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THE INTERNATIONAL COUNCIL ON CLEAN TRANSPORTATION

TECHNICAL NOTE
Airport Emissions Tracker Data
May 2021

The data used for the airport emissions tracker were derived from the Global Aviation Carbon Assessment (GACA) model developed by the International Council on Clean Transportation (ICCT). An in-depth methodology is included in the following report:

> Graver, B., Rutherford, D., and Zheng, S. (2020). *CO_2 emissions from commercial aviation: 2013, 2018, and 2019*. Retrieved from the International Council on Clean Transportation website: https://www.theicct.org/sites/default/publications/CO2-commercial-aviation-oct2020.pdf

The airport emissions tracker contains information for the 1,300 largest global airports by total revenue passenger kilometers (RPKs). This covers 99% of global airline passenger traffic.

Revenue passenger kilometers (RPKs) represents an airline's passenger traffic. It is derived by multiplying the number of fare-paying passengers on a flight by the flight distance.

The airport emissions tracker displays the total passenger transport carbon dioxide (CO_2) emissions from all passenger flights departing an airport in the analysis year. In addition, the carbon intensity of all flights departing an airport is depicted. Freight transport, which is responsible for 15% of CO_2 emitted by commercial airlines, is not included. General aviation and military flights are also not included.

Passenger transport CO_2 emissions represents the apportionment of total CO_2 emissions to passenger transport only. CO_2 emissions associated with the transport of "belly" cargo on a passenger aircraft have been removed.

Carbon intensity, in grams CO_2 per RPK, is the total passenger transport CO_2 emissions divided by the total RPKs.

ABRIDGED METHODOLOGY

Global passenger airline operations data were sourced from OAG Aviation Worldwide Limited. The OAG dataset contained the following variables: air carrier, aircraft type, departure airport, arrival airport, departures (number of flights), and capacity in available seat miles.

Payload associated with the transport of passengers and their luggage was estimated using the number of aircraft seats, a passenger load factor, and a default passenger mass. If passenger load factors for an airline were not publicly available, a region-specific passenger load factor

published by the International Civil Aviation Organization (ICAO) was used.[1] Total traffic, in revenue passenger kilometers (RPKs), was estimated by multiplying seat capacity by the passenger load factor, and associated unit conversions.

Payload associated with the transport of cargo on a passenger aircraft was estimated using either publicly available data or an ICAO region-specific passenger-to-freight factor.

For each combination of route, airline, and aircraft type, GACA modeled fuel burn based on the summation of passenger and cargo payload. Fuel burn was apportioned to passenger and cargo carriage using the following three equations:

Equation [1]

$$Total\ Passenger\ Fuel\ Use\ [kg] = \left(\frac{Total\ Passenger\ Weight\ [kg]}{Total\ Weight\ [kg]}\right)(Total\ Fuel\ Use\ [kg])$$

Equation [2]

$$Total\ Passenger\ Weight\ [kg] = (Number\ of\ Aircraft\ Seats)(50\ kg) + (Number\ of\ Passengers)(100\ kg)$$

Equation [3]

$$Total\ Weight\ [kg] = Total\ Passenger\ Weight\ [kg] + Total\ Cargo\ Weight\ [kg]$$

Thus, total fuel use is proportional to payload mass after taking into account furnishings and service equipment needed for passenger operations. CO_2 emissions were estimated using the accepted constant of 3.16 tonnes of CO_2 emitted from the consumption of one tonne of aviation fuel.[2] Fuel burn modeled by GACA were validated using data published by global airlines on their websites or in public reports.

Passenger operations and fuel burn were characterized by flight distance[3]:

- Short-Haul: Shorter than 1,500 km
- Medium-Haul: 1,500 to 4,000 km
- Long-Haul: Longer than 4,000 km

COMPARISON TO COAL-FIRED POWER PLANTS

A conversion factor of 4 million tonnes CO_2 per coal-fired power plant was used to compare to total passenger emissions of each airport. This is based on data reported by the United States Environmental Protection Agency.[4]

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[1] International Civil Aviation Organization. (2017). ICAO carbon emissions calculator methodology, version 10. Retrieved from https://www.icao.int/environmental-protection/CarbonOffset/Documents/Methodology%20ICAO%20Carbon%20Calculator_v10-2017.pdf

[2] International Civil Aviation Organization. (2020). 2019 Environmental Report. Retrieved from https://www.icao.int/environmental-protection/Documents/ICAO-ENV-Report2019-F1_WEB%20(1).pdf

[3] EUROCONTROL's distance definitions for short-, medium-, and long-haul flights were used. See https://www.eurocontrol.int/sites/default/files/2019-07/challenges-of-growth-2018-annex1_0.pdf

[4] See https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references