# Managing Coffee Cup Waste at Dalhousie University

*ENVS/SUST 3502 Campus as a Living Laboratory*

*Dalhousie University (n.d.). Source: learnandearnabroad.com/list-of-canadian-universities/*

## *Author Details*

Andrew Cavan
Biology and Environmental Science

Kara Koskowich
Biochemistry and Environment, Sustainability, & Society

Stephen Lahaie
Environmental Science and Environment, Sustainability & Society

Jessica Leblanc
Environmental Science

Kaitlyn MacEachern
Environment, Sustainability, & Society and International Development Studies

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# 1.0 Executive Summary

This study was conducted to answer the following research question: Is it feasible to implement a closed-loop system for coffee cup disposal on Dalhousie University's Studley campus? For the purpose of this research, a closed-loop system is considered to be a system in which waste is repurposed into a secondary product for use.

Within Halifax Regional Municipality, paper coffee cups are not recyclable. Due to their popularity and wide use on Dalhousie's Studley campus, an alternative disposal system is needed. Coffee cups contribute to the waste going to landfills and are environmentally damaging. There is currently a closed-loop system for coffee cups in many traditional Tim Hortons restaurants in Nova Scotia that runs by collecting used cups from participating restaurants and transporting them to Scotia Recycling Company. The byproduct is sent to CKF Inc. where it is made into drink trays and later sold back to Tim Hortons. This research aims to determine the feasibility of a similar system being used at Dalhousie University.

The methods used to determine feasibility included quantitative data collection, naturalistic observation, and interviews. Inventory was collected from the Life Sciences Centre (LSC) Tim Hortons in order to accurately determine how many cups are thrown away from that location. Naturalistic observation was used during three sessions of one hour a day, at the Student Union Building (SUB) Tim Hortons, as inventory information could not be acquired from that location. Observation allowed for the amount of coffee cup waste produced from this location to be estimated. A proposed interview to be conducted with CKF would have provided more information on the logistics and cost of a closed-loop system, but was unable to be completed.

The study found that 2,555 cups were distributed weekly at the LSC Tim Hortons. Over the three weekday hours observed at the SUB, a mean of 103 cups were distributed per hour. By estimating that this is the number of cups used per hour from 10 a.m.-4 p.m. daily, the SUB location distributes more disposable cups than the LSC Tim Hortons. During observations at the SUB, it was also found that 99% of people use disposable coffee cups, with only 1% using reusable mugs; this reinforces the idea that there is a need for an alternative waste management system for coffee cups.

The scope of the research was limited to the two Tim Hortons locations on the Studley campus and excluded other coffee vendors. Due to time constraints, it was not possible to look at all of the coffee vendors. Tim Hortons locations were selected because a closed-loop system exists already for their cups. Limitations to the research included limited time and resources, and the inability to complete the proposed interview with CKF inc.

This research showed that a large amount of waste from coffee cups is produced on Dalhousie's Studley campus. This indicates a need for an alternative waste disposal system on campus. However, due to lack of data, further research is needed to determine if the examined version of a closed-loop system is feasible. Further research could examine what secondary products can be made and the associated costs of a closed-loop system. Additional research should also include other potential alternatives to diverting waste from landfills, such as recyclable or compostable coffee cups that would be accepted in the Halifax Regional Municipality waste disposal system.

# 2.0 Introduction

## 2.1 Background and Rationale

Coffee is a widely consumed beverage on Dalhousie campus and is popular with teachers and students alike. The coffee's high caffeine content can be crucial in assisting people through their busy days on campus. At Dalhousie University, it is evident that the majority of hot beverages are being served in disposable cups from the many coffee vendors on the various campuses. Unfortunately, coffee cups are not currently recyclable, as the paper cups distributed by most major coffee businesses are polyethylene lined (Ziada, 2009). This means that the used cups will end up contributing to the large amounts of waste in landfills. By using one disposable coffee cup per day, you are creating 22.75 pounds of waste per year (Deneen, 2005). This is a concern because landfills have a negative environmental impact and can damage ecosystems through pollution of groundwater and surface water (Kjeldsen et al., 2002). Another issue surrounding disposable cups is that not all students are aware that they are not recyclable. Some students are dispose of their used coffee cups into the recycling and green bins – contaminating the entire bin. This is especially a concern at Dalhousie because some vendors advertise their cups as recyclable or compostable, but that is not necessarily true in Halifax Regional Municipality's waste disposal system (Dalhousie University, 2011).

Sustainability is a growing area of interest at Dalhousie University. The university has made the initiative to improve its sustainability in many ways, including improving policy around renewable energy, water conservation, and waste management (Dalhousie University, 2014). There has been great progress in the area of sustainability over the years and we aim to further this improvement. The amount of waste caused by disposable coffee cups alone is an important problem and its reduction would have an impact on Dalhousie's carbon footprint. This project aims to determine if it is possible to divert the current amount of coffee cup waste produced at Dalhousie from local landfills.

The process of recycling paper can be difficult due to the life cycle of its cellulosic fibers (Hubbe, Venditti & Rojas, 2007). The fibers vary as the paper material is recycled multiple times, and different characteristics are created at different stages; paper loses its swelling ability and wet flexibility after being recycled many times, and additives and inks also affect the usefulness of recycled paper (Hubbe et al., 2007). The city's waste management system was integrated by the Ecology Action Centre and has proven to be quite effective in diverting waste (Halifax Regional Municipality, 2014). However, Halifax Regional Municipality does not currently have a recycling program for disposable coffee cups (Halifax Regional Municipality, 2014). Making it evident that an alternative waste disposal of coffee cups is needed. Tim Hortons has been a leader in this domain in Nova Scotia with their "Cup-to-Tray" recycling program. This program entails a closed-loop system where the discarded coffee cups are collected and re-purposed into useful items such as beverage trays (Tim Hortons, 2011). The trays can later be composted after they have been used (Halifax Municipality, 2014).

Tim Hortons has partnered with Scotia Recycling Limited for this endeavor, to collect used coffee cups at Tim Hortons restaurants and deliver them to CKF Inc. in Hantsport, NS (Tim Hortons, 2011). CKF is a long-running company that specializes in producing disposable items, but has recently started an initiative to incorporate more sustainable methods into the business (CKF Inc., 2011). Among other environmental initiatives, CKF has started a closed-loop recovery system (CKF Inc., 2011). This allows other companies to recycle otherwise non-recyclable items by transforming them into other useful items. CKF has since become a leader in converting pulp and polystyrene into other products that can be useful for their customers (CKF Inc., 2011). In the case of Tim Hortons, they are producing drink trays with the recycled materials. Another benefit to CKF is that the company is based out of Hantsport, Nova Scotia – minimizing the transportation costs of materials. With a company such as CKF, there is potential to reduce the amount of coffee cup waste from campus going to landfills. So far, the project seems to be effective in participating Tim Hortons locations (Tim Hortons, 2011), and this research looks at measuring the feasibility of incorporating this practice here at Dalhousie.

There are certainly other methods to reduce the waste caused by disposable coffee cups. Such methods may include replacing polyethylene lined paper cups with biodegradable or compostable coffee cups, or even encouraging students and faculty to use reusable mugs. The integration of biodegradable cups may not be feasible on campus as most coffee retailers are franchises, meaning that such changes would likely require changes within the entire company. Forcing or encouraging consumers to switch to reusable mugs may not be effective purely for the sake of convenience. This would entail declining the distribution of disposable coffee cups, and therefore requiring the mandatory use of reusable mugs by the customer. This is unlikely to be implemented because franchises on campus would lose too much business to students not having such mugs.

## 2.2 Project Definition

There is growing concern surrounding the waste produced by paper coffee cups on campus and the large impact it has on landfills. As such, this research was done to answer the following question: Is it feasible to implement a closed-loop system for coffee cup disposal on Dalhousie University's Studley campus?

A closed-loop system would allow for diversion of coffee cup waste from Dalhousie University. In this study, a closed-loop system is defined as a repurposing of coffee cups into another product for use. Although a closed-loop system normally indicates repurposing into the same product (for example coffee cups into new coffee cups), this study considers the term in a way similar to the Tim Hortons Corporation system in place.

The first research objective was to determine approximately how much waste disposable coffee cups produce on campus. The two Tim Hortons locations on Dalhousie University's Studley campus were used to help determine if there was a large enough volume of cups for a closed-loop system to be beneficial. The second research objective was to collect information about the logistics of the closed loop system in order to identify obstacles to its implementation on campus. A closed-loop system for disposable coffee cups that are currently being distributed and disposed of on campus would allow for repurposing of cups into a secondary product for use rather than the waste accumulating in landfills and contributing to the area's pollution. This research looked to determine the magnitude of coffee cup waste produced on Dalhousie Campus and collect information on logistics and costs of implementing a closed-loop system. The results produced are aimed to generate interest for further research in order to determine if a closed-loop system for diverting waste is feasible.

# 3.0 Methods

The hypothesis for the research study is: A closed-loop system is a feasible alternate waste disposal system for the large amount of coffee cups that are distributed from Tim Hortons and disposed of on Dalhousie's Studley campus. The research methods are designed to contribute to assessing the feasibility of a closed loop system for coffee cups on Dalhousie's Studley campus.

## 3.1 Quantitative Data Collection

The first research method used was quantitative data collection. Quantitative data collection was selected because it is a precise way of collecting numerical data, is useful for studying large groups of people, and the results are independent of the researcher (Strengths and Weaknesses of Quantitative Research, n.d.). Collecting inventory from the LSC Tim Hortons allowed for an accurate measurement of weekly coffee cup distribution to provide a good

indication of waste produced from this location on Studley Campus. This information was important to this study because in order to determine feasibility of an alternative waste management system for coffee cups on Studley campus, it was necessary to establish whether or not there is a significant amount of coffee cup waste generated on campus that will later be sent to landfills. It was assumed that the data obtained from the week of March 10th-14th, 2014 was representative of any week during the winter semester. Data was gathered on the weekly sales from the Tim Hortons located in the LSC. This gives a fairly accurate representation of the number of coffee cups distributed weekly from this location.

## *3.2 Naturalistic Observation*

In order to obtain a more comprehensive view of the Studley Campus, the research aimed to obtain inventory from the other Tim Hortons location in the Student Union Building (SUB). However, this information was not attainable from the Tim Hortons in the SUB. Inventory information from both locations would have given a comprehensive view of coffee cup distribution to locate where most coffee cups are sold, and helped determine whether a closed-loop system would be beneficial across campus to manage coffee cup waste. Due to this unexpected limitation, a naturalistic observational method was proposed to create an estimation of daily coffee cup sales from the Tim Hortons in the SUB. Naturalistic observation allows the researcher to observe behaviours that occur in a natural setting, with no intervention from the researcher (Prince & Oswald, 2006). This was important in order to observe people buying coffee as they normally would, and not altering their behaviour because they knew they were being observed. The team observed and recorded the number of coffee cups distributed and the number of customers who brought reusable mugs. The observer was not able to determine when two cups were used for one beverage, so each beverage was considered one cup. The observations occurred three times and lasted for one hour. The times and dates were: 11:30 a.m.-12:30 p.m. on March 31st, 2014, 12:30 p.m.-1:30 p.m. on March 31st, 2014, and 2:30 p.m.-3:30 p.m. on March 27th, 2014. The other hours of the day that this Tim Hortons is open, including weekends, were not considered in the study.

## *3.3 Interview*

The third research method to collect data was an interview. It was designed to be a semi-structured approach to the interview process. As described by Kirby, Greaves & Reid (2010), this approach allows information to be gathered about specific questions, but with some variation within the interview process. This was chosen over a questionnaire because we were attempting to gather information from a small number of people with specific knowledge about closed-loop systems. We attempted multiple times to reach out to a representative from the recycling company CKF to interview them about the required procedure for implementing a closed-loop system for a company. This would allow for the

criteria and costs of a closed-loop system to be established, which would aid in determining whether or not it would be feasible for Dalhousie University. However, the interview was unable to be conducted. The questions are included in Appendix A, which may be used as a reference for further research.

## *3.4 Reliability and Validity*

A study is reliable if the same results can be obtained again (Kirby, Greaves, & Reid, 2010). This study was reliable in that the data collected from the SUB Tim Hortons by three researchers using naturalistic observation was fairly consistent over the three trials. However, because the study was done in a short amount of time, results may be dissimilar if the research was done at a different time of the semester. Validity has to do with whether the results accurately represent the phenomenon being studied (Kirby, Greaves, & Reid, 2010). Internal validity is established if the outcome makes sense and if the sequence is correct (Kirby, Greaves, & Reid, 2010). External validity can be established if the results are supported by other research (Kirby, Greaves, & Reid, 2010). This study had limited validity because of the research methods used as well as the limitations to the research. In addition, the naturalistic observation method used has limited validity due to the small sample size, observations done within a week of one another, and there were many educated researchers assumptions made when using this method. The quantitative data collection accounts for only one week, which does not provide a comprehensive look at the entire semester. The study does not have much external validity because there is not a lot of research being done on closed-loop systems for coffee cups on university campuses, and more research is required to determine the study's validity.

## *3.5 Limitations and Delimitations*

The delimitation of this research was to do focus on two different Tim Hortons locations on Dalhousie's Studley campus only because the system has been done before with Tim Hortons cups, and these are popular coffee vendors on campus. Other Studley campus coffee cup franchises and the other Dalhousie campuses were excluded, as the scope of the research would have been too large given the research time frame and resources. Two major limitations presented themselves during the course of the research. Multiple attempts were made to facilitate a semi-structured interview with a representative from CKF, a company that currently participates in closed-loop systems for coffee cups with Tim Hortons in Nova Scotia. The lack of response was a limitation to the study. A second limitation presented itself during the research; the quantitative data collection method could not be completed at the SUB Tim Hortons because the daily inventory sales information was not available. To overcome this limitation, the methodology was altered to include a naturalistic observation of qualitative data producing an estimate of daily coffee cup sales from the SUB Tim Hortons.

# 4.0 Results

## 4.1 Quantitative Data Collection

The quantitative data collected from the LSC Tim Hortons location shows that 2,555 coffee cups are purchased each week (Table 1). Using this total, about 10,222 coffee cups are sold each month at this location. (Raw data is included in Appendix A.)

Table 1: Number of coffee cups sold during the week of March 10th -14th, 2014 at the LSC Tim Hortons on Dalhousie's Studley Campus.

| Cup Size | Number of cups (per week) |
|---|---|
| 8oz | 25 |
| 10oz | 700 |
| 15oz | 1500 |
| 20oz | 240 |
| 24oz | 90 |
| Total | 2555 |

## 4.2 Observation

During the three observational periods at the SUB location, the number of disposable coffee cups and the number of reusable mugs were counted. From 11:30a.m. – 12:30p.m. on March 31st, 111 coffee cups were distributed, while only 3 reusable mugs were used (Table 2). There were 91 coffee cups distributed and 0 reusable mugs used during the hour of 12:30p.m. – 1:30p.m. on March 31st, 2014 (Table 2). From 2:30p.m. – 3:30p.m. on March 27th, 108 coffee cups were distributed and only 1 reusable mug was used (Table 2). This data indicates that a large percentage of people choose to purchase coffee cups rather than use a reusable mug. The mean number of coffee cups distributed during the three observational periods was 103.3 cups, while the mean number of reusable mugs used was 1.3. The percentage of reusable mugs used out of the total number of coffee cups used is shown in Figure 1.

Table 2: Number of coffee cups sold and number of reusable mugs at the SUB location on Dalhousie's Studley Campus during three time periods.

| Time | Number of coffee cups sold | Number of reusable mugs used |
|---|---|---|
| 11:30-12:30 | 111 | 3 |
| 12:30-1:30 | 91 | 0 |
| 2:30-3:30 | 108 | 1 |
| Total | 310 | 4 |

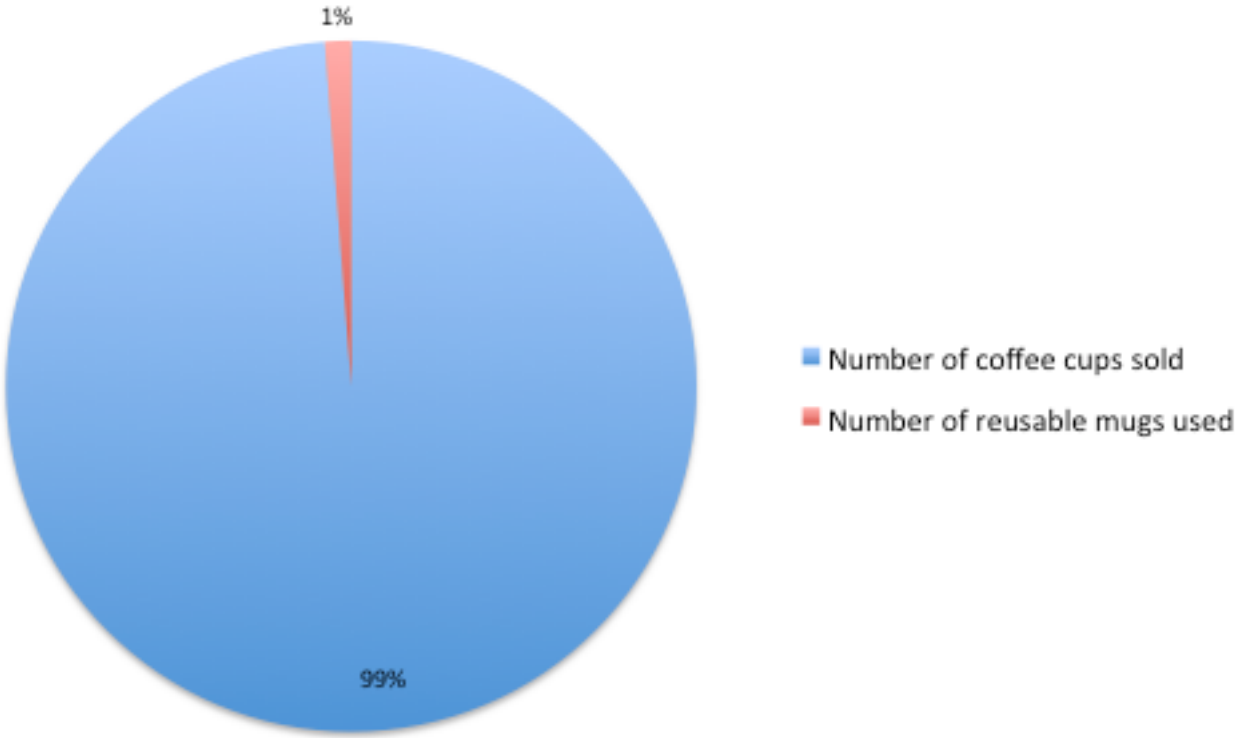


Figure 1: Percent of disposable coffee cups purchased and the number of reusable mugs used at the SUB Tim Hortons.

## 5.0 Discussion

This research aimed to determine the feasibility of implementing a closed-loop system for coffee cups on Dalhousie's Studley campus. Researching the volume of cups used was important to know how much coffee cup waste is being generated. This information was required to determine whether or not there is a need for an alternative waste disposal system such as a closed-loop system based on how much coffee cup waste is produced. It was found that there is a very large amount of waste is produced based on the results that 2,555 cups are distributed weekly at the Tim Hortons in the LSC, and an average of 103 coffee cups are distributed per hour during peak hours at the SUB Tim Hortons. According to the LSC data (Table 1), 15 oz cups are sold the most; although not a research objective for this study, this may be relevant for future studies when it is necessary to determine the amount of paper waste produced. The LSC and SUB locations are comparable, and, according to the results, the SUB location distributes more coffee cups than the LSC. It was also found that over 99% of people use disposable coffee cups, with 1% bringing a reusable mug. The customers bringing reusable mugs give an indication of people who are concerned about their coffee cup waste. It was assumed that the times chosen for observation were representative of any hour during a typical work or school day for the university population, approximately 10am-4pm, and that the sales were consistent every day of the week and over the course of the semester. The findings indicate that a waste management alternative would be beneficial to reduce coffee cup waste going to landfills.

The findings are consistent with the literature of coffee cup usage on campus. In 2011, an estimated 600 coffee cups were used daily in the SUB (Finlayson-Buck, Janega, Maxwell, Verbeek & Weddle, 2011); this is fairly consistent with our data; if 10:00am-4:00pm are considered peak hours, the SUB Tim Hortons would sell over 600 cups just during peak hours, according to the data collected. The very small number of reusable cups being used during the study could have been attributable to the Roll Up the Rim promotion at Tim Hortons during the study period, which has been shown to decrease reusable mug use (Finlayson-Buck, Janega, Maxwell, Verbeek & Weddle, 2011). Our study is consistent with studies at Dalhousie from previous years, indicating that there is a large volume of coffee cup waste going to landfills, which should be reduced, but there is not one obvious solution (Finlayson-Buck, Janega, Maxwell, Verbeek & Weddle, 2011; Fairbairn, Fear, Lyon, Jakubchik-Paloheimo, 2008).

A major limitation to this research was the inability to complete the proposed interview with CKF Inc. – the company that makes Tim Hortons coffee cups into drink trays for other restaurants in Nova Scotia. The interview was unable to occur due to a combination of factors. There was a limited time frame to contact the company after receiving ethics approval and additionally there were likely

conflicting schedules between the researchers and the CKF employees that made getting in contact very difficult. Also, intellectual properties rights issues regarding the logistics of the in place closed-loop system made CKF employees unable to respond right away once in contact, and consequently a very low response rate from the CKF employees. Without having more information on closed-loop systems, such as what coffee cups can be made into and what costs are associated with the system, the feasibility of such a system cannot be assessed. There is not much specific information available online, and an interview would have been useful.

Interviews may also have been ineffective because CKF may not have been the best company to contact with regards to the closed-loop system. Contacting Tim Hortons, for example, could potentially have allowed for more general information on a closed-loop system, if it had been successful. To continue this research in the future, a wider variety of people with knowledge on the closed-loop system should be contacted in order to understand the closed loop system from many points of view, including CKF, Tim Hortons in general, and Tim Hortons franchise owners whose restaurants participate. This may allow for a better range of responses and a better indication of the feasibility of a closed-loop system on Dalhousie's Studley campus.

Dalhousie University produces an abundance of coffee cup waste, and it is recommended that the university contribute to its sustainable initiatives by providing an alternative for coffee cup disposal. That being said, more research is needed in order to determine the feasibility of a closed-loop system, or another waste disposal system, on Dalhousie's Studley campus. To further research the feasibility of a closed-loop system, interviews with CKF, Tim Hortons and/or other companies that have a similar system would be essential. It would also be of interest to get more accurate data from the SUB Tim Hortons. If the system were to be extended to the entire Studley campus, it would be of interest to explore the number of cups used at other coffee vendors, and whether or not the types of cups used at other vendors would be eligible for the closed loop system.

A closed-loop system that repurposes coffee cups into a secondary product for use can be one way to divert coffee cup waste from landfills. Due to limitations of the research, the implementation of a closed-loop system on Dalhousie's Studley campus cannot be recommended immediately, as more information is required regarding costs and logistics of implementing the system.

## 6.0 Conclusion

The research was inconclusive in answering the research question “Is it feasible to implement a closed-loop system for coffee cup disposal on Dalhousie University’s Studley campus?”. However, the research did show that due to the large volume of cups distributed into circulation daily on campus, an alternative waste management system for coffee cup disposal is recommended on Dalhousie’s Studley Campus to reduce waste to landfills. In addition, the example of a closed-loop system has shown to be a good system for diverting coffee cup waste from landfills in other applications. It is recommended that continued action be taken to promote the importance of reusable mugs on campus as well as educating the university community on contamination of recycling and green bins with coffee cups by emphasizing with signage the proper waste disposal practices. Further research is recommended on the feasibility of implementing a closed-loop system for coffee cups on Dalhousie Campus by focusing on the logistical side of closed-loop systems that are in place in Halifax Regional Municipality and Nova Scotia.

## 7.0 Acknowledgements

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## 8.1 Appendix A

Aggregate Data

| LSC Tim Hortons: Cups used March 10th-14th 2014 | |
|---|---|
| Coffee Cup Size | Number of Cups Sold/Used |
| 8oz | 25 |
| 10oz | 700 |
| 15oz | 1500 |
| 20oz | 240 |
| 24oz | 90 |
| Total | 2555 |

In 4 weeks (1 month): (4)(2555)=10,220 cups/month from LSC.

| Number of Coffee Cups Sold at SUB Tim Hortons and Number of Reusable Mugs Used | | |
|---|---|---|
| Time and Date | Number of coffee cups sold | Number of reusable mugs used |
| 11:30am-12:30pm March 31st | 111 | 3 |
| 12:30pm-1:30pm March 31st | 91 | 0 |
| 2:30pm-3:30pm March 27th | 108 | 1 |
| Total | 310 | 4 |

Mean cups sold= (111+91+108)/3 = 103
Mean reusable mugs used= (3+1)/3=1

Assuming 10am-4pm are “peak hours,”
(103cups)(6hours/day)(5 weekdays)= 3090 cups sold/week at SUB Tim Hortons, considering only peak hours

## 8.2 Appendix B

### Interview Questions: CKF

1. Do you currently run any closed loop systems with coffee cups in the Halifax Regional Municipality?

2. What are your criteria for running a recycling program that repurposes used coffee cups?

3. Are there any costs associated with introducing a closed loop system?

4. What are your responsibilities in the closed loop repurposing system?

5. Are there any costs to an organization looking to participate in a closed loop system with you?

6. In order to participate in a closed loop system with you does the participant have to buy back the created products?

7. If not, can the products be redistributed elsewhere?

8. Would it be possible to use multiple and differing coffee cup products in the same closed loop system?

9. If no, is there only one specific type of paper cup your company can work with?

10. If yes, what is makes this product type different from other paper cups?

## *8.3 Appendix C*

Preliminary Proposal

# ENVS/SUST 3502
# Preliminary Proposal and Ethics Review
## Exploring the feasibility of a closed loop system for coffee cup disposal on Dalhousie Campus


### Researchers:
**Andrew Cavan**
**Steven Lahaie**
**Jessica Leblanc**
**Kara Koskowich**
**Kaitlyn MacEachern**

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## Project Definition

The research question to be answered by this study is as follows: Is it feasible to implement a closed loop system for coffee cup disposal on Dalhousie University's Studley campus?

The purpose of this study is to explore the feasibility of implementing a closed loop system for coffee cups on Dalhousie's Studley campus, focusing on coffee vendors, Second Cup and Tim Hortons. For the purpose of this research, a closed loop system will be considered a system that diverts coffee cup waste created by the Dalhousie community and repurposes the cups to create another useful product. The coffee cups that will be considered are paper coffee cups, as these are what other closed loop coffee cup systems in Nova Scotia have used, so closed-loop systems are possible with the material (Tim Hortons, 2011).

Research will include a literature review for background material, followed by content analysis to find out how many disposable coffee cups are distributed to estimate how many are thrown away. Data will also be collected through semi-structured interviews with parties of interest who are knowledgeable on the details of a closed-loop system. The collected data will then be analyzed to figure out the feasibility of implementing a closed loop system on the Studley campus at Dalhousie University. The feasibility describes how easily the closed loop system could be implemented, which will likely include analysis of cost to Dalhousie University and its food vendors, and potential waste diversion; what is included in the final data will depend somewhat on information provided by the individuals interviewed.

Previous studies from Dalhousie students indicate immense waste produced from disposable coffee cups. In 2011, an estimated 600 disposable cups were used daily at the Student Union Building alone (Finlayson-Buck, Janega, Maxwell, Verbeek & Weddle, 2011). Currently, coffee cups on campus are destined for the landfill, as indicated by signs on campus directing people to place them in the garbage can. This is damaging because landfills have a negative environmental effect, including pollution of groundwater and surface water, which can damage ecosystems (Kjeldsen et al., 2002). From an environmental perspective, it is important to try and divert as much waste as possible from landfills to minimize negative effects on the planet, and try to maintain a livable planet for generations to come.

There are two Tim Hortons and two Second Cup locations on Dalhousie's Studley campus, and at least five additional establishments that sell coffee. This shows a large demand for coffee on campus. Although projects in previous years have aimed to increase reusable cup usage on campus, and initiatives are ongoing, many people can still be seen using the paper coffee cups offered at establishments to enjoy their

beverages. This study will explore how to divert paper coffee cup waste from landfills to further decrease environmental effects of coffee cups on campus.

In this study, only Second Cup and Tim Hortons establishments will be considered. As Tim Hortons has already tried a cup-to-tray program in other parts of Nova Scotia (Tim Hortons, 2011), it is wise to explore the possibility of implementing a somewhat similar program on Dalhousie campus. Looking into the possibility of extending the closed loop system to Second Cup, another popular chain coffee vendor, will help divert much more waste generated on Dalhousie campus from landfills. Given the nature of this study, including limited time and resources, the study may become limited to one specific coffee shop on campus; this will depend on whether or not the establishments are timely in their responses and willing to provide information. Considering only Tim Hortons and Second Cup in the study will allow for a more detailed answer to the research question. The findings may also provide somewhat of an indication of the feasibility of a closed loop system with cups from other coffee vendors.

## Background and Rationale

Coffee is a widely consumed beverage on Dalhousie campus and is quite popular with teachers and students alike. The coffee's high caffeine content can be crucial in assisting some people through their busy days on campus. Throughout the campus, it is evident that the majority of these coffees are being served in disposable cups from one of the many coffee distributors on campus. Unfortunately, these cups are not currently recyclable, as the paper cups that are distributed and used by most major coffee businesses are polyethylene lined (Ziada, 2009). This means that the used cups will end up being thrown in the garbage, further contributing to the mass amounts of waste in landfills. In fact, by using one disposable coffee cup per day, you are creating 22.75 pounds of waste per year (Deneen, 2005). Another issue we are having with these disposable cups is that not all students are aware that they are not recyclable. Some students are throwing their used cups into the recycling bins, which can contaminate the entire bin; as a result, the recyclables in the bin end up going into the garbage. With this project, we aim to find out the feasibility of integrating a closed loop system for repurposing the abundance of coffee cups being disposed of on campus.

Sustainability is a growing area of interest at Dalhousie University. The university has made the initiative to improve its sustainability in many ways, including improving policy around renewable energy, water conservation, and waste management (Dalhousie University, 2014). There has been great progress in the area of sustainability over the years and we aim to further this improvement. The amount of waste caused by disposable coffee cups alone is an important problem and its reduction would have a great impact on Dalhousie's carbon footprint. With this project, we aim to provide a way to divert the current amount of coffee cup waste from landfills by determining if a

closed loop system for coffee cups is a feasible option.

Halifax Regional Municipality does not currently have a recycling program for disposable coffee cups (Halifax Regional Municipality, 2014). The city's waste management system was integrated by the Ecology Action Centre and has proven to be quite effective in diverting waste (Halifax Regional Municipality, 2014). We intend to further improve this system by incorporating an option to divert coffee cups from landfills with the use of a closed loop system. Tim Hortons has been a leader in this domain in Nova Scotia with their "Cup-to-Tray" recycling program. This program entails a closed-loop system where the discarded cups are collected and re-purposed into useful items such as trays (Tim Hortons, 2011).

Tim Hortons has partnered with CKF Inc. for this endeavor. CKF is a long-running company that specializes in producing disposable items, but has recently started an initiative to incorporate more sustainable methods into the business (CKF Inc., 2011). Among other environmental initiatives, CKF has started a closed-loop recovery system (CKF Inc., 2011). This allows other companies to recycle otherwise non-recyclable items by transforming them into other purposeful items. Another benefit to CKF is that the company is based out of Hantsport, Nova Scotia, which will minimize the transport costs of materials. With a company such as CKF, we could potentially reduce the amount of accumulating coffee cup waste on campus. So far, the project seems to be effective in participating Tim Hortons locations (Tim Hortons, 2011), and we aim to measure the feasibility of incorporating this practice here at Dalhousie.

There are certainly other methods to reduce the waste caused by disposable coffee cups. Such methods may include replacing polyethylene lined paper cups with biodegradable coffee cups, or even encouraging students and faculty to use reusable mugs. The integration of biodegradable may not be feasible on campus as most coffee retailers are franchises, which means that such changes would require changes within the entire company. Forcing or encouraging consumers to switch to reusable mugs may not be effective purely for the sake of convenience. The only way this method could truly be effective would be by simply not providing disposable coffee cups at all. This would mean that in order to get a coffee, the customer would need a reusable cup. Obviously this could not be implemented because businesses on campus would lose too much business. Another issue with this method is that students would most likely be purchasing multiple travel mugs, which would also be environmentally detrimental.

## Proposed Research Methods

The hypothesis for the research study is: A closed loop system is an effective waste management alternative for diverting the coffee cups disposed of on Dalhousie Studley campus from landfills in Halifax, Nova Scotia. The research methods are designed to

assess the feasibility of a closed loop system for coffee cups on Dalhousie's Studley campus.

A closed loop system would significantly reduce the waste sent to landfills by repurposing used coffee cups that are disposed of on the Dalhousie Studley Campus.

### Literature Review

The first research method is conducting a literature review. The purpose of the literature review is to establish what is already known about the topic of our proposal (Kirby, Greaves, & Reid, 2010). Our literature review will focus on existing data related to closed loop systems, coffee cup waste, and coffee cup garbage disposal, to help gain a comprehensive understanding of the topic. The information collected through this method will be used to determine the feasibility of a closed loop system for the Dalhousie Studley Campus.

### Content Analysis

The second research method will be content analysis. We will gather data regarding inventory and daily sales from one coffee cup distributing franchise within the scope of the research study that has this information available. As outlined by Kirby, Greaves, & Reid (2010), content analysis focuses on manifest content, which is explicit information that can be counted, described, or analyzed. Through content analysis with the inventory and sales data collected, we will use counting and calculations to create an estimate of how many coffee cups are purchased and distributed into circulation on the Dalhousie Studley campus daily. It is important for this study that we know how much coffee cup waste is produced; content analysis is a useful method to use in our research because it is used for systematic measurement and focuses on stable data (Kirby, Greaves, & Reid, 2010). The information will be used in our research when determining how much waste a closed loop system would be able to divert from landfills by examining how much is in circulation on campus and will be used during the final analysis to help determine whether or not a closed loop system for coffee cup disposal will be beneficial and feasible for Dalhousie Studley Campus.

### Interview

The third research method that will be used to collect this social data will be an interview. We will be using a semi-structured approach to the interview process. As described by Kirby, Greaves & Reid (2010), this approach will allow us to gather information about our questions with some variation within the interview process. We will be reaching out to a representative from the recycling company CKF to interview them about the required procedure for implementing a closed loop system for a company. From this interview it is essential that we are able to establish the criteria they require for a closed loop system to exist. Additionally, we will ask about any associated costs to creating and running a successful closed loop system.
The questions that will be asked of a CKF representative can be found in Appendix A.
The submitted ethics application for these two interviews can be found in Appendix D.

### Limitations and Delimitations

The delimitation of this research was choosing to focus solely on the coffee cup distributing franchises located on the Studley campus. Coffee cup franchises on different Dalhousie campuses were excluded, as the range of the research would be too large given the time frame and resources. In addition, only the franchise with available information on inventory of coffee cup sales and/or distribution daily will be used in the content analysis due to the time constraints of the study.

## Schedule and Budget

**Schedule:**

The schedule of the project is shown as Figure 1 in Appendix B and detailed below.

**Weeks 1 and 2:** Information Gathering and Literature Review

This will be divided equally amongst the group. Each member will review journal articles, past research, and related websites and other grey literature that is useful and relevant to the research.

**Weeks 1-3:** Interviews

Interviews will be completed within the first and second week of the project. These interviews aim to obtain information from CKF regarding closed loop systems that involve disposable coffee cups, information from Tim Hortons corporation regarding being a participant in a closed loop system for their coffee cups disposal, and information from the campus franchises around inventory of coffee cup sales vs. reusable cup use. Kaitlyn MacEachern and Kara Koskowich will carry out the interviews.

**Week 2:** Coffee Inventory

Data that is collected through interviews for the inventory of the coffee cup distributing franchises on the Dalhousie Studley campus will be used to create an average daily quantity. Through random sampling of days for all of the applicable franchises, the average will be calculated using the inventory numbers. Steven Lahaie, Andrew Cavan and Jessica LeBlanc will complete this data collection process.

**Weeks 2-5:** Analyzing Data

Analyzing of all of the data will be the final step. This step will incorporate all data collected to determine the feasibility of implementation of a closed loop recycling system on Dalhousie Studley Campus. Each group member will participate in this step during group meetings.

**Weeks 5-6:** Final Draft Proposal

This step will include finishing the report and creating the presentation aspect of the project. It will include the final data collected and analyzed to answer the research

question: What is the feasibility of a closed loop system for coffee cup disposal on the Dalhousie Studley campus? All the group members will complete this process.

**Detailed Budget:**

For the proposed research no funding is needed. However, if the research determines that a closed loop system is feasible for Dalhousie's Studley campus, some implementation costs would exist. The tentative budget for the implementation of a closed loop system is shown as Figure 2 in Appendix C. As of now, it is estimated that a closed loop system for coffee cup disposal would require three gray 16 gallon recycling containers costing $38.95 each (Global Industrial Canada Inc., 2014). An additional three green bottle recycling lids at $36.95 each (Global Industrial Canada, Inc., 2014). With these three bins, recycling bags are also required; per 250 the cost would be $57.00 (ULINE, 2014). The bins for coffee cup disposal will be placed near coffee shops in the Killam library, Student Union Building, and Life Science Centre building. The bins will be labeled for coffee cups only and will then be collected and transported to the CKF Inc. facilities for the closed loop recycling system. Funding will be applied for once the feasibility of a closed loop system is established. The funding needed to cover the base cost of closed loop system implementation for the bins, bags, and paper required to place on campus would be $329.20.

## Deliverables and Communication Plan

Two categories of deliverables exist for the proposed project. One category includes the required academic submissions for the course ENVS/SUST 3502: Campus as a Living Lab. These submissions are the preliminary proposal, the petcha-kucha style presentation, and a final project report. The second deliverable exists if the research determines that a closed loop system is feasible, at which point a closed loop system can be implemented. A third deliverable is leading to further research. If the research finds that a closed loop system is not feasible or beneficial for Dalhousie Studley Campus, further research can be done on other alternatives to waste reduction. This project aims to communicate effective waste management of disposable coffee cups with the university community that uses the building facilities on the Studley campus of Dalhousie University. The success of the project will be measured based on the ability to answer the research question: Is it feasible to implement a closed loop system for coffee cup disposal on Dalhousie University's Studley campus? If it is found that a closed loop system is not feasible, the need for additional research on waste diversion alternatives can be communicated to the university population as well as further promotion of the importance of using reusable mugs.

## References and Appendices


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## Appendix A

### Interview Questions: CKF

**11.** Do you currently run any closed loop systems with coffee cups in the Halifax Regional Municipality?

**12.** What are your criteria for running a recycling program that repurposes used coffee cups?

**13.** Are there any costs associated with introducing a closed loop system?

**14.** What are your responsibilities in the closed loop repurposing system?

**15.** Are there any costs to an organization looking to participate in a closed loop system with you?

**16.** In order to participate in a closed loop system with you does the participant have to buy back the created products?

**17.** If not, can the products be redistributed elsewhere?

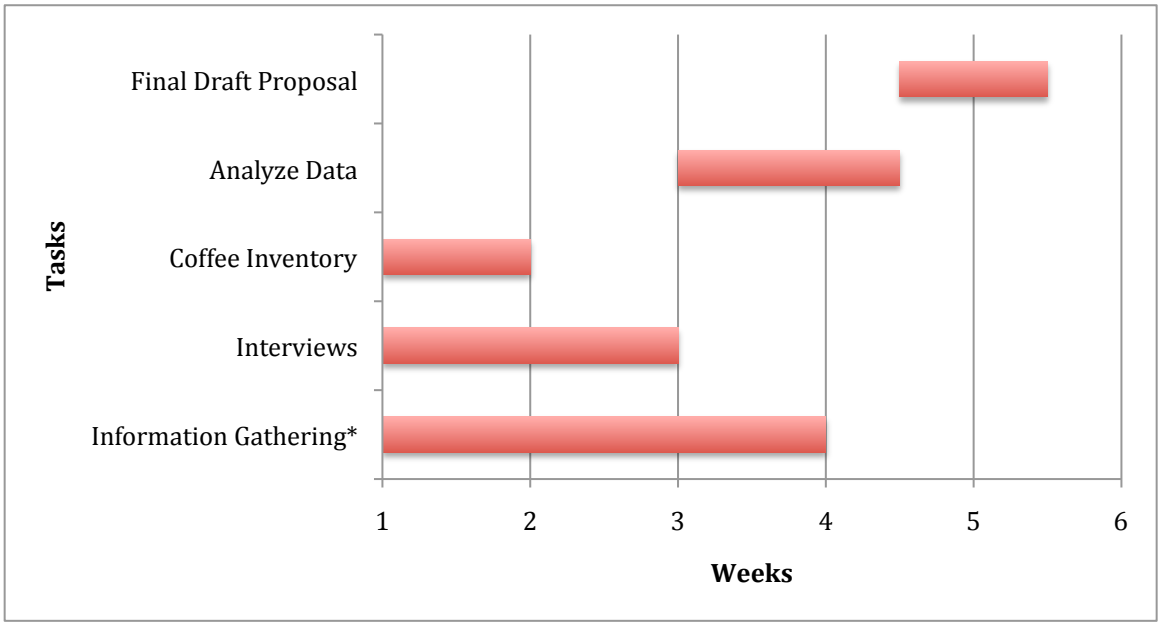
**18.** Would it be possible to use multiple and differing coffee cup products in the same closed loop system?

**19.** If no, is there only one specific type of paper cup your company can work with?

**20.** If yes, what is makes this product type different from other paper cups?

## Appendix C

Figure 1 Schedule February 28, 2014 - April 11, 2014




## Appendix D

Figure 2 Proposed budget of closed loop system implementation

| Product | Cost ($) | Quantity | Total Costs ($) |
|---|---|---|---|
| 16 Gallon Recycling Container (Gray) | $38.95 | 3 | $116.85 |
| Bottle Recycling Lid (Green) | $36.95 | 3 | $110.85 |
| Bags Price per 250 | $57.00 | 1 | $57.00 |
| Poster Paper per 50 | $44.50 | 1 | $44.50 |
| **Total** | | | $329.20 |

# *Appendix D*

## Ethics Review

**UNDERGRADUATE STUDENT SUBMISSION**

RESEARCH ETHICS BOARDS

DALHOUSIE UNIVERSITY

This form should be completed using the guidance document
http://researchservices.dal.ca/research_7776.html

**SECTION 1. ADMINISTRATIVE INFORMATION** [File No: _____]

Office Use

Indicate the Research Ethics Board to review this research:

☐ Health Sciences OR ☒ Social Sciences and Humanities

| Project Title: Exploring the feasibility of a closed loop system for coffee cup disposal at Dalhousie University. |
|---|

| **1.1** Student researcher: Andrew Cavan | | | |
|---|---|---|---|
| Department | Science | | |
| Degree program | Environmental Studies | | |
| Email | andrew.cavan@dal.ca | Phone | |
| I agree to conduct this research following the principles of the Tri-Council Policy Statement *Ethical Conduct for Research Involving Humans* and consistent with the University *Policy on the Ethical Conduct of Research Involving Humans*.<br><br>Student signature: | | | |

| **1.2** Supervisor Name: Dr. Hendricus Van Wilgenburg | | | |
|---|---|---|---|
| Department | Philosophy | | |
| Email | hwilgenb@dal.ca | Phone | (902) 678-3844 |
| I have reviewed the attached ethics application prior to its submission for ethics review, including the scientific/scholarly methods of the research project which is described in the ethics application, and believe it is sound and appropriate. I will ensure this research will be conducted following the principles of the Tri-Council Policy Statement *Ethical Conduct for Research Involving Humans* and consistent with the University *Policy on the Ethical Conduct of Research Involving Humans*.<br><br>Supervisor signature: | | | |

| **1.3** Department/unit ethics review (if applicable). Minimal risk research only. |
|---|
| This submission has been reviewed and approved by the research ethics committee. |

| |
|---|
| Authorizing name and signature:<br>Date of approval: |

**SECTION 2. PROJECT DESCRIPTION**

**2.1 LAY SUMMARY [500 words]**

In lay language, briefly describe the rationale, purpose, study population and methods.

The purpose of this research is to determine if it is feasible to introduce a closed loop repurposing system for used coffee cups at Dalhousie University. Coffee on Dalhousie campus is a highly purchased item. In HRM paper coffee cups must be put into the garbage and ultimately pile up in landfills. You are being asked to participate in this research study because we would like to know what the key elements are to successfully running a closed loop repurposing system for coffee cups. As your company currently uses this system we thought you would be ideal in presenting clarity.

**2.2 RESEARCH QUESTION**

State the hypotheses, the research questions or research objectives.

This study will look at determining if it feasible to introduce a closed loop repurposing system with regards to coffee cups. This system would be implemented at popular locations that serve coffee at Dalhousie University.

**2.3 RECRUITMENT**

2.3.1 Describe how many participants are needed and how this was determined.

We need to ask several experts in the field about the requirements needed for implementing a closed loop system. We will only be contacting one or two representatives from each expert field (CKF and Tim Hortons/other coffee dispensing franchises). This was determined to be a sufficient sample because we will only need to contact those who have knowledge on the subject matter. Looking to ask the general public on the issue would not aid in the research for this study.

2.3.2 Describe recruitment plans and append recruitment instruments. Describe who will be doing the recruitment and what actions they will take, including any screening procedures. Describe any inclusion / exclusion criteria.

We intend to identify people who can answer questions about establishing a closed loop repurposing system of used coffee cups at the various companies we contact. It will be purely based off these employees' good intentions that they participate in the interviews conducted. It is our hope that they see the benefits their company, Dalhousie University, and Halifax Regional Municipality can get from introducing a project like this. Ideally, their understanding that a repurposing system will allow for a better waste management system at Dalhousie can be established will aid in their decision to participate

**2.4 METHODS AND ANALYSIS**

2.4.1 Discuss where the research will be conducted, what participants will be asked to do and the time commitment, what data will be recorded using what research instruments (append copies). Discuss any blinding or randomization measures. Discuss how participants will be given the opportunity to withdraw.

The research will most likely take place over the phone, or in-person interviews at the various locations of the companies. Tim Hortons contact would be at Dalhousie's Studley Campus and CKF would be at their Lower Sackville location. The participants will only be asked to answer 7-12 questions about closed loop systems and how they work. This would take from about 30-50 minutes to conduct. No other time commitments are foreseen of the participants after the initial interview. The data will be collected using handwritten notes taken by the research group. No blinding or randomization measures are needed for this study. If participants wish to withdraw from answering questions they can at any time by a simple verbal acknowledgement.

2.4.2 Describe your role in this research and any special qualifications you have that are relevant to this study (e.g. professional experience, methods courses, fieldwork experience).

As part of the research team I will be involved with conducting interviews along with the other members of the team. As a Dalhousie University science student I have been a part of many laboratory exercises and I believe they have prepared me to conduct research effectively. Additionally, I have completed an ethics class at Dalhousie, which should also aid me in not doing anything unethical during the study.

2.4.3 Describe plans for data analysis in relation to the hypotheses/questions/objectives.

The plan for data analysis is to use observational techniques to compare the answers provided through the interview with Dalhousie University, in attempt to answer the research question of whether or not a closed loop repurposing system for coffee cups is feasible.

2.4.4 Describe and justify any use of deception or nondisclosure and explain how participants will be debriefed.

☒ Not applicable

2.4.5 Describe any compensation, reimbursement or incentives that will be given to participants (including those who withdraw).

☒ Not applicable

in the study.

**2.5 INFORMED CONSENT PROCESS**

Describe the informed consent process (i.e. how and when the research will be described to the prospective participant and by whom, how the researcher will ensure the prospective participant is fully informed of what they will be asked to do). If non-written consent is proposed, describe why and the process. If a waiver of informed consent is sought, address the criteria in the guidance document and TCPS articles 3.7 and/or 5.5. Address how any third party consent (with or without assent) will be managed. Describe any plans for ongoing consent, and/or community consent. Discuss how participants will be given the opportunity to withdraw (their participation and/or their data, and any limitations on this).

Append copies of all consent forms or any oral consent script.

A consent form has been created for any interviews that are conducted in person. The form will be delivered by the researcher conducting the interview and confirm that the participant understands what is required of them during the interview. If the interview is conducted over the phone, the researcher will read the consent form to the participant and get verbal confirmation that they understand and agree with what is said. A phone interview would most likely happen if the participants are not in the Halifax Regional Municipality or cannot sit down for an in person interview. As previously stated, if the participant wishes to withdraw from the interview, he/she can express himself/herself verbally to the researcher conducting the interview and stop answering any questions.

**2.6 PRIVACY & CONFIDENTIALITY**

2.6.1 Describe how data will be stored and handled in a secure manner, how long data will be retained and where, and plans for its destruction.

All data collected will be confidential to the study. This means that all information you provide will not have your name associated with it in any written reports. All handwritten data that is collected by the researchers will be stored safely in a secure building. Only the research group will have access to the information you provide for this study. Once the study is complete, approximately 5 weeks time, all notes will be shredded and disposed of. Confidentiality is of utter importance to us during this study.

2.6.2 Address any limits on confidentiality, such as a duty to disclose abuse or neglect of a child or adult in need of protection, and how these will be handled. Such limits should be described in consent documents.

☒ Not applicable

2.6.3 Does your use of any survey company or software to help you collect, manage, store, or analyze data mean that personally identifiable information is accessible from outside of Canada?

☒ No

☐ Yes. If yes, describe your use of the company or software and describe how you comply with the University *Policy for the Protection of Personal Information from Access Outside Canada*.

2.6.4 Describe the measures to be undertaken for dissemination of research results and whether participants will be identified (either directly by name or indirectly). If participants will be quoted in reports from the data, address consent for this, including whether quotes will be identifiable or attributed. Describe how participants will be informed of results that may indicate they may be at risk (in screening or data collection), if applicable.

Participants will only be identified by name if they agree, prior to the beginning of the interview, to allow the research group to use it. Additionally, we will ask if the participants object to them representing their responses for the company. There is currently no intent to quote participants responses, but if the research group sees fit to quote any participant to aid in the validity of the study, quoting may occur. It is therefore, our intention to make sure that quoting participants is fine before the interview is conducted.

**2.7 RISK & BENEFIT ANALYIS**

2.7.1 Discuss what risks or discomforts are anticipated for participants, how likely risks are and how risks will be mitigated.

Minimal to no risk or discomfort, much like everyday life, will result from your participation in this research. Therefore, no mitigation measures are required.

2.7.2 Identify any direct benefits of participation to participants (other than compensation), and the indirect benefits of the study (e.g. contribution to new knowledge)

This research would help the University population reduce its waste going to landfills. It would also be an ideal model for society to see that waste can be diverted from landfills and be repurposed for other use. Ideally, the participants who represent the companies undertaking the proposed closed loop system would receive some of the repurposed items from the used coffee cups.

**2.8 CONFLICT OF INTEREST**

Describe whether any conflict of interest exists for any member of the research team in relation to potential research participants (e.g., TA, fellow students), and/or study sponsors, and how this will be handled.

☒ Not applicable

**SECTION 3. APPENDICES**

**3.1 Appendices Checklist.** Append all relevant material to this application. This may include:

☐ Recruitment Documents (posters, verbal scripts, online postings, any invitations to participate, etc.)
☐ Screening Documents
☒ Consent Forms (see section 3.2 below)
☒ Research Instruments (questionnaires, surveys, interview or focus group questions, etc.)
☐ Debriefing Forms
☐ Permission Letters (Aboriginal Band Council, School Board, Director of a long-term care facility)

**3.2 Consent Form**
Guidance on the information to be provided in the consent form is described in *Guidance for Submitting an Application for Research Ethics Review – Undergraduate Students,* available on the Research Ethics website.

A sample consent form follows and may be used in conjunction with the information in the *Guidance* document to help you develop your consent form. Remember to use clear, simple language (grade 8 comprehension level and no technical jargon or acronyms) in a readable font size.

DALHOUSIE UNIVERSITY
*Inspiring Minds*

**CONSENT FORM**

**Project Title:** Exploring the feasibility of a closed loop systems for coffee cup disposal on Dalhousie University.

We invite you to take part in a research study being conducted by Andrew Cavan who is a student at Dalhousie University, as part of his ENVS 3502 Class Project. Taking part in the research is up to you and you can leave the study at any time. There will be no impact on your employment if you decide not to participate in the research. The information below tells you about what you will be asked to do and about any benefit, risk, or discomfort that you might experience. You should discuss any questions you have about this study with Andrew Cavan.

**Who Is Conducting the Research Study**

The researchers are Andrew Cavan, Jessica LeBlanc, Kaitlyn MacEachern, Kara Koskowich, and Stephen Lahaie. We are undertaking a project for the ENVS/SUST 3502 class given at Dalhousie University. The contact for this review is the professor, Dr. Hendricus Van Wilgenburg; he can be reached at hwilgenb@dal.ca

**Purpose and Outline of the Research Study**

The purpose of this study is to determine if it is feasible to introduce a repurposing system for used coffee cups at Dalhousie University. These coffee cups would otherwise be thrown out in the garbage and ultimately pile up in landfills. You are being asked to participate in this research study because we would like to know what the key elements are to

successfully running a closed loop repurposing system. As your company current uses this system we thought your knowledge would be beneficial to the study.

**Who Can Participate in the Research Study**

You may participate in this study if you have relevant experience or knowledge. This includes, but is not limited to, knowledge of coffee-cup repurposing or similar closed loop systems, knowledge about coffee cup materials or inventory, and knowledge of Dalhousie University's facilities management and/or food services. The research team will approach people who fit these criteria and ask them to participate in the study.

**What You Will Be Asked to Do**

To help us understand the feasibility of introducing a repurposing system for coffee cups, we will ask you to answer ten to fifteen interview questions presented by research members. The interview will only occur once and will last from approximately thirty minutes to one hour.

**Possible Benefits, Risks and Discomforts**

This research may help the University population reduce waste going to landfills. It would also be an ideal model for society to see that waste can be diverted from landfills and be repurposed for other use. Ideally, the participants who represent the companies undertaking the proposed closed loop system would receive some of the repurposed items from the used coffee cups.

Minimal to no risk or discomfort, much like everyday life, will occur from your participation in this research. If you feel at risk or uncomfortable at all during your participation you can verbally ask for a break or to continue the remainder of the interview at a later time.

**Privacy and Confidentiality**

Information that you provide to us will be kept private. Only the research team at Dalhousie University will have access to this information. We will describe and share our findings in a class presentation and a final written report. We will be very careful to only talk about group results so that no one will be identified. This means that you will not be identified in any way in our reports. The people who work with your information have special training and have an obligation to keep all research information private. Also, we will not use your name in our written and computerized records so that the information we have about you contains no names. All your identifying information will be kept in a separate file, in a locked cabinet, in a locked room. All electronic records will be kept secure in a password-protected file.

Confidentiality: All data collected will be confidential to the study. This means that all information you provide will not have your name associated with it in any written reports. All handwritten data that is collected by the researchers will be stored safely in a secure building. Only the research group will have access to the information you provide for this study. Once the study is complete, approximately 5 weeks time, all notes will be shredded and disposed of. Your confidentiality is of utter importance to us during this study.

Anonymity: You will not be identified in any reports or publications unless otherwise agreed upon before the study.

**Voluntary Participation**

Participation in this study is solely voluntary and if you wish you may stop taking part at any time. Your decision to stop partaking will not change your relationship with the research group or Dalhousie University.

**If You Decide to Stop Participating**

If you must withdraw from the study for any reason you are still eligible for any compensation agreed upon by you and researcher before the study began. Upon withdrawal, if you deem necessary, all of your answers to the questions asked will be destroyed and not considered in the study.

**How to Obtain Results**

We will provide you with a short description of group results when the study is finished. No individual results will be provided. You can obtain these results by contacting the lead investigator after the study is completed, approximately five months time.

**Questions**

If you have questions about the research in general or about your role in the study, please feel free to contact Dr. Hendricus Van Wilgenburg either by telephone at (902) 678-3844, or by e-mail hwilgenb@dal.ca. This research has been reviewed and approved by the Dalhousie University's Environmental Science Program Ethics Review Committee and conforms to the standards of the Canadian Tri-Council Research Ethics guidelines. If you have any questions about this process, or about your rights as a participant in the study, please contact Research Ethics, Dalhousie Research Services, 5th Henry Hicks Building, Rm 231, Dalhousie University, PO Box 15000, Halifax, Nova Scotia B3H 4R2 (telephone 1.902.494.3423 or e-mail ethics@dal.ca).

**Legal Rights and Signatures**:

I_____, consent to participate in the Repurposing of non-recyclable coffee cups at Dalhousie University study conducted by Andrew Cavan. I have understood the nature of this project and wish to participate. I am not waiving any of my legal rights by signing this form. My signature below indicates my consent.

**Signature**_____ **Date**_____
Participant

**Signature** _____ **Date** _____

Principal Investigator