POLICY PAPER

Environmental Sustainability

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Introduction

McMaster University, one of four Canadian universities listed among the Top 100 universities in the world, is renowned for its innovation in both learning and discovery. Fundamental to its role as an innovator is its adoption of environmentally-sustainable practices. While the University has demonstrated a commitment to environmental sustainability, there are further steps the University can take to secure McMaster's spot as a leading innovator both in and outside of the classroom.

The first section of the policy addresses environmental sustainability issues related to food on campus and waste. There is a high volume of waste produced on campus, much of which is related to food. Through the implementation of sustainable waste management strategies such as incentivizing reusable utensils and introducing portion sizing for campus food, there can be an effective reduction in such waste. More awareness regarding composting practices and electronic waste disposal, accompanied by more convenient access to disposal, will also serve to promote more sustainable waste management.

The next section discusses energy, focusing specifically on sustainable energy practices and steps towards further energy conservation. Aspiring towards a green energy campus, the University should consider fossil fuel divestment, LED and sensor lights wherever possible, in addition to other sustainable energy sources. Strategies such as reducing any nonessential usage of energy on campus and a deep energy retrofit will also successfully reduce utility costs expended on energy usage.

Next, the policy puts forth recommended means to reduce the University's carbon footprint, outlining various concerns around greenhouse gas and carbon dioxide emission as well as paper usage. A discussion on the topic of water follows, with recommended strategies for eliminating the usage of single-use water bottles and reducing the University's water consumption.

Finally, the policy closes with recommendations for greater accountability to sustainable goals and more innovation in sustainable practices. The University is urged to improve its transparency regarding water and waste management and energy usage; increase its efforts in educating students in sustainable practices; keep its sustainability policies up to date and include more student consultation; and expand its sustainability initiatives while promoting greater interconnectedness across different University bodies with environmental sustainability causes.

By addressing these specific components of the University's environmental sustainability, McMaster can establish itself to not only be a leader as an academic institution but also a leader in sustainable development as well. The MSU would like to call on university policy makers and relevant stakeholders to tackle these student concerns at a system level, improving the student experience, contributing to a global conversation on sustainable development, and taking a right step forwards in creating a brighter world.

Food and Waste

Food-related Waste Reduction

Principle: All members of the university community have a responsibility to reduce production of all forms of waste.

Principle: McMaster Hospitality Services should work towards developing and implementing sustainable food-related waste management and reduction strategies.

Concern: A high volume of food waste is produced on-campus, with a significant proportion of this waste being neither recyclable or biodegradable.

Concern: Students are unaware of existing discount programs for when they bring reusable containers.

Recommendation: Hospitality services should explicitly advertise discounts for students who bring their own food and beverage containers on campus.

Recommendation: Hospitality Services should expand the Eco-Takeout Container Program to all its facilities.

Recommendation: Hospitality Services should increase promotional efforts and incentivize the eco takeout container for the program.

Recommendation: All McMaster-affiliated groups and events organized on McMaster property should adhere to the Waste-Free Event Guidelines.

McMaster University has implemented commendable initiatives to reduce production and regulate the disposal of waste. However, er, numerous gaps still exist in the current system, and the University has a responsibility to address them at the institutional level. A waste audit was conducted in October 2022 for the Hamilton campus of McMaster University.[1] At the time, McMaster hosted over 30,000 students, over 1,400 faculty members, and over 7,500 staff members, which totaled nearly 40,000 individuals.[2] The audited buildings were Hamilton Hall, Burke Science Building, John Hodgins, Brandon Hall, McMaster University Student Centre, and Mills Library. In total, over 1.2 million kilograms of waste were produced, of which 7.5%went to the landfill. 614, 000 kilograms represents a staggering amount of waste that will permanently reside in landfills.[1] Although this number is much lower than previous annual audits, it may not be completely representative of McMaster's waste reduction strategies, as 2022 was one of three Covid-response years. Virtual learning and occupancy restrictions have likely impacted these numbers.[3]

The most viable approach to reducing landfill-bound waste is to tackle the root of the issue: waste production. Although the university cannot control how its members produce waste, it can take strategic measures to minimize or discourage waste production. Promising efforts that have been made include the installation and promotion of water-refill stations by Facility Services, the Eco-

[1] Waste Reduction Group Inc. McMaster University 2022 Non-Hazardous Waste Audit [Internet]. 2022 [cited 2023Apr24]. Available from: https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Audit-2022.pdf

[2] Get to know McMaster [Internet]. DISCOVER McMASTER. 2023 [cited 2023Apr24]. Available from: https://discover.mcmaster.ca/fast-facts/get-to-know-mcmaster/#:~:text=McMaster%20is%20home%20to%2032%2C119%20undergraduates%20and%205%2C251,McMaster%20students%20were%20international%20students%2C%20from%20120%20countries.

[3] https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Audit-2022.pdf

Takeout Container Program by Hospitality Services, and the MSU Plastic Bottle Free Policy.[4][5][6] However, there is still room for growth.

First, most on-campus food facilities provide plastic or non-recyclable/non-compostable utensils, thereby producing a high volume of landfill-destined waste. McMaster University offers food products and services primarily through Hospitality Services. Certain products and services incorporate more sustainable materials. For instance, single-use takeout containers for hot food from Bridges, Café One, La Piazza, Centro, East Meets West Bistro, and CaFFeINe are composed of sugarcane fibers and are therefore compostable.[7] Additionally, the clear plastic takeout containers from the aforementioned locations are reportedly produced from corn and are compostable.[8]

Despite these efforts, there are a number of remaining gaps that have yet to be addressed. To begin, the compostable containers should be available at all food service locations on campus, including independent franchises (e.g., Teriyaki Experience). Further, the university and Hospitality Services should actively promote these sustainability initiatives further, as those who are not aware that containers and utensils are compostable may throw them in waste bins to eventually end up in landfills. This hinders the value and effectiveness of the compost program. Considering that single-use containers still require greater production of material and may end up in the landfill even though it's compostable, the Eco-Takeout Container Program should be expanded to more dining locations, especially La Piazza. This system requires greater promotional and educational backing, particularly amongst students living in residence, who obtain most of their food from on-campus Hospitality Services facilities. In addition, the Eco takeout program is hindered by issues of returning containers to be washed. Providing an incentive for students to return their containers could improve the efficiency of the program and obtain more members.

Recently, Hospitality Services halted the usage of plastic utensils and opted for entirely compostable utensils, ensuring acknowledgment of the distinction between “compostable” and “biodegradable” The latter can often be deceiving; it signifies that the material can be broken without oxygen within a short length of time, but it does *not* mean that no toxic residue will remain.[9] In other words, *everything* is biodegradable over time. With respect to straws, any straws that are provided on campus are also compostable.[10] To better communicate the switch to compostable items, McMaster should manufacture these containers with a label (e.g. “I am compostable”) to make it clear to each student receiving a container where they should dispose of it. To complement the shift to compostable containers and utensils, McMaster should focus on expanding the infrastructure of the compost program to provide students with more locations to dispose of their containers/utensils and avoid resorting to regular waste bins out of convenience. Currently, compost bins aren’t completely widespread and can be found at only select locations

[4] McMaster University Facility Services, 2016 Sustainability Annual Report, p. 14, https://www.mcmaster.ca/sustainability/documents/Annual%20Report%202016.pdf#page=14, accessed February 2018.
[5] McMaster Hospitality Services, “Eco-takeout container program: Keeping Mac green,” McMaster University. accessed February 15, 2018, http://hospitality.mcmaster.ca/sustainability.html
[6] Sustainability at McMaster, “MSU plastic bottle free policy,” McMaster University. accessed February 15, 2018, https://www.mcmaster.ca/sustainability/waste_bottle.html
[7] Sustainability at McMaster, “MSU plastic bottle free policy,” McMaster University. accessed February 15, 2018, https://www.mcmaster.ca/sustainability/waste_bottle.html
[8] Ibid.
[9] BioBag USA, “Compostable vs biodegradable,” BioBag Americas Inc. accessed February 15, 2018, http://biobagusa.com/environment/compostable-and-biodegradable/
[10] Sustainability [Internet]. Hospitality Services. McMaster University; 2022 [cited 2023Apr24]. Available from: https://hospitality.mcmaster.ca/wellness-sustainability/sustainability/#:~:text=We%20offer%20compostable%20cutlery%2C%20paper,lids%20and%20take%20out%20containers.

on campus.[11] Adding more bins and adjusting the collection system accordingly will provide more opportunities to do the right thing. Additionally, McMaster runs a *Compost Champions* program whose goal is to advocate, educate, and promote composting – especially through setting up compost bins in their workspaces and disposing of them at collection sites on campus. Promoting this initiative at more student events (e.g. club fest) may motivate students to take initiative and become a Compost Champion or simply better understand the importance of properly disposing of their containers.[12]

Second, active measures should be taken to encourage students to bring their own reusable utensils, container, and cups. Contrary to popular belief, coffee cups are *not* recyclable.[13] Certain food vendors have existing policies that offer discounts for customers who bring their own beverage containers, including Tim Hortons, Starbucks, Williams, and even Union Market.[14] The university should push for all vendors, including Booster Juice, to offer this promotion. Moreover, most students are unaware of the discount. The university and MSU should collaborate with the vendors as well as the OPIRG McMaster Group, and Mugs at Mac, to actively promote it.[15] For instance, they could run an awareness campaign. The "Bring Your Own Mug" incentive should be expanded to reward those who bring their own reusable containers. In the implementation of this recommendation, Hospitality Services should adopt a calibration system that accounts for the weight variation amongst different containers. This initiative would primarily apply to food items that are charged by weight, such as self-serve salad bars. Alternatively, Hospitality Services can decrease the per-kilogram cost of food; this would also incentivize students to bring their own reusable containers.

Events hosted on campus grounds or by university-affiliated groups, such as MSU clubs, GSA clubs, and McMaster departments, should strive to maximize environmental sustainability. In particular, these groups should be required to review the Waste-Free Events Guide developed by Sustainability at McMaster and adhere to all feasible recommendations.[16] Recommendations include encouraging participants to bring their own mugs and reusable containers, ensuring compostable materials are used if single-use items are required, considering alternatives to paper advertising, minimizing hand-outs, and ensuring that recycling, composting, and waste bins are accessible and well-labeled. To ensure the active adoption of the guidelines, they should be integrated into the McMaster University Sustainability Policy, which has not been updated since March 2018.[17] As this may require time, immediate actions should be taken to actively promote the use of the guide amongst all event-organizing groups. Groups should be encouraged to explicitly request catering services, including Paradise Catering and TwelvEighty, to use reusable plates and metal utensils instead of paper service, or cream and milk cartons and sugar bowls instead of individual creamers and sugar packets.

[11] Map Viewer. [cited 2023Apr24]. Available from: https://macfacilities.maps.arcgis.com/apps/mapviewer/index.html?webmap=13e1bd1b736a462d8482f5d4b92844d5

[12] Composting champions program [Internet]. Facility Services. 2022 [cited 2023Apr24]. Available from: https://facilities.mcmaster.ca/sustainability/composting-champions-program/

[13] Sustainability at McMaster, "Coffee cups," McMaster University. accessed February 15, 2018, https://www.mcmaster.ca/sustainability/waste_cups.html

[14] Ibid.

[15] OPIRG McMaster, "Mugs @ Mac," OPIRG McMaster. accessed February 15, 2018, https://www.opirgmcmaster.org/portfolio-items/mugs-mac-2/.

[16] Sustainability at McMaster. 2012. "Looking to make your event sustainable and waste-free?" https://www.mcmaster.ca/sustainability/waste_waste_free_events_guide.html

[17] McMaster University. 2010. "McMaster University Sustainability Policy." https://www.mcmaster.ca/sustainability/policies/McMaster_University_Sustainability_Policy.pdf

Solid Waste Management: Recycling and Composting

Principle: Sustainable solid waste management strategies that promote correct recycling and composting practices are an essential component to sustainability.

Concern: Recyclable and compostable waste is not effectively diverted from the landfill, as students and staff do not practice correct waste separation.

Concern: There are not enough designated compost disposal bins available on campus to support the amount of compostable waste produced on campus.

Recommendation: Facility Services should ensure all bins for composting, recycling, and garbage should be located in close proximity to limit incorrect waste disposal.

Recommendation: Facility Services should design waste bins to aid correct disposal and keep the design consistent across all campus buildings to minimize confusion.

Recommendation: The University should aim to expand its compost program and further promote it in order to better support hospitality services' decision to distribute only compostable containers and utensils.

Recommendation: Facility Services should implement clear and consistent signage above waste collection bins to inform individuals and encourage them to practice correct disposal.

Recommendation: Facility Services should implement compost bins at more locations on campus.

Recommendation: Facility Services should clear compost bins daily.

Recommendation: McMaster should expand it's paper towel composting trial program to all high traffic areas and ensure consistent signage.

The University needs to implement more substantial reforms in its solid waste management system to increase its waste diversion. Due to the implementation of McMaster's compost program, around 50% of organic waste on campus was composted according to the 2022 Non-Hazardous Waste Audit.[18] Although this statistic reflects a significant improvement from the diversion rate.

In 2022, the University released a Waste Reduction Work Plan, as mandated by the Ministry of the Environment, outlining its intention to improve waste diversion and reduce waste production.[19] However, many of the stated goals were vague and/or were not supported with definitive action plans. For most of the recyclable materials, the goal statement was "Continue to recycle", and "Remind staff and students of existing programs", with the accompanying implementation plan as "Increase the number of bins and provide educational material". The University should design a comprehensive waste reduction plan with an ongoing evaluative component as well as more detailed and sizeable action items. Moreover, the waste diversion plan should be undertaken with the reduction of waste production as the forefront priority.

Facility Services should redirect their focus from increasing the number of waste bins to increasing the correct and regular usage of recycling and composting bins by students and staff. Proper separation of waste at the source is essential to reduce contamination and, by extension, increase

[18] https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Audit-2022.pdf
[19] McMaster University Facility Services, Ministry of the Environment Waste Form: Report of a Waste Reduction Work Plan, http://www.mcmaster.ca/sustainability/documents/Waste%20Reduction%20Work%20Plan-Schools-2015.pdf, accessed February 2018.

the possibility of recovering the materials to be recycled or composted. When non-recyclable items, such as food- or grease-smeared paper, are placed in recycling bins, they contaminate the recyclable items. Facilities and manufacturers are less likely to accept contaminated materials, meaning the items will ultimately end up in the landfill.[20]

To limit incorrect waste disposal, the bins for composting, recycling, and regular waste should always be located in close proximity to one another. The design of the bins is another critical consideration. Certain recycling bins on-campus have wide openings and differ from waste bins only in their colour; these should be replaced with bins that have openings corresponding to the physical shape of recyclable items. One study recognized that recycling bins with holes in the lids increased the recycling rate by 34%, while those lacking holes were essentially used as regular waste bins.[21] Although McMaster has adjusted recycling bin hole sizes, consistency between bin designs across campus will limit confusion and ensure optimal recycling. Moreover, Facility Services has implemented a "waste labeling criteria aimed at enhancing waste diversion and reducing cross-contamination between different types of recycled waste," which is currently undergoing evaluation.[22] This system may be improved further; Facility Services should also place consistent signs above waste bins to better guide individuals in identifying the acceptable items for each bin. Currently, most bin signage provides photos of acceptable items allowed in each bin. Facility services can aim to make signage more descriptive and consistent between all bins, like the examples posted on Harvard University's sustainability website. [23]

McMaster's composting program includes the McMaster Students Union office kitchen, Mary E. Keyes kitchen and dining area, Bridges Café kitchen and dining area, Twelve Eighty kitchen and dining area, Union Market, Student Centre, MDCL, La Piazza kitchen area, Phoenix kitchen and dining area, Centro @ Commons kitchen and dining area, and the Communications Research Laboratory kitchen areas and paper towels from certain washrooms. The availability of compost disposal bins is important in kitchen areas given the amount of food scraps or waste that are inevitably produced, and it has led to the 100% compost rate of food-waste produced in facility services kitchens.[24] This does not account for other areas on campus where students eat or produce other forms of compostable waste. This makes it difficult for students to adequately dispose of compostable materials, including the take-out containers in which most campus food is served, thus diminishing the potential to reduce campus-wide landfill waste and incineration. Thus, it is recommended that compost bins are implemented at additional locations on campus such as libraries, as well as at all sit-down eateries and cafés including but not limited to the Williams Café in the Health Sciences Building, IAHS Café in the Institute of Applied Health Science, and DSB Bistro in the DeGroote School of Business.[25] Bins for compost disposal should also be made available in-residence buildings.

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[20] Stanford Recycling, "Frequently Asked Questions: Contamination," Stanford University. accessed February 15, 2018, https://lbre.stanford.edu/pssistanford-recycling/frequently-asked-questions/frequently-asked-questions-contamination

[21] Sean Duffy, Michelle Verges, "It Matters a Hole Lot: Perceptual Affordances of Waste Containers Influence Recycling Compliance," Environment and Behavior 41, no. 5 (2009): 1

[22] Sustainability at McMaster, "Waste," McMaster University. accessed February 15, 2018, https://www.mcmaster.ca/sustainability/waste.html

[23] Office for Sustainability, "Frequently Asked Questions: Contamination," Harvard University. accessed February 15, 2018, https://green.harvard.edu/topics/waste/signage

[24] McMaster's sustainability strategy [Internet]. Online Publications. 2022 [cited 2023Apr24]. Available from: https://publications.mcmaster.ca/app/uploads/2022/10/McMaster-Sustainability-Report-2021-22-updated-oct26.pdf

[25] McMaster Hospitality Services, "Hours of operations," McMaster University. accessed February 15, 2018, http://hospitality.mcmaster.ca/hours.html

Compost bins should be accompanied by accessible education material indicating permissible materials to be composted, such as a poster outlining what may be placed in the bin. Coupled with these launches should be awareness campaigns on reducing food waste and compost promotion. McMaster's Composting Champions program aims to increase educational awareness and encourage composting at campus events.[26] However, this program can be further advertised to students to increase its outreach. McMaster should target food waste reduction and compost through educational campaigns that can be held throughout the year in high traffic areas like the student centre. A potential next step in improving composting at McMaster would be to investigate ways in which food waste can be converted into industrial energy. or contributing to efforts that convert food waste into industrial energy. Anaerobic digesters are enclosed structures that use anaerobic organisms to break down organic matter in the absence of oxygen. Its goals would be to produce biogas and fertilizer that can reduce greenhouse gas emissions and the costs of buying fertilizer. It also occurs at a faster rate than the natural biodegradation process and provides compost facilities that reduce the costs of compost pick up and transport.[27] The costs associated with initial building of the structure, maintenance, and management of the microorganism balance prevent its widespread use. Additionally, in order for a digester to be a feasible investment, McMaster would need to produce enough organic waste to feed into the digester to produce considerable amounts of energy and enough space to build such a large facility.[28] The implementation of a digester at Pennsylvania State University was successful due to its collaboration with nearby farms associated with the Penn State Dairy Complex.[29] Large amounts of manure produced on-farm make the digester worthwhile according to the United States Environmental Protection Agency recommendations.[30] Although McMaster alone may not have the space or waste to justify a biodigester, a more in-depth analysis of the feasibility of anaerobic digesters or similar technologies should be conducted by the University. Potential collaboration with nearby farms could make a community digester a feasible option to explore further.[31]

According to the McMaster Waste Reduction Plan 2022 McMaster piloted a paper towel composting strategy in high traffic areas. This should be audited to determine the efficacy and further expansion of implementing a waste management program for paper towels. With adequate signage and easy to access compost bins, this initiative should be effective in mitigating paper towel waste and increase McMaster's waste diversion rate.[32]

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[26] McMaster Facilities Services. "Composting Champions Program," McMaster University. 2022 https://facilities.mcmaster.ca/sustainability/composting-champions-program/

[27] DeRouchey JM. Manure/waste management | Manure Management. Encyclopedia of Meat Sciences. 2014;:152–6. https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/anaerobic-digesters#:~:text=Anaerobic%20digesters%20are%20simply%20an,energy%20as%20a%20flammable%20gas.

[28] Investigating campus anaerobic digestion feasibility [Internet]. The University of Vermont. [cited 2023Apr24]. Available from: https://www.uvm.edu/news/sustainabilityoffice/investigating-campus-anaerobic-digestion-feasibility

[29] All about the Penn State University Digester [Internet]. Penn State Extension. [cited 2023Apr24]. Available from: https://extension.psu.edu/all-about-the-penn-state-university-digester

[30] EPA. Environmental Protection Agency; [cited 2023Apr24]. Available from: https://www.epa.gov/agstar/anaerobic-digestion-right-your-farm

[31] Anaerobic digesters give universities food for thought [Internet]. Lexology. Sullivan & Worcester LLP; 2016 [cited 2023Apr24]. Available from: https://www.lexology.com/library/detail.aspx?g=3ac27c3e-8487-42b1-9d7f-085f8b930771

[32] Facilities.mcmaster.ca [Internet]. [cited 2023Apr25]. Available from: https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Reduction-Workplan-2022.pdf

Electronic Waste (E-Waste) Management

Principle: Students should be equipped with the knowledge and means of safely disposing their electronic devices.

Concern: Due to a lack of knowledge and convenient disposal locations, students incorrectly dispose of e-waste.

Recommendation: McMaster University should inform students of appropriate e-waste disposal practices in collaboration with MSU services through accessible avenues for greater outreach.

Recommendation: McMaster University should establish accessible drop-off locations for e-waste disposal across campus.

McMaster University had a total student population of 37, 370 the 2021-2022 school year.[33] and with post-secondary student owning an average of 7 technology devices,[34] there is a clear need for investment in electronic waste services. Electronic products that have become obsolete need to be disposed properly. Electronic equipment contains harmful chemicals such as cadmium, mercury, and lead.[35] This means that they cannot be disposed of along with regular waste, and should be diverted from landfills. Responsible e-waste disposal is expensive and may be inconvenient due to difficulties with access.[36],[37,38] A more recent initiative developed by McMaster's 2019-2020 IT Strategy was the implementation of an E-Waste bin in the lobby of Mills Library, which provides student's with a safe and secure way to dispose of electronics. However, there is limited knowledge of these services among the student body.

Other collection locations include cages are accessible year-round in locations across campus including the Arthur Bourns Building (ABB), John Hodgins Engineering Building (JHE), Information Technology Building (ITB), in a shed outside of Mills Memorial Library, Michael DeGroote Centre for Learning and Discovery (MDCL) loading dock, Engineering Technology Building, General Sciences Building, Ivor Wynne Centre, and Campus Services Building.[39] While the abundance of locations for electronics collection is commended, the obscurity of the actual collection cages—from inconspicuous basement rooms to outdoor sheds—should be called into question. It is recommended that more concerted efforts should be directed toward providing information about these e-waste drop-off locations to students. Some avenues to disseminate such information include taking advantage of campus-wide events such as welcome week, through information cards available in libraries, campus television screens, and student groups such as the Student Representative Assembly, faculty societies, etc. Additionally, to make these drop-off locations more convenient, designated e-waste containers (along with pictorial instructions of what constitutes e-waste) should be placed in more high-traffic areas, such as

[33] https://discover.mcmaster.ca/fast-facts/get-to-know-mcmaster/
[34] Tammy Nelson, "Tech-Savvy College Students Are Gathering Gadgets, Saying Yes to Showrooming and Rejecting Second-Screening", Globe Newswire, June 13, 2013, http://www.globenewswire.com/news-release/2013/06/13/554002/10036312/en/Tech-Savvy-College-Students-Are-Gathering-Gadgets-Saying-Yes-to-Showrooming-and-Rejecting-Second-Screening.html, accessed February 2018.
[35] Sustainability at McMaster, "Electronics recycling," McMaster University. accessed February 15, 2018, http://www.mcmaster.ca/sustainability/waste_IT.html.
[36] Ibid.
[37] McMaster University Facility Services, 2016 Sustainability Annual Report, p. 15, https://www.mcmaster.ca/sustainability/documents/Annual%20Report%202016.pdf#page=15, accessed February 2018.
[38] Sustainability at McMaster, "Electronics recycling," McMaster University. accessed February 15, 2018, http://www.mcmaster.ca/sustainability/waste_IT.html.
[39] Sustainability at McMaster, "Electronics recycling: Battery recycling," McMaster University. accessed February 15, 2018, http://www.mcmaster.ca/sustainability/waste_IT.html#battery.

libraries and the Student Centre. Further, e-waste drop-boxes should also be made available to the almost 3600 students in residence who bring with them several electronic devices into their temporary living spaces.[40] Information can also be provided to students on where they can dispose of their e-waste within Hamilton if campus drop-off isn't a convenient option. These initiatives will hopefully increase diversion of e-waste from landfills.

The Sustainability at McMaster webpage includes very detailed instructions outlining what materials are permitted to be recycled, and in which drop box it belongs.[41] Dropbox locations may differ for toner cartridges depending on their brand, discs, batteries, cell phones, etc. For example, discs can be dropped off at the Service desks in the Commons Building as well as Mary E. Keyes Residence, and at the OPIRG Office in the Student Centre, while batteries' locations include the service desks in addition to several other locations, such as the ABB room B166, the OPIRG Office in the Student Centre, and more.[42] Given the intricacies of the specific item, it is vital that staff at these drop-off locations are knowledgeable of what materials will be accepted, and that there is clear and informative labelling.

With regards to disposing hazardous waste (e.g. biomedical products, chemicals, syringes, etc) which require special disposal, this should be done in compliance with procedures established by the Environmental and Occupational Health Support Services (EOHSS) office. The University should partner with MSU services to provide greater number of drop-off locations and use their social media outlets to increase promotion on e-waste management efforts

Concerted Collection Efforts

Principle: Reusing and re-purposing materials necessary practices in reducing waste production.

Concern: Large amounts of waste are produced during residence move-outs.

Recommendation: McMaster University should offer specialized waste management services during move-out periods that incentivize reusing and repurposing materials.

Recommendation: McMaster should further promote the Trash to Treasure initiative to clubs and faculties to avoid furniture waste.

An event that occurs during the springtime among North American universities is student move-out. This includes students in university residences and, to a lesser extent, surrounding residential areas. A common trend during periods of student move-out is the production of massive amounts of trash that are no longer useful to the owner but retain the potential to be reused or repurposed; this includes kitchenware, laundry supplies, lamps, general furniture, etc.[43]

In the past during move-out at McMaster, rescinded student group MACgreen, in collaboration with the City of Hamilton's Waste Reduction Division, coordinated an initiative known as Swap-O-Rama. Swap-O-Rama encouraged students and residents in McMaster's surrounding areas to put out onto the curb lightly worn but reusable furniture, utensils, bicycles, electronics, household

[40] McMaster Student Life, "Residence & housing," McMaster University. accessed February 15, 2018, http://future.mcmaster.ca/student/residence/
[41] Sustainability at McMaster, "Electronics recycling."
[42] Ibid.
[43] Matt Rocheleau, "Students' old gear gets a recycling push", Boston Globe, September 2 2014, https://www.bostonglobe.com/metro/2014/09/01/tackle-campus-move-out-mess-groups-collect-sell-college-students-used-gear/dbjILEzAtRmqKigxZuWddN/story.html, accessed March 4, 2018.

items, etc. These items are then free to be picked up by other students and community members, and Waste Management typically collects any unclaimed items on a specified date.[44]

While Swap-O-Rama does not exist, it is strongly recommended that similar initiatives such as "Trash to Treasure[45]," be greatly promoted to ensure a circular economy in terms of used furniture. This outreach can be spearheaded by the Sustainability at McMaster office, in collaboration with student volunteers, Facilities Services, Residence Life, the City of Hamilton's Waste Reduction Division, and other relevant stakeholders. This allows greater community efforts to reduce waste and ensure accessible furniture reuse for students.

To prevent the cycle of wastefulness, unclaimed items can be donated to Hamilton community centres or services that may need them. McMaster may benefit from adopting a move-out program similar to that of Wilfrid Laurier University, which has diverted over 25 tonnes of waste from landfills within its 5 years of operation. Their strategy consists of leaving donation bins around campus during the winter-term exam period and having volunteers sort donations and distribute to local charities and organizations.[46] Alternatively, to reduce waste as well as promote affordability of what some may consider student essentials, leftover departing students' reusable gear can be sold at lower prices or redistributed for free to incoming students. Similar to the Clothing Swap run by the MSU service, Maroons, McMaster should facilitate an event dedicated to the sharing/selling of unused and donated gear no longer needed by students on and off campus during move-out. Whichever items are not sold by the end of the event can be donated to local organizations.

The Trash to Treasure Initiative began as a SUSTAIN 3S03 project, which aimed to repurpose unused computers by donating them to children in need. The pilot project resulted in the repurposing of 150 technological devices by McMaster students and the donation of 70 computers to children in need of them within the Hamilton community.[47] According to its webpage on the Facility services website, the program continues to run – accepting e-waste donations and facilitating surplus-furniture reuse between departments and clubs at McMaster.[48] The promotion of this program should be more widespread to sustain the program and reduce IT and furniture waste on campus.

Food Waste Reduction and Food Literacy

Principle: Food-related sustainability practices are an important component of sustainable development.

Principle: Food literacy is an essential aspect of promoting healthy-living on campus and can promote sustainability by reducing food-waste

Concern: Many students have limited experience in food literacy, which encompasses the knowledge and skills related to the nutritional, health, environmental, and economic impact of food decisions.

Concern: Currently, food purchased on campus goes to waste.

[44] McMaster Office of Public Relations, "McMaster and City of Hamilton prepare for student move-out," McMaster University. accessed March 4, 2018, http://www.mcmaster.ca/opr/html/opr/media/main/NewsReleases/2005/NR_moveout.html.
[45] From Trash to Treasure: Furniture Reuse. 2023. McMaster University. https://facilities.mcmaster.ca/sustainability/from-trash-to-treasure-furniture-reuse/
[46] Waste reduction [Internet]. Wilfrid Laurier University. [cited 2023Apr24]. Available from: https://students.wlu.ca/student-life/sustainability/waste-reduction.html
[47] "it was so much more than reducing it waste" [Internet]. Daily News. [cited 2023Apr24]. Available from: https://dailynews.mcmaster.ca/articles/it-was-so-much-more-than-reducing-it-waste/
[48] From trash to treasure: Furniture reuse [Internet]. Facility Services. 2023 [cited 2023Apr24]. Available from: https://facilities.mcmaster.ca/sustainability/from-trash-to-treasure-furniture-reuse/

Recommendation: McMaster University should provide more accessible resources for food literacy and integrate this knowledge into engaging events and campaigns.

Recommendation: Hospitality Services should introduce portion sizes options by providing customers with the option of using smaller containers or receiving a reduced portion while adjusting for costs.

Many students have limited experience in food literacy, which encompasses the knowledge and skills related to the nutritional, health, environmental, and economic impact of food decisions. Consequently, their attitudes or behaviours relating to food choices may have detrimental impacts. The limited knowledge is partly due to a lack of awareness of the food literacy resources available to students. Consequently, students require more accessible resources for food literacy. This may include workshops on meal preparation, budgeting and spending, grocery shopping, and food waste. Both on-campus and off-campus groups should collaborate to organize food literacy programming. This programming should be financially, temporally, and geographically accessible, and it should be strongly promoted to the student body. Existing programming should be more heavily promoted. For example, the Food for Thought program, which is a collaborative effort between the Student Wellness Centre, Mac Farmstand, and Mac Bread Bin, offers interactive meal preparation classes. McMaster's community garden is a relatively recent initiative developed by students that aims to improve student access to fresh produce for the community and encourage sustainable gardening practices. Involvement in the garden can improve food literacy and should be more heavily promoted on campus and in classes. Potential expansion of the garden and collaborations with the McMaster community fridge and Food for Thought program may allow it to have a greater impact on the McMaster community,

In Canada, about 50 million tonnes of food intended for human consumption is wasted annually.[49] In addition to obvious ethical concerns, food waste has significant short- and long-term environmental and economic consequences.[50,51] For one, this results in a loss of approximately around $20 billion worth of food annually[52]. McMaster University's sustainability efforts should include strategies to decrease food waste and the release of harmful greenhouse gases (such as methane) produced from its decomposition.[53]
First, it is important to conduct a food waste audit at high traffic food locations of both pre-consumer and post-consumer waste. Once adequate and accurate methods for data collection and analysis have been established, such audit can be expanded to other food vendors on campus. Pre-consumer waste is also referred to as "kitchen waste" which tends to accumulate due to food spoilage, meal overproduction, expiration, and such. This is said to be under the

[49] Blair N. Food Waste Statistics in Canada for 2023 [Internet]. Made in CA. 2023 [cited 2023Apr24]. Available from: https://madeinca.ca/food-waste-canada-statistics/#:~:text=In%20Canada%2C%20over%2050%20million,average%20household%20in%20a%20year.
[50] Ibid.
[51] Kylie Merrow, Phillip Penzien, and Trevor Dubats, "Exploring Food Waste Reduction in Campus Dining Halls" (PhD diss., Western Michigan University, 2013), p. 3. Retrieved from https://wmich.edu/sites/default/files/attachments/ENVS%204100%20Final%20Project%20Report%20-%20Merrow,%20Penzien,%20Dubats.pdf.
[52] Admin, * N. Food waste in Canada [Internet]. Youth in Food Systems. [cited 2023Apr24]. Available from: https://seeds.ca/schoolfoodgardens/food-waste-in-canada-3/#:~:text=The%20average%20sized%20family%20in,waste%20a%20lot%20of%20food.

[53] Petergaye Gilliard, "Assessing and Quantifying Food Waste", p. 9.

control of kitchen staff, while post-consumer or "plate waste" is controlled by the consumer/guest due to food behaviours, portion sizes, and the like.[54]

One such waste audit conducted at the University of Saskatchewan's Marquis Culinary Centre revealed the highest contributor of food waste to be at the pre-consumer (kitchen) stage, followed by the post-consumer stages of edible plate waste, and then non-edible waste.[55] This highlights a need to educate both kitchen staff and the general student body about how they work to reduce food waste. The former can be achieved through the provision of training of kitchen staff on waste reduction. An avenue for education can be focused on increasing awareness of food waste on campus—information from such audits can be published by MSU's student-run newspaper, The Silhouette, to increase outreach and information dissemination to a larger student audience. Another means by which this can be done using clear bins (as green bins) that show the food waste they contain as is done at Carleton University.[56] Additionally, simple awareness campaigns can have far-reaching effects. For example, a study on food waste at Kansas State University revealed that 15% fewer students wasted their food after short anti-waste slogans were placed in the dining hall.[57] Moving beyond simple awareness campaigns, it is possible to follow in the footsteps of the University of Guelph by integrating the issue of food waste into students' education plan.

With regards to portion control, McMaster University is encouraged to consider reducing the size of plates used to serve food based on the theory that smaller plates result in less waste by holding less food.[58] With such an initiative, it is important that meal costs are adjusted to reflect the amount of food provided. Specifically, the price per unit should remain consistent as to not discourage students from purchasing smaller portion sizes. In other words, lower-cost meals with smaller portion sizes should offer the same value as higher-cost meals with larger portion sizes. Alternatively, the adoption of buffet-style cafeterias on campus may potentially reduce the ”plate-waste” being produced at the post-consumer level. If students are given the option to choose the amount of food they put in their plate rather than be served a standardized portion, they may be more inclined to take only what they will eat.[59] Additionally, if students are given the option to take only small portions of foods they are unsure about, they can taste it and determine their preference rather than buying a whole meal of it and discarding it. Unfortunately, dining halls that have *All-you-care-to-eat* meals at a fixed price have been shown to increase food waste, as students may fill up their plate to maximize the value of their meal plan dollars they spent. Thus, a pay-by-weight buffet style like the one currently used at the University of Waterloo, will optimize the price and amount of food a student wants and prevent unnecessary food waste from ending up in landfills.[60] McMaster Hospitality Services should thoroughly investigate the feasibility and environmental impact of switching to a pay-by-weight dining system in an effort toward becoming a waste-free campus.

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[54] Andrew Shakman, “Food waste tracking: The path to pre-consumer food waste prevention” Leanpath Inc., p. 9. accessed February 15, 2018. https://www.epa.gov/sites/production/files/2016-01/documents/2_leanpath_shakman.pdf

[55] Petergaye Gilliard, "Assessing and Quantifying Food Waste”, p. 24.

[56] Ibid., 18.

[57] Ibid., 19.

[58] Ibid., 10.

[59] UNB Fredericton serving students buffet style | CBC news [Internet]. CBCnews. CBC/Radio Canada; 2013 [cited 2023Apr24]. Available from: https://www.cbc.ca/news/canada/new-brunswick/unb-fredericton-serving-students-buffet-style-1.1369911

[60] Food waste reduction through our pay by weight system [Internet]. UW Food Services. 2019 [cited 2023Apr24]. Available from: https://uwaterloo.ca/food-services/blog/post/food-waste-reduction-through-our-pay-weight-system

Another strategy to reduce food waste would be to collect and review data on students' eating preferences and patterns; this way, food that is preferred by consumers is served and waste generated from unsold foods is limited. Thus, it is recommended that Hospitality Services use consumer feedback to not only inform what meals they serve at campus vendors, but also how much of it is prepared.

Reducing Resource Consumption

Unnecessary Energy Usage

Principle: Energy consumption across buildings on-campus should be conserved whenever possible.

Principle: Energy conservation efforts should not detract from the quality of education and campus life.

Concern: Many buildings are outfitted with outdated lighting technology that uses more energy than newer and more innovative designs.

Concern: After evening classes have been completed, many lecture halls and buildings remain with lights on through the duration of the night.

Concern: The temperature in the University's building inadequately match the temperature outside, indicating a potential waste of energy on heating or air conditioning.

Recommendation: McMaster University should reduce nonessential energy use, such as heating and lighting, when campus buildings are not in use.

Recommendation: McMaster University should focus on energy conservation measures when constructing new buildings or retrofitting existing ones.

Recommendation: McMaster University should install sensor lights in buildings wherever possible in order to avoid unnecessary usage of energy on lighting.

Recommendation: McMaster should reduce unnecessary usage of energy on temperature control in campus buildings through adjusting building temperatures according to time of day and weather.

Recommendation: McMaster should retrofit all existing buildings to meet Leadership in Energy and Environmental Design (LEED) standards

McMaster University space is regulated and managed by an extensive group of personnel and systems. The consumption of energy for lighting and heating to provide comfortable and safe environments is essential. However, the university should not be wasteful in its consumption of energy and seek to improve practices with current technology [61] The COVID-19 pandemic has uniquely impacted the energy consumption at the McMaster campus. Fifty one percent of McMaster's greenhouse gas emissions come from its electricity use.[62] If 1000 of McMaster staff members unnecessarily leave the lights on in their offices for 2 hours each workday, this would consume 86,000 kWh of electricity each year. This is equivalent to powering three average Canadian homes for an entire year. Hamilton Property Standards By-law requires that that all buildings have illuminated hallways, stairways, common areas and underground parking at all times. The spaces not covered under the bylaw often have lights left on. By ensuring that lighting

[61] Campus Sustainability Best Practices. 2008. http://www.mass.gov/eea/docs/eea/lbe/lbe-campus-sustain-practices.pdf
[62] Facility Services. 2016. "Energy Management Plan". McMaster University.

in non-essential spaces is shut off when not in use, there will be a significant reduction in overall energy usage.

Like most other Canadian universities, the academic year runs from September to April; with approximately 3,700 students occupying 13 residences. Even during summer, the energy cost is not significantly decreased with just 10,000 students and staff on campus. Most of the energy consumption is takes place due to heating, ventilation, lighting etc.[63] This was uniquely affected by. the COVID-19 pandemic, as reduced occupancy led to decreased electricity usage during the 2020-2021 academic year. The 2020-2021 energy management plan is the most up-to-date publicly available information on McMaster's energy usage. Thus, it does not reflect the changes that have occurred after the transition to in-person classes.[64] McMaster needs to provide current information on energy usage to identify areas for improvement and take the necessary active measures to reduce it. This includes ways to conserve energy in existing buildings and retrofit infrastructure to utilize more sustainable insulation/heating practices.

Currently, all new infrastructure is being designed with LED retrofitting and occupancy-sensing lighting control can significantly reduce the energy consumed by lighting fixtures. As this technology advances, it is becoming a more economically favourable investment, which has demonstrated the potential to reduce lighting costs by 30-35%.[65] [66] which provides further incentive to retrofit existing buildings with these lighting systems. A study done at a university campus of a similar size in Seoul, Korea, analyzed the effectiveness of motion detection sensors and room management systems in underground parking lots, lecture rooms, and dormitories. It demonstrated an electricity savings rate of 77.6% in underground parking lots, 32.4% in lecture halls, and 28.2% in dormitories.[67] [68] [69] McMaster should continue to adopt the use of light sensors in their buildings to reduce energy waste on campus. Although adopted in some buildings such as Burke Science Building, many buildings on campus lack this technology. Doing this would ensure that once an individual exits a room, the lights turn off. This would thereby help to prevent any unnecessary usage of electricity on campus and save the University more money regarding utility expenses.

Energy consumption can also be greatly reduced by addressing heating and air ventilation in campus buildings. The Covid-19 pandemic has warranted adjustments to the air circulation to reduce the spread of disease, including the circulation of more fresh air into buildings and adequate thermal conditioning of this air.[70] In buildings with recirculated air, MERV-13 filters have been installed. McMaster has maintained these measures, which may result in an increase in energy consumption as the building occupancy increases from in-person classes.[71] [72] Demand

[63] McMaster University. "Annual Sustainability Report 2012". https://www.mcmaster.ca/sustainability/documents/2016-Energy-Management-Plan.pdf#page=46
[64] https://facilities.mcmaster.ca/app/uploads/2021/06/McMaster-EMP-Report-2021.pdf
[65] Lighting controls strategies can save money [Internet]. Facilitiesnet. 2010 [cited 2023Apr24]. Available from: https://www.facilitiesnet.com/lighting/article.aspx?id=11916
[66] https://facilities.mcmaster.ca/app/uploads/2021/05/Net-Zero-Carbon-Roadmap-Report-ver-5.pdf
[67] https://www.researchgate.net/publication/346996289_Energy_Saving_of_a_University_Building_Using_a_Motion_Detection_Sensor_and_Room_Management_System
[68] Lee J-W, Kim YI. Energy saving of a university building using a motion detection sensor and room management system. Sustainability. 2020;12(22):9471.
[69] Lighting Controls Strategies Can Save Money, (2010). https://www.facilitiesnet.com/lighting/article.aspx?id=11916
[70] https://facilities.mcmaster.ca/app/uploads/2021/06/McMaster-EMP-Report-2021.pdf

[71] Home - facility services [Internet]. [cited 2023Apr25]. Available from: https://facilities.mcmaster.ca/app/uploads/2021/05/Net-Zero-Carbon-Roadmap-Report-ver-5.pdf
[72] Ventilation - covid-19 (coronavirus) [Internet]. COVID. 2022 [cited 2023Apr24]. Available from: https://covid19.mcmaster.ca/campus-health-safety/ventilation/

control ventilation had been implemented in several laboratory buildings such as John Hodgins Engineering building, Arthur Bourns Building, and Michael DeGroote Centre for Learning and Discovery due to their need for high exhaust and make-up air rates. The Net-Zero Carbon Roadmap published in 2020 recommends that demand control ventilation in combination with active contaminant monitoring can save a significant amount of energy and should be retrofitted into all laboratories and designed in new ones.[73]

Regarding the temperature control of non-laboratory buildings on campus, leaky windows currently? exist in buildings such as Ivor Wynn Centre and the Life Sciences building, and the tandem accelerator. Replacing these windows can reduce the energy needed too heat/cool these buildings. The State University of New York at Buffalo adopted a heating policy that calls for the university's facilities to be heated to 68 degrees (Fahrenheit) during normal occupied hours and 55 degrees during off-ours.[74] This helped substantially reduce energy consumption especially during peak hours. McMaster can implement a similar policy and the temperature may change based on the weather conditions. At Cape Cod Community College a solar array has been installed on the school's new science building. Combined with the dual occupancy/daylight sensors and daylight controls, the building systems used 35% less energy than conventional systems.[75]Although an expensive undertaking, campus-wide demand control ventilation could lead to significant energy, cost, and greenhouse gas (GHG) reductions, which is a goal McMaster should aim to reach in the future.

Therefore, by reducing unnecessary usage of energy for lighting and heating purposes, the University can drastically decrease its overall energy consumption as well as its utility costs.

Paper Usage

Principle: Sustainable practices should be followed in the classroom.

Concern: Many courses at McMaster currently rely on physical handouts and submissions, using unnecessary energy and creating waste in the campus environment.

Concern: Many courses at McMaster currently rely on physical custom courseware using unnecessary energy and creating waste in the campus environment.

Concern: Many course outlines in a variety of programs do not contain information related to the Sustainable Written Work Submission Guidelines or relevant McMaster sustainability policies.

Recommendation: McMaster University should mandate that professors, whenever possible, should accept student submissions for assignments using online tools.

Recommendation: McMaster University should mandate that custom courseware is made available online.

Recommendation: McMaster's Sustainable Written Work Submission Guidelines should be included on every course outline and uploaded to the program's website for easy access.

As students make up most of the university's population, it is of great importance that they are both encouraged to follow and to become involved in sustainable practices. The classroom setting is a great opportunity for students to become sustainable leaders. The shift to and from virtual learning over the past few years has led to the development of several hybrid course models that rely less on in-person class time and paper usage. This has certainly impacted the amount of

[73] https://facilities.mcmaster.ca/app/uploads/2021/05/Net-Zero-Carbon-Roadmap-Report-ver-5.pdf
[74] Campus Sustainability Best Practices. 2008.
[75] Ibid.

paper used for assignments and course evaluations, as several courses use online submission platforms. However, this does not consider the individual printing and paper-use by students because of their coursework. Faculty and staff should teach students sustainable practices such as double-sided printing, recycling, and reusing their course materials. Any coursework that is still being submitted in person should be readjusted to fit online submission portals Students believe that the ability to submit work online is ideal as there is generally no waste created in the process, apart from being an easier option than a physical submission. Courses that already use Avenue to Learn or LearnLink for their courses have the option to have course work submitted online. By doing so, students would not need to print physical copies or travel to campus.

Furthermore, several university courses require purchasing of custom courseware. Unlike most textbooks, not all courseware is available online requiring students to purchase physical copies of them. Further, several courses incentivize the purchasing of courseware with extra marks or boosts, which poses a financial burden for students and increases paper-waste from printing. Students would like to have the option of accessing online copies of courseware and professors should avoid incentivizing courseware. Moving forward, they should also look to Open Educational Resources, making additional materials required for courses accessible to all students.

Water Usage and Single-use Water Bottles

Principle: Institutions have a responsibility to eliminate unnecessary waste and promote positive and sustainable lifestyle changes

Principle: When it does not detract from the quality of education and student, faculty, and administrative life, the University should conserve water whenever possible.

Concern: Plastic water bottles are unsustainable due to costly productions and significant impact to the environment and local communities.

Concern: Students have reported cases of unclean or discoloured drinking water in various buildings across campus.

Recommendation: McMaster University should be a water-bottle free campus, enforcing a water-bottle free policy and refraining from selling plastic water bottles.

Recommendation: McMaster should conduct research on the impact of banning single-use plastic water bottles supported through a pilot project to better understand how to reduce plastic waste on campus.

Recommendation: Where possible, the university, in line with guidance from the Okanagan committee, should retrofit water fountains with water bottle refill stations and conduct proper audits to ensure an up-to-date filtration system

Recommendation: The University should develop a strategy to reduce water consumption in buildings through the creation of a Water Management Plan.

Recommendation: The University should inform students of water quality and work to actively maintain drinkable water quality across campus.

Water bottles pose a significant environmental concern. In Canada alone, 1.2 million barrels of oil each year are used to produce water bottles that meet the country's demands.[76] Not only does

[76] FAQs - disposable water bottles [Internet]. Mission Zero. [cited 2023Apr24]. Available from: https://missionzero.sheridancollege.ca/faqs/disposable-water-bottles/#:~:text=Each%20year%20in%20Canada%2C%20the,1%20liter%20of%20bottled%20water.

this result in the release of 162 000 tonnes of CO_2 into the atmosphere but also plastic waste that if not recycled, takes an average of 450 years to biodegrade[77]. Students applaud McMaster University's collaboration with the Office of Sustainability to provide fountain stations all over campus. To date, there are over 200 water stations since its implementation in 2010, diverting over 20 million water bottles from landfills.[78] Students believe that the university should continue to retrofit water fountains to provide drinking water to campus to reduce the use of disposable single-use plastic water bottles and encourage refilling reusable water bottles. Audits should be conducted on these fountains regularly to provide information on the efficacy of filtration to inform when repair is necessary.

Moreover, students believe that the university should continue to conduct its operations in a socially, economically and environmentally responsible manner. According to McMaster's most current waste audit, only 2.1% of mixed containers (this includes plastic beverage and food containers) was diverting from landfills through the recycling program in 2022.[79] A study evaluating the effectiveness of bottled water bans on university campuses highlighted the success of a water bottle ban at the university of Washington, which reduced plastic bottle sales by 39.4% a few years after its implementation[80]. Several Ontario universities have pledged to being water-bottle free such as University of Toronto, Queens University, University of Guelph and University of Western. Students believe McMaster has a responsibility in eliminating unnecessary waste. McMaster should follow the pledge of McMaster Students Union in making campus plastic water bottle free. The first step to reducing plastic bottle waste on campus would be piloting a project that investigates the efficacy of a plastic bottle ban on the McMaster campus. Obtaining student opinions on incentives and plastic-free alternatives would help the university create a realistic and successful plastic-bottle free program. It is important to recognize that banning single use water-bottles could result to an increase in purchasing of other drinks such as bottled soda, juices or sugar-free drinks[81]. Students believe that the university should take a multi-pronged approach to addressing this such as promoting the sale of Boxed Water or increasing the usage of reusable water bottles.

One such area of concern is that of water quality on campus. Students who have lived in one of the twelve current on-campus residence buildings have reported yellow water flowing from their taps at times. This has generally been an issue of the building's water system being temporarily shut down for maintenance, leading to rust from the pipes being carried into running water when the water system is initially turned on once more. In these cases, students should be informed not only when the water is turned off for maintenance but also when the water is safe again to use in cases of discoloured water.

Also relevant to the discussion on water quality on campus is the drinking water available through the bottle filling stations. Following a 2010 sampling and testing program done by the University to test for the concentration of lead in the drinking water, where concentrations above the Ontario drinking water standard were found in some campus buildings, the University undertook control measures including the installation of lead filters from water at the tap. Buildings constructed

[77] Ibid.
[78] Sustainability. engagement. excellence. discovery. - online publications [Internet]. 2022 [cited 2023Apr25]. Available from: https://publications.mcmaster.ca/app/uploads/2022/06/Facility-Services-Strategic-Plan-2022-26-June-20.pdf
[79] https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Audit-2022.pdf
[80] D'Altrui EM. Bottle water bans: How can we curb the thirst for bottled water? Elements. 2017;13(1). file:///Users/amelia/Downloads/Bottle_Water_Bans_How_can_we_curb_the_thirst_for_b.pdf
[81] Hutchins, Aaron. 2018. "How Banning Bottled Water Can Backfire - Macleans.Ca". Macleans.Ca. http://www.macleans.ca/news/canada/how-banning-bottled-water-can-backfire/.

before 1990 with original fountains continue to be tested annually, with newly installed fountains being tested biennially.[82]

While the University's concern for safe drinking water with acceptable concentrations of lead is clear, many students remain unaware of such concerns surrounding the drinking water on campus. Looking to the enhanced bottle filling stations across campus that came as a result of a water fountain retrofits initiative that begun in 2009,[83] they use a filter that reduces aesthetic chlorine, taste and odour, particulate class I, and notably, lead.[84] The enhanced bottle filling stations come with visual filter monitor lights. Many students are unaware of the monitor lights or unknowing of what the different lights mean. The LED lights on the bottle filing station are there to indicate the status of the filter. The green light means the filter is in good condition and does not need any attention. A yellow light indicates that a new filter will be needed shortly. At this point, the unit is still safe to drink from as water is still being filtered. A red light indicates that the filter has reached 100% of its useable life and should be replaced promptly. The filters are good for 3000 gallons, or the equivalent of 24,000 16-ounce bottles.[85] Given the total student enrolment population of over 37,000 students,[86] it's evident that filters will reach 100% of their useable lives and need to be changed often. The University should improve awareness of the visual filter monitor lights so that students are better informed of their drinking water quality. While University has considerably implemented a map to water fountains across campus at the water refill stations such as in the case of an inadequate filtrate, water filling station, this does not exist for all water refill stations and such efforts should be implemented for consistency and access across campus.

The University should assess where water is being consumed and target specific areas where additional conservation where possible. Students believe that McMaster should continue its progress to reducing water usage and develop a Water Management Plan to outline strategies for further waster conservation.

McMaster Water Management Plan should consider such aspects as:

- Standards for plumbing fixtures for use at McMaster University. The standards need to be detailed and address the different typed of fixtures that may be needed in different settings at McMaster University (residence, public washroom being renovated in an existing building, washrooms in a new building).
- Development of a McMaster University Water Conservation Policy.
- A review of all laboratory equipment to ensure that water efficiency is considered.
- An assessment of the sewage infrastructure that is needed to support decreased flow rates.
- The provision and maintenance of public drinking fountains and water bottle filling stations.
- Impact on the capacity of the sewage pumping station.
- Exploring further opportunities for using grey water and/or rainwater from roof areas.
- Ensure that the implications of current and future sewer use bylaws and the associated cost are considered as part of the water management plan.
- Exploring reduction of water usage in washrooms and showers in residence such as retrofitting taps to be more efficient and showers

[82] McMaster University. n.d. "Drinking Water Quality Testing." Accessed March 3, 2017. http://www.workingatmcmaster.ca/eohss/prevention/drinking-water-quality-testing/index.php
[83] McMaster University. 2007. "MSU Plastic Bottle Free Policy." https://www.mcmaster.ca/sustainability/waste_bottle.html
[84] Elkay Manufacturing Company. 2017. "ezH2O Water Bottle Filling Stations." http://www.elkay.com/ezh2o
[85] Ibid.
[86] McMaster University. "McMaster Fast Facts." Accessed March 3, 2018. http://www.mcmaster.ca/opr/html/opr/fast_facts/main/about.html

Greenhouse Gases

Sustainable Energy and Technology

Principle: Sustainable energy practises are fundamental to a sustainability-friendly campus.

Principle: LED lighting is more efficient and cost effective and McMaster should continue to adopt its usage on campus.

Concern: Currently the University relies heavily on fossil fuels for many of its energy needs, and these are not a sustainable means of powering the University's operations.

Concern: McMaster continues to use less-than-optimally-sustainable lighting technology, which is old, costly, and environmentally unsustainable.

Recommendation: McMaster University should use more sustainable energy sources to reduce its greenhouse gas emissions.

Recommendation: McMaster University should replace regular light bulbs in its buildings with LED lights wherever possible.

Recommendation: McMaster should replace regular light bulbs in lamps and equipment used on campus to compact fluorescent lights (CFLs) wherever possible.

Recommendation: McMaster should conduct deep energy audits in its buildings to identify specific areas to improve energy efficiency.

Recommendation: McMaster University should ensure that all new infrastructure on campus should adopt the most cutting-edge technology and innovative practices in green energy and sustainable energy.

If the University adopted more sustainable practices, McMaster would also cut back on costs of utilities given its large usage of energy.

Fossil fuel use represents approximately 80% of all energy used in Canada and is the main source for greenhouse gas emissions.[87] McMaster is one of the largest energy consumers in Ontario, and the University currently relies heavily on fossil fuels for energy, which this is not a sustainable practice.[88] The University should consider implementing more localized and sustainable methods for energy production, such as solar panels. Although implementing sustainable technologies such as solar panels require a large upfront investment, after installation they simply require maintenance for upkeep. Solar panels have the potential to long-term savings while reducing McMaster's greenhouse gas emissions.

Although McMaster has begun to implement more sustainable lighting technologies, it is imperative that all new lighting installed at McMaster is LED. LED lighting has a longer life span and significantly lower energy use compared to traditional lighting methods. LED bulbs use 75-

[87] Canadian Council on Renewable Electricity. 2016. "Canada's Advantage: A Vision For Renewable Electricity In Canada."

[88] Home - facility services [Internet]. [cited 2023Apr25]. Available from: https://facilities.mcmaster.ca/app/uploads/2021/05/Net-Zero-Carbon-Roadmap-Report-ver-5.pdf

80% less energy than a traditional incandescent bulb and the estimated lifespan of about 30 000 - 50 000 hours.[89] In 2014, McMaster implemented LED lighting in stairways and corridors of various buildings on campus. Buildings included Gilmour Hall, Togo Salmon Hall, Chester New Hall, Kenneth Taylor Hall and Thode Library. This change resulted in savings of $154,500 annually and had a payback time of 2.6 years.[90] In the interest of sustainability, efficiency, and cost effectiveness, McMaster should switch as many light bulbs as possible to LED. The estimated annual electricity consumption saving is around 985,000 kWh, and the annual GHG avoidance is estimated to be 123 metric tonnes.[91] Moving forward, the university should consider fully replacing all lights with LEDs. The fact that the advantages to retrofitting have been immediate and drastic in areas where it has already taken place should make clear the benefits of such action.

In addition, change to use of compact fluorescent lights (CFLs) in lamps and equipment when possible.[92] CFLs use 75% less energy and last seven to ten times longer than regular light bulbs. Sensor lights are an excellent way to reduce unnecessary energy consumption. The university should investigate vending misers, which allow vending machines to turn machine lights off. This piece of equipment cuts energy consumption in half for the beverage vending machines. After the implementation of vending misers on 90 machines, Tufts University was able to save $17,000 and 100 tonnes of Carbon dioxide annually.[93]

McMaster should explore and fund the implementation of other sustainable energy sources on pre-existing university buildings. For example, uOttawa deep energy retrofit in the Roger Guidon Hall has savings of 1 million dollars and more than 1000 tonnes of GHG.[94] A deep energy retrofit is a whole-building analysis and construction process that uses "integrative design" to achieve much larger energy savings than conventional energy retrofits. The Pembina Institute reports that two-thirds of GHG reductions from buildings will come from retrofits to existing building stock.[95] Deep energy retrofits take a holistic approach to renovations, targeting “energy hog” buildings, and using proven methods and technologies, will quickly help to achieve emissions reductions targets and ensure that current buildings are as energy efficient as possible. Infrastructure is essential to the economic, social and political fabric of communities. Infrastructure that is adaptable to new and improved ways of energy use will not only restore and sustain these buildings but may also protect them against disasters. McMaster currently upholds the promise that all new infrastructure will be built to meet a LEED silver certification or higher, in accordance with the Canada Green Building Council.[96] However, the university should ensure that all existing buildings on campus are retrofitted to meet these same standards and all new buildings aim for a higher level of certification (i.e LEED gold standard). This includes the construction and renovation of buildings with sustainable energy sources. Construction of such buildings is possible, as illustrated by the Engineering Technology Building (ETB), which is outfitted with a rainwater

[89] McMaster University. "Annual Sustainability Report 2016". https://www.mcmaster.ca/sustainability/documents/Sustainability%20Report%202016.pdf
[90] Facility Services. 2016. “Energy Management Plan”. McMaster University.
[91] Council of Ontario Universities. (2018). Going Greener 2017: The Road to Low-Carbon University Campuses | Council of Ontario Universities. [online] Available at: http://cou.on.ca/reports/going-greener-2017/.
[92] Campus Sustainability Best Practices. 2008. http://www.mass.gov/eea/docs/eea/lbe/lbe-campus-sustain-practices.pdf
[93] Campus Sustainability Best Practices. 2008. http://www.mass.gov/eea/docs/eea/lbe/lbe-campus-sustain-practices.pdf
[94] Council of Ontario Universities. (2018). Going Greener 2017: The Road to Low-Carbon University Campuses | Council of Ontario Universities. [online] Available at: http://cou.on.ca/reports/going-greener-2017/.
[95] Pembina Institute. 2018. "Deep Emissions Reduction In The Existing Building Stock". Pembina Institute. http://www.pembina.org/pub/building-retrofits.
[96] Buildings & Sustainability [Internet]. United Nations Sustainable Development Goals. 2020 [cited 2023Apr24]. Available from: https://un-sdgs.mcmaster.ca/more-on-the-sdgs/building-and-sustainability/

treatment mechanism and the ability to house solar panels.[97] The L.R. Wilson Hall is a gold LEED certified building.[98] The University should look to continue outfitting upcoming buildings, such as the residence on Traymore Avenue, with renewable energy usage potential.

Students commend the University for taking steps in deep energy retrofitting and would like to see this process applied to other buildings. In 2016, the University completed work to retro-commission the ventilation in several energy-intensive labs using Demand Control Ventilation (DCV), which is recognized by the U.S. Department of Energy as a best practice. Retro commissioning is a type of deep energy retrofit that improves the systems and equipment within a building. With DCV, ventilation is automatically adjusted based on the number of occupants or the demands they create. The Michael DeGroote Centre for Learning and Discovery and the John Hodgins engineering building now reduces CO2e (carbon dioxide emissions) by 760 tonnes annually. McMaster more recently implemented DCV in the ABB Physics Wing, which reduced Co2 emissions by 248.3 tonnes in the 2020-2021 school year. By continuing to apply this in other buildings, McMaster could reduce thousands of tonnes of Co2 annually.[99]

Sustainable Transportation

Principle: Higher education institutions are looked to as leaders in promoting sustainable practices to address greenhouse gas emission.

Concern: While McMaster University current efforts are directed towards reducing emissions originating from powerplant and energy production, the university can also act to reduce emissions in smaller and mobile sources across campus.

Concern: The thousands of automobiles arriving on and driving through campus contribute to the University's greenhouse gas emissions.

Recommendation: McMaster's Climate Action Plan, should reach it's goal to reduce its carbon footprint by 90% by 2050 and in the interim set to reduce the carbon footprint 75% by 2030.

Recommendation: McMaster University should update and enforce a campus-wide no-idling policy

Recommendation: Parking Services should establish discounts and other incentives to encourage carpooling.

Recommendation: Parking Services should look to expand preferential parking programs for Electric Vehicles, Low Emission Vehicles and Carpool Vehicles.

Recommendation: More green spaces on campus should be established with proper maintenance for community and student use.

The Ontario university community is deeply aware of the challenges that face the world arising from climate change and the degradation of natural environments. Accepting this responsibility, universities have long been committed to addressing climate change.[100] The University and

[97] Canadian Consulting Engineer. 2009. "Engineering building at McMaster shows how times have changed." https://www.canadianconsultingengineer.com/buildings/engineering-building-at-mcmaster-university-shows-how-times-have-changed/1000347313/

[98] New Liberal Arts Building Moving Forward. 2012 Jun 28, http://www.mcmaster.ca/opr/html/opr/media/main/NewsReleases/2011/BackgrounderTheWilsonBuildingforStudiesinHumanitiesandSocialSciences.htm

[99] Council of Ontario Universities. (2018). Going Greener 2017: The Road to Low-Carbon University Campuses | Council of Ontario Universities. [online] Available at: http://cou.on.ca/reports/going-greener-2017/.

[100] Council of Ontario Universities. (2018). Going Greener 2017: The Road to Low-Carbon University Campuses | Council of Ontario Universities. [online] Available at: http://cou.on.ca/reports/going-greener-2017/.

College Presidents' Climate Change Action Plan, signed by Patrick Deane in 2010, commits McMaster to reducing its greenhouse gas emissions. In accordance to this action plan, all Canadian university signatories must commit themselves to reducing emissions in collaboration with their communities to develop reduction targets and measurement procedures and develop initiatives to achieve said targets.

Much work has been undertaken over the past decade to reduce its carbon footprint and carbon emissions in university operations. McMaster has achieved considerable progress toward this goal. However, to become a leader in sustainability, students believe that McMaster should reach its goal of becoming carbon neutral in the future and ensure accountability by updating the student body on it's progress. In alignments with the United Nations sustainability goals, McMaster's accelerated its target of net zero emissions to 75 percent by 2030, and 90% by 2050.[101] While ambitious, the University in collaboration with relevant stakeholders, should ensure greater efforts to accelerate this goal.

Current recommendations on the Net-Zero Carbon Roadmap involve a commitment to encouraging alternative forms of transportations. Students believe that McMaster should look to other avenues such as updating and enforce a campus-wide, no-idling policy. For example, at the University Calgary the fine for idling is $50, which will be reinvested in sustainable transportation initiatives on campus.[102] Furthermore, carpooling has been found to be beneficial for both employers as it reduces the need for parking and reduces transportation costs for employee[103]. Students believe that McMaster should look to encourage carpooling through incentivization programs. McMaster could create a platform specifically for commuters (both students and staff) that allows for rideshare coordination. Additionally, a study done at Michigan State university revealed a potential benefit to providing lunches to staff and students to build connections and potential ridesharing arrangements. These luncheons could be held during Welcome Week for commuting first years to learn about ridesharing platforms (i.e website, Facebook) and even arrange rides with each other. Additionally, the University should encourage sustainable transportation by expanding preferential parking programs for Electric Vehicle, Low Emission Vehicle and carpool vehicles. Special constable vehicles could also transition to fully electric cars to reduce vehicle-emissions on campus, as recommended by the Net-Zero Carbon Roadmap.

Another stride toward sustainable transportation would be to improve the bicycle infrastructure and cycling programs on campus. Currently, SoBi bikes are located at select locations on campus, and bike racks/lockers provide parking spaces for students and staff. Promoting cycling at the university through campus-wide events could encourage cycling as a major mode of transportation for students. Additionally, Western and Trent University have implemented bikeshare programs that repurpose used bikes to keep them out of landfills and provide students with cheaper bike rentals for the day or semester. A similar program could enhance cycling interest for students on campus.[104]

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[101] Net-Zero Carbon Roadmap. 2020. McMaster University. https://facilities.mcmaster.ca/app/uploads/2021/05/Net-Zero-Carbon-Roadmap-Report-ver-5.pdf

[102] Idle Free | Office Of Sustainability | University Of Calgary". 2018. Ucalgary.Ca. https://www.ucalgary.ca/sustainability/transportation/idle-free.

[103] "Carpool Incentive Programs: Implementing Commuter Benefits As One Of The Nation's Best Workplaces For Commuters A Website - Cite This For Me". 2018. Bestworkplaces.Org. https://www.bestworkplaces.org/pdf/carpool_June07.pdf.

[104] On-campus cycling infrastructure - share the road [Internet]. [cited 2023Apr25]. Available from: https://www.sharetheroad.ca/files/Bike_About_Summary___Infrastructure.pdf

Lastly, the university should look to installing more greenspaces on campus to reduce McMaster's carbon footprint. Green spaces are defined as soil surface area capable of supporting vegetation Green spaces can balance energy consumption causing changes in bio-geochemical cycles and pollution levels thereby affecting McMaster's carbon [105]

The Net-Zero Carbon Roadmap and McMaster's energy management plan provide useful information on the energy usage and GHG emission trends from operations at McMaster. However, this information is outdated, and newer reports are needed to better guide next steps in energy conservation.

Accountability and Innovation

Transparency, Outreach, and Accountability

Principle: The energy usage, water management, and waste management on campus should be communicated clearly and transparently.

Principle: Students are stakeholders in the functioning well f the University and should be able to easily access information and provide input on the university's environmental practices.

Concern: Students have reported cases of unclean or discoloured drinking water in various buildings across campus.

Concern: Students are not aware of single-stream recycling programs taking place on campus.

Concern: Students are not aware of matters regarding the institution's energy use.

Concern: Students are not aware of how the University is disposing of waste, recyclables, e-waste, and composting.

Concern: Due to a lack of periodic and consistent reports, McMaster is unable to be held accountable for their waste management practices.

Concerns: McMaster's decarbonization strategy fails to account for the call for accelerated divestment of carbon intensive investment pools.

Recommendation: The University should inform students more effectively of their waste disposal methods, recycling programs, e-waste disposal, and composting on campus.

Recommendation: The University should inform students of their energy use, and initiatives in place to decrease energy use.

Recommendation: The University should use consistently and periodically update online (website, social media) and in person (posters, digital signage, signs on trash and waste disposal cans) means of information to educate the McMaster community.

Recommendation: The University should update their decarbonization strategy to align with the calls for divestment from the student body.

Recommendation: The University should centralize, annually update and improve access to its sustainability-related reports and website in line with the University's effort to increase transparency.

[105] : Strohbach, M.W., Arnold, E. & Haase, D. (2012) The carbon footprint of urban green space - A life cycle approach. Landscape & Urban Planning. 104: 220-229.

Recommendation: The University should ensure yearly waste audits are performed and compared with past audits to determine waste composition, the success of current waste diversion programs, and to identify possible program improvements in reducing, reusing and recycling waste.

As students are also stakeholders in the overall wellbeing and well functioning of the institution, McMaster University should make efforts to increase transparency of its procedures of water and waste management on campus, thereby improving the access to such information for students. Currently, students are largely disconnected from the reporting practices employed by the university with regards to waste management practices and environmental sustainability initiatives.

In addition, the University can improve in its transparency regarding waste disposal practices and energy usage. According to the waste audit of non-hazardous waste in 2022, McMaster had a waste diversion rate of 53% where as the ministry of the Environment, Conservation and Parks provincial objective is 60%.[106] McMaster should not only aim to increase this diversion rate but also increase awareness on waste audit reports to get the information to the students. A typical student will not seek out waste audit reports without being prompted to do so, and it is therefore on the initiative of the University to implement outreach efforts to spread its updated waste disposal and energy use reduction strategies. Therefore, the University should aim to improve outreach through using a variety of means to communicate with students, such as better utilizing social media to spread awareness and educational information as well as employing in-person tactics such as posters, digital signage, and signage on all trash and waste disposal bins.

One of the main reasons why the University is facing issues in terms of outreach regarding such environmental sustainability-related matters may be the source of the outreach and information. [107] Unfortunately, the reality is that students will not, unless specifically prompted to do so, search out such information on the Facility Services website, hence outreach should take a form that adequately reaches and informs the student body. McMaster should make use of MSU platforms for outreach and bridge gaps in access to information and further promote their advocacy efforts through such avenues.

Facility Services also leads an initiative to upload monthly waste reports for each campus loading dock to McMaster's electronic resource management system and manages the McMaster Teaching and Learning Community Garden (MTCG). Given that Facility Services does so much outside of taking care of work orders and repairs, more efforts need to be undertaken to extend their relationship and communication with students. Alternatively, the educational and information function currently being spearheaded by Facility Services could be centralized elsewhere in a department or location with greater outreach with the general student population, such as under MacSustain.

The university in the past has made statements regarding the important of a transition from fossil fuels to clean and renewable energy. Suncor, Cenovus, Canadian Natural Resources, and Exxon, are four out of five CU200 (carbon underground) companies that are known as a lobbying group called CAPP (Canadian Association of Petroleum Producers), rated the 6th most negative organization in lobbying against climate regulations. As of 2023, McMaster has 2.4% of their portfolio, which is equivalent to 30.4 million dollars invested in such companies.[108] It is necessary that McMaster effectively follow the strategy of divestment with full public exposure to reinforce

[106] McMaster University, 2022. https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Audit-2022.pdf
[107] McMaster University, 2022. https://facilities.mcmaster.ca/app/uploads/2023/02/Waste-Audit-2022.pdf
[108] McMaster Financial Audit, 2022. https://financial-affairs.mcmaster.ca/app/uploads/2022/10/FS_AFR_2022_Oct31.pdf

the goal of being a carbon free campus. Divestment and McMaster's decarbonization strategy implemented in 2018 in alignment with the UN Principles of for Responsible Investment, are not mutually exclusive and McMaster should put forth steps to ensure that adequate actions are taking place to decarbonize McMaster investment pool.[109] This includes proof of action via slowly de-segregating investment pools starting at the most carbon intense manager, here BlackRock. Such aligns with student pressure for divestment and allows McMaster to update their decarbonization strategy to better align with student voices while fulfilling its carbon reduction goals. The University should also collaborate with student groups to make use of resources around divestment and align itself with the growing number of Canadian universities that have pledged themselves to divestment.

In improving the visibility and ease of access of its reports and any progress or updates, the University will also have a greater degree of accountability to uphold its commitments to its sustainability goals as well as elicit greater engagement from the student population and the greater Hamilton community in such matters.

General Sustainable Practices Education

Principle: Sustainability education should begin when students arrive on campus and should continue through their undergraduate education.

Concern: Many students do not know how to properly dispose of waste, recyclables, and compost due to a lack of awareness, education and resources.

Concern: Many McMaster students who live in student housing in the greater Hamilton community do not know how to properly dispose of wastes, recyclables, and compost.

Concern: Students foreign to Hamilton and McMaster University's surrounding area may be unaware of the cleanliness of Hamilton's drinking water and, as a result, resort to plastic water bottles, reboiling tap water, or using external water filters that are sources of waste.

Recommendation: McMaster University should be proactive in educating students of proper waste, recyclables, and compost management as soon as they come to McMaster and throughout their university experience.

Recommendation: McMaster University in collaboration with the City of Hamilton should inform all residents, including students, of municipal tap water quality and potability.

McMaster University should educate students of proper waste, recyclables, and compost management as soon as they come to McMaster and throughout their time at university. Students may not be aware of the best waste management practices, and information regarding proper waste disposal may be cumbersome to access. At the moment, the McMaster Sustainability website's guidelines for proper disposal of waste, recyclables, and compost are disjointed because information regarding the disposal of wastes, such as coffee cups, compost, plastic bottles, and electronics are on separate tabs.[110] To address this, McMaster should develop a sustainability toolkit to summarize waste disposal and sustainability best practices on campus, similar to the sustainability toolkits used by Western University.[111] The contents of these toolkits are consistent and summarize how to dispose of common campus wastes (plastic bottles, food

[109] McMaster Investment Pool. 2023. McMaster University. https://financial-affairs.mcmaster.ca/mcmaster-investment-pool/#tab-content-carbon-intensity

[110] McMaster University. "Sustainability at McMaster. McMaster University. https://www.mcmaster.ca/sustainability/index.html

[111] Rezlife. n.d. "Sustainability Toolkit Make purple more green!". University of Western Ontario. Accessed 4 March 2018. http://www.rezlife.uwo.ca/book_sustainability/sustainability_toolkit.pdf

containers, and electronics), and sustainable practices (shorter showers, eating seasonally, and bringing reusable containers).

In addition, students are unaware of McMaster's switch to single-stream recycling. A toolkit should also be developed to help students transition into using single-stream recycling bins, similar to the guide produced by University of Saskatchewan.[112] These guides describe what is single stream recycling, and what can and cannot be recycled via single stream recycling.

As students transition from living on campus to living off campus, they may not be properly educated on disposal of waste in their new homes. Off-campus-housing landlords may not adequately prepare or inform new tenants in matters of proper waste management, and the responsibility thereby falls upon the students as tenants to inform themselves. McMaster University should take a more proactive role in educating its students to be contributing members of the Hamilton community through collaborating with the city of Hamilton to teach students how to properly dispose of waste when they transition into their new homes. For example, McMaster can work with the city of Hamilton to provide recycling bins or trash tags to students who do not have them already in their homes. As well, they can disseminate information regarding the use of trash tags and weekly-garbage days.[113] Taking these actions will ease the transition for students from residence to off-campus housing, preparing them to be a responsible member of the greater Hamilton community.

Students have expressed concerns regarding the quality of tap water at McMaster University and the greater Hamilton area. Many students have resorted to wasteful and non-sustainable "purification" practices of boiling tap water, purchasing bottled water, or using external filters prior to consuming Hamilton tap water. To prevent these practices from occurring, McMaster University should with greater effort inform students that Hamilton's drinking water is potable in accordance with Ontario's Drinking Water Quality Management Standard.[114] Through taking these direct measures to educate students in proper waste disposal, single-stream recycling, waste-management off campus, and the quality of Hamilton's drinking water, McMaster University can assure that students maintain the thriving green space of the Hamilton community.

Policy Creation

Principle: Students should be involved in institutional changes related to maintaining and improving sustainability practices on campus.

Principle: Institutional sustainability policies should be up-to-date and be accessible to the community.

Concern: McMaster University does not have a comprehensive and transparent plan for fossil fuel divestment and have inadequate policies related to sustainable reinvestment.

Concern: The University does not currently emphasize student opinions in their sustainability policies.

Recommendation: McMaster University should update its Climate Action Plan to include its stances and approaches to current sustainability related issues on campus, while also including research and tangible steps to accomplish each of their goals.

[112] University of Saskatchewan. n.d. "Single Stream Recycling Guide". University of Saskatchewan. Accessed 4 March 2018. http://sustainability.usask.ca/documents/Single_Stream_Recycling_Brochure.pdf
[113] The City of Hamilton. n.d. "Garbage & Recycling". Accessed 4 March 2018. https://www.hamilton.ca/garbage-recycling
[114] Hamilton Water Division. (2015). "Drinking Water Quality Management Standard (DWQMS)". https://d3fpllf1m7bbt3.cloudfront.net/sites/default/files/media/browser/2015-04-15/certificateofaccreditation-dwqms_may2015.pdf

Recommendation: The University should periodically revisit its sustainability policies and initiatives, with reference referring to the United Nations' Sustainable Development Goals as a guideline for developing such policies.

Recommendation: When appropriate and relevant, McMaster policies on sustainability should emphasize the student consultation that occurred, and how this consultation ensures that new sustainable practices are amenable to students.

Recommendation: McMaster University should publicly outline a comprehensive divestment and investment strategy with time-specific goals. Further, the university should implement a sustainable investment subcommittee under their financial subdivision to ensure that goals are met on time.

As a world leader in innovation, McMaster University has a responsibility to aspire to the highest standards of sustainable practices within the institution. A fundamental requirement of sustainable practices is the vision: in other words, established sustainable goals put forth by the University. The University should be establishing such goals for sustainability milestones as well as moving forwards with innovative green initiatives to accomplish these goals.
Despite these expectations, the University's sustainable goals do not adequately address the concerns put forth by students. With students participating in the University experience as fully as faculty, staff, and administration, it is important for student opinion to be included in sustainability efforts. One section of the McMaster University Sustainability Policy provides a strong example of the importance of student consultation outlining objectives: 1) Provide faculty, staff and administration with opportunities to increase their awareness and knowledge of sustainability; 2) Provide students with internships and volunteer opportunities in the areas of sustainable development.[115]

Allowing students to engage in conversations with the University could increase the effectiveness of any future sustainability methods. Although McMaster's policy base is not as expansive as students may desire, this is not to say that McMaster does not have a robust plans on sustainability as evidenced in the Sustainability Annual Report.[116] Students would definitely like to see McMaster's policies completed with the same level of thought and insight as their reports and action plans. Students believe that McMaster should update the Climate Action Plan and policies based on surveys and involvement with students, staff, faculty and community members in order to establish a carbon neutrality goal. The newly identified plan should also identify reduction opportunities and successes in the past.

It is important for McMaster to move towards conducting and then including student consultation and opinions in their policies. This provides several benefits. First, it empowers students to look at sustainability issues critically, and to be able to see their influence on the university environment. Second, it strengthens the University's policies because it includes an additional perspective. Students are often recognized for bringing unique contributions and solutions to global problems, and student insight into University sustainability practices is no different. Lastly, including student consultation satisfies an important accountability measure for McMaster. Students are just as active of a stakeholder in the well-being of universities as faculty and staff and therefore deserve the right to shape how their university operates.

[115] "McMaster University Sustainability Policy" (2011). McMaster University. http://www.mcmaster.ca/sustainability/policies/McMaster_University_Sustainability_Policy.pdf
[116] "McMaster University Sustainability Report 2016" (2016). McMaster University. https://www.mcmaster.ca/sustainability/documents/Sustainability%20Report%202016.pdf

University Sustainability Initiatives

Principle: Sustainability initiatives should reflect unified interests of relevant university parties with sustainability causes.

Principle: Students should be provided with adequate opportunities and resources to lead sustainability initiatives.

Concern: Currently, sustainability initiatives on campus are separately organized and implemented, lacking elements of interconnectedness and collaboration.

Concern: There are limited opportunities for students to lead sustainability initiatives with the support of relevant university bodies.

Recommendation: McMaster University should coordinate a unified sustainability campaign to standardize sustainability practices among different facilities, including but not limited to Hospitality Services, University Facility Services, McMaster Student Union, OPIRG, and Hamilton Health Sciences

Recommendation: McMaster University should establish a network of sustainability-related groups and initiatives on campus and in Hamilton.

Recommendation: There should be a physical space on campus that acts as a central location or office for university parties involved in sustainability causes to meet.

Recommendation: The University parties involved in running sustainability initiatives should employ robust cross-departmental and cross-institutional engagement to identify important questions on pertinent issues.

Recommendation: The University should increase its funding of McMaster University's sustainability education program, or the Academic Sustainability Programs Office, to allow for more undergraduate student participation in sustainability initiatives.

Sustainability initiatives on campus are currently separately organized and implemented by individual university bodies invested in sustainability causes. While these initiatives are not ineffective on their own, it is when sustainability initiatives reflect unified interests of and are supported by all relevant parties that they achieve their maximum potential for impact. A unified sustainability campaign should therefore be pursued, allowing the development of standardized sustainability practices across different facilities, including but not limited to Hospitality Services, Facility Services, the McMaster Students Union, OPIRG, Academic Sustainability Programs Office, and the Hospital, with input from the Sustainability Education Committee. Research by the Massachusetts Public University found that continuity and consistency with one authority was essential for sustainable development decisions.[117] On that note, inter-party communication and relations should be maintained so that sustainability initiatives on campus are better connected not only internally but also externally (i.e. with parties outside of the University such as other universities), which can be achieved through various means such as meetings, email groups, or conferences. Having a physical space on campus that acts as a central meeting point for university bodies committed to sustainability causes will also help to facilitate these relationships. The University should continue it's existing efforts to connect all faculties on sustainability and promote inter- and intra- faculty communication towards reaching it's sustainable goals and use research from faculty members to inform their sustainability practices.

[117] Pavlova-Gillham L., Swinford D. 2017. "Becoming Sustainable in Our Own Way: Sustainability at the Flagship Massachusetts Public University." In: Leal Filho W., Mifsud M., Shiel C., Pretorius R. (eds) Handbook of Theory and Practice of Sustainable Development in Higher Education. World Sustainability Series. Springer, Cham.

The Academic Sustainability Programs Office has been successful in fostering relationships between university staff, community members, and students in their efforts to engage more undergraduate students in taking leadership within sustainability initiatives. In one instance in the United Kingdom where undergraduate learning for environmental management systems was linked with small campus development projects, there was a resulting response from support staff from estates, facilities management, learning resources and catering. These staff identified proposed projects in which students could get involved, for which they needed further data such as that on lighting in learning resources centre areas and food waste management schemes.[118] Therefore, in expanding the Academic Sustainability Programs Office, the University in turn increases environmental initiatives on campus and incentivize the collection of further data that can be used to inform sustainability initiatives. Expanding the Academic Sustainability Programs office is thus a central part of sustainability integration as it would motivate change makers to action and promote innovation.

[118] Taylor, Ros, Elise Barron and Katherine A.T. Eames. 2018. "Embedding Sustainability Learning: Robustness in Changing Circumstances - Perspectives From a United Kingdom (UK) Higher Education Institution (HEI)." In Sustainable Development: Concepts, Methodologies, Tools, and Applications, ed. Information Resources Management Association, 486-515, accessed February 27, 2018. doi:10.4018/978-1-5225-3817-2.ch023

Policy Statement:

Whereas: The University should employ environmentally-sustainable practices whenever possible.

And Whereas: All members of the university community have a responsibility to reduce production of all forms of waste.

And Whereas: McMaster Hospitality Services should aspire towards developing and implementing sustainable food-related waste management and reduction strategies.

And Whereas: Sustainable solid waste management strategies that promote correct recycling and composting practices are an essential component to sustainability.

And Whereas: Students should be equipped with the knowledge and means of safely disposing their electronic devices.

And Whereas: Reusing and re-purposing materials is necessary to reduce waste production.

And Whereas: Food-related sustainability practices are an important component of sustainable development.

And Whereas: Energy consumption across campus buildings should be conserved whenever possible.

And Whereas: Energy conservation efforts should not detract from the quality of education and student, faculty, and administrative life.

And Whereas: Sustainable practices should be followed in the classroom.

And Whereas: Sustainable energy practises are fundamental to a sustainability-friendly campus.

And Whereas: LED lighting is more efficient and cost effective and McMaster should continue to adopt its usage on campus.

And Whereas: Higher education institutions are looked to as leaders in promoting sustainable practices to address greenhouse gas emission.

And Whereas: Institutions have a responsibility to eliminate unnecessary waste.

And Whereas: When it does not detract from the quality of education and student, faculty, and administrative life, the University should conserve water whenever possible.

And Whereas: The energy usage, water management, and waste management on campus should be communicated clearly and transparently.

And Whereas: Students are stakeholders in the well functioning of the University and should have ease of access to information about the university's environmental practices.

And Whereas: Sustainability education should begin when students arrive on campus and should continue through their undergraduate education.

And Whereas: The University should establish goals for sustainability and continue support and creation of green initiatives to accomplish these goals on campus.

And Whereas: Students should be involved in institutional changes related to maintaining and improving sustainability practices on campus.

And Whereas: Institutional sustainability policies should be up-to-date.

And Whereas: Sustainability initiatives should reflect unified interests of relevant university parties with sustainability causes.

And Whereas: Students should be provided with adequate opportunities and resources to lead sustainability initiatives.

Be It Resolved That: The University should make efforts to adhere to the best possible environmental sustainability practices.

Be It Further Resolved That (BIFRT): The University should implement a ban for single-use plastic products, including plastic cutlery, styrofoam plates, hot beverage cups, and straws; replace them with compostable products; and encourage the use of reusable metal utensils.

BIFRT: Food vendors should implement and explicitly advertise discounts for students who bring their own food and beverage containers.

BIFRT: Hospitality Services should expand the Eco-Takeout Container Program to all its facilities and increase promotional efforts for the program.

BIFRT: All McMaster-affiliated groups and events organized on McMaster property should adhere to the Waste-Free Event Guidelines.

BIFRT: Facility Services should ensure all bins for composting, recycling, and garbage should be located in close proximity to limit incorrect waste disposal.

BIFRT: Facility Services should design waste bins to aid correct disposal and keep the design consistent across all campus buildings to minimize confusion.

BIFRT: Facility Services should implement clear signage above waste collection bins to inform individuals and encourage them to practice correct disposal.

BIFRT: Facility Services should implement compost bins at more locations on campus.

BIFRT: Facility Services should clear compost bins daily.

BIFRT: McMaster University should inform students of appropriate e-waste disposal practices.

BIFRT: McMaster University should establish accessible drop-off locations for e-waste disposal across campus.

BIFRT: McMaster University should offer specialized waste management services during move-out periods that incentivize reusing and repurposing materials.

BIFRT: McMaster University should provide more accessible resources for food literacy.

BIFRT: Hospitality Services should introduce portion sizes options by providing customers with the option of using smaller containers or receiving a reduced portion while adjusting for costs.

BIFRT: McMaster University should reduce nonessential energy use, such as heating and lighting, when campus buildings are not in use.

BIFRT: McMaster University should retrofit buildings, whenever possible with LED lights.

BIFRT: McMaster University should install sensor lights in buildings wherever possible in order to avoid unnecessary usage of energy on lighting.

BIFRT: McMaster should reduce unnecessary usage of energy on temperature control in campus buildings through adjusting building temperatures according to time of day and weather.

BIFRT: McMaster University should mandate that professors, whenever possible, should accept student submissions for assignments using online tools such as Avenue to Learn or LearnLink.

BIFRT: McMaster University should mandate that custom courseware is made available online.

BIFRT: McMaster's Sustainable Written Work Submission Guidelines should be included on every course outline and uploaded to the program's website for easy access.

BIFRT: McMaster University should divest from the use of fossil fuel.

BIFRT: McMaster University should use more sustainable energy sources to reduce its greenhouse gas emissions.

BIFRT: McMaster University should replace regular light bulbs in its buildings with LED lights wherever possible.

BIFRT: McMaster should replace regular light bulbs in lamps and equipment used on campus to compact fluorescent lights (CFLs) wherever possible.

BIFRT: McMaster should conduct deep energy retrofits in its buildings to identify specific areas to improve energy efficiency.

BIFRT: McMaster University should ensure that all new infrastructure on campus should adopt the most cutting edge technology and innovative practices in green energy and sustainable energy.

BIFRT: McMaster's Climate Action Plan, like other universities, should set a target to be carbon neutral by 2040 in the interim set to reduce the carbon footprint by 35 percent by 2020 and 70 percent by 2030.

BIFRT: McMaster University should update and enforce a campus-wide no-idling policy.

BIFRT: Parking Services should establish discounts and other incentives to encourage carpooling.

BIFRT: Parking Services should look to expand preferential parking programs for Electric Vehicles, Low Emission Vehicles and Carpool Vehicles.

BIFRT: Facility Services should increase green spaces on campus.

BIFRT: McMaster University should be a water-bottle free campus, enforcing a water-bottle free policy and refraining from selling plastic water bottles.

BIFRT: Where possible, the university should retrofit water fountains with water bottle refill stations.

BIFRT: The University should develop a strategy to reduce water consumption in buildings through the creation of a Water Management Plan.

BIFRT: The University should inform students of water quality and work to actively maintain drinkable water quality across campus.

BIFRT: The University should inform students more effectively of their waste disposal methods, recycling programs, e-waste disposal, and composting on campus.

BIFRT: The University should inform students of their energy use, and initiatives in place to decrease energy use.

BIFRT: The University should use online (website, social media) and in person (posters, digital signage, signs on trash and waste disposal cans) means to educate the McMaster community.

BIFRT: The University should centralize its sustainability-related reports to improve ease of access as well improve its information outreach efforts.

BIFRT: The University should keep the sustainability website and reports up to date.

BIFRT: The University should perform yearly waste audits to determine waste composition, the success of current waste diversion programs, and to identify possible program improvements in reducing, reusing and recycling waste.

BIFRT: McMaster University should be proactive in educating students of proper waste, recyclables, and compost management as soon as they come to McMaster and throughout their university experience.

BIFRT: The City of Hamilton should inform all residents, including students, of municipal tap water quality and potability.

BIFRT: McMaster University should update its Climate Action Plan to include its stances and approaches to current sustainability related issues on campus, while also including research and tangible steps to accomplish each of their goals.

BIFRT: The University should revisit its sustainability policy, referring to the United Nations' Sustainable Development Goals as a guideline for developing such policies.

BIFRT: When appropriate and relevant, McMaster policies on sustainability should emphasize the student consultation that occurred, and how this consultation ensures that new sustainable practices are amenable to students.

BIFRT: McMaster University should coordinate a unified sustainability campaign to standardize sustainability practices among different facilities, including but not limited to Hospitality Services, University Facility Services, McMaster Student Union, OPIRG, and Hamilton Health Sciences

BIFRT: McMaster University should establish a network of sustainability-related groups and initiatives on campus and in Hamilton.

BIFRT: There should be a physical space on campus that acts as a central location or office for university parties involved in sustainability causes to meet.

BIFRT: The University parties involved in running sustainability initiatives should employ robust cross-departmental and cross-institutional engagement to identify important questions on pertinent issues.

BIFRT: The University should increase its funding of McMaster University's sustainability education program, or the Academic Sustainability Programs Office, to allow for more undergraduate student participation in sustainability initiatives.