

**LIFE WITHIN THE PLASTIC CRISIS:
A STUDY OF STUDENT AWARENESS & BEHAVIOUR
REGARDING PLASTIC USAGE ON LAKEHEAD UNIVERSITY
CAMPUS**



LIFE WITHIN THE PLASTIC CRISIS:
A STUDY OF STUDENT AWARENESS & BEHAVIOUR REGARDING PLASTIC
USAGE ON LAKEHEAD UNIVERSITY CAMPUS

by

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ABSTRACT

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Key Words: Plastic waste, plastic pollution, single-use plastic, low-waste, waste-management, natural resources, sustainability, awareness, behaviour, Lakehead University, Thunder Bay.

Human induced plastic pollution is causing undeniable devastation among Earth's natural resources. As research concerning the crisis begins to progress, it is important that its data includes human awareness and behaviours regarding plastics' utilization. University students may be an important demographic for this investigation, as they resemble highly diverse communities which exhibit a wide array of consumption habits. Ultimately, these habits often result in varying consequences among the environment, as many include improper waste disposal and use. Despite the devastating evidence of plastics' effects on our health and the environment, LU appears to be withholding the key tools and information needed for its students to consume and utilize plastics responsibly. In this paper, 381 active LU students were assessed through an online questionnaire to observe personal awareness, usage, and disposal of plastic waste on campus. Evaluation of willingness to improve was also examined. Most were found to be aware of plastic pollution's consequences, yet many were uneducated about proper methods of utilization and disposal on campus. Additionally, it was observed that most were willing to reduce their consumption, if not already, through advanced initiatives if implemented by the university. A condensed list of recommendations was developed for Lakehead University's benefit.

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I would like to thank my loving mom for not only raising me to live sustainably and to be aware of my ecological footprint, but for always encouraging me to follow both my goals and dreams; my dad, for the continuous love and support; and my brothers, Mike and Shawn, for always being my biggest inspirations in life. To Oluwatomi, for supporting me before this process even begun. Your continuous love, support, input, and guidance brought me so far- and has taught me so much more about my capabilities than I could ever fathom. And lastly, to my best friend Natasha, for supporting me and my work since we were kids.

I hope that my findings encourage students at Lakehead University to build up off this research, and to become more conscious about their consumption habits. After all, it is our responsibility to take care of our only home, and ensure a brighter future for the generations to come.

LIST OF ACRONYMS

GHGs	Greenhouse Gases
UN	United Nations
SUPs	Single-use plastics
LU	Lakehead University
UBC	University of British Columbia
HDPE	High-density polyethylene
PVC	Polyvinyl chloride
LDPE	Low-density polyethylene
PP	Polypropylene
PS	Polystyrene
PET	Polyethylene terephthalate
UNEP	United Nations Environment Programme

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INTRODUCTION

PICTURE THIS: THE YEAR IS 2050.

Human beings (*homo sapiens*) have managed to perpetuate the highest levels of self-destruction, natural resource depletion, and irreversible pollution effects ever recorded. Plastics, the most ubiquitous material ever developed and utilized, posed the largest threat to Earth's ecosystems,¹ yet production never ceded. This pathology was encouraged by world leaders who wasted decades in denial debating if the plastic crisis was truly factual or not (Lenore 2019). With now over 9.7 billion human beings inhabiting the planet (UN 2019), Mother Earth is desperately demanding their attention- demonstrating that this ignorance and denial will result in unforgiving consequences.

In the Great Lakes, there is now more plastic waste contents than total fish populations (Gatehouse 2019). Several watersheds within them are now completely impotable, due to decades of chemical contamination (McCartney 2017). Boreal ecosystems have collapsed due to toxic runoff poisoning soil and water reserves (Lamizana 2018).

In the world of 2050, cities such as Thunder Bay, Ontario, for example, are highly affected by this crisis. This small-town community is highly dependent on the surrounding natural resources for sustenance, recreation, energy, economic, and educational opportunities. With many of its' residents attending Lakehead University, it is unfortunate that the institution's environmental initiatives had not improved rapidly enough to help its students combat the crisis. Left ill-informed and unaware of the

¹ Producing 26 billion tons in the last 100 years alone (Guglielmi 2017), plastic waste became the primary contributor to their own atmospheric, aquatic, and terrestrial poisoning (Patz 2002).

consequences of plastic use, improper utilization and disposal have contributed to the devastating effects upon this community.

In retrospect, Lakehead University's decision makers reminisce on the year 2020, where revised action plans had the ability to avoid these disasters. Now, only time will tell how the plastic crisis ensues.

Clearly, it is Time to Wake Up.

The futuristic representation above is a mere example of what humans could face if predicted catastrophic tipping points are reached by 2050. As we enter the year 2020, it is important to acknowledge that plastic waste is accumulating at one of the greatest rates ever witnessed by mankind, and our policies to positively utilize the material are desperately failing (UNEP 2018). Of the 9 billion tonnes of plastic ever produced, only 9% has been recycled, while the additional proportions are disposed among landfills or our natural environment (Ibid.). As a result, research based on plastic pollution awareness and its usage has grown tremendously (Hayward 2019). Surprisingly although, the bulk of this research does not involve student's awareness about the plastic epidemic, or how students are utilizing the materials at universities. This lack of representation raises a concern, as students can exhibit some of the most careless and destructive consumption habits, due to an over-reliance on convenience (Wilcox 2014). Notably, these behaviours in the long-term could have devastating consequences among our natural environment.

Lakehead University (LU) Thunder Bay for example, is an extremely tight knit community with a growing population of students from all across the world.

Unfortunately, data concerning its current students' actions, preferences, and knowledge regarding plastic use and pollution is virtually non-existent. Furthermore, any plans to mitigate plastic use through environmental programming has been significantly absent in recent years, due to lack of funding and priority (Earth Care 2014; LU Sustainability Stewardship Council 2019; Sustainability Plan 2019; McKellar 2019).

Because of these existing flaws in the educational system, university students may be discouraged to adopt long-term sustainable behaviours, even if they are implemented by the law² (CBC News 2019; Kitching 2019; Trudeau 2019). Therefore, promptly combatting plastic waste through strategic behaviour analyses and improved initiatives may be of interest to this school community.

Universities across Canada have implemented several environmental policies designed to improve students' consumption habits and mitigate plastic waste (Carson 2019; Sustainable Loyalist 2020, Zero Waste Action Plan 2014), and LU Thunder Bay campus should be no exception. If LU executes similar initiatives within its sustainability plans, students may finally acquire the essential knowledge and tools needed to utilize plastics responsibly, and take action against the plastic crisis post-graduation (Study International Staff 2019).

² If LU fails to provide plastic product alternatives that are widely accessible before 2021, students may be unequipped to adapt to Canada's 'Single-use plastics ban' (Trudeau, 2019), within and beyond the school environment. Likewise; if campus initiatives to improve education and incentives are not offered, ignorant consumption and plastic mismanagement may continue to be encouraged through unawareness, denial, and over-reliance on waste management systems to deal with plastic properly.

RESEARCH OBJECTIVE

This study will be divided into four sections. The first section will contain the literature review.

In this section, the origins of plastics will be analyzed while focusing on its rising patterns in consumption, followed by Thunder Bay's current waste program, and the consequences of plastics on our health and in the environment. Awareness and behaviours will then be examined, with a specific focus on Thunder Bay's current waste management programs, and single-use plastics use (SUP). Lastly, we review how universities in Canada have implemented strategies to curb plastic usage (Sustainable Loyalist 2020, Zero Waste Action Plan 2014). Here, we identify if these plans been successful, or effective, in mitigating the plastic waste. Using LU's current waste management systems and environmental initiatives in place, we will identify any limitations that could be present in comparison. The insights from these articles inspired us to design the research questions which make up this survey.

In the materials and methods section, we discuss the research method used to collect data from our sample size, and the criteria used to select our participants. In order to collect data for this study, we conducted an online survey with active LU students constituting the sample size. Based on these research findings, we hope to identify any educational gaps that may be present, current issues regarding its use and disposal, and how students choose to evolve their own environmental consciousness.

In the discussion section, we analyze the results by reviewing the most relevant data collected, along with student commentaries, current constraints, and potential areas of concern.

In the final section, we will combine the results from this research and past articles to provide recommendations on viable solutions in which LU could adopt and implement. It is our hope that the future we painted in the 2050 scenario does not become reality. Therefore, we anticipate that LU takes a stance on fighting the plastic pollution crisis here in Thunder Bay, by first acting locally, and thinking globally.

RESEARCH QUESTION

As mentioned, this thesis aims to investigate LU students' current awareness and behaviours regarding plastic usage on campus. Awareness will be examined through environmental consciousness evaluations involving plastic's effects on our health and the environment. Behaviour will be examined by analyzing what students do currently to reduce, or intensify, their environmental impacts regarding plastic usage at Thunder Bay's LU campus. Plastic use includes areas concerning consumption, application, reusing, reducing, recycling, and disposal. Here, we hope to discover if reducing plastic usage through advanced initiatives is a practical idea for Lakehead University, while also seeing which incentives are encouraged, or discouraged, the most by students in the LU community.

HYPOTHESIS

We hypothesize that LU students are aware of plastic pollution being a global issue. However, we assume that most are unaware of proper utilization methods, due to failure of instruction of both LU and the city of Thunder Bay. Additionally, we hypothesize that students wish to mitigate their plastic consumption on campus, but

nevertheless require modernized incentivizes to improve their behaviours for the long-term.

LITERATURE REVIEW

THE UBIQUITOUS NATURE OF SINGLE-USE PLASTICS

The American Chemical Society (ACS) explains that “[h]uman history is shaped by the materials we develop and use” (ACS 2019, p.2). This statement encapsulates why plastics have become the most fundamental material we have ever created and utilized (Plastiquarian 2015). Without it, our modern lives would be unrecognizable. For example, the laptop the author used to write this thesis would cease to exist if not for plastic materials (Apple Inc. 2018). On a broader scale, the clothes we wear (Resnik 2019), the books we read, the chairs we currently sit on- likely all contain it (Plastiquarian 2015). Undeniably, this ubiquity has given us the ability to technologically advance as a species (Abbing 2019). Now, it is our responsibility to advance our knowledge about this omnipresent material we use so habitually. In order to accomplish this, we will first discuss its rapid evolution and utilization.

Evolution & Utilization

When you think about the term ‘*plastic*’, which items first come to mind? A pen? A bag? A disposable water bottle? Similar to the taxonomic hierarchy system, each of these plastic items (including the one you considered) are derived from the same broad chemical class, called *polymers* (Beckman 2018). Thus, the distinction between the items we label as either ‘*plastics*’ or ‘*polymers*’ can be quite subjective (Ibid.). Under a

microscopic lens, these polymers resemble extremely long and stable chains of molecules which are comprised of several smaller monomers (ACS 2019; Gurnagul 1992). These polymers can be synthesized through artificial modification, or natural resources such as *cellulose*³ (Ibid.). Following the polymerization process⁴, these stable molecules provide the many valuable characteristics in plastics which we see today. These attributes include, but are not limited to; plasticity, insulation, heat resistance, malleability, and durability (Beckman 2018).

In 1862, the first plastic ever created was an organic polymer, named *Parkesine* (ACS 2019; Mossman 2013). Parkesine possessed certain characteristics, which included transparency, moulding capabilities when heated, and concrete stable states upon cooling (Mossman 2013; Bellis 2019).

Advancing beyond the archaic-organic modifications of Parkesine; 99% of all plastics made today are now manufactured from fossil fuels, a non-renewable resource (Laville 2019; Wernick 2019; Plastiquarian 2015). Produced through a *fracking* process⁵ (Dartmouth College 2018; Wernick 2019), extreme heat is used to ‘crack’ the molecular bonds within crude oil (such as petroleum) or natural gasses (such as ethane), into *ethylene* (Wernick 2019; Climate Reality Project 2018; Plastiquarian 2015). As a result,

³ Polymers can be created synthetically through fossil fuels or derived naturally through the cell walls of plants (*I.e.* cellulose; The History and Future of Plastics 2016). Synthetically produced polymers contain longer chains of atoms, thus being much stronger and flexible than organically sourced polymers.

⁴ Through the *polymerization* process, thousands of monomers can be linked together to create one single polymer unit, regardless of synthetic or organic origin (Plastiquarian 2015). Thus, plastics are polymers made by polymerisation.

⁵ Fracking includes the drilling, extraction, and pipeline transportation of fossil fuels (Dartmouth College 2018; Wernick 2019).

ethylene is then transformed into a resin, where it is then manipulated to create several different plastic product types⁶ (Wernick 2019).

This manufacturing process is typically carried out in petrochemical refineries (Plastiquarian 2015), and can also be used to reverse the process, through *catalytic cracking* methods, or recycling (to learn more about this reverse process, see Noreña et al. 2012). Today, it is actually *cheaper* to purchase *virgin plastics*, than to have them recycled (CBC News 2020). As conveyed by Thunder Bay’s city manager of solid waste; “It is still cheaper to throw away plastic than [to] recycle [it]” (Ibid, pg. 1).

Due to these benefits in manufacturing⁷, the plastic industry forecasts to produce over 34 billion metric tonnes of the product by 2050 (*Figure 1*; Garside 2019).

⁶ Today, there are seven groups of plastic, 1-6 of which can be recycled (as shown in Table 1; Beall 2016; The History and Future of Plastics 2016). These seven can be divided into one main family of plastics; called *thermoplastics* (UNEP 2018). Thermoplastics can be repeatedly melted and reformed upon heating, thus containing recycling capabilities (Table 1). In contrast, a separate family of plastics called *thermosets* are composed of immutable molecules (Freinkel 2011). This means that once they become a solid, the process is irreversible (UNEP 2018). Thus, they cannot be recycled and forever remain in that state.

⁷ Through fracking, natural gas production is enabled to increase due to improved accessibility, which thus lowering plastic production costs. Hence, benefiting the plastics industry and its future infrastructure (Currie & Meckel 2018).

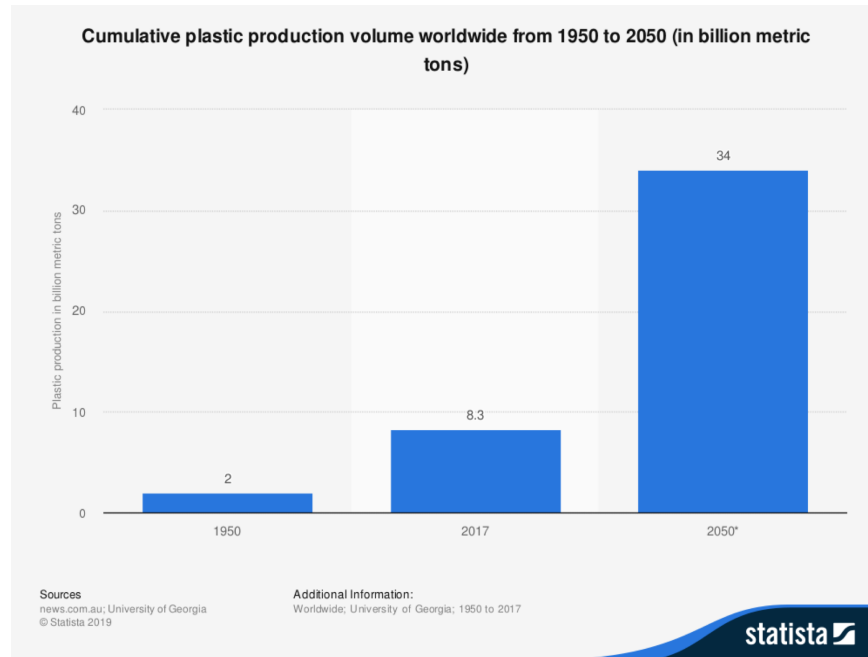









Figure 1. Evolution of global plastic pollution, in billion metric tons, from 1950 to 2050. Source: Garside 2019.

This projection is an alarming increase from the 8.3 billion metric tonnes that have already been produced globally today (Ibid.). While this increase in production may further assist in our everyday lives, our landfills may be filling up with plastics faster than we can contain them (UNEP 2018).

In Canada alone, residents are responsible for disposing over 3.3 million tonnes of plastic waste a year (Young 2019). Of this, 2.8 million tonnes are thrown away and left to break down in landfills or the environment. Single-use plastics (SUP), or ‘disposable; throw-away’ plastics, comprise almost half of this total waste quota (UNEP 2018.). United Nations Environment Programme 2018 (UNEP) defines SUP as “items intended to be used only once before they are thrown away or recycled” (UNEP 2018, pg. 2). Examples of these forms of plastics include, food packaging, takeout cutlery,

plastic bottles, takeout containers, grocery bags, ‘paper’ coffee cups, and plastic straws
(Table 1; Abbing 2019.; Parker 2019).

Table 1. The seven plastic polymer types with their corresponding recycling codes and modern uses.

Plastic Polymer Type	Recycling Code	Product Examples
Polyethylene Terephthalate (PETE or PET)	 PETE	Disposable water bottles, soft drink bottles, clothing fibres, salad trays, peanut butter containers, high resistance food trays
High-Density Polyethylene (HDPE)	 HDPE	Food packaging, milk jugs, juice bottles, cleaner bottles, yogurt containers, trash can liners, grocery bags, garbage bags
Polyvinyl Chloride (PVC)	 V	Film wrap, clear food packaging, cleaner bottles
Low-Density Polyethylene (LDPE)	 LDPE	Garbage bags, food packaging films, squeezable bags
Polypropylene (PP)	 PP	Takeout containers, plates, cutlery, microwavable dishware, chip bags, bottle caps, ketchup bottles, drinking straws
Polystyrene or Styrofoam (PS)	 PS	Plastic cutlery, plates, hot drink cups, protective packaging, takeout containers
* Misc: Acrylic (ABS) Nylon (PA) Polycarbonate (PC) Polylactic acid (PLA)	 OTHER	PA & ABS: fibre textiles; PC: cups, CD's, baby feeding bottles.

Source: Beall 2016; Isangedighi et al 2018; Tanguay 2019; SPI 1988; The History and Future of Plastics 2016; UNEP 2018.

As SUP items are designed to be disposed immediately after consumption, their lifespan period is only 15 minutes on average (Plastics Oceans Canada 2019). With students displaying irresponsible consumption habits (Wilcox 2014), LU and the City of Thunder Bay may be encouraging the plastic industry to meet its 2050 production targets, especially if sensitized programs are not implemented or provided correctly.

THUNDER BAY'S WASTE PROGRAM

To reiterate, majority of the world's plastic waste ends up in landfills, with only 9% recycled (UNEP 2018). These figures are also reflective of Canada's annual plastic waste reports⁸ (Young 2019). However, since this study is focusing on students at Lakehead University (LU), elaborating on Canada's waste program is beyond the scope of this thesis. Therefore, due attention has to be paid to the city that accommodates LU.

Currently, there is no limit on how much plastic waste you can recycle in the city of Thunder Bay (City of Thunder Bay 2018), however, the types of plastics accepted *within* those bags are severely limited (Prokopchuck 2019). Currently, the city only recycles a very small variety of plastics; PETE (#1) and HDPE (#2; *Table 1*). These plastics only include plastic bottles with 'necks' (Ibid.). This excludes plastic bottle lids, and any other type #1 and #2 containers (i.e., clamshell containers; CBC News 2020). An illustration of this can be seen on the bottom of the city's collection schedule directory, *Figure 2*.

⁸ A report from Oceana (Young 2019) states that Canada is a large part of the global plastic waste issue. To be exact, about 86% of Canada's plastic waste becomes displaced among landfills or the environment, 9% is recycled, while the remaining percentage becomes incinerated.

GENERAL INFORMATION			THUNDER BAY SOLID WASTE & RECYCLING FACILITY - 5405 Mapleward Road	
<ul style="list-style-type: none"> - Dumping on streets or public property is illegal. - Householder is responsible for clean-up of improperly set out garbage. 			Vehicles charged based on weight of load. \$10 for less than 130 kg. Subject to change. Loads must be secured and covered. Before leaving home, sort your load so materials can be taken off in these laydown areas:	
CURBSIDE RECYCLING	(BAG 2) PAPER	RECYCLING DEPOTS	<ul style="list-style-type: none"> - recycling depot - metal bin - Household Hazardous Waste Depot - tire bin - electronic waste bin - leaf & yard waste compost area 	
(No bag limit) <ul style="list-style-type: none"> - Place sorted recyclables in see-through blue plastic bags. - Place recycling bags 1.5 m (5 ft) away from your garbage at the curb. - Maximum bag weight is 18 kg (40 lbs). 	<ul style="list-style-type: none"> - newspapers, flyers, magazines, catalogues & soft cover books - household fine paper - paper egg cartons - boxboard boxes (eg. cereal) Gift Wrap is NOT recyclable	(Hours of operation subject to change.) <ul style="list-style-type: none"> - Front St. at McIntyre St. - Mountdale Ave. at Walsh St. Mon. - Sat. 8 am - 6:30 pm. Closed Sundays & holidays. • Solid Waste & Recycling Facility – open Landfill Site hours of operation.	Landfill Site Hotline: 623-5756 WEEKDAYS: 8 am-6:30 pm SATURDAYS: 8 am-4:30 pm SUNDAYS: CLOSED	
(BAG 1) CONTAINERS	CARDBOARD	RECYCLING TIPS:		
<ul style="list-style-type: none"> - glass, metal food & beverage containers - pop cans - clean aluminum foil containers - No. 1 & 2 plastic bottles only - Tetra Paks & milk cartons 	<ul style="list-style-type: none"> - cardboard in bundles (90 cm x 60 cm x 30 cm) (3 ft x 2 ft x 1 ft) broken down flat & tied with string or rope - clean pizza boxes only 	<ul style="list-style-type: none"> - rinse all bottles and jars of food residue - remove plastic lids from bottles and put in garbage - don't be a Wishcycler, get a copy of Our Green Guide from City Dispatch at 625-2195. 		
FOR MORE INFO: Garbage Collection: 625-2195 Recycling (GFL): 577-0411				

Figure 2. City of Thunder Bay 2020 Collection Schedule, Area 4 - Zone 1. Source: Auld 2020

This may be deceiving students, as this information can be easily mistaken or overlooked. For instance, students seem to be unaware of these regulations at Lakehead University, as a plastic bag, contaminated cup; straw, and tainted napkin had been placed in the recycling bin (*Figure 3*).



Figure 3. An example of sorting failures in Lakehead University Thunder Bay campus' recycling systems (CASES Building, Room FB 2002). The blue 'recycling bin' exhibits an unwashed Starbucks plastic coffee cup and straw (#5, PP), a plastic bag (#2, HDPE), and a contaminated napkin. Source: Auld 2020.

As the City of Thunder Bay (2014) does not have a sorting facility, it is the student's responsibility to educate themselves of the city's guidelines in order for their plastic waste to be accepted and recycled (Ibid.).

For several reasons, this is quite problematic. First, being that students may confuse *recyclable* items with those that are *unacceptable* (i.e., recycling a PP #5 Starbucks iced cup with PETE #1 plastic water bottle). Secondly, as Lakehead's bins do not specify its preferred contents stream (*Figure 3*), students have no way of knowing if the bin requests paper, or container waste (i.e., #1 and #2 plastic bottles, metal, or glass). Such mistakes would result in the entire bag being disposed of in the landfill due to improper disposal (City of Thunder Bay 2014; Rinne 2019).

Moreover, if students separate their items properly but fail to clean them, cross contamination would issue a similar fate⁹. According to the manager of Thunder Bay’s solid waste and recycling facility, cross contamination of recycling materials is one of the most challenging occurrences among waste management sectors, as “curbside blue bags contain[s] too much [of it]” (Prokopchuck 2019, pg. 1).

One major factor that may contribute to these wrongful recycling tactics includes a lack of awareness and direction between the consumer, education systems, and waste management facilities. The reason for this strong assertion is that residents may be utilizing their plastic products with good intentions, but a lack of awareness regarding city regulations may lie. This thereby contributes to recyclable waste winding up in the Thunder Bay region’s landfills, as seen in *Figure 4* below.



Figure 4. Display of Lappe, Ontario’s industrial landfill site, full of recycling bag liners and milk-type jugs, potentially all type #2 materials. Source: Elaine Foster-Seargeant; Facebook: Prokopchuck 2019.

⁹ Cross contamination refers to “non-recyclable items mixed in with a blue bag’s contents”. (Prokopchuck 2019, pg. 1). This may include unwashed items, or plastic products of PVC, LDPE, PP, PS, or type 7 origin (Refer to *Table 1* for more information).

CONSEQUENCES

With approximately 30% of Ontario's waste sent to the United States for disposal (Jones 2019), more landfills may be closer to capacity than we actually think. According to the Chris Jones (2019; pg. 1.), if our disposal methods continue at present rates, "Ontario[s] landfills will be full in less than 15 years". This is extremely concerning, as landfill overflows may trigger consequences on both a financial¹⁰ and ecological level.

As landfills play a significant role in Thunder Bay's waste management strategy (City of Thunder Bay 2014), it is important that we uncover the consequential effects that over-occupied landfills play on our ecosystems. To begin, by-product gases and leachates will be examined.

Landfill Gases & Leachates

Unbeknownst to many, landfills threaten the Earth's atmosphere. Gasses such as methane, carbon dioxide, ammonia, sulfide, and volatile organic compounds (VOCs) for example, are all produced from waste decomposition in landfills (Ibid.). Landfill fumes such as these contribute to over 20% of the world's anthropogenic greenhouse gases (GHGs) and are consequently fuelling the climate crisis (Ibid.). As seen in *Figure 5* below, solid 'waste' is highest in contribution to Thunder Bay's GHG emissions.

¹⁰ When landfills grow near capacity, costs to dispose our plastic waste increase substantially (Jones 2019). Thus, increasing the urgency for consumers to reconsider their current plastic consumption and disposal behaviours.

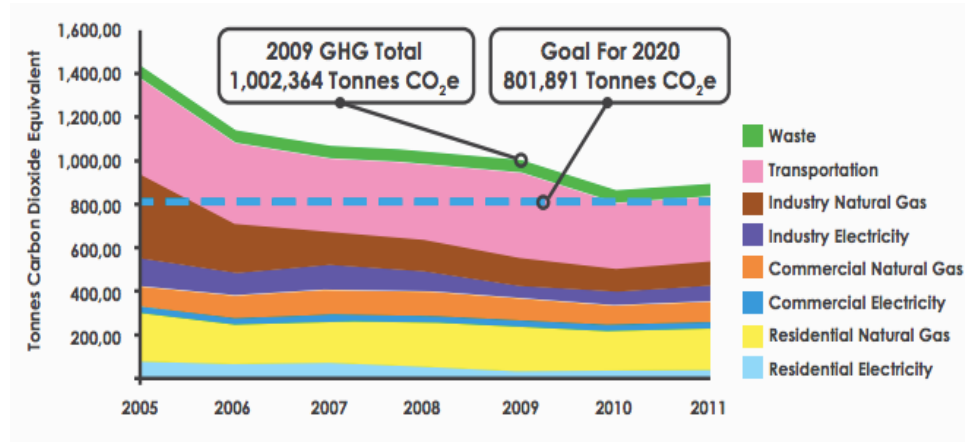


Figure 5. Greenhouse gas emissions emitted in tonnes between 2005 – 2011 among the City of Thunder Bay. Source: Earth Care 2014.

Additionally, landfills threaten Earth’s ecosystems. Leachate, otherwise known as the substance which drains from landfill waste and water runoff, is created by highly toxic and carcinogenic chemicals partially derived from plastics (Danthurebandara *et al* 2012). When it rains, ground and surface water are increasingly susceptible to leachate toxins, posing a major threat among surrounding soils, wildlife¹¹, and human health (Ibid.).

To reiterate, plastics’ have extremely stable and slightly permanent characteristics. Thus, the products that we dispose of or litter¹², never truly ‘go away’ or disappear indefinitely. Instead, they break down into smaller and smaller micro-fragments over time, through *photodegradation* (Ibid.). This process then creates a bi-product, called *microplastics*¹³ (<5mm) (Ibid.). Through photodegradation, microplastics

¹¹ Plastic leachate has been proven to cause acute toxicity to freshwater phytoplankton, otherwise known as *Daphnia magna* (Bejgarn *et al.* 2015). This species is an extremely important source of food for aquatic organisms (Ibid.).

¹² According to the Rochester Institute of Technology, “More than 22 million pounds of plastic pollution end up in the Great Lakes every year” (Alliance for the Great Lakes 2019)

¹³ Microplastics can occur in two forms: *primary* and *secondary*. Primary microplastics resemble the small circular granules which are visibly found in facial scrubs or toothpastes. On the other hand, secondary

then flow discreetly throughout our ecosystems, eternally remaining as *nurdles* or *microfibres* (UNEP 2018). As plastic can take thousands of years to photodegrade; most, if not all plastic that has ever been disposed of at LU still exists in today in some form (Ibid.).

Over time, these microfibers are refined to even finer nanoparticles, making it virtually impossible for waste management divisions to detect, filter, or remove from our ecosystems (UNEP 2018).

Still fairly new to research, there are only three studies in the world which confirm the presence of microplastics in rainwater (Leahy, 2019). Microplastics have, however, been discovered to exist on virtually every extremity of the planet; and more locally, in high concentrations among the Great Lakes (Parker, 2019; Mason 2017; *Figure 6*). According to this research, microplastics may exist from the peaks of the Sleeping Giant, to the depths of the Lake Superior (Ibid.)

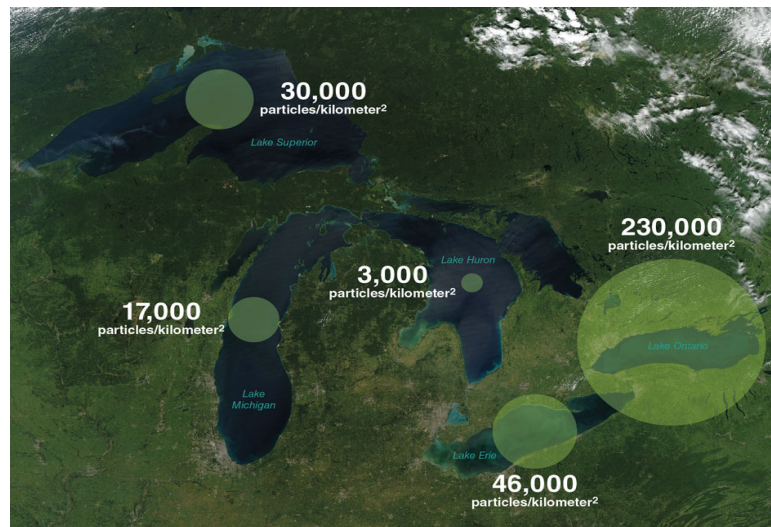


Figure 6. Satellite imagery displaying the total average of plastic pollution particles per km² in the Great Lakes. Source: Mason 2017; Barbara Aulicino; satellite image Jeff Schmaltz, MODIS Rapid Response Team/NASA/GSFC

microplastics are derived from the photodegradation process of macroplastics (>5 mm) (Pettipas *et al.* 2016).

As a result of biomagnification (Mason 2017; *Figure 7*), it is no surprise that microplastics have been finding their way into Canadian's bottled water and food webs, as represented in *Figure 7* (Szeto *et al.* 2018; Mason 2017).

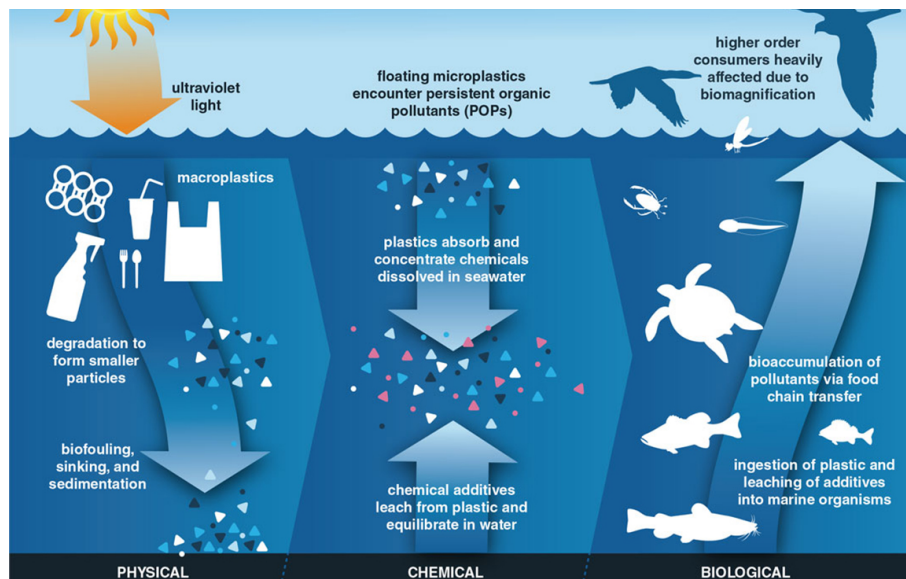


Figure 7. An example of the biomagnification process, including the physical, chemical, and biological consequences of macroplastics. Source: Mason 2017

Not only are we ingesting microplastics, but we are inhaling them too. A recent American research study suggests that the average person may be consuming over 1,769 microplastics *a week* from water consumption alone (either bottled or tap; WWF 2019), while eating and breathing about 74,000-121,000 microplastics *annually* (Cox *et al.* 2019). Individuals who solely drink bottled water can add up to 90,000 microplastics to their annual total (Ibid.). This equates to ingesting about a credit card of plastic, or *five grams* of plastic every week (WWF 2019).

Surely, we do not know the effects these might have among human health, as studies are still very much in their infancy and are being carried out (World Health

Organization 2019; Cox *et al.* 2019). However, this does not mean we should wait to bear the same consequences as millions of aquatic species¹⁴ in order to improve our awareness and behavioural habits.

As discussed previously, students may be unaware of the effects' plastics pose on our health and the environment, as well as proper utilization methods. Unfortunately, such knowledge deficiencies may be indirectly encouraging the consumer to wrongly consume and dispose of the material. Since plastics play such large role among our lives, accepting the fate of these consequences is crucial to effectively improving the way we use plastics. In order to accomplish this locally, it is important that students are given the necessary tools to advance the way they use and think about plastics. Going forward, we will analyze how improvements in awareness can subsequentially lead to a more positive development in behaviour.

AWARENESS & BEHAVIOUR

To begin, I will briefly define awareness and its usefulness in regard to attitude and behavioural changes. Merriam-Webster (2020) defines awareness as “knowledge and understanding that something is happening or exists”. Due to this rationale, developing an understanding (or awareness) about plastics' consequences, along with proper usage methodologies, both have the ability to advance values of “intention, attention, and meaningful action” (Vyas & Young 2012). If individuals are made aware about the dangers of improper plastic usage, the crucial importance of a clean

¹⁴ According to *No Plastic Oceans* (NPO; 2019), over 100 million marine species are killed annually due to plastic related incidents, as they often mistake micro and macro (>5 mm) plastics for food (NPO 2019; UNEP 2018). Marine species are seen to ingest the largest quantities of our plastic by-products, and their populations are quite literally suffering from it (Isangedighi *et al.* 2018)

environment, and their city's waste disposal expectations through engaging activities and initiatives- their consumption habits would be encouraged to improve. Thus, awareness is could be the first step towards changing one's behaviour.

This isn't to say that changing one's behaviour is an easy or rapid process.

Zimmerman *et al.* (2000) broadly defines behaviour changes as a rarely discrete, long-term modification of an individual's performance, which, more often than not, people are unwilling to modify. Expressed by Albert Bandura (1977; pg. 194),

“People fear and tend to avoid threatening situations they believe exceed their coping skills, whereas they get involved in activities and behave assuredly when they judge themselves capable of handling situations that would otherwise be intimidating.”

This articulates that students may be more obliged to avoid intimidating life changes, especially those which threaten their convenience. The *instant gratification* of purchasing a coffee in a disposable cup, versus the ‘*inconvenience*’ of preparing, carrying, utilizing, and later cleaning a reusable mug- is an excellent example.

Some alternate methods that could help the consumer overcome this inconvenience may include a SUP ban, an incentivized mug-share program, or a significant discount for bringing their own reusable product. Desa *et al.* (2011) implies that behaviours are likely to be incorporated into personal values and long-term routines if rewarded, reinforced, or required by a higher authority. Thus, institutions could do so by claiming responsibility for the consumer, easing intimidation and offering a valuable return. Such incentives could lead to desirable outcomes, such as developed awareness, improved recycling and disposal methods, a reduction in SUP consumption, and thus a better environment for future generations (Mrema 2018; Singh *et al.* 2017; Opeolu

2019; Wilcox 2014). In turn, these behaviours could later aggregate into a collective pressure on plastic producers, encouraging greater structural changes to be implemented.

Now that I have provided an overview of the importance of improved awareness and behaviours, in the next subsection, I will apply these processual concepts (*i.e.*, awareness – behaviour – attitude) into reviewing how some universities have mitigated plastic usage.

EXAMPLES OF CANADIAN UNIVERSITY INCENTIVES

As consumption and proper disposal of plastics is a voluntary behaviour, it is important that post-secondary institutions are making every step possible to improve the awareness and behaviours of its students. In order to accomplish this, incentivized mechanisms must be widely available and accessible for students in the academic realm. Since Lakehead University (LU) is the focal point of this study, we will discuss how two other post-secondary schools in Canada are advancing their sustainability policies and initiatives by contrast.

University of British Columbia

Situated in Vancouver, British Columbia, the University of British Columbia (UBC) attracts over 64,798 students from across the world (UBC 2019). Although the difference in UBC's campus size and enrollment is radically opposite to LU's (Ibid, LU 2017), it is important that we first discuss UBC as Canada's global leader in sustainability for reference.

The UBC has committed to becoming a zero-waste campus for a long period of time. For example, UBC was the first university in Canada to have a sustainability office by 1993 (Ramsey 2019). This makes UBC an excellent archetype for LU, as they have been practicing sustainability for over three decades. Additionally, their first plastic-focused policy¹⁵ was launched in 1993, and involved the recycling of surplus equipment and miscellaneous materials on campus. This policy promotes a circular disposal model, rather than a linear model¹⁶ (Figure 8), which is often used for such items (UNEP 2018).

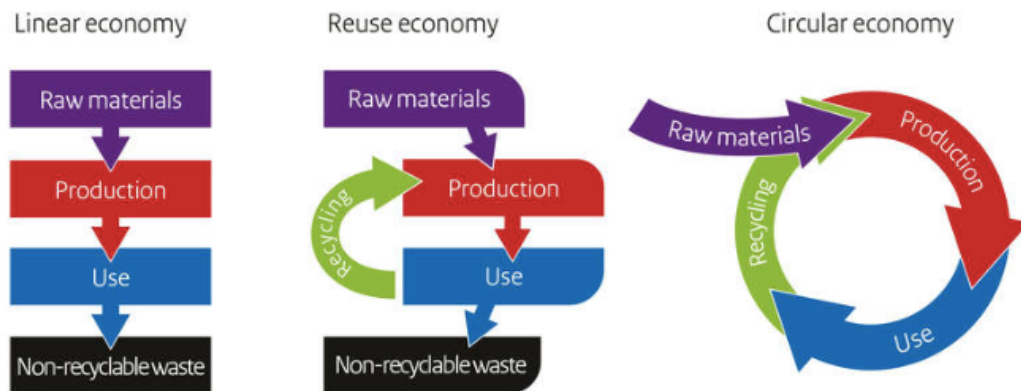


Figure 8. An example of a linear economy. Source: Government of the Netherlands 2017.

Moreover, they have an *Environmental Protection Compliance Policy: SC4* (2005), which represents UBC’s commitment to mitigating environmental issues and pollution effects in the long-term. This is done through continuous monitoring and auditing. Embraced by UBC’s Environmental Committee, this policy is encouraged

¹⁵ This policy is represented as the *Disposal of Surplus Equipment and Materials Policy: UP3* (1993). This involved materials that are declared “surplus” by the administrative lead. The consumer is accountable for ensuring the materials are not contaminated (Ibid).

¹⁶ A linear economy encourages items to become disposed immediately after use, often because of restricted recycling capabilities (I.e., plastic pens or ink cartridges). On the contrary, reuse or circular economies are designed to promote the reuse of the product (UNEP 2018).

through several pollution prevention programs, education initiatives, and action plans for identifying weaknesses in present legislation (The University of British Columbia Board of Governors 2005).

Lastly, their latest policy, the *Zero Waste Action Plan* (2014), aims to divert 80% of their campus' waste by 2020. Already displacing over 70% waste in 2016, they are confident in achieving this new goal by improving recycling infrastructure, campus wide engagement, behavioural change campaigns, awareness building activities, and strategic partnerships (For more, please see *Zero Waste Action Plan 2014*). For example, they have implemented 700 multi streamered recycling stations in and outdoors (including composting), a Food Ware Strategy¹⁷, a Composting Program¹⁸, and several student involvement programs¹⁹ (Ibid.).

By recognizing the consequences of plastic contamination due to faults in sorting, UBC has fostered a '*Sort It Out*' campaign (Sort It Out 2020). Here, they emphasize the importance of product separation by providing several accessible waste management assistance programs (Ibid.). These include downloadable information guides (*Figure 9*), a '*Sort It Out*' waste sorting game (*i.e.*, to test student's knowledge while incentivising with a gift certificate), and an A-Z Recyclepedia, which can be used

¹⁷ UBC's Food Ware Strategy aims to mitigate SUP's through several strategies. For example, fees will be placed on certain plastic items, such as coffee cups, to encourage the use of reusable alternatives. Additionally, a 'Mugshare Program' is in place. Here, the student can buy a drink at any partnering location, ask for the program mug, pay a deposit, and return the mug when they wish to obtain their deposit back. The establishment is responsible for sanitation maintenance (*Zero Waste Action Plan 2014*). This is also an example of a circular economy model (UNEP 2018).

¹⁸ UBC's Compost Program aims to reduce their campus' food waste by utilizing in-vessel facilities. This is an excellent way to encourage sustainable solid waste recycling among students. Here, they provide ongoing composting education, awareness activities, consultations and support, and monitoring to incentivize the experience for students (UBC Building Operations N.D.). In doing so, they can divert food waste materials from the landfill, contribute to on campus gardening, and promote a circular economy.

¹⁹ Student involvement at UBC involves a sustainability ambassadors program, a student sustainability council, a zero waste squad, a sustainability student network, and a green labs program (For more information, refer to *UBC's Get Involved* N.D.)

as an interactive search tool to indicate which products can be recycled respectively (For more information, see *Sort It Out 2020*).



Figure 9. An example of UBC’s ‘Sort It Out’ infographic, which encourages a zero-waste university community. Source: Sort It Out 2020.

Loyalist College

Diverging from UBC’s large enrollment scale, we will now concentrate on an institution that is more comparable in size to Lakehead University’s. Located in Belleville, Ontario, Loyalist College has roughly 3,000 full-time students enrolled at its institution. (Davis & Cunningham 2018) What Loyalist lacks in size, they make up in sustainability policies and initiatives. Loyalist demonstrates this nationally, as they rank as Canada’s 2nd most sustainable post-secondary institution, next to UBC (DH Vancouver Staff 2017).

Loyalist pledges to minimize the college's impacts on the environment through several unique low-waste initiatives (Sustainable Loyalist 2020). For example, their innovative composting program. At Loyalist, every multi-waste stream disposal bin contains a mandatory compost generator, operating with either electricity or fertilizers, (*Figure 10*; Compost, Recycling, & Waste 2020). Both biodegradable and compostable materials are encouraged among the 'Organics' section (Ibid.).



Figure 10. An example of Loyalist College's waste stream infographics. Source: Sustainable Loyalist 2020

To improve composting accessibility, Loyalist provides each residential apartment on campus with composting bins (Compost, Recycling, & Waste 2020). Moreover, Loyalist has five recycling-composting receptacles in their cafeteria alone, each with innovative and engaging signage (*Figure 10*; Ibid.). This encourages responsible consumerism behaviours among students, due to the comprehensive nature of the instructions paired with bin accessibility. A 'drop off waste station' for items not

accepted²⁰ by the multi-waste stream bins is also provided throughout the school term (Food & Water 2020; Compost, Recycling, & Waste 2020). Loyalist students are encouraged to access these stations through a comprehensive campus map (Ibid.).

Aside from improved waste programs, Loyalist reduces plastics through improved technology and programming. For example, their installation of 20 hydration stations in 2011 diverted over one million disposable plastic bottles from reaching their landfills (Food & Water 2020). Their service provider, Aramark, also supports such behaviours by providing locally sourced products²¹ among cafeteria selections (Ibid). Sensitized programs such as their Sustainability Policy (Loyalist College 2012), mug share program (Food & Water 2020), 30-day zero waste challenges (Sustainability News & Blog 2019), campus clean-ups, and electronic waste repair events have reinforced their zero-waste mission (Learning, Planning, & Past Initiatives 2020).

Here, it is evident that both UBC and Loyalist continue to empower the firm standards and initiatives needed to extenuate the plastic crisis for students, especially among a centre of learning.

Lakehead University

Lastly, Lakehead University's (LU) current initiatives regarding plastic usage and mitigation will be discussed. Smaller than UBC yet larger than Loyalist, LU has integrated several unique initiatives to help its 9,700 students become more sustainable (Lakehead Orillia 2019). For instance, LU has launched its first Sustainability Office in

²⁰ This includes items such as highlighters, pens, ink-cartridges, cellphones, and batteries (Food & Water 2020.)

²¹ Through their "I go local" program, Aramark provides items such as cage-free eggs, fair trade coffee, and sustainably sourced sea food to both students and staff (Food & Water 2020).

2015 (Sustainability Plan 2019), its first student-ran Sustainability Initiatives club in 2017 (CBC News 2019), and first Sustainability Plan in 2019 (Sustainability Plan 2019). The Sustainability Plan was especially influenced by the university's bronze STARS (Sustainability, Tracking, Assessment, and Rating System) rating, which represented both campuses' need for improvement in the sustainability category (Ibid.) In the fall of 2020, however, the Sustainability Initiatives club was cut due to loss of funding. Nevertheless, the Sustainability Plan (2019) attempts to make up for this absence by enhancing LU's commitments to being sustainable by 2024. This includes changes regarding the curriculum, dining services, waste management, and engagement on both the Orillia and Thunder Bay campuses. Each of the enhancements will be critiqued below.

Curriculum

In order to improve its student's awareness regarding sustainability, LU has proposed an adjustment within its curriculum. This would involve more sustainability focused courses, literacy assessments, internships, community engagement, and specialized undergraduate and graduate programs (Sustainability Plan 2019). Although this is an extremely valuable first step, there is no indication of what would be taught or encouraged within the addressment of 'sustainability' (Ibid.). Since plastic usage is the focus of this study, it is important to state that plastic related content was not mentioned in the Curriculum section of the framework.

Dining Services

In regard to the Dining Services, LU highly concentrated on enhancing its sustainable food systems, specifically involving vegan-vegetarian alternatives or

produce that is ‘ecologically sound’ (Sustainability Plan 2019). This is in line with Loyalist’s initiatives with Aramark, to provide locally owned products. Among this category however, there was also no mention on plastic packaging, usage, disposal, or steam-signage improvements; the latter of which is unequivocally needed in the LU cafeteria, as seen below in *Figure 11*.



Figure 11. Waste bin representation in the LU Thunder Bay campus main dining hall. Source: Auld 2020.

As you can see in *Figure 11*, the LU dining services are lacking in several areas outside of ‘sustainable food systems.’ Firstly, the signage is evidently poor and is completely absent of its requested stream preference. It is extremely impractical for LU to expect successful recycling habits due to this. Also seen in *Figure 11*, the blue ‘recycling’ bins are lined with black plastic bag liners, not recycling bags- those of which are required by the city of Thunder Bay for recycling purposes (City of Thunder

Bay 2014). Among this paradox, students' irresponsible disposal behaviours may be indicative of LU's waste management service's neglect.

Moreover, an infographic involving a waste-audit was displayed in the Dining Services' footnote (*Figure 12*).

In an effort to integrate sustainability into the curriculum, the Office of Sustainability coordinated a waste audit with a 4th year Natural Resource Management Class.

The purpose of the waste audit was to provide Lakehead University's Physical Plant Administrative Office with a detailed understanding of the types and weights of waste material being generated at the cafeteria and the Agora buildings, and to determine whether or not waste materials are being properly sorted.

Photo credit: Ledah McKellar



Figure 12. Lakehead University's Sustainability Plan 2019-2024 Dining Services segment displaying the student waste audit experiment. Source: Lakehead University Sustainability Plan 2019.

Although its motive is encouraging, the event was a one-off occurrence taking place in 2016, much before the Sustainability Plan (2019) was executed (Ibid). Here, the audit data is also unavailable to the public, in contrast to UBC and Loylists waste data transparency (Sustainable Loyalist 2020; Zero Waste Action Plan 2014). For example, there is no information signifying how much garbage was examined to indicate its relevance among the action plan (Ibid.). Furthermore, there is no information implying its continuance, how students were enabled to participate, or how they can improve their disposal habits from such results (Ibid.). Thus, its placement can be viewed as somewhat perplexing.

Orillia & Thunder Bay Campuses

As this Sustainability Plan (2019) focuses on LU's two campuses, Orillia and Thunder Bay, it is surprising that there is no mention of Orillia's plastic water bottle ban among the Waste or Dining Services sectors, nor the Plan's entirety (Ibid.; Lakehead Orillia 2019; Bucik 2019). As of January of 2019, Orillia had prohibited the sales of single-use plastic water bottles (Bucik 2019; Lakehead Orillia 2019). Orillia established this bottle-ban policy by installing two new water bottle refill stations, in addition to the five already in existence. Notably, this ban was carried out to "raise awareness of the environmental, economic, and social impacts of bottled water" and to "reflect the University's increasing commitment to sustainability" (Campus Connection 2019, pg 1). If this were true, how could LU's *primary* campus fail to invest in the same commitment, if not act first? With a greater campus size, vast enrollment count, and therefore much greater funds (Campus Connection 2019; Lakehead Orillia 2016), would it not be logical that LU's Thunder Bay campus would follow suit?

An interview was conducted with Lakehead University's Office of Sustainability Coordinator, to discuss the possibility of this commitment on Thunder Bay's campus (McKellar 2019). According to Ms. McKellar, this process may be a challenge due to water security:

"Currently, the University is without [a] policy, and there is not a water bottle refilling station on every floor at LU" (Ibid. 2019, 1:26).

Although this may be true, Orillia has only 7 water bottle refill stations on their campus. Alas, they were enabled to execute a bottle-ban (Lakehead Orillia 2016). Loyalist college has 1/3 of the students to Lakehead yet has 20 water bottle refill stations. As LU

Thunder Bay campus stands, the Sustainability Office does not have a “thought out strategy” (McKellar 2019, 4:26) to implement the latter. I was unable to find data pertaining to the amount of water bottle refill stations on campus.

Waste

The waste sector involved the most plastic-focused content, although the word *plastic* was never actually utilized in the action plan’s entirety. Here, LU’s aim regarding waste can be seen in *Figure 13* below.

<p>Waste</p> <p>Increase diversion of materials from landfills and incinerators, and conserve resources, by recycling and composting.</p>	<p>STRATEGY</p>	<p>ACTIONS</p>
	<p>1. Transition to centralized and standardized waste on both campuses.</p>	<p>1.1 Create an ad hoc committee to further explore strategies 1-4 for this recommendation.</p> <p>1.2 Analyse results from 2016 Waste Audit led by Office of Sustainability and NRMT to help develop a strategy for improving recycling.</p> <p>1.3 Pilot centralized waste in the CASES building to test feasibility.</p> <p>1.4 Develop strategies such as education and awareness campaigns for the University community, and training on proper recycling procedures for maintenance and third party cleaning staff.</p>
	<p>2. Update the type of multi-unit recycling bins and rearrange them to synchronize with consumer behavior.</p>	<p>2.1 Identify areas of concern with regard to recycling and how they can be improved.</p>
	<p>3. Implement institution-wide composting.</p>	<p>3.1 Involve an undergraduate class in conducting a feasibility study for implementing institution-wide composting.</p> <p>3.2 Consult with local composting company Eco Depot about possibility of a composting contract.</p> <p>3.3 Identify next steps needed to implement composting.</p>
	<p>4. Identify ways to reduce consumption at intake. For example, in tandem with the goal to increase recycling rates, reduce the amount of paper used or increase use of reusable dining ware in cafeterias and conference services.</p>	<p>4.1 Contact other universities and identify best practices.</p>

Figure 13. Lakehead’s Sustainability Plan – Waste category objectives. Source: Sustainability Plan 2019.

As seen above, there is a large motivation to improve LU’s centralized waste, recycling bin streams, composting, and consumption reductions. Although these are excellent objectives, there are several flaws present. For example, regarding the centralized waste system, there is no detailed instruction exemplifying how they will

enforce a pilot study, especially regarding funding, space, engagement, or authorization. Thus, the 2016 data (*Figure 12*) is an outdated and statistically insignificant method to rely on for this enforcement.

Furthermore, the ‘*institution-wide composting*’ is a baffling aim for numerous reasons. Firstly, the Office of Sustainability indicated that on-campus composting would be somewhat unreasonable, due to the fact that “There is no place in Thunder Bay that would be able to receive the amount of food waste we produce” (McKellar 2019, 7:56).

This is surprising, as LU actively promotes that they already *have* a ‘thermal composter’ through their Operations (n.d) website. This appliance “recycles approximately 700 lbs (317 kg) of pre- and post-consumer food waste per day during the school year (September to April), and 2 times per week during the off season (May-August)” (Operations n.d., pg 1). *Eco-stations* are also stated to be used to hold this food waste, which would be located near campus retail locations to encourage good student consumption behaviours (Ibid.). The waste would then be collected and deposited among the thermal composter, located in the UC ‘main kitchen’ (Ibid.). This information is actively displayed to date.

Personally, this author had not witnessed an eco-station amidst her entire university career, and thus, took it upon herself to confront the Sustainability Office regarding the matter. The email response (McKellar 2020), was that:

“Yes, we used to have a composter in the cafeteria which Physical Plant bought through a rebate. It ran for a few years. Unfortunately, the model was discontinued and a part of the composter broke which could not be replaced. My understanding is that an internal department tried to make the part in-house but failed to work. As such the composter was recycled for scrap metal.”

So, not only is LU providing student's with inadequate and outdated information, but they actively excluded the thermal composter's existence from the action plan.

Mitigation Strategies

Lastly, we will briefly examine LU's current plastic mitigation strategies among the Thunder Bay campus. It is noteworthy to mention that among the Operations (n.d., pg. 1) website, LU has been "Investing in additional recycling bins as to make recycling the most convenient option for waste". Although this subsection may be factual in comparison to the latter discussed, LU fails to indicate which recycling bins require the desired stream product (*i.e.*, paper products versus specific HDPE or PETE products) as seen in *Figure 3* and *Figure 11*. This is due to a lack of legible signage. Thus, paper products become mixed with miscellaneous items, and (often uncleaned) plastic items (*Figure 3*). To reiterate, this would result in the entire recycling bag being becoming garbage, due to the failure in sorting capabilities (Prokopchuck 2019).

LU has, however, launched two new low-waste programs in 2020, dubbed "*Lug a mug*" and "*I Reuse*" (*Figure 14*; *Figure 15*).



Figure 14. “Lug A Mug” and “I Reuse” program stands, located in the main cafeteria next to the cashier exit point. Source: Auld 2020.

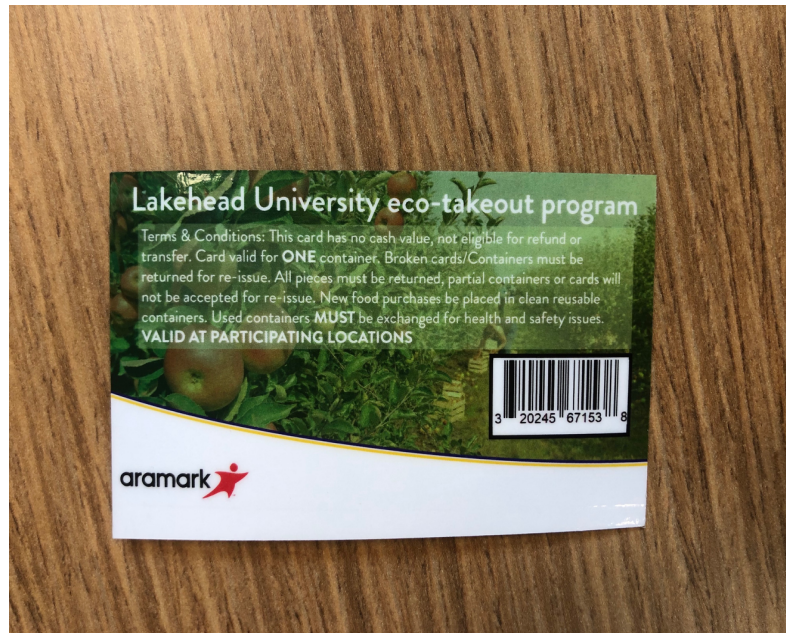


Figure 15. An example of the Eco-Takeout program card to be utilized by students. Source: Auld 2020.

These programs aim to reduce plastic cup and container waste by incentivising a circular takeout system, where LU is responsible for the cleaning and maintenance. Such initiatives are an excellent step in the right direction, as \$0.40 off a beverage would be a significant motive to encourage the practice of reusable products.

Alas, the initiatives are somewhat restrictive. For example, the Lug-A-Mug program restricts students by requiring the use of LU's mug for participation *only* (as pictured in *Figure 14*). This would force the student purchase *another* reusable plastic item, while they may already have one at home. Moreover, the mug and containers are only accepted at limited locations (*i.e.*, the main or residence cafeteria, ATAC or library café, and Dans Diner). This may be a deterrent for students, as these locations exclude the Study Coffeehouse, the Outpost, and Starbucks; some of LU's most popularized dining venues.

Nevertheless, both programs still remain in their introduction phases. And so, incentives have yet to be created to improve student accessibility, encouragement, education, or input; outside the stand display (*Figure 14*).

Conclusively, further adjustments to the Sustainability Plan (2019) may need to be considered to ensure reductions in plastic's ubiquity. Since Lakehead requires data indicating areas of concern (Sustainability Plan 2019), the following survey results can function as an archetype to ensure the 2024 waste targets are met, or perhaps, exceeded.

MATERIALS & METHODS

RESEARCH GOAL

The goal of this research is to examine active student's awareness and behaviours regarding plastic use, and their roles as consumers at Thunder Bay's Lakehead University (LU) campus. With this information, we hope to identify any systematic issues concerning plastic waste that may prevent students from being more aware, and from utilizing plastic products incorrectly. We also expect to discover the most preferred requests by students to mitigate plastic waste effectively. With this information, we will provide a condensed list of recommendations for improving LU sustainability initiatives.

RESEARCH METHODOLOGIES

Prior to working on this study, the author contacted the Natural Resources Management (NRMT) faculty, LU's Office of Sustainability, as well as Lakehead University Student Union (LUSU) to discuss the proposal to conduct the research topic. Upon approval, Lakehead University's Thunder Bay campus was selected as the study's primary focus. The reason for this selection was due to two reasons. First, as this study is required to fulfill the author's undergraduate honours thesis requirements, it was logical to reduce the scope of the study to the campus the author was attending. This decision was reinforced by the Office of Sustainability, who expressed that extending this research to cover the Orillia campus would require more time and financial commitment. Having specific expectations and deadlines for her undergraduate thesis, it was important that the scope was focused towards a smaller sample size. This decision helped maintain cost and time effectiveness at an acceptable level, while also allowing the author adequate time to

collate an appropriate response rate from students. The second reason is because Orillia already has successful initiatives in place (Bucik, J. 2019).

As the Thunder Bay campus requires considerable improvements in order to meet Orillia's sustainability achievements, it was more feasible to evaluate what they could do to better their techniques. With this knowledge in mind, a survey-based approach to collect data from students was developed.

Since this study involves human participants, the author followed the Tri-Council Policy Statement (TCPS 2) ethical standards and conduct. As part of the research, the author submitted an Undergraduate Research Ethics Application Form was submitted. This form was reviewed and approved by the Lakehead University Research Ethics Board (REB), as well as the NRMT faculty.

SAMPLING METHOD

Following the REB approval, it was decided to measure awareness and behaviours through a one-time, online survey, which was active from November 3, 2019 to December 20, 2019. The survey was administered by SurveyMonkey, and its questions, marketing processes, and results can be found in *Appendices I* through *IV*.

Survey Monkey is designed to help researchers collect and interpret data from specific target populations (SurveyMonkey 2019). In order to gain an appropriate response rate, the author promoted the survey by placing 200 posters on campus (*Appendix III*). The poster displayed the value of the focus of the research at Lakehead, as well as information on how to participate. The poster was placed in highly visible areas around campus and shared on various social media platforms.

Requirements to participate in this study were based on the participant being an active Lakehead University student in Thunder Bay. Faculty staff was not permitted to participate. The vetting process of active LU students was ensured by outlining the requirements of taking the survey, found on the participant information sheet (*Appendix I*). In addition, each participant had to provide consent of their active student status before taking the survey (Question 1).

The questionnaire was prepared with great consideration over a 4-month period. Some questions (Q) were based on knowledge of plastic use and pollution, as well as the author's anticipated reasonings behind why students may be unaware of plastic's negative consequences. For example, Q2 examines if students are aware of plastic pollution being a current issue around the world, while Q3 analyzes if students believe being taught about its effects on ecosystem health is an important topic to learn at school. If students aren't aware of it being an issue, they may not believe it is worth being educated about. However, other questions focused on current initiatives that may be individually practiced, as well as ones that could be implemented on campus in the future. For example, Q6 analyzed student's personal methods to reduce plastic consumption, while Q15 examined student preference regarding the most successful incentives to reduce plastic waste (*Appendix II*).

SAMPLING CRITERIA

Concerning the sampling criteria, a realistic target audience was evaluated. The author's supervisor, Dr. Wang, declared that obtaining 50 participants was mandatory to reaching the minimum sample size requirements. However, the sample size goal was aimed at 500 participants as it appeared to be an achievable target, given the time and

budget constraints. Nevertheless, the ideal sample size would be at least 1000, because it would be more representative of LU's current population of 9,700 full-time students (Lakehead 2018). Due to the constricting factors of being in an undergraduate degree, it was unrealistic for the author to meet either targets. Additional limitation factors include student's reluctance to participate. Without tangible incentives to encourage involvement (i.e., gift cards, cash, or credits), students may have been less willing to complete the survey. Thus, if the author had more time to canvass her study as well as the availability of finances to encourage participation, reaching both goals in sample size could have been more realistic.

QUESTIONNAIRES FOR STUDENTS

By responding to the link to participate, students were offered a 5-minute, multiple choice survey to measure individual awareness and behaviours. Students will be asked 19 questions in total on the topic. 3 of the 19 questions are optional depending on personal opinion (*Appendix II*; Q5; Q12; Q19), with 16 questions requiring mandatory response. The first question represents the students' consent to reading the participation information form (*Appendix I*; Q1). The survey does not require the participants identification, so they are able to remain completely anonymous. Q2 remains the only question that possesses an identification element, examining age category (*Appendix II*). As students remain anonymous and the data is collected via survey, there is a risk of skewed results. In attempt to mitigate this skew, I restricted survey access to one IP address.

Both the principal investigator, Dr. Wang, and co-investigator, Dr. Meyer, will have constant access to this data. Data will be securely stored, password protected, for

five years on three separate private hard drives. Both Lakehead University's library and the faculty of Natural Resources Management will have physical copies of the data.

RESEARCH FINDINGS & DISCUSSION

Introduction

In this section, survey results are discussed according to their corresponding category. The subsequent categories include the awareness, behaviour, and attitudes of Lakehead University's students. The observations will be discussed among the three and can be used by Lakehead University to enhance existing research, initiatives, or future plans of action. Due to the time and length limitations of this study, only the most significant results will be analyzed. For more information, the complete survey results can be found in the *Appendices*.

This study initially consisted of 444 Lakehead University (LU) students. The 444 participants provided their consent by agreeing to the terms and conditions page (see *Appendix II*, Question 1 (Q1)), however, only 381 students committed to completing the survey. It is possible that the 63 participants who exited the survey did so from lack of time, or interest. Because of the personal limitations mentioned previously, 381 is not an ideal representation due to LU's large student population. Nevertheless, this is a satisfactory depiction of students who were voluntarily driven to contribute to conservation research.

Awareness

Plastic Pollution

Table 2. Data results pertaining to student’s awareness regarding plastic use at LU & its ecological consequences.

Questions (Q)	Answer Choices	Results (%)
Q3. Are you aware of plastic pollution being a current worldwide issue?	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • 98.43% • 1.57%
Q4. Do you think educating students about the effects of plastic on our health & the environment is: (Move scale ranging from 1: Not important – 5: Very Important)	<ul style="list-style-type: none"> • 1: Not Important • 2: Somewhat not important • 3: Neutral • 4: Somewhat important • 5: Very important 	<ul style="list-style-type: none"> • $\mu = 4.69$ • $\sigma = 0.70$
Q5. Have you been educated about the significance of the Waste Hierarchy? (i.e., refuse, reduce, reuse, recycle, recover, dispose?)	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • 67.98% • 32.02%
Q6. If “NO” to question 5 above, would you like to learn?	<ul style="list-style-type: none"> • Yes • No 	<ul style="list-style-type: none"> • 82.51% • 17.49%
Q18 a) Paper coffee cups from the Study or cafeteria can be recycled on campus	<ul style="list-style-type: none"> • Strongly disagree • Disagree • Neutral • Agree • Strongly agree 	<ul style="list-style-type: none"> • 13.12% • 19.16% • 16.54% • 36.22% • 14.96%
Q18 b) Styrofoam take-out containers from the Outpost will decompose in the landfill	<ul style="list-style-type: none"> • Strongly disagree • Disagree • Neutral • Agree • Strongly agree 	<ul style="list-style-type: none"> • 55.12% • 21.52% • 11.55% • 7.61% • 4.20%
Q18 c) Thunder Bay adequately sorts & recycles all plastic products	<ul style="list-style-type: none"> • Strongly disagree • Disagree • Neutral • Agree • Strongly agree 	<ul style="list-style-type: none"> • 31.50% • 31.50% • 27.56% • 6.82% • 2.62%
Q18 d) Plastic waste is harmful to our environment	<ul style="list-style-type: none"> • Strongly disagree • Disagree • Neutral • Agree • Strongly agree 	<ul style="list-style-type: none"> • 1.84% • 0.00% • 2.62% • 14.96% • 80.58%

Source: Auld 2020.

Of the students surveyed, 98.43% were aware of plastic pollution being a current global issue (Q3). Only 6 participants (1.57%) were unaware of this being a global matter. Based on the numbers, the data reveals that most students were aware of plastic usage being an issue prior to participation. Perhaps, these participants had greater access to social media, news broadcasting, and/or communal knowledge.

Because of the limitations of this survey, the author is left to assume the reason why 1.57% of the respondents selected “unaware.” For example, some students may have a different worldview on the consumption of plastics and its effects, while others may fall victim to industrial ‘green washing’²². Or perhaps, some are not invested enough to seek out further information regarding the plastic crisis. Another possibility to consider is that LU may not be providing its students with the correct tools to become aware of plastic’s effects. An observation of this, can be exemplified through an anonymous student’s commentary in the survey, as seen below. The lack of signage above waste bins, or encouragements to use their low-waste programs, are also indicative of this (see *Figure 3 & Figure 11*).

“I believe that educating about what is and is not recyclable in Thunder Bay should be provided to the students in some capacity. Educating students on single use plastic and what is recyclable in our region is important. I also think the lack recycling bins around campus contributes to plastics not being recycled properly. I really appreciated the “tap in” water dispensers around campus but we could probably have some more installed. Thank you.” (Auld 2020)

Recycling

Another area the author focused on is the lack of knowledge LU students have pertaining to recycling plastics. For example, 51.15% of students believe that paper

²² Green washing is a harmful tactic used by corporations that claims their environmental stewardship through misleading advertisement (See Dahl 2010 for more). For example, labelling plastic products with general terms such as ‘eco friendly’, ‘natural’, or ‘biodegradable’.

coffee cups from LU *can* be recycled (Q18 a). Only 32.28 disagreed, and 16.54% were indifferent. This is worrying, as the Study Coffeehouse uses hot coffee cup lids that are Polystyrene (PS, #6; hence, un-recyclable), and paper cups lined with Ingeo *bioplastics*; or corn kernel polymers (see EcoProducts 2020 & Mannix 2017 for more; *Figure 16*). It is important to note, the cups are labelled as ‘*biodegradable and compostable*’, with words such as ‘*eco*’ in olive green labelling.



Figure 16. An example of the Study Coffeehouse’s hot beverage lids (PS, #6; left) and Ingeo compostable cups (right). Source: Auld, 2020.

While the Study’s Ingeo cups technically *can* be recycled through composting, most disposal facilities often lack the time, money, and technology to do so (Mannix 2017). For instance, these cups require extremely strict monitoring processes to prevent

cross-contamination; and high temperatures over long durations to break them down for reuse (Ibid.). Since the city of Thunder Bay lacks a specialized composting plant to do so, the idea that the cups can be recycled is misleading to students as they believe they are performing their civic duties by disposing the cups in the recycling bins (Ibid).

BioPak’s own founder supports this assertion: “Without the [specialized] facilities there, [the cups] won’t be recycled” (Mannix 2017, pg. 1). Because of the deceiving branding, most end up contaminating a recycling stream, as seen below in *Figure 17*.



Figure 17. An example of the Study Coffeehouse’s recycling bin contents. Pictured right: Study cup disposed uncleaned, with its paper sleeve and PS lid intact among other contaminants. Source: Auld 2020.

In hindsight, it would have been valuable to ask students if they have confidence in Ingeo products being beneficial for the environment, perhaps, by breaking down more ‘organically’ and ‘efficiently’ than a plastic cup would.

Unfortunately, this is not the case. Once the garbage bag from *Figure 17* reaches our landfills, the paper portion of the Ingeo cups will break down to release *greenhouse gases*, just as petroleum-based plastic cups do (Mannix 2017). The bioplastic lining on the other hand, is actually designed to *never break down* (Ibid.). Thus, the Study's 'biodegradable and compostable' cups are just as harmful as those of plastic composition.

To make matters worse, both LU's cafeteria and Starbucks Coffee Company give rise to this issue. All 'paper' coffee cups provided, unless stated otherwise- contain a Polyethylene lining which *cannot* be recycled unless done so by specialized facilities (Bronner 2019). To become recycled the plastic linings have to be physically separated, which ultimately raises the both the costs, and the risks of contamination for the facility (Ibid.). Thus, 'compostable' cups often end up in our landfills, photodegrading into microplastics (Ibid).

Alternatively, Starbucks' iced coffee cups and lids can be recycled, however, just not in the Thunder Bay district. As seen in *Figure 3*, Starbucks cold cups are diminutively labelled as Polypropylene (PP, #5), while their hot coffee lids are vaguely labelled as Polystyrene (PS, #6). According to the author's personal observation, recycling codes cannot be found on the hot cup products. Strategically, Starbucks offers 'responsible branding' to manipulate this knowledge (*Figure 18*).



Figure 18. An example of Starbucks’ greenwashing. Source: Robinson 2013.

For instance, an unaware consumer may see this eco-positive cup program (*Figure 18*) and assume that Starbucks’ products align with the same values. Perhaps, assuming that their coffee cups are entirely paper based (*i.e.*, without a plastic lining) as they do not contain recycling codes. Consumers may make these quick assumptions, since it would be easier than taking the time to verify, or perhaps, the information is inaccessible.

Encouraging greenwashing through even worse marketing schemes, the LU cafeteria’s coffee cup paper sleeves claim that the consumer is ‘Supporting a greener future!’ with every coffee cup purchase (*Figure 19*). This quote manipulates the fact that the sleeve is securing a petroleum-based, unrecyclable product. Thus, the student may actually be supporting the exact opposite type of future.

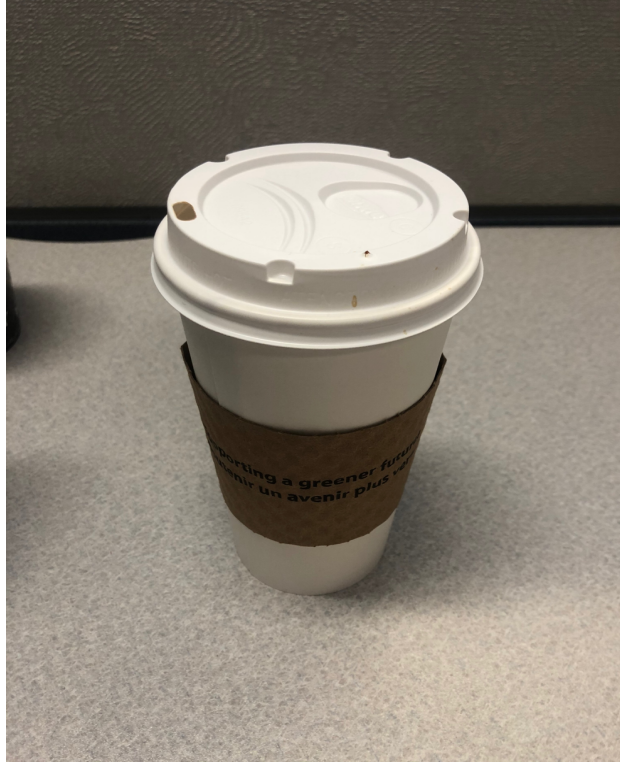


Figure 19. An example of a LU main cafeteria coffee cup. Source: Auld 2020.

Given LU's support of industrial greenwashing, the plastic crisis continues to be exacerbated. As 63% of LU students are aware of Thunder Bay sorting deficiencies (Q18 c), it is suggested that students are incorrectly disposing their plastics because they are not encouraged, or required by the university, to behave otherwise.

Waste Hierarchy

In regard to the waste hierarchy (Q5; *Figure 20*), 67.98% of participants were aware of its significance.



Figure 20. The five-tier waste hierarchy pyramid. Source: Downes 2017.

With this information, one would assume that most students understand the importance of first refusing and reducing plastic products, when contemplating a future purchase. It is also stressed that recycling and disposing of waste are done as last resorts; done only if *absolutely necessary*. This data reinforces the hypothesis, in which LU students' awareness is inconsistent with their behaviours.

Behaviour

Plastic Consumption Reduction

Table 3. Survey data results pertaining to student's behaviours regarding plastic use at LU.

Questions (Q)	Answer Choices	Results (%)
Q7. If any, what do you do currently to reduce your plastic consumption? (Select all that apply)	• I go without a straw or bring my own when I buy a drink	• 63.52%
	• I bring my reusable bag	• 79.79%
	• I bring my cup/mug	• 64.57%
	• I bring my cutlery/containers	• 32.55%
	• I use bees-wax wraps	• 24.67%
	• I use the establishments kitchen utensils	• 74.28%
	• None of the above	• 3.94%
Q9. What material do you utilize the most concerning cups, containers, & bottles on campus?	• Single-use plastics	• 22.57%
	• Reusable plastics	• 45.41%
	• Metal	• 21.00%
	• Glass	• 11.02%

Table 3. Continued. Survey data results pertaining to student's behaviours regarding plastic use at LU.

Questions (Q)	Answer Choices	Results (%)
Q11. Which resource do you use the most for water consumption on campus?	• Water bottle refill stations	• 79.79%
	• Vending machines	• 2.62%
	• Water fountains	• 17.59%
Q12. What do you do with garbage that can be recycled on campus?	• I always use the recycling bins	• 57.48%
	• I sometimes use the recycling bins	• 32.28%
	• I use the most convenient bin, even if it's not the correct one	• 10.24%
Q13. If answered B) or C) from Q12 above, what might cause you to misuse the recycling bins the most?	• The bins are too far away	• 25.71%
	• I'm not sure which items can be recycled	• 41.90%
	• The bin labels are unclear	• 25.24%
	• I don't know why I should recycle, therefore it doesn't concern me	• 1.90%
	• I don't believe recycling helps the plastic pollution problem, therefore I don't bother	• 5.24%

In Q7, students were asked how they actively reduce their plastic consumption.

As we can conclude from the results (Figure 21), students participate in a range of mitigation strategies, which involves reusable bags, cutlery, mugs, and straws.

Q7 If any, what do you do currently to reduce your personal plastic consumption? (Select all that apply)

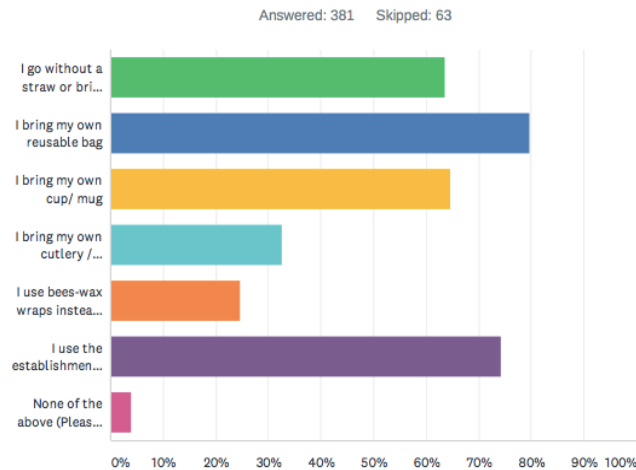


Figure 21. Survey Q7 analyzing student’s plastic mitigation strategies. Source: Auld 2020

The few who chose ‘None of the above’, identified their own personal approaches. This included buying items with less packaging, investing in a ‘Diva Cup’, or recycling their plastics- while others stated that they ‘frequently use single-use plastics’, or that they ‘do not do anything’ to reduce their consumption.

As this survey is a quantitative research tool, the author is left to speculate how often students truly perform the behaviours in which they claim. For instance, some students may have only brought their reusable mug to the Study Coffeehouse once in their university career. While others, who claimed that they do not do anything, may only do so periodically. Using a qualitative approach (*i.e.*, interview, participant observations, etc.) to delve further into the reasons for their behaviours would enrich these survey results.

Reluctancy & Misuse

In hindsight, it would have been beneficial to ask how frequently the participants perform the actions in which they claim. For instance, negative behaviours (*i.e.*, not doing anything) could be assessed on a ‘daily’ to ‘once a year’ scale. If they chose the latter, we could ask why, if at all, the participant feels reluctant to make sustainable commitments regularly. Reluctancy may be caused by a number of factors, such as financial instability. For instance, most students may be on a strict budget. And thus, may be more willing to opt for free plastic straws, over a pack of \$5.99 metal straws. This can be seen in Q15, where 42.26% of participants indicated that they would choose more plant-based products over plastics, as long as the price is reasonable.

Additionally, if the individual has to expend more energy to make a positive behaviour adjustment, reluctancy may also arise. For instance, having to navigate through Lakehead’s sustainability page to learn what items can be recycled in the office blue bins (Sustainability 2020), or perhaps, not having enough access to the bins indoors, or outdoors. According to an anonymous participant’s commentary (Auld 2020):

“ I am from BC (specifically Vancouver Island) and at UVic there are [a] minimum 4 bins to sort waste in any lecture hall/ common area (garbage, recycling, organics, and paper). This does not exist here! You are lucky if there is even a garbage bin within eyesight. Also, barely any garbage bins, let alone recycling, at bus stops”

Important to note, LU does not have a public, or private directory which states how many bins (*i.e.*, recycling or garbage) exist on its campus (McKellar 2019). This lack of data is a major concern to LU’s Sustainability Plan (2019), as they proposed to endorse a centralized waste system with improved recycling initiatives. I believe that an absence

of a directory will affect the plan's capabilities, while also increasing the amount of plastic waste produced on a janitorial and scholarly scale. For instance, LU janitors may be disposing empty bags more frequently due to the lack of visual guidance; whereas students may be improperly disposing plastic waste in high traffic areas, because a recycling bin is absent, or they don't know where to find one. To reiterate from the literature review, both UBC and Loyalist College have disposal bin directories available to the public, and its presence appears to be conspicuous (Sustainable Loyalist 2020; Zero Waste Action Plan 2014).

To reinforce the beliefs of the author, evidence of LU's influence on student's behaviours can be seen below (Q13; *Figure 22*).

Q13 If answered B) or C) from question 12 above, what might cause you to misuse the recycling bins the most on campus?

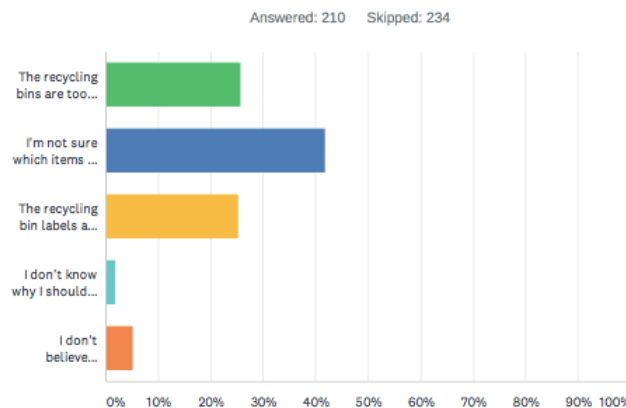


Figure 22. Question 13 depicting student's reluctance to recycle on campus. Source: Auld 2020

According to the students; 41.90% stated that they are 'not sure which items can be recycled', 25.71% stated that the recycling bins are too far away, and 25.24% stated that the recycling bin labels are unclear. Moreover, 5.24% don't believe recycling helps the plastic pollution problem therefore they do not bother; whereas 1.90% don't know why they should recycle. From this data, we can conclude that many students (57.48%;

Q12), do recycle, however, 42.52% are reluctant to do so, based on the seemingly lack of effort of both Thunder Bay and LU. This deficiency the dearth of comprehensible signage, accessibility, and education. According to an anonymous participant (Auld 2020):

“Question 12 & 13 stood out to me, as it has never really occurred to me that I don’t know what I can/ cannot recycle on campus. I think better education on that topic would be a good starting point and could be used to encourage students to cut down on waste.”

This data should inspire Lakehead University’s executives to re-evaluate their existing roles and responsibilities regarding plastic usage. As a leading institution, LU should be equipped to provide its students with sensitizing programs that enhance its students’ learning behaviours, while also providing easier access to recycling bins. All individuals, especially those with disabilities or financial limitations, should also have access to information in which they can actively participate and become more sustainable.

Attitudes

Plastic Mitigation

Table 3. Survey data results pertaining to student’s behaviours regarding plastic use at LU.

Questions (Q)	Answer Choices	Results (%)
Q10. Do you think that plastic products are a necessary aspect of your school experience? (i.e., pens, binders, etc.)	• 1: Absolutely not necessary	• $\mu = 2.92$
	• 2: Somewhat not necessary	• $\sigma = 1.42$
	• 3: No opinion	
	• 4: Somewhat necessary	
	• 5: Extremely necessary	
Q14. Would you like to see less plastic utilized on campus?	• Yes	• 91.18%
	• No	• 1.57%
	• I don’t care	• 5.25%

Source: Auld 2020

Table 3. *Continued.* Survey data results pertaining to student’s behaviours regarding plastic use at LU.

Questions (Q)	Answer Choices	Results (%)
Q16. Which incentives do you believe would eliminate SUP the most on campus?	• A complete ban (<i>i.e.</i> , plastic bottles, bags, straws)	• 17.06%
	• Store discounts	• 14.96%
	• Tax incentives	• 5.25%
	• Compostable alternatives	• 17.32%
	• More campus education (<i>i.e.</i> , lectures, fliers, campaigns)	• 0.79%
	• A year-round composting program	• 0.52%
	• All of the above	• 43.04%
	• None of the above	• 1.05%
Q17. Would you feel a personal violation if the most common SUP were banned on campus? (<i>i.e.</i> , water bottles, cutlery, etc.)	• Yes, I would feel a personal violation	• 12.07%
	• No, it wouldn’t affect me	• 87.93%
Q18e. It is important to address plastic consumption & waste management issues at LU	• Strongly disagree	• 1.05%
	• Disagree	• 0.79%
	• Neither disagree nor agree	• 6.82%
	• Agree	• 24.93%
	• Strongly agree	• 66.40%
Q18f. LU should ban single-use plastics	• Strongly disagree	• 2.62%
	• Disagree	• 6.56%
	• Neither disagree nor agree	• 18.64%
	• Agree	• 33.86%
	• Strongly agree	• 38.32%

Source: Auld 2020

Perhaps the most useful question for LU appears to be Q16, which asks students what incentives, they personally think, would eliminate SUP the most on campus. Here, most students chose ‘All of the above’ (43.04%), pertaining to: a complete ban, store discounts, tax incentives, plant-based alternatives, more education and campus wide recognition, and on campus composting. Despite this richness in response, the limitations of the survey leave the author to speculate which option(s) students would

like to see implemented, if not all. Those who did not choose ‘All of the above’ indicated that a complete ban of single-use plastics (SUPs) should be executed (*i.e.*, plastic bottles, bags, straws, cutlery; 17.06%), or that more plant-based alternatives should become available (*i.e.*, cutlery, containers, straws, bags; 17.32%).

Conversely, 1.05% chose ‘None of the above’, and provided support to their reasoning. One explained how plastic straws are a necessary tool for individuals with disabilities, whereas another wished to have both plastics and alternatives available. Both comments resembled the right of consumer choice. These examples should be rightfully considered when contemplating a single-use plastics (SUPs) ban, as desired by students in Q18 (f). In this final question, 72.18% of students agreed that Lakehead University (Thunder Bay campus) should ban SUPs, thereby aligning itself with Orillia’s sustainability actions. 18.64% were indifferent, whereas 9.18% opposed the idea.

In regard to this rich data, the author is left to assume the ambivalent reasonings behind the participants’ answers. The contradictory results are evident in their answers being spread towards being hesitant, or willing to ban SUPs. Some students may perceive the transition to banning SUPs around campus as easy and straightforward, especially since many universities, including LU Orillia, UBC, Loyalist (Zero Waste Action Plan 2014; Sustainable Loyalist 2020; Campus Connection 2019), have set precedence. Those who are indifferent may believe that a referendum should be conducted to reflect the predominant opinion. On the contrary, students who are against

the ban may be debating how a SUPs ban would normalize eco-ableism²³, or exclusionary activism.

Since a SUPs ban would change the lifestyles of LU students, it is crucial that the school considers and consults every stakeholder, including those with disabilities, chronic illnesses, health problems, and financial insecurities- prior to any implementation. Thus, further studies and a student-lead vote would be suitable in this situation, as this thesis is restricted by time, monetary, and social constraints. In the next and final chapter, I will provide a conclusive plan of action for Lakehead University will be provided.

CONCLUSION & RECOMMENDATIONS

Over the last decade, Lakehead University (LU; Thunder Bay) has made several innovative changes to promote its commitment to being sustainable, despite challenges faced. By integrating a five-year Sustainability Plan (SP), an Office of Sustainability and numerous student-ran environmental clubs, ecological values have begun to be fostered by the entire university community. It is the author's sincere hope that every goal within the SP is implemented effectively with tangible results. Nevertheless, this thesis's final results suggest that the university's current programs and strategies have been highly ineffective in changing its student's awareness, behaviours, and thus attitudes in regard to plastic use. Thus, this thesis provides a condensed list of recommendations with hope that they will provide LU with the information needed to advance further research and subsequent action within this area.

²³ Eco-ableism is a form of discrimination which may be used (unconsciously or consciously) by environmental activists to discriminate against those of less-privilege, while being in favor of able-bodied (Flowr, 2018) This term can also be regarded as 'exclusionary activism' (Ibid.).

Recommendations

Although the participants demonstrated a very high level of awareness in regard to the consequences of plastics (98.43%; Q3), very few are recycling their plastics properly (57.46%; Q12) or using plastic-alternative reusables on campus (32.02%; Q9). This information reveals that students' awareness regarding plastics is not consistent with their subsequent behaviours. This may indicate that students *are* aware about plastic's negative implications, but they don't care enough to improve their behaviours, unless *required* or *encouraged* by someone to do so.

This imbalance leaves the author to assume that LU does not have an effective plan in place for its students to be consuming and utilizing plastics responsibly. This assumption is reinforced with the fact that 49.04% of the students are unaware of how to, or why they should recycle the products in the first place; while 50.94% feel restricted by the current waste mechanisms already available (Q13). Since consuming plastics appears to less of a *necessary* behaviour for students, but more so a *convenient* behaviour (Appendix V), it is crucial that students understand the benefits of mitigating plastic usage and waste, while having their behaviours positively reinforced by the institution.

The author believes this can all be accomplished if LU reevaluates its Sustainability Plan Waste strategies 1-4, and current initiatives in place (Sustainability Plan 2019 pg. 24; *Figure 12*). Waste strategy recommendations are listed as follows.

Strategy 1 - Waste

In order to implement standardized waste, LU *must* do more than analyze 2016's waste audit results. As of 2020, the human population is projected to produce more

plastic waste than ever before- far surpassing 2016's consumption and disposal rates (Guglielmi 2017). Thus, LU must be executing yearly, if not monthly or weekly, waste audits to provide the Office of Sustainability and Physical Plant with the data needed to accomplish its sustainability goals. Waste audits can provide LU with an accurate evaluation and effectiveness of the waste management processes in place, and thus, it should be a great priority. Unfortunately, the commitment and cost of doing this work is not yet apparent to LU. Perhaps, junior students from environmental programs²⁴ can be responsible for the audits, and in turn, receive a credit or mark for their participation. Junior students in these programs should be a focus group for this study, due to their comparably higher curiosity and behavioural malleability (Q2, Cantor *et al.* 2018). These audits have the potential to improve student's awareness, while reinforcing their positive actions through scholastic benefits.

Waste Strategy 1.4 and Campus Engagement Strategy 1 are the only sections that address student awareness campaigns (Sustainability Plan 2019). It is believed that student awareness campaigning should exist in all of the 'Contents' categories of the Sustainability Plan. After all, students make up the largest portion of the LU community (Facts and Figures 2020)- and deserve attention that is representative of their presence.

Awareness mechanisms that could be implemented include:

- Zero Waste Events (See Zero Waste Guide N/D; Plastic-Free Campus Manual 2017 for more)
- Campus Thrift Store Events (See Free & Thrift Store Manual 2015 for more)

²⁴ For example, students from Natural Resources Management, Outdoor Recreation, Environmental Studies, Geology, Biology, or Geography can be encouraged participate in the routine audits.

- Campus-Wide Interactive Waste Audits
- Water Taste Test Activities with Interactive Displays
- Disposable Plastics & Recycling Information Interactive Activities
- Monthly Stakeholder Presentations (*i.e.*, Eco Superior, Roots to Harvest, etc.)
- Join Eco Superior's 'Last Straw' Campaign (*i.e.*, Contact Eco Superior for more)
- Monthly Campus Cleanups
- Improved & *Regulatorily Updated* Social Media
- A-Z Recyclapedia
- Re-execution of LUSU's Sustainability Initiative Office
- Annual Plastic Initiatives Check-In Surveys
- Ensure the sales of eco-supplies on campus (*i.e.*, Beeswax wraps, reusable straws, reusable produce bags, reusable cutlery sets, etc.)
- Student waste councils; Zero-waste 'squads'
- Obligatory Infographic Manuals provided at Orientation, on weekly Communication Bulletins, at Events, LUSU Organizations, Residence Rooms, etc.

Strategy 2 - Waste

Although recycling should only be encouraged as a last resort (*Figure 17*), the implementation of multi-stream recycling bins is an excellent objective. From the data results, areas of concern include:

- Poor signage or indication of specific waste stream / municipally accepted materials

- Poor recycling bin availability (*i.e.*, outdoors, classrooms, offices, library)
- LU's waste management workers encourage ignorant behaviours (*i.e.*, visibly placing black garbage bags within 'recycling bins'; *Figure 10*)
- Lug-A-Mug and 'I Reuse' programs are restricting; poor incentives and education to engage participation
- The Study, Cafeteria, and Starbucks actively deceives students by conveying their packaging products are 'environmentally friendly' and thus recyclable, when they are not

Strategy 3 - Waste

It is worth noting and admirable that LU aims to implement institution wide composting, while involving undergraduates to conduct its feasibility (Sustainability Plan 2019). However, if this study is carried out, a campus-wide quantitative and qualitative study must also be executed to ensure that all individuals are accounted for and represented, especially those of smaller minorities. For example, individuals with disabilities must be highly considered during the planning and consultation processes. Additionally, Eco Superior should be contacted to acquire specialized knowledge and expertise on the matter. If an industrial composter becomes implemented, LU must provide transparency regarding their previous failures in the composting process. This could help prevent challenges from arising in the future.

Strategy 4 - Waste

Finally, the last strategy involving consumption mitigation is considered. The only action involved requests studying and applying other university's best practices where they deem fit. Both UBC and Loyalist Colleges should be contacted by the Office of Sustainability to build off of their mitigation strategies. Perhaps, LU should also implement a policy that mitigates plastic use and consumption on campus. Whether this be a single-use plastics ban (*i.e.*, the ban of plastic water bottles), or greater incentives that encourage the use of reusables (*i.e.*, 50 cents off coffees with a personal reusable, and not restricted to the Lug-A-Mug program); policies must be implemented to engage students to first refuse plastics, and recycle as an absolute last resort. Lastly, the deployment of more water refill stations should be considered for accessibility and incentive purposes (Q11). If these four strategies are reassessed, I believe that the attitudes and behaviours of LU students will be improved.

Conclusion

In conclusion, this study was developed to analyze Lakehead University's (LU) student awareness and behaviours regarding plastic use on campus. A specific emphasis was placed on determining which incentives were encouraged or discouraged the most the demographic. Thus, both objectives were successfully achieved.

This study's hypothesis was also supported. Students exhibited varying levels of awareness, particularly high concerning plastic's consequences, and particularly low concerning disposal methods. Consequently, student's consumption behaviours were not consistent with their awareness. This appears to be a result of an ineffective incentive

program on LU's behalf. Most participants exemplified a high willingness to improve, providing the adequate tools are provided.

It is the author's hope that LU addresses the concerns raised by this study. If we work together and learn from our mistakes, we can implement the tangible alternatives needed to guide action; to promote a sustainable future. Lakehead University students are an exceptional demographic and must be considered as such. Together, as stewards of the Earth, we can create the change we want to see in the world. We must take responsibility for our actions and begin by inspiring change, *today*. Let's start here, at Lakehead University, Thunder Bay.

LITERATURE CITED

- Abbing, M. R. 2019. *Plastic soup: an atlas of ocean pollution*. Washington, DC: Island Press.
- ACS. 2019. Man and Materials through History. American Chemical Society: National Historic Chemical Landmarks. Print.
- Alliance for the Great Lakes. 2019. Great Lakes Plastic Pollution. <https://greatlakes.org/great-lakes-plastic-pollution-fighting-for-plastic-free-water/>. April 1, 2020.
- Apple Inc. 2018. Product Environmental Report: 13-inch MacBook Air with Retina display. https://www.apple.com/environment/pdf/products/notebooks/13-inch_MacBookAir_w_Retina_PER_oct2018.pdf
- Arbogast, C. 2015. Different types of thermoplastic resins and their applications. Pleasant Precision Inc. <http://inbound.teampi.com/blog/different-types-of-thermoplastic-resins-and-their-applications>
- Bandura, A. 1977. Self-efficacy: Toward a Unifying Theory of Behavioral Change. Stanford University. https://pdfs.semanticscholar.org/9530/70a862df2824b46e7b1057e97badfb31b8c2.pdf?_ga=2.166448318.1489294635.1580773386-663130430.1580773386
- Beckman, E. 2018. The world's plastic problem in numbers. World Economic Forum. <https://www.weforum.org/agenda/2018/08/the-world-of-plastics-in-numbers>
- Bellis, M. 2019. *The History of Plastics From Photographic Film to Polyester Suits*. Retrieved from <https://www.thoughtco.com/history-of-plastics-1992322>.
- Bronner, D.W. 2019. Forget plastic straws. Starbucks has a cup problem. CNN Business. <https://www.cnn.com/interactive/2019/02/business/starbucks-cup-problem/index.html>. April 5, 2020.

- Bucik, J. 2019. Lakehead Orillia institutes campus ban on disposable water bottles. Lakehead University Campus Connection. Orillia, ON. <https://www.lakeheadu.ca/about/news-and-events/news/archive/2019/node/49859>
- Campus Connection. 2019. Lakehead Orillia institutes campus ban on disposable water bottles. Lakehead University. <https://www.lakeheadu.ca/about/news-and-events/news/archive/2019/node/49859>. March 3, 2020.
- Cantor, P., Osher, D., Berg, J., Steyer, L., Rose, T. 2018. Malleability, plasticity, and individuality: How children learn and develop in context. *Applied Developmental Science*. 23:4, 307-337, DOI: 10.1080/10888691.2017.1398649. March 12, 2020.
- Carson, S. 2019. Lakehead University Orillia going green by no longer selling bottled water. Simcoe.com. Retrieved from <http://www.simcoe.com/news-story/9119326-lakehead-university-orillia-going-green-by-no-longer-selling-bottled-water/>
- CBC News. 2019. Lakehead University Student Union cutting programs due to loss of funding. Thunder Bay. <https://www.cbc.ca/news/canada/thunder-bay/lusu-cuts-1.5356809>
- CBC News. 2020. Thunder Bay to accept more types of plastics for curbside recycling pickup. <https://www.cbc.ca/news/canada/thunder-bay/thunder-bay-plastic-recycling-1.5507816>. March 1, 2020.
- City of Thunder Bay. 2014. Thunder Bay Solid Waste Management Strategy: Our Green Guide. <https://www.thunderbay.ca/en/city-services/resources/Documents/Green-Guide-2018---FINAL.pdf>
- City of Thunder Bay. 2018. Recycling Collection & Depots. <https://www.thunderbay.ca/en/city-services/recycling-collection-and-depots.aspx>.

- Compost, Recycling, & Waste. 2020. Loyalist College. <https://www.loyalistcollege.com/about-loyalist/sustainability/compost-recycling-waste-3/>. February 23, 2020.
- Cox, K. D., Covernton, G.A., Davies, H.L., Dower, J.F., Juanes, F., Dudas, S.E. 2019. Environmental Science & Technology. <https://doi.org/10.1021/acs.est.9b01517>. March 1, 2020.
- Cox, K., Covernton, G., Davies, H., Dower, J.F., Juanes, F., & Dudas, S. 2019. Environmental Science & Technology. 53 (12), 7068-7074. DOI: 10.1021/acs.est.9b01517
- Currie, J., Meckel, K. 2018. Fracking Has Its Costs And Benefits – The Trick Is Balancing Them. Forbes. <https://www.forbes.com/sites/ucenergy/2018/02/20/fracking-has-its-costs-and-benefits-the-trick-is-balancing-them/#6450dca919b4>
- Dahl, R. 2010. Green Washing. Environmental Health Perspectives. 118. A246-A252. https://www.researchgate.net/publication/275031024_Green_Washing. March 30, 2020.
- Danthurebandara, Maheshi & Passel, Steven & Nelen, Dirk & Tielemans, Yves & Van Acker, Karel. 2013. Environmental and socio-economic impacts of landfills. Linnaeus Eco-TECH 2012. https://www.researchgate.net/publication/278738702_Environmental_and_socio-economic_impacts_of_landfills
- Dartmouth College (2018). How slick water and black shale in fracking combine to produce radioactive waste: Research papers explain the transfer of radium during hydraulic fracturing for oil and gas. ScienceDaily. Retrieved January 11, 2020 from www.sciencedaily.com/releases/2018/09/180918154831.htm

- Davis, D., Cunningham, S. 2018. Foreign students on the rise at Loyalist College in Belleville. Global News. <https://globalnews.ca/news/4044901/foreign-students-on-the-rise-at-loyalist-college-in-belleville/>. February 23, 2020.
- Desa, A., Abdul K., Nor, B., & Yusoooff, F. 2011. A Study on the Knowledge, Attitudes, Awareness Status and Behaviour Concerning Solid Waste Management. *Procedia - Social and Behavioral Sciences*. 18. 643-648. 10.1016/j.sbspro.2011.05.095.
- DH Vancouver Staff. 2017. UBC named most sustainable university in Canada. Daily Hive News. <https://dailyhive.com/vancouver/ubc-most-sustainable-university-in-canada>. February 23, 2020.
- Disposal of Surplus Equipment and Materials Policy: UP3 (1993). The University of British Columbia Board of Governors. https://universitycounsel-2015.sites.olt.ubc.ca/files/2019/08/Surplus-Equipment-Policy_UP3.pdf?file=2010/08/policy108.pdf. February 20, 2020.
- Downes, J. 2017. We can't recycle our way to 'zero waste'. *The Conversation*. <https://theconversation.com/we-cant-recycle-our-way-to-zero-waste-78598>. March 8, 2020.
- Earth Care Thunder Bay: Waste. (2018). City of Thunder Bay. Retrieved from <https://www.thunderbay.ca/en/waste.aspx>
- Earth Care. 2014. Earth Care Sustainability Plan, 2014-2020. The City of Thunder Bay. Retrieved from <https://www.thunderbay.ca/en/city-hall/resources/Documents/2014-2020-EarthCare-Sustainability-Plan.pdf>. February 8, 2020.
- Ecoproducts. 2020. Ingeo Brand PLA. EcoProducts. https://www.ecoproducts.com/ingeo_brand_pla.html. March 10, 2020.

- Facts and Figures. 2020. Lakehead University. <https://www.lakeheadu.ca/faculty-and-staff/ppm/facts>. March 28, 2020.
- Food & Water 2020. Loyalist College. <https://www.loyalistcollege.com/about-loyalist/sustainability/food-water-2/>. February 23, 2020.
- Free & Thrift Store Manual. 2015. PLAN. <https://www.postlandfill.org/free-thrift-store-manual/>. March 25, 2020.
- Freinkel, S. 2011. A Brief History of Plastic's Conquest of the World. Scientific American. <https://www.scientificamerican.com/article/a-brief-history-of-plastic-world-conquest/>
- Garbage & Recycling. 2020. City of Thunder Bay. <https://www.thunderbay.ca/en/city-services/garbage-and-recycling.aspx>
- Garside, M. 2019. Global cumulative production of plastic 1950-2050. Statista. University of Georgia. <https://www.statista.com/register/corporate/D1FXJwLogGCeIjnuzleIPupOE26V3zZ0o6E9iNNzFVU=>
- Gatehouse, J. 2019. Will there be more plastic than fish in the ocean by 2050? CBC News Radio-Canada. Retrieved from <https://www.cbc.ca/news/politics/ocean-plastic-liberals-fact-check-1.5212632>.
- Government of the Netherlands. 2017. From a linear to a circular economy. <https://www.government.nl/topics/circular-economy/from-a-linear-to-a-circular-economy>. February 19, 2020.
- Guglielmi, G. 2017. In the next 30 years, we'll make four times more plastic waste than we ever have. Sciencemag. <https://www.sciencemag.org/news/2017/07/next-30-years-we-ll-make-four-times-more-plastic-waste-we-ever-have>. March 16, 2020.

Guide to Sustainable Behaviour on Campus. 2019. Lakehead University.

<https://www.lakeheadu.ca/about/sustainability/guide-to-sustainable-behaviour-on-campus->

Gurnagul, N. 1992. The effect of cellulose degradation on the strength of wood pulp fibres.

Nordic Pulp and Paper Research Journal 07(03): 152-154.

https://www.researchgate.net/publication/250208040_The_effect_of_cellulose_degradation_on_the_strength_of_wood_pulp_fibres

Hayward, J. 2019. Ontario government ponders ban on single-use plastics. CBC News. Canada

Press. Retrieved from <https://www.cbc.ca/news/canada/toronto/ontario-plastics-ban-1.5050539>

Isangedighi, I.A., David, G.S., & Ofonmbuk, O.I. 2018. Plastic Waste in the Aquatic

Environment: Impacts and Management. 2. 1-31.

<http://dx.doi.org/10.31058/j.envi.2018.21001>.

Jones, C. 2019. Waste management association says landfills to reach capacity by 2032. The

Oshawa Express. <https://oshawaexpress.ca/waste-management-association-says-landfills-to-reach-capacity-by-2032/>

Lakehead University. 2019. Lakehead Orillia Institutes Campus Ban on Disposable Water

Bottles. <https://www.lakeheadu.ca/about/news-and-events/news/archive/2019/node/49859>

Lakehead University. 2017. Facts and Figures. <https://www.lakeheadu.ca/faculty-and-staff/ppm/facts>.

February 20, 2020.

Lakehead University. 2018. Lakehead University welcomed a record number of international students to orientation. <https://www.lakeheadu.ca/about/news-and-events/news/archive/2018/node/48530>

Lamizana, B. 2018. Plastic planet: How tiny plastic particles are polluting our soil. UN Environment Programme. <https://www.unenvironment.org/news-and-stories/story/plastic-planet-how-tiny-plastic-particles-are-polluting-our-soil>

Laville, S. 2019. *Single-use plastics a serious climate change hazard, study warns*. The Guardian. Retrieved from <https://www.theguardian.com/environment/2019/may/15/single-use-plastics-a-serious-climate-change-hazard-study-warns>.

Leahy, S. 2019. Microplastics are raining down from the sky. National Geographic. <https://www.nationalgeographic.com/environment/2019/04/microplastics-pollution-falls-from-air-even-mountains/>

Lenore, T. 2019. Australia wasted decades in climate denial- and must break free of the mire of misinformation. The Guardian. <https://www.theguardian.com/environment/2019/oct/16/australia-wasted-decades-in-climate-denial-and-must-break-free-of-the-mire-of-misinformation>

Loyalist College. 2012. Sustainability Policy. Policy and Procedure Manual. <http://www.loyalistcollege.com/wp-content/uploads/2014/03/ADMIN-118-SustainabilityPolicy.pdf>. February 23, 2020.

LU Sustainability Stewardship Council. 2019. Sustainability Plan 2019-2024. <https://www.lakeheadu.ca/sites/default/files/uploads/108/Sustainability%20Plan%202019-2024%20WEB.pdf>

- Mannix, L. 2017. The compostable cup you can't compost, and the trouble with our recycling system. The Sydney Morning Herald. <https://www.smh.com.au/environment/the-compostable-cup-you-cant-compost-and-the-trouble-with-our-recycling-system-20170701-gx2kpu.html>. March 10, 2020.
- Mason, S. 2017. Plastics, Plastics Everywhere. American Scientist. <https://www.americanscientist.org/article/plastics-plastics-everywhere>. March 28, 2020.
- McCartney, A. 2017. Chemical pollution in the Great Lakes. Office of Response and Restoration. <https://response.restoration.noaa.gov/about/media/chemical-pollution-great-lakes.html>
- McKellar, L. 2019. Personal Communication Interview: Lakehead Office of Sustainability. Shayla Auld. Recording. 0:00-14:25. March 3, 2020.
- McKellar, L. 2020. Re: Campus Thermal Composter. Message to Shayla Auld. Gmail. March 3, 2020.
- Merriam-Webster. 2020. Definition of awareness. <https://www.merriam-webster.com/dictionary/awareness>
- Miller, K. 2011. Student attitude and action regarding the single-use plastic shopping bag on the University of Alabama campus. http://libcontent1.lib.ua.edu/content/u0015/0000001/0000543/u0015_0000001_0000543.pdf
- Mossman, S. 2013. *Alexander Parkes – Materials Man and Polymath*. Retrieved from <https://blog.sciencemuseum.org.uk/alexander-parkes-materials-man-and-polymath/>.
- No Plastic Oceans. 2019. How Many Animals Die from Plastic? No Plastic Oceans. Retrieved from: <http://noplasticoceans.com/how-many-animals-die-from-plastic/>

- No Plastic Oceans. 2019. How Many Animals Die from Plastic? No Plastic Oceans. Retrieved from: <http://noplasticoceans.com/how-many-animals-die-from-plastic/>
- Noreña, L., Aguilar, J., Mugica, V., Gutiérrez, M., Torres, M. 2012. Materials and Methods for the Chemical Catalytic Cracking of Plastic Waste. Material Recycling – Trends and Perspectives. DOI: 10.5772/31705
- Opeolu, O. 2019. Plastic Waste Awareness and Practices among Students. A Case study of the students of the Faculty of Environmental Sciences, University of Lagos. 10.13140/RG.2.2.29359.18081.
- Parker, L. 2019. The world's plastic pollution crisis explained. National Geographic. <https://www.nationalgeographic.com/environment/habitats/plastic-pollution/#close>
- Patz, J. A. 2002. Global Climate Change and Health: Challenges for Future *Practitioners*. Retrieved from <https://jamanetwork.com/journals/jama/article-abstract/1844773>.
- Pettipas S., Bernier, M., Walker, T.R. 2016. A Canadian policy framework to mitigate plastic marine pollution. Marine Policy 68. DOI: 10.1016/j.marpol.2016.02.02
- Plastic-Free Campus Manual. 2017. Plastic Pollution Coalition; PLAN. https://www.postlandfill.org/wp-content/uploads/2017/01/Plastic_free_campus_updated_intro.pdf. March 28, 2020.
- Plastiquarian. 2015. An Introduction to Plastics. The Plastics Historical Society. <http://plastiquarian.com/wp-content/uploads/2015/06/plasticbook.pdf>
- Ramsey, M 2019. UBC tops global university impact rankings: Times Higher Education. UBC News. <https://news.ubc.ca/2019/04/03/ubc-tops-global-university-impact-rankings-times-higher-education/>. February 19, 2020.

- Resnik, B. 2019. More than ever, our clothes are made of plastic. Just washing them can pollute our oceans. Vox. <https://www.vox.com/the-goods/2018/9/19/17800654/clothes-plastic-pollution-polyester-washing-machine>
- Rinne, G. 2019. City installing more methane gas wells to feed Mapleward Road power plant. Tbnewswatch.com. <https://www.tbnewswatch.com/local-news/city-installing-more-methane-gas-wells-to-feed-mapleward-rd-power-plant-2-photos-1663444>
- Robinson, M. 2013. Starbucks' new reusable cups: responsible branding or greenwashing? Madelaine Robinson. <https://madelainerobinson.wordpress.com/2013/02/01/starbucks-new-reusable-cups-responsible-branding-or-greenwashing/>. March 30, 2020.
- Singh, Saumya & Mishra, Seema. (2017). MASS EDUCATION AND AWARENESS GENERATION ON PLASTIC WASTE MANAGEMENT. SIES Indian Institute of Environmental Management, Nerul, Navi Mumbai. https://www.researchgate.net/publication/317578359_MASS_EDUCATION_AND_AWARENESS_GENERATION_ON_PLASTIC_WASTE_MANAGEMENT
- Sort It Out. 2020. UBC Sustainability. The University of British Columbia. <https://sustain.ubc.ca/get-involved/campaigns/sort-it-out>. February 23, 2020.
- SPI. 1988. Resin Identification Coding System. The Society of the Plastics Industry (SPI). <http://www.minigrip.com/resin-identification-codes.html>
- Study International Staff. 2019. 5 Ways to be Eco-Friendly and Sustainable at Universities. SI News. November 2, 2019. <https://www.studyinternational.com/news/campus-sustainability-eco-friendly/>

Survey Monkey. 2019. About Us.

https://www.surveymonkey.com/mp/aboutus/?ut_source=footer

Sustainability News & Blog. 2019. Loyalist College.

Szeto, E., Sadler, G., Common, G. 2018. Microplastics found in some Canadian bottled water.

CBC News. <https://www.cbc.ca/news/technology/marketplace-canadian-bottled-water-microplastics-1.4606182>

Tanguay, M. 2019. What are the Different Plastic Recycling Codes? (Examples & Disposal).

EBP Supply Solutions. <https://www.ebpsupply.com/blog/plastic-recycling-codes-types-explanation>

The Climate Reality Project. 2018. Ethane Cracker Plants: What Are They?

<https://www.climaterealityproject.org/blog/ethane-cracker-plants-what-are-they>

The History and Future of Plastics. 2016. Science History. [https://www.sciencehistory.org/the-](https://www.sciencehistory.org/the-history-and-future-of-plastics)

[history-and-future-of-plastics.](https://www.sciencehistory.org/the-history-and-future-of-plastics)

The University of British Columbia Board of Governors. 2005. Environmental Protection

Compliance SC4. The University of British Columbia. February 19, 2020.

tLearning, Planning, & Past Initiatives. 2020. Loyalist College.

<https://www.loyalistcollege.com/about-loyalist/sustainability/learning-planning-past-initiatives-3/>. February 23, 2020.

Trudeau, J. 2019. Canada to ban harmful single-use plastics and hold companies responsible for

plastic waste. Prime Minister of Canada. Mont-Saint-Hilaire, Quebec.

<https://pm.gc.ca/en/news/news-releases/2019/06/10/canada-ban-harmful-single-use-plastics-and-hold-companies-responsible>

UBC. 2019. UBC Overview & Facts. <https://www.ubc.ca/about/facts.html>. February 20, 2020.

- UNEP. 2018. Single-Use Plastics: A Roadmap for Sustainability. The United Nations Environment Programme. ISBN: 978-92-807-3705-9
https://wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1
- Vyas, P., Young, R. 2012. The Importance of 'Becoming Aware'. The 8th Philosophy of Management International Conference 2012. Oxford. <http://nrl.northumbria.ac.uk/25728>
- Wagner, M., Lambert, S. 2017. Freshwater Microplastics: Emerging Environmental Contaminants? Springer. Print. <https://doi.org/10.1007/978-3-319-61615-5>
- Wei-Haas, M. 2018. Why 'BPA Free' May Not Mean a Plastic Product is Safe. National Geographic. <https://www.nationalgeographic.com/science/2018/09/news-BPA-free-plastic-safety-chemicals-health/>
- Wernick, A. 2019. New ethane cracker factories raise climate change and pollution concerns. PRI. <https://www.pri.org/stories/2019-11-11/new-ethane-cracker-factories-raise-climate-change-and-pollution-concerns>
- Wilcox, M. 2014. A study of college student attitudes and behaviors related to recycling. Dissertations and Theses @ UNI. University of Northern Iowa. <https://scholarworks.uni.edu/etd/2>
- World Health Organization. 2019. Microplastics in drinking water. Geneva. <https://apps.who.int/iris/bitstream/handle/10665/326499/9789241516198-eng.pdf?ua=1>
- Young, R. 2019. Canada's plastic problem: Sorting fact from fiction. Oceana: Protecting the World's Oceans. <https://oceana.ca/en/blog/canadas-plastic-problem-sorting-fact-fiction>

Zero Waste Action Plan. 2014. The University of British Columbia.

<https://planning.ubc.ca/sustainability/sustainability-action-plans/zero-waste-action-plan>.

February 19, 2020.

Zero Waste Guide. N.D. Plastic Pollution Coalition; PLAN. https://www.postlandfill.org/wp-content/uploads/2019/08/Zero_Waste_Events_preview.pdf. March 28, 2020.

Zheng, Y., Yanful, E.K., & Bassi, A. 2005. A Review of Plastic Waste Biodegradation, *Critical Reviews in Biotechnology*, 25:4, 243-250, DOI: 10.1080/07388550500346359

Ziady, H. 2020. Fires, storms and floods cost \$150 billion in 2019. More disasters are on the way. CNN Business. <https://www.cnn.com/2020/01/08/business/munich-re-climate-change-natural-disasters/index.html>

Zimmerman, G., Olsen, C., Bosworth, M. 2000. A 'Stages of Change' Approach to Helping Patients Change Behavior. *American Family Physician*.

<https://www.aafp.org/afp/2000/0301/p1409.html>

APPENDICES

APPENDIX I

Life Within the Plastic Crisis: An Inquiry into Student Awareness & Behaviour
Regarding Plastic Usage at Lakehead University Campus, Thunder Bay:

Participation Information Sheet

Researchers:

Shayla Auld, HBEM student, Lakehead University, saauld@lakeheadu.ca.

Dr. Jian Wang, Research supervisor, Lakehead University, jwang1@lakeheadu.ca.

Ethical Review committee, Lakehead University bknott@lakeheadu.ca

You are invited to participate in a research study conducted by Shayla Auld, a 4th year Honours of Environmental Management student from Lakehead University, Department of Natural Resources Management & Forestry. This research study examines the awareness and behaviours of students regarding their role in utilizing plastics at Thunder Bay's Lakehead University campus.

Here, I hope to identify the systematic issues concerning plastic pollution & waste management, while analyzing any education gaps that may be present at Lakehead University. **With more than 3.25 million tonnes of plastic waste being lost due every year to improper disposal in Ontario alone**, I hope to develop more awareness among this severe issue, while also evolving a more sustainable and conscious campus for future generations.

The term "*single-use plastics*" (SUP's) will be utilized frequently throughout the survey. These include items that are readily disposable and typically made from petroleum-based materials. SUP's are often represented through products such as plastic bags, cups, stir-sticks, food packaging, containers, and soda/ water bottles among campus.

Students will be given a five-minute, multiple choice survey to measure individual opinions and behaviours regarding plastic use at Lakehead University campus. Contribution is completely voluntary and anonymous. Individual participants will **not** be identified in the published results, as personal data will not be recorded. The data that you provide will be securely stored at Lakehead University for a period of 5 years.

If you are involved as a participant in this study, it is because you are an **active** student at Lakehead University's Thunder Bay campus. University faculty is not permitted to participate. If the topic of plastic use and pollution on campus interests you, please contact me to discuss the results and/ or any commentaries further.

Contributions towards this study have the ability to alter our campus' current waste management methods, recycling programs, plastic inventory, and sustainability education. Your decisions or opinions will **not** affect your relationship with Lakehead University. You may decline to answer any question and/ or end your participation at any time. Please be informed that withdrawal post-submission is not possible due to the anonymous nature of your data.

If you do not wish to participate in this survey, please close & exit the browser.

Thank you!

APPENDIX II

Life Within the Plastic Crisis: An Inquiry into Student Awareness & Behaviour
Regarding Plastic Usage at Lakehead University Campus, Thunder Bay:

Survey

1. I have read and understand the above information and agree to proceed to the survey. Submitting the completed survey is my implied consent.

a) [CLICK HERE](#) to proceed.

2. How old are you?

- a) Below 18
- b) 18 – 22
- c) 23 – 30
- d) 31 – 40
- e) 41 +

3. Are you aware of plastic pollution being a current worldwide issue?

- a) Yes
- b) No

4. Do you think educating students about the effects of plastic on our health & the environment is: (Move scale ranging from 1: Not important – 5: Important)

1: Not Important

3: Somewhat Important

5: Important

5. Have you been educated about the significance of the significance of the Waste Hierarchy? (*i.e.*, Refuse, reduce, reuse, recycle, recover & dispose)?

- a) Yes
- b) No

6. If “**NO**” to question 5 above, would you like to learn?

- a) Yes
- b) No

7. If any, what do you do currently to reduce your personal plastic consumption? (Select all that apply)

- a) I go without a straw or bring my own when I buy a drink
- b) I bring my own reusable bag
- c) I bring my own cup/ mug
- d) I bring my own cutlery/ containers when I get takeout orders
- e) I use bees-wax wraps instead of cling-film
- f) I use the establishments kitchen utensils (*i.e.*, plates, cutlery)
- g) None of the above (Please specify)

8. Have you ever purchased a single-use plastic product (*i.e.*, plastic water bottle, cups, cutlery) and reused it more than twice?

- a) Yes
- b) No

9. What material do you utilize the most concerning cups, containers, and bottles on campus?

- a) Single-use plastics
- b) Reusable plastics
- c) Metal
- d) Glass

10. Do you think that plastic products are a necessary aspect of your school experience? (*i.e.*, pens, binders, lab instruments, backpacks, etc.)

1: Not necessary

3: Somewhat necessary

5: Very necessary

11. Which resource do you use the most for water consumption on campus?

- a) Water bottle refill stations
- b) Vending machines
- c) Water fountains

12. What do you do with garbage that can be recycled on campus?

- a) I always use the recycling bins
- b) I sometimes use the recycling bins
- c) I use the most convenient bin, even if it's not the correct one

13. If answered B) or C) from question 12 above, what might cause you to misuse the recycling bins the most on campus?

- a) The recycling bins are too far away
- b) I'm not sure which items can be recycled
- c) The recycling bins are unclear
- d) I don't know why I should recycle, therefore it doesn't concern me
- e) I don't believe recycling helps the plastic pollution problem, therefore I don't bother

14. Would you like to see less plastic utilized on campus?

- a) Yes
- b) No
- c) I don't care

15. How willing are you to choose more plant-based or compostable products over single-use plastic products, if offered on campus?

- a) Willing
- b) Willing if the price is reasonable
- c) I don't care

16. Which incentives do you believe would eliminate single-use plastics the most at Lakehead campus?

- a) A complete ban (*i.e.*, plastic bottles, bags, straws, cutlery)
 - b) Store discounts (*i.e.*, 25 cents off food or drink for bringing your own container)
 - c) Tax incentives (*i.e.*, extra 50 cent fee for takeout containers, cups, bags)
 - d) Plant based or compostable alternatives (*i.e.*, cutlery, containers, straws, bags)
 - e) More education & campus wide recognition (*i.e.*, lectures, fliers, posters, campaigns)
 - f) A year-round composting program (*i.e.*, for compostable cups, lids, bags)
 - g) All of the above
 - h) None of the above (Please specify)
-

17. Would you feel a personal violation if the most common single-use plastics were banned from Lakehead Campus? (*I.e.*, water bottles, cutlery, stirring sticks, bags, containers, etc.)

- a) Yes, I would feel a personal violation
- b) No, it wouldn't affect me

18. Please answer the questions on a scale range: 1: Strongly Disagree – 5: Strongly Agree

- a) Paper coffee cups from The Study or the cafeteria can be recycled on campus
- b) Styrofoam take-out containers from The Outpost will decompose/ break down in the Thunder Bay landfill
- c) Thunder Bay adequately sorts and recycles plastic products
- d) Plastic waste is harmful to our environment
- e) It is important to address plastic consumption & waste management issues at Lakehead University (Thunder Bay) campus
- f) Lakehead University (Thunder Bay campus) should ban single-use plastics

19. If you have any additional comments, questions, or concerns regarding this study or plastic use at Lakehead, please state them below. (Optional)

APPENDIX III

Life Within the Plastic Crisis: An Inquiry into Student Awareness & Behaviour
Regarding Plastic Usage at Lakehead University Campus, Thunder Bay:

Posters



22 MILLION POUNDS OF PLASTIC ARE DUMPED INTO OUR GREAT LAKES EVERY YEAR.



SURVEY ADMINISTERED BY SHAYLA AULD, 4TH YEAR HBEM STUDENT. CONTACT SAAULD@LAKEHEADU.CA FOR MORE INFORMATION

Education, sustainable plastic alternatives, & campus initiatives are lacking.

Active students are welcomed to participate in a 5-minute research study to evaluate personal awareness & behaviours regarding plastic-usage at Lakehead University campus.

We all need to do our part to produce less plastic waste.

Learn more at <https://www.surveymonkey.com/r/lakeheadplastics> or scan the QR code above by using your smartphone's camera app to take you directly.

**PARTICIPATE
IN VALUABLE
RESEARCH**

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**HOW DO YOU
USE & RECYCLE
PLASTICS ON
CAMPUS?**

WE WANT TO KNOW!

HELP SHAPE LAKEHEAD'S FUTURE AT:
www.surveymonkey.com/r/lakeheadplastics

For more info.

LUSU
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STUDENT UNION

APPENDIX IV

Life Within the Plastic Crisis: An Inquiry into Student Awareness & Behaviour
Regarding Plastic Usage at Lakehead University Campus, Thunder Bay:

Expanded Answers

* Student commentaries which the author believes are statistically valuable and/ or hold strong recommendations for LU's sustainable improvements.

Q7. If any, what do you do currently to reduce your personal plastic consumption?
(Select all that apply); None of the above (Please specify)

1. .
2. Idk
3. Hi
4. Multi use water bottle, reuse single use containers, yogurt containers, etc
5. I do not do anything
- * 6. Attempt to buy products in either metal or glass, since they are infinitely recyclable
7. Try to buy items with less plastic packaging
- * 8. Diva cup
9. F
10. I have my own reusable water bottle
11. Reusable water bottle, packing instead of buying lunch/ dinner
12. Nothing
13. Reject consumerism
14. I frequently use single-use plastics
15. I recycle my plastic, cans, and paper, and cardboard

Q16. Which incentives do you believe would eliminate single-use plastics the most at Lakehead campus?; None of the above (Please specify)

- * 1. Make the alternatives available and have the other ones on hand too if people want them they can ask
2. Nothing
- * 3. Plastic straws are a necessary accessibility tool for the disabled community- please read about and consider this.

4. It's a life style change and many people are not willing to do that. So a complete ban would require influencing lifestyles

Q19. If you have any additional comments, questions, or concerns regarding this study or plastic use at Lakehead, please state them below. (Optional)

1. Lakehead doesn't have any composting for those living on campus.

* 2. There need to be more bins around campus at the very minimum. For every garbage bin, there should be a recycle bin right beside it. Thank you for doing this study. :)

* 3. Regarding question 13, it feels pointless to recycle knowing that hardly any "recyclable" items in Canada aren't even properly recycled once they are taken away in your blue bag (not Lakehead's or any individual's fault). They either end up in the landfill anyway, incinerated, or shipped overseas. Canada either needs to step up it's recycling programs or drastically reduce the use of single-use plastics. I'm sure you have probably seen articles such as this but I figured I'll link it just in case <https://www.cbc.ca/news/technology/marketplace-recycling-trackers-b-c-blue-box-1.5299176>

4. Single use plastics were completely banned at my workplace last year; the transition was painless and effective.

5. Stream Charli by Charli XCX

6. Good job Shayla!!

* 7. Question 12 & 13 stood out to me, as it has never really occurred to me that I don't know what I can/ cannot recycle on campus. I think better education on that topic would be a good starting point, and could be used to encourage students to cut down on waste.

8. No

9. Great job on the thesis Shayla! You'll do great

* 10. I think that if we don't ban plastics we need to implement a tax and a discount. If people feel rewarded when doing something well and punished when do something poorly I think it has a lot better chance of working

* 11. If banning single-use plastic is an option there definitely needs to be easily accessible alternatives. As someone that carries my own water bottle even filling it up isn't easy on campus at the moment.

12. Great survey, Shayla! Thank you <3 Xoxo

13. Many of the bins around campus do not have the option to recycle all recyclable materials. E.g. some just have garbage a paper bins.

* 14. There needs to be a recycle program for paper coffee cups on campus. More water bottle refill stations. They should bring back pen recycling in the bookstore. And the recycle bins need more description to help sort (pictures would help), and more recycling options.

* 15. I would also like to see compost at LU, especially since we have a community garden which could use the compost. Food waste is also a big thing especially when considering organic materials cannot break down in anaerobic landfill conditions. Keep up the great work, thanks for the survey!

16. I don't think that single use plastics should be fully ban. I think the most effective way to see change is for the campus to offer discounts for students who bring reusable items.

17. Ban them! I am a huge proponent of this. Many other campuses are already investing in this – don't be the last one Lakehead – take initiative.

* 18. I am from BC (specifically Vancouver Island) and at UVic there are minimum 4 bins to sort waste in any lecture hall/ common area (garbage, recycling, organics, and paper). This does not exist here! You are lucky if there is even a garbage bin within eyesight. Also barely any garbage bins, let alone recycling, at bus stops!

* 19. I have been a 'waste reducer' for the last two years. It would be extremely beneficial to have organic compost bins on campus, as well as having every garbage bin paired with a recycling to increase waste diversion. It is so important to make these changes now. Great survey!

20. Recycle

21. Thunderbay should have a bottle depot. Same as Alberta has. That will help recycle not only plastic but glass bottles, juice boxes, etc.

22. Not ban single use plastics but ban stores on campus from selling them

* 23. A ban of single-use plastics should be a decision of the students by referendum. As a student, I would want to be able to participate in that choice.

* 24. I believe that education about what is and is not recycleable in Thunder Bay should be provided to the student in some capacity. Education student on single use plastic and what is actually recyclable in our region is important. I also think the lack of recycling bins around campus contributes to plastics not being recycled properly. I really appreciated the “tap in” water dispensers around campus but we could prob have some more installed. Thank you.

25. What question 18 is asking is a bit confusing. Requires some preamble. Are you asking us our opinion or is this a fact? E.g. paper coffee cups from The Study or the cafeteria can be recycled on campus – what am I trying to agree with here, that I want this to be an initiative.

26. No

27. Every dollar spent on disposable single-use plastic is a vote cast for a petroleum lobbyist to control the future of the fragile planet.

* 28. Single use plastics (such as straws) can aid some people with disabilities. I feel like reducing use massively is best with the option still available if needed

29. Thank you for doing this survey!

* 30. Plastic bans that neglect to realize the ways in which disabled people need certain single use plastic products are ableist. But messaging and initiatives that encourage abled people to eliminate or reduce their plastic usage are amazing. All beverage establishments should have plastic straws for those who need and at this time none of
31. We need more garbage/ replying bins that have the labels of what can be put in thm maybe with something talking about different plastics that can't be recycled and how to figure out what can and can't, also more water bottle filling water fountains the mouth ones are terrible for filling up water bottles

32. It's also important to consider that places on campus (though stated recycling bins) just go to the dumpsters for landfill anyway (ie the study)

* 33. There are no more styrofoam containers at the outpost. And I knew about the 3Rs the 5 mist be new. Thunder Bay is very poor for recycling as any contaminated items don't get recycled. Therefore one incorrect disposal in a recycling bin that dirties items within wont get recycled. At least from what I know. So I don't tend to recycle at school.

* 34. If you wish to impose a plastic ban, you MUST provide alternatives at comparable cost; similarly, if you wish to incentivize alternatives, you MUST de-incentivize wasteful products. The two don't function nearly as well in isolation.