

Clarification Numbers Green Baggage Launch Video 8 Dec 2021

Overview

Per conference visitor (from a weighted average departure location), the following numbers apply:

	One way trip CO2 footprint (kg CO2/visitor)	Number of mature trees required for compensation in a year (per visitor)	Notes
Total flight	239	10.9	Flight only (for every 100 kg PAX)
Flight passenger contribution	175	7.93	Flight only, using average passenger contribution to average PAX weight (73 kg of 100 kg)
Flight baggage contribution	64.6	2.94	Flight only, using average passenger baggage contribution to average PAX weight (27 kg of 100 kg)
Airport baggage handling	3.66×10^{-1}	16.6×10^{-2}	Baggage handling only, per average passenger baggage
Total baggage contribution	64.9	2.95	Flight (baggage only) + baggage handling
Contribution per checked bag (18.2 kg)	43.7	1.99	Flight (checked bag) + baggage handling (checked bag)
Contribution per carry-on bag (7 kg)	16.8	0.76	Flight (carry-on bag) + baggage handling (carry-on bag)
Total journey	239.4	11.1	Flight + baggage handling

In this table:

- The total flight numbers describe the carbon footprint of transporting 100 kg PAX (passenger + baggage) from point X to Las Vegas.
- The flight passenger contribution is the carbon footprint of transporting the weight of a passenger (73 kg on average, ICAO, FAA)
- The flight baggage contribution is the carbon footprint of transporting the weight of a single passenger's baggage, both checked baggage and carry-on baggage (27 kg on average, ICAO, FAA)
- The airport baggage handling footprint describes the footprint contribution of the departure and arrival airport baggage handling system transporting average passenger baggage.
- The total baggage contribution is equal to the baggage contribution to flight footprint + the airport baggage handling footprint
- The contribution per checked bag gives the footprint contribution of a single checked bag having a weight of 18.2 kg (IATA average)
- The contribution per carry-on bag gives the footprint contribution of a single carry-on bag having a weight of 7 kg (IATA average)
- The total journey numbers represent the carbon footprint of transporting 100 kg PAX (passenger + baggage) from point X to Las Vegas, now including the airport baggage handling contribution.

Considering a total of 700 visitors, the total numbers are:

[single visitor contribution multiplied by 700]

	One way trip CO2 footprint (kg CO2)	Number of mature trees required for compensation in a year	Notes
Total flight	167300	7604.5	Flight only
Flight passenger contribution	122500	5568.2	Flight only, using average passenger contribution to average PAX weight (73 kg of 100 kg)
Flight baggage contribution	45220	2055.5	Flight only, using average passenger baggage contribution to average PAX weight (27 kg of 100 kg)
Airport baggage handling	256.2	11.6	Flight (baggage only) + baggage handling
Total journey	167576.2	7616.1	Flight + baggage handling

How have these numbers been derived?

Grey text for more detailed clarification

1. The world is divided into areas, each representing a potential visitor departure location. The area density is high in North America (as most visitors are departing from North America, a higher accuracy is desired there) and low for other parts of the world.
2. From each area, a representative departure airport is determined
3. Using the ICAO Carbon Emissions Calculator, the single passenger (+ baggage) carbon footprint is determined.
 - a. This calculator takes an average fuel consumption of the different aircraft flying the specified route from the area representative airport to Las Vegas, and translates this to carbon footprint
 - b. If no direct flight is available, a representative transfer airport is chosen. (e.g. London Heathrow for visitors coming from Istanbul). The footprints of both flights are added to a single flight footprint.
4. The footprints of all departure locations are then averaged to give average conference visitor carbon footprint [weighted according to departure location].
 - a. The weighting is done by weighting continent weighted averages according to the following visitor distribution: 80% coming from North America, 15% from Europe, 2% from South America, 3% from Asia, Africa, and Australia
 - b. The continent weighted average is determined by estimating the footprint contributions of different areas and scaling them to the probability of a visitor coming from this area.
 - c. Example: in Europe, 40% of the people are estimated to depart from London (or similar distance), 40% from Munich and 20% from Istanbul. The average carbon footprint of passengers coming from Europe is then determined using this contribution. It is then estimated that 15% of all conference visitors come from Europe and therefore, the average Europe carbon footprint has a 15% contribution to the average conference visitor carbon footprint.
5. According to the European Environment Agency, a mature tree can absorb 22 kg of CO2 every year. The carbon footprint numbers (in kg CO2) are divided by 22 to get the footprint in equivalent number of mature trees capable of compensating this footprint in a year.
6. For the baggage handling system calculation, representative airport BHS power consumption per passenger is used.
7. The footprint per bag is calculated by finding the weight contribution of an average carry-on and checked bag (7 kg and 18.2 kg respectively, IATA), relative to the 27 kg average passenger baggage weight. Per 27 kg baggage, 2.95 trees are required for compensation, for a one-way trip.
8. For a single checked bag we can then say that $(18.2/27)*2.95 = 1.99$ trees per single checked bag (one-way trip), and $(7/27)*2.95 = 0.76$ trees per X to Las Vegas, now including the airport baggage handling contribution.

How to interpret these numbers?

Carbon footprint numbers

- The carbon footprint numbers are derived by determining the fuel consumption of a flight going from point A to B. This is then divided by the average number of passengers on this flight to get the fuel consumption per passenger, which is translated to emitted CO₂ per passenger. Saying this implies that by removing all PAX, no CO₂ would be emitted. This is not true as the aircraft (obviously) also emits CO₂ when flying unloaded. For passengers you can say that by removing all passengers, the flight would probably not take place and then emissions would be reduced by the carbon footprint per PAX multiplied by the number of PAX. For baggage, this does not hold as (partly) removing baggage from the aircraft would not necessarily mean that the aircraft does not fly. The decrease in baggage weight would only result in a minor decrease in fuel consumption.
- Example: we say that for each visitor, their baggage has an average carbon footprint of 64.6 kg CO₂. Here you cannot say that if the visitor does not take any baggage, the footprint would be 64.6 kg less. The 64.6 kg CO₂ is only a 27kg/100kg portion of what the aircraft emits by transporting 100 kg PAX while having to overcome drag (air resistance) and lifting its weight in the air.
- Key point: the numbers are correct if you say that the flight is only a method of transporting a certain weight (100 kg per passenger, including baggage) from point A to B. The carbon footprint is the cost corresponding to the transport of this weight using the specified transportation method (flight).

Trees

- A world average tree can only absorb 22 kg of CO₂ when it has fully matured every year.
- Example: a single tree can absorb all CO₂ emitted by all visitors during their journey, as long as you take enough time. Likewise, if you want to compensate for all CO₂ instantly, you will need a much higher number of trees. (This can be calculated, if necessary)
- Key point: planting a certain number of trees does not directly compensate for all visitors



**To travel around the world,
we need a world to travel around**