Contrasting in-person to virtual conference & teaching emission footprints

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IR2022 CO_2 Emissions

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Abstract

The pivot to online conferences and teaching due to the sudden onset of the COVID-19 pandemic has demonstrated the strengths and weaknesses of this approach. In this poster we estimate the CO_2 emission savings by holding conferences and classes online as compared to face to face and attempt to place these savings in context.

Background

The COVID-19 pandemic introduced a need for conferences to meet virtually rather than in-person. While online conferences do have negative aspects, such as difficulty networking and lack of personal interaction, it is important to consider the environmental benefits of them as well. We discuss the CO_2 emissions saved by having this meeting online.

Methods

This meeting is being held online, but to estimate the CO2 footprint for an in-person meeting, we obtained the host institute of each participant. We could then estimate the travel from that institute to the conference venue using Barret's Travel Carbon Footprint Calculator at https://travel-footprint-calculator.irap.omp.eu/. Additionally, we separated the countries into four bins (USA, Japan, EU, and other) to find their relative footprints.

Google Flights also provides carbon emission estimations for each flight. Thus we can compare and confirm the results of Barret's travel estimation calculator. When compared to the calculator, we find an 11% difference. This is likely due to the extra, but minor, CO2 emission for local travel being included in Barett's calculator but not in the Google Flight CO_2 estimator. The difference is relatively small and builds confidence in Barett's calculator .

We then followed the methodology of Burtcher at al. 2020 to estimate the CO2 footprint of the additional power needed for both computers (clients) and servers for a typical zoom meeting. Using values from "The carbon footprint of large astronomy meetings" and gCO2e kWh-1 values for each country bin, we calculate the network, laptop, and zoom server-related emissions.

Using the Greenhouse Gas Equivalencies Calculator at https://www.epa.gov/sites/default/files/widgets/ghg-calc/calculator.html we find emission equivalencies for the in-person and virtual emissions.

Results

For the **virtual** IR2022 meeting, network, laptop, and Zoom-related emissions total 2.8 metric tons of CO_2. This is equivalent to the CO2 emissions from:

- 1.4 tons of coal burned , 0.015 railcars' worth

Or

- 1,192 liters of gasoline consumed, 0.037 tanker trucks' worth

This is equivalent to the carbon emissions saved by running 1 wind turbine for 0.0002 seconds.

Or

The amount of carbon sequestered by 46.3 tree seedlings grown for 10 years, or 0.014 square kilometers of forests in one year

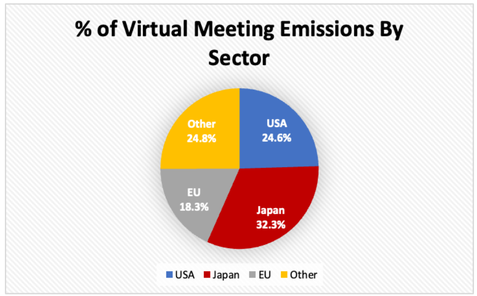

Figure 1. The emission per country bin for this conference, taking account of the different CO_2 per kilowatt hour. We have not estimated the emission at the persons attendance location (i.e. heating, electricity, food/drink, etc.)

For the **in-person** IR2022 meeting, Barret's calculator estimates 653.3 metric tons of travel emissions. This is equivalent to CO_2 Emissions from:

- 328 tons of coal burned, 3.6 railcars' worth

Or

- 278,273 liters of gasoline consumed, 8.6 tanker trucks' worth

This is equivalent to the carbon emissions saved by running 1 wind turbine for 0.06 seconds.

Or

The amount of carbon sequestered by 10,802 tree seedlings grown for 10 years, or 3.24 square kilometers of forests in one year

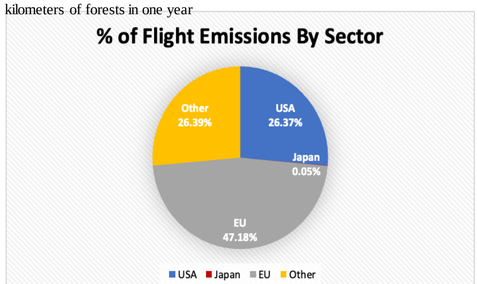

Figure 2. The relative flight CO_2 footprints for each of the four country bins. USA is 26.37%, Japan is 0.05%, EU is 47.18%, and Other is 26.39%.

Figure 3. The flight emissions per participant's city as estimated by Barret's calculator

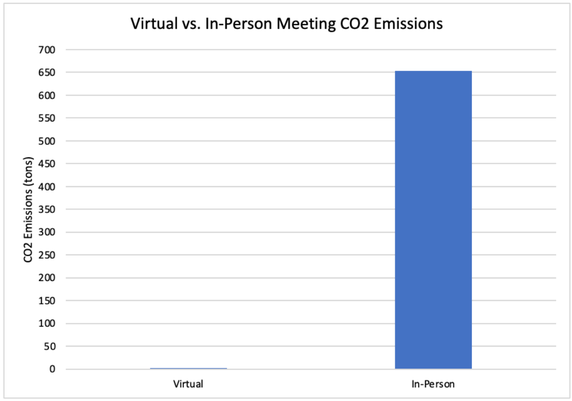

Figure 4. The CO_2 Emission footprint of a Virtual vs. In-Person meeting for IR2022.

Conclusions

While the difference in CO_2 emissions between the virtual and in-person conference is very large, we understand that this is not the only factor in deciding between them. Online conferences are not a total replacement for all face to face meetings, but improvements continue. However, we feel strongly that it is a face in deciding the location and type of conference. Being able to quantitively estimate the reduced CO_2 emissions serves to enable conference planners to make a well-educated decision.

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