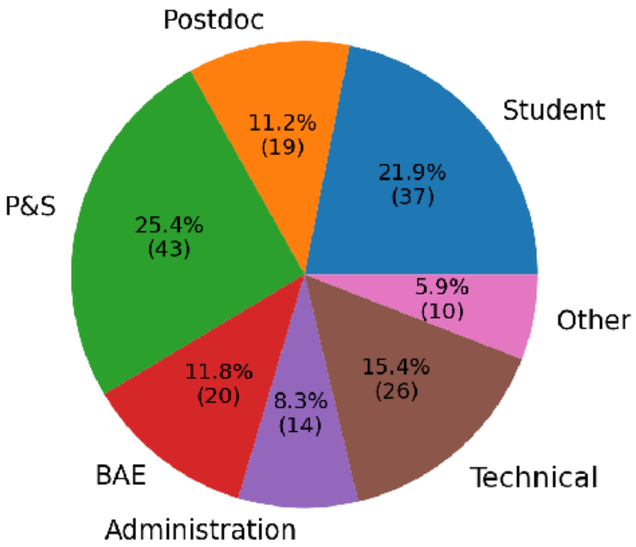
Community Survey on Transportation Usage

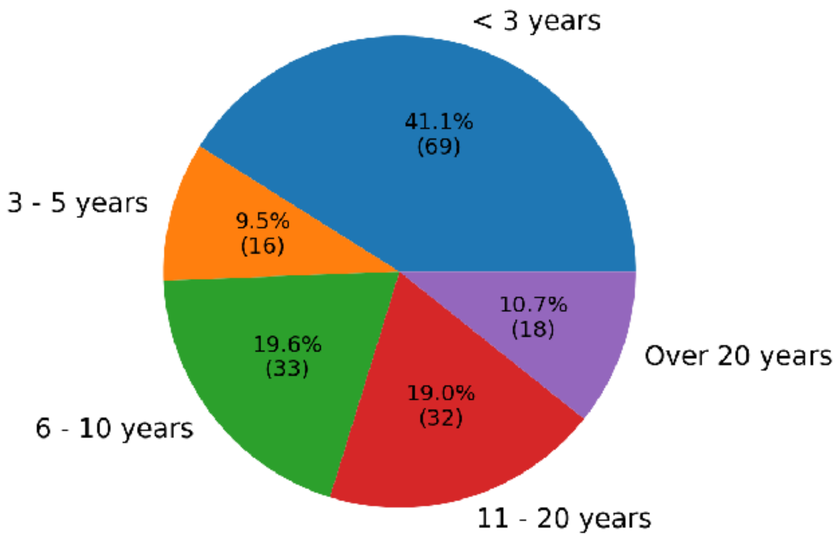
- 3 questions on demographics
- 5 questions on commute to work
- 7 questions on work-related travel
- Many thanks for filling out the survey!

Surveyed demographics

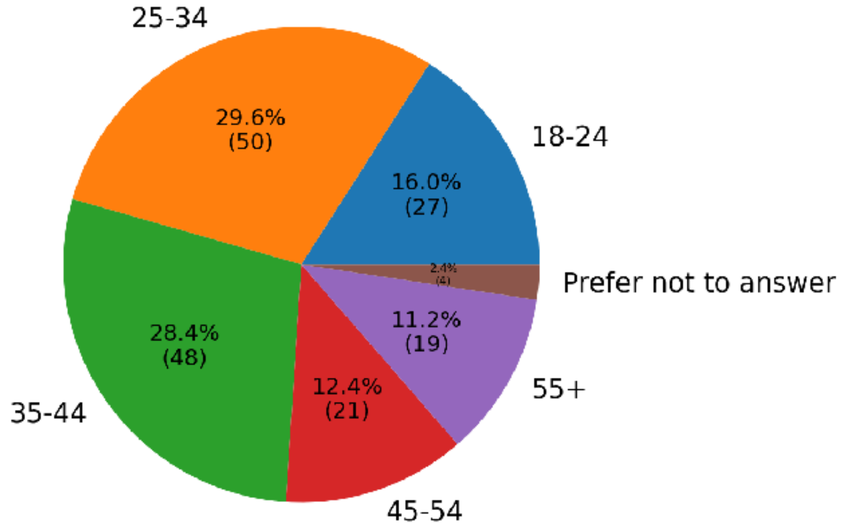
By nature of job



By length of working at TRIUMF



By age group

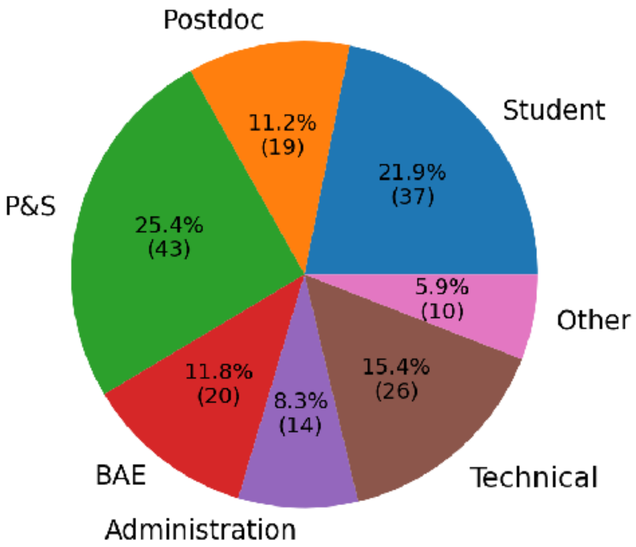


- Total responses: **181**
- Valid responses: **169**
  - Eliminated responses that only contain demographic information

- Surveyed demographics skew young and relatively recent hire
  - ~50% with less than 5 years at TRIUMF
  - ~50% under 35

Surveyed demographics

By nature of job



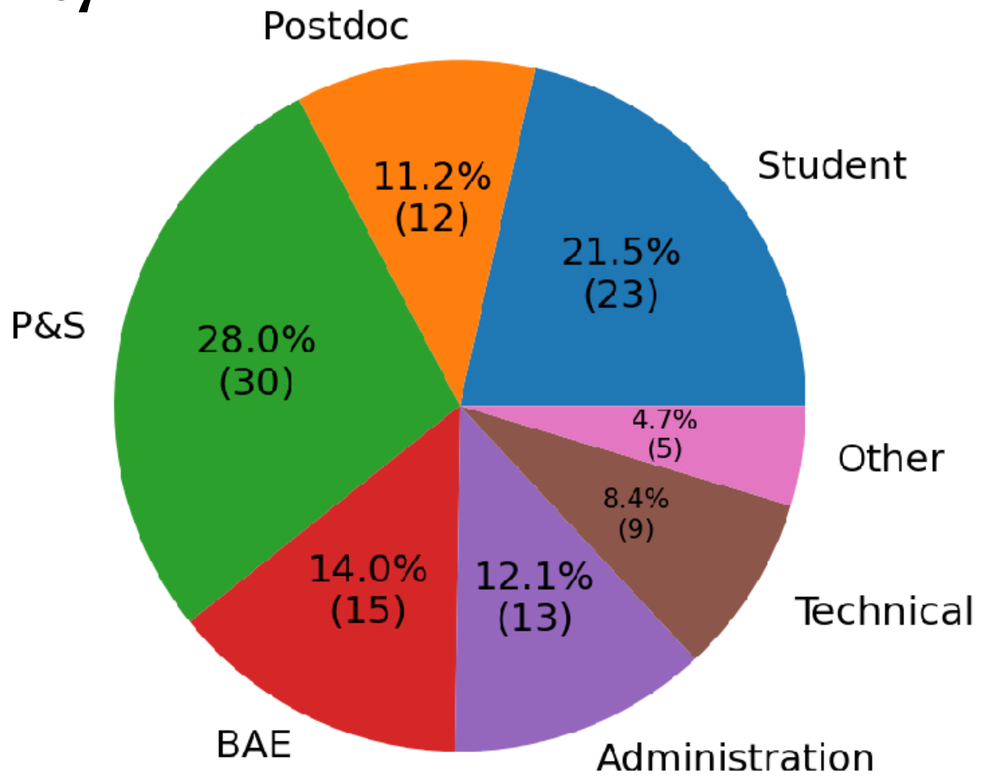
Executive management	7
Technical certified	159
Student	112
Engineering & applied science	107
Management	79
Admin & professional	66
Research	62
BAE	49
Technical	29

- Valid responses: **169**; total employees: **670**
- Unfortunately, job categories in the survey did not perfectly match the HR definitions

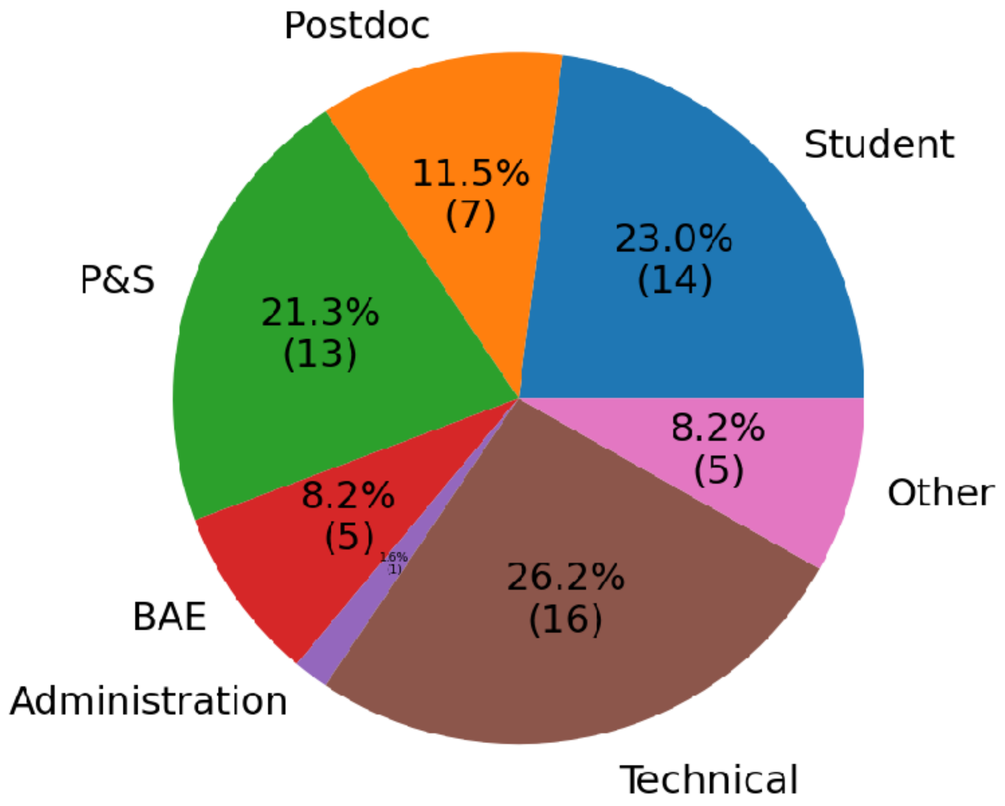
Commute to work

1. Does the nature of your work support a remote work option?

Yes: **107**



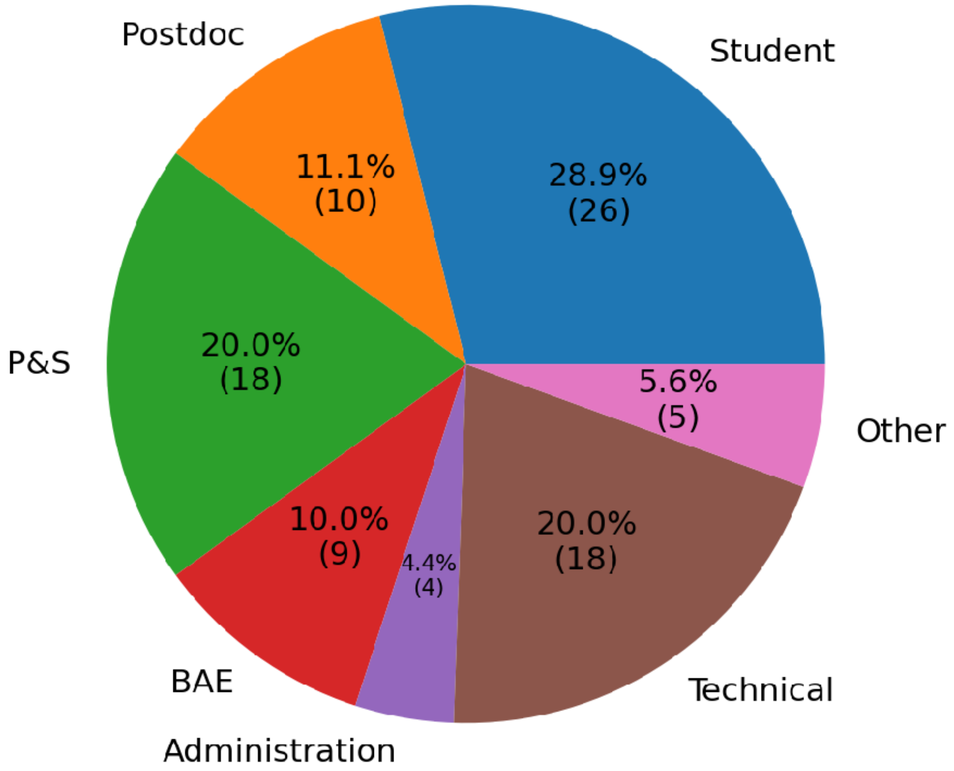
No: **61**



Commute to work

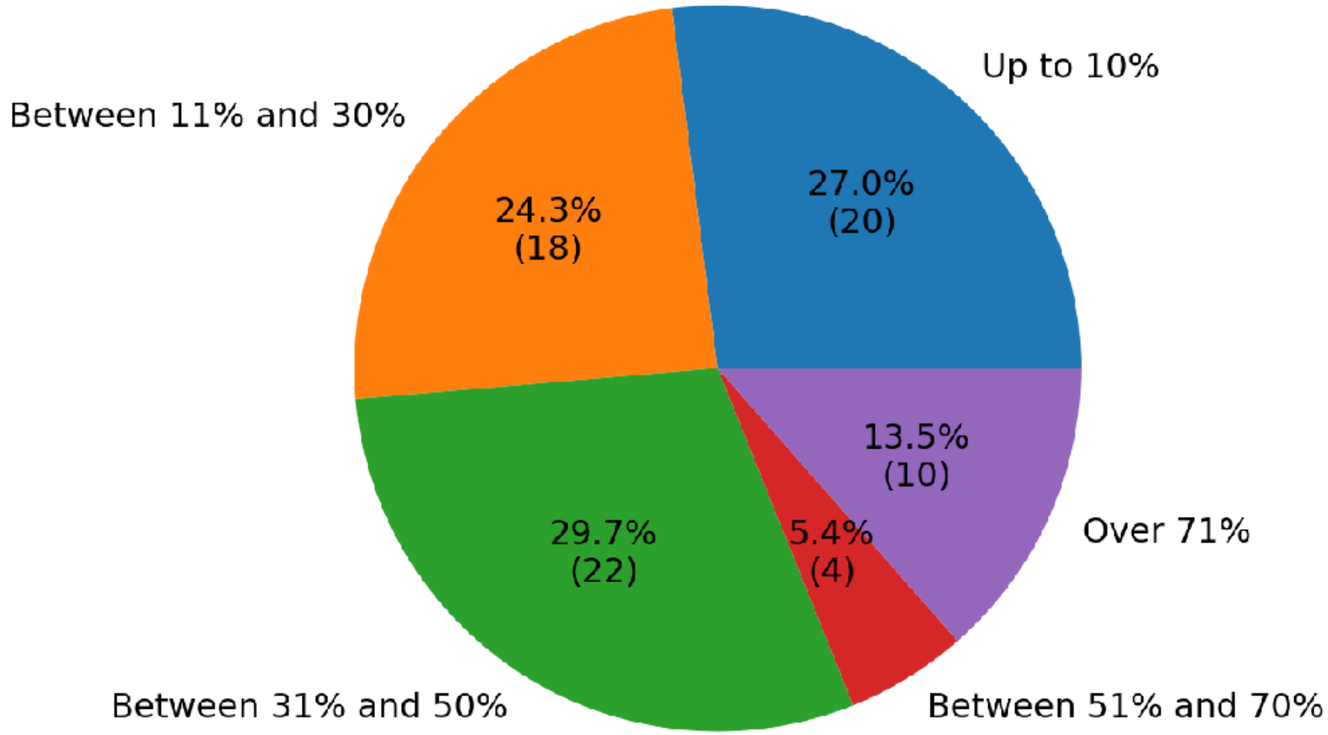
2. Do you use the remote option? If so, what fraction of the time?

Yes: **75**



Fraction of remote working time

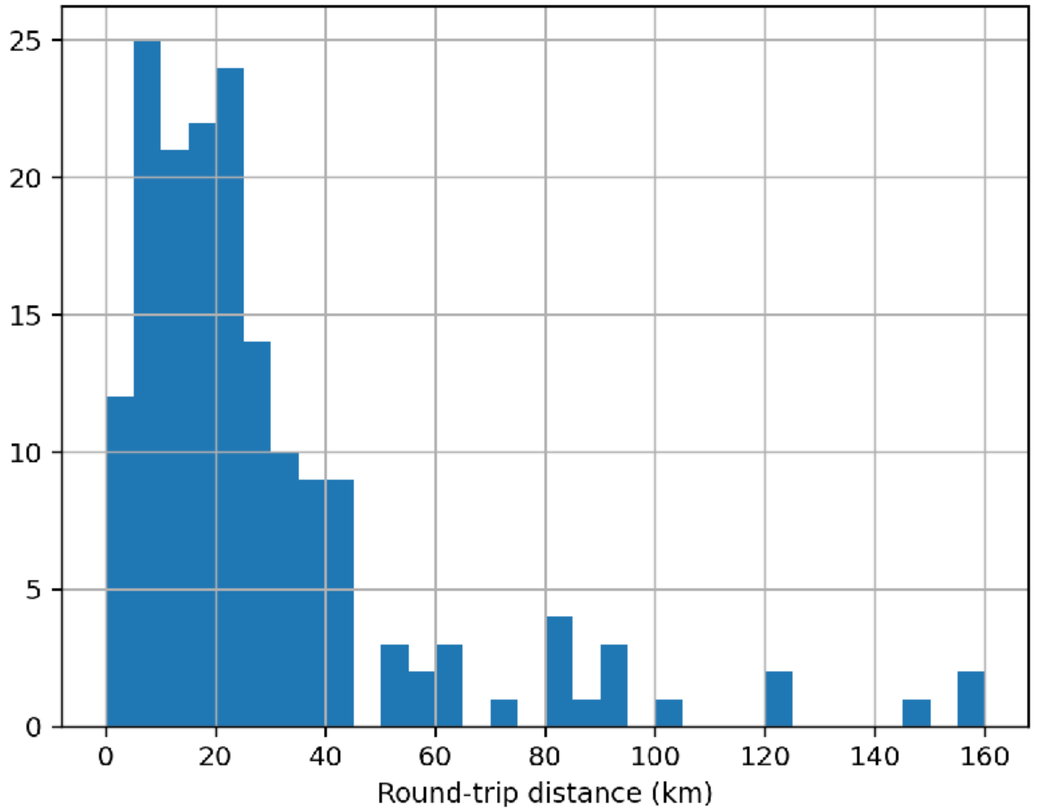
Average: 35%



Commute to work

3. Mode of transportation and commute distance

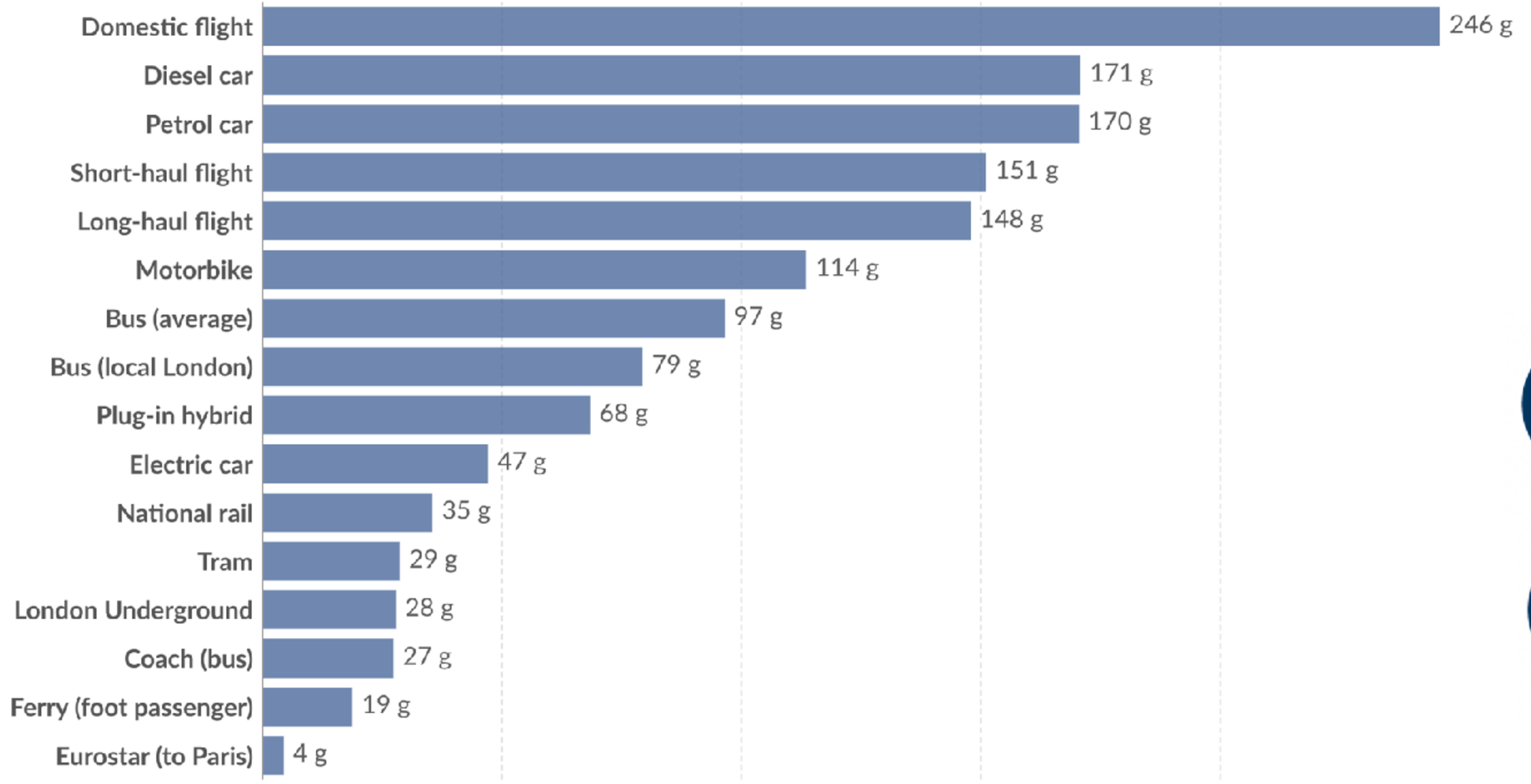
- Erroneous data corrected rather than eliminated
  - If entered more than 22 commute trips in total over all modes of transportation per month, normalize entries to a total of 22 trips per month
  - Data input otherwise untouched
- Majority with round-trip commuting distance <=40 km
- Average round-trip commuting distance: **27.6 km**
- **Commute distance is a good predictor for mode of transportation**
- Carbon footprint calculation is only a rough estimate, not least because I have committed the cardinal sin of not estimating the uncertainties



Carbon footprint of travel per kilometer, 2022

Our World in Data

The carbon footprint of travel is measured in grams of carbon dioxide-equivalents[1] per passenger kilometer. This includes the impact of increased warming from aviation emissions at altitude.



Translink GHGs emissions

A trip on a SkyTrain or electric bus reduces your GHGs by 99% compared to driving.

A trip on a hybrid-diesel bus reduces GHGs by 56% compared to driving.

Data source: UK Government, Department for Energy Security and Net Zero

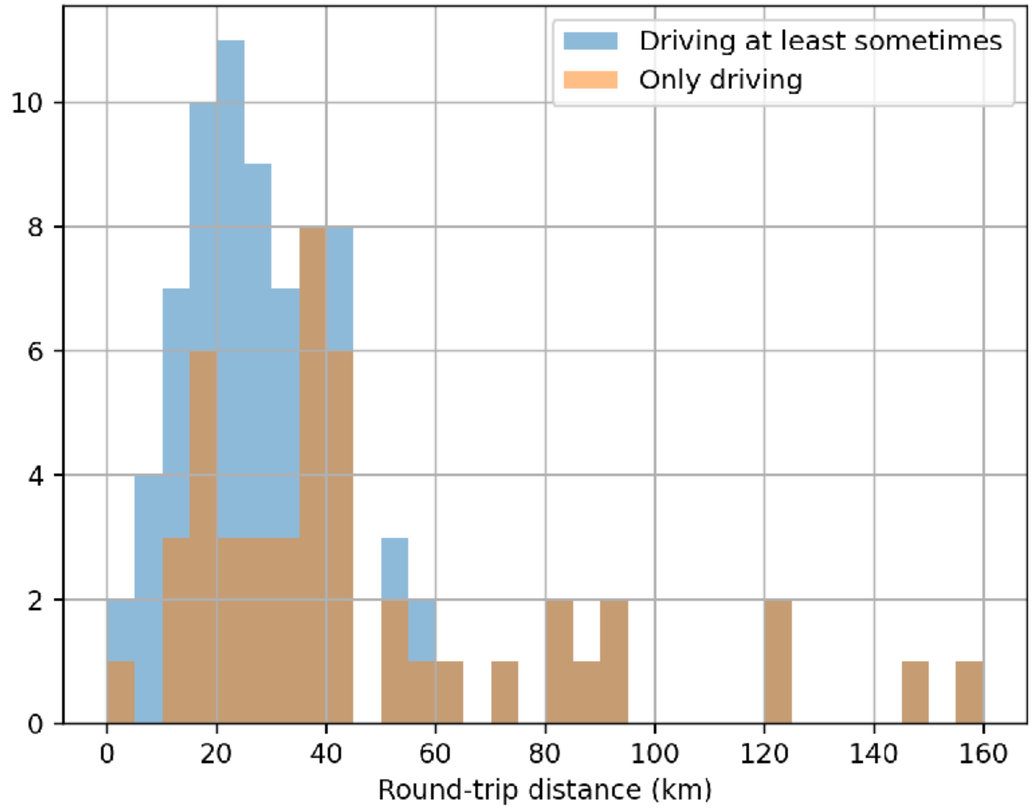
OurWorldInData.org/transport | CC BY

Note: Official conversion factors used in UK reporting. These factors will vary across countries depending on energy mix, transport technologies, and occupancy of public transport. Data for aviation is based on economy class.

Commute to work

3.1 Driving

- Number of people who drive at least sometimes: **82**
  - Average commute distance: **36 km**
  - Average number of trips per month: **12.2**
  - Average distance covered per month: **477 km**
  - Carbon footprint **per year**: **973 kg***
- Number of people who only drive: **47**
  - Average commute distance: **46 km**
  - Average number of trips per month: **17.0**
  - Average distance covered per month: **748 km**
  - Carbon footprint **per year**: **1526 kg***

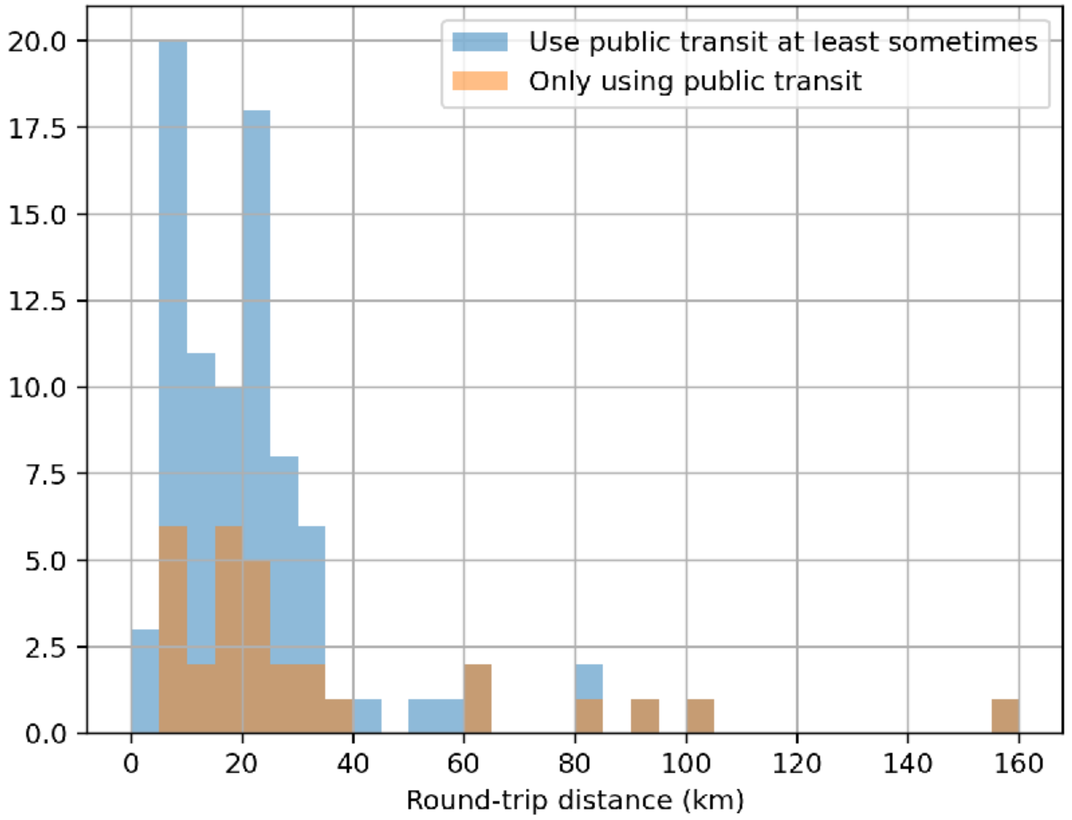


* Assuming 170 g per km per passenger

Commute to work

3.2 Public transit

- Number of people who use public transit at least sometimes: **87**
  - Average round-trip distance: **23.3 km**
  - Average number of trips per month: **11.8**
  - Average distance covered per month: **271 km**
  - Carbon footprint **per year: 189 kg***
- Number of people who only use public transit: **30**
  - Average round-trip distance: **32.4 km**
  - Average number of trips per month: **19.0**
  - Average distance covered per month: **504 km**
  - Carbon footprint **per year: 351 kg***

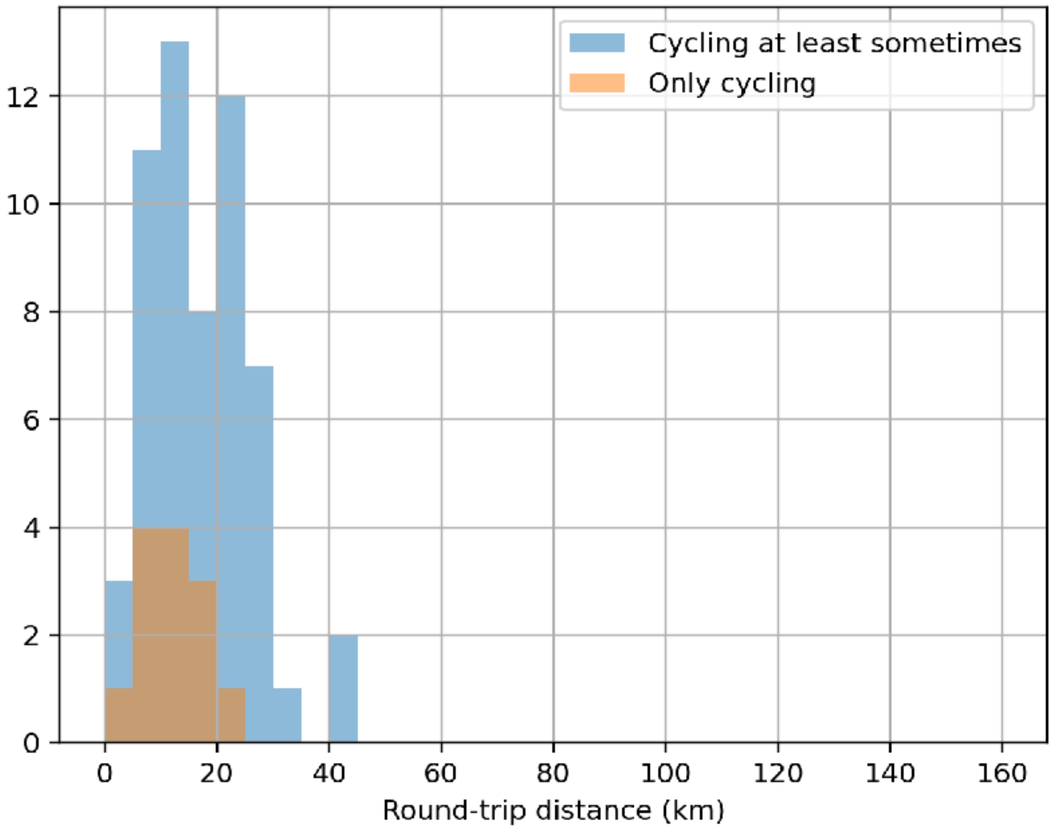


* Assuming 60 g per km per passenger

Commute to work

3.3 Cycling

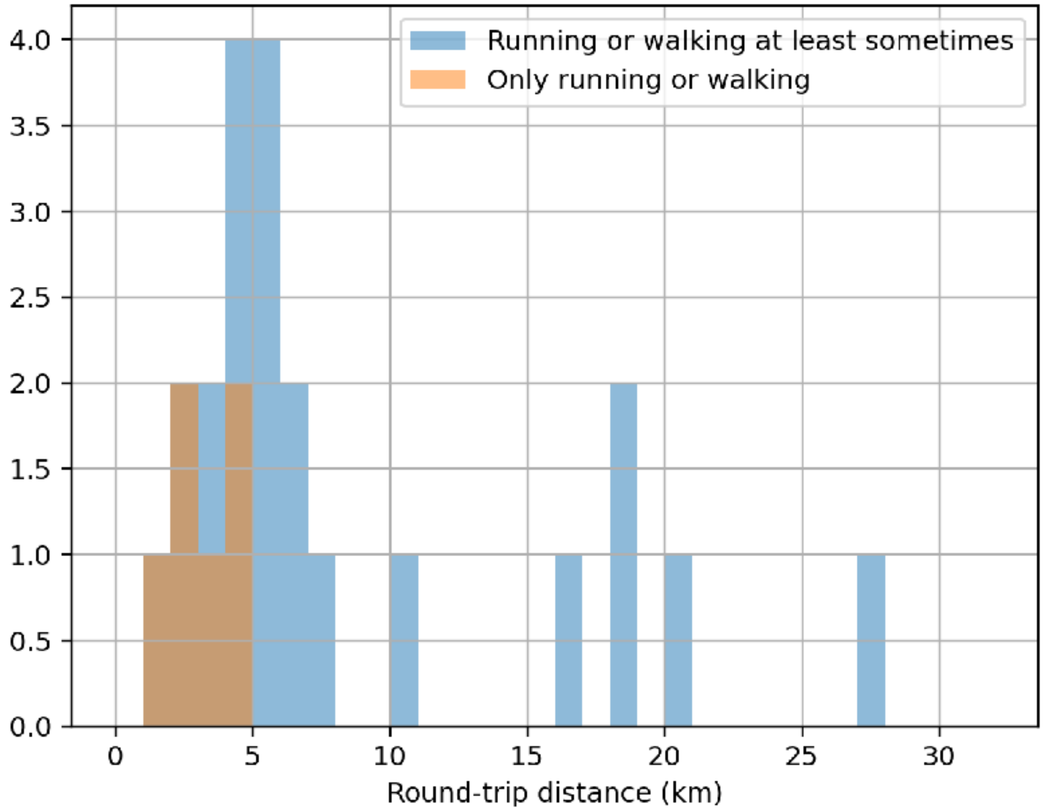
- Number of people who cycle to work at least sometimes: **57**
  - Average round-trip distance: **15.9 km**
  - Average number of trips per month: **13.1**
  - Average distance covered per month: **207 km**
- Number of people who only cycle to work: **13**
  - Average round-trip distance: **10.8 km**
  - Average number of trips per month: **20.2**
  - Average distance covered per month: **220 km**
- **Negligible** carbon footprint



Commute to work

3.4 Walking or running

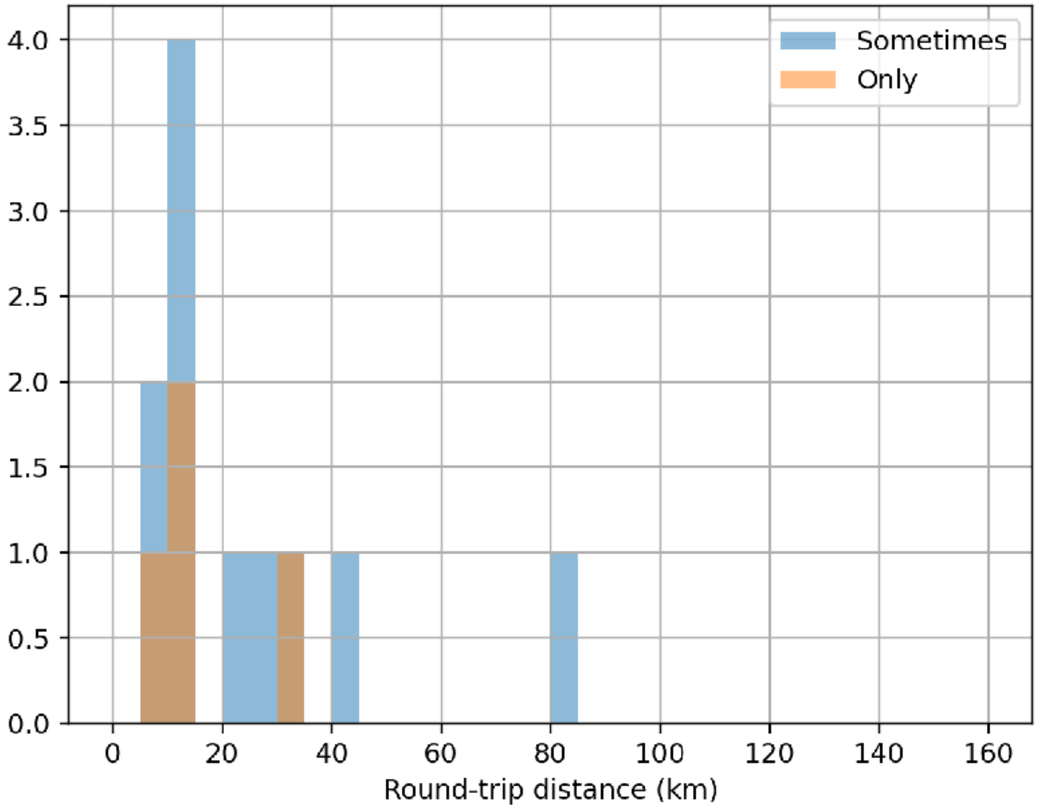
- Number of people who walk or run to work at least sometimes: **22**
  - Average round-trip distance: **8.0 km**
  - Average number of trips per month: **11.9**
  - Average distance covered per month: **90.1 km**
- Number of people who only walk or run to work: **6**
  - Average round-trip distance: **2.7 km**
  - Average number of trips per month: **16.2**
  - Average distance covered per month: **46.8 km**
- **Zero** carbon footprint



Commute to work

3.5 Combination of cycling and public transit

- Number of people who use a combination of cycling and public transit at least sometimes: **11**
  - Average round-trip distance: **23.3 km**
  - Average number of trips per month: **10.2**
  - Average distance covered per month: **173 km**
  - Carbon footprint **per year** < **124 kg**
- Number of people who only commute by a combination of cycling and public transit: **4**
  - Average round-trip distance: **14.3 km**
  - Average number of trips per month: **22**
  - Average distance covered per month: **313.5 km**
  - Carbon footprint **per year** < **225 kg**



Commute to work

4. What would encourage you to reduce driving?

- **104** people answered the question
  - If TRIUMF subsidized public transit : **52**
  - If the cost of parking were to increase significantly : **16**
  - If there was a R4 bus stop at the intersection of Marine Drive and Wesbrook Mall : **35**
  - When the Skytrain gets to Broadway-Arbutus : **20**
  - If TRIUMF provided a direct shuttle between the Arbutus station and TRIUMF after the Skytrain gets to Broadway-Arbutus : **30**
  - If the future Skytrain extension got to UBC : **51**
  - If the future Skytrain extension got to Wesbrook Village : **59**
  - If Bus 49 was more frequent and less crowded : **26**
  - If there was an Evo parking station on TRIUMF premises : **16**
  - If the bike paths were safer for cyclists : **23**

Commute to work

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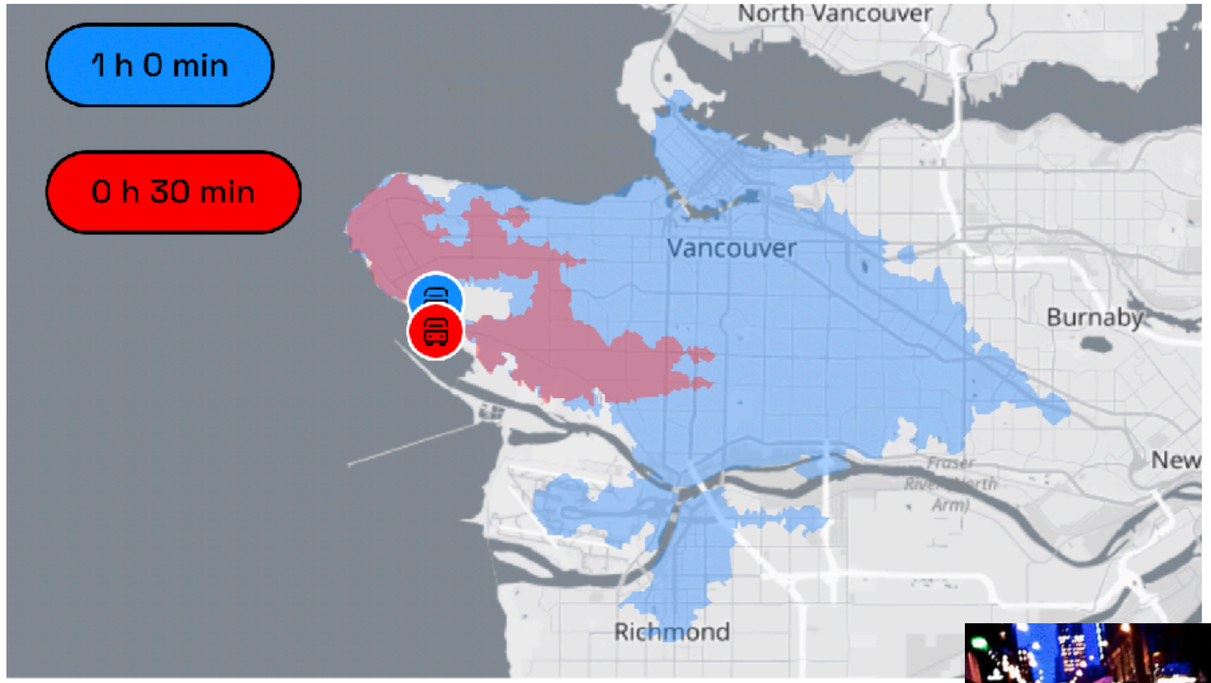
  - If the bike paths were safer for cyclists : **23**

Allowing temporary cancellation of monthly parking pass to allow certain months of public transit

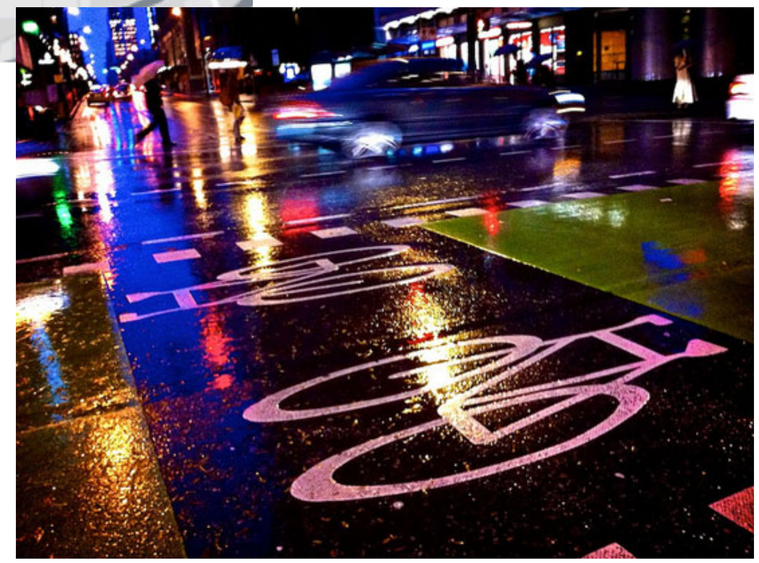
Commute time by public transit in Vancouver



https://app.traveltime.com/

- Public transit can be much more time-consuming than driving, and simply not an option for many people due to factors such as shift work at odd hours, lack of connections, etc.

- The dreaded “SORRY BUS FULL” on every 49 during rush hours outside of the summer months



- Hazardous cycling conditions in the long rainy seasons

Commute to work

4. What would encourage you to reduce driving?

- Many pointed out that the cost of living is the reason why people live far away and have to drive to work, and that increasing the cost of parking would further discourage people from working at TRIUMF

"The cost of living pushes people & their families out of the Vancouver area. Can't be late to pickup the kids from after school care because "my bus didn't make it". Public transport options east of Surrey become more limited or much longer commutes. 1 hr avg. commute in the morning, up to 2 hrs to get home. 3 hrs a day avg., driving 120+km because it's truthfully amazing to work here. But driving is necessary for the freedom/flexibility & efficiency of movement to maintain a family life. There are a number of us that carpool out into the Fraser Valley. Be it to save on gas, travel safely w/ an experienced winter driver, or if one another has car troubles, etc. Quite a few employees also work extra hours on site, 4 days a week, then work from home for 1 shorter day. Saves greatly on fuel & one can get more done during the long day especially for tight deadlines. ... TRIUMF members come from regions ranging from near Squamish to out past Abbotsford."

Business travel

1. Mileage in the last 12 months

- We asked the number of domestic and international flights taken and the average distance covered by the one-way flight
- Corrected obviously erroneous input
  - 6 entries are likely round-trip distance (e.g. quoting 11000 km as distance covered by domestic flight): use 1/2 of the mileage entered
  - 1 entry is off by an order of magnitude (e.g. quoting domestic flight distance as 40000 km): use 1/10 of the mileage entered
  - 1 entry is obviously wrong in an ambiguous way (e.g. quoting international flight distance as 30000 km): average distance calculated based on valid entries are used
  - Some people claimed non-zero number of domestic or international flights but did not fill in the average distance: average distance calculated based on valid entries are used
- Sizeable uncertainties are associated with the estimates

Business travel

1. Mileage in the last 12 months

- **70** people have taken at least one **domestic flight** for work in the last 12 months
  - Average number of domestic flight is: **5.19**
  - Average distance for domestic flight is: **2872 km**
  - Average mileage per person is **15081.4 km: 2.715 ton CO_2 equivalent***
  - Total domestic milage is **1055698 km: 190 ton CO_2 equivalent***
- **48** people have taken at least one **international flight** for work in the last 12 months
  - Average number of international flight is **3.73**
  - Average distance for international flight is **6890 km**
  - average mileage per person is **24813.5 km: 4.466 ton CO_2 equivalent***
  - total international milage is **1191047 km: 214 ton CO_2 equivalent***

	# of flights
Student	0.92
Postdoc	3.4
P&S	1.2
BAE	4.8
Administration	2.9
Technical	0.23
Other	7

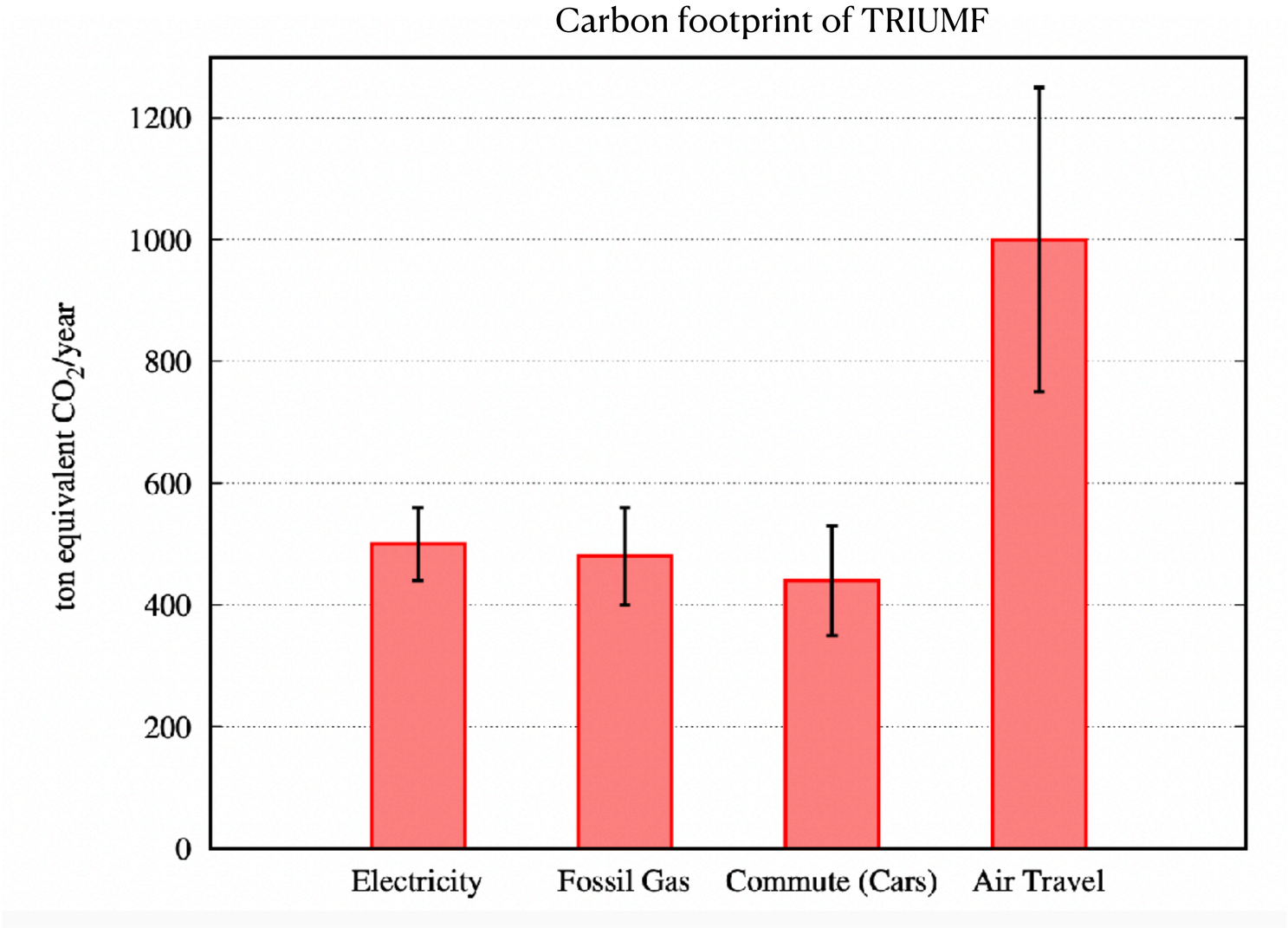
	# of flights
Student	0.49
Postdoc	1.7
P&S	0.60
BAE	3.9
Administration	0.07
Technical	0.19
Other	1.9

* Assuming 180 g per km per passenger

Business travel

Why bother?

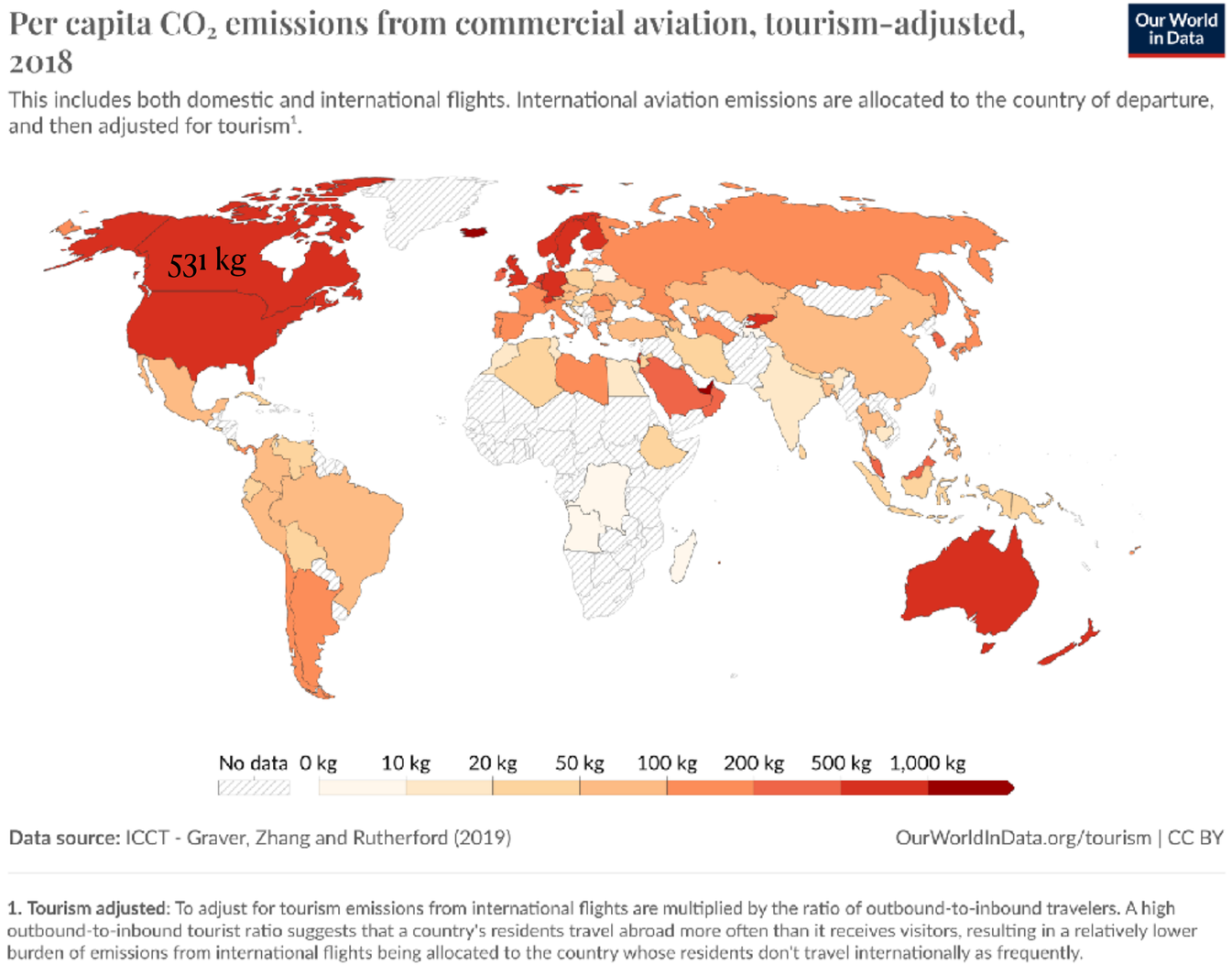
- Calculations by Thomas Planche for Science Week 2023 (link to talk) showed that air travel has the largest carbon footprint
  - Calculation done based on the total expenditure on air travel



Business travel

Why bother?

- Around 2.4% of global CO2 emissions come from aviation
- Together with other gases and the water vapour trails produced by aircraft, the industry is responsible for around 4% of global warming
- For individuals who fly frequently, air travel makes up a significant fraction of their carbon footprint
  - Even in richer countries like the UK and the US, around half of people fly in any given year, and just 12-15% are frequent fliers



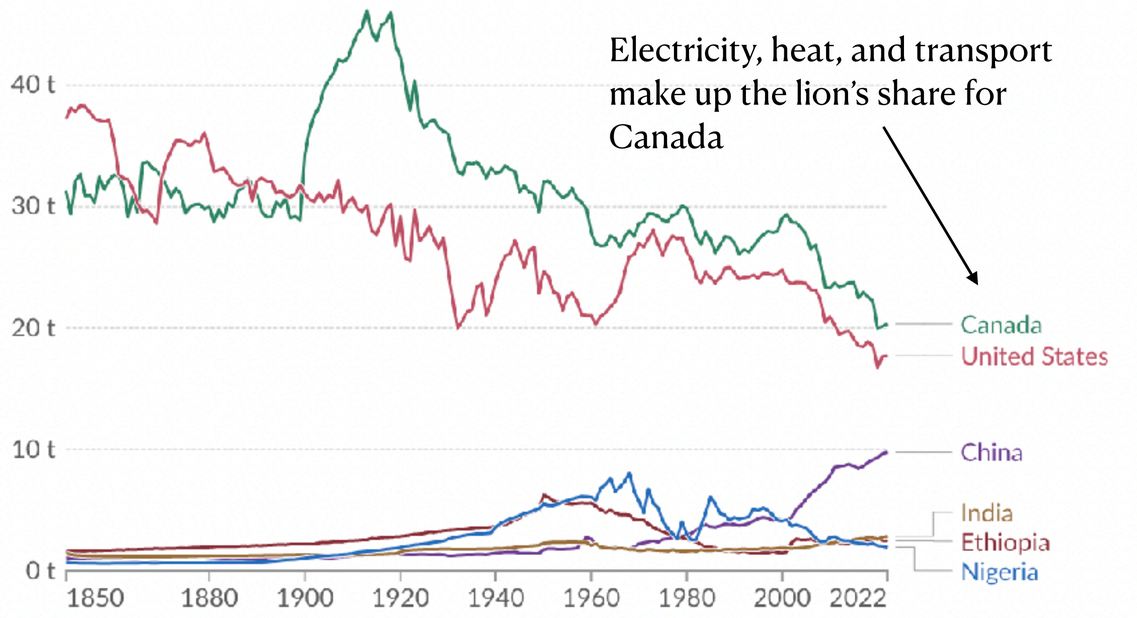
Business travel

Why bother?

For many of us, flying makes up a significant share of annual carbon footprint

Per capita greenhouse gas emissions

Greenhouse gas emissions[1] include carbon dioxide, methane and nitrous oxide from all sources, including land-use change. They are measured in tonnes of carbon dioxide-equivalents[2] over a 100-year timescale.



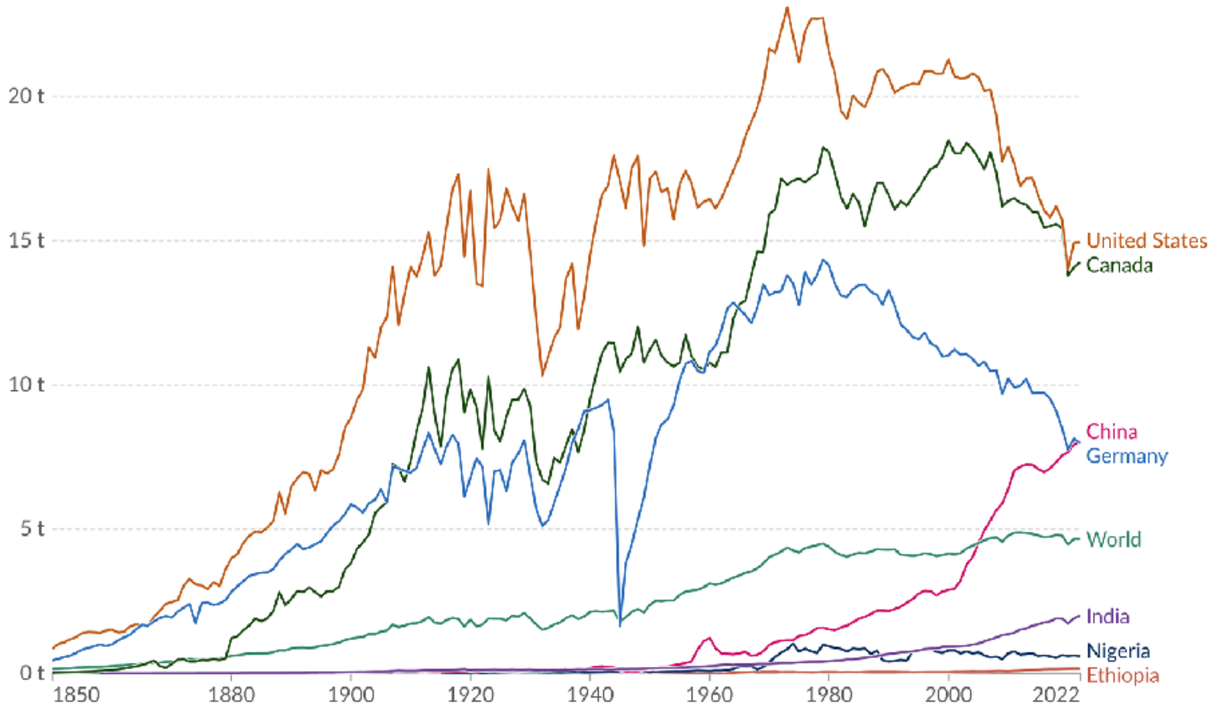
Data source: Jones et al. (2024); Population based on various sources (2023)
Note: Land-use change emissions can be negative.
OurWorldInData.org/co2-and-greenhouse-gas-emissions | CC BY

Our World in Data

Per capita CO_2 emissions

Carbon dioxide (CO_2) emissions from fossil fuels and industry[1]. Land-use change is not included.

Our World in Data



Data source: Global Carbon Budget (2023); Population based on various sources (2023)
OurWorldInData.org/co2-and-greenhouse-gas-emissions | CC BY

1. Fossil emissions: Fossil emissions measure the quantity of carbon dioxide (CO_2) emitted from the burning of fossil fuels, and directly from industrial processes such as cement and steel production. Fossil CO_2 includes emissions from coal, oil, gas, flaring, cement, steel, and other industrial processes. Fossil emissions do not include land use change, deforestation, soils, or vegetation.

Business travel

2. Carbon offsetting?

- Number of people that offset flying carbon emission occasionally or regularly: **23**
  - Via airline or other website: 9
  - Via booking low carbon emission flights: 2
  - Other means: 2
- Reasons for not choosing to offset carbon emission from flying
  - Never heard of it or not sure how to: 24
  - Distrust of carbon offset claims or effectiveness: 19
  - Unsure whether grant eligible or concerned about the cost: 14
  - Prefers other methods to reduce emission: 3
  - Don't care: 1

Tri-agency Guide on Financial Administration

"The Government of Canada recognizes the importance of decreasing greenhouse gas (GHG) emissions in order to reduce the negative impacts of climate change on Canada and globally. In this context, the Agencies encourage grant recipients to consider the necessity of grant-funded travel, and to reduce this when possible. When grant-funded travel is necessary for the research activities, the Agencies encourage grant recipients to use lower-carbon forms of transportation to help reduce GHG emissions. The Agencies consider carbon offset costs (related to air travel or other transportation) to be an appropriate use of grant funds for research/activities that are aligned with the principles and directives of the Tri-agency Guide on Financial Administration."

Business travel

3. Willing to reduce travel? How many trips?

- Number of valid answers: **92**
  - No trip reduction: **45**
  - Willing to reduce one or more trips: **31**
  - Already tried to reduce: **5**

It is difficult to reduce the number of trips because of the nature of the trip, e.g. participating in hands-on work related to running the experiments

In-person participations are essential and effective, and therefore should not be reduced

Unfair to ask early career people to cut trips, given that they are already traveling much less than staff scientists or BAEs

Unsure if cutting travel will do any professional harm, given the emphasis placed on being “visible” within the community

Business travel

4. What would lead to a reduction in travel?

- Well-run, fully remote meetings/conferences: **35**
- Well-run, hybrid meetings/conferences: **25**
- Well-run, fully remote or hybrid meetings/conferences with dedicated networking and/or discussion sessions: **27**
- A moderate increase in flight costs: **2**
- A significant increase in flight costs: **19**
- An obligation to offset the carbon emission: **6**

Fewer conferences but each of higher attendance & impact

Sometimes you have to see people with whom you work and maintain connections between them and TRIUMF.

Hard to fight time-zone differences in remote/hybrid conferences

There should be a TRIUMF and/or National (e.g. NSERC) policy that strongly disfavours frequent travels by flight

Remote conferences are no substitute for in-person conferences

Physics conferences

Past

- Meeting other physicists and having heated (occasionally acrimonious) discussions is a time-honoured tradition for physicists
  - “Social capital is conferred by brilliant presentations or devastating criticisms”

Present

- Example: the APS March Meeting, held 14-18, 2022 in Chicago Illinois, attracted over 13,000 physicists from across the globe with ~8,000 attending in person and ~5,000 participating virtually. More than 10,000 technical papers were presented
- Many 15-20 minutes presentations with highly condensed and technical content
- Findings are now often available on arXiv before conference
- Means of communication are abundant
- Physicists are almost invariably aware of the environmental impact from traveling to conferences. Maybe it is time to rethink our own behaviours and culture to better align them to our scientific beliefs

Business travel

5. Would you support any policies?

- Policy on trip duration to distance ratio, e.g. flights to Europe are only permitted for work lasting longer than three days (with exceptions): **57**
- Limits on the maximum number of flights per year (with exceptions): **46**
- Obligation to offset carbon emissions by a reputable provider: **47**
- I do not think TRIUMF should have any regulations on work-related travel: **46**

Any policy would be futile if the overall academic culture and career advancement criteria do not change

Obligation to take the train when possible

Encourage remote attendance whenever possible

TRIUMF should lead by example by holding all meetings in hybrid mode

Senior people should lead by example

Other comments

- Many emphasized the importance of in-person meetings, especially its importance for early career researchers, as well as for TRIUMF's standing in the scientific communities
- Many pointed out the varied reasons for travel (experimental work v.s. conference) and that one-size-fits-all policies do not work
- A few expressed strong opinions against restrictions on travel
- A few mentioned that there should be EV charging
- "Make it easier to bring a bike inside the fence"
- "Unspoken perception that remote work means less work needs to change"