Quantifying Scope 3 $\text{CO}_2$ Emissions Associated with Employee Air Travel at Boston University

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Campus Climate Lab Final Presentation

January 2021
Background

What are we investigating?
- Scope 3 CO$_2$ emissions associated with BU employees’ business travel
- Previous work by Transportation Working Group of the Climate Action Plan (2015)

What are Scope 3 Emissions?
- Induced emissions, eg.:
  - commuting, travel, waste disposal, purchasing supplies, dining services
- On the order of 200,000 MT CO$_2$e, greater than Scopes 1 and 2 combined (129,400 MT CO$_2$e)
Methodology Summary

Collected over 46,000 employee flight records from Concur in the period from 2017 through early 2020.

Distributed a survey to explore the flight behavior of a sample of 118 staff and faculty at BU.

Survey results were analyzed using Qualtrics.

Emissions were calculated using the ICAO carbon emissions calculator (ICEC).

Flight records and emissions were analyzed using R software.

Survey and flight data results were examined in order to make estimates about total emissions.
Survey Results - Key Findings

On average, the employees in our sample self-reported that only 33% of their flights are booked through the Concur platform.

Despite the changes that have been made since early 2020 and the start of the COVID-19 pandemic, the majority of our respondents said that they expect to fly as much as before COVID-19 once travel is deemed safe again.
Concur Data Results - Key Findings

We were able to determine total CO2 emissions for our flight data from Concur, as well as information about the location and quantity of flights from 2017 through early 2020.
Estimates

We estimated total yearly emissions based on two models: Best Case and Worst Case.

**Best Case:** the flights reported through Concur account for all employee travel in 2017 through 2020.

**Worst Case:** Concur records account for only 33% of all employee flights, as reported in our survey.

<table>
<thead>
<tr>
<th>Year</th>
<th>Best-Case Estimate</th>
<th>Worst-Case Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017</td>
<td>2369</td>
<td>7177</td>
</tr>
<tr>
<td>2018</td>
<td>2429</td>
<td>7360</td>
</tr>
<tr>
<td>2019</td>
<td>2764</td>
<td>8376</td>
</tr>
<tr>
<td>2020</td>
<td>2319</td>
<td>7027</td>
</tr>
<tr>
<td>Total 2017-2020</td>
<td>9880</td>
<td>29940</td>
</tr>
</tbody>
</table>

![Graph showing emissions estimates](image-url)
Recommendations

1. Mandate the usage of Concur for travel booking

2. Increase promotion of alternate forms of travel (eg., bus, train, car) for shorter-distance business trips

   NYC was the most common domestic destination, easily accessible by Amtrak - fewer emissions (and less $$)

3. Maintain use of teleconferencing post-COVID-19

   Survey results: 66% of travel is necessary for professional development

   Some in-person travel, and some flights, will always be necessary
Acknowledgements: thank you!

Melinda Wheeler and Ian Poole at Boston University Sourcing and Procurement

Emma Bonanomi, Director of Communications at the Boston University Office of Research

Ziba Cranmer, Greta Bruce, and Gowtham Asokan of BU Spark! and the Boston University Hariri Institute for Computing

John Helveston, of the Climate Action Plan’s Transportation Working Group

Lisa Tornatore and Stephen Ellis of BU Sustainability

Jacqueline Ashmore; we couldn’t have asked for a better mentor!

Finally, thank you to the Campus Climate Lab program and board of directors for funding this research and helping make this project possible.
Questions?
Conclusions

Most common domestic destinations from Boston:

- New York
- Philadelphia
- Chicago
- Charlotte
- Washington, D.C.

-> all short-haul flights*

* 6 hours or less, as defined by the International Air Transport Association (IATA)
Challenges

1. Finding an accurate, verified platform for calculating emissions
   Documented and informed methodology; preferably open-source

2. Coding/Scraping
   Limitations of ICEC website and our own experience

3. Making sound estimations/assumptions

-> Learning experience at every step!
Conclusions

Total recorded emissions: 2,368.54 MT CO$_2$
   Actual total could be up to 7,177 MT CO$_2$

Average distance flown: 1,245.44 miles.
   About the distance from Boston to Miami, Florida (1,258 miles)

Many, short-distance flights were comparable in emissions to fewer, long-distance flights
### ICAO Flight Emissions Calculator

<table>
<thead>
<tr>
<th>One Way/Round Trip</th>
<th>Cabin Class</th>
<th>Number of Passengers</th>
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<tbody>
<tr>
<td><strong>Round Trip</strong></td>
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<table>
<thead>
<tr>
<th>Leg</th>
<th>From City/Airport</th>
<th>To City/Airport</th>
<th>Action</th>
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<tr>
<td>1</td>
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</table>

- **Delete All Location(s)**
- **Delete Leg**
- **Add New Leg**

**Metric (KG / KM)**  **Standard (LBS / MI)**