Environmental Tools

By ICAO Secretariat

The International Civil Aviation Organization (ICAO) develops and maintains many environmental tools that are made available to States and the general public. These tools support the development of State Action Plans, support initiatives to reduce aviation's carbon footprint and the implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). The following paragraphs provide an overview of the ICAO tools designed to support various ICAO environmental protection projects.

ICAO Carbon Emissions Calculator

Background—ICAO has developed a publically available methodology[1], through the ICAO Committee on Aviation Environmental Protection (CAEP), to calculate carbon dioxide (CO_2) emissions from air travel. This methodology provides the basis for the ICAO Carbon Emissions Calculator[2] (ICEC), which allows the estimation of CO_2 emissions from passenger air travel on a specific route. The ICEC is an internationally approved and user-friendly tool that requires only a limited amount of information from the user (origin and destination airports and the cabin class). The ICEC is available free of charge on the ICAO website. The methodology applies the best publicly available industry data to account for various factors such as aircraft types, route specific data, passenger load factors and cargo carried. The fuel consumption based on distance flown is estimated with the ICAO Fuel Formulas (IFFs) which are regularly updated. The fundamental principle of the IFFs is to estimate in-service aircraft fuel consumption based on aircraft manufacturers handbooks and corrected with available in-service fuel consumption data.

New seat class configurations—Currently, the ICEC supports two cabin classes, economy class (the base class) and premium class (representing all other higher cabin classes). These assumptions can potentially underestimate the carbon footprint per seat. In order to address this issue, the Aviation Carbon Calculator Support Group (ACCS) reviewed a proposal from the ICAO Secretariat for a new approach, based on pitch and abreast seat information, to allocate passenger CO_2 emissions on the basis of an extended cabin class, such as economy class, premium class, business class and first class. This new approach is currently under development.

New interface—In order to improve data visualization, user experience, and compatibility with mobile devices, ICAO developed a new ICEC interface (Figure 1) to be launched in 2022.

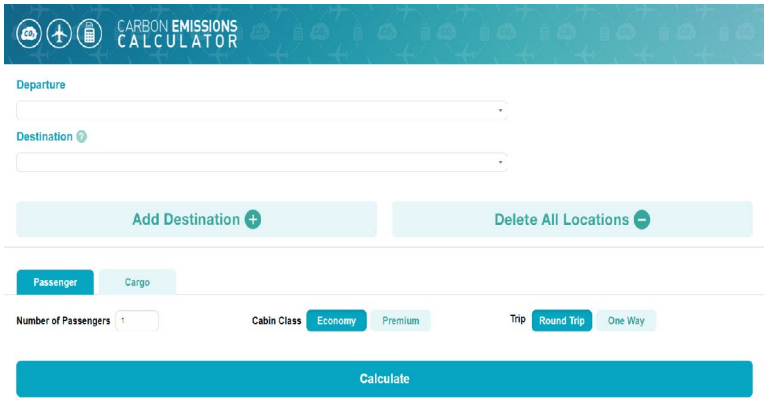

FIGURE 1: ICEC new interface

1 https://www.icao.int/environmental-protection/CarbonOffset/Documents/Methodology%20ICAO%20Carbon%20Calculator_v11-2018.pdf
2 https://applications.icao.int/icec

Application Programming Interface—ICAO has also developed a new Application Programming Interface (API) for the ICEC that allows its automatic integration with software, webpages, or mobile applications released by third party organizations. A version of the ICEC API has been published for public use and another version for the UN usage is also available to consolidate emissions on mission travel. Depending on the licensing agreement with ICAO, the API will allow the user to execute a certain number of calls to compute emissions inventories. For more information on the ICEC API, please contact icecapi@icao.int.

ICAO Green Meetings Calculator

Similar to the ICEC, the ICAO Green Meetings Calculator (IGMC) is a tool designed to support decision-making in reducing CO_2 emissions from air travel to attend meetings. An enhanced version of the IGMC, incorporating a mobile interface, was launched in April 2020. The IGMC can be used to estimate air travel related CO_2 emissions for a specific meeting, and to assist in identifying an optimal location for a meeting in terms of CO_2 emissions. The methodology for IGMC takes into consideration the city of origin of each meeting participant and the total number of participants. While many factors may affect the decision for where a meeting should be held, the calculator helps facilitate the planning process for an international meeting/conference.

ICAO Fuel Savings Estimation Tool

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 greenhouse gas models approved by CAEP and the ICAO Global Air Navigation Plan (GANP). 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 fuel savings benefits from operational improvements in a harmonized way. IFSET provides a robust platform for estimating the incremental fuel burns from adopting procedures different from the baseline. IFSET has demonstrated that it is capable of providing a reasonable estimate of changes in fuel consumption in a manner that is consistent with more sophisticated approaches. In IFSET, scenarios are defined by climb/descent phases, level phases and taxi phases. Climb and descent rates are not specified with the IFSET default values used. The estimates generated by IFSET can be improved if savings in distance or time inputted into IFSET comes from empirical radar tracks and or using the domain expertise of the air navigation service provider.

ICAO CORSIA CO_2 Estimation and Reporting Tool

The ICAO CORSIA CO_2 Estimation and Reporting Tool (CERT) is detailed in chapter 8 of the report.

ICAO Tools for the State Action Plan Focal Points

To facilitate the State Action Plan (SAP) development process, all State Action Plan focal points have been granted access to the Action Plan on Emissions Reduction (APER) website. APER is a secured, web-based platform that can be used to interact with ICAO, upload administrative and quantified information related to State Action Plans and consult guidance material, such as Doc 9988, and the following tools:

Environmental Benefit Tool (EBT)—For the purpose of supporting States to establish a quantified State Action Plan, ICAO developed the EBT helping States to estimate fuel burn and CO_2 emissions baseline and forecast scenarios with a selection of mitigation measures up to 2050. While requiring minimal data inputs (historical international Revenue Tonne Kilometres (RTK) data and associated fuel burn), the EBT estimates a baseline scenario and a forecast scenario of CO_2 emissions with the quantifiable benefits resulting from the selected mitigation measures and provides estimated expected results. The EBT could be considered as the transformation of Doc 9988 into an interactive, structured and easy-to-use tool. The tool allows generating a robust and complete State Action Plan

FIGURE 2: AES graphical user interface

with a minimum of information provided by the users. A new version of the tool is being developed to increase the compatibility with Excel architecture.

ICAO Carbon Emissions Calculator for State—In order to support States in the preparation of the Actions Plans, ICAO has also developed a standalone application allowing SAP Focal Points to generate a State-level emissions inventory by simply importing batches of flights containing the airport pair, the number of flights in the year, and the aircraft type. This application uses the same methodology than the one underpinning the ICEC.

Aviation Environmental System (AES)—In the scope of the ICAO-European Union Project from 2014 for the monitoring of expected results from the implementation of the SAP, ICAO developed the AES to allow Civil Aviation Authorities (CAAs) to collect, monitor and consolidate CO_2 emissions from international aviation at the State level. The AES consists of the AES 1.0 application and the AES Data Visualisation website to enable the group of 14 beneficiary States to collect aeroplane emissions data and monitor the progress of the SAPs. The AES is composed of a user Graphical User Interface (GUI) (Figure 2) and a database, integrated in one single user-friendly tool.

Marginal Abatement Cost (MAC) Curve—Under the partnership with the United Nation Development Program (UNDP) and financing from the Global Environment Facility (GEF) (ICAO-UNDP-GEF project), ICAO has designed the MAC Curve tool to support States and their stakeholders prioritize the most appropriate international aviation CO_2 emissions mitigation measures. This tool was developed to support States with the process of selecting mitigation measures as a part of the SAP development process. It offers the possibility for States to identify and rank up to 20 mitigation measures across all elements of the ICAO Basket of Measures in order to facilitate future decision-making. The tool includes a user-friendly interactive interface embedded into the APER website and is fully customizable to fit the State's situation. Based on the analysis of the mitigation measures included in the SAPs submitted by ICAO Member States, ICAO has developed global MAC curves, which simplify the process of assessing the CO_2 emissions reductions and the costs for individual measures and put them in priority order. The MAC Curve

Tool can be tailored to the individual reality of States, allowing them to input their local data, create MAC curves and therefore prioritize the measures to be implemented at the national level in light of their own circumstances and conditions (Figure 3).

Next developments

Cargo emissions calculator—The ICEC new interface was also designed to integrate cargo emissions calculations, according to the CAEP approved cargo methodology. Following the growing interest from the UN, general public and freight forwarders to receive CO_2 information on cargo shipped by air, the capabilities of the ICAO carbon calculator methodology has been further extended to estimate carbon emissions associated with these activities. The implementation of the cargo methodology is currently under development.

New display—Moreover, in response of several requests from UN organizations and the general public to further update the level of detail in the Carbon Emissions Calculator and the recent launch of publically available calculators (such a Google Flights[3] or Atmosfair[4]), the ICAO Secretariat is developing a new approach to display CO_2 emissions. The goal is to display specific CO_2 emissions per aircraft type compared to the weighted average currently computed.

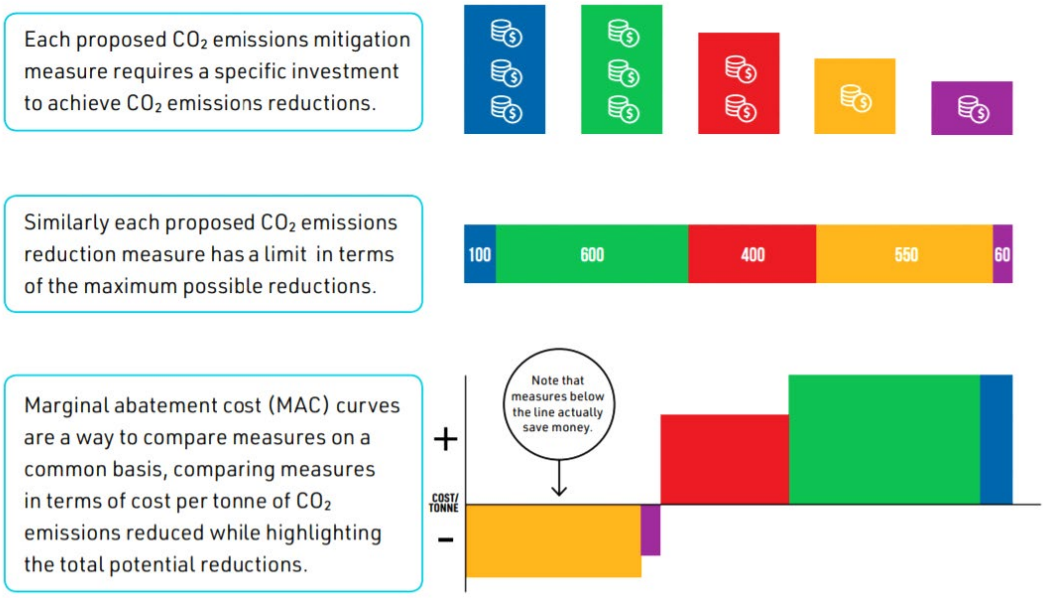

FIGURE 3: MAC curve tool structure

3 https://www.google.com/travel/flights
4 https://www.atmosfair.de/en/offset/flight/