

Dalhousie's Water Pledge Reviewed; A look at Perceptions and Actions Taken

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Executive Summary

The privatization of water as a commodity is an issue that has touched the world in recent years. Single-use plastic water bottles are contributors to ongoing environmental and social stressors by causing plastic pollution and fueling ongoing fears of water insecurity (Olsen, 1999). The impact that selling water as a commodity has had has driven post-secondary institutions, as well as governments to change their drinking water practices, moving away from single-use plastic water bottles when possible (Chung, 2010 ; Jaffee & Case, 2018). At Dalhousie University a Drinking Water Pledge was signed in 2013 with the goal of creating more choice when it comes to obtaining drinking water, as well as decreasing overall drinking water use on campus when possible (Dalhousie, 2013). This study looks deeper into the perceptions of the community surrounding the pledge and the actions being taken six years after implementation. The hopes are that these perceptions will aid administration in updating the pledge accordingly, incorporating the wants and needs of the current Dalhousie community.

Data was gathered using surveys as well as audits of both the water fountains and vendors to gather information on both perceptions surrounding drinking water habits as well as data on actions being taken. It was found that many individuals are using water fountains in the Killam library, where the study took place, and few individuals were found purchasing water from vendors. This matched the survey data, where many participants stated their regular use of water fountains. The perceptions of the Dalhousie community, specifically on Studley campus, supported a culture transitioning away from single-use plastic water bottles. When asked about specific sections of the pledge, participants often were unaware of the step that was pledged to be taken (i.e. reusable water bottles in vending machines) or found that the university was falling short in meeting the pledge (i.e. offering tap water, and maintenance). From here, the data was analyzed and results were used to make recommendations for the future of the drinking water pledge.

To conclude, thus far the Dalhousie drinking water pledge has helped in an initial reduction of single-use plastic water bottles on campus, but there is still room for improvement. To continue transitioning the community towards a drinking culture with little emphasis on single-use plastic water bottles steps must be taken to address the accessibility and maintenance of campuses drinking water infrastructure. It is recommended that this be done by creating an updated pledge, paying special attention to these areas. As the Dalhousie community supports a transition to a single-use plastic water bottle free campus, it is recommended that the future pledge addresses this as a future goal, and research the logistics behind this transition.

Introduction

Every step of the production and consumption of single-use plastic bottled water creates a persistent, pervasive negative impact on the natural environment, contributing to climate change and water insecurity (Olsen, 1999). Increasing rates of plastics pollution is coupled with fears of global water insecurity. While Canada has large reserves of fresh-water, the remaining supply is “heavily used and often overly stressed” (Government of Canada, 2018). In response to these environmental stressors, students on post-secondary campuses across Canada have acted. The University of Winnipeg, Ottawa University, Memorial University and Brandon University have all banned bottled water from vending machines (Chung, 2010). Following a single-use plastic water bottle water ban at the University of Winnipeg, *DalNews* posed a question to students and faculty in March 2009 pertaining to a ban on Dalhousie campus (Gagnon, 2009). Approximately 55% of respondents supported a single-use plastic water bottle ban (2009). Among those against the ban, they would consider it if water fountains on campus were upgraded and maintained. Students and faculty in support of the ban believed that tap water was equal to, if not superior to bottled water in terms of cleanliness (2009).

In 2013, Dalhousie University signed a drinking water pledge outlining ways in which the university would look to improve its drinking water practices in response to the question of a ban posed by *DalNews* (Dalhousie, 2013). Administration chose to sign a pledge rather than a ban as they believed a ban would have left space for other single-use plastic bottle alternatives (R. Owen, personal communication, March 15, 2019). As these options are often pop and juice there was a fear that individuals would be steered towards choosing unhealthy alternatives with single-use plastic water bottles removed from vendors and vending machines (R. Owen, personal communication, March 15, 2019). Rochelle Owen expressed that the pledge was “created with the ethos of creating more choice and reducing overall potable water use”, this can be seen throughout the multiple sections in the pledge itself (personal communication, March 15, 2019). The pledge consists of four sections, each pledging to address a different aspect of the drinking water issue. The first section considers equipment and infrastructure, generally pledging that the university will provide maintenance to both existing and future water fountains on campus (Dalhousie, 2013). Second, the university pledged to “terminate the sale of office-sized cooler bottled water” on all campuses, this excluded emergency situations use may be necessary (2013). The third section pledged to “reduce consumption of individually-sized single-bottled water”, this included working with food services and faculties to aid with this reduction (2013). Finally, Dalhousie pledged to “engage in education and projects that promote the importance of healthy and sustainable public water infrastructure” (2013). Following the signing of the pledge to public knowledge, little has been done to ensure that Dalhousie has been held accountable to implementing the articles within.

This is not just an issue that action is being taken on by Universities, but rather by governments around the world as well. In a 2018 study by Jaffee and Case it became apparent that the United States bottled water consumption has grown dramatically in recent years as communities have turned to beverage companies to provide them with water security. Specifically, “44% of total drinking water consumption” came from single-use bottled water, which “costs up to 10,000 times more per unit than tap water” (2018). The groundwater extraction that has provided these companies with marketable water has left many communities in southwestern Ontario, where the water is extracted, without adequate drinking water (2018). In places where drinkable tap water is available governments have questioned the need for the commodity, including past Ontario Premier Kathleen Wynne who stated that the industry needs to be relooked at all together. Wynne directed the Environment Minister of Ontario to improve access to refillable water stations in public spaces (2018). Likewise, in Toronto and San Francisco, grassroots organizations have led to city bans on certain single-use bottled water sales in the public (2018). It is evident that the transition to a more sustainable drinking water protocol is important in the eyes of many governmental bodies.

Despite these environmental stressors being a priority in the minds of universities and governments, behavioural research around water conservation is virtually non-existent (Van der Linden, 2013). Environmental behavioural science offers key insights into the motivations and perspectives of individuals who aim to reduce the impact of their drinking water consumption. A literature review on consumer preferences regarding water consumption suggests that bottled water use is driven by beliefs and perceptions about water (Gorelick et al., 2011). The drive to consume bottled water is influenced by sensory information such as taste, odor and sight. It is also driven by factors such as convenience, location, and lifestyle choices (O’Donnell and Rice, 2012). This study touches upon the usage of bottled water in the context of the Dalhousie Water Pledge, as well as analysing students’ awareness and perception of drinking water in general. This is an area in which there is little research, but is beneficial to investigate when looking towards the future of drinking water choices.

This literature review will focus on the broader conservation psychology literature, and how it plays out in social situations such as post-secondary institutions. There is contradictory data on the efficacy of informational campaigns on water conservation. Fielding et al. (2013) conclude that campaigns led to direct savings in household water use. However, a study by Johnson and Saylor et al. (2011) asserts that information is not enough to change behaviour. It is an interesting gap in research to look at as to whether in the context of the water pledge if it has been enough to push behavioural change within the past six years. A stronger factor for behavioural change is interpersonal information from people within one’s social network. However, there is a “lack of comparative experimental evidence...(which) leaves little clues as to what works in the context of water conservation” (Fielding et

al.,2013). A study conducted at a Dutch University explored students' beliefs about water consumption, and how to develop effective persuasive messaging (Van der Linden, 2015). This was done by directing students to a series of surveys via an online link. However, this study did not delve into students' perceptions about existing protocol developed by administration, rather the broader idea of water conservation on campus. Another study consisting of surveys was given to students at a university in Osaka, Japan (Uehara, 2018). Through examining willingness to pay for refillable water stations, the researchers collected insights into how to encourage pro-environmental behaviour. It concluded that refillable stations were strongly linked to perceptions about campus sustainability, and students were willing to make use of stations in lieu of single use water bottle usage (Uehara, 2018). In the context of Dalhousie, both bottled water and refillable stations exist. While this study aimed to look at students' sustainability practices around drinking water, students were surveyed based on existing conditions, particularly how effective the water pledge has been.

Another key aspect of research is the role that administrative regulation plays in students' perceptions about water conservation, of which little peer reviewed literature already exists. While there are articles that delve into the behavioural psychology of groups and individuals in regards to decreasing water wastage and purchasing less bottles, they do not quite fit in with our research. None of the peer reviewed literature used existing administrative protocols to base their surveys on, and very few considered the current climate of conservation on campus. Past ENVS 3502 Projects have explored informational campaigns conducted by concerned student groups. The last of the relevant projects was conducted in 2011, by Abercrombie et al. Considering factors such as turnover, recent capital investments into refillable water stations and changing perceptions of environmental stewardship, an updated survey is sorely needed.

While the research faces precedent in terms of method and intentions, the approach is novel in the realm of existing literature. As well, while perceptions around water conservation in general have been looked at, little research has been done around the specifics of perceptions around water drinking habits. Exploring perceptions on post-secondary campuses is key to understanding the behaviours of society in general, considering the importance of university to establishing social norms, and its reputation as an incubator for lifelong habits and outlooks. The goal of the study was to consider the perceptions surrounding drinking water on campus, and use them to see where the Dalhousie Water Pledge has succeeded, and where it has fallen short. With these, a better idea of the wants of the Dalhousie community going forward are obtained and can be used to make recommendations for addressing the issue. By understanding perceptions areas that need particular attention when revamping the current pledge can be identified. As well, what could be taken out due to improvements that have taken place or the addition of new areas that have been identified by the community as important can be included. The

purpose of this research project is to create a more sustainable Dalhousie campus using community perceptions, specifically when it comes to the availability and accessibility of drinking water. We look to obtain these results in the following pages by answering our research question: **What is the progress behind the 2013 Dalhousie Water Pledge based on the perceptions of the Dalhousie Community, and the principles indicated within the pledge?**

Methodology

The research was conducted using a combination of qualitative and quantitative methods. This mixed methodology approach was used as it increases the credibility and reliability of results (Atchison & Palys, 2014). A non-probabilistic sampling method was used for the surveys, to answer the aforementioned research question (2014). The sampling frame is members of the Dalhousie community on Studley Campus, with the quantitative data being taken at the Killam Library. For spatial scope, the Killam library was chosen, as it represents a hub on the Studley campus. Students, faculty, administration and other staff members/volunteers are likely to congregate there, regardless of department or degree program. Furthermore, it has water fountains on each floor, and several vendors. Thus, data could be gathered that relates to refillable water fountains and vendor water bottle sales.

Survey and Justification

Data was gathered using an online survey, executed through google forms (see Appendix A). A survey was chosen over interviews as surveys can reach larger quantities of participants, which is important when trying to identify common perceptions that apply to a larger body (Atchison & Palys, 2014). The survey consisted of thirteen questions, with a combination of closed and Likert scale techniques. The first question is a closed ended question to determine demographic information. Namely, what faction of the Dalhousie Studley campus they identified with. The second was another closed ended question regarding water bottle usage (establishing the main aim of the survey). This was followed by two ratio scale questions to determine the frequency of water bottle usage. The same style of questions was mirrored in asking about single-use plastic water bottles. Each of the ordinal ranking questions were followed by an open-ended comment section. One con with ordinal ranking, and online surveys in general, is being unable to clarify ambiguities, and the comments section was one way to ameliorate this (Atchison & Palys, 2014). Questions six to twelve aimed to explore student perceptions about refillable water stations and single bottle vendors on campus. The questions were adapted from the existing Dalhousie Pledge. This was done using a Likert 5-point scale, ranging from “Strongly Agree” to “Strongly Disagree”.

A Likert type scale has several key features. Firstly, there is a declarative statement. Secondly, there is an ordered continuum. Thirdly, there is a variety of response categories (Atchison & Palys, 2014).

The Likert Scale was used to offer respondents a range of answer options. It consists of five values, consisting an ordinal scale. The Likert scale was used as it allows respondents to use a scale to easily understand the degree to which they agree or disagree with a statement. As the aim was to understand the perceptions of Studley campus users, it was an effective method. The 5-point scale had a balanced number of positive and negative response options.

One exception is question 7, which is a multiple choice based on a hypothetical. Respondents are given several behavioral choices should single-use plastic water bottles were removed from campus. The rationale behind a multiple choice is twofold. Firstly, it allows the group members to easily analyze the data. Secondly, it provides information for respondents, and in turn the administration, regarding the behaviour of students in a more sustainable scenario. The last two questions are preceded by the Dalhousie Pledge. The blurb given online includes a summary of the clauses that were mentioned in the previous questions, as well as a link to the full pledge, should respondents be interested. Question twelve aimed to gauge student interest in action around the water pledge, and used a closed ended “Yes/No” question. The last question was an open-ended question to collect information for those interested in the prize.

Gathering Responses

Survey distribution consisted of online surveys that were advertised through physical posters placed throughout Studley campus (see Appendix B). The posters were hung in common areas that emphasized visibility and traffic. Furthermore, they were placed in areas where students would be idling, and thus more likely to take the time to complete a survey. Both the email account associated with the survey and the QR code was included in the poster. A QR code was chosen versus a survey link for ease and clarity. Smartphones with a camera are increasingly common, and scanning a QR code was an easy way to collect data. To incentivize completing the survey, a prize was offered. This prize was funded through DSUSO, which provided two \$25 giftcards to Glitter Bean Co-Op.

The total population on Studley campus was 15,000 students. Based on the population size, a confidence interval of 95% and a margin error between 5-10%, the target population sample size was between 96 and 375 participants. Thus, the group aimed for around 100 surveys. In actuality, a total of 104 survey respondents were analysed. In accordance with the guidelines presented in the REB form, the survey responses and other raw data was stored in a series of google documents only accessible by link. The posters resulted in a small number of survey responses. To encourage more participation, group members spent time in certain locations on Studley campus. Canvassing locations consisted of the general study area in the Student Union Building (SUB) and the Killam Library, and the Tim Hortons line at both the LSC and SUB. The in person campaigning to complete the surveys was done using disproportionate stratified random sampling methods.

Quantitative Data

The quantitative data was collected through interval sampling throughout the data collection period. Group members conducted self-done audits, tallying the frequency of water fountain usage at different locations through the Killam. As well, additional data such as accessibility of the fountains and what was being refilled was collected. Data was taken at each floor of the Killam at half hour intervals. Audits were chosen over counts as it allowed for more data to be gathered.

Understanding that the group members' ability to focus on a single observation may be limited, a data collection period of 30 minutes was decided upon. To increase reliability and ensure accurate data analysis, three replicates at each fountain were conducted during the data collection stage at different times in the day.

To compare the water fountain usage against the single bottled water purchases, an attempt was made to access back end information, to limited success. In contact with Rochelle Owen, the group members accessed data from conference services. The data outlined the purchases of jugs of water and bottled water from 2016 to 2019, in seven month intervals between September 1st and March 15th (see Appendix C). To bolster this data, group members conducted audits of vendors in half hour intervals at various times in the day to ascertain the water bottles sold, as well as additional data surrounding water practices. This included the availability of tap water and cost of single-use plastic water bottles. The raw data is found in Appendix D.

Data Analysis

All the collected data was exported into an excel spreadsheet. The open-ended questions that accompanied closed end questions were analyzed using deductive coding. Repeating comments were taken to be important, and a frequency table was created. Repeated indicators for Question 2 regarding why respondents use water bottles included "better for the environment", "easy", and "keeps water cool longer". The raw data can be found in Appendix E. The Likert scale data was converted into pie graphs that provide a visual aid to the perceptions of Studley campus users.

The water fountain usage counts were converted into a multi-level bar graph that indicates frequency and time of day. A chi squared test was also conducted. The Chi Square method compares observed frequencies between two or more nominal variables. It allows us to tell us if there was a significant association between the observed numbers.

To conclude, a majority of the data analysis that was performed was done through descriptive statistics and coding, however, inferential statistics were used where fitting.

Limitations of Study

Both the questionnaire and qualitative data collections faced limitations. In regards to the questionnaire, it is hard to determine the validity and sincerity of the respondents. This was apparent in the answers. For instance, one student stated in an open-ended question that they were a Sexton student, so the survey would not apply. To ameliorate this, the group members opted to delete their responses. Furthermore, posters with the QR code were only placed in areas on Studley campus. Thus, to participate in the survey, respondents had to be on Studley campus to access the QR code. Considering the non-probabilistic method of survey collection, it was difficult to ascertain whether it was representative of the general population. The sustainable-minded survey responses, coupled with the high-water fountain usage and low single use purchases, lead us to conclude certain assumptions. However, these assumptions are from a certain group of people, not the general Studley population. Despite efforts to reach as many people as possible, the very nature of non-probabilistic means it does not represent a diverse population. While the sampled data is not representative, it still allows valuable generalizations that can be applied to constructive policies moving forward. As well, the survey being online may have limited the individuals that could respond as a smart phone or computer was needed to answer the questions. Furthermore, there is a tendency with surveys to answer questions untruthfully. Respondents, knowing this was for a sustainability class, may have skewed their answers to what they felt the survey creators wanted to hear. Thus, there is the respondent bias.

Another limitation was the nature of the questions. There was no question asking respondents what faculty or degree program they belonged to. If this question was asked, there could have been further analysis using T-Test to see if there was a significant difference between the means of groups in different faculties. Moving forward, this distinction could provide valuable information regarding the perception of different faculties' perception of water bottle usage.

As well, there were inevitable limitations in our quantitative approach. The main limitation was where the data collection occurred. Qualitative data was conducted only in the Killam Library. This was due to time period given to complete the study, but also due to the nature of heavy traffic and the ability to predict when it would be busy. Furthermore, we only decided on Studley Campus. The other campuses had clear limitations in terms of distance and familiarity. Another clear limitation was the lack of data for suitable comparison. There was an effort to contact vendors, to collect data on water bottle purchases. As this was unsuccessful, group members conducted self-done audits of vendors in the Killam library which may not have provided as accurate counts of water sales. Furthermore, Rochelle Owens from the Dalhousie Sustainability Office provided data for internal purchases which gave a better idea of water sales on campus, although it was pertaining to catering and not on-campus vendors.

Results

The initial set of results explain the perceptions and water habits of survey participants. The data from the surveys concluded that overall 94% of the Dalhousie Studley campus use a reusable bottle meanwhile the remaining 6% do not. The most popular reasons for using a reusable bottle included “easy to use”, “better for the environment”, “reduces waste” and “cheaper than the alternative”. Those who do not use reusable water bottles claim that they “don’t drink that much water”, “had a bottle, but lost it” and “own one but never use it”. Those who use a reusable bottle bring their water bottle to campus at an average of 5.53 times per week and they fill up their water bottle at an average of 2.42 times per day. The sample population also showed that 23% of the respondents purchase single use bottled water from campus vendors. Those who purchase bottled water do so on an average of 1.10 times per week. As seen in Figure 1, 48% of the participants claim that the reason they purchase bottled water is because they forgot their reusable bottle, meanwhile 22% claim they do it for the convenience, 17% purchase it to quench their thirst, 9% are specific about the taste of water and 4% cannot find a water fountain. A chi-squared test was completed to compare if there was a significant difference between whether a participant used reusable bottles compared whether they purchased bottled water. The chi-squared value in this test equaled 0.3773 while the p-value was 0.5390. This test showed that there is no significant difference in whether a participant used a reusable bottle or purchased bottled water.

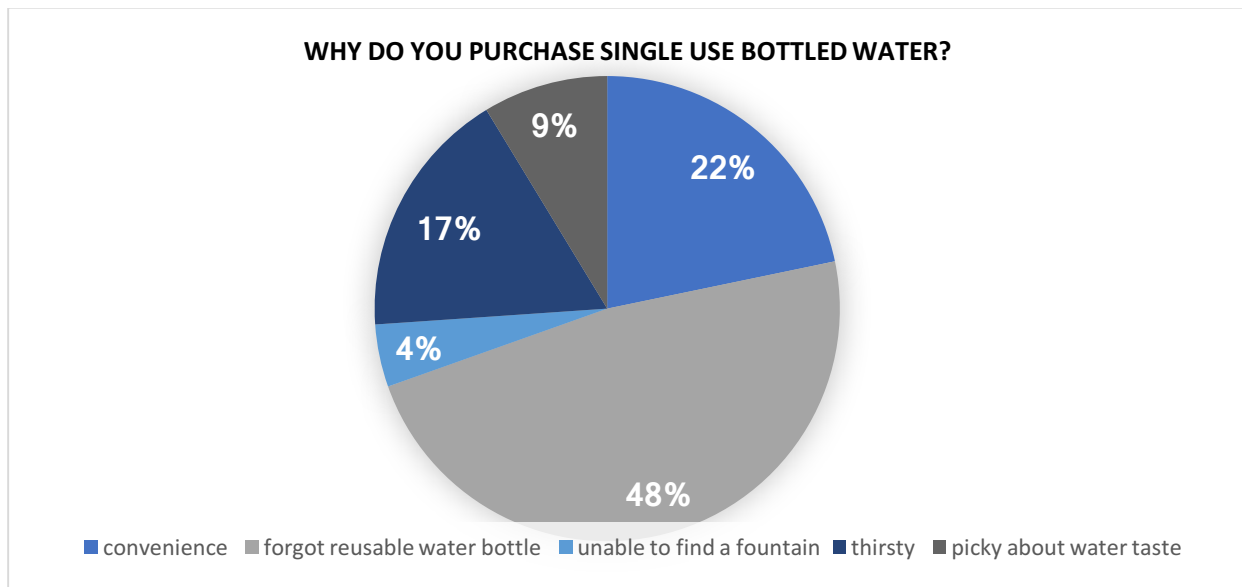


Figure 1. Pie chart representation of most popular reasons why sample group chooses to purchase single use bottled water.

The results from participants opinions of how well Dalhousie was upholding their agreement to the water pledge were expressed on a range from strongly agree to strongly disagree. Figure 2 shows that when participants were asked whether Dalhousie has made an effort to offer reusable bottles in vending

machines, 32 strongly disagreed, 29 were neutral, 26 disagreed while 9 agreed and 8 strongly agreed. When asked if accessibility for those who require assistance or are in wheelchairs is sufficient on Dalhousie campus, 43 agreed, 35 were neutral, 18 strongly agreed while 8 disagreed and 0 strongly disagreed. Some commented stating that fountains are either hard to find or are in tight spaces that those who require special access may not be able to use. The question on whether the fountains are maintained regularly and are up to standard show that 45 agree, 25 are neutral, 17 disagree, 15 strongly agree and 2 strongly disagree. Comments included issues of specific broken fountains not replaced such as ones in the McCain building as well as the Henry Hicks and others not maintain regularly when monitoring filter lights. When participants were asked if Dalhousie vendors, departments and societies encourage the use of tap water instead of purchasing bottled water, 39 disagreed, 35 were neutral, 17 agreed, 10 strongly disagree and 3 strongly agree. On the opinion on whether Dalhousie is making the community aware of the culture around bottled water and working to eradicate them from the campus, 40 disagreed, 29 were neutral, 22 agreed, 9 strongly disagreed and 4 strongly agreed. Many commented that Dalhousie could increase the campaign of limiting single use bottled water better. Finally, when asked if fountain were available at food service locations would you use them instead of purchasing bottled water, 73 strongly agreed, 21 agreed, 5 were neutral, 5 strongly disagreed and 0 disagreed.

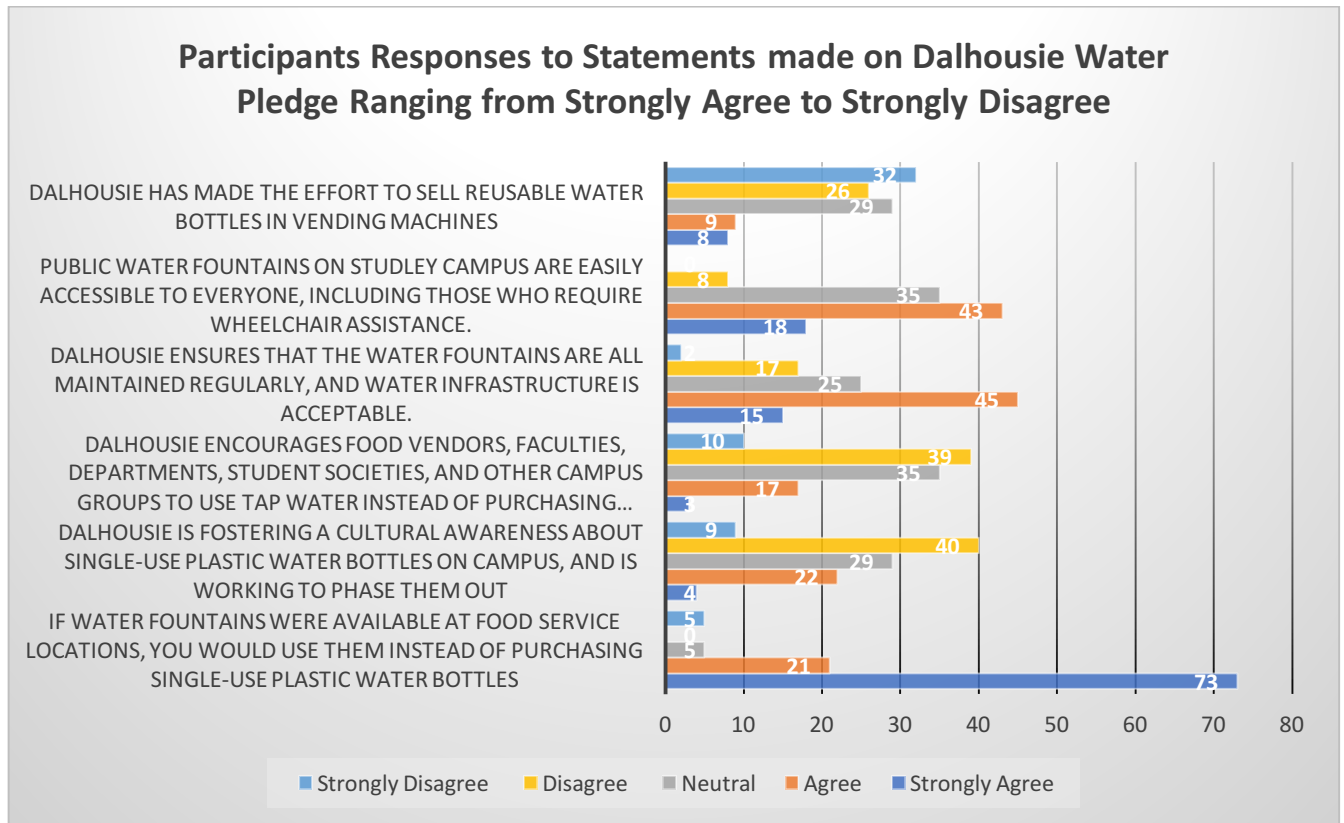


Figure 2. The survey participants responses of their own opinion surrounding different statements found within the Dalhousie Water Pledge created in 2013.

When posed the question of what participants would do if Dalhousie bans all bottled water on campus respondents claimed that 83% will instead bring a reusable bottle, 9% will use a fountain, 7% will go dehydrated and 1% will purchase another bottled beverage as seen in Figure 3. As for bottled water use versus water jug use during Dalhousie catering events the bottle water use has decrease from 1790 units from the 2016/2017 academic year to 1319 units in the 2018/2019 academic year and water jug use has increased from 1943 units from the 2016/2017 academic year to 3215 units in the 2018/2019 academic year as seen in Figure 4.

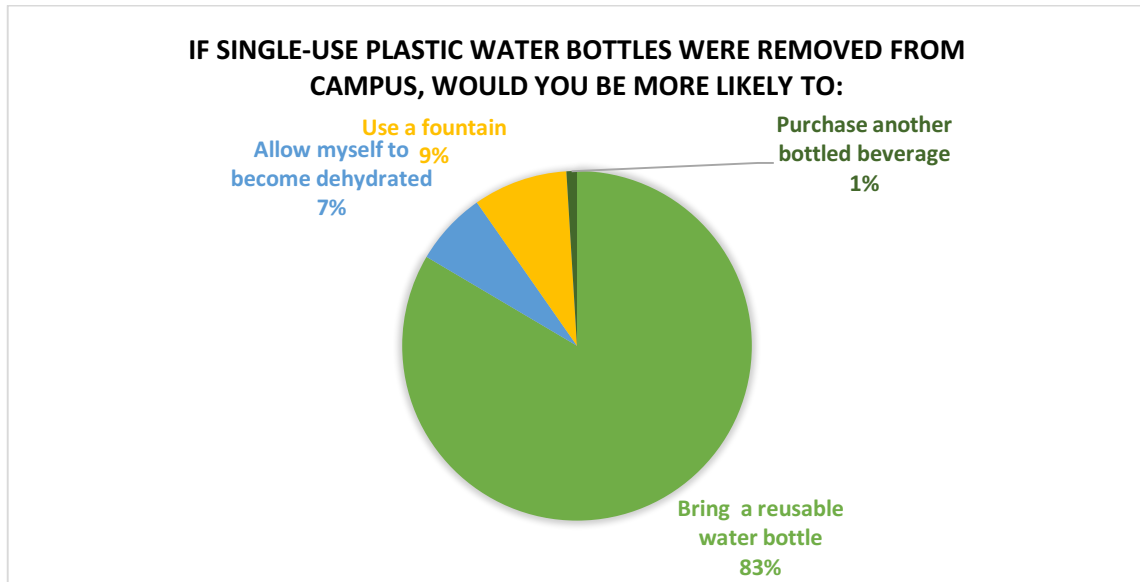


Figure 3. Pie chart representation of opinions on what respondents would do in the case of a single-use plastic water bottle ban on Dalhousie campus within the sample population.

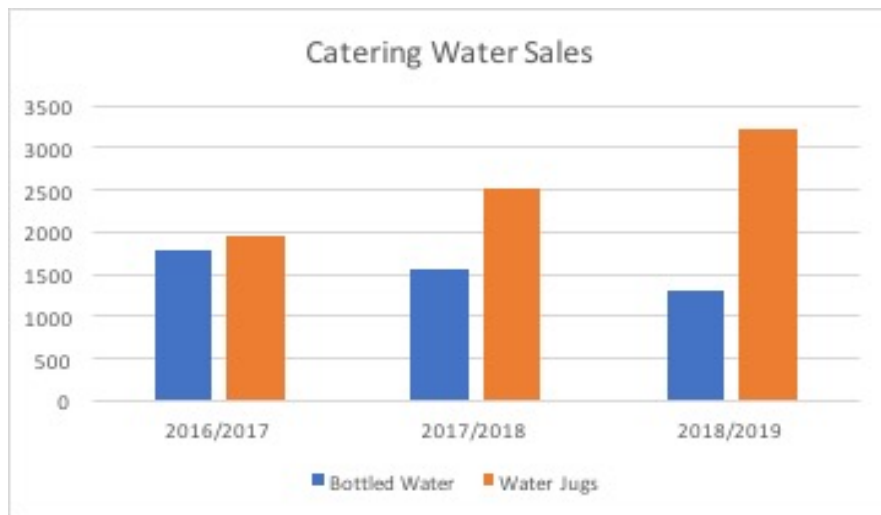


Figure 4. The number of bottled water sales versus the number of reusable water jugs used for catering events on Dalhousie campus.

Audits collected on five fountains within the Killam Library showed that fountains are used on an average of 2.71 times every 30 minutes. Meanwhile water purchases from Subway and Second Cup average 1.50 purchases every 30 minutes. When each fountain and vendor average use or purchase was compared in Figure 5, the fountains on floor 1, 4 and 2 averaged the most visits while uses on floor 3 and purchases at both Subway and Second Cup average the least number of visits. There was no signage at the vendors offering tap water, and when conducting the audit vendors were not informing customers of tap water availability.

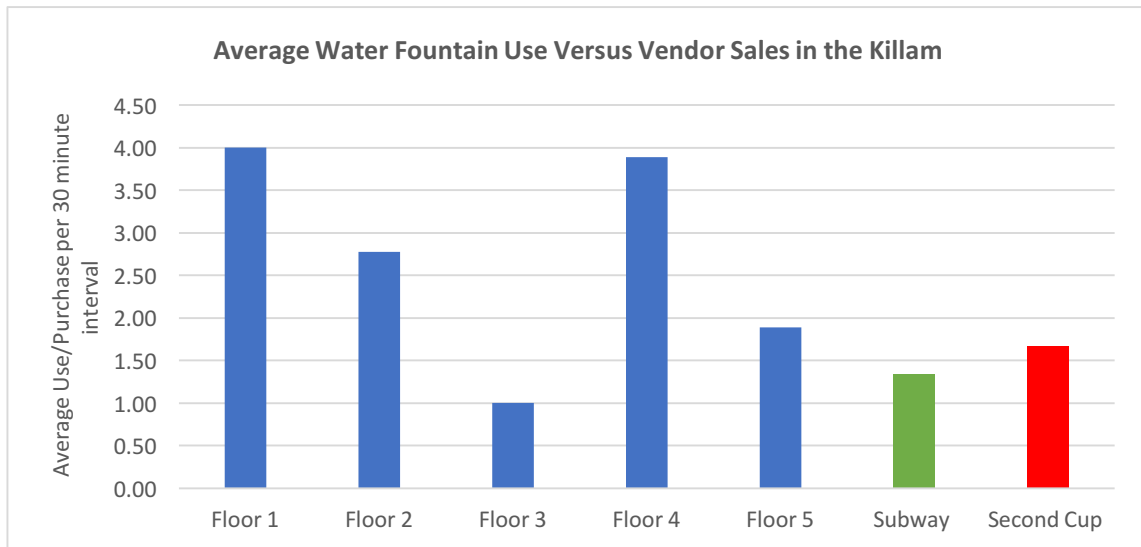


Figure 5. The average visits of each fountain and each vendor, Subway and Second Cup, per 30-minute interval in the Killam Library on Dalhousie Studley campus.

Discussion

With the research and results being outlined, we once again revisit the research question with what we've learned in mind: What is the progress behind the 2013 Dalhousie Water Pledge based on the perceptions of the Dalhousie Community, and the principles indicated within the pledge? Part of the purpose of exploring this topic was to see how well the perceptions aligned with what was initially suspected, with has been shown as part of the qualitative data results to be so. The latter part of the research question, outlined the progress based on the principles indicated.

The significant findings, reflected within both the qualitative and quantitative research methods, included the following:

- The Dalhousie community's values in regards to water usage and consumption on campus align with the principles indicated in the Water Pledge

- The Dalhousie community would like to see more action on promises within the pledge (outlined below)
- Accessibility, in terms of both mobility and general access, can be improved: some fountains are not easily accessible for those who are disabled, and some areas are lacking in fountains all together
- Maintenance, in terms of general upkeep, replacement, and repairs, is perceived as a need to be done more frequently
- Single use water bottle sales have decreased, but have not been eliminated, and tap water is not knowingly being offered at vendors as an alternative, not yet fulfilling this promise of the pledge
- The vast majority of the Dalhousie community would use reusable water bottles (if they aren't already) should the sale of single use water bottles cease.

In comparison to similar research studies, specifically the University of Winnipeg study done in 2009, there was an overwhelming positive response to banning single use water bottles on campus. Our study sample size showed that it was a higher percentage than the 55% obtained from their community, and given that our study did not encompass the entire community, we can confidently presume that percentage would remain on par within the community as a whole. Bans done at other universities, such as the previously mentioned, University of Ottawa and McGill, have shown to be successful, should that be a direction we could explore for action based on our findings.

Another interesting consideration of our findings in relation to existing studies was the results we received in regard to the perceptions of what clean and drinkable water is. Many concerns came from the community regarding the filter status on the refillable water fountains. The filter status being orange or red gives off the perception that the water is no longer good enough for consumption, despite the water being perfectly fine to drink regardless of the filter status. As previously mentioned, the Gorelick et al. study completed in 2011 indicated that the perception of water being “cleaner” and “having a better taste” was a primary reason individuals were more inclined to buy bottled water, which based on our results, is the same perception in regards to the filter status on the refillable machines.

Conclusion

Based on the above findings and comparisons, recommendations for action and further research are required.

In terms of future research, having a larger sample size for both qualitative and quantitative purposes would provide a better understanding of what is, and can be, done to continue the promises outlined in the Water Pledge. Having access to sales records of vendors would be an essential part of this research to fully understand its impact. A financial assessment would need to be conducted as well to

present a case for how much revenue Dalhousie is generating off water sales, how much they're spending to have the suppliers provide the single use water bottles for sale, and how much they could be saving (if any) by switching solely to refillable stations.

A focal recommendation would be to have more attention on maintenance and accessibility to the water fountains. As mentioned in the Results section, there are currently fountains that were removed and never replaced, which is in direct contradiction of the Pledge promise. Replacing these would be the first step for progress in regards to maintenance. Regular attention to replacing the filters when the status indicates a need to do so would also be an important action item. To aid in ensuring this is done regularly, providing awareness to students that they are eligible to report these to maintenance for their attention would be a key change that could see this being done more frequently. This could be done by simply putting the phone number above each fountain so students can place the maintenance request. To go a step further, we could explore putting an indicator above a fountain to state whether a request has already been made for the fountain to ensure it doesn't become a nuisance for the maintenance staff.

As accessibility comes in various forms in regards to the fountains, the first action recommendation would be in regards to reallocation (if possible) or new placement of fountains in areas where they can be accessed by all. The results indicated that several fountains were in tight spots that would be difficult for someone who is disabled to access to get water. General locations of the fountains are also not in areas that are visible or well known: having fountains located in more central and visible locations would increase the usage.

As an overall recommendation for action, Dalhousie should consider revisiting the Pledge, as it has been six years since its conception, to ensure that these values and promises are being addressed as intended. Providing a larger cultural awareness of the Pledge and its implications would be another general recommendation, as many survey participants were unaware of the existence of the Pledge to begin with.

As an establishment that is priding itself in its progressive practices, these actions would help create a forward motion to a healthier and more sustainable campus environment. In doing the above, Dalhousie would be able to also satisfy the desires of their community, making it an overall better campus for all.

References

- Abercrombie M., Cranston S., Hidalgo J., Kietzman W., Powell C., Sandell M. (2011). Diagnosis of the level of student support of campus-wide removal of bottled water. ENVS 3502: Dalhousie University. Halifax, Nova Scotia
- Atchison, C. & Palys, T. (2014). *Research Decisions: Quantitative, Qualitative, and Mixed Methods Approaches 5th Edition*. Nelson.
- Chung, E. (2010, April 21). Bottled water sales banned at Ottawa Campus. *CBC*. Retrieved from <https://www.cbc.ca/news/canada/ottawa/bottled-water-sales-banned-at-ottawa-campus-1.900754>
- Dalhousie University. (2013). Dalhousie University Drinking Water Pledge April 2013. *Dalhousie University*. Retrieved from: <https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/sustainability/Dalhousie%20Final%20Water%20Pledge.pdf>
- Fielding, K. & Hornsey, M.(2016). A Social Identity Analysis of Climate Change and Environmental Attitudes and Behaviors: Insights and Opportunities. *Front Psychology, 7*(121). Retrieved from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4749709/>
- Gagnon, G. (2009). Wading into the bottled water debate. *DalNews*. Retrieved from: <https://www.dal.ca/news/2009/04/21/water-debate.html>
- Gorelick, M.H., Gould L., Nimmer M., Wagner D., Heath M., Gashir H & Brousseau. D. C. (2011). Perceptions about water and increased use of bottled water in minority children. *Archives of Pediatrics and Adolescent Medicine, 165*, 928-932. Retrieved from: <https://www.ncbi.nlm.nih.gov/pubmed/21646572>
- Government of Canada. (2018 March). Frequently Asked Questions about Water Services. Retrieved from: <https://www.canada.ca/en/environment-climate-change/services/water-overview/frequently-asked-questions.html>

- Jaffee, D. & Case, R. (2018). Draining us dry: scarcity discourses in contention over bottled water extraction, Local Environment. *The International Journal of Justice and Sustainability*, 23(4), 485-501. DOI: 10.1080/13549839.2018.1431616.
- O'Donnell, C., and R.E. Rice. (2012). A Communication Approach to Campus Bottled Water Campaigns. *Social Marketing Quarterly*, 18(4), 255–273. Retrieved from:
<https://journals.sagepub.com/doi/abs/10.1177/1524500412466075?journalCode=smqa>
- Olsen, E. D. (1999). Bottled Water: Pure Drink or Pure Hype. *NRDC Citizen Petition*. Retrieved from
<https://www.nrdc.org/sites/default/files/bottled-water-pure-drink-or-pure-Hype-report.pdf>
- Van der Linden, S. (2015) Exploring Beliefs about Bottled Water and Intentions to Reduce Consumption: The Dual-Effect of Social Norm Activation and Persuasive Information. *Environment and Behaviour*, 47(5). 526-550. Retrieved from:
<https://scholar.princeton.edu/sites/default/files/slinden/files/bottled.pdf>
- Uehara, T., Ynacay- Nye A. (2018). How Water Bottle Refill Stations Contribute to Campus Sustainability: A Case Study in Japan. *Sustainability Basel Volume 10(9)*. Retrieved from:
https://search-proquest-com.ezproxy.library.dal.ca/docview/2108762370?rfr_id=info%3Axri%2Fsid%3Aprimo

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Appendices

Appendix A: Survey

Water Practices of the Dalhousie Community on Studley Campus (Research Project for SUST 3502)

This survey is being conducted for a research project in ENVS 3502: Environmental Problem Solving 2. The information collected from your responses will only be shared in aggregate form with the class and the Dalhousie Sustainability Office. No personal information will be recorded, and your identity will remain anonymous. The data will only be used within the scope of this research project. If you have any other questions, you can contact dal.water.survey@gmail.com or Dr. Amy Mui, at amy.mui@dal.ca

* Required

1. As a member of the Dalhousie community, you identify as... *

Mark only one oval.

- Student
- Faculty
- Staff
- Administration
- Volunteer
- Other: _____

2. Do you use a reusable water bottle? *

Mark only one oval.

- Yes
- No *Skip to question 6.*

This survey is being conducted for a research project in ENVS 3502: Environmental Problem Solving 2. The information collected from your responses will only be shared in aggregate form with the class and the Dalhousie Sustainability Office. No personal information will be recorded, and your identity will remain anonymous. The data will only be used within the scope of this research project. If you have any other questions, you can contact dal.water.survey@gmail.com or Dr. Amy Mui, at amy.mui@dal.ca

3. Why do you use a reusable water bottle? *

4. On average, how many times a day do you fill up your water bottle on Studley campus? *

Mark only one oval.

- Zero
- 1
- 2
- 3
- 4
- 5
- 6
- 7+

5. On average, how many times a week do you bring your reusable water bottle to Studley Campus? *

Mark only one oval.

- Zero
- 1
- 2
- 3
- 4
- 5
- 6
- 7

Skip to question 7.

This survey is being conducted for a research project in ENVS 3502: Environmental Problem Solving 2. The information collected from your responses will only be shared in aggregate form with the class and the Dalhousie Sustainability Office. No personal information will be recorded, and your identity will remain anonymous. The data will only be used within the scope of this research project. If you have any other questions, you can contact dal.water.survey@gmail.com or Dr. Amy Mui, at amy.mui@dal.ca

6. Why do you NOT use a reusable water bottle? *

This survey is being conducted for a research project in ENVS 3502: Environmental Problem Solving 2. The information collected from your responses will only be shared in aggregate form with the class and the Dalhousie Sustainability Office. No personal information will be recorded, and your identity will remain anonymous. The data will only be used within the scope of this research project. If you have any other questions, you can contact dal.water.survey@gmail.com or Dr. Amy Mui, at amy.mui@dal.ca

7. **Do you purchase single-use plastic water bottles? ***

Mark only one oval.

- Yes
- No

8. **If YES, how often do you purchase single-use water bottles on a weekly basis? ***

Mark only one oval.

- Not Applicable
- 1
- 2
- 3
- 4
- 5
- 6
- 7+

9. **If YES, what is your reason for purchasing single-use plastic water bottles? (Please type N/A if not applicable) ***

10. **If water fountains were available at food service locations, you would use them instead of purchasing single-use plastic water bottles ***

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

15. **Comments**

16. **Dalhousie encourages food vendors, faculties, departments, student societies, and other campus groups to use tap water instead of purchasing bottled water ***

For the following statement, please indicate whether you agree or disagree. Leave a comment in the next screen if desired.

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

17. **Comments**

18. **Dalhousie ensures that the water fountains are all maintained regularly, and water infrastructure is acceptable. ***

For the following statement, please indicate whether you agree or disagree. Leave a comment in the next screen if desired.

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

19. **Comments**

20. **Dalhousie is fostering a cultural awareness about single-use plastic water bottles on campus, and is working to phase them out ***

For the following statement, please indicate whether you agree or disagree. Leave a comment in the next screen if desired.

Mark only one oval.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

21. **Comments**

Dalhousie Water Pledge

Dalhousie signed water pledge in April 2013, summarized below:

Dalhousie promises to:

- Carry out public water infrastructure improvement when deemed necessary & maintain at a level deemed necessary by regulatory bodies, the University standards, and Health Canada;
- Replace any fountain that is to be decommissioned;
- All new fountains be wheelchair accessible and encourage easy refill of reusable water containers;
- Actively pursue water conservation;
- Terminate sales of office-sized cooler units and cooler bottled water;
- Work with campus beverage providers and on campus food providers to reduce bottled water in catering and at on-campus food service locations;
- Reduce bottled water at campus events;
- Actively build a culture of awareness and responsibility regarding bottled water and water sustainability;
- Encourage campus vendors to offer tap water free of charge and without pressure to purchase other items;
- Make annual upgrades to existing drinking fountains or replace as necessary; and
- Explore the subsidized sale of reusable water bottles in snack vending machines.

The full pledge can be found at

<https://cdn.dal.ca/content/dam/dalhousie/pdf/dept/sustainability/Dalhousie%20Final%20Water%20Pledge.pdf>

22. **Are you willing to engage in mobilization around holding administration accountable for easy access to healthy water, as well as limit ***

Mark only one oval.

Yes

No

23. **By participating in this survey, you are eligible to be part of a draw for several prizes. Would you be interested in entering for a chance to win? ***

Mark only one oval.

Yes

No *Skip to question 25.*

24. **Please enter your email address below. Winners will be selected by random draw, and contacted by email on 02/04/2019 ***

25. **Thank you for your participation in this survey. Please feel free to include any additional comments in the space below.**



Appendix C: Data from Rochelle Owen

With regards to the water pledge here is some background:

- In 2009 – 2010 banning bottled water on campus was brought up at the President’s Advisory Council on Sustainability. After three years of debate 2009-2013 at the Council and many versions of a document, a water pledge was agreed to as opposed to a ban for the University. The DSU opted to create their own water bottle ban for the SUB (as the DSU controls the food services contracts here) but think in the end was not implemented. There were a number of issues discussed including:
 - If you ban bottled water than you still have single plastic bottles being used for sugar water (pop), juice, vitamin water in vending, catering, retail. Some suggest water is healthier than other options. There was discussion of options eliminating vending, only providing jugs of juice and water in catering, and no drinks in retail unless it was fountain. There was discussion over not providing options that some campus members want and/or could get next-door to campus.
 - Social stance of not commodifying a public good that we already pay for through our taxes
 - Other suggested we provide more choice and incentives for campus members to choose alternatives.
- In the end a pledge was created with the ethos of creating more choice and reducing overall potable water use. The largest contributors of potable water (drinking water) use on campus is process water for activities like research and central cooling.

What has happened during the development and after the pledge:

- Our Office worked with the Centre for Water Resources, Halifax Water Commission, Facilities Management and the Health and Safety Office to test drinking water fountains and sinks on campus. From this activity (started in 2009 - three years of work and published research articles) a fillable water fountain standard was created, and fountains that were older and showing closer to Health Canada standards were replaced. Each year groups like Facilities Management and Ancillary Services – add fillable water fountains on campus to replace older ones and create better access for alternatives. Attached is the list of fillable fountains that was recently updated from Ancillary Services. A water testing standard was also developed and has been given to FM to implement on a rotating cycle.
- The cost of Jugs of Water in catering use to be \$6.00 they were reduced to be \$3.00. You see some of the pricing showing up in the reduction numbers.
- Ancillary Services (food services) at one point but stickers up to say you can ask for tap water at any retail location for no charge. Haven’t checked recently to see if they are there.
- Potable water reduction. A number of water projects have been undertaken on campus to reduce potable water including campus wide fixture upgrades, recirculating water for research and cooling purposes, ... You can see the reductions and some of the actions in the Sustainability progress report.

Bottled Water:

Sept 1, 2016 to March 15, 2017 = 1790 units

Sept 1, 2017 to March 15, 2018 = 1571 units

Sept 1, 2018 to March 15, 2019 = 1319 units

Pitchers of Ice Water

Sept 1, 2016 to March 15, 2017 = 1943 units

Sept 1, 2017 to March 15, 2018 = 2512 units

Sept 1, 2018 to March 15, 2019 = 3215 units

**Please note that this does not include pitchers of water which are included with packages

**I would estimate that to be double

Appendix D: Raw Quantitative Data

Water Fountain Audits

Location	Time & Date	Number of reusable water bottles filled	Number of single use bottles filled	Number of single uses	Total uses	Accessible?
Floor 1	March 7 Start: 4:16pm	3	3	8	14	Yes
Floor 1	March 13 Start: 10:22 am	9	-	3	12	Yes
Floor 1	March 13 Start: 10:52 am	8	1	1	10	Yes
Floor 2	March 7 Start: 4:48pm	4	1	4	9	Yes
Floor 2	March 12 Start: 6:55pm	9	-	3	12	Yes
Floor 2	March 13 Start: 12pm	3	-	1	4	Yes
Floor 3	March 8 Start: 11:45 am	3	-	1	4	Waste bins surrounding
Floor 3	March 13 Start: 10:57am	1	-	1	2	“
Floor 3	March 14 Start: 3:04pm	2	-	1	3	“
Floor 4	March 11 Start: 6:50pm	8	-	1	9	“
Floor 4	March 12 Start: 3:40pm	9	-	2	11	“
Floor 4	March 14 Start: 2:32pm	11	1	3	15	“

Floor 5	March 12 Start: 1:15pm	5	-	4	9	Yes
Floor 5	March 12 Start: 3:07pm	3	-	-	3	Yes
Floor 5	March 13 Start: 10:25 am	5	-	-	5	Yes

Vendor Audits

Location	Time & date	Cost of bottled water	Count of water bottles sold	Is tap water available?
Second Cup	March 20 Start: 10:52am	\$2.82 for Aquafina \$2.57 for Carbonated \$3.66 for Life water	1	Yes, but not advertised.
Second Cup	March 21 Start: 1:59pm	"	2	"
Second Cup	March 22 Start: 2:02pm	"	2	"
Subway	March 20 Start: 10:50 am	\$2.75 for Aquafina	1	Yes, but not advertised.
Subway	March 21 Start: 2:29pm	"	1	"
Subway	March 22 Start: 2:32pm	"	2	"

