POLICY PAPER

Environmental Sustainability

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Introduction

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Food and Waste

Food Waste

Principle: McMaster's hospitality services should incorporate more sustainable waste management strategies related to food waste.

Concern: A high volume of waste is produced on-campus, and a significant proportion of this waste is not recyclable or biodegradable.

Recommendation: The university should implement a ban for single-use plastic products, including plastic cutlery, styrofoam plates, and hot beverage cups; replace them with compostable products; and encourage the use of reusable metal utensils.

Recommendation: Food vendors should implement a discount for students who bring their own containers (i.e., mugs, tupperware).This should be explicitly advertised in places that already have the policy.

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

McMaster University has implemented commendable initiatives to reduce the production and regulate the disposal of waste. However, numerous gaps still exist in the current system and must be addressed.

A waste audit was conducted in October 2015 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 totalled to nearly 40,000 individuals. The audited buildings were Hamilton Hall, Burke Science Building, John Hodgins, Brandon Hall, McMaster University Student Centre, and Mills Library. In total, over 2.5 million kilograms of waste was produced, of which two-thirds went to the landfill. Less than one-quarter was recycled (paper, electronics, metal, wood, etc.), and only 9% was composted (organics). 1.68 million kilograms represents a staggering amount of waste that will permanently reside in landfills.

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. Commendable efforts that have been made include the installation and promotion of water-refill stations by Facility Services, the Eco-Takeout Container Program by Hospitality Services, and the MSU Plastic Bottle Free Policy (2,3,4). However, more improvements must be made.

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 (5). Additionally, the clear plastic takeout containers from the aforementioned locations are reportedly produced from corn and are compostable (5).

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 their compostability, as compostable items that end up in landfills do not break down well and therefore contributes to large volumes of waste rather than being processed into a valuable resource. This proposal is closely linked to Concerns 2 and 3. Considering that single-use containers still require greater production of material and may end up in the landfill despite its compostability, 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 the majority of their food from on-campus Hospitality Services facilities.

Regarding single-use plastic products, Hospitality Services should halt their usage of plastic utensils and opt for entirely compostable utensils, ensuring to acknowledge 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 (6). In other words, *everything* is biodegradable over time.

Second, active measures should be taken to encourage students to bring reusable utensils, tupperware, and cups. Contrary to popular belief, coffee cups are *not* recyclable (7). 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 (7). 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, Mugs at Mac, to actively promote it (8). For instance, they could run an awareness campaign. The “Bring Your Own Mug” incentive should be expanded to reward those who bring their own tupperware.

Sub-Heading

Principle: The University should adopt more sustainable waste management strategies.

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

Concern: There are not enough designated compost disposal bins available on campus.

Recommendation: Bins for composting, recycling, and waste should be located in close proximity to limit incorrect waste disposal. The bins should be consistent across all campus buildings and be designed to aid correct disposal.

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

Recommendation: Compost bins should be implemented at more locations on campus.

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, 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 (1). Only recently in Fall 2017 was a compost bin implemented in the Student Centre thanks to a Sustainability 3X03 student initiative (2). While the availability of compost disposal bins is important in kitchen areas given the amount of food scraps or waste that are inevitably produced, 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 (3). Bins for compost disposal should also be made available in residence buildings.

In addition to increasing the number of compost bins, these bins should be adequately labelled as being for the purposes of composting and 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 overall. Currently, composting rests at the bottom of the United States Environmental Protection Agency's (EPA) food recovery hierarchy (4). Thus, the university should strongly consider first of all prioritizing food waste reduction. Additionally, the university should consider investing in, or contributing to efforts that convert food waste into industrial energy.

Sub-Heading

Principle: The University should adopt more sustainable waste management strategies.

Concern: Areas to conveniently dispose of e-waste on campus are lacking.

Recommendation: Students should be made aware of acceptable e-waste disposal practices.

Recommendation: McMaster should have permanent dropbox locations for e-waste disposal.

McMaster University has a total student population of 31,265 (1), and with post-secondary student owning an average of 7 technology devices (2), there is a clear need for investment in electronic waste services. As well, providing the McMaster community with several accessible locations to dispose of, and recycle old electronics aligns with the university's mission to strive for sustainability (3). Electronic products that have become obsolete need to be disposed properly. Electronic equipment contains harmful chemicals such as cadmium, mercury, and lead (4). 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 (4). As such, it is important that McMaster invests in a robust e-waste collection system that promotes responsible e-waste disposal and facilitates e-waste reuse and recycling. Currently, there are initiatives in place that serve this purpose. However, there is limited knowledge of these services among the student body.

As of July 2017, collection cages are located year-round in locations across campus including the Arthur Bourns Building (ABB), John Hodgins Engineering Building (JHE), Information Technology Building (ITB), 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 (5). 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. Thus, 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 programming such as "tech lit" week, through information cards available in libraries, campus television screens, and student groups such as the Student Representative Assembly, and faculty societies, etc. Additionally, in an effort 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 high-traffic areas, such as 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 (6). These initiatives will hopefully increase the amount of e-waste that is diverted from landfills.

Sub-Heading

Principle: McMaster should adopt more sustainable food-related practices.

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. 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.

Concern: Currently, food received from some vendors goes to waste.

Recommendation: Students require more accessible resources for food literacy. This may include workshops on meal preparation, budgeting and spending, grocery shopping, and food waste. 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.

Recommendation: Food vendors can introduce portion sizes by providing customers with the option of using smaller containers or receiving a reduced portion while adjusting for costs.

In Canada, about 40% of food intended for human consumption is wasted annually (2). In addition to obvious ethical concerns, food waste has significant short- and long-term environmental and economic consequences (1,2). For one, this results in a loss of approximately $31 billion worth of food annually (2, 3). McMaster University's sustainability efforts should include strategies to decrease food waste. Reducing food waste decreases associated food waste costs as well as contributes to reducing the release of harmful greenhouse gases (such as methane) produced from decomposing food (2).

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 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 (4).

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 (2). This highlights a need to educate both kitchen staff and the general student body about how they contribute to, and can 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 The Silhouette. Another means by which this can be done is through the use of clear bins (as green bins) that show the food waste they contain as is done at Carleton University (2). 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 (2). 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. The unit plan is reportedly accessible to over 200 teachers from Ontario, China, and Australia (2).

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 (2). With such an initiative, it is important that meal costs are adjusted to reflect the amount of food provided. Another strategy to reduce food waste would be to collect and review data on patrons' 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..

Energy

Sustainable Energy Practices

Principle: McMaster should adopt more sustainable energy practices.

Concern: McMaster is not transparent about their energy practices; students are not aware of various sustainable practices on campus.

Concern: McMaster continues to use fossil fuels as an energy source.

Concern: McMaster continues to use non-LED lighting.

Concern: McMaster wastes energy as many buildings lights stay on permanently.

Recommendation: McMaster should divest the use of fossil fuel and invest in more sustainable energy sources (e.g. solar panels).

Recommendation: McMaster should implement more LED lights by replacing regular light bulbs with LED lights.

Recommendation: McMaster should increase their usage of sensor lights in order to conserve energy.

Recommendation: All new infrastructure on campus should adopt better insulation/heating practices.

Recommendation: McMaster should reduce unnecessary use of energy source (e.g. AC).

McMaster University is always at the forefront of innovation and technology and for this reason, it is imperative that the University implement the use of more sustainable energy sources. McMaster is one of the largest energy consumers in Ontario and currently, the University relies heavily on fossil fuels for energy which this is not a sustainable practice. Fossil fuel use represents approximately 80% of all energy used in Canada and is the main source for greenhouse gas emissions. Specifically, 51% of McMaster's greenhouse gas emissions are coming from its electricity use. In 2010, University president Patrick Deane signed the University and College Presidents' Climate Change Action Plan which commited McMaster to reducing its greenhouse gas emissions. Unfortunately, there is little information on McMaster's progress or where McMaster's energy is sourced.

McMaster has the opportunity to become a leader in Canadian Universities by adopting more sustainable energy sources which would thereby reduce greenhouse gas emissions. Furthermore, if the University adopted more sustainable practices, they could cut back on cost given their large use of energy. The University sound consider implementing more localized and sustainable methods for energy production, for example, solar panels. Although implementing sustainable technologies such as solar panels requires a large upfront investment, after

installation they simply require maintenance for up keep. Solar panels would create savings in the long term and would also reduce 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. 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 pay back time of 2.6 years. McMaster should continue to implement more LED lighting such that the entire University becomes equipped with LED's. This is not only more sustainable for the environment but it is more cost friendly for the University as well.

McMaster should also 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. If McMaster were to adopt the use of more occupancy sensors, it would ensure that once an individual exits a room, the lights turn off. This would help to prevent any unnecessary usage of electricity on campus and save the University more money.

McMaster university is well known for its contributions towards research and education. However, its role should extend beyond its academic achievements. The university needs to invest in more sustainable practices to conserve energy and meet the needs of students and faculties. In order to prevent electricity shortages in the province, a reserve of approximately 1,400 megawatts (MW) is always on stand-by [1.] The wholesale price of electricity is dynamic – changing hourly based on the availability of supply and changes in demand. Nevertheless, roughly 70% of the energy used in commercial and residential buildings is used for heating, insulation etc. [2] Like most other Canadian universities, the academic year runs from September to April; with approximately 3,700 students occupying 12 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. [3] McMaster needs to take active measures to reduce unnecessary use of energy. This includes ways to conserve energy for existing buildings and for infrastructure implement more sustainable methods of insulation/heating practices.

In October 2010, the university's president, Patrick Deane, signed the University and College Presidents' Climate Change Action Plan, committing 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 develop reduction targets and measurement

procedures and develop initiatives to achieve said targets. The campus net Electricity consumption/student/year has remained somewhat steady since 2009.[3] This is indicative of not taking measures to reduce unnecessary use of electricity. Energy consumption can be greatly reduced by implementing stick policies that overlook the use of Air conditioning in buildings. There are numerous buildings that are either too cold or hot, thereby not only wasting energy but also affecting students and staff comfort. In addition, changing to use of compact fluorescent lights (CFLs) in lamps and equipment when possible. CFLs uses 75% less energy and last seven to ten times longer than regular light bulbs. Sensor lights are an amazing way to reduce unnecessary energy consumption. University should look into implementing vending misers which allow vending machines to turn machine lights off and cycle machine when not in use while still keeping beverages cold. This piece of equipment cuts enegy consumption in half for the beverage vending machines. Vending Misers were implemented by Tufts university on 90 machines, and they were able to save $17,00 on 100 tons of Carbon dioxide annually. [4]

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. New buildings should implement CFLs in the first place so there is no replacement cost associated with it. 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 during normal occupied hours and 55 degrees during off-hours. [4] 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 the roof of newly constructed infrastructure, the university along with partnership with other organizations can implement solar panels. At Cape Cod Community College (MA) 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 will use 35% less energy than conventional systems. [4]

Energy
Sub-Heading

Principle: Higher education institutions are looked to as leaders in promoting sustainability practices.

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.

Recommendation: 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.

Recommendation: McMaster University should update and enforce a campus-wide no-idling policy and work with the community to encourage carpooling.

Recommendation: McMaster University should look to expand preferential parking programs for EV, LEV and carpool vehicles.

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. In 2009, Ontario's universities pledged to "assist in finding solutions to the challenges of environmental sustainability; to share knowledge about sustainability and climate change; and to incorporate, wherever possible, principles of sustainability into our own operations."(1)

Much work has been undertaken over the past decade to reduce reliance on fossil fuels in university operations. Over the next two years, every Ontario university will develop a plan to commit to a low-carbon campus. McMaster's Climate Action Plan in 2013 outlines a goal of reducing fleet emissions by 20% over the next four years.(2) However in order to be leader in sustainability, students believe that McMaster should establish a goal of becoming carbon neutral in the future. In the interim, it should be setting higher targets similar to that of other universities such as Queen's University which has has set low-carbon solutions to reduce the carbon footprint by 35 per cent by 2020 and 70 per cent by 2030, set against a baseline year of 2008 (1). Moreover, universities like University of British Columbia have also followed a commitment to carbon neutrality in their operations as mandated by British Columbia law (3).

Current recommendations on the Climate Action Plan 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 (4). Furthermore,

carpooling has been found to be beneficial for both employers as it reduces the need for parking and also reduces transportation costs for employee (5). Students believe that McMaster should look to encourage carpooling through programs such as incentivization. The university should also encourage sustainable transportation by expanding preferential parking programs for EV, LEV and carpool vehicles.

An updated Climate Action Plan will reinforce this university's leadership in and commitment to a sustainable future, including reducing energy use and emissions, and helping Ontario meet climate change targets.

Sub-Heading

Principle: Students should be encouraged to follow sustainable practices 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 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: Instead of physical handouts, professors, whenever possible, should use online tools such as Avenue to Learn or LearnLink to upload documents and accept student submissions for assignments.

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 the majority 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. Despite efforts of many faculty members to decrease their waste, many course assignments and evaluations are still submitted and communicated on paper. Thus, since a great portion of the average student's time on campus takes place in the classroom, McMaster's ability to create sustainably minded students will be most effective by focusing on this environment.

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

When requiring a physical submission, many course instructors currently have strict course submission guidelines, often requiring double spaced, one side of text per page rules, among other margin outlines. A study was done at McMaster through the Sustainability Office where professors in the faculties of Social Science and Arts & Science were surveyed to see whether they would consider changing the requirements for assignment submissions to be more sustainable with the amount of paper used. Options they were given included reducing margins, printing single-spaced and printing double sided. This data was used to create the Sustainable Work Submission Guidelines to be implemented on McMaster's campus (6).This policy however is currently not heavily advertised or implemented in the classroom environment as they are rarely included in course outlines are conveyed to classes.

Sub-Heading

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

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

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

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.

Recommendation: When University buildings are not in use nonessential energy use such as light and heating should be reduced.

Recommendation: McMaster University should retrofit buildings, whenever possible with LED lights, which offer better energy efficiency over the long term.

Recommendation: McMaster University should implement newer and more environmentally friendly ways of producing energy to reduce its dependency on non-renewable forms of energy creation.

Recommendation: McMaster University should conduct a deep energy retrofit based for its energy demanding buildings.

Recommendation: The University should continue in completing work to retro-commission all labs using the Demand Control Ventilation.

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.

If 1000 of Mcmaster staff members unnecessarily left the lights on in their offices for 2 hours each work day, 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. However, spaces not covered under the bylaw such as hallways, stairways, common areas and underground parking often have lights left on. Students believe that ensuring that lighting in non-essential spaces is shut off when not in use could be a significant contribution to reducing overall energy usage.

While McMaster Sustainability's website provides suggestions on "Living Green" like turning off lights, the university should take a proactive approach in enforcing this practice. One approach that has been used to great effect at American universities is an innovative, volunteer-driven initiative known as Friday Night Lights Out. At Penn State University, student volunteers come together weekly on Fridays to turn off unnecessary classroom lights that would otherwise stay on all weekend. This program has been in operation since 2006 and has saved Penn State more than 700,000 kilowatt hours of electricity (7). Moreover, the university should also look to either installing scheduling lights or occupancy sensors which have been noted to reduce lighting costs by 30% and 35% respectively (8). While the 2013 Climate Action Plan has outlined recommendations such as placing "Turn Me Off" stickers on light switches located in offices and lab spaces, students believe that the university should take a multifaceted approach and run multiple projects/campaigns (6).

Last year, McMaster Facilities Services completed the replacement of nine residence buildings with LED retrofits. The initiative builds on the previous success of implementing LED lighting retrofit in campus stairwells and corridors. The estimated annual electricity consumption saving is around 985,000 kWh, and the annual GHG avoidance is estimated to be 123 metric tonnes (9). LED bulbs use 75-80% less energy than a traditional incandescent bulb and the estimated lifespan of about 30 000 - 50 000 hours (9). 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.

The University should look to the construction of greener buildings and for the renovation of existing buildings to retrofit them with sustainable energy sources. Construction of such buildings is possible, as illustrated by the Engineering

Technology Building (ETB), which is outfitted with a rainwater treatment mechanism and the ability to house solar panels (10). The L.R. Wilson Hall is a gold LEED certified building (11). The University should look to continue outfitting upcoming buildings, such as the residence on Traymore Avenue, with renewable energy usage potential.

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 (1). 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 (12). 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.

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. Retrocommissioning 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 by 760 tonnes annually. By continuing to apply this in other buildings, McMaster could save upwards of $400000 annually (1).

Sub-Heading

Principle: Students should be encouraged to participate in conversations by the University related to maintaining and improving sustainability practices on campus.

Principle: McMaster University should maintain an up-to-date policy bank on sustainability-related issues on McMaster's campus.

Concern: McMaster University's current policy base is outdated and small in both the number of policies it contains and the scope of each individual policy.

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

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.

For sustainability practices to be solidified on campus, the University should look for new and creative ways to integrate students. Currently, McMaster University has developed a Climate Action Plan in 2013 that set out their intentions for maintaining sustainable practices, while also keeping these efforts accountable to society at large. McMaster University's Office of Sustainability is responsible for the sustainability of the University's campus, including areas of focus such as education, energy, transportation, waste, and water (13). This office also contains McMaster's policy bank on sustainability, which includes policies on sustainable buildings, battery recycling, environmentally green purchasing, plastic bags, and the official McMaster University Sustainability policy (14). These policies and plans have not been updated for the past five years, and the MSU is concerned is concerned regarding the lack of updated official stances the university has taken on sustainability.

All five of McMaster's sustainability-related policies do not include or allude to student consultation having been conducted during the policy process. 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 (15).

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 (16). 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 deserve the right to shape how their university operates.

Green Spaces

Principle: Concern: Recommendation:

Lorem ipsum

Water Usage

Principle: Concern: Recommendation:

Lorem ipsum

Education and Transparency

Education

Principle: The University should be more transparent regarding water and waste management on campus.

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

Concern: Floods occur in varying areas across campus and flooding is known to affect local water sources.

Concern: The University does not inform students of single-stream recycling programs taking place on campus
McMaster University does not inform students on about energy use.

Concern: Students are unaware of how the University is disposing of waste, recyclables, e-waste, and composting

Concern: Due to a lack of transparency, McMaster is unable to be held accountable for their waste management actions.

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

Recommendation: Students should be informed of flood management procedures currently in place.

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

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

Recommendation: 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.

Lorem ipsum.

Accountability

Principle: The University should be held accountable for improper waste management practices

Concern: There is nobody monitoring the proper disposal of waste.

Concern: There is no unified education program on campus to encourage proper waste disposal.

Concern: Waste disposal is not done properly and recycling often gets mixed with garbage and vice versa.

Recommendation: The University should look into successful ways an education program has taught people to sort waste properly.

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Subheading

Principle: Sustainability education should begin as early as students arrive on campus, as well as throughout their undergraduate education.

Concern: Students foreign to Hamilton and McMaster'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.

Concern: First-year residence students - who have never lived alone previously - may not know how to properly dispose of waste, compost, and recyclables.

Concern: Lack of waste management education leads students to dispose of wastes, composts, and recyclables inappropriately.

Recommendation: The University should provide educational programs to first year students in order to educate about waste management.

Recommendation: [Who] should include waste management practices in WHMIS and other regulatory trainings on campus.

Recommendation: [Who] should create educational advertisements both online and in person to raise awareness for proper waste management.

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Subheading

Principle: Students should be informed and incentivized to pursue more sustainable alternatives to resources use.

Concern: Single-use plastic water bottles, cardboard takeout containers, and disposable coffee cups are built out of one-use wasteful materials that eventually end up in a landfill.

Concern: Food-providers on campus sell single-use plastic water bottles.

Recommendations: Incentivize the use of reusable plastic water bottle, coffee mugs, thermoses, and takeout containers.

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Subheading

Principle: The University should increase presence and use of composting on campus.

Concern: Students are unaware of composting practices on campus, including how to compost and how the compost is used

Concern: Due to a lack of portion sizing, differences in diet, or overproduction of food there is high amounts of food waste on campus.

Recommendations: [Who] should advertise composting [through what means]
Recommendation: Make compost available in all residences.

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Subheading

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

Concern: Waste programs across different areas of the university are disconnected.

Concern: University sustainability goals are outdated, the "McMaster University Sustainability Policy" was originally approved in December of 2010.

Concern: The current sustainability initiatives on campus are not interconnected.

Recommendation: A unified sustainability campaign should be pursued to standardize sustainability practices among different facilities, including but not limited to Hospitality Services, University Facilities, McMaster Student Union, OPIRG, and the Hospital.

Recommendation: The University follows the WHO's Sustainable Development Goals as a guideline for writing their sustainability policies.

Recommendation: Steps should be taken to ensure that sustainability initiatives on campus are connected (ex. Through meetings, email groups, or conferences).

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Policy Statement:

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