

SUST 3502 - Environmental Problem Solving II: The Campus as a Living  
Lab

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**Green Transportation at Dalhousie's  
Studley Campus:**  
Exploring Sustainable Transportation  
Usage and Access Improvement  
Opportunities

Dalhousie University  
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# Executive Summary

Dalhousie University faces problems with traffic congestion and limited parking, resulting from over 50% of commuters in HRM (Price et al., 2021) and over 33% of Dalhousie students (Walker et al., 2020) using cars or motorcycles as their primary mode of transit. Sustainable transit, such as public transportation, cycling, and walking, can significantly aid HRM, specifically Dalhousie, in reducing greenhouse gas emissions by 55% by 2030 and reaching net zero by 2050, as outlined in Dalhousie's Climate Action Plan (Dalhousie, 2020). This research aims to identify barriers to using sustainable transportation options and potential solutions, explore attitudes and perceptions towards sustainable transportation among the campus community, understand current usage of green transportation options among undergrads at Studley Campus, and develop strategies for improving access to and promoting the use of sustainable transportation at Studley Campus.

An online survey was conducted to gather information from full-time Dalhousie undergraduate students at the Studley Campus, which collected opinionated and statistical answers. The survey data was organized in an Excel spreadsheet to calculate the percentage of individuals who agreed with each statement and to provide insights into undergraduate students' attitudes, behaviours, and preferences towards green transport on the Studley campus. While some undergraduate students use sustainable transportation options, barriers prevent more students from utilizing them.

The survey results indicate significant improvements to green transportation methods within HRM are needed. Specifically, bike lane infrastructure needs significant improvement regarding safety and effectiveness, and transit service in and around the Dalhousie campuses needs improvement with more frequent, faster, and connected routes. Additionally, the survey results indicate that the majority of participants feel that Dalhousie University should have a more prominent role in promoting greener transportation in HRM.

In conclusion, this research emphasizes the need for Dalhousie University to promote green transportation and for the HRM to make significant changes to the current transit infrastructure. Recommendations from this research can help the university improve access to sustainable transit options and aid in reducing carbon emissions while promoting a more sustainable community.

# Introduction

Transportation is a vital component of modern societies but is also a significant contributor to environmental degradation and climate change. As such, there has been a growing interest in promoting sustainable transportation, which refers to using modes of transportation that have a lower environmental impact and are more socially equitable. Universities are critical for promoting sustainable transportation as they have large campus populations and can serve as models for other organizations and communities. This research project is focused on our research question: How are Full-time Dalhousie Undergraduate Students currently using green transportation on Studley Campus, and how can the university better provide access to it?

Dalhousie University is located in Halifax, Nova Scotia, and faces several transportation-related challenges, including traffic congestion, limited parking, and environmental concerns resulting from 50% of commuters in HRM (Price et al., 2021) and over 33% of Dalhousie students (Walker et al., 2020) using cars or motorcycles as their primary mode of transit. The university has set ambitious sustainability goals, including reducing greenhouse gas emissions by 55% by 2030 and achieving net-zero emissions by 2050 (Dalhousie, 2020). Sustainable transportation options, such as public transit, cycling, and walking, are critical to achieving these goals. In addition, green transportation options have significant economic and social benefits, including reducing transportation costs, promoting physical activity, and providing equitable transportation options for disadvantaged populations.

The primary objective of this research project is to identify the barriers and opportunities for sustainable transportation usage and access improvement at Dalhousie's Studley Campus. The project will accomplish this objective through a comprehensive analysis of the green transportation options currently available on campus, a survey of full-time Dalhousie undergraduate students to assess attitudes toward sustainable transportation, and the development of strategies to improve the accessibility and promotion of green transportation options.

This dissertation presents the research project's findings, including analyzing the green transportation options available at Studley Campus, assessing student attitudes towards sustainable transportation, and identifying opportunities for improving sustainable transportation usage and access. The research concluded with recommendations for

implementing the strategies developed in this research project to promote sustainable transportation usage and access at Dalhousie's Studley Campus.

## **Rational**

Sustainable transportation is critical in achieving environmental sustainability and reducing carbon emissions. As such, there is a growing interest in promoting sustainable transit in universities with large campus populations that can serve as models for other organizations and communities. The present study focuses on sustainable transportation options at Dalhousie University's Studley Campus and seeks to identify barriers and opportunities for improving sustainable transportation usage and access.

Firstly, identifying the barriers to sustainable transportation usage is essential in improving access and promoting usage among the campus community. Several factors may deter students from using sustainable transportation, such as a lack of infrastructure, perceived inconvenience, and safety concerns. By identifying these barriers, the university can develop strategies to address them and improve the accessibility and promotion of sustainable transportation options on campus.

Secondly, assessing student attitudes toward sustainable transportation is crucial in understanding the factors influencing their choices. This study will survey full-time Dalhousie undergraduate students to determine their perceptions of sustainable transportation options and explore opportunities to promote their usage. Understanding the attitudes and perceptions of students towards sustainable transportation options can inform the development of effective strategies to encourage their use and increase accessibility.

Lastly, developing strategies to improve accessibility and promote sustainable transportation options is crucial in achieving the university's sustainability goals. Sustainable transportation options such as public transit, cycling, and walking have significant economic and social benefits, including reducing transportation costs and providing equitable transportation options for disadvantaged populations. Sustainable transit also promotes physical activity leading to improved cardiovascular health, reduced risk of obesity, and improved mental health. (Boone-Heinonen et al., 2009). By developing strategies to improve the accessibility and promotion of sustainable transportation options, the university can contribute to achieving its sustainability goals while also promoting the well-being of the campus community.

## Methodology

The data collection method used in this research project was an online survey created. The survey was designed to gather information on undergraduate student attitudes towards sustainable transportation options at Dalhousie Studley campus and their perceptions of the barriers and opportunities for improving sustainable transportation usage and access.

## Recruitment

The study's target population was full-time Dalhousie undergraduate students who attended classes at the Studley Campus. Participants were recruited through social media posts, several Dalhousie professors' posts on the University's online course management system and links posted to our classes' online discussion board. The online survey contained a brief explanation of the study's purpose and objectives. The sample size was determined based on the minimum sample size calculation using a confidence level of 95% and a margin of error of 5%, which yielded a minimum sample size of 370 students.

## Survey Methods

Data were collected using an online survey that was designed to assess student attitudes toward sustainable transportation options and identify barriers to their use. The survey was administered using the Google Form online survey platform. The survey was open for a period of two weeks, and participants were allowed to complete the survey at their convenience. The survey consisted of 15 questions including open-ended and close-ended questions and was estimated to take approximately 10 minutes to complete.

The survey questions were designed to gather information on several key areas related to sustainable transportation, including:

- Demographics (the participants are undergraduate students or not)
- Current mode of transportation to and from campus
- Barriers to using sustainable transportation options
- Attitudes toward sustainable transportation options
- Suggestions for improving sustainable transportation options on campus

## Data Analysis

The quantitative data collected through the online survey were analyzed using descriptive statistics, including means, frequency distributions, and percentages. The responses to open-ended questions were analyzed using content analysis. The results were presented in tables and charts, and themes were identified for open-ended responses.

## Ethical Considerations

The research team obtained ethical approval from the Dalhousie University Research Ethics Board. The survey included an informed consent form explaining the study's purpose, voluntary participation, and confidentiality of participants' responses. The survey collected no identifiable information, and all responses were kept confidential.

## Limitations

Firstly, the survey was limited to full-time Dalhousie undergraduate students, and thus the findings may not be generalizable to other groups on campus. Secondly, our survey responses were low, and the sample size may not be representative of all undergraduate students, which was the case for our study.

## Results

Our survey consisted of 15 questions which identified which campuses participants frequented most, which method of transportation they primarily and secondarily used to commute to and from their campus, as well as their opinions on current bike lane infrastructure and green transportation method accessibility. Out of the 15 questions, there were seven that provided data regarding the current state of green transportation in and around our Dalhousie campuses as well as identifying areas of improvement.

The pie chart in Figure 1 shows the response distribution of question nine from our survey, which asked participants how they viewed transit service and accessibility to and from the Dalhousie campuses. The results indicated that the majority, 67.2%, of respondents said that service and accessibility was satisfactory. However, it is important to highlight that nearly a quarter, 23.4%, of respondents noted that it needs improvement. The following question, question 10, asked respondents who indicated that transit service and accessibility needs improvement to write a written response on what they believe needs improvement.

There were 10 responses to this question, all with the same theme of there needing to be more frequent and faster transit routes surrounding the Dalhousie campuses.

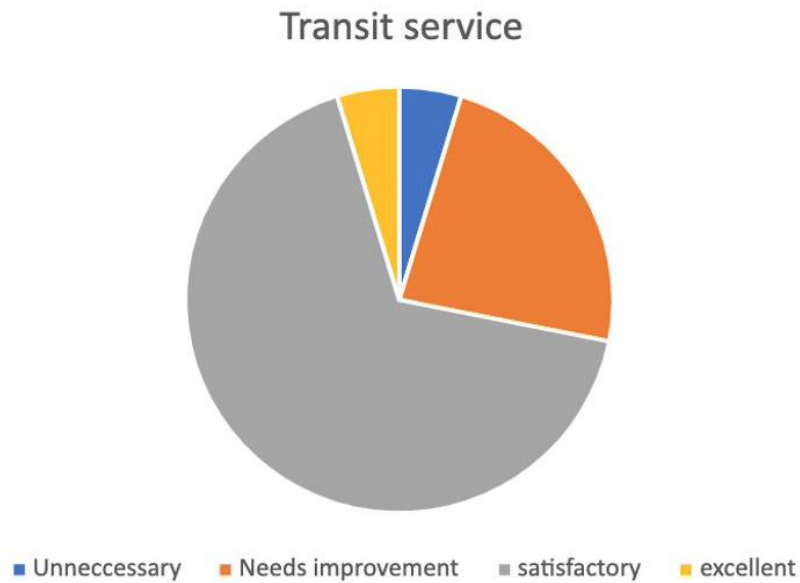


Figure 1. Question 9: “How do you view transit service and accessibility to and from Dalhousie campuses?” With response options being: unnecessary (4.7%), needs improvement (23.4%), satisfactory (67.2%), and excellent (4.7%).

Below, Figure 2 represents the data collected in question 9 of our survey which asked participants how they view bike lane infrastructure in and around HRM given the options of unnecessary, needs improvement, satisfactory, and excellent. 48.4% of responses indicated that bike lane infrastructure is satisfactory, while 40.6% indicated it needs improvement. Similar to the question regarding transit accessibility and service, we asked those who stated bike lane infrastructure needs improvement to give a written response as to what they believe needs improvement. There were 20 written responses with three main themes regarding improvements in the number of bike lanes, the safety of bike lanes, and increased signage for both motorists and cyclists.



### Bike Lane Infrastructure

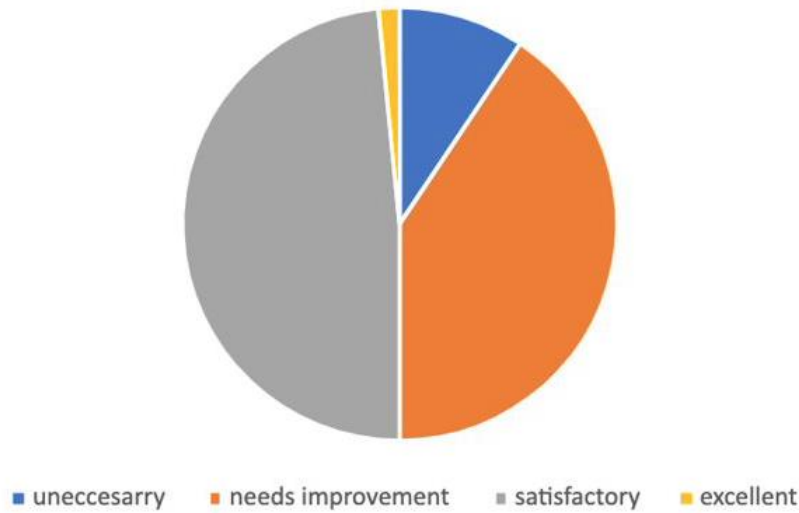


Figure 2. Question 11 from the survey asked, “How do you feel about bike lane infrastructure in HRM?” Response options were: unnecessary (9.4%), needs improvement (40.6%), satisfactory (48.4%), and excellent (1.6%).

Figure 3 illustrates the responses given when participants were asked what their primary method of transportation to and from the Dalhousie campus was. The survey presented the following options: internal combustion engine vehicle (ICE), hybrid electric vehicle (HEV), electric vehicle (EV), bike, walking, public transit, carpool, and taxi services.. From the histogram we can see that the majority of students, 26, chose walking as their primary method of transportation. Keeping in mind, ICE vehicles and public transit followed close behind at 15 and 14 individuals respectively.

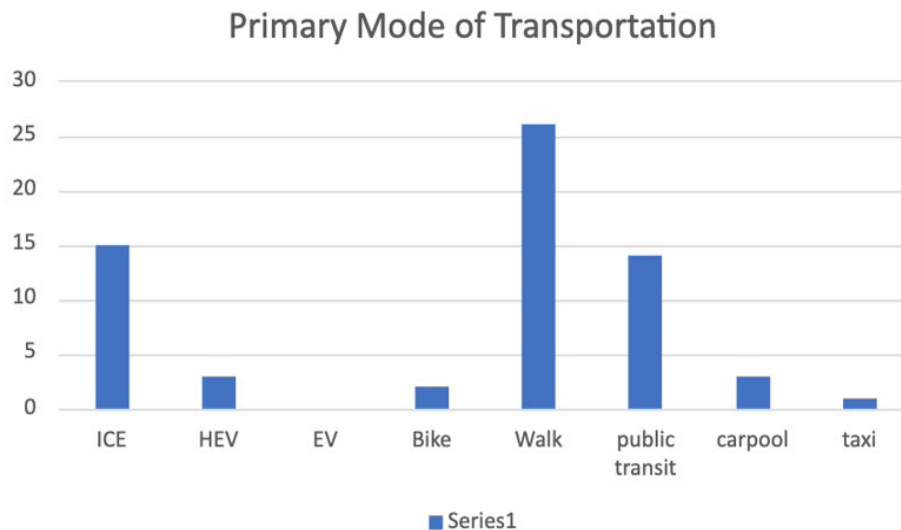


Figure 3. Question 5 from the survey asked, “What is your primary method of transportation to and from the Dalhousie campus?” Response options were: internal combustion engine vehicle (15), hybrid electric vehicle (3), electric vehicle (0), bike (2), walking (26), public transit (14), carpool (3), taxi (1).

Figure 4 below shows the responses given from survey question 7 when asked to identify their secondary method of transportation to and from the Dalhousie campus given the response options of internal combustion engine vehicle (ICE), hybrid electric vehicle (HEV), electric vehicle (EV), bike, walking, public transit, carpool, and taxi. The most frequently used secondary methods of transportation were similar to that of the primary methods, except public transit took the top place at 22 responses, walking at 12, and ICE vehicles at 10. It is also important to note that although it is great to see two greener methods of transportation being the top choice, these are the secondary methods of transportation and are only used when the primary method is unavailable and therefore, usage occurs less frequently.

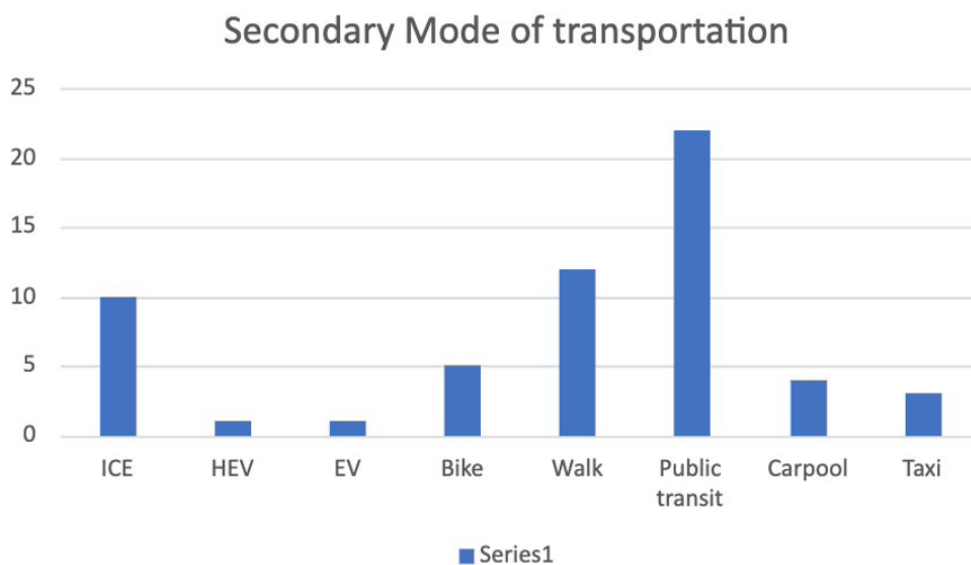


Figure 4. Question 7 from the survey asked, “What is your secondary method of transportation to and from the Dalhousie campus?” Response options given were: internal combustion engine vehicle (10), hybrid electric vehicle (1), electric vehicle (1), bike (5), walking (12), public transport (22), carpool (4), taxi (3).

The below figure shows the responses to questions 13, 14, and 15 of our survey. Question 13 asked participants if they feel as if Dalhousie University should play a bigger role when it comes to promoting green methods of transportation within the HRM, given the options of yes, no, or prefer not to say. 90.6% of respondents indicated that they think the university should play a bigger role as the university is highly influential in the community. Question 14 asked participants to indicate their level of agreement with the following statement: "HRM provides adequate accessibility for more sustainable transportation

practices such as; cycling, public transit, carpool/rideshare, and electric vehicles," given the choices of strongly disagree, disagree, neutral, agree, or strongly agree. The majority of participants, 37.5%, indicated that they were neutral to the statement. However, 29.7% indicated that they disagree with this statement, meaning that there are areas of improvement that need to be explored regarding the accessibility of sustainable transportation methods within the HRM. Question 15 asked the participants if, after completing this survey, they would consider using greener methods of transportation, given the options of yes, no, or prefer not to say. The majority, 78.1% of respondents, indicated that they would, showing promise for improvement regarding the increase in usage of greener transportation.

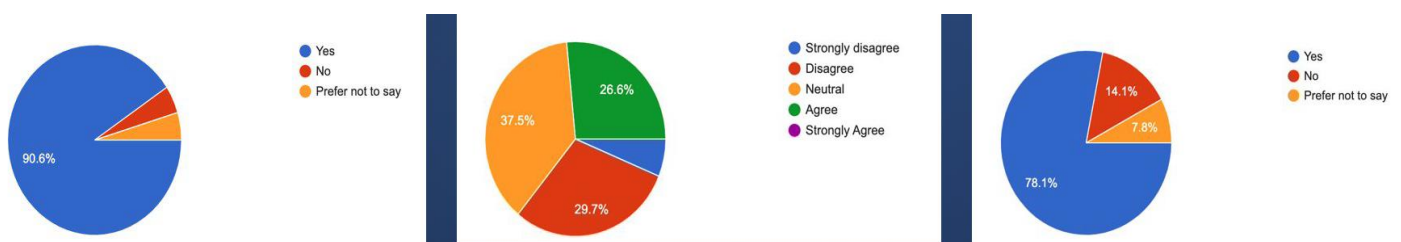


Figure 5. Questions 13, 14, and 15 from the survey which asked participants if they feel as if Dalhousie University should have a bigger role in promoting green transportation in HRM, to identify their level of agreement with the following statement: "HRM provides adequate accessibility for more sustainable transportation practices such as; cycling, public transit, carpool/rideshare, and electric vehicles", and if after completing this survey would participants consider using greener methods of transportation.

## Discussion

The objectives we established for our research project focused on identifying key areas of improvement for the transportation methods surrounding Dalhousie's Studley Campus. This prompted the preparation of our research question:

*How are the full-time Dalhousie Undergraduate student body currently using green transportation on Studley Campus, and how can the university better provide access to this transportation?*

Creating a better understanding of the current use of green transportation among undergraduate students became a priority during our research while creating strategies to improve access and promote the use of sustainable transportation for the Studley Campus. Another central factor of our research focused on reducing the carbon footprint of transportation on campus to contribute to the university's sustainability goals. The collection of qualitative data allowed us to explore the opinions, attitudes, and perceptions of Dalhousie

students in regard to transportation, while the quantitative data reflected the priority areas of improvement indicated by the participants of the survey. Distinguishing the barriers that inhibited the transportation methods from reaching their full potential became a focal point, such as a lack of infrastructure or perceived inconvenience that prevents more students from using sustainable transportation options. Our hope was not only to identify these barriers but understand the direction that must be initiated to reduce the effect of these barriers on the enjoyment of the campus community.

The results of our research indicate that there are substantial improvements that can be made to our transportation system to encourage the use of green transportation methods near Dalhousie's Studley Campus and the surrounding areas. Additionally, the responses recorded in our survey demonstrate that the promotion of green transportation requires both improvements on campus and in the surrounding community. Our study revealed that the public transit system and bike lane infrastructure are the two main points of focus for improvement to boost the likelihood of our respondents engaging with these means of transportation during their commute. The first important takeaway is that the bike line infrastructure needs substantial improvements concerning safety and effectiveness, which will also encourage more individuals to use bikes as a means of transportation. The second point of focus is that respondents noted that increased efficiency in public transit could encourage more individuals to use this alternate mode of transportation. The responses in our survey were almost unanimous in agreement that the combination of efforts of Dalhousie University and the Halifax Regional Municipality could lead to significant changes in reducing the impact on the environment and improving our collective sustainable habits. Most notably, a key statistic to emerge from the analysis of the quantitative data is that 90.6% of participants said they would consider making greater use of transportation methods if accessibility were to improve. Monitoring this statistic during future iterations of studies surrounding this topic could produce critical results in the case of improving green transportation methods on the Studley Campus.

Categorizing the perceptions of the campus community towards sustainable transportation assisted our efforts in informing potential future initiatives and policies on campus to concentrate on the main areas of concern. There were limitations to our data collection, as we did not achieve the number of respondents that would meet the representative sample size of the Studley Campus. Additionally, there is a potential that the online distribution of our survey may have prevented potential respondents from participating using non-digital data collection methods.

## **Conclusion**

The result of our research project provides a direction for the initiatives that can be taken to improve green transportation methods in the Studley Campus community at Dalhousie University. Our research reflects the opinions of undergraduate students and their perspectives on green transportation, with a unified concentration on bike lane infrastructure and the public transit systems present on the Studley Campus. The project explored full-time Dalhousie undergraduate students' attitudes and perceptions toward sustainable transportation options and identified potential areas of improvement. The study found that while the majority of respondents viewed current transit service and accessibility as satisfactory, significant improvements could be made to the bike lane infrastructure and public transit efficiency. The data also highlighted the need for increased efforts to promote sustainable transportation methods on campus and in the surrounding community. These findings suggest that a combination of Dalhousie University and the Halifax Regional Municipality's efforts could significantly reduce the environmental impact and improve our collective sustainable habits. However, the study also had limitations, such as a smaller sample size and potential bias toward online survey respondents. Overall, our research represents the necessary steps to improve green transportation methods on Dalhousie's Studley Campus, which is a process that will continue to hold great importance in the community.

## References

- Boone-Heinonen, J., Jacobs, D. R., Sidney, S., Sternfeld, B., Lewis, C. E., & Gordon-Larsen, P. (2009). A walk (or cycle) to the Park. *American Journal of Preventive Medicine*, 37(4), 285–292. <https://doi.org/10.1016/j.amepre.2009.06.006>
- Dalhousie University. *Climate Change Operations Plan*. (2020, January 31). Retrieved from <https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/sustainability/resources/publications-and-plans/Climate%20Change%20Plan%20Final.pdf>
- Price, K., Romaneh, L., & Wilmshurst, D. (2021, May 7). *Traveller opinion survey 2019*. Halifax. Retrieved from <https://www.halifax.ca/transportation/transportation-projects/traveller-opinion-survey-2019>
- Walker, K., & Habib, M. A. (2020). *Dalhousie University Commuter Survey 2019-2020*. DalTRAC. Retrieved from <https://www.dal.ca/sites/daltrac/HaliTRAC.html>

## Appendices

Survey:

<https://docs.google.com/forms/d/1b11Zcd1kNLr8foMeoNK8oUWufz5DW4Nv6UvEuTvSzyQ/edit>