An investigation into current emissions associated with travel by Bartlett staff and students

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Abstract

Travel emissions are an important aspect of a University's carbon footprint. This report has investigated the UCL Bartlett Institute's travel emissions, focusing on three types of travel: academic travel, international student travel and commuter travel. Through analysing travel data from 2018/19 and using guided estimations, it was found that international student travel contributed most to the Bartlett's travel emissions, emitting an estimated 11463 tonnes CO_2, primarily due to students travelling from Asia. This was followed by academic travel, which emitted 3031 tonnes CO_2, and finally commuter travel, which was estimated to have emitted 389.6 tonnes CO_2 in 2018/19. For academic travel, recommendations for emissions reductions include regionalising and digitalising academic conferences and meetings; introducing environmental risk assessments and a carbon calculator to Bartlett travel bookings; and encouraging staff to pledge to reduce their emissions by 40% for 2030. For international student travel, the possibility of branch campuses or blended delivery courses have been suggested as long-term solutions, meanwhile high-quality carbon offsetting could reduce environmental impacts short-term. Regarding commuter travel, attempts to promote cycling could further reduce emissions whilst the long-term prospect of partial teleworking has also been considered in this report. The final recommendation suggests the Bartlett collects more detailed data on each of these travel activities, as this would enable more targeted recommendations to be generated.

Introduction

Travel is a significant contributor to greenhouse gas emissions (Davidson et al., 2015), with fossil fuel-burning transportation releasing primarily carbon dioxide (CO_2) but also other environmentally damaging gases like methane, nitrous oxide and water vapour (Schrems and Upham, 2020). Higher Education Institutions (HEIs), like the Bartlett Institute, produce travel emissions primarily through three activities: academic travel (for conferences, fieldwork, presentations and networking), commuting and international student travel (Hopkins et al., 2016; Waring et al., 2014; Fox et al., 2009). Previous studies have found travel to form a significant portion of HEI emissions (Hoolohan et al., 2021); Arsenault et al.'s (2019) research found that academic mobility alone contributed to 39% of total carbon footprints for the Universite de Montreal, with air travel specifically contributing 30%. To aid with emissions reductions, Higher Education Institutions (HEIs) commonly measure their emissions according to three 'scopes' provided by the Greenhouse Gas Protocol (GHG protocol, n.d.): scope 1 defines emissions directly controlled and owned by the university; scope 2 describes indirect emissions from purchased energy use; finally, scope 3 emissions cover all remaining indirect emissions from the supply chain (Davies and Dunk, 2016; Hoolohan et al., 2021; Waring et al., 2014; Mitchell-Larson et al., 2021; Versteijlen et al., 2017). Whilst academic travel and commuting classify as scope 3 emissions, measured by most UK HEIs, international student travel currently falls outside all three scopes (Waring et al., 2014; Mitchell-Larson et al., 2021). Due to the significance of air travel to emissions (Glover et al., 2018; Smythe, 2010; Buchs, 2019; Nursey-Bray et al., 2019; Gremillet, 2008), this report follows calls from Mitchell-Larson et al. (2021) to include international student travel in emissions evaluations. This seems particularly appropriate given UCL's prominent international student culture (UCL, n.d. a).

Following this introduction, a summary of methodologies will be provided. After this, a summary of the Bartlett's travel emissions are detailed, and the three types of travel 'activity' are examined more granularly: academic mobility, international student travel and student/staff commuting. Within each, data specific to the 2018/19 academic year is presented, and possible solutions for the institute are proposed. In the conclusion, a summary of the main issues and potential solutions for Bartlett travel emissions are offered, followed by calls to further research.

Methodology

This report first utilised a literature review of research concerning travel emissions at University, followed by some basic calculations using data retrieved from the Bartlett Institute in the 2018/19 academic year. The literature review took inspiration from Wolfswinkel et al.'s (2013) systematic approach, detailed below:

1. **Establish database and type of source**: the database was confirmed as Google Scholar whilst acceptable sources were any peer-reviewed journal articles.
2. **Define key terms**: this directed the Google Scholar search. 'Travel' 'University' and 'Emissions' were chosen due to their high relevance to my report brief.
3. **Collate articles**: articles were then collected by searching with the key terms on Google Scholar. This returned over 700,000 results. Only the first ten pages of results were used due to time constraints.
4. **Refine selections based on article content**: after examining 100 articles, this was reduced to 15 highly relevant articles when examining their abstract and title.
5. **Add backward citations**: relevant articles from the reference list of each of the 15 articles were added to the review.
6. **Evaluate whether there is new material:** This process was continued until no new relevant articles were found from the backward citations. A total of 76 articles were retrieved from the review.

Owing to time constraints, only 36 articles could be reviewed. However, efforts were made to choose a broad range of articles from the 76 initially collected, ensuring a wide-ranging understanding of travel emissions problems could be achieved. This meant academic travel, commuting and international student travel were all investigated, despite the literature being somewhat dominated by articles on academic travel.

The second aspect of this report focused on analysing primary data concerning the Bartlett Institute's travel emissions. After conducting the literature review, it was clear that data was needed on academic travel, commuting and international student travel. Academic travel data could be provided by the platform Tableau, in which all academic travel from the 2018/19 year was documented. This came in the form of a map showing locations, frequencies of trips and emissions, as well as a table that split emissions departmentally. The table displayed the number of journeys, overall emissions and the average emissions per journey for each department. The overall emissions from academic travel in the Bartlett, locations travelled to and departmental standings could be directly taken from Tableau. Meanwhile, some case study comparisons of emissions from close destinations were taken from Tableau, whilst their potential emissions if travelled via rail were taken directly from Seat61 (2021), which has been established for these precise comparisons (Seat61, 2021). To compare the Bartlett Institute's share of academic travel emissions, staff numbers and student numbers, simple percentages were derived from the Tableau travel data, staff data retrieved by Dr Nick Hughes and publicly available student numbers (UCL, 2021) respectively.

However, the academic travel data showed significant discrepancies. The travel map dataset displayed a total of 2417 journeys taken across 2018/19, whilst the tabular dataset displayed, in two different tables, 5211 and 9110 journeys taken. Moreover, the tabular data exhibited a total emissions value of 3031 tonnes CO_2, whilst the travel map data presented a total of 1431 tonnes CO_2 emitted. Similarly, some location emission statistics appear inaccurate. For example, a journey to Wellington, New Zealand, was registered as emitting 7726 kg CO_2; the same journey (London Heathrow to Wellington) via economy class on a scheduled flight is recorded on Atmosfair to be 12,975 kg CO_2 (Atmosfair, 2021). These apparent inconsistencies, which could not be fully understood under the scope of this project, should be clarified. In future, this report recommends ensuring the datasets on which future analysis is based are as robust and transparent as possible. Without accurate and reliable datasets, it is very hard to generate targeted solutions for reducing travel emissions. For the purposes of continuing the analysis, this report utilises the tabular dataset, except when dealing with specific locations, when the travel map dataset is used. This will be marked in relevant sections and below relevant Figures.

Data for commuting was only available at a UCL-wide scale, and only included GHG-emitting modes of transport. To estimate the Bartlett's commuting emissions, staff numbers data retrieved by Dr Nick Hughes and publicly available student numbers data (UCL, 2021) were used to calculate the proportion of UCL staff and students working under the Bartlett (5.6% and 8.2% respectively) and assuming commuting emissions proportionate to this. Whilst this calculation makes the large assumption of an even spread of emissions across faculties at UCL, it still serves a valuable purpose, providing initial estimations of the scale of the commuting emissions problem. To enable a more directed analysis, and subsequently more specific recommendations, the Bartlett should endeavour to collect their own commuter data that includes all mode types, like cycling.

International student travel is not covered by the Greenhouse Gas Protocol's Scope 3, meaning UCL do not measure these emissions and there is no data available. To extend the analysis, an estimation of Bartlett international student travel emissions was made. Using publicly available student numbers data (UCL, 2021) the number of international students in the Bartlett during 2018/19 was established (1828). UCL-wide data from 2020/21 (the closest available year) on the origins of international students was then utilised to estimate the proportion of Bartlett international students from different regions of the world (the EU, the rest of Europe, Asia, Africa, North America, South and Central America and the Middle East). Following Mitchell-Larson et al. (2021), a conservative estimation of two return journeys per international student per year was assumed. The busiest airports within each of the above world regions were utilised to estimate travel distance and using the well-established aviation emissions calculator Atmosfair, CO_2 emissions for Bartlett international students from each world region were calculated (Atmosfair, 2021). As with the commuting calculations, these estimations made considerable assumptions about the proportion of Bartlett international students from different world regions, the locations they flew to and the number of return flights they took. However, as highlighted by Davies and Dunk (2016), this fails to account for visiting family and friends emissions, which could arguably be included because they only exist due to international students' enrolment at a foreign University. Omitting this, as well as conservatively estimating two round trips per year for the student, means these estimations are unlikely to exaggerate the scale of emissions. They should therefore provide a useful approximation of the environmental cost of international student travel. For future studies, the Bartlett should consider recording international student travel data as this would enable more accurate analysis and subsequent generation of emission-reduction recommendations.

In the following section, the available data on academic travel, alongside estimations from commuting and international student travel, have been combined with literature review findings to produce bespoke suggestions for a reduction of the Bartlett's travel emissions.

Bartlett travel emissions 2018/19

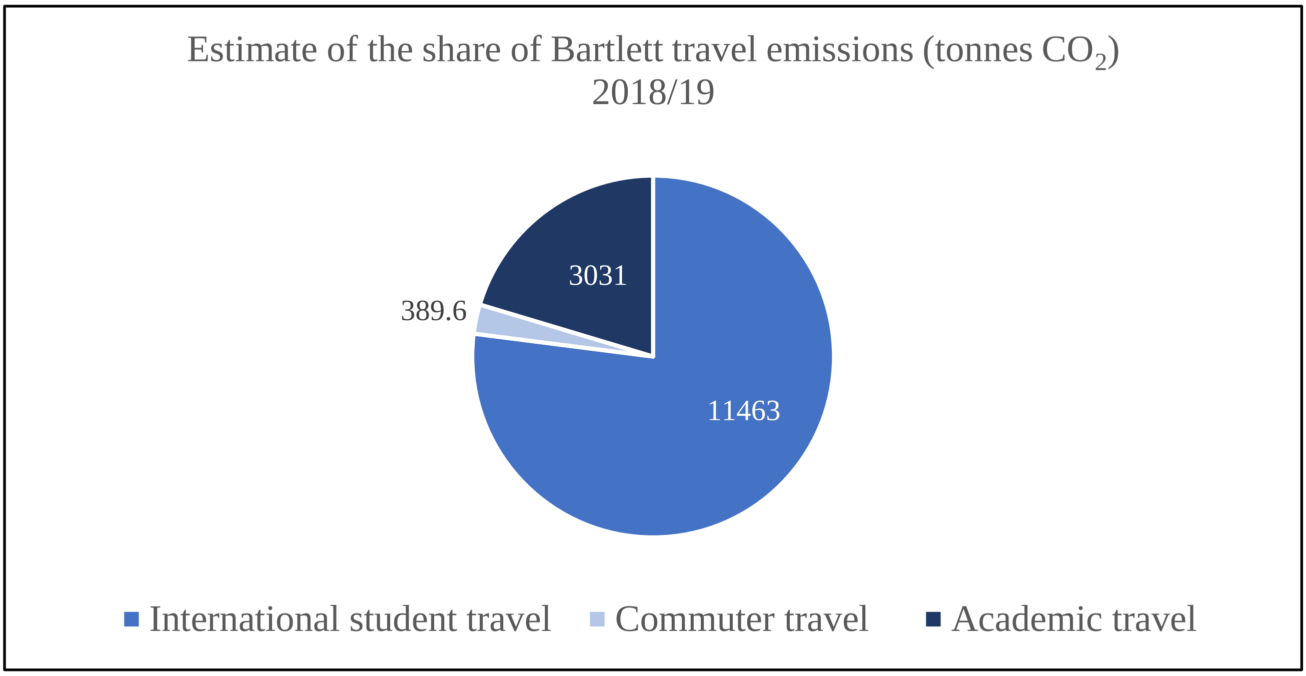

Figure 1: Share of Bartlett travel emissions (tonnes CO_2) in 2018/19, estimated from Tableau (2021) data, author calculations of international student travel emissions and author calculations of commuter travel emissions.

Figure 1 shows the estimated share of Bartlett travel emissions for the 2018/19 year. As shown, international student travel represents over 75% of all travel emissions, meanwhile academic travel accounts for just under 25% and staff/student commuting is responsible for only 2.6% of all travel emissions. International student travel and academic travel therefore comprise the vast majority of emissions. This fits with prior research, which emphasised the disproportionate significance of air travel when examining travel emissions (Glover et al., 2018; Smythe, 2010; Buchs, 2019; Nursey-Bray et al., 2019; Gremillet, 2008; Nevins, 2014). It corresponds that the report recommends focusing more on academic travel and international student travel, as reductions in these activities would prove most effective in reducing the Bartlett's total travel emissions.

Academic Travel

The Bartlett Institute produced 3031 tonnes of CO_2 from academic travel in 2018/19. Destinations ranged from Manchester, UK, to Wellington, New Zealand. According to the tabular dataset, over 5,000 journeys were taken across 2018/19, with an emissions per journey value of 582kg CO_2. UCL's total academic travel emissions amount to 22,770 tonnes CO_2, meaning the Bartlett Institute accounts for 13.3% of this. As seen in Figure 2, the Bartlett is only responsible for almost 6% of UCL staff and just over 8% of UCL students, so the Faculty is responsible for a disproportionate volume of emissions. UCL's mean emissions per journey are also lower than the Bartlett's, at 463 kg CO_2. This implies that the institute is either using higher-emission modes of transport, travelling to more remote destinations, or both.

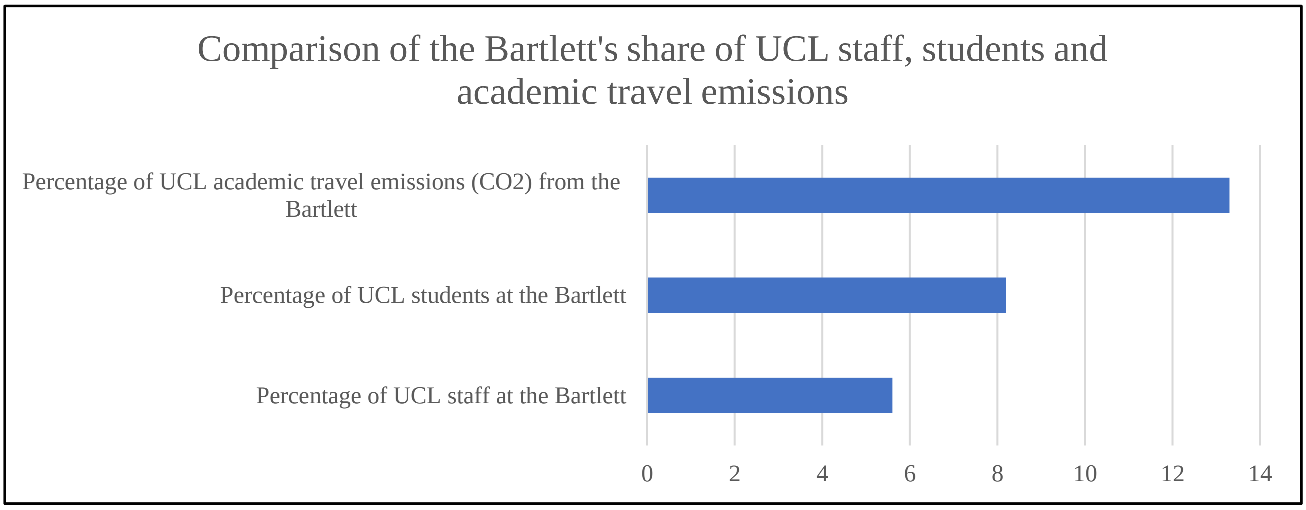

Figure 2: Comparison of the Bartlett's share of UCL staff, UCL students and UCL academic travel emissions. Based on author calculations from Tableau (2021) academic travel data, publicly available student numbers (UCL, 2021) and staff numbers data from Dr Nick Hughes.

Figure 3 shows a departmental breakdown of the Bartlett's academic travel emissions. As seen below, the distribution of emissions between departments is highly uneven. In fact, the School of Architecture and the Development Planning Unit are responsible for 61% of all Bartlett Faculty emissions. These two departments were also the highest emitting in the whole institution. Meanwhile, six departments in the Faculty were below the average department emissions across UCL (which is 188 tonnes CO_2): the School of Construction and Project Management, Institute for Global Prosperity, Centre for Advanced Spatial Analytics, Institute for Innovation and Public Purpose, Built Environment Faculty Office and the Real Estate Institute.

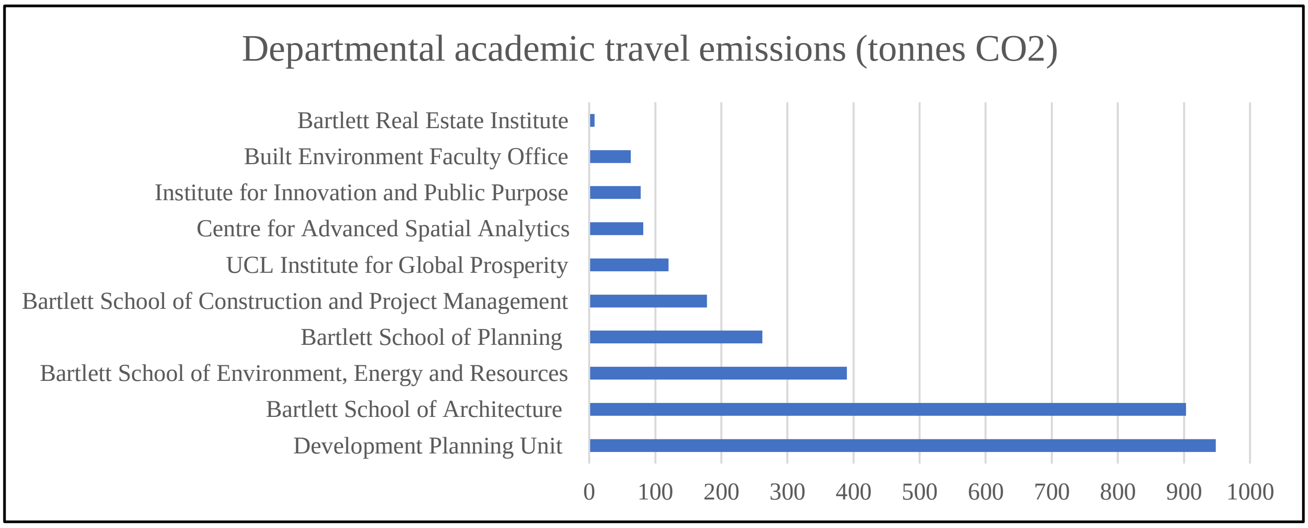

Figure 3: Departmental academic travel emissions (tonnes CO_2). Taken directly from Tableau (2021) tabular dataset.

In terms of individual destinations, the highest emitting destinations according to travel map data on Tableau were Beijing with 106 tonnes CO_2 emitted over 40 journeys, and Hong Kong, with 103 tonnes CO_2 emitted over 30 journeys. The following eight largest emitting destinations were Nairobi, Beirut, Shanghai, New York, Havana, San Francisco, Sydney and Bangkok (see Figure 4).

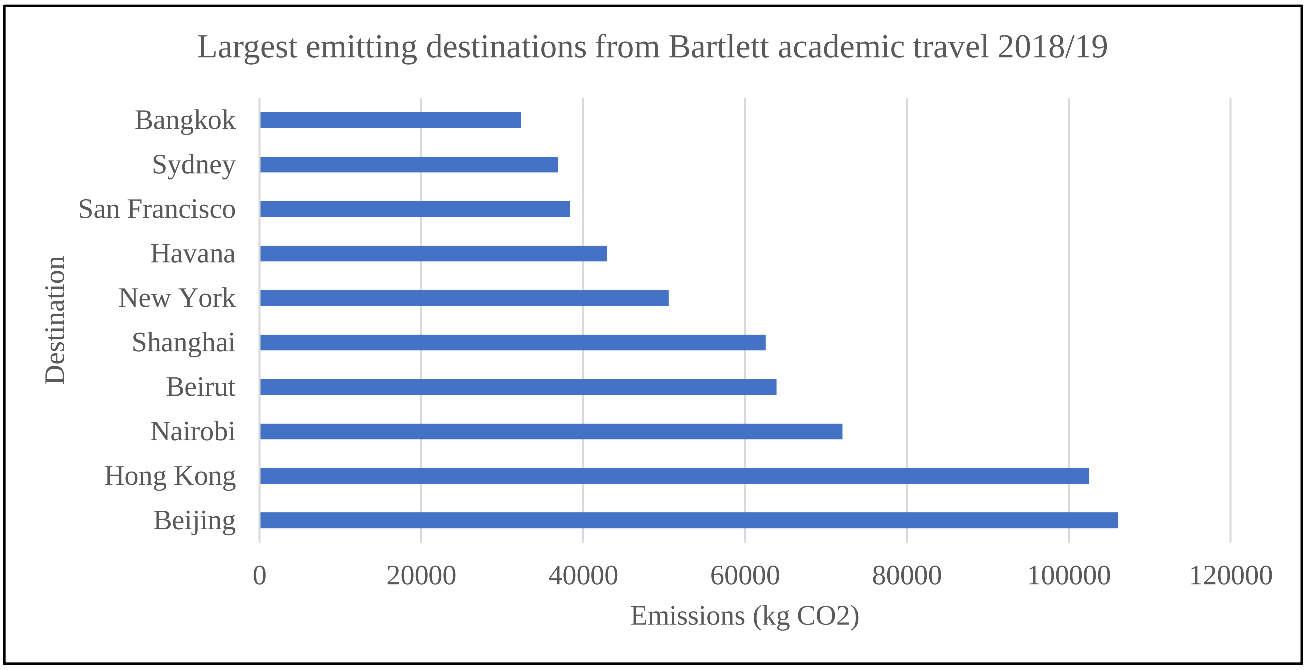

Figure 4: Largest emitting destinations from Bartlett academic travel 2018/19. Taken from Tableau (2021) travel map data.

Potential avenues for emission reduction

Videoconferencing

Academic travel is often carried out to attend conferences, present work, conduct research/fieldwork and attend meetings (Fox et al., 2009; Nursey-Bray et al., 2019). Whilst some research is hard to conduct virtually, many scholars highlight the transformative potential of videoconferencing for reducing the need to travel for conferences, meetings and presenting work (Arsenault et al., 2019; Fox et al., 2009; Fraser et al., 2017; Glover et al., 2017; Harvey-Scholes, 2019; Hoolohan et al., 2021; Ponette-Gonzalez and Byrnes, 2011; Schrems and Upham, 2020; Smythe, 2010; Stroud and Feeley, 2015). Furthermore, as Hoolohan et al. (2021) highlight, due to the COVID-19 pandemic many are well-attuned to virtual technologies, making a potential transition to virtual conferencing, meetings and presentations more feasible. As a Faculty, the Bartlett could demand that national/international conferences, meetings and presentations led by their staff be virtual wherever possible, encouraging staff to also promote this with other activities they partake in. Educating staff with a series of briefings or emails on the emissions produced by these activities may help promote this policy. This would also necessitate providing staff with the required videoconferencing equipment and/or software.

Regionalisation

Whilst modern videoconferencing technologies provide strong opportunities to listen to others virtually, their ability to adequately replace face-to-face interactions has been called into question (Arsenault et al., 2019; Fraser et al., 2017; Glover et al., 2018). For this reason, scholars have proposed the regionalisation of academic conferences (Arsenault et al., 2019; Caset et al., 2018; Ponette-Gonzalez and Byrnes, 2011; Smythe, 2010). This could involve designing a conference with a certain maximum radius of participants or finding the least emitting location considering the location of all conference participants (Smythe, 2010; Stroud and Feeley, 2015; Ponette-Gonzalez and Byrnes, 2011). Fraser et al. (2017) have developed the most advanced conference framework, combining regionalisation and virtual conferencing. They suggest the 'hub and node' system, whereby a central hub (like a university) houses conferencing equipment and houses a small regional conference, meanwhile smaller nodes tune in virtually and interact online (Fraser et al., 2017). This can be developed into a 'multihub and node' system, whereby multiple hubs in a similar time zone contain regional conferences whilst other nodes interact virtually (Fraser et al., 2017). Finally, this can evolve into a 'multilateral hub and node' system, whereby hubs and nodes in multiple time zones partake in the conference – due to the time zones, delegates could have 24 hours to respond to questions from other participants (Fraser et al., 2017). Any conferences hosted by the Bartlett could take on this new format, whilst the Faculty could also reduce allowances for far-away conferences or reward staff for attending regional ones.

Reducing flight frequency, changing modes

To reduce academic travel emissions, there is no doubt that flight frequency needs to be reduced (Fox et al., 2009; Caset et al., 22018; Buchs, 2019; Nursey-Bray et al., 2019). To make this easier for academics, scholars have developed the idea of an environmental risk assessment, to be conducted by those looking to travel to determine the necessity of their trip (Buchs, 2019; Nursey-Bray et al., 2019). Questions for academics to answer could be:

1. Is the travel essential?
2. Can the travel be done in any other way? E.g. via train instead of plane.
3. Can the activity be done in any other way?
4. Can someone else at the location do the task?
5. How long and how far away is the location? And therefore what proportionate benefit to climate miles expended is there?

(Nursey-Bray et al., 2019; Buchs, 2019).

Buchs (2019) also recommends using a carbon calculator when journey bookings are made, to further raise awareness of environmental costs and collect better data. Caset et al. (2018) suggest academics pledge to reduce their travel by 5% every year to a 40% reduction by 2030. The environmental risk assessment, carbon calculator and the pledge could all be implemented at the Bartlett, forcing academics to reconsider their travel behaviours.

Figure 5 shows the emissions produced from all Bartlett journeys to Edinburgh, Paris and Nice in 2018/19, and the comparison if these journeys had been taken via train. As seen, dramatic reductions in emissions can be made if air travel is avoided. If nearby destinations were exempt from travel expense claims, perhaps staff would be incentivised to use rail instead.

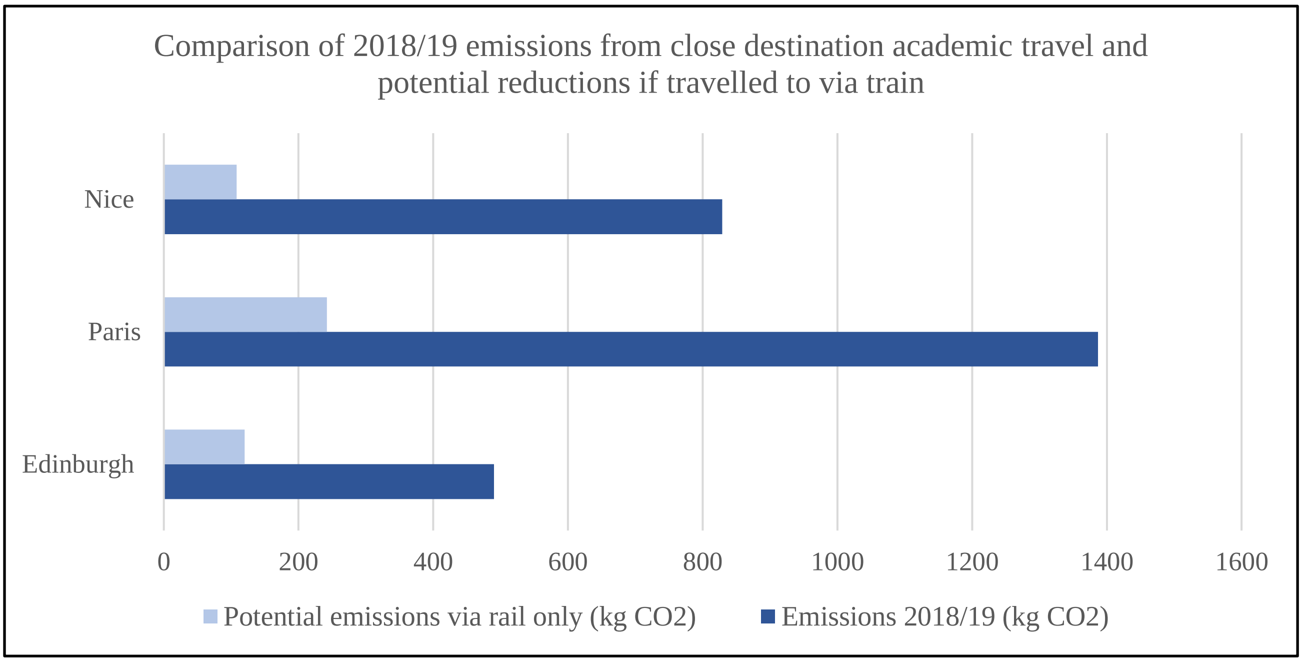

Figure 5: Comparison of 2018/19 emissions from close destination academic travel and potential reductions if travelled to via train. Taken from Tableau (2021) travel map data and Seat61 (2021) train emissions data.

The role of the wider institution

However, as many papers point out, it cannot be merely academics themselves held responsible for travel emissions; universities often promote an internationalisation agenda that encourages academic travel and scholarly careers are often assessed on global mobility (Caset et al., 2018; Glover et al., 2017; Glover et al., 2018; Le Quere et al., 2015; Buchs, 2019). It is the responsibility of the whole institution (in this case UCL), to embed a sustainability-oriented culture into their activities. An ethos that promotes vast internationalisation with travel bursaries, promotion of international networking and international research with no regard for environmental concerns makes it hard to limit academic travel. UCL, and the HEI sector as a whole, need to find a way to measure success in the academic field whilst incorporating environmental sustainability, only permitting a continuation of international ties through the more sustainable means detailed above.

International Student travel

Many scholars have highlighted the significance of international student emissions (Davison et al., 2015; Arsenault et al., 2019; Buchs, 2019; Davies and Dunk, 2016; Glover et al., 2017; Mitchell-Larson et al., 2021). Davies and Dunk's (2016) analysis of 25 UK HEIs finds that inbound international student travel emissions were equivalent to 65% of mandatorily reported emissions (scope 1 and 2). Equally, Arsenault et al.'s (2019) evaluation of the University of Montreal estimated that 5785 international students were responsible for 23,049 tonnes CO_2 emitted, assuming only one return flight was taken for each international student. This report has followed Mitchell-Larson et al.'s (2021) calculations in estimating two return flights per international student per year. As of 2018/19, the Bartlett Institute had 1828 international students. Accounting for UCL-wide estimations of home location, and assuming two return flights per student, an estimated total of 11463 tonnes of CO_2 was emitted. This amounts to an average of 6.27 tonnes of CO_2 emitted per person. Figures 6 and 7 show the estimated distribution of these emissions around world regions; Figure 6 shows the world regions excluding Asia, whilst Figure 7 shows all world regions (including Asia). As is clearly shown from comparing the two Figures, Asia is estimated to be responsible for the vast majority of international student emissions (85.7%). Indeed, the combination of long distances to the UK and making up an estimated majority (62.2%) of international students can explain this. The only region with more students than tonnes of CO_2 emissions is Europe, as international students have to travel much smaller distances than those from other regions.

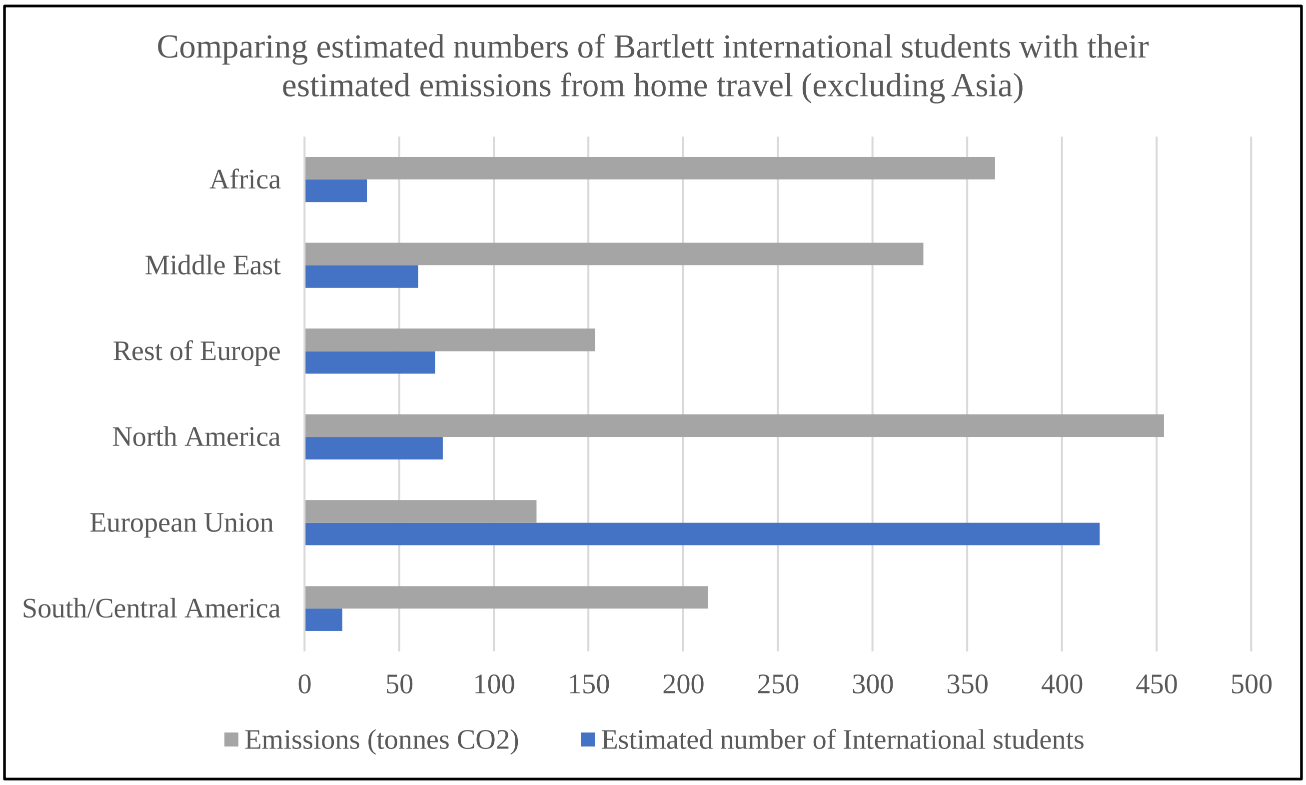

Figure 6: Comparing estimated numbers of Bartlett international students with their estimated emissions from home travel (excluding Asia). Author calculations based on publicly available student numbers data (UCL, 2021), Atmosfair (2021) CO_2 emissions calculator and AirportCodes (2021) busiest airport data.

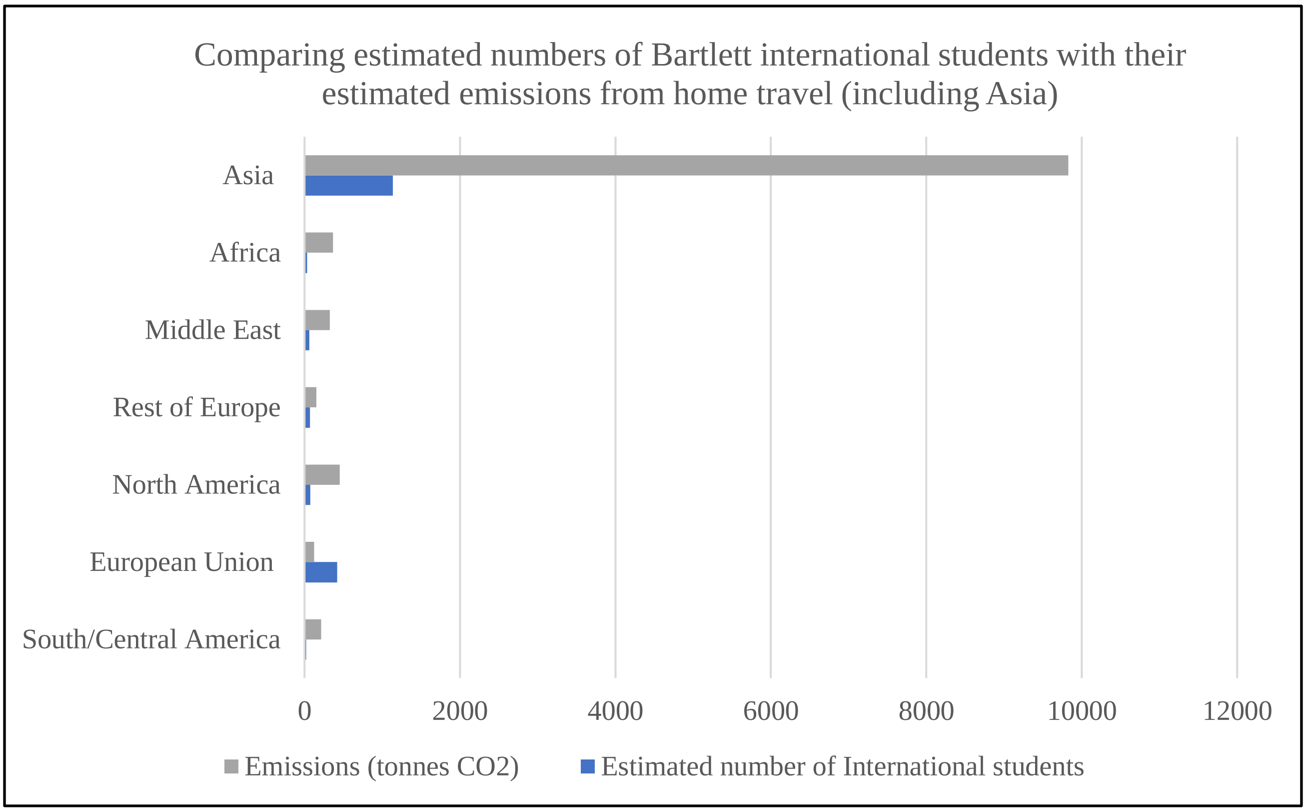

Figure 7: Comparing estimated numbers of Bartlett international students with their estimated emissions from home travel (including Asia). Author calculations based on publicly available student numbers data (UCL, 2021), Atmosfair (2021) CO_2 emissions calculator and AirportCodes (2021) busiest airport data.

Potential avenues for emission reduction

Hoolohan et al., (2021) estimate that 30-55% of a Russel Group University's income comes from student fees. At UCL international students represent a significant proportion of these fees, as they often pay over double domestic fees and in 2018/19 35% of students were international (UCL, 2021). For this reason, reducing international student numbers would be difficult for the university to justify. It is also hard for the University, or the Bartlett Faculty, to demand international students reduce flights as this encroaches on personal decisions outside of the University's control. Moreover, as is the case with many Universities (Glover et al., 2017; Buchs, 2019; Mitchell-Larson et al., 2021), it is against UCL's strong internationalization culture to attempt to reduce international student numbers – the University's motto is 'London's Global University' (UCL, n.d. b). However, as the institution responsible for causing students to emit large volumes of CO_2, this report believes that the Faculty and the University still have a responsibility to attempt to reduce international student travel emissions in some capacity.

Branch campuses and collaborative delivery

Davies and Dunk (2016) offer the idea of branch campuses to reduce international student travel. Given UCL's strong Asian connections (seen in Figure 7), a branch campus that could enable these students to attend

UCL on their own continent has the potential to reduce emissions dramatically. Bartlett international student emissions without Asian students for 2018/19 would've been 1635 tonnes CO_2, significantly lower than academic travel emissions (3031 tonnes CO_2). Collaborative delivery is a similar concept, whereby UCL could partner with a University on another continent to deliver a joint degree programme, involving less travel for international students (Davies and Dunk, 2016). Further examinations of these possible solutions are outside the scope of this report.

Carbon offsetting

Failing a reduction in international student travel, it may be necessary to offset these emissions. Offsetting has received considerable scrutiny, as many believe it may not be an effective method of emissions reduction (Anderson, 2012; Mitchell-Larson et al., 2021). Anderson (2012) argues that offsetting reinforces the continuation of high-emitting activities (like flying), thereby encouraging policies that continue to facilitate such activities. Equally, Mitchell-Larson et al. (2021) highlight how some offsets can be poor-quality, engendering further environmental damage or lacking permanence. Importantly, some scholars believe that high-quality offsets could have a role to play, at least initially, in reducing emissions (Davies and Dunk, 2016; Mitchell-Larson et al., 2021). The Bartlett could utilise the framework suggested by Mitchell-Larson et al. (2021) to find high-quality offsets, then pledge to allocate some of their budget to offsetting international student flights. Mitchell-Larson et al.'s (2021: 5) criteria consists of considering seven factors:

- **Permanence**: 'If the offset involves storing carbon, is the stored carbon locked away for a very long time (ideally thousands of years) or is there a significant risk of it being re-emitted back into the atmosphere in the coming decades? Are there legal, institutional, physical, or financial protections in place to reduce the risk of reversal?'
- **Additionality**: 'Would the emission reduction or the carbon removal have occurred in the absence of the project?'
- **Avoidance of double-counting**: 'The reductions or removals that an offset project generates must not be claimed by more than one party (e.g. both the purchaser and the government of the project's host country).'
- **Avoidance of "carbon leakage"**: 'There needs to be only a very low risk that a carbon project has merely displaced the emissions to another place or time'
- **Accurate carbon accounting**: 'Offsets issued by a carbon project must accurately reflect the quantity of reduced or removed greenhouse gas, as well as account properly for the warming impacts of non-CO2 climate pollutants (e.g. short-lived climate pollutants like methane).'
- **Atmospheric outcome secured**: 'Offsets should ideally stem from actions that are confirmed to have already taken place. For example, projects should not give full credit upfront for carbon removal that will take decades to be fully realised. If offsets are not secured, the future action that the offset pays for must be proximate (not decades away) and guaranteed.'

- **Sustainable:** 'Offsets must not cause environmental or social harm, must protect the self-determination of local communities and Indigenous Peoples, and should ideally advance the Sustainable Development Goals (e.g. biodiversity protections, equality, etc.).'

Student and staff commuting

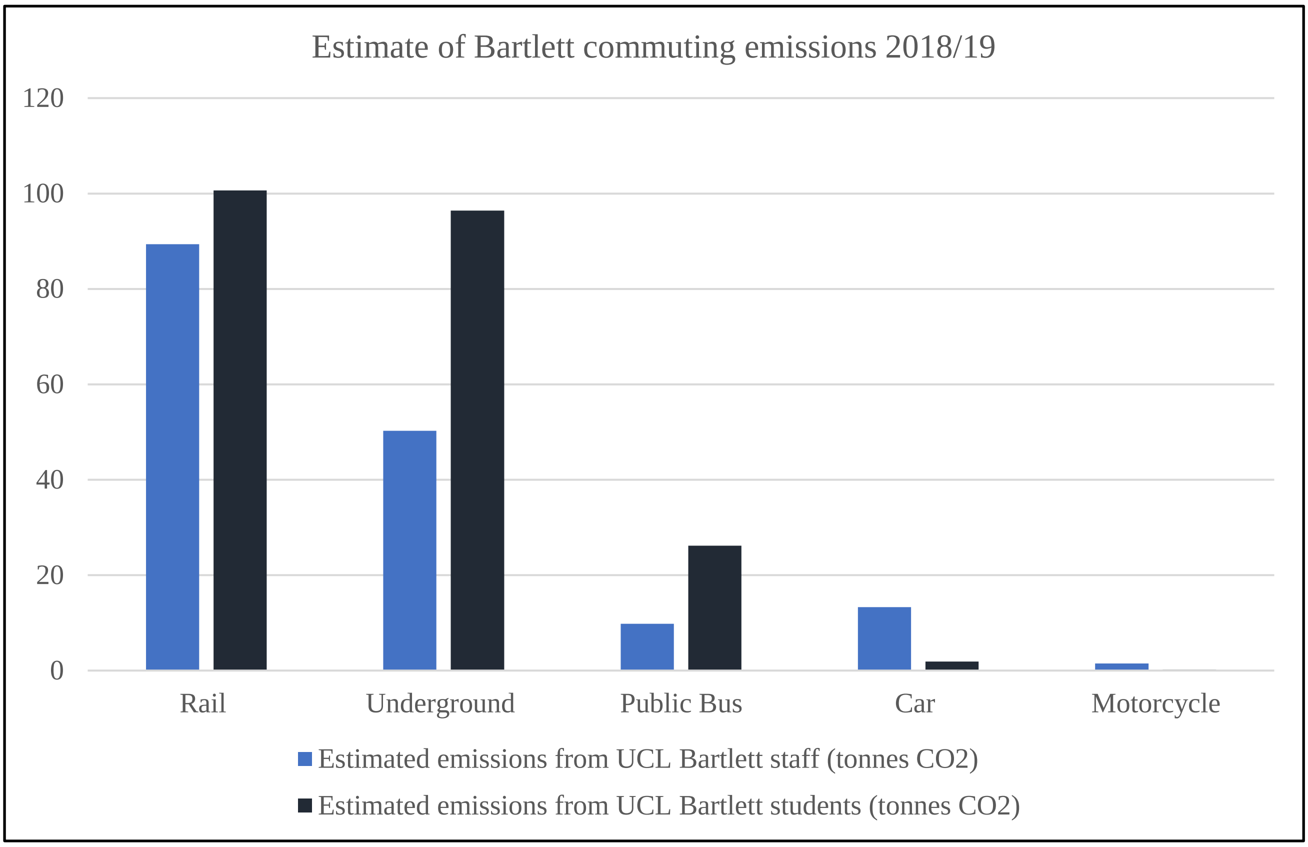

Figure 8: Estimate of Bartlett commuting emissions 2018/19. Author calculation based on UCL-wide emissions data retrieved by Dr Nick Hughes, publicly available student numbers data (UCL, 2021) and Bartlett staff numbers data retrieved by Dr Nick Hughes.

Estimates from scaling down UCL-wide commuting data to Bartlett staff and students indicates that commuting produces relatively little CO_2 emissions compared to academic travel and international student travel. Overall, the Faculty is estimated to have produced 389.6 tonnes of CO_2 in 2018/19. As seen in Figure 8, the majority of emissions stem from the use of public transport (rail, underground and public bus), meanwhile car and motorcycle use is rare. As stated in the literature, public transport produces much less CO_2 than cars or motorcycles (Balsas, 2003; Perez-Neira et al., 2020; Zhou, 2012), meaning Bartlett staff/student commuting is relative environmentally progressive. This may be due to UCL's location; in central London driving cars is expensive, owing to the Ultra-Low Emissions Zone (ULEZ), and it is slower than various modes of public transport. Most scholars have reported staff emitting more CO_2, due to having a higher tendency to drive to work (Hafezi et al., 2019; Sobrino and Arse, 2021), yet estimates for the Bartlett suggest students emit more – this is perhaps explained by their superior number, especially considering car-use is lower.

Potential avenues for emission reduction

Whilst this form of travel emission is less significant, and therefore in less urgent need of reduction, more can still be done to improve the sustainability of Bartlett staff and student commutes. Students are estimated to be the highest emitters at the Bartlett; this is promising for attempting to reduce emissions, as students are typically receptive to trying more environmentally-friendly modes of transport (Davison et al., 2015; Balsas, 2003; Zhou, 2012).

Promotion of cycling

Cycling is a very environmentally-friendly mode of commute, even more so than public transport (Zhou, 2012; Wilson et al., 2018; Shannon et al., 2006). First, it would be very helpful to know cycling data for Bartlett staff and students. An annual commute survey could provide this. In many university commute studies, more directed solutions could be provided through understanding what persuades and dissuades people to cycle (Wilson et al., 2018; Zhou, 2012; Shannon et al., 2006; Perez-Neira et al., 2020). Without this data, it is still possible to suggest general recommendations that have been provided in the literature.

Whilst not all staff and students will deem it feasible to cycle to the Bartlett (especially if they live far out of London and commute via rail), evidence from Figure 8 shows that many commute via the underground or the bus. This suggests that a strong proportion of commuters live within the metropolitan area of London, perhaps close enough to UCL main campus to cycle. To persuade these people to cycle, Wilson et al. (2018), Perez-Neira et al. (2020) and Balsas (2003) advocate for infrastructural policies like increasing safe bike parking with the instalment of bike cages and increasing/improving shower facilities on campus. Given London's reputation for bike theft, and the importance of bike safety in encouraging bike use (Wilson et al., 2018), the Bartlett could explore the possibility of constructing more safe bike storage around their building. 'Soft' policies may also prove effective (Perez-Neira et al., 2020: 2). Shannon et al. (2006) highlight that cycling has strong health benefits, and advertising these can have persuasive effects on commuters. Wilson et al. (2018) believe hosting cycling promotional events may help raise awareness of the transport mode for commuting. These two policy ideas could be combined; for example, the Bartlett Institute could formally participate in UK Bike Week, which occurs from 30th May – 5th June annually. The week-long promotion could be implemented alongside an advertising campaign explaining the health benefits of cycling to work or study. This could also be used as an opportunity to advertise how cycling works around the Bartlett, with the production of bespoke cycle lane maps, as recommended by Wilson et al. (2018), and showcasing of cycle storage or shower facilities.

Teleworking and blended learning

Another potential method to reduce emissions is to reduce the frequency of commutes through teleworking. Hook et al.'s (2020) extensive review of teleworking research found that 26/39 studies reported a net decrease in emissions from teleworking, with only five studies discovering an increase. However, many studies highlighted that decreases were less pronounced than first thought (Hook et al., 2020). Filimonau et al.'s (2021) study of Bournemouth University during the COVID-19 lockdown also emphasized how reductions in commuting emissions were somewhat cancelled out by increases in home-related emissions. Increased energy use from heating and cooking at home, alongside continued mandatory electricity use at an empty campus, meant that estimated reductions in carbon footprint amounted to just 29% (Filimonau et al., 2021). Hook et al. (2020) posit that teleworking disposes people to living further from their place of work, meaning commutes when they do go in produce more emissions. Versteijlen et al. (2017) and Mathez et al. (2012) promote the idea of blended learning, whereby staff and students work remotely for parts of the week. This may provide a welcome balance, however, the efficacy of this for reducing emissions needs further investigation. Due to the COVID-19 lockdowns, all staff and students have had experience working remotely. Therefore, the Bartlett have a perfect chance to speak to its staff and students to help understand the opportunities and challenges relating to teleworking for the future.

Conclusions

This report has highlighted emissions from three major travel activities undertaken by Bartlett staff and students. It is clear that academic travel and international student travel are the highest emitting activities, yet improvements can also be made from commuting. The Bartlett institute is emitting proportionately more from academic travel than other Faculties in UCL, with particularly high emissions from the School of Architecture and the Development Planning Unit. To reduce emissions in this area, this report recommends employing an environmental risk assessment, carbon pledge, carbon calculator for travel bookings and a reduction in funding for air travel expenses. In the long term, a focus on regionalising/virtualising conferences could also make a difference. International student travel is estimated to be the highest emitting travel activity within the Bartlett, yet it is the hardest to reduce. Suggestions from this report include establishing branch campuses in particularly popular world regions (like Asia) and using high-quality carbon offsets. However, both of these solutions are problematic - establishing a branch campus is a huge task, outside the scope of the Bartlett Faculty, and offsetting fails to address the strong internationalization culture at UCL which will continue to cause high international student travel emissions. This culture needs to be reconsidered by the University if significant reductions are to be made. Commuting is the least emitting of the three travel activities, owing to existing high usage of public transport by both staff and students. To reduce emissions further, the Bartlett should encourage cycling through the instalment of infrastructure and implementation of promotional events like Bike Week. Equally, the possibility of partial teleworking should be investigated – it should be noted that this is also a large long-term project, potentially outside the scope of the Faculty. Finally, to produce more specific evaluations of the Bartlett's travel emissions, more detailed data on academic travel, international student travel and commuting should be collected. This will enable further understanding of where emissions can feasibly be cut.

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