



ICAO



# UNITED NATIONS INTERFACE TO THE ICAO CARBON EMISSIONS CALCULATOR

## FREQUENTLY ASKED QUESTIONS

VERSION 6.1

INTERNATIONAL CIVIL AVIATION ORGANIZATION  
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## **ABOUT THE UN ICEC, USERS, METHODOLOGY, AND BENEFITS**

### **1. What is the UN ICEC?**

The ICAO Carbon Emissions Calculator (ICEC) allows users to estimate the CO<sub>2</sub> emissions associated with passenger air travel and freight operations. It is easy to use and requires only limited information from the end-user. The ICEC is the only internationally approved tool for estimating carbon emissions from air travel. Its methodology uses the best publicly available industry data and takes into account various factors, such as aircraft types, cabin class configurations, route-specific data, passenger load factors, and cargo carried.

The ICEC has been the official United Nations (UN) tool for calculating carbon emissions from air travel since 2009, when it was adopted by the UN Environment Management Group (EMG). It supports UN system-wide climate neutrality efforts and the annual preparation of greenhouse gas inventories. Using a common, transparent, impartial, and internationally approved methodology across the UN system enables the aggregation of air travel emissions data from different organizations and ensures the integrity and consistency of reported emissions.

ICAO provides the United Nations interface to ICEC (UN ICEC<sup>1</sup>) and related support services to UN agencies at no cost, supporting system-wide efforts to manage air travel emissions under the Greening the Blue initiative<sup>2</sup>.

### **2. Who can use the UN ICEC?**

Only authorized members of United Nations organizations have access to the UN ICEC. The UNEP (United Nations Environment Programme) SUN team<sup>3</sup> officially registers UN users and coordinates distribution to UN agencies. Access could include both current versions of the UN ICEC in MS Excel and an application programming interface (API).

### **3. Can I share the UN ICEC with someone else?**

No. The UN ICEC may only be shared with individuals or organizations that use the Calculator exclusively for Greening the Blue purposes. Non-UN users require a separate license agreement and should use another version of ICEC. For additional information, please contact the ICAO/Office of the Environment and Cleaner Energy through the ICEC team (e-mail: [icec@icao.int](mailto:icec@icao.int)).

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<sup>1</sup> UN ICEC website: <https://www.icao.int/environmental-protection/environmental-tools/UN-ICEC>

<sup>2</sup> For more information about Greening the Blue: <https://greeningtheblue.org/>

<sup>3</sup> For more information, please contact the SUN Team: <https://greeningtheblue.org/contact>

#### 4. What types of emissions does the UN ICEC calculate and how?

The ICEC calculates CO<sub>2</sub> emissions per passenger for a selected trip and cabin class. It provides UN entities with a transparent, easy-to-use method built on publicly available information and is internationally reviewed and approved.

The ICEC methodology estimates a traveler's CO<sub>2</sub> emissions using a distance-based approach and currently available data on a range of aircraft types. The ICEC considers four key factors: 1) flight schedule and frequency, which also considers distance, aircraft types, and estimated fuel efficiency; 2) cabin class configuration, e.g. number and size of seats; 3) the average percentage of passengers on the flight; and 4) cargo weight to passenger ratio.

For each route, these four components produce a weighted-average total fuel use for the journey, and then the CO<sub>2</sub> per traveller is estimated. The ICEC also provides additional information related to the CO<sub>2</sub> emissions covered via the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)<sup>4</sup>.

#### 5. What is the methodology used to develop the UN ICEC?

Please refer to the detailed methodology available on the ICEC website<sup>5</sup> which covers both passenger air travel and freight operations.

The information used for the ICEC calculations comes from publicly available data sets. Aircraft types and flight frequencies are sourced from global airline schedule data. Fuel consumption formulas, passenger load factor and the passenger-to-cargo ratio are based on ICAO's data; aircraft seat configurations are collected from different data sources; and the flight distances are based on Great Circle Distance (GCD) between airports.

#### 6. What is new in the UN ICEC version 6?

The ICEC now calculates estimated CO<sub>2</sub> emissions while fully accounting for the four cabin classes available: economy, premium economy, business, and first class. This is possible with the availability of improved data, specifically the exact seat configurations and sizes of all four cabin classes for each aircraft type operating along the same route.

This expanded data set allows the ICEC to more accurately reflect the space each seat takes and, therefore, allocate CO<sub>2</sub> emissions more precisely. This improved precision and expanded data set are the main reasons year-over-year CO<sub>2</sub> emissions from some similar flights have increased.

The table below describes the main differences between the past version of UN ICEC and the current version 6.

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<sup>4</sup> ICAO CORSIA website: <https://www.icao.int/CORSIA>

<sup>5</sup> ICEC methodology is available at: <https://www.icao.int/environmental-protection/environmental-tools/icec>

| Features                            | Versions 1- 5                                       | Version 6                                                                                      |
|-------------------------------------|-----------------------------------------------------|------------------------------------------------------------------------------------------------|
| <b>Cabin class methodology</b>      | Two cabin classes based on generic layout           | Four cabin classes based on actual layout                                                      |
| <b>Cabin class codes</b>            | Economy and Premium cabin class codes               | Expanded fare-class mapping covering Economy, Premium Economy, Business and First class        |
| <b>Emission allocation approach</b> | One generic estimation covering all premium classes | Based on actual seat dimensions for each of the four cabin classes                             |
| <b>CORSIA coverage</b>              | Yes (since 5.0.9bis)                                | Yes                                                                                            |
| <b>Bridging factors</b>             | N.A.                                                | Introduced to allow for progress tracking against results from the two-cabin class methodology |

## 7. What are the benefits of the improved four-cabin class methodology?

The greater precision of ICEC version 6 now allows UN entities to track impacts from air travel policy changes, facilitating decision-making and policy-making. With ICEC version 6, UN entities can more accurately quantify the emissions reductions achieved by shifting travel from among cabin classes. Additionally, the more detailed air travel CO<sub>2</sub> emissions estimates provide a clearer understanding of which travel activities contribute most to an organization's overall carbon footprint, helping to identify and prioritize effective mitigation measures and policies.

## 8. How does the UN ICEC 6.1 support comparison with past performance (trends)?

As a result of the updated ICEC methodology, total CO<sub>2</sub> emissions may differ from previous years' calculations, depending on the distribution of cabin classes. To support UN entities in tracking CO<sub>2</sub> emissions progress, ICAO developed a method in the UN ICEC 6.1 version to compare results from the four-cabin class methodology with results from earlier versions of the ICEC (two-cabin class adjustment approach). Using a mathematical approach, a "Bridging Factor" in version 6.1 estimates CO<sub>2</sub> emissions results from the four-cabin classes as values comparable to the old methodology. This bridging factor was calculated using a 3-year average of all past flights<sup>6</sup>.

While the approach has been thoroughly tested, it is important to note that it is an estimation and carries a small uncertainty range of approximately +/-3%. The approximated two-cabin class results can be used to track progress against an entity's established baseline and maintain historical trend comparisons.

<sup>6</sup> For more information about 'Bridging Factor', please see Question 25 and section 10 of the UN ICEC User Guide available at: <https://www.icao.int/environmental-protection/environmental-tools/UN-ICEC>

## **9. What is the ICEC version update frequency for UN organizations?**

ICAO releases an updated version of the UN ICEC each year in March<sup>7</sup>. The UN ICEC files are provided to the UNEP (United Nations Environment Programme) SUN team, which coordinates their distribution to UN agencies.

## **10. Does the UN ICEC provide information on emissions offsetting?**

The UN ICEC provides supplementary information only on ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)<sup>8</sup>. Adopted by the ICAO Assembly, CORSIA is the only global market-based measure that applies to CO<sub>2</sub> emissions from international aviation.

Due to the global scope of CORSIA and the limited availability of comparable information on other market-based measures, the UN ICEC includes only data related to CORSIA. Please note that this tool is not intended to guide offsetting policies, and any decision to offset air travel CO<sub>2</sub> emissions is entirely at the user's discretion.

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<sup>7</sup> Starting with UN ICEC version 6.0 (released in March 2026), there will no longer be a mid-year update (see Question 23 for further details).

<sup>8</sup> ICAO CORSIA website: <https://www.icao.int/CORSIA>

## USING THE UN ICEC AND CONFIGURATION

### 11. How to use the UN ICEC?

The UN ICEC is available in MS Excel and an application programming interface (API). Please refer to the latest UN ICEC User Guide included in the UN ICEC files and API credentials distributed by the UNEP SUN team. To ensure UN ICEC functions properly, the MS Access database and the UN ICEC Excel file must be saved in the same folder on the user's computer or local drive.

In general, two inputs are required to run the UN ICEC:

- i. Complete trip routing (3-letter IATA airport codes)
- ii. Cabin class letter code

These inputs must be entered into the UN ICEC using the format specified in the UN ICEC User Guide. For example:

| Route   | Class | OR | Route   | Class |
|---------|-------|----|---------|-------|
| YUL/IAD | Y     |    | YUL-IAD | W     |
| DXB/BAH | C     |    | DXB-BAH | F     |

### 12. Which cabin classes does the UN ICEC support?

As of June 2026, the UN ICEC supports four cabin classes: Economy, Premium Economy, Business Class, and First Class, identified by single letters (fare class codes) that indicate the cabin type.

| Cabin class | Economy                                           | Premium Economy | Business Class | First Class |
|-------------|---------------------------------------------------|-----------------|----------------|-------------|
| Letter code | Y, B, M, H, K, L, Q, V, T,<br>U, X, N, S, G, O, R | W, E            | C, J, D, I, Z  | F, A, P     |

### 13. Where can I get data on air travel?

This depends on your organization's travel arrangements. For example, staff travel data may be obtained from your ERP system (e.g., ATLAS, IMIS), travel office, or travel agency.

In ICAO's case, the Travel Services Unit provides a list of staff travel routes and cabin classes, which ICAO uses to calculate its annual air travel emissions.

### 14. Is there a limit to the number of trips that can be calculated?

For the MS Excel file, yes. The number of trips that can be calculated is limited only by the maximum number of rows supported by Microsoft Excel. For example, the current version of Excel (including Microsoft 365 and Excel 2021) supports up to 1,048,576 rows per worksheet. For the API version, there is no limit on calculations.

### **15. Why are airport codes required?**

Airport codes enable the UN ICEC to map each flight to an aircraft type in its fuel-consumption database. CO<sub>2</sub> emissions are then calculated based on the aircraft type operating each route.

City names are not used because they can be ambiguous. For example, “San Jose” may refer to SJC (USA), SJD (Mexico), SJE (Colombia), SJI (Philippines), or SJO (Costa Rica). Please note that some airports that do not operate commercial scheduled flights may not have an IATA airport code.

### **16. Why is the three-letter city code not recognized by the UN ICEC?**

The UN ICEC only recognizes IATA three-letter airport codes<sup>9</sup>. It will not operate correctly if city codes, rail station codes, or other non-airport codes are used as inputs.

### **17. Why are certain routings not computable using the UN ICEC?**

Route or airport pairs in the UN ICEC are based on available scheduled commercial flights. If the input route does not include a direct scheduled flight or a valid one-stop connection, the UN ICEC cannot process it. In such cases, please specify the connecting airport(s) to generate a result.

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<sup>9</sup> IATA three-letter airport codes website: <https://www.iata.org/en/publications/directories/code-search>

## **INTERPRETATION OF THE METHODOLOGY AND RESULTS**

### **18. Can I use the UN ICEC version 6.1 to calculate emissions for previous inventories (i.e. not 2025)?**

No. Version 6.1 of the UN ICEC is specifically designed for the 2025 inventory and provides emissions calculations aligned with data from that year. Its use for calculating previous inventories is not recommended, as it may produce results that are inconsistent with those from earlier flight operations.

This version should only be used for its intended purpose, to ensure accurate reporting for the 2025 inventory.

### **19. Why do CO<sub>2</sub> emissions for the same route vary across different versions of the calculator?**

This may be due to updates to the fuel calculation methodology, changes in airline aircraft planning, modifications to seat configurations, or updates to route city pairs (as indicated in the first sheet of the UN ICEC Excel file). If you require a more specific and detailed explanation, please contact the ICEC team (e-mail: [icec@icao.int](mailto:icec@icao.int)).

### **20. Why did the total CO<sub>2</sub> change compared to the previous methodology?**

As a result of the updated methodology, total CO<sub>2</sub> emissions may differ from previous years' calculations, depending on the distribution of cabin classes. Do not use comparisons from the new methodology with the baseline or results from the previous two-cabin UN ICEC to inform decision-making, because the methodology has changed. To compare the version 6.1 outcomes from the four-cabin class with results from the old methodology, please see the *"two-cabin class adjustment"* approach in Question 8.

These differences reflect improved methodological accuracy rather than actual changes in travel activity. For example, total CO<sub>2</sub> emissions may increase significantly even if the total travel distance decreases, due to higher emissions associated with business and first-class travel under the four-cabin methodology.

### **21. How does the calculation differ between the four cabin classes?**

Under the new methodology, the total fuel burn and CO<sub>2</sub> emissions for a flight are allocated more accurately across the four cabin classes: Economy, Premium Economy, Business Class, and First Class. Each cabin class is assigned a share of the emissions based on factors such as seat space and typical occupancy (cabin-class distribution). As a result, higher-class cabins, which occupy more space per passenger, are allocated a proportionally larger share of the flight's CO<sub>2</sub> emissions. This approach improves calculation precision compared with the previous two-cabin methodology and provides a more accurate representation of emissions per passenger.

## **22. Why have CO<sub>2</sub> emissions associated with economy and premium economy class travel increased under the new methodology?**

The observed differences are primarily due to the updated cabin-class allocation methodology. The new methodology uses actual airline seat configurations at the route level, rather than relying on generic aircraft seating capacity, which is the old methodology. This refinement provides a more precise representation of cabin class distribution, which in turn leads to the variations observed in the results.

## **23. What is the “additional CO<sub>2</sub> range (low/high)” result?**

This result indicates how much the reported CO<sub>2</sub> value may vary from the baseline estimate under realistic schedule-based alternatives. The low value represents a possible downward adjustment (usually negative), while the high value represents a possible upward adjustment (usually positive).

This range reflects scenarios based on yearly scheduled-flight data, and not a statistical confidence interval. In cases where a cabin fallback is used (for example, *“Requested cabin class not available—emissions computed using Business class”*), this range may be blank because no route-specific estimate is available for the originally requested cabin class.

## **24. What is the new two cabin class adjustment worksheet?**

The new *“Two Cabin Class Adjustment”* worksheet/results supports users during the transition period between the new four-cabin methodology (i.e. UN ICEC V6.1) and the old two-cabin methodology (i.e. V5.09bis and preceding). This temporary feature has been introduced to support continued progress tracking and allows comparability with baseline(s) established under the previous methodology, until new baseline(s) or trends can be defined. The end date is to be determined under the Greening the Blue process.

These new outcomes present air travel emissions results based on the four-cabin-class methodology, alongside an estimated emissions value of how these results would appear under the previous two-cabin-class methodology. In other words, CO<sub>2</sub> emissions adjustment results can be comparable to the old methodology by applying “Bridging Factors” (see Question 25 for further details) to adjust outputs from the current method, allowing users to estimate how their inventory would have performed under the previous approach.

In this worksheet, users will find the following information:

- air travel emissions calculated using the four-cabin-class methodology;
- emissions adjusted to reflect the two-cabin-class methodology using the Bridging Factors; and
- remaining CO<sub>2</sub> emissions after CORSIA, adjusted to the two-cabin-class methodology.

## 25. What are bridging factors?

Bridging Factors<sup>10</sup> are mathematical adjustment factors developed to facilitate comparison between results generated using the four-cabin methodology and past inventories calculated using the previous two-cabin methodology.

Once the UN ICEC processes the standard inputs under the “*Passenger Air Travel Emissions*” worksheet, it automatically applies the bridging factors to these results in the “*Two Cabin Class Adjustment*” worksheet. This approach estimates CO<sub>2</sub> emissions results for the four cabin classes as values comparable to the old methodology.

The Bridging Factors applied in the UN ICEC v6.1 are derived from the full flight operations database and based on a three-year average comparison. The Bridging Factors used in v6.1 are:

- Economy: +6.06%
- Premium Economy: +11.70%
- Business Class: +100.27%
- First Class: +471.38%

These Bridging Factors reflect the percentage difference between the new and previous methodologies for each cabin class.

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<sup>10</sup> For more information about ‘Bridging Factor’, please see section 10 of the UN ICEC User Guide available at: <https://www.icao.int/environmental-protection/environmental-tools/UN-ICEC>

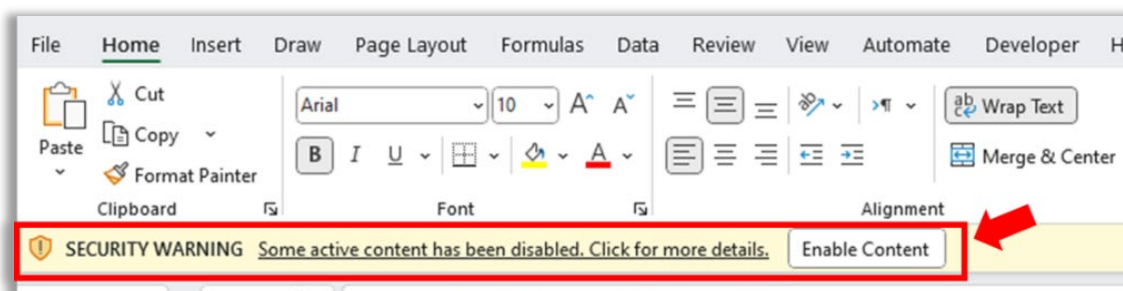
## **TECHNICAL SUPPORT AND TROUBLESHOOTING**

### **26. Why is there an error message related to accessing the UN ICEC Excel file?**

The UN ICEC Excel file may not run if it is saved in a cloud-based location, such as a OneDrive or Google Drive folder. Please ensure that the entire UN ICEC ZIP file is downloaded and stored on a local drive (e.g., C:\) on the user's computer.

### **27. Why is the macro restricted when opening the UN ICEC Excel file?**

For possible causes, please check with your IT colleagues to enable macro use, or trust the file you downloaded and extracted. For additional information, please refer to the Microsoft Support website<sup>11</sup> on the “Macro Blocking” issue.



### **28. Why does nothing happen when I press the “Click to compute CO<sub>2</sub>” button?**

For possible causes, please check the following:

- Macros are enabled
- The ICAO\_Carbon\_db.mdb file is in the same directory as the spreadsheet
- Only flight routes are provided (the UN ICEC is meant for air travel emissions only; it does not cover rail transport)
- The data format is aligned with the format specified in the UN ICEC User Guide (further details in Question 11).

### **29. Why does the calculator compute CO<sub>2</sub> for some trips but stop before completing others?**

To identify possible causes, check for formatting errors in the inputs provided. Please note that for large datasets, the UN ICEC may also require additional time to complete the calculations.

<sup>11</sup> Microsoft support website related to macro blocking: <https://support.microsoft.com/en-us/office/vba-a-potentially-dangerous-macro-has-been-blocked>

### **30. Why are the summary results not displayed?**

The UN ICEC does not display summary results if one or more input rows contain errors, as the totals would be incomplete or misleading. Please correct the flagged rows (highlighted in light yellow) and rerun the calculation. To avoid recalculating all rows, users may select “*Compute CO<sub>2</sub> only if the CO<sub>2</sub> field is blank*” after correcting the inputs.

**— END —**

*For all further enquiries, please contact the ICEC team at the following email address: [icec@icao.int](mailto:icec@icao.int)*