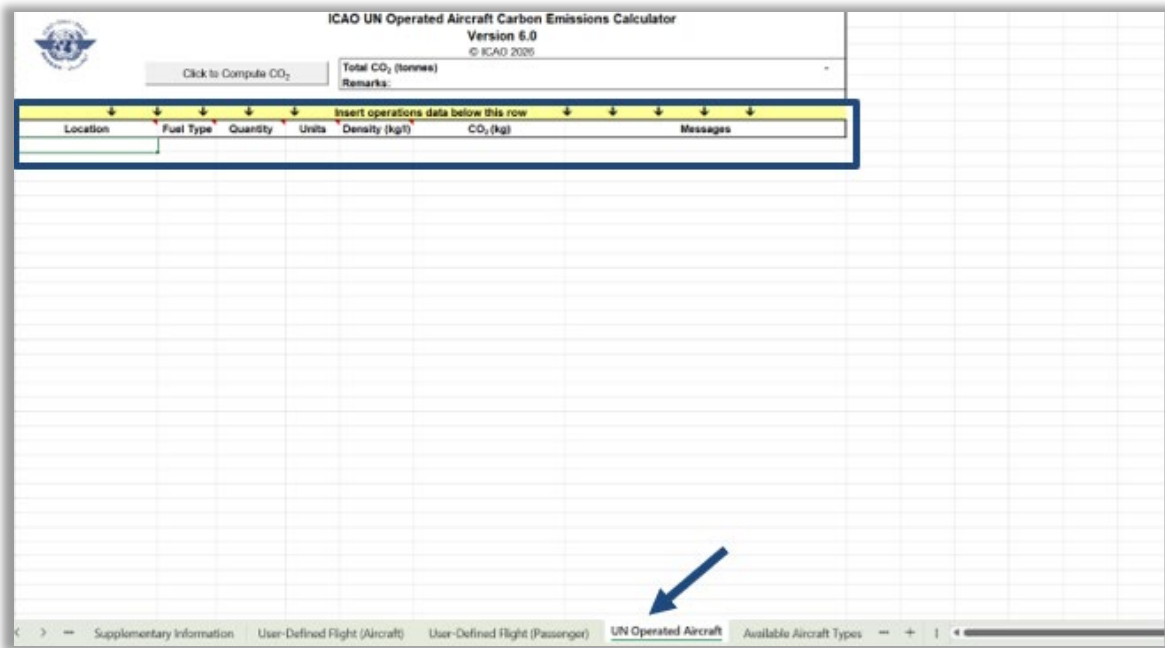
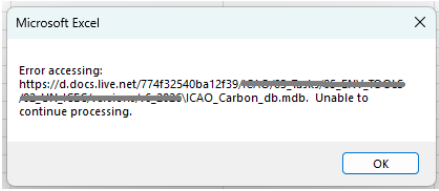


Figure 10. UN Operated Aircraft Tab.

ANNEX A: Troubleshooting

Problem	Possible Solutions
	<p>This error happens because the Calculator cannot access the database file if it is stored on OneDrive, SharePoint, Teams, or any other cloud drive.</p> <p>To fix it, close Excel, then move the entire extracted folder (containing both the .xslm and .db files) to a folder on your local computer. For example, <i>C:\Users\[YourName]\Documents\ICAO_Calculator</i>, and open the Excel file from that location. Make sure both files stay in the same folder and do not run them directly from cloud locations, otherwise the Calculator will not work.</p>
<p>Nothing happens when I click the “Click to Compute CO₂” button.</p>	<p>Macros may not have been enabled when the spreadsheet was opened. Save and close the spreadsheet, open it again, and follow the troubleshooting tips on Page 3.</p> <p>Check that the columns containing the class of service and the route are correctly specified in cells B8 and B10, respectively.</p> <p>The database file: <i>ICAO_Carbon_db.mdb</i> must be in the same directory/folder as the spreadsheet. If it is not, simply extract the .mdb file from the original zip archive into the directory/folder where the spreadsheet is saved.</p> <p>Row 13 must contain headers for the data fields below. Each column with data must have a header or the Calculator will not read the data properly.</p> <p>The data must start in row 14, directly below the header row and not have any blank rows. The Calculator looks for the first blank record after row 13 to determine when to stop computing.</p>
<p>I receive the error message: “Unable to find a direct route between XXX and YYY.”</p>	<p>The airport code entered may not be correct (for example, outdated airport codes, or railway codes were provided).</p> <p>The field separator specified in cell F10 may not be correct (for example, the airports are separated by slashes ‘/’ in the data, but cell F10 specifies that a dash ‘-’ is used).</p> <p>The connecting airports may need to be specified for routings with multiple connections. Specify the airports used for connection and try again.</p> <p>The wrong airport within a city was selected (for example, a trip from New York to London where there are multiple airports on both ends. Specifying a route of Newark (EWR) to London Gatwick (LGW) will give an error, but JFK to LGW is a valid route).</p>

Problem	Possible Solutions
<p>The CO₂ computed for the same route is the identical for different cabin classes.</p>	<p>Premium cabin classes may not be available for some routings, resulting in the economy class value being generated. This can result from aircraft configuration differences or airline business models. For example, some fares marketed as premium economy or business class may use enhanced economy seating rather than a distinct premium cabin.</p> <p>In some cases, the trip may have been too short in distance for significant differences between cabin classes. See the Calculator methodology for more information:</p> <p>Check that the cabin class designators were specified correctly in cells B8, F8, F9, G8 and G9. Note: only the first character of the class of service data is read for each record (for example, two-letter class codes such as HX and HW would both be interpreted simply as 'H').</p>
<p>The Calculator computes CO₂ for some of the trips in the spreadsheet and then stops without finishing.</p>	<p>The data cannot have any blank rows between records. The Calculator looks for the first blank record after row 13 to determine when to stop computing.</p>

- END -