



CARBON FOOTPRINT OF THE INTERNATIONAL STUDENTS IN FINLAND

A Model Case Study on the International Students Enrolled in Bachelor Programs at LUT University

Lappeenranta–Lahti University of Technology LUT

Bachelor's Degree Program in Environmental Technology, Bachelor's thesis,

Bachelor's Programme in Technology and Engineering Science

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ABSTRACT

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Universities often overlook the air travel emissions of international students. However, they can be highly responsible, as there are thousands of international students traveling around the world by air. This research study is invested in comprehending the phenomenon through a rigorous medium of study by exploring the prior literature review and embracing a survey data collection procedure. The study's methodology involves a group of international bachelor's students who share a common ground, such as having applied to the university from outside Finland. A series of questions has been asked to estimate their carbon footprints due to their air travel. The carbon footprint calculation was performed individually, considering all responses, and a comprehensive interpretation of the data was derived. Later, the results were presented in graphs, and comparisons were also made. Lastly, the discussion reveals that the carbon emissions of the 53 respondents who took 76 trips covering 346,726 km were recorded at 23,583 kg CO_{2e}. Ultimately, recommendations, potential future opportunities, and conclusions were drawn.

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After countless sleepless nights, this is where destiny brought me. Little did I know that the journey would be so engaging!

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Signing Off!

Afsana Aktar Ridmi

Bachelor's in Environmental Technology

ABBREVIATIONS

CF	Carbon Footprint
CO ₂	Carbon dioxide
CO ₂ e	Carbon dioxide equivalent
CSR	Corporate Social Responsibility
CSRD	Corporate Sustainability Reporting Directive
EU	European Union
GHG	Greenhouse Gas
HEI	Higher Education Institution
ICONTEC	Colombian Institute of Technical Standards and Certification
IPCC	Intergovernmental Panel on Climate Change
kg	Kilogram
km	Kilometres
QR	Quick Response
UV	Ultraviolet

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1 Introduction

Higher education institutions (HEIs) are considered pioneers in maintaining a low-carbon economy (Idundun et al., 2021). To achieve a low-carbon economy, one of the fundamental tasks is to report carbon emissions as meticulously as possible. The reasoning behind accurately reporting carbon emissions can be understood by examining the actions of British universities. In terms of the universities in the UK, they acknowledge carbon emissions, such as direct and indirect emissions related to their operations. However, the supply chain emissions of universities have not met the standard and are, in fact, inconsistent (Idundun et al., 2021). The researchers found that carbon emissions increased significantly due to the rise in air travel by international students who came to the university for the first time and subsequently returned to their home countries to visit family and friends (Idundun et al., 2021). It is alarming because the emissions created were significant and were responsible for Scope three carbon emissions, which had not been regularly and adequately reported in their institutional sustainability report (Robinson, Kemp, & Williams, 2015).

International relevant bodies have agreed to form a common action plan in combating climate change. Therefore, the introduction of the Paris Agreement, a landmark international treaty adopted by 196 countries, has come into light (Blau, 2017). This agreement aims to limit global warming to well below 2 degrees Celsius, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. However, attaining the goal is not a simple task. Instead, it requires steps that entail a formidable and impactful reduction in emissions across every sector (Blau, 2017; Delbeke et al., 2019). According to the Intergovernmental Panel on Climate Change (IPCC), it is crucial to reduce greenhouse gas (GHG) emissions by at least 50% by 2030 to keep the agreement on track. It is challenging if all sources have not been considered (Allan et al., 2021). Therefore, there are potentially huge sources of carbon emissions that can be identified through studies on travel-oriented emissions caused by international students.

Arsenault et al. (2019) had shed light on a phenomenon where the air travel emissions were significant. They explored 'academic mobility' in response to addressing the

environmental footprint conducted at Université de Montréal (UdeM), which is a prominent university in Canada. The university had approximately 33,000 undergraduate students, 12,000 graduate students, and 1,500 full-time professors. In this research, the international graduate students, professors, and research professionals were taken into consideration. The average air travel distance for the research community was found to be 8,525 km per person. Hence, at UdeM, international students generate 3.85 T CO₂, whereas professors are responsible for generating 10.76 T CO₂ per year. Therefore, air travel emissions have been a significant contributor to carbon release into the environment (Arsenault et al., 2019).

However, interestingly, carbon emissions related to the education sector, particularly those associated with international students, have not garnered much attention (Arsenault et al., 2019). Therefore, the study incorporates greenhouse gas (GHG) emissions related to air travel, specifically those caused by international students studying at Lappeenranta-Lahti University of Technology (hereinafter referred to as LUT University) in Finland. It is also justified that the number of students at LUT University has been increasing exponentially. Hence, it is high time to investigate the environmental impacts associated with CF caused and generated by international students studying at LUT University, Finland.

Air travel can be regarded as one of the most intensive sources of carbon emissions. Students from all over the world travel to different countries in search of quality education. This accumulates the increase of carbon emissions (Donahue et al., 2021). The following Table 1 provides statistics in this regard for the LUT University:

Table 1: Statistics of the number of students admitted to LUT University 2021-2024 (Vipunen.fi, 2025)

Years	Total Students Admitted in Different Programs at LUT University	International Students	Percentage of International Students
2021	2699	193	7.15%
2022	3083	451	14.63%
2023	3487	717	20.56%
2024	3841	1052	27.39%

1.1 Scope of the Study

The dynamic trend in culture is also attributed to the cause of carbon emissions. For instance, Nordic countries have a declining birth rate. Universities are not attracting enough students to develop them into human assets for the country (Hellstrand et al., 2022). In response to this, universities like LUT University have broadened their horizons to admit students from all over the world, contributing to international student mobility and the associated carbon emissions. It is also possible, given the increase in bachelor's degree programs at the university, that international students are being drawn to these programs. Additionally, international students can choose to pursue admission to either of the bachelor's programs. Then, they can obtain a residence permit for 5 years, which attracts international students to come to Finland. If international students decide to live in Finland for five years and study at LUT, they are expected to visit their home country multiple times during this period. Hence, the need to study the carbon emissions caused by international students is salient.

Therefore, it is essential to understand the extent to which international students contribute to atmospheric carbon emissions. As the number of students increases, so do the emissions, and this impact needs to be realized. This is where the study comes into play. Furthermore,

attempts to manage carbon emissions reporting have been relatively underrepresented among universities. Hence, the need for investigation arises in this particular subject of interest.

1.2 Motivation of the Study

The movement of international students produces economic opportunities. However, the environmental cost is notably significant and has been overlooked for years. The emission can be called 'Scope 3' emissions under the protocol of GHG (Valls-Val & Bovea, 2021). It accounts for the indirect emissions caused by the organization's operations that are not directly controlled or owned. However, due to the 'complexity of the data collection and measurement', reporting of Scope 3 emissions often fails to be adequately reported (Stridsland & Sanderson, 2023).

Figure 1, taken from Valls-Val and Bovea (2021), showcases the Carbon Footprint (CF) in higher educational institutions (HEIs). From the portrait, it is evident how many units contribute to the Scope three emissions. Moreover, due to 'complexity', it goes unnoticed at times when it should not. Furthermore, it is also clearly visible that the HEIs are not very enthusiastic about reporting the air travel histories of international students. Therefore, it also highlights the incompleteness of the data. As the number of international students continues to grow, air travel is expected to have a significant impact on reporting. Even though universities are not breaking any rules for not reporting it, the responsibility to become environmentally cautious and friendly justifies the positive intent of the universities.

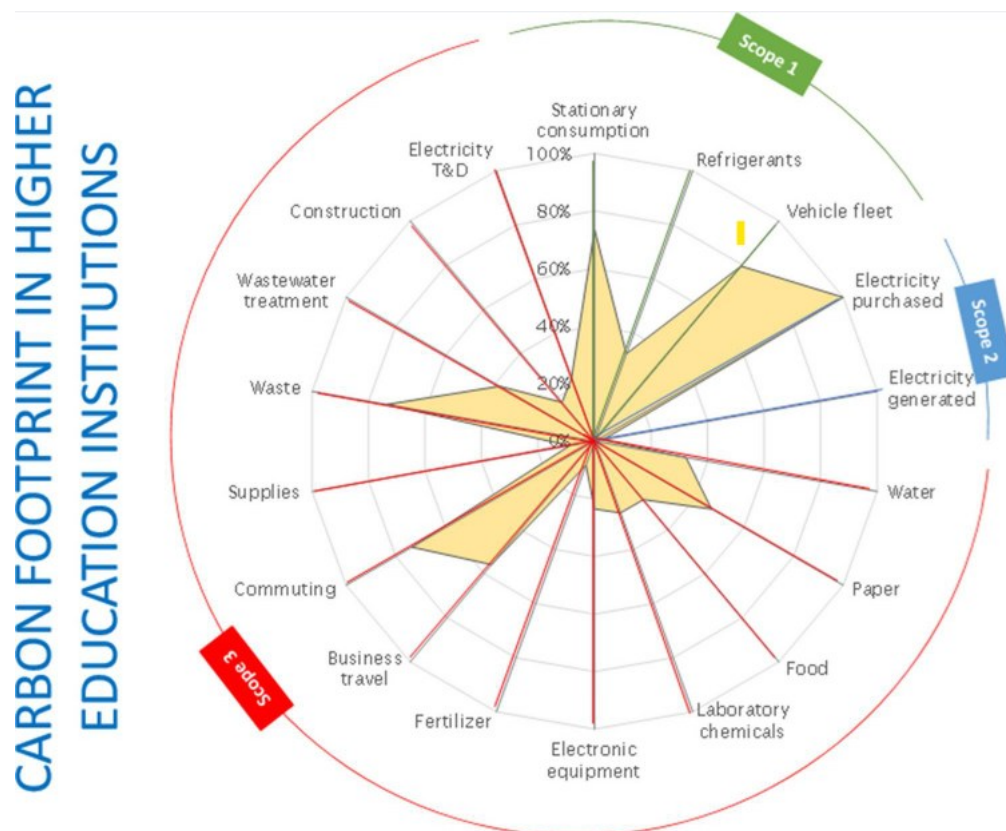


Figure 1: Carbon Footprint in Higher Educational Institutions (Valls-Val & Bovea, 2021)

In addition, Woszczek et al. (2025) found that data accuracy has been a prominent factor in determining the Scope 3 emissions at LUT University even though the universities have the advantage of tackling carbon emissions by reporting the Scope 3 emissions, a lack of completeness (poor data) in data availability results in data inaccuracy (overestimation or underestimation).

Therefore, it motivates the author of this research article to investigate the carbon footprint of international students.

1.3 Relevance of the Study

The study is relevant, and its impact extends beyond local boundaries. It can serve a global purpose, and this study has the potential to be a pioneer in understanding and addressing the carbon footprints of international students studying at LUT University at the bachelor's level. This study can guide future research, and its shortcomings will be easier to address, allowing our environment and climate to remain environmentally friendly.

The number of bachelor's students grew exponentially as the number of international bachelor's programs (with English as the mode of instruction) increased. In 2019/2020, only one international bachelor program was available, whereas in 2025/2026, the number of international bachelor programs will be ten. According to the diagram in Figure 2, it is evident that students from South Asian countries, including Bangladesh, Nepal, Sri Lanka, Pakistan, and India, have become increasingly focused on gaining admission to Finland through LUT University. According to Packer (2024) from The Pie Network, Sanna Marin, the former Prime Minister of Finland, had a meticulous plan to attract many students. She aimed to triple the existing number of international students and wanted at least 75% of them to remain in the country to contribute to the economy. Additionally, Hanna Isoranta, Chief Specialist at Study in Finland, noted that they had previously discussed the attraction of international students to choose Finland as their destination. The chief specialist also claimed that they have been focusing now on retaining students and turning them into a skilled workforce (Packer, 2024).

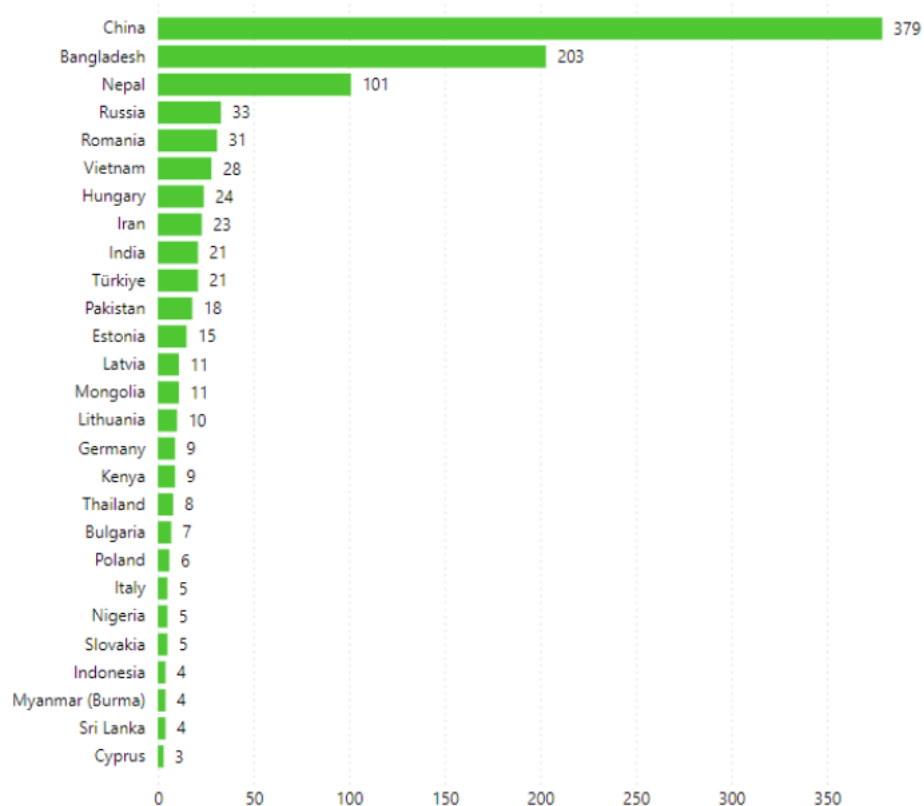


Figure 2: Number of students enrolled in 2024 at LUT University at the bachelor's level

1.4 Research Questions

The following research questions have been developed to investigate the phenomenon:

RQ₁: What categories should be considered to measure the carbon footprint caused by the international students due to their air travel?

RQ₂: What is the carbon footprint of international students caused by air travel during their studies in a foreign country?

RQ₃: What actions can be taken within universities to measure the climate impacts more accurately and manage them more effectively?

1.5 Aim of the Study

The thesis aims to produce a piece of research investigating the carbon footprint of international students at the LUT University. Hence, the research piece will examine the data of international bachelor's degree students at LUT University, Finland, regarding the air travel associated with their study purposes in Finland. Furthermore, the air travel caused by their visits to their home countries will be studied and considered to measure carbon emissions. In these circumstances, the research tends to address the academic and institutional responsibility. The formulated research questions will act as a guide to the successful and meaningful completion of the thesis.

2 Literature Review

This research aims to investigate the global trends in international students' air travel activities to understand the level of carbon emissions intensity. In this section, the history will be investigated, shedding light on the actions of the respective parties involved, including international students, universities, governments, and other relevant stakeholders.

2.1 Trends and Drivers of International Student Mobility

International student mobility has increased significantly. A comparison can be found in De Wit et al. (2018), who discovered that international student mobility has increased by a factor of 15. In 1965, the number of international student circulation was around 250,000 globally, and after 40 years, it has crossed the mark of 3.7 million. In addition, worldwide competition for attracting and retaining skilled force (pull factor) is another crucial trend that has been perceived (De Wit et al., 2018).

International student mobility in a country is presumably decided by the government of that country (De Wit et al., 2018). The trends are set and influenced by the country's governmental policies and the education board. Educational institutions need to be on board, aiming towards the sustainable attractiveness of international students. The government, upon identifying opportunities to earn international currency and attract young talent, incentivizes international students by easing migration policies and offering lucrative employment and residence opportunities (Chankseliani, 2018). In addition, universities may also benefit from these opportunities by admitting more international students to secure research funding (Wen & Hu, 2019). The education board of a country is responsible for creating an environment in which educational institutions can operate by the rules and regulations set by the government. Therefore, with the guidance of the education board, educational institutions formulate marketing strategies to attract students from around the world (De Wit et al., 2018).

Furthermore, the trends of international student mobility are often driven by the engagement of social media (Zhu, 2019) and the recruitment efforts of educational agencies (Nikula &

Kivistö, 2020) in different countries, which are two prominent ways that overseas universities attract students. Social media enables the university to interact directly with international students, allowing them to have all their questions answered by the university's international office. This is one of the most efficient and trustworthy ways to communicate with students and attract them directly (Zhu, 2019). Educational agencies serve the purpose of handling the admission and migration procedure. The agencies make it easy for students by streamlining the processes and are a viable option for universities to attract international students through educational agencies (Nikula & Kivistö, 2020).

The act of attracting international students does not necessarily bring economic sustenance and workforce circulation to the country. Instead, it also invites 'probable' undocumented carbon emissions. Although there is no legal obligation under the GHG protocol to report Scope 3 emissions, universities that actively recruit students from different parts of the world may still have a significant amount of carbon emissions that remain undocumented. Hence, it is essential to manage the situation by assuming responsibilities (Arsenault et al., 2019).

There is no obligation set in the GHG Protocol. The point should be that if the universities are actively recruiting students from abroad, there should at least be some responsibility assigned to measure and manage the situation.

2.2 Scopes of Carbon Emissions

Three types of carbon emissions reporting persist in Greenhouse Gas accounting terms (Hall, 2024). According to the World Resources Institute (2011), businesses are required to report Scope 1 and Scope 2 emissions. Scope 1 emissions refer to the direct emissions that originate from sources owned by the organization, whereas Scope 2 emissions are considered indirect emissions associated with the sources' electricity, power, and heat. However, in terms of Scope 3 (all other carbon emissions, excluding Scope 1 and Scope 2), the standard has been lenient and non-mandatory. Figure 3 portrays the definition of the scopes in a diagram.

Specifically, it is relevant and important to highlight a recent study that revealed the European Union (EU) has played a crucial role in reducing emissions to combat climate change. Hence, the Corporate Sustainability Reporting Directive (CSRD) was introduced in

2022. According to this directive, it is necessary to report the Scope 3 transportation emissions of the companies (Munthe Nilsson & Nilsson, 2023).

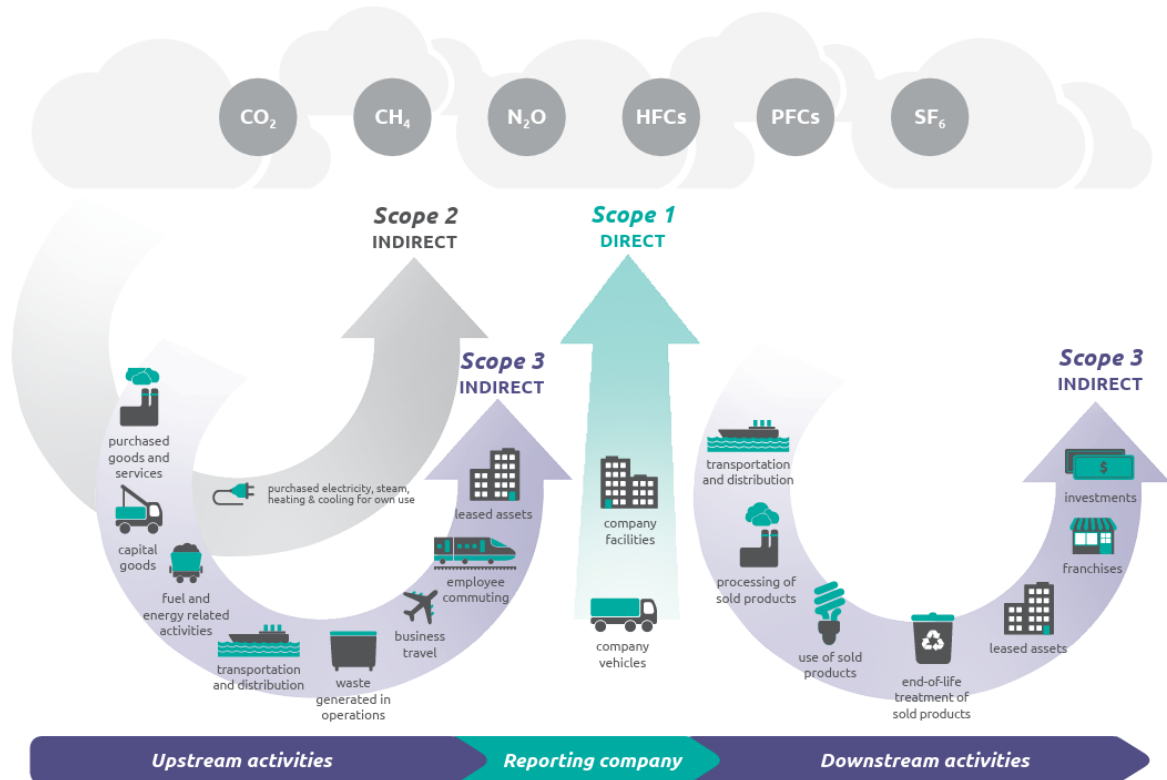


Figure 3: Overview of GHG Protocol Scopes and emissions across the value chain in a business (World Resources Institute, 2011).

The importance of reporting Scope 3 emissions can be understood from the research conducted by Vásquez et al. (2015). The study took place at the Curico Campus of the Universidad de Talca in Chile. The carbon emissions reported in 2012 were 1.0 t CO₂e per student. Of this, 68% of the emissions originated under the Scope 3 category, while the remaining 32% were shared between Scope 1 and Scope 2, with 16% each. This illustrates the importance of Scope 3 in higher educational institutions, where the number of students and staff is large and they are often drawn from different parts of the world (Vásquez et al., 2015).

In Canada, only 20% of universities have been reporting their carbon emissions (Hall, 2024). In addition, researcher Hall (2024) also found significant differences in data collection and emission calculations among the universities. Those attributes are due to the complexity and do not necessarily provide the whole picture of the emissions. It has also been explored that there was no ‘common’ system to follow to report carbon emissions, and universities were

reporting them as they saw fit. This required an ask for a standard set of policies (Hall, 2024). Furthermore, the difficulties and differences have been disclosed that how the universities report such as how the flights are counted, how to collect 'precise' data of the travel emissions, which emission calculations approach to adopt from a variety of available approaches, and how to incorporate the flight's institutional emissions which itself is difficult to calculate (Hall, 2024).

2.3 Scope 3 Emission Reporting

Valls-Val and Bovea (2021) found that educational institutions are more likely to report Scope 1 (direct emissions) and Scope 2 (indirect emissions from the purchase of electricity). It is salient to include this information in the university sustainability report. Nevertheless, there is no option to look the other way when 'Scope 3' emissions come into light. According to Nayak (2023), Scope 3 emission reporting differs from both Scope 1 and Scope 2; it also exhibits ambiguity. Since Scope 3 emissions are 'mostly' voluntary in educational institutions, they get little recognition in reporting as well. However, research by Nayak (2023) found that 65% of an organization's carbon footprint is comprised of Scope 3 emissions. Therefore, failing to report the Scope 3 emissions properly will result in the report having an underreporting issue in the end. It has also been found in Nayak (2023) that universities have not been very keen on reporting Scope 3 emissions, as it involves a significant amount of data collection, planning, and resources. Additionally, since it has not been compulsory for institutions, it is often overlooked.

According to the GHG protocol, the indirect operations of an organization can cause emissions, even if the organization has not been directly involved in the action. The emission is said to be a 'Scope 3' emission (World Resources Institute, 2011). Therefore, for many years, educational institutions have not been 'active' in reporting the Scope 3 emissions. This is not a straightforward process to follow, and complexity often arises because students from all over the world attend foreign universities. Hence, this might seem 'extra & non-economic' to report the Scope 3 emission (Stridsland & Sanderson, 2023).

The Scope 3 emission report should include the indirect emissions caused by the students in this aspect. For instance, the air travel itineraries of the students should be included in the university's sustainability reports. A study conducted by Varón-Hoyos et al. (2021)

concluded that the Technological University of Pereira accounted for 97% of the emissions, which can be categorized under Scope 3. It is due to the mobility of the students and staff. This high level of Scope 3 emissions is not very common, but it highlights the necessity of reporting it, which is often overlooked.

Research conducted by Davies and Dunk (2015) found that UK universities are more likely to report the emissions directly related to their operational activities. Moreover, a few universities have been reporting the air travel emissions from international students. In Germany, the University of Applied Sciences in Konstanz analyzed carbon emissions, excluding those of the students' travel (Sippel et al., 2018). Universities in Australia often understand and acknowledge students' air travel histories. However, they have often failed to measure and report the Scope 3 carbon emissions generated by international students (Glover et al., 2018).

2.4 Ways to Reduce Carbon Emissions

The following actions can be embraced by the international students and by the foreign universities to serve the environment by being proactive in choosing green at all levels:

A reduction in frequent visits to the birthplace may significantly reduce carbon emissions. International students, due to the availability of cheap flights or special occasions, often visit their homes frequently. This increases the emission, which can be easily mitigated by reducing the frequency of visits to homes (Liu et al., 2022). On another note, it is essential to explore sustainable and environmentally friendly travel alternatives. Rather than using connecting flights, direct flights emit less carbon and thus, it is better to use direct flights. However, in terms of economic feasibility and demographics, international students are more likely to choose connecting flights over direct flights, as these are often more affordable (Rotaris et al., 2020). However, again, international students who are keen on saving the earth may opt for sustainable travel alternatives, such as using trains, buses, or ships to commute within the European Union (EU) region (Avogadro et al., 2021).

Furthermore, becoming carbon neutral should be the motto of universities around the world. If the university takes steps to become carbon neutral, the students will follow even after they graduate. Osorio et al. (2022) have made a case by conducting research at two

universities in Colombia, namely the Universidad Pontificia Bolivariana and the Universidad EAN. In Latin America, the first institution was recognized as the first carbon-neutral university in 2017, and the latter became the second carbon-neutral university in 2021. The whole process was verified and certified by the Colombian Institute of Technical Standards and Certification (ICONTEC). Universities can play a significant role in becoming a carbon-neutral institution, provided they follow all the GHG protocol and adhere to the standard throughout (Osorio et al., 2022). Finally, the availability of degree programs with an online study mode can necessarily decrease the carbon emissions of international students. This is one of the best alternatives, enabling students to earn a degree from the comfort of their own homes by studying online. The student may not be required to visit the university in person, which allows for the omission of emissions caused by air travel. Heller et al. (2022) conducted interesting research involving 128 students from 30 countries, representing 70 different cities. Of them, 93 students came from African territories, whereas 18 students were from the subcontinent. All the students were enrolled in an online degree program. The study took place in Manchester, UK. The flights, on average, to and from Manchester can be equivalent to 114,553 kg of CO₂. Living in Manchester for the entire degree would result in a total equivalent of 854,904 kg of CO₂. A total of 969,457 kg of CO₂ net savings was recorded in the research.

2.5 Scientific Community's Advocacy

Proper Scope 3 reporting is important so that an appropriate set of actions can be taken to protect the environment. Otherwise, the chances of misreporting occur, and a sensitive issue like the environment will be the first to suffer; later, humankind will face the devastating consequences of a harsh environment. The university should include a carbon footprint assessment when reaching out to international students. A standardized methodology for including Scope 3 can be introduced with the help of experts, and training can be provided to the staff as well. The university staff will then become proficient in reporting Scope 3 emissions upon receiving the training. If needed, it is also possible to hold a group discussion by selecting students from the same country. That way, a great deal of identical information can be collected altogether, which will ease the operation. On another note, when students arrive at the university, the international office can share a drive link to answer questions

about their itinerary. This can save a lot of time and resources (Ducoulombier, 2021). In addition, governmental policies and regulations should incentivize international students to use low-carbon producing options rather than inviting them to use air travel. Students living within the EU can take trains, buses, or ships to commute to their home country (Avogadro et al., 2021). The government, as well as the education board of a country, can implement stricter rules on educational institutions to adopt green operations and introduce sustainability in their activities. Additionally, it is crucial to periodically assess the progress of universities in implementing green operations within their activities. If the implementation does not go as planned, serious consequences should be taken (Aleixo et al., 2018). LUT University has provided 'green' guidelines for exchange students to choose environmentally friendly travel options, ensuring the environmental sustainability of their travel choices. This includes selecting buses, trains, or carpooling instead of air travel, which can reduce travel emissions by up to 75%. The university also suggests that students apply for the higher travel grant if they pursue exchange studies or an internship with partner institutions in the EU through the Erasmus+ Programme, which is run by the European Commission (LUT University, n.d.). This is how LUT University intends to change the behaviour of the exchange students and guide them to choose green travel options. However, LUT University has not provided any information on choosing green modes of transportation for international students.

Furthermore, changes in behaviour and attitude are necessary. Becoming humane is essential to preserving the environment for future generations. Selecting environmentally friendly choices fosters the best version of humankind, enabling people to take responsibility for their actions. Therefore, traveling home with a direct flight may require a significant amount of money, but the environment benefits every time one selects a direct flight over a connecting flight (Rotaris et al., 2020). Additionally, as the LUT University suggests, if a direct flight is not possible, it is a good choice to select a mode of transportation using a bus, train, or even carpooling, which can reduce travel emissions by up to 75% (LUT University, n.d.).

Universities should have a rigorous process in place to ensure the inclusion of all data, thereby preventing underreporting. Underreporting may invite trouble since the exact scenario is often overlooked, and the dire consequences of Scope 3 emissions will ultimately harm humanity (Patchell, 2018). In addition, to add more value in this instance, universities may offer fully online degree programs for students who want to get a degree. There may be

a choice of how the students want to do the degree. For instance, if someone can choose to stay at their home and complete a degree from a foreign university, a significant amount of carbon emissions can be saved, and the university can take credit for its sustainability efforts in the admission process. Introducing or expanding hybrid learning opportunities can significantly reduce carbon emissions, as the need for long-distance travel is expected to decrease (Heller et al., 2022).

2.6 Existing Challenges and Controversies

Research has found that the effectiveness of online studies is enhanced by a study with a sample of 128 students (Heller, 2022). The researchers had demonstrated a significant reduction in carbon emissions when the need to travel is reduced. However, online studies generate less revenue for universities. Additionally, universities require fewer resources to conduct online programs. For example, universities do not need to allocate large classrooms for students, and heat and electricity are also saved. Even though many carbon emissions could have been saved by going fully online, universities are unable to do that since a lot of scientific operations are conducted in well-equipped laboratories, and merely ‘seeing’ the video will not add value to students’ learning. Therefore, international students need to pursue these degrees (Heller, 2022).

As it has been found, not many universities include Scope 3 emissions in the sustainability report they produce (Glover et al., 2018). However, it is worth mentioning that there has not been a specific set of methodologies to follow, and accountability is not particularly robust. Additionally, research has shown that reluctance to report Scope 3 emissions may instill disinterest in the minds of international students, potentially impacting the revenue systems of universities. The research revealed some controversial steps taken by the university, which believed that carbon offset programs would suffice in addressing the need to tackle Scope 3 emissions—a stance deemed morally and ethically unjustified (Glover et al., 2018).

Controversies and challenges exist. Universities are gradually making efforts to include Scope 3 emissions (Osorio et al., 2022). Hence, it is essential to take appropriate actions and establish a common rule and methodology to include the Scope 3 emissions generated by international students. Only then will steps like carbon offset programs become viable and

make sense. By doing so, universities may also be aware of their performance in maintaining a carbon-neutral environment (Osorio et al., 2022).

3 Research Methods

The research methodology outlines the in-depth analysis of the data collection process, calculation tools, and procedures, as well as the data analysis procedure on which the research is based.

3.1 Data Collection

The data collection section outlines the details of sample selection, data source, data collection medium, and the contents of the questionnaire from which the data were collected.

3.1.1 Sample Selection

Two specific attributes have been looked at in students for sample selection:

- The international students, who are currently enrolled in any of the bachelor's degree programs at LUT University, Finland, have been considered as the sample of this research study.
- The students who were outside of Finland during their application and had to use air travel to be in Finland have been specifically considered as the sample of this research study.

To be included in the sample, both attributes must be fulfilled. It is essential to note that Finnish citizens who meet the criteria can also be included in this sample. A total of 53 responses were recorded after the data cleaning. The incomplete data were cleaned since some respondents did not complete the entire questionnaire.

3.1.2 Data Source

The survey was the primary source of collecting data. In addition to the survey, to get a comprehensive understanding of the demographics, institutional statistics (publicly

available) have also been taken as a resource. The data mentioned has been collected from Education Statistics Finland (Vipunen.fi, 2025). The collected data provided comprehensive information on the total number of students who have enrolled in Finnish universities over the last 4 years, as well as the country of origin of these students. This is a credible database that played an important role in understanding the phenomenon at a high level.

There were several reasons for selecting a survey as a data collection source. One of the fundamental reasons is that the lack of existing data led the author to conduct extensive research and collect information firsthand.

3.1.3 Data Collection Medium

The primary data collection medium is a survey. It has been addressed to the students who meet the criteria for being in the sample. A custom-designed online survey, generated using the Webropol tool, was created to collect responses from international students studying at LUT University. The questionnaire was comprehensive and asked respondents to provide detailed information about their travel itineraries in 2024. The questionnaire included questions regarding the country of origin, arrival and departure flight routes, layover locations, total number of trips taken in 2024, and the purpose of their trips.

3.1.4 Aims and Contents of the Questionnaire

The survey consisted of 55 questions. The questions were formulated to discover the number of flights international students (at LUT University) took in 2024 and the nature of the flights, such as direct flights or connecting flights. The questions were a mix of closed-ended and open-ended questions. Thus, this survey questionnaire could be regarded as a 'semi-structured questionnaire'. In addition, the questions were posed as multiple-choice, dichotomous, Likert scale, and open-ended questions to gain more insight into the matter at hand. In several instances, students could freely add information if they felt more was needed to explain their unique situations. The survey has been attached to the appendix.

The questionnaire aimed to ask a series of questions to international students, from which a comprehensive dataset could emerge regarding their trips taken in 2024. Hence, the survey

has been conducted in two parts to address different aspects separately. In the first fold, the survey began with an introduction to the topic. Instructions, confidentiality, and obtaining consents have been followed thereafter. Afterwards, it came to the part of selecting which country the respondent was in when they applied for LUT University admission and which country they belong to, as it is essential to understand the nature of the flight and the availability of direct flights, which necessarily impact the carbon emission. The following sets of questions inquired about the program and school the international student represents.

In the second fold, the survey focused on gathering the travel histories of international students who participated in 2024. The questions considered the destination countries, the layover countries, the method of return to Finland (using the same itinerary or a different one), and the purpose of the trips. Even though the purpose of the trips may or may not directly concern the university, it was still important to ask, as frequent flights could lead to a student being more responsible for carbon emissions. Additionally, if the student holds a ‘student residence permit or student visa’, the university should monitor the student to report any air travel. Additionally, respondents could select multiple trips. The respondents were asked to rank their choices when booking air travel, considering factors such as price, direct flight options, carbon emissions, overall convenience, and their environmental attitudes. In addition to these inquiries, the respondents were also asked some factual questions to check whether they were informed about specific environmental facts regarding carbon emissions, such as whether they knew that their air travel has a direct impact on carbon emissions and whether they knew that choosing a connecting flight increases carbon emissions by about 50%.

3.1.5 Data Collection Channels

The data regarding air travel were gathered through an online survey. Several channels have been established to conduct the online survey and gather as many responses as possible. For instance, LUT University has two campuses situated in Lahti and Lappeenranta, and both campuses’ electronic noticeboards were occupied with it. In addition, an email notification was sent to the department chairpersons of various bachelor’s degree programs, who can encourage the ‘eligible’ students to share their opinions. The channels of responding to the survey were initially open for 3 weeks. Later, it was extended further due to the low response

rate. Additionally, information screens on both campuses of LUT University displayed details about the survey, and QR codes were shared to access it. The Heads of different programs were also cordially informed and welcomed to share information about the survey with their students. The survey was available to international students from February 17 to March 5, 2025.

3.2 Emission Factors

It is essential to possess standardized emission factors so that the quantification of carbon emissions generated by international students can be achieved. The study utilizes the ICAO (International Civil Aviation Organization) Carbon Emissions Calculator, as it has been a prominent and popular academic tool for estimating CO₂-equivalent (CO₂e) emissions per student boarded on commercial flights (Graver et al., 2019).

The calculator takes into account the following variables, for instance:

- Distance of the flight (great circle distance)
- Type of aircraft
- Load factor of the passenger
- Cabin class (business, economy, etc.)

With the aforementioned information, the calculator provides a sophisticated and realistic estimate of emissions for the specified route. Even with multiple connecting flights, this tool can help estimate valid emissions. Additionally, it can also develop data for a given route for the year. This tool enables this research to possess a significant level of credibility and consistency, which can elevate optimal research practice at an international level. The output of the emissions calculated by the ICAO calculator is in kilograms of CO₂e per passenger, as well as distance in passenger-kilometres. This makes it simpler to represent a broad set of student groups.

3.3 Data Analysis

3.3.1 Calculation Methods

All the flight entry was gathered from the survey. Then, one by one, all the responses were booked into the ICAO Carbon Emission Calculator. The emissions were considered for both one-way and round-trip trips, and then the total aggregate emissions were calculated for each of the valid student responses. Once the data was cleaned of incomplete and duplicate entries, the ICAO carbon emission calculator was used. The calculation was done to estimate the CO₂ emissions. In this calculation, the total flight routes, consisting of departure, layover, and destination, have been considered. In addition, the usual aircraft and their operational factors have been incorporated accordingly by the ICAO calculator. Since the respondents are international students, it was rationally assumed that cabin class would be equivalent to economy class for the sake of standardization.

All the travel routes have been entered into the calculator for a single flight. If the route is identical for the round trip, a multiplication has been initiated. In the event of adopting a return route, new calculations have been conducted. To maintain accuracy, it was essential to consider each case individually, allowing for a clear view of the estimated emissions rather than relying on an average, which would not produce a comprehensive estimation as it does now. After the calculation was completed, the data has been compiled and presented in the following section, where different figures are attached and analyzed. The analysis has been conducted based on the 'Student Origin by Region', 'Total Carbon Emissions (kg) by Region', 'Total Carbon Emissions by Students from Top 6 Countries', 'Flight Frequency by Region', 'Top Reported Travel Locations by International Students', and 'Reasons for trips'.

3.4 Calculation Tools

Several tools and software were utilized to handle the collection, processing, and analysis of data in this study, such as,

The ICAO Carbon Emissions Calculator serves to estimate the emissions generated by the air travel of students. All the reported emissions from the survey have been entered into

this calculator, and the value of CO_{2e} is then calculated. The inclusion of both direct and connecting flight routes has been included in the calculation. The results of the emissions are deemed credible and reliable, as the calculator relies on standardized aviation data.

Microsoft Excel has been used to compile the raw data. Additionally, it helped to clean the data by addressing inconsistent or incomplete responses. Additionally, formula-based calculations and pivot tables have been utilized to group students by region or country of origin, calculate the number of trips for each student, determine the average and total emissions, and identify frequent flyers. It has also been used in the compilation of various demographic data gathered from Education Statistics Finland, allowing for the integration of this data with the survey to produce a meaningful explanation. Furthermore, data visualization tools have been utilized within Excel to create visualizations, using graphs and charts that display the rate of emissions generated by each student, the total emissions generated in different regions, data comparisons between direct and connecting flights, and the distribution of emissions.

4 Results

This section will occupy all the data gathered from the online survey. The data are presented in graphs, and they accompany the illustrations. Additionally, potential trends and comparisons have been identified in data interpretation.

4.1 Emission Estimation and Data Description

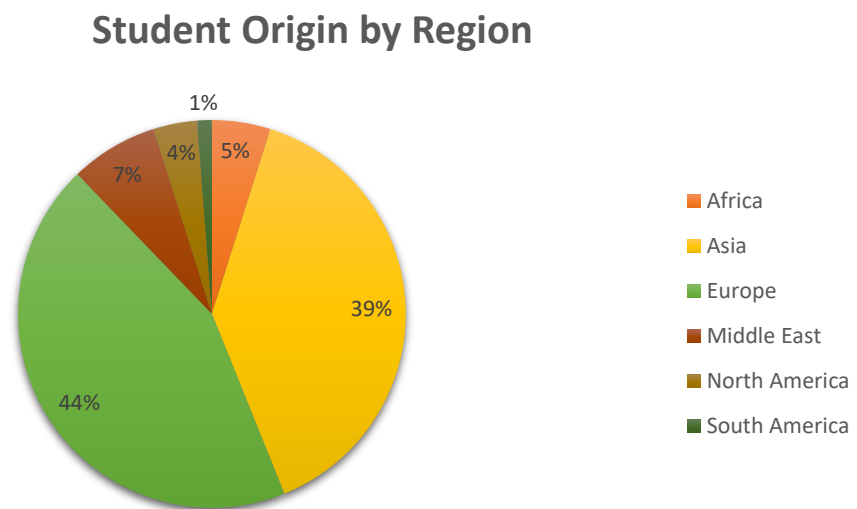


Figure 4: Student Origin by Region

Figure 4 represents the students' residence regions during their application period. It facilitates the categorization of emissions by region and also takes into account the flights that international students may take for their arrival in Finland to estimate the associated emissions. From the figure, it is evident that European and Asian students primarily comprise the international student population at LUT University.

Total Emission by Region

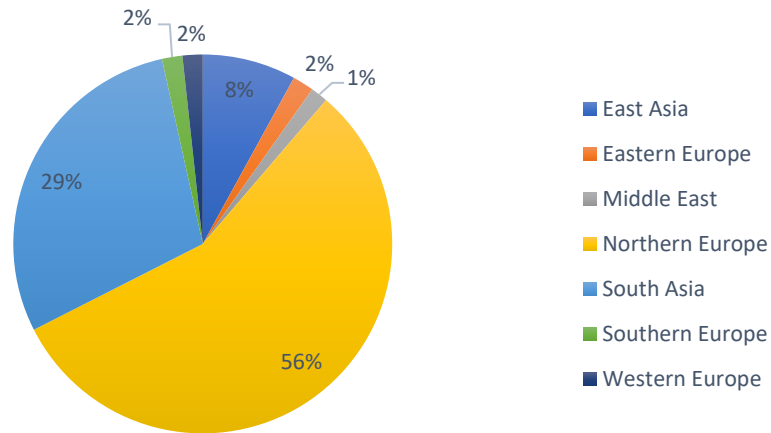


Figure 5: Total Carbon Emissions by Region

Figure 5 illustrates the regions that contribute to emissions based on the travel patterns of international students. The regions can be defined as the point of departure and arrival. From the figure, it is evident that students from Northern Europe and Southeast Asia at LUT University are contributing significantly to carbon emissions. A trend can be understood since Asia is on the map; due to the long-haul flights, the total emissions are significant. Moreover, for Europe, it is possible that students visit their families more frequently using air travel, and thus, Europe tops the list in that regard.

Top 6 Countries by Total Student Carbon Emissions

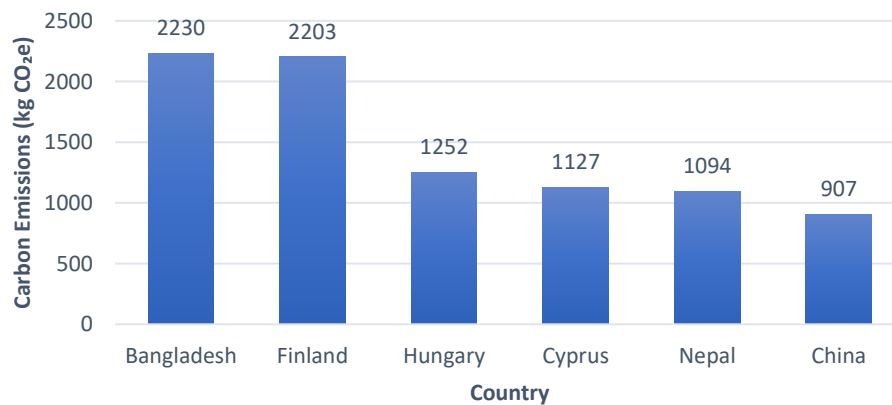


Figure 6: Total Carbon Emissions by Students from Top 6 Countries

Figure 6 represents the total carbon emissions (in kg CO₂ equivalent) from air travel by students from the top six countries with the highest emissions, as determined by survey responses. These countries contributed the most to the overall emissions, highlighting regional concentration in long-distance travel. From the picture, a South-Asian country, Bangladesh, is seen alongside Finland, which are the top two countries emitting carbon, according to international students. This means that over the last year, a significant number of Bangladeshi students have come to LUT University in Finland, resulting in a substantial increase in carbon emissions. Finland is on the list because a significant number of people left Finland in 2024 to visit their families or for personal reasons, thus putting Finland in the second spot.

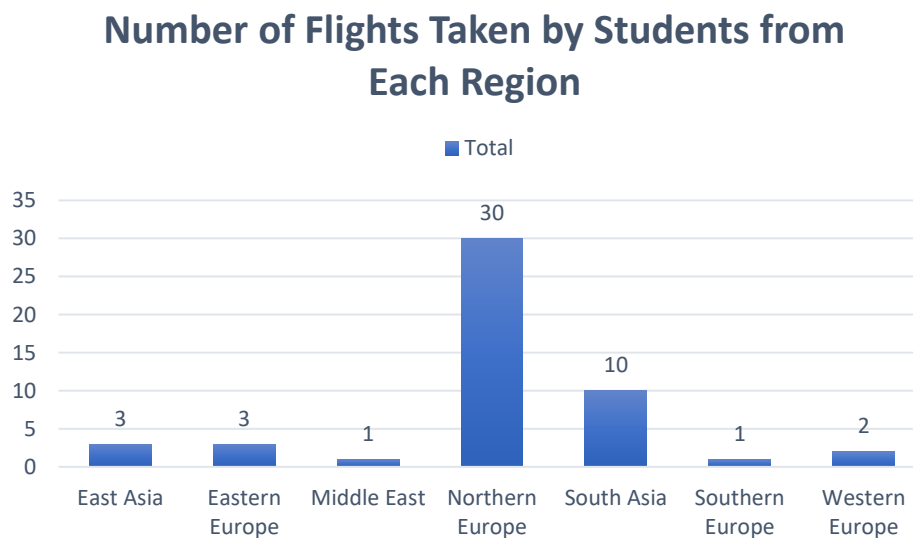


Figure 7: Flight Frequency by Region

Figure 7 portrays the frequency of air travel reported by students from each global region based on survey data. Northern Europe shows the highest travel frequency, followed by South Asia. The values represent the number of individual flight events. Therefore, it is understood that international students from European countries are more likely to travel during their stay in Finland while studying at LUT University. On the other hand, South

Asian countries such as Bangladesh, India, Pakistan, Nepal, and Sri Lanka have fewer departure points. However, due to the long-haul flights, carbon emissions are significant.

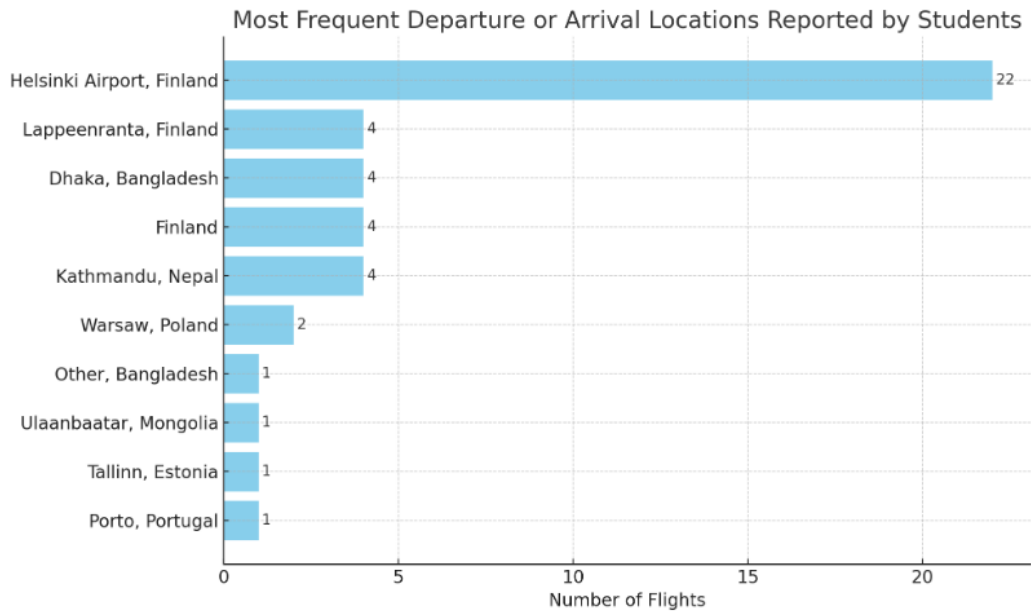


Figure 8: Top Reported Travel Locations by International Students

Figure 8 presents the most frequently mentioned departure or arrival locations based on the student survey responses. Helsinki Airport, Finland, appears most frequently, indicating its role as the primary gateway for international students arriving in or departing from Finland. Other notable locations include Lappeenranta (due to its proximity to LUT University), Dhaka, and Kathmandu, reflecting the high participation from South Asian students. Additionally, it makes sense that Helsinki Airport tops the list, as it is the primary point of international arrivals and departures. However, the fourth option, 'Finland', was created because some respondents did not mention the airport. Instead, they mentioned the country.

Main Purpose of International Student Air Travel in 2024

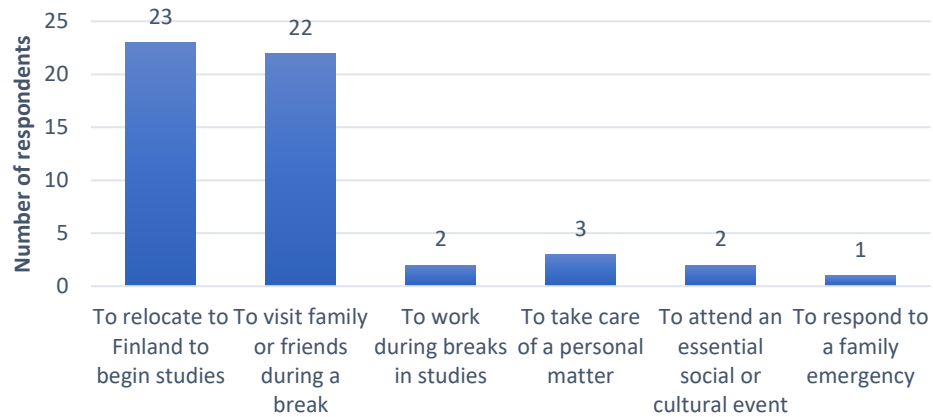


Figure 9: Purposes of the International Students' Air Travel in 2024

Figure 9 entails the distribution of reasons why international students studying at LUT University travelled by air in 2024. The two most common reasons were relocating to Finland to begin studies and to visit family or friends during study breaks. Other reasons included work, personal matters, social and cultural events, and emergencies that required students to travel back to their country of origin.

Percentages of Direct and Indirect Flights

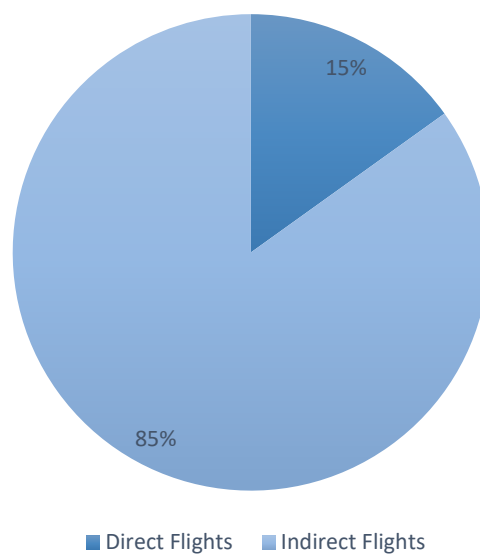


Figure 10: Percentages of Direct and Indirect Flights

Figure 10 depicts the responses received from the respondents. According to the responses received, 45 respondents (84.9%) chose indirect flights, while only eight respondents (15.1%) took direct flights. The preference for indirect flights over direct flights is evident. However, respondents' preferences for choosing indirect flights were due to the unavailability of direct flights to Helsinki-Vantaa Airport in Finland.

5 Discussion

This section provides insight into how the research questions have been addressed, identifies the research limitations, offers recommendations, and outlines potential directions for future research. Lastly, a conclusion was drawn.

5.1 Addressing the Research Questions

The first research question seeks a methodology that can measure the carbon footprint associated with international students' air travel, categorized by specific parameters. Through this research, it is key to formulate a thorough questionnaire, which plays a significant role in measuring the CF. The detailed questionnaire requires detailed responses, and the calculation methods have been pivotal in this regard. Additionally, the literature review reveals that the university should collect data from students to measure their carbon footprint on a regular and accurate basis. Therefore, the data collection from the respondents is the cornerstone of the research, and it is critical to ask relevant and valid questions. The categorical questions, such as the students' trip history, knowledge, and intent regarding the choice of green transportation, have been asked. It will enable the university to calculate travel emissions using Microsoft Excel and the ICAO calculator and then take the necessary steps to address the carbon footprint.

To answer the second research question, which was the amount of carbon footprint generated by the international students, a total of 53 responses were recorded. Of those 53 responses, a few respondents mentioned that they had visited a place (for instance, their home country to spend their leisure time or some other countries) and used the same itinerary. On another note, a few respondents have mentioned that they have visited somewhere else at different times in 2024. Therefore, the emission is not the same for all. It can be understood from the following points-

1. For example, according to the calculated dataset, if someone travels from Dhaka International Airport, Bangladesh, to Helsinki-Vantaa Airport, Finland, using Qatar Airways (with one layover in Qatar), then the total emission of this itinerary is 568

kg CO₂e. However, if someone takes Turkish Airlines, the emissions will be different. The use of different flight operators can impact the carbon emissions generated by international students. Additionally, the number will also differ if someone adds another trip to any other place using air travel. The total emission of the 53 respondents can be estimated at 17,790 kg CO₂e for covering a total distance of 259,920 km in 2024. At least 53 respondents took one flight (including direct and indirect flights) to come to Finland in 2024.

2. Out of these 53 respondents, 23 had multiple trips. For example, someone relocates to Finland and then returns to their home country to visit family, work during breaks, or attend to personal matters. Therefore, for the 23 respondents, the total emissions for the second trip can be calculated to be 5793 kg CO₂e for covering 86,806 km in 2024.

Therefore, in this research, total carbon emissions can be recorded as the sum of the two findings, which is 23,583 (17,990 + 5,593) kg CO₂e. In summary, 53 respondents took a total of 76 trips.

Lastly, the final research question seeks solutions to address the climate impacts of universities. To address the last research question, a study by Heller et al. (2022) found that students who completed the degree program online, remaining in their respective countries, helped save 969,457 kg of CO₂. In this research, it was found that 53 respondents took 76 trips in 2024, covering a total distance of 346,726 km, and carbon emissions were recorded at 23,583 kg CO₂e. By comparing the results of Heller et al. (2022), it can be argued that the carbon emissions would be low if international students studied online. Therefore, to take meaningful actions, the universities must acknowledge the Scope 3 emissions. When they acknowledge the Scope 3 emissions, it is imperative to incorporate the air travel emissions data from the international students. Hence, it is high time that the universities should form a set of guidelines to manage the situation effectively and efficiently.

5.2 Limitations

Data collection appeared insignificant, as almost 40% of students (out of 84 responses, only 53 students could respond to all questions) reported not traveling in 2024. So, a broader

timeline might attract more students. However, the data collection method was highly dependent on the responses of international students. Thus, the research does not present a holistic view of the situation. More responses could be used to further the cause. Hence, the lack of time for study has been intense. This study would require a few more weeks to get more responses. Moreover, attracting students to respond to online surveys is not easy, as this study included a comprehensive questionnaire. Hence, offering the students gift cards might allow them to become more responsive. However, the researcher has budget constraints to offer them any. On another note, gathering data on the Autumn semester would have been fruitful since international students will be returning home after vacation or arriving at the university for the first time. In terms of past literature, unfortunately, the absence of a relevant literature review posed a significant challenge to addressing the topic. However, germane topics have been found to generate ground ideas on the topic.

5.3 Recommendations

First and foremost, the universities should have a clear guide for recruiting international students. For instance, when international students arrive on campus, they should be given a set of questionnaires to fill out with all the necessary details regarding their air travel. The data collection should not stop right there. The university must monitor the air travel of students who are valid and possess a legal status with a 'student residence permit'. Therefore, sending out a questionnaire each year to the students' university email may be introduced, so that the estimate of the emissions will be closer to reality. Once the data is collected, the university should attempt to calculate the carbon emissions and react accordingly. To be more student-friendly and environmentally responsible, universities may consider establishing regional campuses in various countries. Additionally, online programs should be available to international students, and it should be made easy for them to study remotely. The universities may go in partnership with prominent airlines such as Qatar Airlines, Finn Air, Turkish Airlines, and Emirates to get 'low-fare rates' for international students to choose direct flights as part of a sustainability plan. The airlines may incur costs, but they can be regarded as an investment in Corporate Social Responsibility (CSR), for which they spend millions of euros. Exchange students should be able to choose online programs, which can help reduce a significant amount of carbon emissions. In terms of students' level, they can

take direct flights, if available, to their home countries to reduce carbon emissions. If possible, avoid taking flights and encourage students to use the bus or other low-emission vehicles as a means of transportation.

At the government level, a strict policy should be introduced to require universities to report their emissions. The emissions related to international students' air travel are significant and must be reported rigorously, as the number of international students continues to increase daily.

5.4 Future Research

Targeting bachelor's degree international students merely does not depict the overall scenario of a university. Instead, PhD candidates should also be included, as they often need to travel to different countries for conferences and other academic events. To address this, a longitudinal study will help to discover pertinent information, and the changes can also be observed. However, this research focused solely on air travel. However, the carbon emissions generated by the international students while residing in Finland have not been studied. Carbon emissions may include their use of vehicles and living standards (whether they use sustainable electricity sources). Therefore, it is possible to calculate the carbon footprint efficiently and more accurately.

Future researchers can gather data from the universities. However, universities may not have a comprehensive dataset. Nevertheless, basic data, such as the number of international students enrolled in a semester or a year, the countries from which the students come, and the degrees in which international students are enrolled, can be collected from universities. In addition, the education statistics from government websites may also prove to be a handy data mine to have an idea.

In brief, this research has the potential to provide an overview of the carbon emissions generated by international students in Finland as a whole. With sufficient time and resources, a substantial number of responses can be gathered (for instance, 10,000 complete responses) from major or large universities with high acceptance rates.

5.5 Conclusions

This research paper examines the carbon footprint cases among international students of LUT University, which occurred during their air travel in 2024. Upon acquiring 53 responses from international students, the study quantifies the cost of the students' relocation, family visits, and other categories.

The emissions resulting from air travel varied since the students came from different parts of the world. Additionally, as the population and demographics of the students change, carbon emissions do not remain static every year. Therefore, to address this situation, universities need to have accurate data on international students upon their arrival on campus. However, South Asian and North European countries had been the top producers of CF by international students. Students from South Asian countries often have long flights, which frequently require them to take connecting flights, thereby generating additional carbon emissions. However, even though the travel is short inside Europe, the number of students is significant. Hence, carbon emissions are also higher in this region.

This research presents the calculations of individual emissions for international students based on their country of origin, layover, destination, and number of flights. Based on the calculations, a more pragmatic and accurate estimate of carbon emissions has been made — a key component that universities may overlook in their corporate footprint (CF) reporting. Since universities around the world have begun taking responsibility for greening their operations, acknowledging Scope three emissions would help them take the necessary steps to further their environmental sustainability.

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Appendix 1. Questionnaire

International Student Travel Survey

1. Survey Introduction

Dear Participant,

Thank you for taking the time to participate in this survey, which is part of the a Bachelor's thesis project within the department of Sustainability Science. The thesis aims to estimate the GHG emission that came from international student air travel in 2024 to and from LUT University. At the same time, we wish to estimate the average number of trips students are making on an annual basis, so please give responses to some questions even if you did not travel by air in 2024.

Your responses are essential to understand a broader GHG footprint of the LUT University community and formulate what kinds of actions we may collectively be willing or able to make to mitigate Climate Change.

The information collected will be used solely for research purposes, and all responses will remain anonymous.

Instructions:

In this survey, you will be asked a series of questions related to different aspects of air travel in 2024. There will be several places to make additional comments if your unique situation is not fully covered by the questions asked. Feel free to provide any additional context necessary to understand your answer.

Your participation is greatly appreciated and will contribute to valuable insights.

Confidentiality

All information collected in the study will be handled with strict confidentiality. Participants' identities will not be disclosed in any reports, nor they will be asked. Your individual responses will not, under any circumstances, be disclosed to your employer, supervisor, peers, or colleagues. The collective information reported based on this study will be presented at the programme, school or country levels (e.g., average of responses) and may be used in the production of a

Bachelor's Thesis and possibly a manuscript for publication in a scientific journal. Data may also be used in public presentations, such as lectures.

Informed Consent

Informed consent is a core principle of research ethics, based on the assumption that participants take part voluntarily, understanding the purpose of the study and their role as participants. Before the study begins, participants are asked to read the project introduction. The study complies with GDPR.

If you have any questions about the research project or your participation, please feel free to contact Michael.Child@lut.fi.

Thank you for your time!

Sincerely,

Michael Child

I have read the Privacy notice above and agree to these terms

- Yes
 No

2. I consent to my responses being used as part of this research.

- Yes
 No

3. Please select your country of residence at the time you made your application to become a student at LUT University.

- Afghanistan
 Albania
 Algeria
 Andorra
 Angola
 Antigua and Barbuda

- Argentina
- Armenia
- Austria
- Azerbaijan
- Bahrain
- Bangladesh
- Barbados
- Belarus
- Belgium
- Belize
- Benin
- Bhutan
- Bolivia
- Bosnia and Herzegovina
- Botswana
- Brazil
- Brunei
- Bulgaria
- Burkina Faso
- Burundi
- Cabo Verde
- Cambodia
- Cameroon
- Canada
- Central African Republic
- Chad
- Channel Islands
- Chile
- China
- Colombia
- Comoros
- Congo

- Costa Rica
- Côte d'Ivoire
- Croatia
- Cuba
- Cyprus
- Czech Republic
- Denmark
- Djibouti
- Dominica
- Dominican Republic
- DR Congo
- Ecuador
- Egypt
- El Salvador
- Equatorial Guinea
- Eritrea
- Estonia
- Eswatini
- Ethiopia
- Faeroe Islands
- Finland
- France
- French Guiana
- Gabon
- Gambia
- Georgia
- Germany
- Ghana
- Gibraltar
- Greece
- Grenada
- Guatemala

- Guinea
- Guinea-Bissau
- Guyana
- Haiti
- Holy See
- Honduras
- Hong Kong
- Hungary
- Iceland
- India
- Indonesia
- Iran
- Iraq
- Ireland
- Isle of Man
- Israel
- Italy
- Jamaica
- Japan
- Jordan
- Kazakhstan
- Kenya
- Kuwait
- Kyrgyzstan
- Laos
- Latvia
- Lebanon
- Lesotho
- Liberia
- Libya
- Liechtenstein
- Lithuania

- Luxembourg
- Macao
- Madagascar
- Malawi
- Malaysia
- Maldives
- Mali
- Malta
- Mauritania
- Mauritius
- Mayotte
- Mexico
- Moldova
- Monaco
- Mongolia
- Montenegro
- Morocco
- Mozambique
- Myanmar
- Namibia
- Nepal
- Netherlands
- Nicaragua
- Niger
- Nigeria
- North Korea
- North Macedonia
- Norway
- Oman
- Pakistan
- Panama
- Paraguay

- Peru
- Philippines
- Poland
- Portugal
- Qatar
- Réunion
- Romania
- Russia
- Rwanda
- Saint Helena
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- San Marino
- Sao Tome & Principe
- Saudi Arabia
- Senegal
- Serbia
- Seychelles
- Sierra Leone
- Singapore
- Slovakia
- Slovenia
- Somalia
- South Africa
- South Korea
- South Sudan
- Spain
- Sri Lanka
- State of Palestine
- Sudan
- Suriname

- Sweden
- Switzerland
- Syria
- Taiwan
- Tajikistan
- Tanzania
- Thailand
- The Bahamas
- Timor-Leste
- Togo
- Trinidad and Tobago
- Tunisia
- Turkey
- Turkmenistan
- Uganda
- Ukraine
- United Arab Emirates
- United Kingdom
- United States
- Uruguay
- Uzbekistan
- Venezuela
- Vietnam
- Western Sahara
- Yemen
- Zambia
- Zimbabwe

4. Please select the best choice of your country of origin or long-term residence.

- Afghanistan
- Albania

- Algeria
- Andorra
- Angola
- Antigua and Barbuda
- Argentina
- Armenia
- Austria
- Azerbaijan
- Bahrain
- Bangladesh
- Barbados
- Belarus
- Belgium
- Belize
- Benin
- Bhutan
- Bolivia
- Bosnia and Herzegovina
- Botswana
- Brazil
- Brunei
- Bulgaria
- Burkina Faso
- Burundi
- Cabo Verde
- Cambodia
- Cameroon
- Canada
- Central African Republic
- Chad
- Channel Islands
- Chile

- China
- Colombia
- Comoros
- Congo
- Costa Rica
- Côte d'Ivoire
- Croatia
- Cuba
- Cyprus
- Czech Republic
- Denmark
- Djibouti
- Dominica
- Dominican Republic
- DR Congo
- Ecuador
- Egypt
- El Salvador
- Equatorial Guinea
- Eritrea
- Estonia
- Eswatini
- Ethiopia
- Faeroe Islands
- Finland
- France
- French Guiana
- Gabon
- Gambia
- Georgia
- Germany
- Ghana

- Gibraltar
- Greece
- Grenada
- Guatemala
- Guinea
- Guinea-Bissau
- Guyana
- Haiti
- Holy See
- Honduras
- Hong Kong
- Hungary
- Iceland
- India
- Indonesia
- Iran
- Iraq
- Ireland
- Isle of Man
- Israel
- Italy
- Jamaica
- Japan
- Jordan
- Kazakhstan
- Kenya
- Kuwait
- Kyrgyzstan
- Laos
- Latvia
- Lebanon
- Lesotho

- Liberia
- Libya
- Liechtenstein
- Lithuania
- Luxembourg
- Macao
- Madagascar
- Malawi
- Malaysia
- Maldives
- Mali
- Malta
- Mauritania
- Mauritius
- Mayotte
- Mexico
- Moldova
- Monaco
- Mongolia
- Montenegro
- Morocco
- Mozambique
- Myanmar
- Namibia
- Nepal
- Netherlands
- Nicaragua
- Niger
- Nigeria
- North Korea
- North Macedonia
- Norway

- Oman
- Pakistan
- Panama
- Paraguay
- Peru
- Philippines
- Poland
- Portugal
- Qatar
- Réunion
- Romania
- Russia
- Rwanda
- Saint Helena
- Saint Kitts and Nevis
- Saint Lucia
- Saint Vincent and the Grenadines
- San Marino
- Sao Tome & Principe
- Saudi Arabia
- Senegal
- Serbia
- Seychelles
- Sierra Leone
- Singapore
- Slovakia
- Slovenia
- Somalia
- South Africa
- South Korea
- South Sudan
- Spain

- Sri Lanka
- State of Palestine
- Sudan
- Suriname
- Sweden
- Switzerland
- Syria
- Taiwan
- Tajikistan
- Tanzania
- Thailand
- The Bahamas
- Timor-Leste
- Togo
- Trinidad and Tobago
- Tunisia
- Turkey
- Turkmenistan
- Uganda
- Ukraine
- United Arab Emirates
- United Kingdom
- United States
- Uruguay
- Uzbekistan
- Venezuela
- Vietnam
- Western Sahara
- Yemen
- Zambia
- Zimbabwe

5. Feel free to offer any additional comments related to Questions 3 or 4.

6. What is your current School at LUT University?

- LUT Business School
- LUT School of Energy Systems (LES)
- LUT School of Engineering Science (LENS)

7. What is your current programme of study at LBS?

- B.Sc. in Sustainable International Business
- M.Sc. in Business Analytics
- M.Sc. in International Business and Entrepreneurship
- M.Sc. in International Marketing Management
- M.Sc. in Strategic Finance and Analytics
- M.Sc. in Supply Management

8. What is your current programme of study at LES?

- B.Sc. in Electrical Engineering
- B.Sc. in Energy Technology
- B.Sc. in Mechanical Engineering
- B.Sc. in Technology and Engineering Science
- M.Sc. in Supply Management
- M.Sc. in Electrical Engineering
- M.Sc. in Renewable Power-to-X Economy
- M.Sc. in Sustainable Energy Systems
- M.Sc. in Energy Conversion

- M.Sc. in Nuclear Engineering
- M.Sc. in Sustainability Science Solutions
- M.Sc. in Circular Economy
- M.Sc. in Industrial Design Engineering
- M.Sc. in Materials Science and Technology
- M.Sc. in Mechanical Engineering
- M.Sc. in Mechatronics

9. What is your current programme of study at LENS?

- B.Sc. in Computational Science and Artificial Intelligence
- B.Sc. in Industrial Engineering and Management
- B.Sc. in Software and Systems Engineering
- B.Sc. in Social Sciences
- B.Sc. in Communication Sciences
- M.Sc. in Digital Social Science
- M.Sc. in Global Communications and Clean Air, Water and Energy
- M.Sc. in Sociotechnical Systems and Sustainability Transitions
- M.Sc. in Biorefineries
- M.Sc. in Chemical Engineering for Energy Transition
- M.Sc. in Food processing technology
- M.Sc. in Water Technology
- M.Sc. in Sustainable Biomass and Bioproducts Engineering
- M.Sc. in Engineering, Entrepreneurship and Resources
- M.Sc. in Data-Centric Engineering
- M.Sc. in Applied Physics
- M.Sc. in Innovation and Logistics
- M.Sc. in Management of Organizational Development
- M.Sc. in Digital Systems and Service Development
- M.Sc. in Software Engineering and Digital Transformation
- M.Sc. in Software Product Management and Business
- M.Sc. in Software Engineers for Green Deal

Thank you for your answers so far! Now you will report on the trips that you may have taken during 2024.

You will be asked about cities of departures, possible layover stops and final destinations. There will also be the opportunity to mark if there was a return journey that followed the same route. If a return journey followed a different route (e.g. had different layovers), then please enter that as a separate trip. Please report trips that are either a direct or indirect result of your choice to study at LUT University. Do not include trips that are purely recreational or unrelated to your status as an international student.

The main question to consider is whether or not the trip is essential to supporting your role as an international student or maintaining social, economic or cultural relations with a home country. You will be asked the purpose of your trip from the following list:

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

Some trips may be ambiguous in terms of how essential they might be or how they may be related to your status as an international student. Trips related to weddings, funerals and even some aspects of health care, for example, could be seen as either essential or non-essential to different people in different contexts. Please use your own judgement based on this information to decide whether to include a trip or not.

After all trips have been reported, you will then be asked four simple Yes/No style questions.

10. Please confirm that you have travelled by air in 2024.

- Yes, I have.
- No, I have not.

11. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter

- To respond to a family emergency
- To receive health care

12. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

13. Feel free to write any additional comments that would explain the itinerary of this trip.

14. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

15. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation

- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

16. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

17. Feel free to write any additional comments that would explain the itinerary of this trip.

18. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

19. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

20. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

21. Feel free to write any additional comments that would explain the itinerary of this trip.

22. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.

- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

23. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

24. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

25. Feel free to write any additional comments that would explain the itinerary of this trip.

26. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

27. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

28. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

29. Feel free to write any additional comments that would explain the itinerary of this trip.

30. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

31. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

32. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

33. Feel free to write any additional comments that would explain the itinerary of this trip.

34. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

35. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

36. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____
Layover 1 location _____

Layover 2 location _____
Layover 3 location _____
Destination location _____

37. Feel free to write any additional comments that would explain the itinerary of this trip.

38. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

39. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies
- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

40. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the

city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____
Layover 1 location _____
Layover 2 location _____
Layover 3 location _____
Destination location _____

41. Feel free to write any additional comments that would explain the itinerary of this trip.

42. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
 Yes, but I would like to add another trip.
 No, and I have no further trips to add.
 No, but I would like to add another trip.

43. What was the main purpose of your trip?

- To relocate to Finland to begin studies
 To relocate after graduation
 To work during breaks in studies
 To visit family or friends during a break in studies
 To attend an essential social or cultural event
 To take care of a personal matter
 To respond to a family emergency
 To receive health care

44. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____
Layover 1 location _____
Layover 2 location _____
Layover 3 location _____
Destination location _____

45. Feel free to write any additional comments that would explain the itinerary of this trip.

46. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

47. What was the main purpose of your trip?

- To relocate to Finland to begin studies
- To relocate after graduation
- To work during breaks in studies
- To visit family or friends during a break in studies

- To attend an essential social or cultural event
- To take care of a personal matter
- To respond to a family emergency
- To receive health care

48. Provide an itinerary of your air trip. Indicate locations by city, airport name and/or airport code. Provide enough context (country, state, province, etc.) if the city name is used in more than one location (e.g. London, Ontario or London, England)

Departure location _____

Layover 1 location _____

Layover 2 location _____

Layover 3 location _____

Destination location _____

49. Feel free to write any additional comments that would explain the itinerary of this trip. As this will be the final trip that you can enter, you could also use this space to describe more trips if the questions so far have not been enough to report all your air trips.

50. Did you take a return flight that followed this same itinerary?

- Yes, and I have no further trips to add.
- Yes, but I would like to add another trip.
- No, and I have no further trips to add.
- No, but I would like to add another trip.

51. Rank the following in terms of importance (First being most important) to you when booking air travel.

Price	<input type="radio"/> 1
	<input type="radio"/> 2
	<input type="radio"/> 3
	<input type="radio"/> 4
	<input type="radio"/> 5
Direct flight option	<input type="radio"/> 1
	<input type="radio"/> 2
	<input type="radio"/> 3
	<input type="radio"/> 4
	<input type="radio"/> 5
GHG emissions	<input type="radio"/> 1
	<input type="radio"/> 2
	<input type="radio"/> 3
	<input type="radio"/> 4
	<input type="radio"/> 5
Overall convenience	<input type="radio"/> 1
	<input type="radio"/> 2
	<input type="radio"/> 3
	<input type="radio"/> 4
	<input type="radio"/> 5
Environmentally friendly attitude or reputation of the airline	<input type="radio"/> 1
	<input type="radio"/> 2
	<input type="radio"/> 3
	<input type="radio"/> 4
	<input type="radio"/> 5

52. Are you typically aware of and interested in GHG emissions associated with air travel?

- Yes
 No

53. Are you aware that using connecting flights can increase GHG emissions up to 50% more than comparable direct flights?

- Yes
 No

54. Do you feel that you travel by air less frequently due to knowledge related to GHG emissions.

- Yes
 No

55. Your participation in this survey is appreciated very much, and it has made a positive contribution to our university community as well as to science! Feel free to write any additional comments about the survey as a whole.
