Understanding the climate impact of transportation choices to travel to the AMERSA annual meeting in Chicago, Illinois in November 2024

Transportation contributes more to the amount of Greenhouse Gasses (GHGs) that we individually produce than anything else. Making different choices about transportation is one of the most significant ways for us to cut our carbon footprint. [1] One way to significantly reduce the climate impact of traveling to annual meetings is to use a form of travel that has a lower climate impact. It can be difficult to make exact estimates of the carbon emissions created by various activities, this varies by other factors in addition to choice of major transport (for instance, do you need to drive in the opposite direction from your destination in order to reach an airport or train station? Is the route direct, or does your plane or train go through a hub that adds miles to your trip?). Some climate impact is calculated as carbon emissions, while other calculations attempt to take into account other climate impacts (e.g., emission of other gasses, adverse climate impact of condensation trails from air travel).

Unfortunately, there is not a simple way to figure out whether a train or a plane is a more climate-friendly choice. This is because all trains, and all train routes, are not created equal. [2] Amtrak trains in the Northeast corridor are all electric trains, and all produce much less GHG emissions than flying. The trains running west of the East Coast are primarily diesel trains, and produce substantially more greenhouse gas emissions. [3]

For flight up and down the East Coast, a train is always a better choice. Anywhere else in the country, it depends on the length of the journey: the break-even point is around 700-800 miles. The advantage of train travel compared with air travel is most pronounced for shorter-haul flights, or non-direct flights, since the worst emissions impact from air travel occurs during take-off and landing, with less emissions occurring during cruising. Less than 800 miles or so, then the train is a better choice because a smaller percentage of the distance would be performed at the less-polluting cruising altitude for a plane. Longer than 800 miles (1287 km), and air travel is likely to produce less greenhouse gas emissions, since most of the trip is at cruising altitude (and the trains burn diesel fuel, which is much more polluting than the electric trains that run along the Eastern seaboard).

Car travel is usually the most polluting option. However, if there is more than one person in the car then it becomes one of the least polluting options, since the greenhouse gas emissions per person are cut in half, thirds, etc, depending on the number of passengers.

The estimates below attempt to take into account the total GHG's produced by different modes of transportation, and they express them in terms of CO_2 equivalents. Trains are NOT included in this table, since there is no simple way to build in the differing production of GHGs from diesel vs electric trains.

Comparing the carbon impact of modes of transportation to Chicago from the top ten origin cities for AMERSA members who attended the 2023 Annual Meeting

According to Our World in Data [4] (which calculates the CO_2 equivalents of total Greenhouse Gases emitted):

		Greenhouse Gas (Co_2 equivalents) for round trip, kg		
City of Origin	Distance to Chicago (km)	Flying	Bus	Car**
Baltimore	997	300 kg	194 kg	338 kg
Boston	1393	420 kg	270 kg	474 kg
Denver	1616	488 kg	314 kg	550 kg
New Haven (Hartford)	1257	380 kg	244 kg	428 kg
New York (La Guardia)	1180	356 kg	228 kg	400 kg
Philadelphia	1069	322 kg	208 kg	364 kg
Portland OR	2821	852 kg	547 kg	959 kg
San Francisco	2983	900 kg	578 kg	1014 kg
St. Louis	420	206 kg *	82 kg	142 kg

* Flights <1000 km produce more emissions/km due to higher % of total time spent on take-off & landing
**Emissions/person from car travel are halved if there are two people traveling in the car

How to make sense of these data? To put these numbers in context, flying roundtrip from Boston to Chicago emits more carbon than the average per capita carbon emissions of the populations of approximately 17 countries in the world.[5] On the other hand, eating a vegan diet for a year (compared with a diet that includes meat and dairy) saves almost as much as avoiding the roundtrip flight from San Francisco to Chicago (800 kg saved, vs 900 kg emitted). [5]

Finally, when choosing between various travel options, there are clearly substantial differences in the time and cost for each method. From Boston to Chicago, a non-stop flight takes about 3 hours, whereas the train takes approximately 22 hours. A roundtrip flight purchased well in advance costs about $230. A roundtrip train ticket costs $408 for a reclining coach seat with a fully refundable ticket; and upwards of $1000 for a sleeper car (although this accommodates two people). [2] If you do end up deciding to fly, there are still ways to reduce your GHG emissions. Fly like a NERD: Choose a New(er) aircraft; book Economy class; take a Regular, medium-sized plane instead of a less-efficient small regional or jumbo jet; and select a Direct flight. [5]

1. Our world in data, Emissions by sector: where do greenhouse gasses come from? - Our World in Data
2. Amtrak: Amtrak Tickets, Schedules and Train Routes And Amtrak Sustainability reports
3. Is Traveling by Train Always Cleaner than Flying? It's Complicated. - The New York Times (nytimes.com)
4. Our world in data, "CO_2 and GHG emissions" and "Which form of transport has the smallest carbon footprint?" https://ourworldindata.org/travel-carbon-footprint
5. The Guardian, Niko Commenda, How your flight emits as much CO_2 as many people do in a year. How your flight emits as much CO_2 as many people do in a year | Carbon footprints | The Guardian
6. Lund University, Sweden, The four lifestyle choices that most reduce your carbon footprint. The four lifestyle choices that most reduce your carbon footprint | Lund University
7. Science News: What lifestyle changes will shrink your carbon footprint the most? What lifestyle changes will shrink your carbon footprint the most? (sciencenews.org)

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