

INTRODUCTION

This report quantifies the main greenhouse gas emissions associated with the BNA Festival of Neuroscience 2025 and explains, in a transparent way, how those emissions were estimated. The analysis was built around the GHG Protocol principles, using the 2025 UK Government conversion factors for travel, hotel stays and material production. Across the categories quantified in this report, the festival footprint is estimated at 228 t CO₂e.

The results are clear: travel is by far the dominant driver of impact. Participant travel accounts for 177 t CO₂e, or 78% of quantified emissions. Venue operations from the ACC Liverpool report add 21 t CO₂e, while accommodation contributes 22 t CO₂e and quantified materials contribute 0.25 t CO₂e.

The report also sets out what BNA is already doing well: measuring emissions, choosing venues with stronger sustainability credentials, encouraging greener transport, and using previous reporting to improve the next event. It closes by identifying practical next steps for BNA2027 in Belfast.



British
Neuroscience
Association

GHG SCOPE BREAKDOWN

SCOPES	DESCRIPTION	CARBON FOOTPRINT CO ₂ E
SCOPE 1	Direct fuel and process emissions controlled by the organiser	No significant emission
SCOPE 2	Purchased electricity: Venue energy from ACC Liverpool	4.100 t CO ₂ e
SCOPE 3	Other indirect emissions across the event value chain: Travel, accommodation, food, beverage, waste, water, and materials.	224.163 t CO ₂ e

228.3 t CO₂e

Total Carbon Footprint



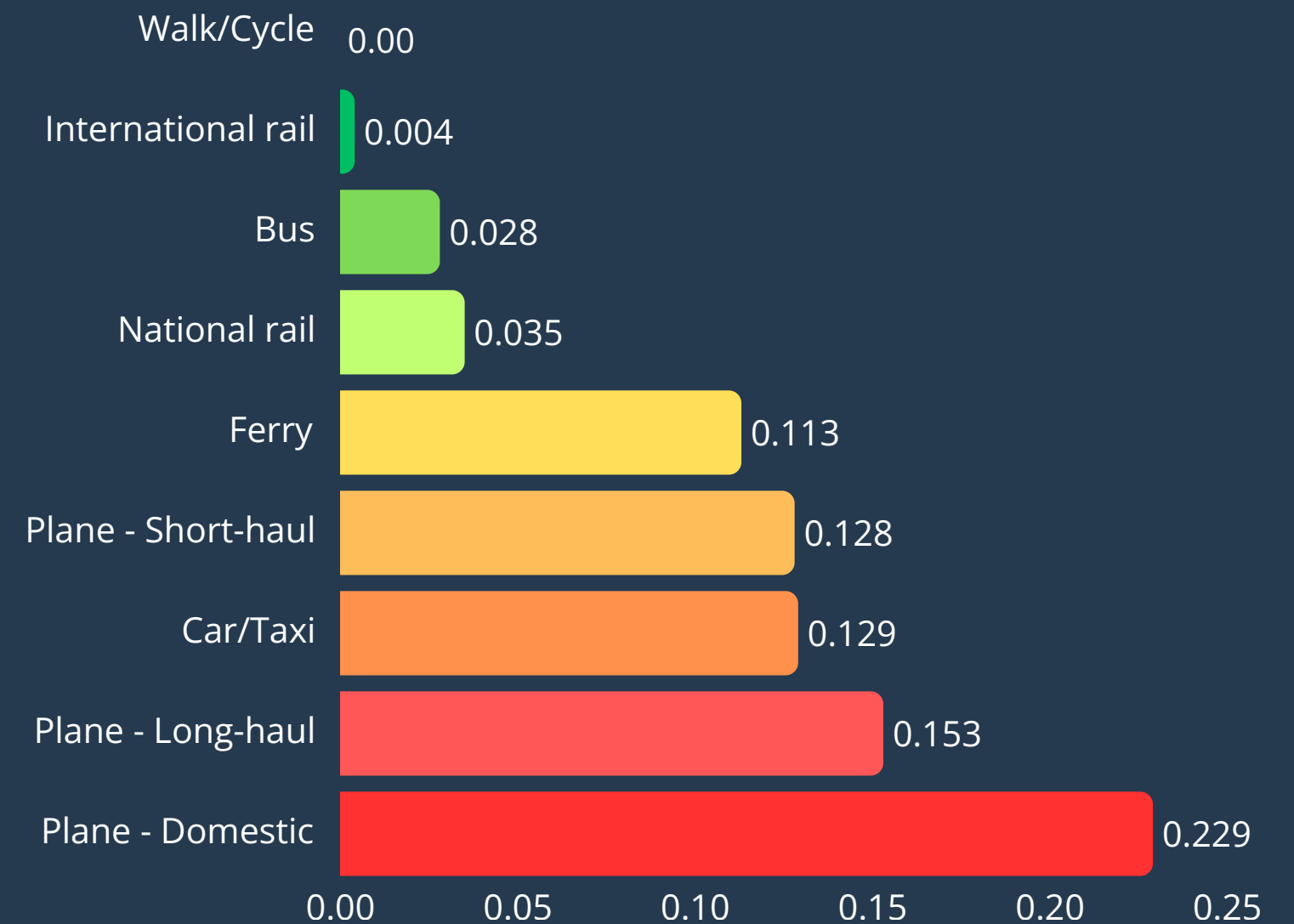
MODES OF TRANSPORT

Transport mode strongly influences emissions, with flights and car travel being the most carbon-intensive, while rail and bus travel are substantially more efficient.

This demonstrates that shifting travel choices could significantly reduce overall emissions.



Carbon Intensity by Transport Mode (kg CO₂e per km)



METHODOLOGY

All calculations were performed in accordance with the UK Government Greenhouse Gas (GHG) Conversion Factors for Company Reporting (2025)

GHG emissions = activity data x emission conversion factor

Factor	Value	Use in this report
National rail	0.03546 kg CO ₂ e/passenger-km	Travel modelling for rail
Domestic flight	0.22928 kg CO ₂ e/passenger-km	UK domestic air travel
Short-haul flight	0.12786 kg CO ₂ e/passenger-km	Short-haul international air
Long-haul flight	0.15282 kg CO ₂ e/passenger-km	Long-haul air travel
UK hotel stay	10.4 kg CO ₂ e/room-night	Staff and speaker



TRAVEL

Travel data were collected for attendees and speakers, including:

- Origin location (town/city/postcode)
- Mode of transport (e.g. train, plane, car, bus, ferry)

Invalid or incomplete entries were removed prior to analysis.

Travel distances were estimated using the Haversine formula with geospatial coordinates (latitude and longitude) for origin locations and the event venue (Liverpool). Mode-specific adjustment factor was applied to approximate realistic journey most closely. Travelling by plane was separated by the flight distance: domestic (up to 800km), short-haul (801km - 3700km), long-haul (above 3700km).

VENUE

Venue-related emissions were obtained using EVENTsmart reporting and included:

- Catering (food and beverage)
- Energy consumption
- Waste
- Water use

ACCOMMODATION

Accommodation data included:

- Number of hotel night stays for staff, speakers and estimated stays for attendees
- Emission Factor: 10.4 kg CO₂e per night

PRODUCTION

Production-related emissions:

- Printed materials
- Merchandise (e.g. t-shirts)
- Transport of materials to the venue

Where details were unavailable, estimates based on material type and typical dimensions were applied.

METHODOLOGY



COLLECT THE
DATA

CLEAN AND
CHECK THE
DATA

CALCULATE
EMISSION

ANALYSE
RESULTS

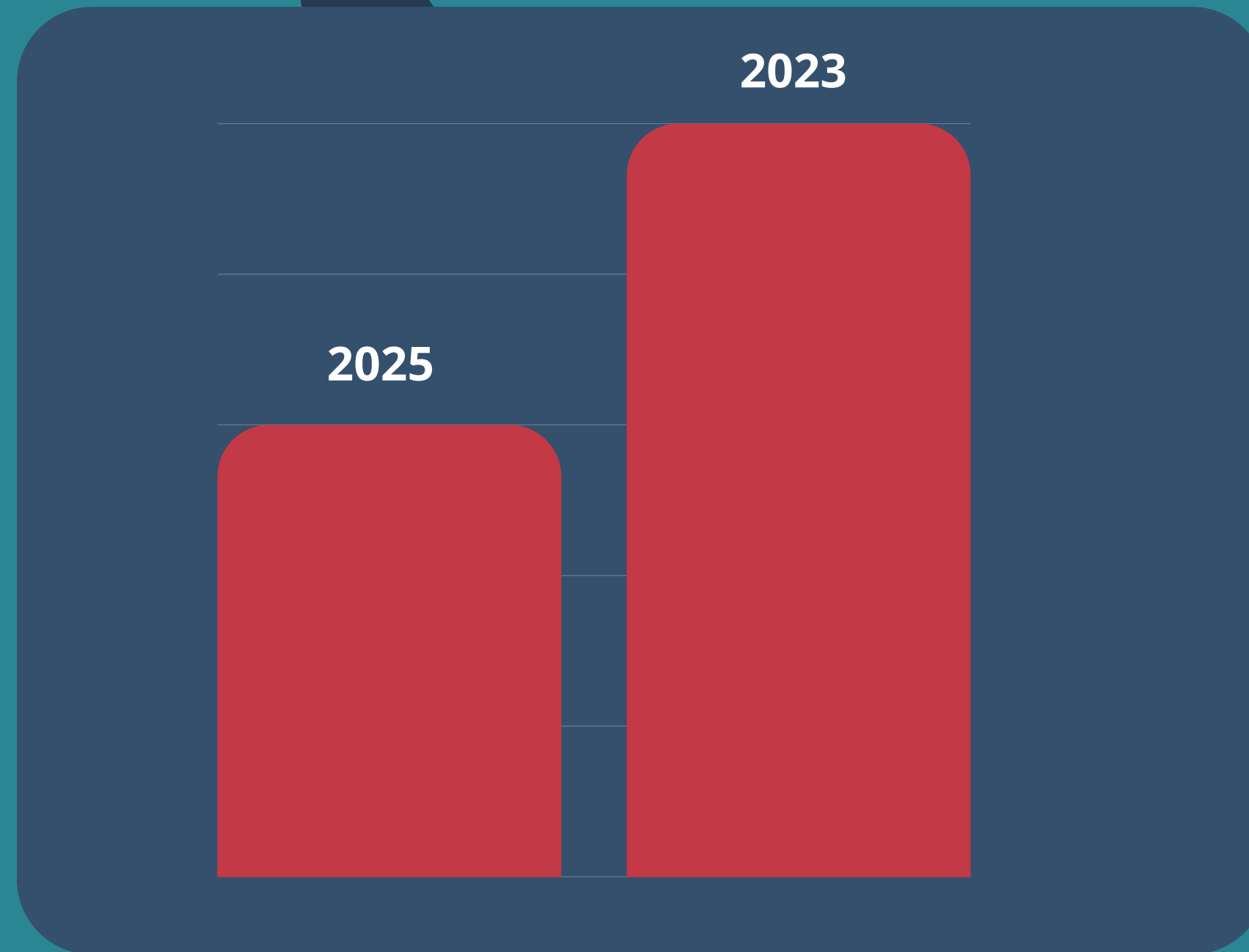
REPORT
FINDINGS

COMPARISON WITH BNA2023

BNA2023: 250.91 t CO₂e

BNA2025: 228.26 t CO₂e

BNA2025 Carbon emission was
22.65 t CO₂e lower than previous
BNA Festival



Travel remained the largest contributor in both years
The reduction suggest progress that we hope to maintain over next years for future Festivals of Neuroscience

Carbon Emissions Reduction: 22.65 t CO₂e

This reduction is roughly equivalent to around 1000 trees growing for 10 years



NEXT STEPS FOR BNA2027



Reduce travel-related emission

The BNA2027 Venue has already been announced, which gives attendees and speakers more time to plan their journey in advance. This creates an opportunity to make more conscious travel decisions, including choosing lower-carbon transport options such as rail where feasible, and reducing reliance on last-minute flights.

Venue sustainability

BNA2027 will take place at ICC Belfast, a venue with strong sustainability credentials. ICC Belfast reports that it is the first venue on the island of Ireland to achieve Green Meetings Gold certification and the first venue in Northern Ireland to achieve ISO 20121, the international standard for sustainable event management. The venue also highlights local sourcing, farm-to-fork catering, and a wider city context in which most hotel rooms are Green Tourism accredited. This gives BNA2027 a stronger foundation for lower-impact event delivery.

Improving future reporting

Future reporting could be strengthened through more detailed and standardised data collection, particularly for travel, accommodation and production-related emissions. Improving the quality and consistency of reporting would make future carbon assessments more accurate and allow stronger year-on-year comparisons. Sharing this report also plays an important role in raising awareness of the climate crisis, encouraging more sustainable choices, and supporting a culture of continuous improvement across future BNA events.

THANK YOU

SEE YOU AT BNA2027

RESOURCES:

- British Neuroscience Association (BNA) (2026) BNA2027 International Festival of Neuroscience. Available at: <https://www.bna.org.uk/events/bna2027-international-festival-of-neuroscience/> (Accessed: 16 April 2026).
- Department for Energy Security and Net Zero (2025) Greenhouse gas reporting: conversion factors 2025. London: GOV.UK. Available at: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025> (Accessed: 16 April 2026).
- ICC Belfast (2026) Sustainable venue hire. Available at: <https://iccbelfast.com/organise/event-sustainability/sustainable-venue> (Accessed: 16 April 2026).
- International Festival of Neuroscience 2025 (n.d.) Carbon report [internal venue/event emissions summary]. Provided by user.
- BNA (2025) BNA Festival of Neuroscience 2025 attendee and speaker travel dataset [internal spreadsheet]. Unpublished internal data.
- BNA (2025) BNA Festival of Neuroscience 2025 hotel night stay records [internal records]. Unpublished internal data.
- BNA (2025) BNA Festival of Neuroscience 2025 production and printed materials records [internal records]. Unpublished internal data.





Carbon accounting

For international conferences, based on minimal information

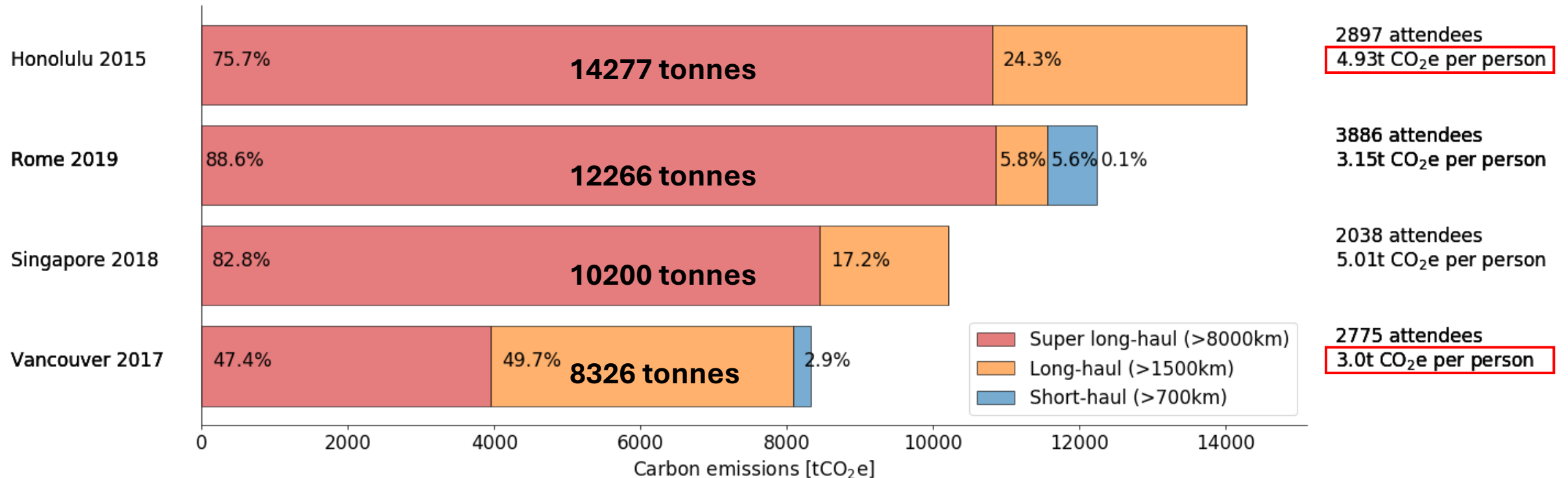
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Emissions due to travel are location-dependent



➤ Aviation/travel to an international conference is the single biggest CO₂e emitter



Epp et al., 2023, Aperture Neuro

→ Total emissions depend on the number of people and the distance attendees have to cover

Results based on harmonized methods



Find script on https://github.com/samiraapp/carbon_accounting_conference

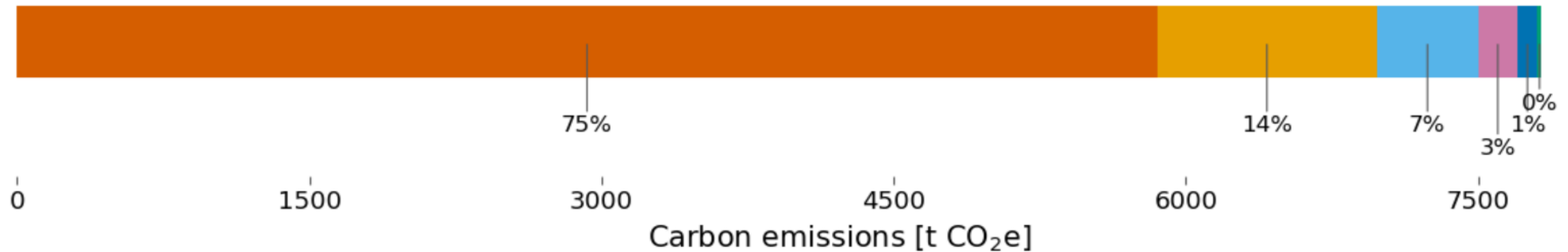
Find UK Government Conversion Factors for greenhouse gas (GHG) reporting 2025 here:

<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025>

- Long-haul flights (>8000 km)
- Short-haul flights (1500-8000 km)
- Domestic flights (700-1500 km)
- Train / car / bus (<700 km)
- Hotel nights
- Conference center emissions

Rome 2019

3886 attendees | total emissions: 7826 t CO₂e | 2.01 t CO₂e per person



Rome 2019

88.6%

12266 tonnes

5.8%

5.6%

0.1%

3886 attendees

3.15t CO₂e per person

Hands-on: minimal data needed



Microsoft Excel interface showing a spreadsheet with columns: Town, Country, Attendees, Latitude, Longitude, Distance. The formula bar displays the Haversine distance formula: $=6371*ACOS(COS(RADIANS(90-SE$2))*COS(RADIANS(90-E3))+SIN(RADIANS(90-SE$2))*SIN(RADIANS(90-E3))*COS(RADIANS(F2-F3)))$. The spreadsheet data is as follows:

Town	Country	Attendees	Latitude	Longitude	Distance
Rom	Italy	147	41.902782	12.496366	0
Buenos Aires	Argentina	3	-34.48297	-58.42305188	$90-SE$2$)*
Sydney	Australia	92	-33.83261	151.1887727	16317.577
Wien	Austria	46	48.2118617	16.36382706	764.22915
Region Br	Belgium	89	50.8776303	4.429144546	1172.61709
Brasília	Brazil	21	-15.798785	-47.89573416	8906.2878
Toronto	Canada	130	43.6551998	-79.38121711	7080.7952
Vancouver	Canada	130	49.3153542	-123.0596653	8983.42783
Santiago de	Chile	25	-33.449295	-70.63930671	11908.0843
Peking	China	229	40.0256992	116.4143205	8116.78046
Taipeh	Chinese Taipei	2	25.0478612	121.5776087	9610.18025
Zagreb	Croatia	1	45.815749	15.97982123	516.905598
Republik Z	Cyprus	1	35.0551696	33.21359288	1951.13206
Prag	Czech Republic	21	50.0754523	14.4333455	920.9107
Pjöngjang	Laos	2	39.1446163	125.7842317	8767.55346
Kopenhagen	Denmark	14	55.7222612	12.57227332	1536.66579
Helsinki	Finland	33	60.1992893	24.997173	2205.51716
Paris	France	172	48.8846	2.314358662	1109.40723
Berlin	Germany	399	52.5754632	13.39730156	1188.67005

- First column: destination
- Location & number of attendees needed.
- Distance calculated via longitude & latitude information

Harmonized methods: assumptions

Plane (distances > 700km)*

- Domestic (between 700 and 1500km) → 0.22928 kg CO₂e/km;
- Short-haul (between 1500 and 8000km) → 0.12786 kg CO₂e/km;
- Long-haul (>8000km) → 0.15282 kg CO₂e/km;

Distances < 700km: car/taxi, bus, rail, ferry

→ Estimated average of 0.06 CO₂e/km & distance multiplied by factor 1.3

Hotel stays*

10.4 kg CO₂e/room-night (UK, different for different countries!)

Conference center emissions**

estimate of 5.25tCO₂e for 1000 people per day = 5.25kg / person / conference day

*based on UK Government Conversion Factors for greenhouse gas (GHG) reporting 2025

<https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025>

**based on BNA 2025 numbers

Hands-on: python script explained



Find script on https://github.com/samiraapp/carbon_accounting_conference

please update the following section!

```
## please UPDATE PATH!!  
path = '/YOUR/PATH/'  
  
## please update: length of the meeting (in days)  
n_days = 5  
  
## please update: depending on the length of the conference (n_days), what's the average stay  
n_night = 5  
  
## please update: what are the carbon emission of the conference center per day and participar  
center_CO2 = 5.25  
  
## read excel file, please update filename!  
df = pd.read_excel(path+'Rome_2019_data_example.xlsx', engine='openpyxl')
```

Adjust

- the path where your excel lies
- the number of days & nights of the conference
- carbon emissions of the conference center (if available, if not, leave this estimate)

Hands-on: python script explained



```
#####  
### assumptinos are based on kilometers/distance to conference center  
  
#numbers per scenario: how many people took what kind of flights?  
#Vancouver  
print('Total number of people attending ' + ': ' + str(N_sum))  
ic =sum([N for N,d in zip(N,dist) if d >= 8000])  
people_longhaul_percentage = round(ic/N_sum*100, 1)  
print('long-haul ' + ': '+ str(ic))  
lh = sum([N for N,d in zip(N,dist) if d >= 1500 and d < 8000 ])  
people_shorthaul_percentage = round(lh/N_sum*100, 1)  
print('short-haul ' + ': '+ str(lh))  
sh = sum([N for N,d in zip(N,dist) if d >= 700 and d < 1500])  
people_domestic_percentage = round(sh/N_sum*100, 1)  
print('domestic ' + ': ' + str(sh))  
ra = sum([N for N,d in zip(N,dist) if d < 700])  
people_residence_percentage = round(ra/N_sum*100, 1)  
print('rail/bus/car/ferry ' + ': ' + str(ra))
```

```
Total number of people attending : 3886  
long-haul : 1771  
short-haul : 350  
domestic : 1370  
rail/bus/car/ferry : 395
```

Output: Quick overview over the total number of attendees, and their (assumed) modes of transport

Hands-on: python script explained

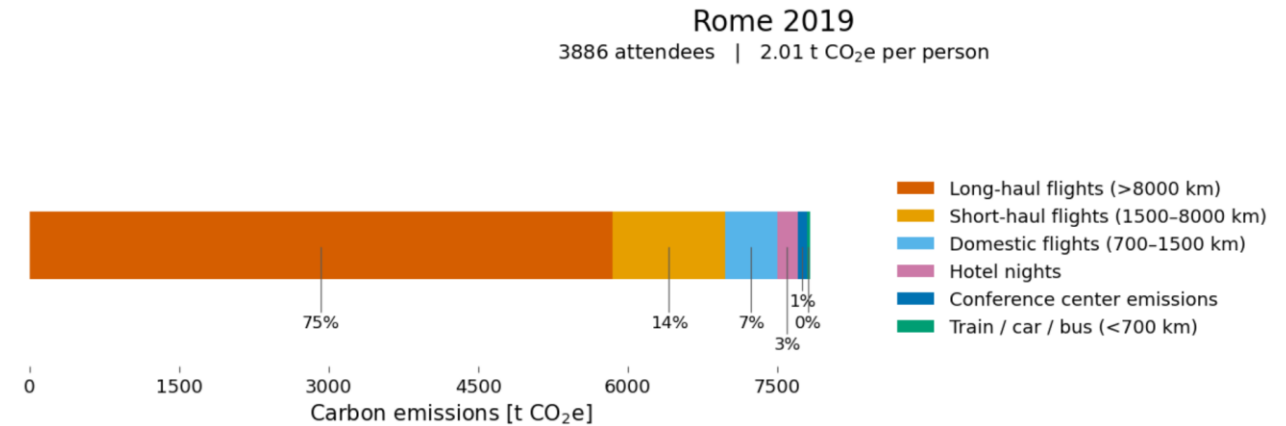


```
dist = np.array(df["Distance"]) #distance in km, one-way
```

```
N = np.array(df["Attendees"]) # how many people
```

```
# -----  
# Calculate emissions  
# -----  
C1lc = sum([num*d*2*0.22028 for num, d in zip(N, dist) if d >= 8000]) / 1000  
C1lh = sum([num*d*2*0.12786 for num, d in zip(N, dist) if d >= 1500 and d < 8000]) / 1000  
C1sh = sum([num*d*2*0.15282 for num, d in zip(N, dist) if d >= 700 and d < 1500]) / 1000  
C1ra = sum([num*d*2*1.3*0.06 for num, d in zip(N, dist) if d < 700]) / 1000  
nights = (N_sum * n_night * 10.4 / 1000)  
conference_CO2 = (N_sum * n_days * center_CO2 / 1000)  
  
values = [C1lc, C1lh, C1sh, C1ra, nights, conference_CO2]  
labels = [  
    "Long-haul flights (>8000 km)",  
    "Short-haul flights (1500-8000 km)",  
    "Domestic flights (700-1500 km)",  
    "Train / car / bus (<700 km)",  
    "Hotel nights",  
    "Conference center emissions"  
]  
  
# Colorblind-safe palette  
colors = ["#D55E00", "#E69F00", "#56B4E9", "#009E73", "#CC79A7", "#0072B2"]  
  
total_emissions = sum(values)  
  
# -----  
# Sort by emissions descending  
# -----  
data = sorted(zip(values, labels, colors), key=lambda x: x[0], reverse=True)
```

Output:



→ Generates graph of total emissions, sorted by % of emissions per category

Hands-on: python script explained



Two plots in one

upper part: total emissions;

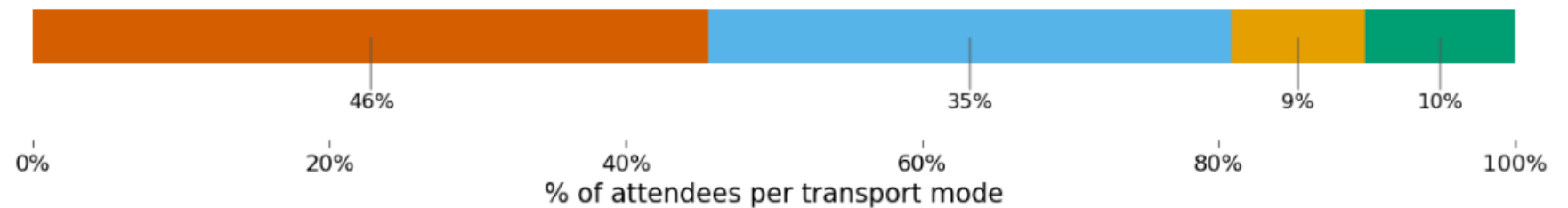
lower part: % of attendees per mode of transport ¶

```
import numpy as np
import matplotlib.pyplot as plt
from matplotlib.ticker import MaxNLocator, PercentFormatter
from matplotlib.patches import Patch

# -----
# Calculate emissions
# -----
C1lc = sum([num*d*2*0.22028 for num, d in zip(N, dist) if d >= 8000]) / 1000
C1lh = sum([num*d*2*0.12786 for num, d in zip(N, dist) if d >= 1500 and d < 8000]) / 1000
C1sh = sum([num*d*2*0.15282 for num, d in zip(N, dist) if d >= 700 and d < 1500]) / 1000
C1ra = sum([num*d*2*1.3*0.06 for num, d in zip(N, dist) if d < 700]) / 1000
nights = (N_sum * n_night * 10.4 / 1000)
conference_CO2 = (N_sum * n_days * center_CO2 / 1000)

values = [C1lc, C1lh, C1sh, C1ra, nights, conference_CO2]
labels = [
    "Long-haul flights (>8000 km)",
    "Short-haul flights (1500-8000 km)",
    "Domestic flights (700-1500 km)",
    "Train / car / bus (<700 km)",
    "Hotel nights",
    "Conference center emissions"
]
```

Output:



→ Second part: how many percent have taken which mode of transport (based on our assumptions)

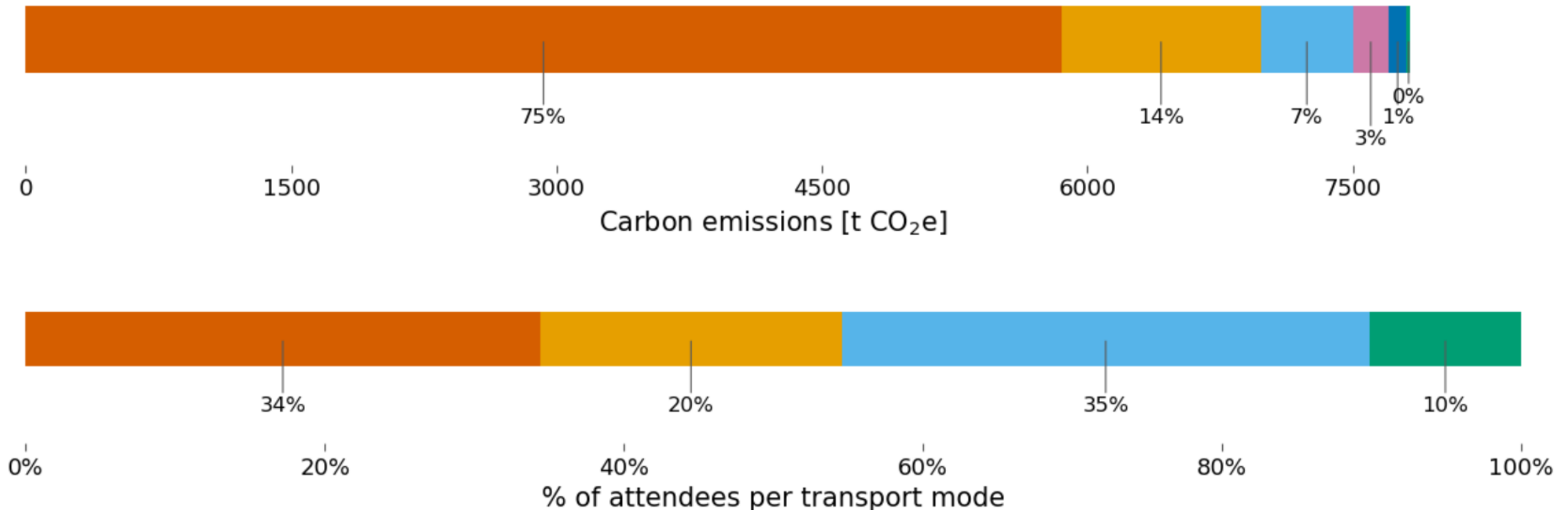
Methods harmonized with the BNA



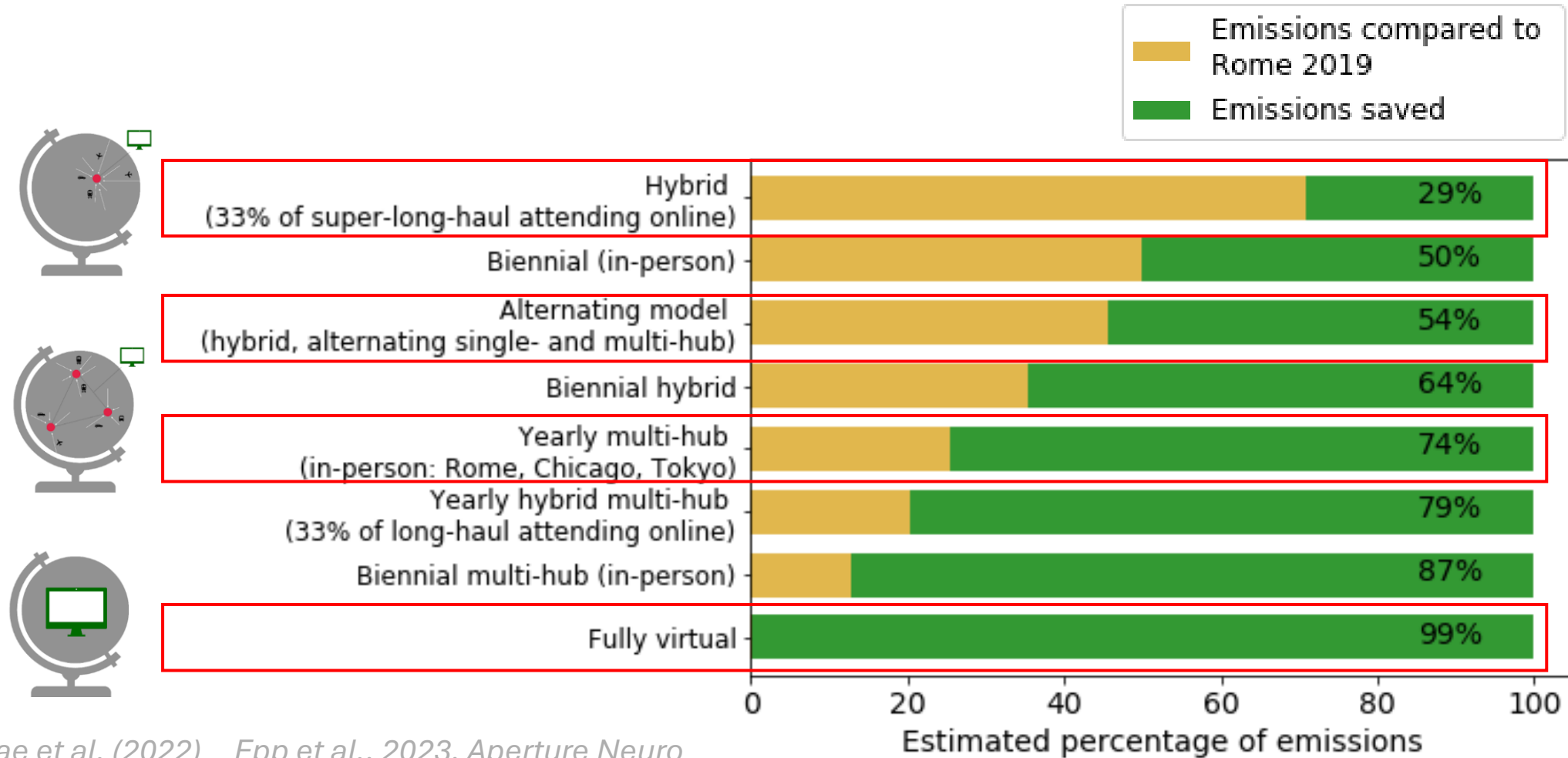
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- Domestic flights (700-1500 km)
- Train / car / bus (<700 km)
- Hotel nights
- Conference center emissions

Rome 2019

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Alternative conference models



Rae et al. (2022) Epp et al., 2023, Aperture Neuro



Thank you!

And have fun replicating / estimating your own emissions!

https://github.com/samiraepp/carbon_accounting_conference