Measuring our Success:

The University of Winnipeg's Annual Sustainability Report

Fiscal Year 2017

Table of Contents

LIST OF TABLES

LIST OF FIGURES

1 EXECUTIVE SUMMARY

1.1 About this report: Scope and Purpose

This report provides a review of the University of Winnipeg's environmental performance and other sustainability impacts during the fiscal year of 2017 (FY2017), from April 1, 2017 to March 31, 2018. The University sustainability staff prepared this document using a wide range of sustainability indicators and metrics to assess:

- ✓ the day-to-day operations and management of all the University's owned and leased space, including capital construction and renovations, and all university programs and services,
- ✓ all university programs, initiatives and events, and all "arms-length" agencies, corporations, institutes, research centres or other entities, to which University policies may generally apply,
- ✓ and the routine activities of students, faculty, and staff on campus, including their daily commutes,

This report considers both the environmental impacts of the University's buildings and operations, such as resource consumption, waste generation, and emissions, and the contributions made by research, education, engagement, and community partnerships to broader sustainability objectives. It is an approach that reflects our commitment to leading on sustainability by taking responsibility for our environmental footprint and leveraging the many ways in which universities mobilize knowledge, foster innovation, and inspire change.

Beyond accounting for sustainability outcomes within a given year, our annual reporting process allows us to assess our progress toward our strategic objectives over an extended period of time. This is our first year reporting on the University's new five year Institutional Sustainability Strategy, which established nineteen specific targets within four overarching goals:

1) Exceed Canada's commitments under the Paris Accord.

2) Cultivate principled relationships with people on and off campus and with ecosystems near and far.
3) Develop and deliver curriculum, student services, and programming that deepen student knowledge about sustainability and that help motivate thoughtful leadership and action
4) Mobilize evidence and research to address local and global sustainability challenges

The four main sections of this report each focus on one of these goals, assessing progress on specific targets and outlining our strategic approaches to navigating emergent challenges.

This report can help people on and off campus learn about the University's sustainability initiatives and the challenges we are working to overcome in the fight to address climate change and ecological injustice. We are intentionally contributing to a body of knowledge guiding university sustainability professionals across Canada and abroad, while inviting businesses and organizations here in Manitoba into a dialogue about how we uphold our environmental responsibilities. If you would like to learn more about the University's sustainability projects, or take a closer look at the data presented in this report, please contact the Campus Sustainability Office.

If you have any questions please contact

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1.2 Reviewing the University's Environmental Performance in 2017

1.2.1 CHANGES TO OWNED AND OCCUPIED SPACE AND THE CAMPUS POPULATION

Effective comparison of the University's environmental performance between years requires two key considerations: changes to owned and leased space and changes to the number of people occupying this space. For example, the opening of a new campus buildings or enrollments spikes can explain increases in energy consumption and waste production. They also help contextualize our sustainability successes. In 2015 the University's annual emissions were 32% less than in 1990, an impressive accomplishment given the fact that 38% of the space we owned in 2015 did not exist in 1990. There has been an increase in total owned space over the last year, which reflects corrections that have been made to our space inventory data. The 31% reduction in leased space comes from the University giving up the use of Lion's Manner for student housing. (See Table 1)

Table 1: Changes to the University's occupied, owned and leased space between FY2016 and FY2017

	Total Area Occupied	**Total Owned Space**	**Total Leased Space**
FY2016	153,093.21	138,964.31	14,128.91
FY2017	154,904.49	145,207.20	9,698.29
% change between FY2016 and FY2017	**1%**	**4%**	**-31%**

FY2017 saw a slight increase in the campus population. We will continue to account for a growing population as we move forward with Sustainability Strategy goals.

Table 2: Student and staff population of University of Winnipeg from FY2010 – FY2017.

Fiscal Year	Students (FCE*)	Students (FTE)	Staff (FTE)
FY2010	NA	NA	724
FY2011	23,452	NA	756
FY2012	24,074	7,559	824
FY2013	27,842	7,679	810
FY2014	26,961	7,496	854
FY2015	26,567	7,563	832
FY2016	26,567	7,576	832
FY2017	**26931**	**7680**	**869**

*FCE numbers revised to align with streamlined reporting processes.

1.2.2 PRIMARY ENVIRONMENTAL PERFORMANCE INDICATORS

Looking at the University's environmental impact across a range of indicators, we continue the trend of steady, year-over-year improvement on sustainability performance. However, FY2017 saw decreased performance in certain areas compared to more recent years. As seen in Figure 1, emissions increased 13% as a result of using more natural gas in our energy mix, while landfill diversion rates dropped significantly.

Despite these setbacks, those working on building operations and management also had a number of successes in the last year. A new biomass energy system pilot was installed and will be operational for the FY2018 heating season. Advanced electrical metering systems were installed, giving the Facilities team a greater ability to optimize the energy efficiency of individual's buildings. We were also able to lower our campus-wide water use and overall waste generation (see Figure 1). Sections 2 and 3 provide more detail about the environmental costs of day-to-day operations and what the University is doing to mitigate negative impacts.

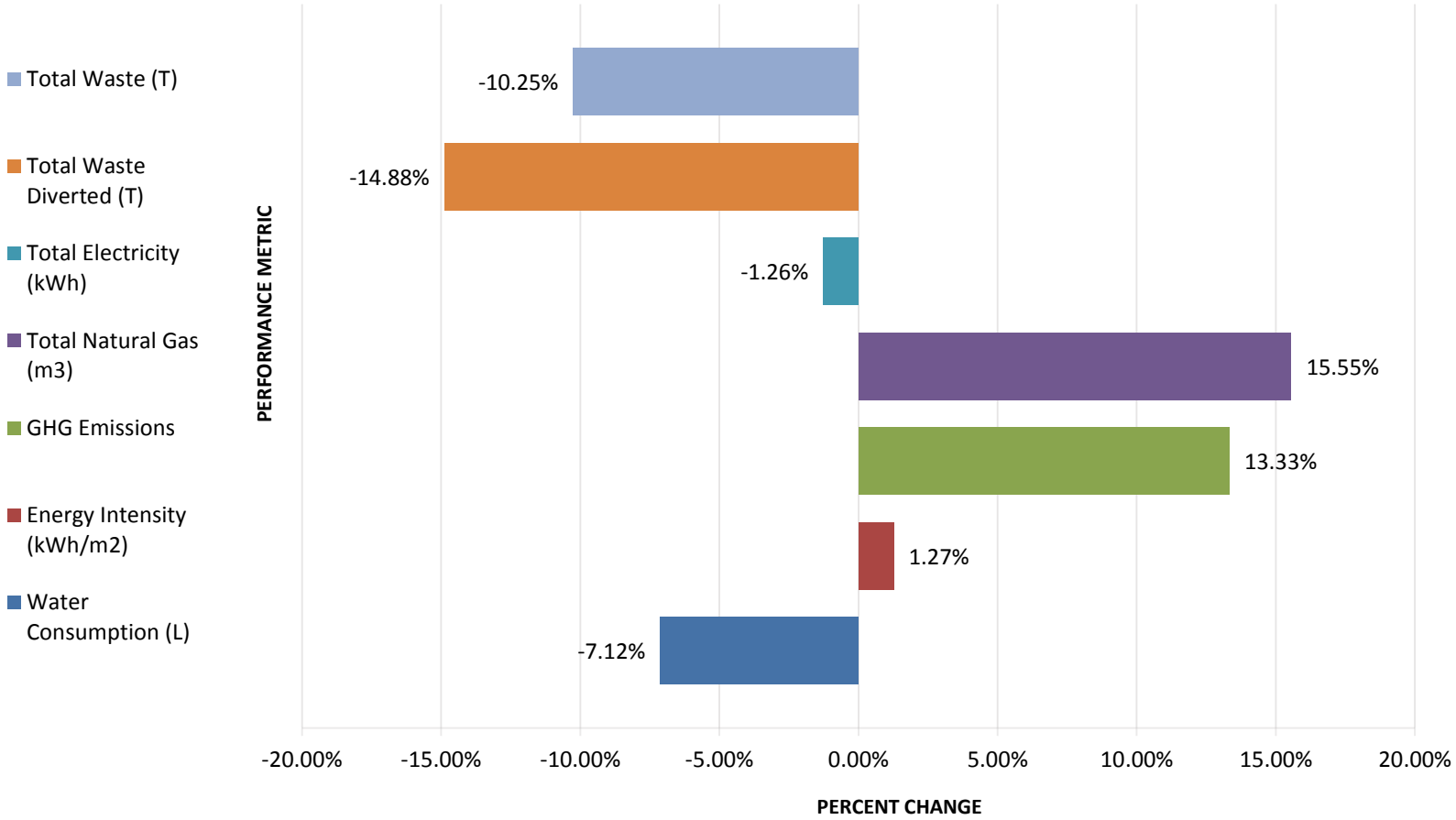


Figure 1. Sustainability performance summary for the University of Winnipeg from April 1st, 2017 – March 31st, 2018 showing annual percent change for waste collection (T), waste diverted (T), water consumption (L), energy intensity (kWh/m^2), electricity consumption (kWh), natural gas consumption (m^3), and greenhouse gas (GHG) emissions (TCO_2e). GHG emissions and natural gas consumption are normalized for weather.

1.3 Sustainability Highlights in FY2017

The 2017 Institutional Sustainability Strategy

The University of Winnipeg published its second five year Institutional Sustainability Strategy in June 2017. The document builds off of the progress achieved through the University's 2012 strategic plan and is an important milestone for our institution. The Strategy incorporates a review of our past approaches and an extensive consultation process, and signals a renewed commitment to ecological and social responsibility on behalf of a wide range of campus stakeholders. The document establishes nineteen specific targets within four broad goals that reflect the science of climate change and best practices for campus sustainability. Consistent with the philosophy that a transition to sustainability is primarily a change in management process that should draw on existing capacities and resources, the majority of the targets included in the Strategy can be achieved within existing staffing structures and budgets. It will guide the work of the CSO for the next five years and provide the framework for measuring our performance, with clear objectives and a wide range of indictors. Appendix A presents the Strategy's goals and targets and outlines implementation plans for the coming year.

Diversity Food Services

Diversity Food Services continues to be one of the University's most profound sustainability success stories. Diversity's commitment to local and ethical purchasing has had important benefits for the agricultural economy in Southern Manitoba. The company sources nearly 60% of its inputs from within a 100 kilometre radius of campus. Several of Diversity's suppliers have been able to expand their operations as a result of the University's large, stable demand for local produce, dairy and meat, resulting in increased market availability of sustainable food products in our province. Because of Diversity's employment practices, the company continues to experience a Social Return on Investment (SROI) of about 1:1.68, this means that for every dollar Diversity spends on employment the local community experiences a social benefit of $1.68, and 70 cents of every dollar that Diversity receives as revenue is returned to the local economy. Thanks to Diversity, the University was ranked first in Sierra Magazine's Cool Schools 2017 list in the sustainable food category, out of 227 undergraduate colleges and universities in North America which participated.

Transportation Survey

The CSO, in partnership with the Green Acton Centre, conducted the University's triennial Campus Commuting Survey in January and February of 2018. More than 2,400 staff and students (24% of the campus population) completed the online questionnaire. The results from the survey provided the University with an updated picture of our commuting habits, revealing that one out of two students ride the bus to and from campus while almost a quarter of staff walk, run, bike or car pool. The survey also indicates that the CSO still has work to do when it comes to promoting the programs and services that exist to make sustainable commuting options affordable and accessible. The full report is available here.

1.4 2017 Sustainability Challenges in 2017

Energy Sources and Emissions Reduction Targets

The University's greenhouse gas (GHG) emissions are up 15% since FY2016. This correlates with an increase in consumption of natural gas and highlights an emerging energy management challenge for our institution. Natural gas prices appear to falling steadily while the cost of hydroelectricity is on the rise. As the trend continues, it becomes less economically feasible to substitute hydro for natural gas as a source of energy for heating our buildings, but returning to natural gas increases our GHG emissions. Facilities managers are working to overcome this challenge by lowering our energy demands through further building optimization. Over the long term, however, the University must take a creative approach to using alternative renewable energy sources in ways that fit within our existing infrastructure, investing in large and small-scale projects. The new biomass system demonstrates the University's commitment to innovative solutions, but biomass is only one piece of the puzzle. Achieving our emission reduction targets will require a diverse mix of energy sources including solar, geothermal and the continued use of hydroelectricity.

Landfill Diversion and Waste Contamination

The University has room to make significant progress in waste management. Data collected from our waste haulers indicates that since FY2014, between 63% and 69% of all waste generated on campus in a given year ends up in landfill. The results of our recent internal waste audit also revealed that 52% of all our compostable and recyclable materials were sent to the landfill. Our data tell us that the campus community can be more diligent when it comes to ensuring waste items end up in the correct stream while striving generate less landfill waste in the first place. To address these challenges, the CSO will be engaging staff and students with waste education initiatives throughout 2018. This will include the development of better instructional materials and a bin-side waste volunteer program. The CSO hopes to create a new part-time waste management staff position tasked with coordinating education and outreach as well as the monitoring and upkeep of waste collection infrastructure.

1.5 Priorities and Opportunities for 2018

Sustainability Data and Reporting

The FY2016 Annual Sustainability Report identified the collection and management of data as a persistent challenge for campus sustainability managers, and issues remained apparent throughout the FY2017 reporting cycle. In response, the CSO plans to work Facilities over the coming months to establish new systems and more collaborative procedures, including developing a new filing system and incorporating historical data into more manageable databases. The Campus Sustainability Coordinator will work with Facilities and Physical Plant staff to clarify roles and responsibilities associated with data collection. Furthermore, the Facilities team will continue developing its approach for using the Optergy, a software program that uses smart metering across campus for tracking energy use and other building performance metrics. Once this system becomes fully operational in FY2018, it will provide more reliable and fine-grained data than what we currently take from utility bills.

In 2018, the CSO will apply for a new AASHE STARS (the Association for the Advancement of Sustainability in Higher Education’s Sustainability Tracking, Assessment & Rating System) rating. STARS is a self-reporting framework that allows

post-secondary institutions to assess and compare their sustainability performance. STARS accounts for a wide range of environmental and social factors by looking at many different performance indicators; the application process is a large undertaking requiring cooperation and input from departments across campus. Our goal is to maintain the silver rating that we received in FY2015.

Developing a Sustainability Community of Practice with the Richardson College for the Environment

Toward the end of FY2017, the CSO and the Principal of the Richardson College for the Environment, Dr. Ian Mauro, began discussing possibilities for working together on various projects related to sustainability research and education. These conversations stemmed from our realization that the University's original vision for the College as a collaborative, interdisciplinary space aligns well with objectives in the Sustainability Strategy aimed at supporting environmental research and strengthening sustainability curricula. In FY2018, the CSO and Dr. Mauro plan on hosting a series of events intended to mobilize environmental knowledge and research and spark collaborative teaching and learning. The CSO and the RCFE also hope to work together on a sustainability course inventory and tracking sustainability-related research.

Engaging our Students

The 2017 Institutional Sustainability Strategy establishes clear goals for enhancing sustainability education with skills and leadership development and supporting students who are looking to engage with environmental issues. We also know that our waste and emissions reduction initiatives depend on a student population that understands how individual and collective actions connect with climate change and sustainability. For these reasons, the CSO will begin developing and implementing a strategic framework for student engagement in FY2018, including outreach, events, volunteer recruitment and training. We will also be developing metrics and systems for tracking the number of students we connect with and the impact our initiatives have.

2 ENERGY, EMISSIONS AND RESPONDING TO CLIMATE CHANGE

2.1 Energy Sources, Consumption and Intensity

As in years past, we are reporting on the energy consumption and GHG emissions for owned space only. Because we do not operate the energy systems of leased buildings and cannot exercise direct influence over these spaces, they are not included in our inventory. (More on this in Section 1.8.) Table 1 displays changes in owned space since FY2008, numbers that should be kept in mind when making year to year comparisons for energy and emissions.

The University's greenhouse gas (GHG) emissions are up 15% since FY2016. This correlates with an increase in consumption of natural gas and highlights an emerging energy management challenge for our institution. Natural gas prices appear to falling steadily while the cost of hydroelectricity is on the rise. As the trend continues, it becomes less economically feasible to substitute hydro for natural gas as a source of energy for heating our buildings, but returning to natural gas increases our GHG emissions. Facilities managers are working to overcome this challenge by lowering our energy demands through further building optimization. Over the long term, however, the University must take a creative approach to using alternative renewable energy sources in ways that fit within our existing infrastructure, investing in large and small-scale projects. The new biomass system demonstrates the University's commitment to innovative solutions, but biomass is only one piece of the puzzle. Achieving our emission reduction targets will require a diverse mix of energy sources including solar, geothermal and the continued use of hydroelectricity.

Beyond fluctuating energy prices, several other factors help explain the increase in emissions that occurred in 2017:

- Leatherdale Hall was brought online, increasing our owned space and energy needs
- For the first time, the Downtown Commons was active for the entire year,
- The hot water heating plant in Centennial experienced higher than normal gas consumption due to some component failures.

2.2 Scope 1 and 2 Emissions Summary

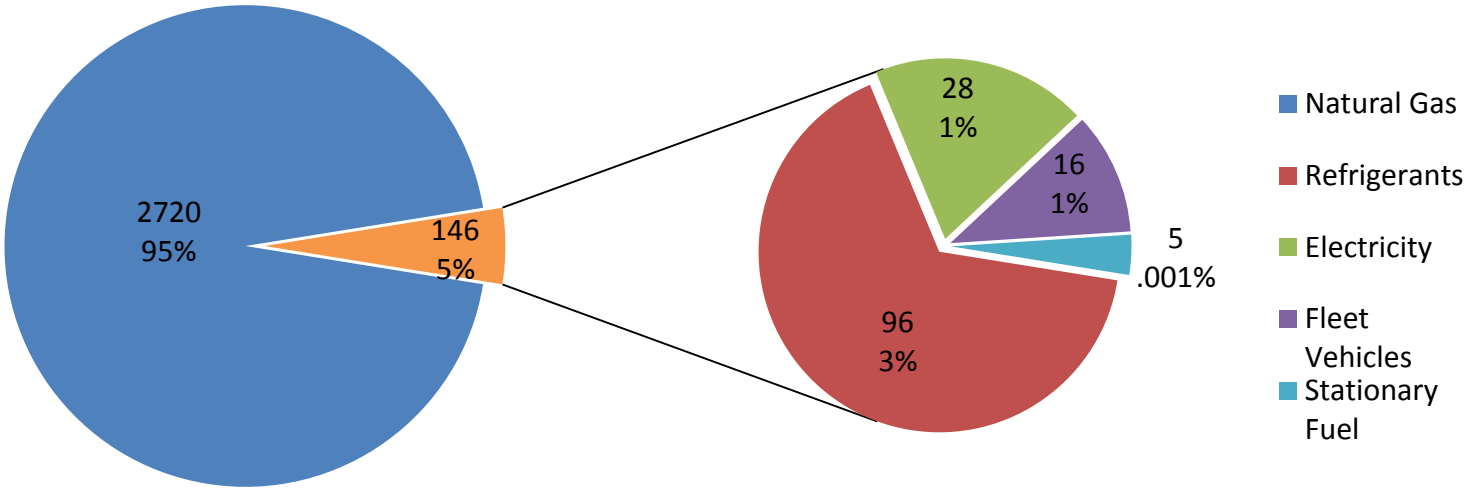


Figure 2. Breakdown of greenhouse gas emissions (TCO2e) from the University in FY2017 by source, including electricity, natural gas, fleet vehicles, stationary fuel, and refrigerants.

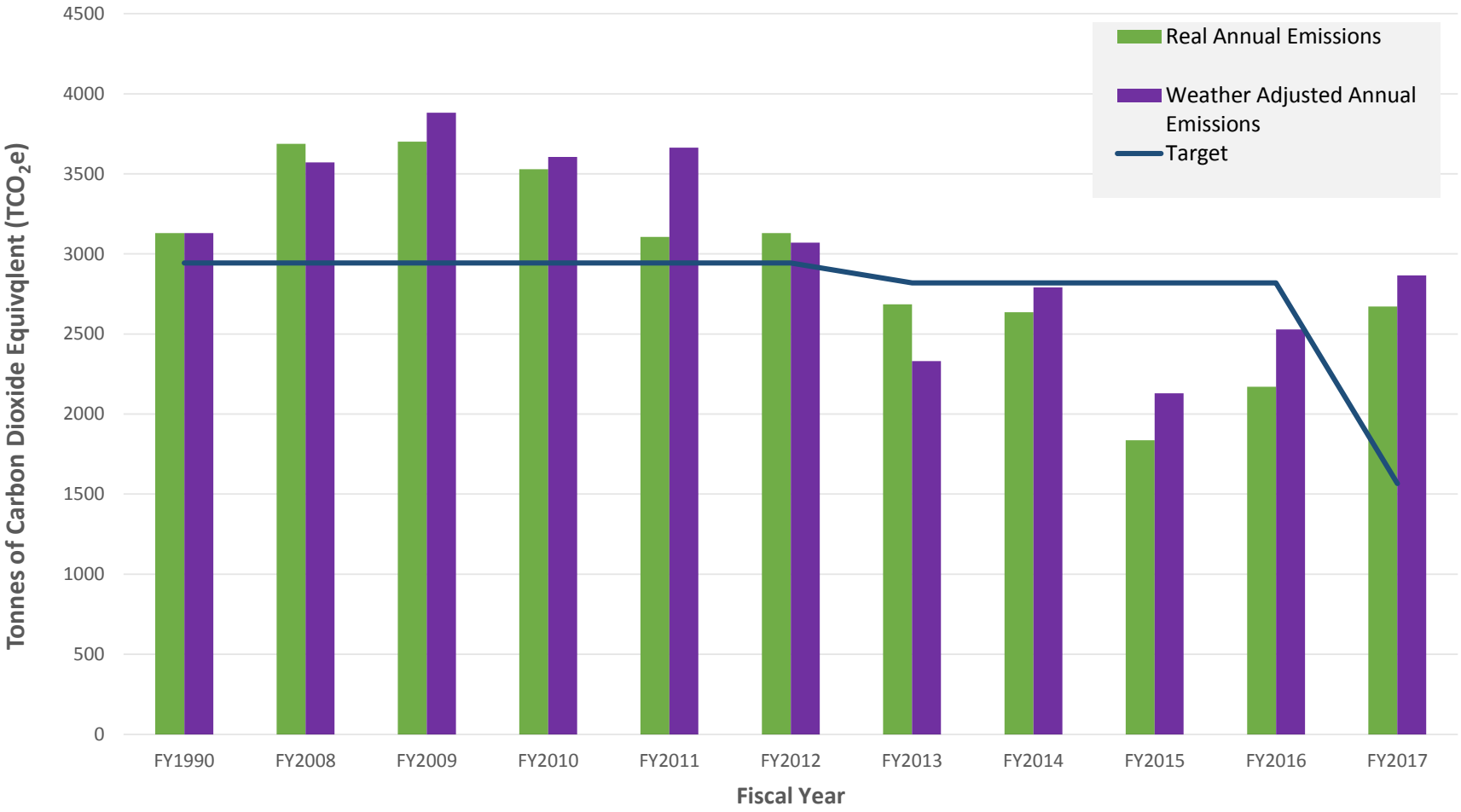


Figure 3. Greenhouse gas emissions and targets (TCO2e) from FY2008 to FY2017 (including the baseline year of 1990) for the University. Real annual emissions and weather adjusted amounts are shown.

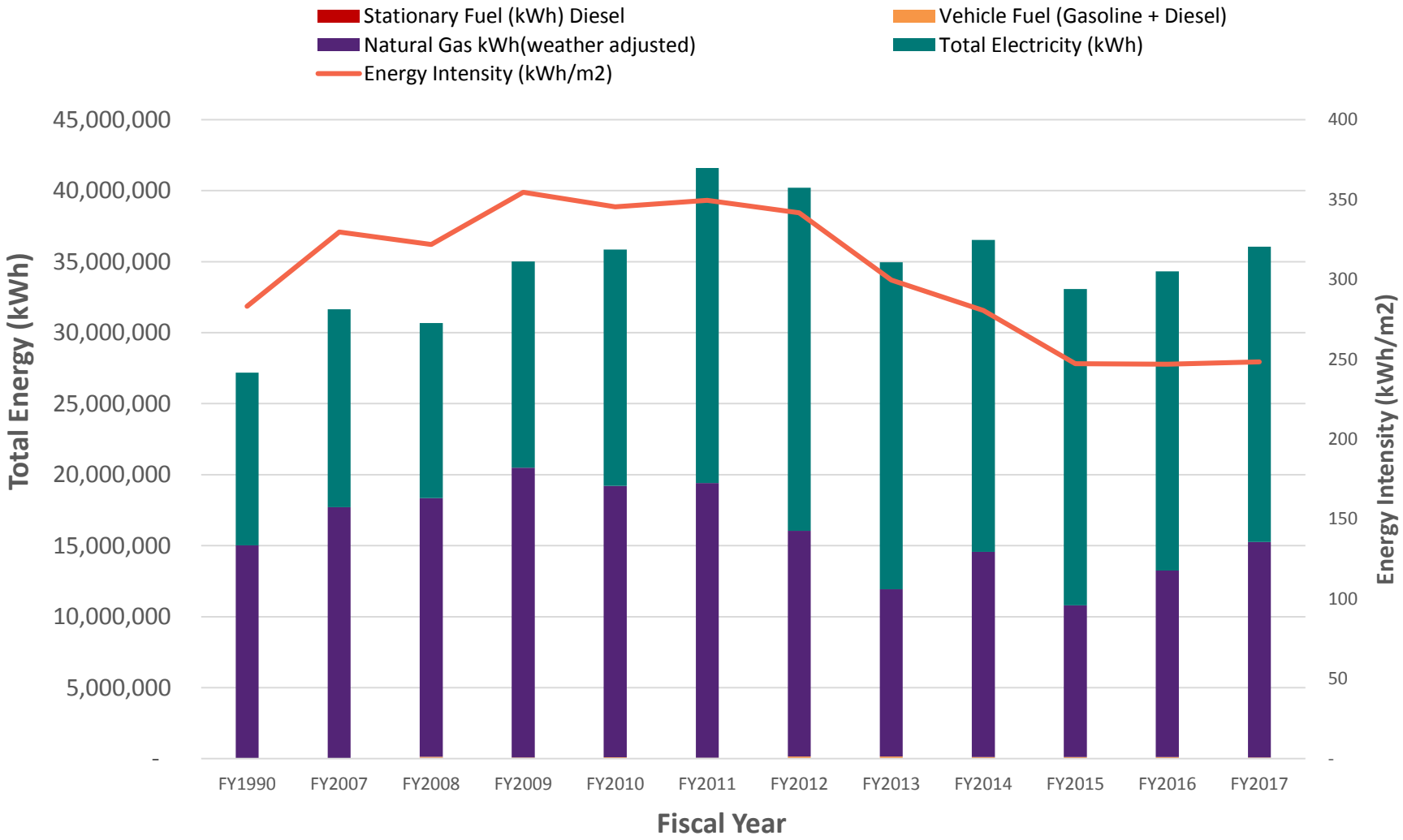


Figure 4. Energy consumption (kWh) breakdown for the University from FY2007 to FY2017 including natural gas (weather adjusted) and hydro. The intensity (kWh /m2) is also shown. (Stationary fuel and vehicle fuel, which comprise <1% energy consumption per year, not pictured.)

2.3 Scope 3 Emissions Summary

Scope three emissions are those that occur as a consequence of operations, but are not owned or controlled by the University. Classic examples include air travel and waste emissions. In early 2017, the CSO hired an EcoCanada intern to establish a baseline for the University's Scope III emissions, as required by the Sustainability Strategy. This included:

- Estimating magnitude of emission categories
- Identifying areas for improvement
- Developing actions with meaningful impact

We found that the majority (66%) of our Scope III emissions can be traced back to GHGs associated with the production of purchased goods. As such, the CSO is no longer tracking air travel, and will be focusing efforts on responsible purchasing (see Section 3.6).

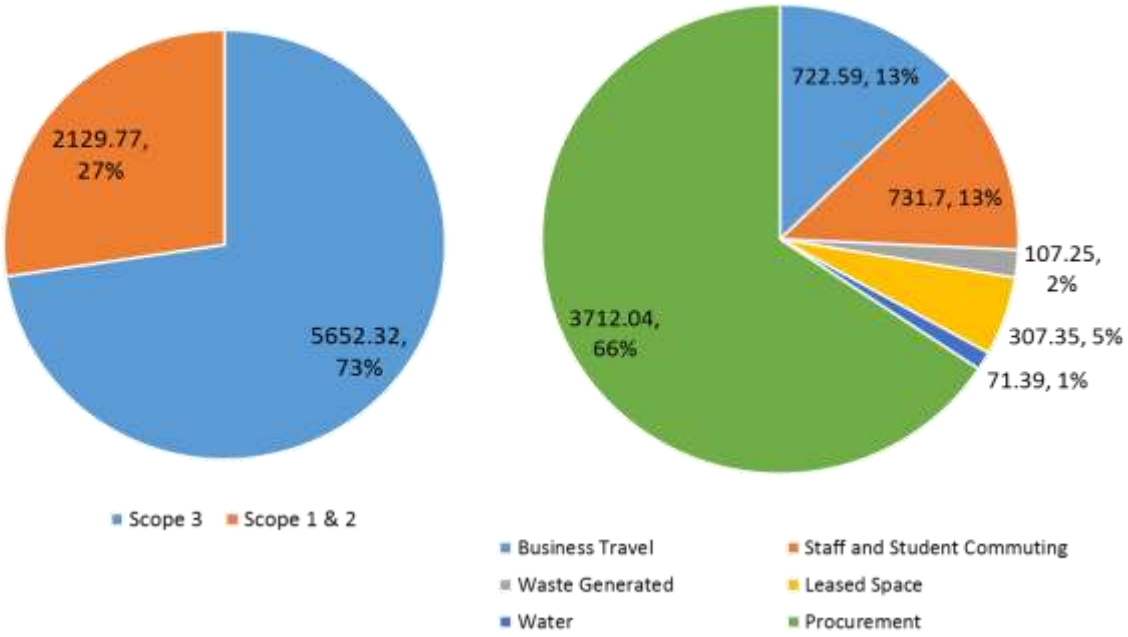


Figure 6. Left: The proportion of the University emissions attributed to Scope I and II vs. Scope III emissions. Right: A categorical breakdown of the University's Scope III emissions. Note the magnitude of purchasing

3 RESILIENT ECOSYSTEMS AND HEALTHY COMMUNITIES

3.1 Water Consumption

Water consumption in FY2017 decreased 7.12% over the previous year (see Figure 7). A small number of fixtures on campus have not yet been replaced with low-flow alternatives. These fixtures will be replaced as possible. Water consumption has gone down since retrofits, but fluctuations still occur.

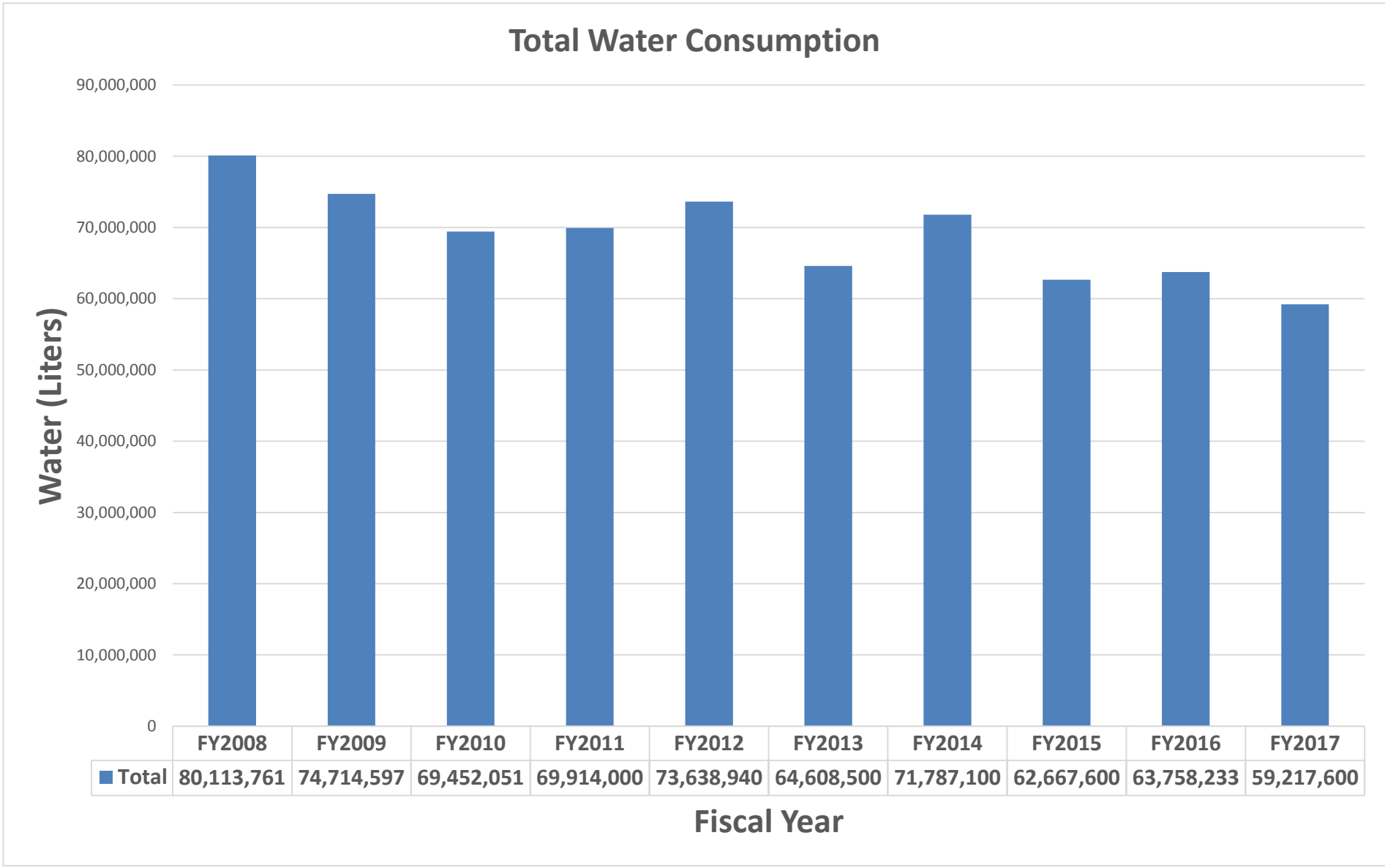


Figure 7. Water consumption (L) for UWinnipeg from FY2008 to FY2017.

3.2 Waste Diversion

Total waste as reported by our hauler is down 12% from FY2016, but diversion is also down 13% (see Figure 8). In FY2016, the CSO hired 30 students to conduct an in-house waste audit. The CSO worked with the Canadian Beverage and Recycling Center and the Facilities department for four days to sort and weigh waste from the Richardson, Buhler, and Main Campus buildings. As has been the case in years past, total weights reported for the audit were considerably lower than those reported by the hauler (332 vs. 171; see Figure 11). This is in part because waste from the Rice and Helen Betty Osborne buildings were not audited, but the audit also does not reflect reduced use for weekends or summers (numbers reported are simply weekday audit numbers multiplied to reflect the number of days in a year). The audit also reported a higher diversion rate (53%, vs. the hauler's 35%). We continue to work on student outreach around proper waste diversion and reduction.

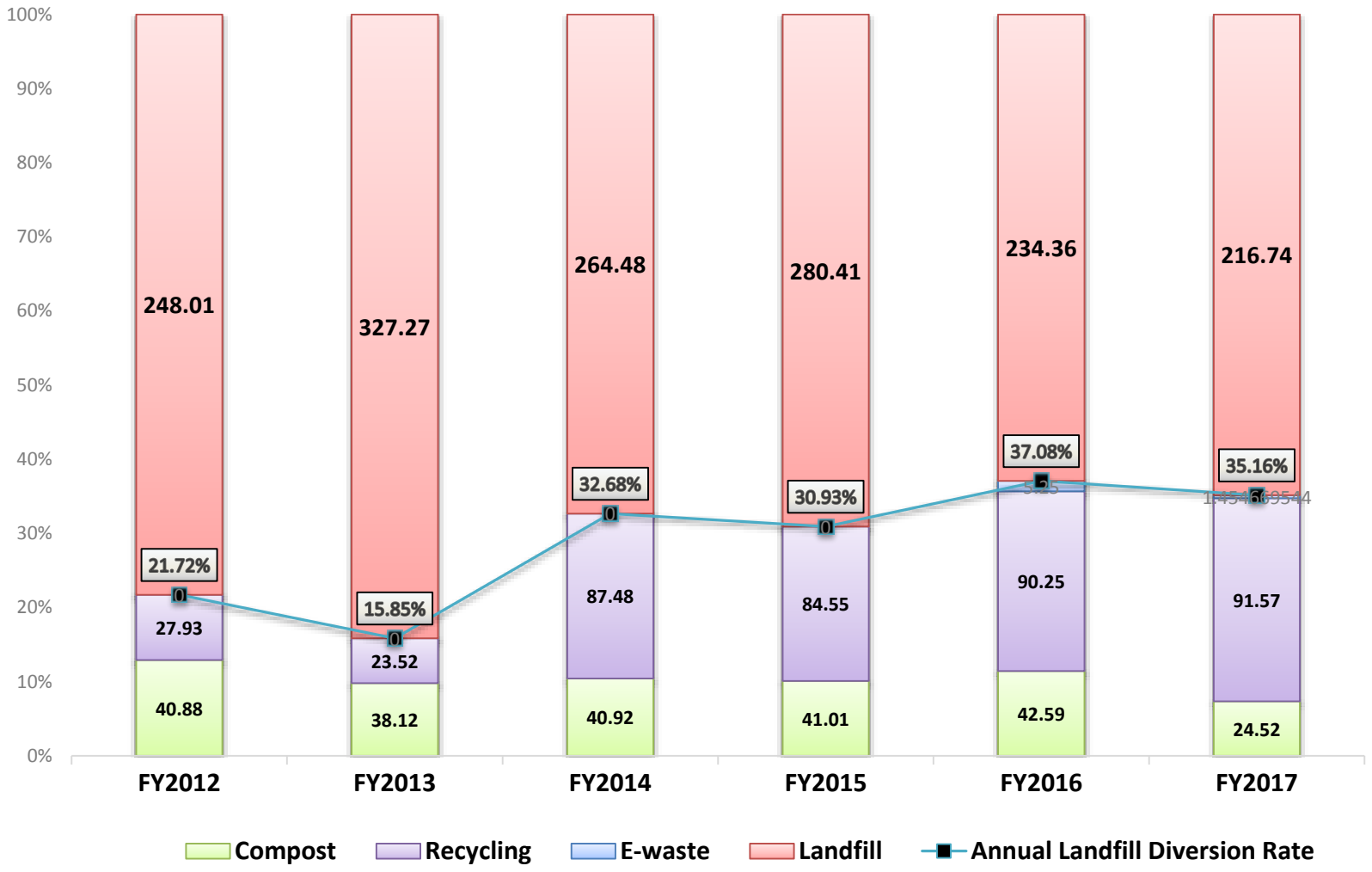


Figure 8. Annual compost, landfill, and recycling weights by proportion and diversion rate, as reported by hauler (FY 2008-2017).

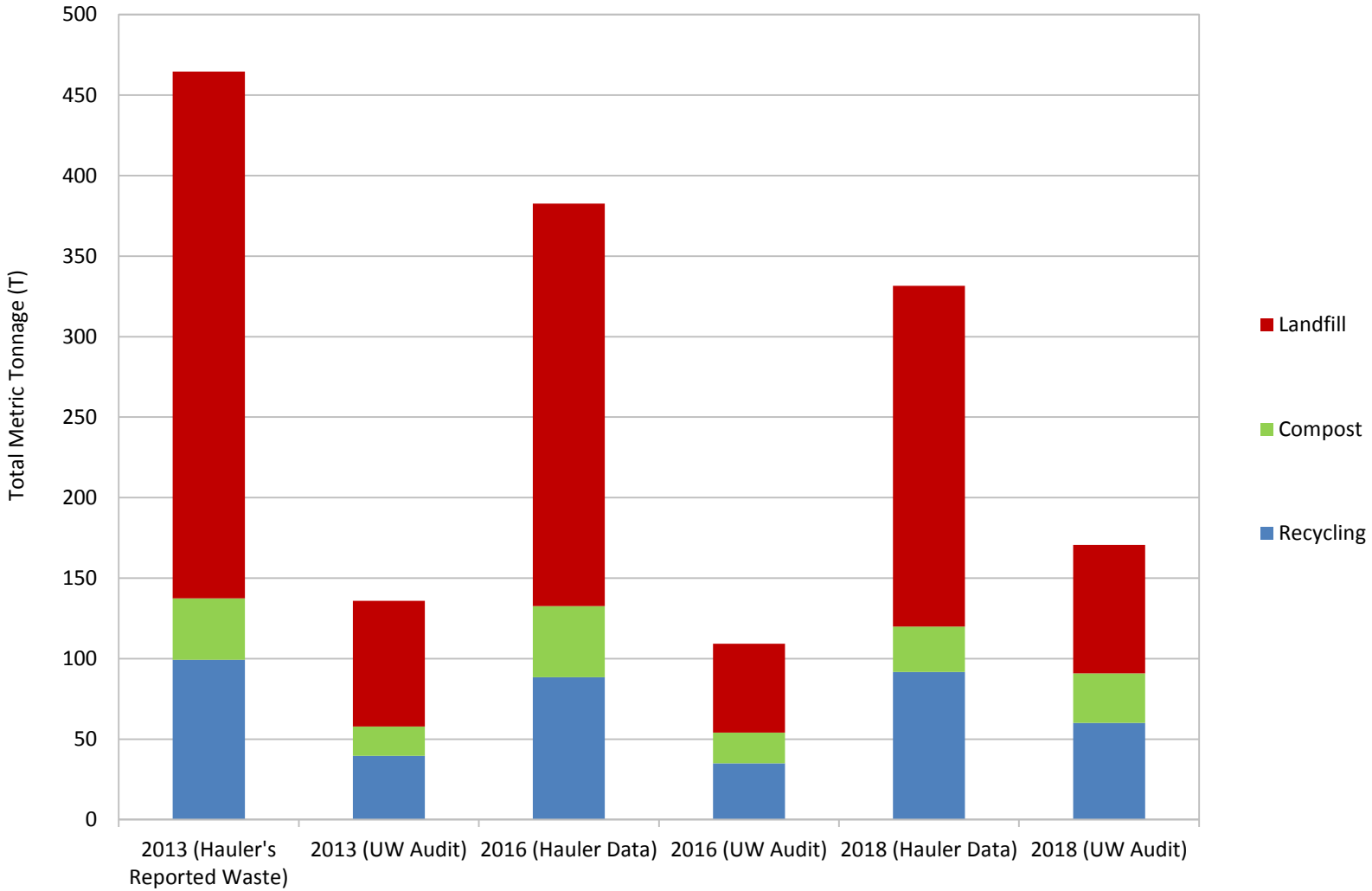


Figure 9. Comparison of total waste reported (T) by campus hauler and waste audit (FY2013, 15, and 18).

3.3 Cleaning, Maintenance and Grounds Keeping

In an effort to reduce the amount of grit and salt used on campus in the winter, the University purchased a new power broom bobcat extension for snow cleaning. Because of the relatively low snowfall last year, the impact of this purchase has yet to be determined. Physical Plant has reported a reduction in slippery conditions related to the use of only bobcats with buckets.

Bee Clean continues to expand the use of ionized water for cleaning, which has meant a reduction in the amount of green cleaning products brought on campus. Because this is not a purchased product, our data shows an increasing percentage of non-green cleaning products on campus. We are working on a way to report natural, non-certified cleaning products as a cleaning subcategory.

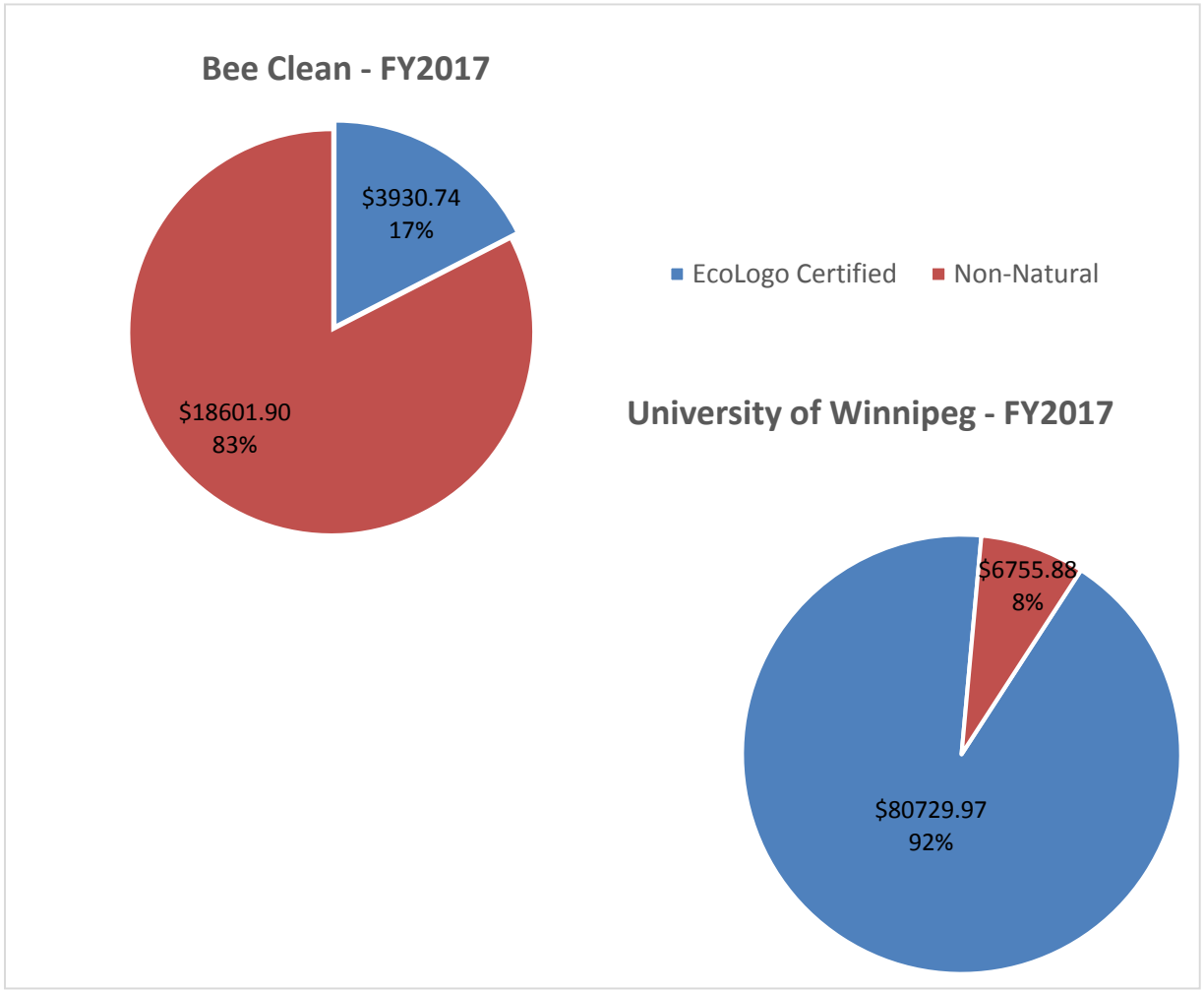
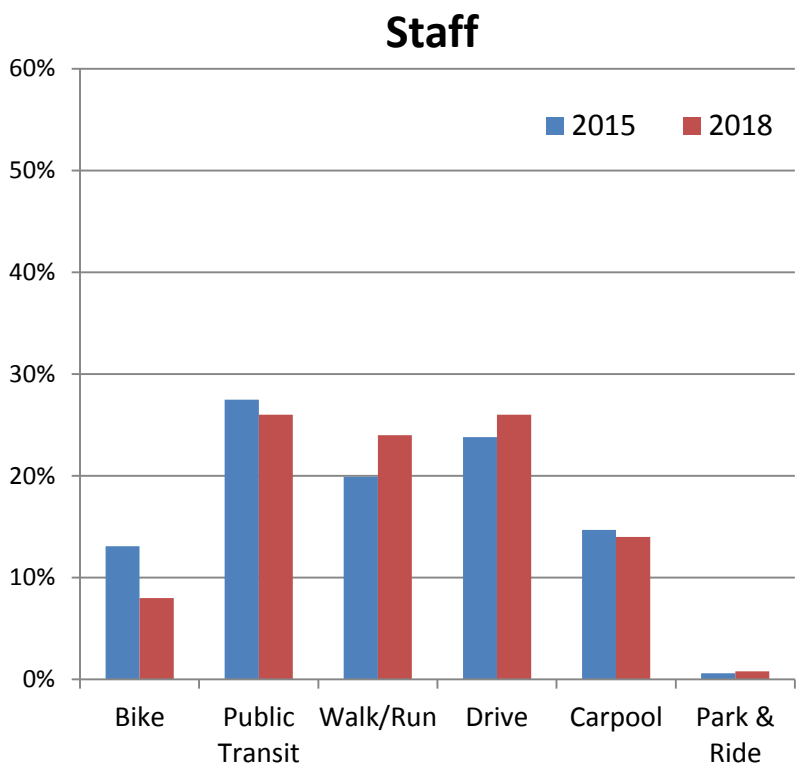


Figure 10. Percentage of cleaning products purchased in FY2017 by Bee Clean and UWinnipeg that are EcoLogo Certified vs. non-certified.

3.4 Transportation Modal Split

In January and February of 2018, the CSO conducted our triennial commuting survey. The survey provides a detailed look at how people travel to and from campus and sheds light on what barriers exist for people when it comes to choosing green modes of transportation. 47% of the 2,473 respondents indicated that they regularly commute by public transit, while 16% walk, run or bike, and 22% drive. 52% of students take the bus, a nearly 10% increase from FY2015. Figure 10 provides a complete comparison of the FY2015 and FY2018 transportation modal splits for staff and students at the University. On average, each person on campus generates 400 kg of GHGs through their daily commutes, most of which comes from single-occupancy vehicle travel. Nearly 60% of respondents had not heard of our GoManitoba rideshare program, while safety and security concerns are one of the main reasons people choose not to travel to campus by bicycle. The CSO needs to find ways to promote green alternatives and teach people on campus about the benefits of green communing.



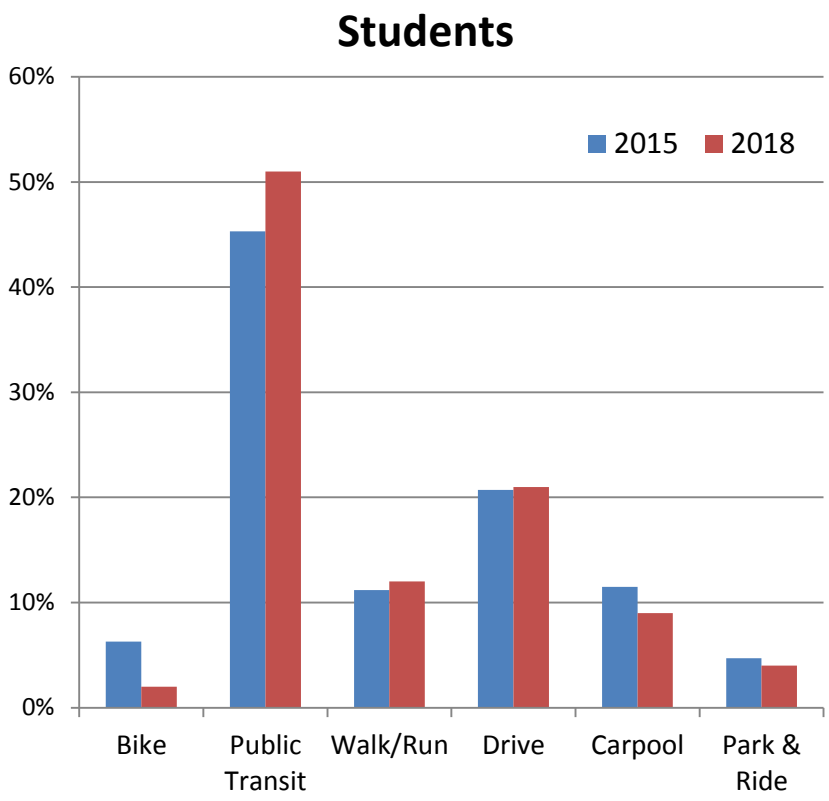


Figure 11. Comparison of the FY2015 and FY2018 transportation modal splits for staff and students at the University

3.5 New Buildings, Renovations and Retrofits

3.6 Environmentally and Socially Preferable Purchasing

In FY2017, the University renewed its membership with the Worker Rights Consortium (WRC) after affiliating for the first time in FY2015. The WRC is an independent labour rights monitoring organization that conducts investigations of working conditions in factories around the globe. WRC affiliate universities receive regular reports on conditions in factories that produce collegiate apparel, with specific reference to whether factories are in compliance with universities' codes of conduct. Each year, the CSO sends the WRC a vendor report of all clothing and merchandise sold on campus, which is then verified by their organization. To date, there has been no response indicating undesirable practices at the factories that produce our school's merchandise.

The 2017 Institutional Sustainability Strategy establishes a commitment to sustainable procurement extending beyond clothing to include all goods and services purchased by are organization. In FY2018, the CSO will be leading an effort to improve purchasing practices at the University by updating purchasing guidelines and the criteria used to select suppliers and contractors. Our goal is to begin tracking the portion of all purchases on campus (excluding those made at the department level) that are environmentally and socially preferred. Once we establish a baseline, we will work to achieve targets similar to those called for in the LEED Operations and Maintenance standard. While we won't soon be able to track the ongoing, small-scale purchases made by all staff, we will be communicating the new sustainability purchasing guidelines through our Green Office Program.

3.7 Campus Food

The University continues to practice socially and environmentally responsible procurement for campus food, thanks to the efforts of Diversity Food Services. Diversity's commitment to local, organic and fair trade products has had important benefits for the agricultural economy in Southern Manitoba. Several of Diversity's suppliers have been able to expand their operations as a result of the University's large, stable demand for local produce, dairy and meat, resulting in increased market availability of sustainable food products in our province. In fact, Diversity sources close to 60% of its inputs from

within 100 kilometres of campus. Because of Diversity's procurement practices about 70 cents of every dollar that Diversity receives as revenue is returned to the local economy.

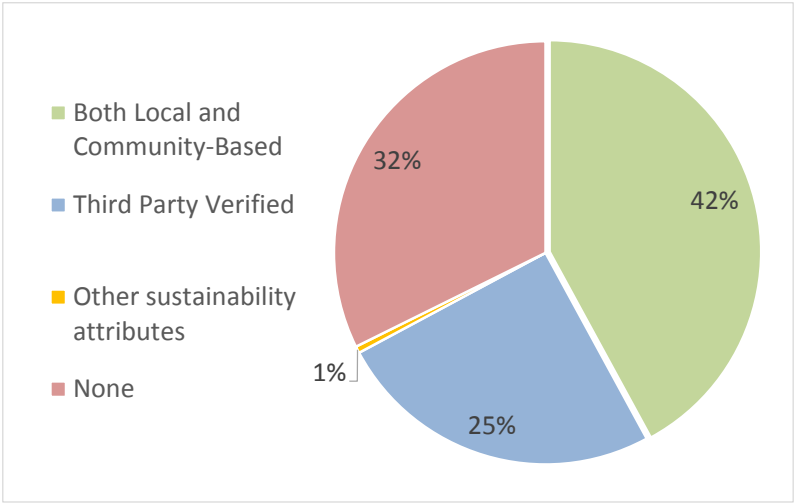


Figure 12: Sustainability attributes of Diversity's expenditures on food and beverage products for FY2017.

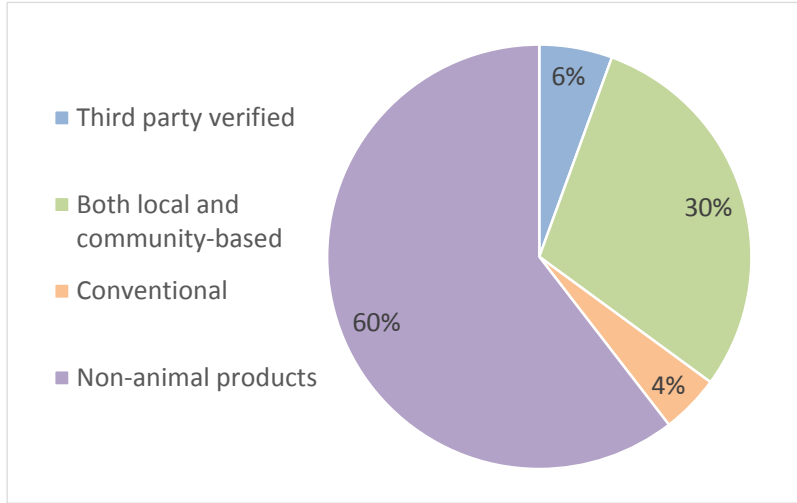


Figure 13: Sustainability attributes of Diversity's expenditures on animal products for FY2017.

In 2017, Diversity spent over $566,000 on food and beverage items that were local and community-based, or had a third-party sustainability verification. That means that roughly 67% of the food and beverages sold on campus are recognized as environmentally responsible, as classified by AASHE's STARS rating system. Because of the significant impacts of meat, Diversity has focussed on meat for the past year's improvements. This year, all the chicken that Diversity

purchased was raised by local (largely Certified Organic) farmers without the use of antibiotics or hormones. As seen in Figures 11 and 12, only 40% of food items sold on campus are produced from animals, of which nearly 90% are considered local, organic or sustainable. Diversity has dramatically increased its 'in-house' production of food, allowing for increased control of input ingredients.

Diversity's off-campus businesses were also successful in 2017. Operations at Fort Whyte Alive, MacDon industries, and Players Golf Course allow Diversity to ensure that staff have full time jobs despite seasonal effects of the campus calendar. Diversity Catering and Diversity To-Go both make Diversity's sustainable food available throughout the wider Winnipeg community.

As a social enterprise, Diversity continues to improve the social sustainability of our community. Between 60 and 65% of its roughly 100 employees face recognized barriers to employment, and Diversity is proud to offer all employees a living wage (at least $14.54/HR) and offer extensive on-the-job training. As a result of Diversity's employment practices, the company continues to experience a Social Return on Investment (SROI) of about 1:1.68, meaning that for every dollar Diversity spends on employment the local community experiences a social benefit of $1.68. For a more detailed looked at the positive impacts resulting from Diversity's commitment to local agriculture, please see the *Catalyst for Sustainability* report on the University of Winnipeg Community Renewal Corporation published by the McConnell Foundation in September 2018 (http://data.uwcrc.ca/uploads/Catalyst-for-Sustainability-Full-Report-Final-Oct-18-2018.pdf).

3.8 Equity, Inclusion, Diversity and Indigenization

IN FY2017, UWinnipeg welcomed Stacey Belding as our new Human Rights and Diversity Officer who is now working with campus stakeholders to ensure we uphold our commitments to equity and diversity. One milestone is the language on diversity hiring now included on all UWinnipeg job postings and position descriptions. The CSO will be supporting work related to assessing levels of diversity, inclusion and accessibility throughout the coming year.

2017 was also the second year of the UWinnipeg Indigenous Course Requirement (ICR). The ICR was an idea that was brought forward by the students and was implemented soon after the final report from the Truth and Reconciliation

Commission was released, outlining 94 Calls to Action. Many of the Calls to Action focus on the need for sustained public education and dialogue, including youth engagement, about the history of residential schools, Treaties, and Indigenous rights, as well as the historical and contemporary contributions of indigenous peoples to Canadian society.

In addition, as part of UWinnipeg's approach to reconciliation, we recognize the central role of language as the carrier of culture, tradition and knowledge. The University is offering Ojibwe and Cree credit courses, and through the Wii Chiiwaakanak Learning Centre, we have 44 free Indigenous language classes for neighbourhood residents.

4 SUSTAINABILITY EDUCATION AND KNOWLEDGE MOBILIZATION

4.1 Sustainability Education

In addition to taking responsibility for the ecological impacts of physical operations, the University also demonstrates sustainability leadership by providing high quality environmental education opportunities and nurturing tomorrow's environmental leaders. In addition to Environmental Studies and Science programs, we know that sustainability topics are covered in many different courses across all faculties. Last year, as part of measuring the broad outcomes of sustainability education on campus, the CSO and the Sustainability Council's Academic Working Group dedicated time to reviewing syllabi and updating a list of sustainability courses taught at the University. In FY2018 this list will be used to track the number of students who are taking sustainability courses, which is one of the goals outlined in the new strategy. In years to come we will develop incentives for encouraging students to learn about environmental issues regardless of their department of study.

FY2017 brought several highlights for sustainability education at the University. In the winter 2018 semester, CSO director Alana Lajoie-O'Malley taught *Critical Environmental Issues: Campus Sustainability* to ten fourth year students. This honors-level Environmental Studies course, running for the second time, allowed students an in-depth exploration of university sustainability management and required them to complete projects that are in line with the University's sustainability objectives. The University also offered the experimental, interdisciplinary course *Communicating Climate Change.* For this class, students were able to sit on The City of Winnipeg's Climate Action Stakeholder Group, which guided the development of a city-wide climate action plan. Students learned about the scientific and cultural issues around

climate change while actually being involved in a real-world process. Finally, the CSO gave guest lectures in three classes to teach about sustainability topics, including a public health course taught in Kinesiology.

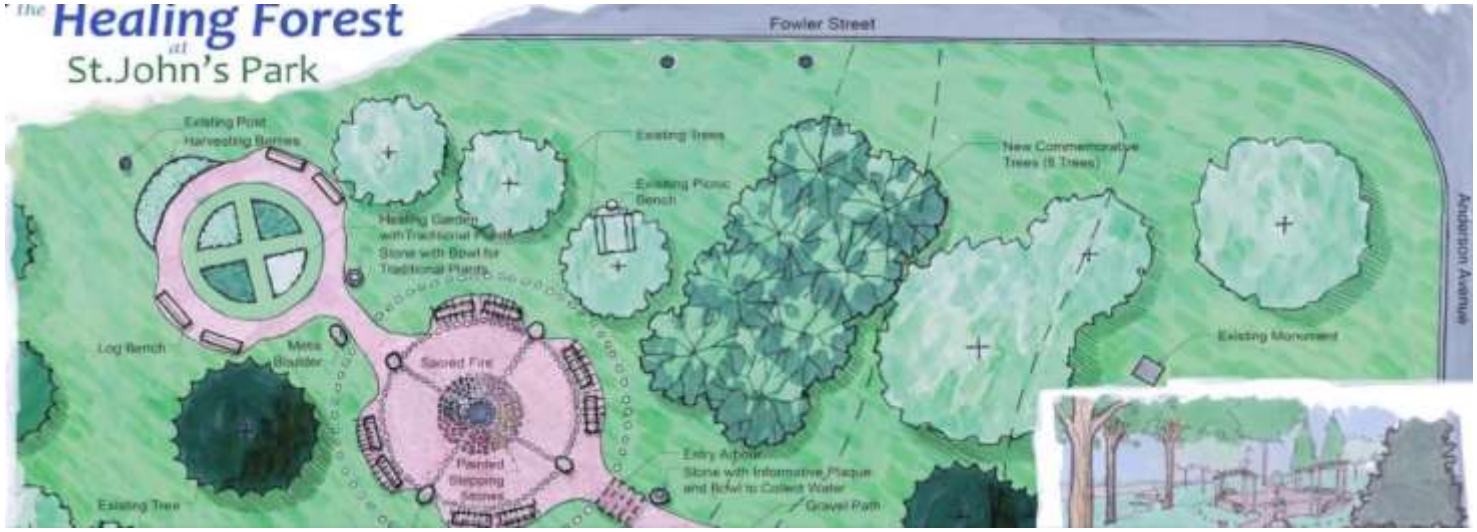
The Norway-Canada Sustainable Energy Project was also a milestone for sustainability education at the University. This research exchange program saw students from the University and the Norwegian Institute for Science and Technology travel to each other's countries to study approaches to sustainable energy management. This past year included a cross-listed course on Sustainable Energy which was taught to 36 undergraduates and 10 Masters' students from the University and the University of Waterloo.

4.2 Experiential and Work-Integrated Learning

Throughout FY2017, the CSO provided several work-integrated learning opportunities through which students were able expand their sustainability expertise and professional skillsets. With funding made available through the federal government's Eco Canada program, our office hosted two student co-op positions. Connor Penton, an Environmental Science major from the University of Manitoba, joined us for the Fall 2017 semester and completed an inventory of the University's Scope III emissions, work that is helping us our emissions accounting. Sara Campbell, an Environmental Studies major from the University, worked with us during the Winter 2018 Semester to coordinate our STARS application and develop outreach programing. Sara is now working at the CSO part time. We also hosted a student as part of the University Work-Study Program who coordinated our newsletter and social media. 30 students also gained hands on experience in sustainability management by working for the CSO as waste auditors during our recent internal waste audit, collecting and analyzing data about our institution's waste practices.

4.3 Sustainability Research

Throughout FY2017, faculty and staff worked on a wide range of research initiates at the University, ensuring that our institution continues adding important knowledge to sustainability discourses. The Research Office provided ethics



Design Plans for the St John's Healing Forest

approval to over 40 sustainability-related projects last year that looked at everything from the impacts of hydro development on northern communities and the role of storytelling in climate change education to invasive species mitigation and ecosystem restoration. Appendix B contains the full list of sustainability-related research projects carried out at the University last year.

There are a few initiatives and research success stories that are worth highlighting. First, the University Bat Lab, headed by Dr. Craig Willis, was awarded $148,406.80 from the Species at Risk Fund of Ontario to support innovative bat conservation research to help combat white-nose syndrome.

Faculty of Education member Dr. Lee Anne Block played a major role in the St. John's Healing Forest project, which connects indigenization, sustainability and outdoor learning. The Healing Forest is a redevelopment project in St John's Park that establishes a memorial garden based around Anishinaabe tradition to honor victims of Canada's residential

school system. Dr. Block played a key role in organizing project stakeholders and is incorporating the Healing Forest into her place-based learning research, leading programs at the memorial that connect students to their histories and cultivate citizenship and sustainability. She was awarded the 2017 Campus Sustainability Award for her work on the project.

The CSO would also like to recognize the work of the University faculty on the planning committee for the Langside Learning Garden, a collaborative and community-based research project led by the University of Winnipeg and the Spence Neighbourhood Association. The Learning Garden will develop sustainable urban gardening practices and model meaningful relationships between the university and the Spence neighbourhood.

The PCC's new interactive Climate Atlas of Canada. Go to climateatlas.ca to explore how climate change will impact people and ecosystems across the country.

The University is also proud of the accomplishments of the Prairie Climate Centre (PCC), a research and communications institute based in the Richardson College for the Environment and Science. In April 2018, the PCC launched the Climate Atlas of Canada with the Honourable Catherine McKenna, Minister of Environment and Climate Change Canada. Between April and October, the tool has reached over 121 million

people through print, broadcast, and social media coverage about the project. It is estimated that the Atlas has earned $1.2 million in “advertising equivalency value.” The PCC continues to innovate the atlas and relationships with numerous partners across the country.

In FY2018, the CSO will work with the Sustainability Council’s Academic Working Group and the Principal of the Richardson College for the Environment to support environmental research and education at the University. Energy will go toward taking a detailed inventory of sustainability related courses and research and helping faculty connect through a sustainability community of practice. We hope to provide platforms for faculty to share their work with new audiences while highlighting the interdisciplinary nature of sustainability research.

5 ENGAGING OUR COMMUNITY AND NURTURING CHANGE-MAKERS

5.1 Outreach and Engagement

At the start of the fall 2017 semester, the CSO initiated a new, systematic approach for engaging students, faculty and staff at the University. The central component of this work is the new campus sustainability contact database, which tracks contact information for anyone that has expressed interest in our sustainability initiatives and consented to receiving our newsletters. Between August 2017, and March 2018, 823 individuals had signed up for the CSO mailing list, including 50 faculty members, 142 staff and 605 students. In FY2017, the CSO sent out 20 mass emails, including 7 monthly newsletters.

Our mailing list allows us to communicate with a growing number of campus community members on an ongoing basis; we're now able to promote events, highlight accomplishments, and share tips, reminders and resources encouraging people to make sustainable choices. The campus sustainability contact database will also be important for the CSO's future work on developing student environmental leaders and providing experiential, work, and volunteer learning experiences for those looking to make a difference, which are all goals outlined in the 2017 Sustainability Strategy.

5.2 Events and Initiatives

1.1.1 GRASS ROUTES

The CSO proudly partnered with the University of Winnipeg Student Association again last year to host the 8th annual Grass Routes Festival from January 30th to February 1st, 2018. This yearly event aims to generate awareness of important environmental issues at global and local scales. Last year's festival offered a range of talks, workshops and hands-on activities focusing on the theme "Solutions", a call for participants to consider their role in solving social and ecological challenges. We engaged nearly 500 students across 10 events including a feature lecture by activist Clayton Thomas-Muller, a sustainable fashion show and a lesson on local cooking. Among other activities, the CSO was responsible for hosting a Three Minute Thesis completion, where over 30 students ranked presentations from faculty engaged in sustainability research. Based on feedback and experience, the CSO will be working with the UWSA to transition Grass Routes to a conference model for the upcoming school year, with the goal of having a more meaningful impact on a smaller group of students.

Faculty Three Minute Thesis Competition during the 8th annual Grass Routes Festival

1.1.2 GREEN OFFICE PROGRAM

The CSO's Green Office Program (GOP) allows us to reach staff across campus and work with departments to improve their environmental performance. While students come and go, staff are here on a more permanent basis and thus play a critical role in maintaining sustainability culture at the University. In FY2017, we provided six GOP department-level training sessions, reaching over 50 staff. These sessions reviewed sustainable purchasing practices, waste reduction tips, green commuting options, and more. In 2018 our office will develop a new online green office scorecard that will allow staff to identify areas for improvement in their work spaces. We'll also be offering lunch-and-learn presentations and workshops aimed at increasing awareness of environmental issues and solutions among staff.

6 CONCLUSION

The Campus Sustainability Office would like to thank you for taking the time to read our Annual Performance Report. FY2017 saw some challenges in emissions reductions and waste diversion, but also the adoption of an Institutional Sustainability Strategy that sets ambitious new goals for future performance. We were glad to have the opportunity to engage with new faculty and students over the course of the year through our Green Office Program, the Grass Rotues festival, and our in-house waste audit. We look forward to continued progress in FY 2018. If you have any questions or ideas related to campus sustainability, or you would like to be involved with our Office's work, please contact us at sustainability@uwinnipeg.ca.

APPENDIX A: PROGRESS ON STRATEGIC OBJECTIVES

Goal 1: Exceed Canada's Commitment Under the Paris Accord		
Target 1	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Achieve a 50% reduction of scope 1 & scope 2 GHG emissions compared to a 1990 baseline by 2020 and achieve 0 emissions by 2035.	- Challenge: Increased electricity and lower natural gas costs are changing how we are using our hybrid heating system. As a consequence, we are using more natural gas which is increasing our emissions.	- Advanced gas metering to be installed which will allow energy breakdowns by building to make more informed decisions on emission reduction projects. - Work on short and long term infrastructure plans for alternative energy sources.

Goal 1: Exceed Canada's Commitment Under the Paris Accord		
Target 2	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Aim for 5% of total energy use on campus to be derived from unconventional renewable energy sources (solar, geothermal, wind, sustainable biomass) by 2025.	- Biomass heating system is installed which will help us meet our renewable energy targets.	- Facilities will install Biomass pilot project and monitor impacts; - Facilities will implement other renewable energy systems including Solar PV on the Rec Plex roof

Goal 1: Exceed Canada's Commitment Under the Paris Accord		
Target 3	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Establish baseline for key scope 3 (ex. Air travel) by 2017 and report annually; set a reduction target by 2018.	- Inventory completed by co-op student, along with a proposed system for tracking data - Co-op student identified challenges and need for certain emissions factors	- Determine appropriate emissions factors - Incorporate scope 3 reporting needs into changes to procurement tracking - Include scope 3 indicators in annual report

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 1	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Aim to align facilities management to reflect the equivalent of LEED Operations & Maintenance standards by 2021; integrate reporting metrics from LEED O&M into annual reporting; achieve full alignment and reporting capacity by 2021.	- CSO examined LEED O&M and identified UW policies, procedures and guidelines requiring updating; - Senior Advisor for Research and Sustainability drafted updates and suggested targets and approach that fit best with UW	- CSO Coordinator and Facilities Executive director will work to finalize changes to all relevant documents - CSO coordinator will work with Institutional Analysis and VP, FA to determine steps of approval and implementation of changes

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 2	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Ensure that all new buildings and major renovations are built to the highest possible standards appropriate to the given project and context. By July 2017, draw on LEED, LivingBuilding, Passive House, and Green Globes to develop (a) transparent decision-making criteria that will be used to determine the most appropriate approach for a given project (b) a publicly available internal sustainability project checklist (c) standard template sustainability RFP requirements for all projects. Report on projects annually.	- CSO examined LEED O&M and identified UW policies, procedures and guidelines requiring updating; - Senior Advisor for Research and Sustainability drafted updates and suggested targets and approach that fit best with UW	- CSO Coordinator and Facilities Executive director will work to finalize changes to all relevant documents - CSO coordinator will work with Institutional Analysis and VP, FA to determine steps of approval and implementation of changes

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 3	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Publish sustainability requirements and standards for environmentally and/or socially preferable purchased goods as well as detailed sustainability-related scoring requirements for RFPs on the Purchasing Services website by the end of December 2017 for use by all the University staff making purchasing decisions. Ensure requirements reflect metrics that support the University's Indigenization goals.	- CSO and Purchasing developed draft of a sustainability score checklist for RFPs	- Test draft of checklist by having Purchasing collect and analyze responses; CSO to work with Purchasing to update and finalize checklist

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 4	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Establish reporting fields in financial software to track: (a) The percentage of all goods purchased that are environmentally and/or socially preferable; and (b) the average sustainability-related RFP scores of awarded contracts by the end of FY2017. Establish baseline data in 2018 and set targets by 2019.	- Report fields and sustainability checklist established in financial software	- Promote these tools and track the results; make improvements as needed

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 5	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Support campus food services as they continue to achieve the highest standards as measured by the foremost standards of sustainability in the campus food service industry, currently LEAF and/or STARS.	- The CSO helped convene meetings with campus stakeholders where plans for repurposing the library greenhouse were developed – plans include space for Diversity to grow tomatoes and herbs for their kitchens	- The CSO will work with Diversity to streamline reporting on sustainability impacts, while demonstrating the social and enivronmental value of the organization - File Diversity's STARS data and communicate results - Explore the possibility of having students start a Meal Exchange initiative

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 6	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Work in partnership with the University Foundation to evaluate alignment between the over-arching purpose of the University, its policies and strategic directions and Foundation investment policies by the end of 2017. Provide ongoing support to the Pension Board of Trustees in their efforts to ensure that pension options for staff are similarly aligned.	- The Campus Sustainability Coordinator, Senior Advisor for Research and Sustainability, Vice-President Finance an Administration, and the President of the Foundation reviewed the new green investment policy and investment options, and began working on an evaluation statement	- Publish the evaluation statement on the CSO and Foundation websites - Promote green fund options to staff and donors

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 7	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Begin an ongoing institutional learning process with Indigenous elders and traditional knowledge keepers, to develop an implementation framework for the United Nations Declaration on the Rights of Indigenous Peoples as it applies to the University and its activities and to continually integrate Indigenous knowledge and ways of knowing into our sustainability efforts. Complete framework by the end of 2018 and report on ongoing learning activities and outcomes annually in the annual Sustainability Performance report.	-	- Engage stakeholders from Indigenous Affairs and convene exploratory meetings; identify reps for the Sustainability Council and individuals who can lead the development of this framework

Goal 2: Cultivate principled relationships with people on and off campus and with ecosystems near and far		
Target 8	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Link to the work of existing University bodies addressing human rights, equity, wellness, and accessibility for students, staff and faculty and include a summary of progress in the annual sustainability planning and reporting process by 2017. Building on the experience of the Sustainability Office in setting goals and measuring progress, work with the responsible offices for each of the aforementioned areas to establish and report ongoing data improvement processes to aid in evaluation and planning related to work in these areas, and include appropriate data in the annual sustainability performance report as it becomes available.	-	- Convene planning meetings with Human Rights and Diversity Office and other stakeholders for improving reporting on social sustainability indicators - Establish a set of indicators relating to University bodies addressing human rights, equity, wellness, and accessibility and include a section about these in the 2018 Annual Report

Goal 3: Develop and deliver curriculum, student services, and programming that deepen student knowledge about sustainability and that help motivate thoughtful leadership and action		
Target 1	**Progress and Challenges in 2017**	**Key Objectives for 2018**
In collaboration with those responsible for implementing sustainability action on campus, generate, publish and promote a list of campus-based sustainability related student project and research opportunities annually. Support work to include these projects in coursework through efforts such as the establishment of the Campus Sustainability Course as a standing course in the University course catalogue and the launch of the Sustainability & Corporate Responsibility Certificate program at PACE.	- Collaborating with campus and community stakeholders, the CSO began developing an online survey system to take stock of research, work-integrated learning and volunteer opportunities - Challenge: the Campus Sustainability Course has had enrollment challenges - Challenge: Due to low enrollment, the Sustainability & Corporate Responsibility Certificate program was cancelled by PACE before it started	- Work with the Principal of the Richardson College to develop a plan for promoting research, work-integrated learning and volunteer opportunities to students, and for tracking participation

Goal 3: Develop and deliver curriculum, student services, and programming that deepen student knowledge about sustainability and that help motivate thoughtful leadership and action		
Target 2	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Undertake a research project in 2017 using appreciative inquiry to better understand the learning process, learning outcomes and interests of students who act and lead. In 2018, apply findings to develop a framework and action plan for growing leaders and continually engaging students who are actively working towards positive impacts on campus and in their communities.	- Challenge: the research project was being led by the former Senior Advisor for Research and Sustainability who is no longer at the University - The CSO developed a proposal for a leadership engagement framework that was presented to the Sustainability Council and approved. It combines the frameworks called for in Goal 3, Target 1 and Target 2 - CSO established a contact list for communicating with students, faculty and staff who are interested in environmental issues which has nearly 1000 names	- The CSO will finish the leadership engagement framework document and publish it on their website by March, 2018; This document will contain the frameworks called for in Goal 3, Target 1 and Target 2, and Goal 4, Target 3

Goal 3: Develop and deliver curriculum, student services, and programming that deepen student knowledge about sustainability and that help motivate thoughtful leadership and action		
Target 3	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Create a framework for linking academic advising, career services, experiential learning, and on-campus leadership development opportunities to better support students wishing to understand how to make the biggest difference possible both on campus and in their future careers. Complete framework by the end of 2017 for implementation through 2021. Report on implementation progress in the annual Sustainability Performance report.	- The CSO engaged stakeholders to discuss possibilities related to this target - The CSO developed a proposal for a leadership engagement framework that was presented to the Sustainability Council and approved. It combines the frameworks called for in Goal 3, Target 1 and Target 2, and Goal 4, Target 2	- The CSO will finish the leadership engagement framework document and publish it on their website by March, 2018; This document will contain the frameworks called for in Goal 3, Target 1 and Target 2, and Goal 4, Target 2

Goal 3: Develop and deliver curriculum, student services, and programming that deepen student knowledge about sustainability and that help motivate thoughtful leadership and action		
Target 4	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Support an ongoing “community of practice” with an interest in enhancing sustainability education on campus, e.g., organizing workshops, developing peer-to-peer exchange, further integrating sustainability throughout the curriculum and identifying support resources for faculty and staff.	- The CSO held brainstorming meetings with the Academic Working Group to identify events and opportunities for fostering connections among faculty who do Sustainability research and education - The CSO examined the approaches of other universities for supporting sustainability educators and researchers	- The CSO will work with the Richardson College for the Environment as the new Principal (Ian Mauro) establishes a new mandate for the College - The CSO will re-launch the Green Office Program, and use it to engage staff and offer a series of lunch-and-learn workshops - Host an event for faculty and researchers to start conversations about interdisciplinary collaboration and knowledge mobilization

Goal 3: Develop and deliver curriculum, student services, and programming that deepen student knowledge about sustainability and that help motivate thoughtful leadership and action		
Target 5	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Develop the mechanisms required to track how many students graduate from the University having taken at least one sustainability-focused course, as well as to track which and how many sustainability courses all students are taking, by 2019.	- The CSO and the Academic Working Group worked to update the list of sustainability-related courses - The CSO examined the approaches of other universities for designating and tracking sustainability courses	- Work with the Academic Working Group to set the criteria and vetting process for the sustainability course designation; - Publish updated course list by for the start of the Fall 2019 semester; Work with the Registrar’s Office to determine enrollment in sustainability designated courses for Fall 2018-Winter 2019.

Goal 4: Mobilize evidence & research to address local and global sustainability challenges		
Target 1	**Progress and Challenges in 2017**	**Key Objectives for 2018**
In partnership with the Research Office, develop metrics related to research knowledge mobilization consistent with the Integrated Academic and Research Plan by 2018.	-	- The CSO will engage the research office and other stakeholders, and work with them to develop metrics

Goal 4: Mobilize evidence & research to address local and global sustainability challenges		
Target 2	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Develop and publish a sustainability outreach & engagement plan for internal and external engagement by the end of October 2017, and implement it through to 2021.	- The CSO developed a proposal for a leadership engagement framework that was presented to the Sustainability Council. It combines the frameworks called for in Goal 3, Target 1 and Target 2, and Goal 4, Target 2 - CSO established a contact list (now with 1000 names) to reach students and staff who are interested in environmental issues	- The CSO will finish the leadership engagement framework document and publish it on their website by March, 2018; This document will contain the frameworks called for in Goal 3, Target 1 and Target 2, and Goal 4, Target 2 - Establish a team of Student Green Ambassadors and use this team to achieve framework objectives

Goal 4: Mobilize evidence & research to address local and global sustainability challenges		
Target 3	**Progress and Challenges in 2017**	**Key Objectives for 2018**
Engage faculty, staff and students with relevant expertise to develop workshops and courses that support campus community members in better understanding how their day-to-day work on campus relates to, and can impact positively or negatively on, key sustainability issues. By 2020, have 75% of non-faculty staff complete at least one sustainability-related workshop per year. Develop targets for students and faculty as part of a sustainability outreach and engagement plan.	- The CSO began tracking a range of engagement mechanisms for staff, faculty and student engagement that are connected to the framework - The CSO began working on revisions for the green office program, focusing on updated content and trainings that connect individual choices of campus community members connect to the University's sustainability performance and broader environmental issues	- The CSO will re-launch the Green Office Program, using it as a starting point for engaging staff, and as a way to offer a series of lunch-and-learn workshops - The CSO will update Green Office Program content and resources, and develop a new training workshop that will focus on best practices and the new sustainable purchasing guidelines among other things

APPENDIX B: SUSTAINABILITY RESEARCH AT UWINNIPEG

Research Project	Research Lead	Department
Smart Cities: Visions of the Future	Sylvie Albert	Business Administration
1. Phytochemical Studies on Medicinally Important Plants	Athar Ata	Chemistry
Determination of nitrogen content of roots, stems and leaves of tomato plants under contrasting nitrogen availability treatments	Germán Avila-Sakar	Biology
Trade Policies and International Cooperation on Mitigation of Transboundary Pollutants	Soham Baksi	Economics
Co-operatives in rural and remote communities in Canada's North	Simon Berge	Business Administration
Enhancement of Manitoba Hydro's physically-based inflow and flood forecasting capabilities through code optimization and parellel execution	Christopher Bidinosti	Physics
Teleconnections and summer severe weather in the Canadian Prairies Provinces	Jacqueline Binyamin	Geography
Climate Atlas of Canada	Danny Blair	Geography
Langside Learning Garden- Spence Neighbourhood Gardeners	Lee Anne Block	Education
Video documentary on Dead Horse Creek, MB	William Buhay	Geography
Canada Research Chair in Human-Environment Interactions	Ryan Bullock	Environmental Studies
Historical Development and Current Policies in Canadian Agriculture: A Macroeconomic Analysis and Micro Longitudinal Data	Wenbiao Cai	Economics
Spatial and temporal variability of nitrogen cycling in forests	Nora Casson	Geography

Research Project	Research Lead	Department
Culture, Resiliency, and Prosperity: Transitioning from Food Security to Food Sovereignty and the role of Relocation and Migration on Traditional and Market-based Food Consumption	Jaime Cidro	Anthropology
Estimating the Relationship Between Cardiovascular Health and the Use of Neurodegenerative Pharmaceuticals	Luc Clair	Economics
Evaluating experiential learning programs to support biodiversity conservation in urban gardens	Alan Diduck	Environmental Studies
Sustainable Supply Chain Management: an Empirical Study	Kamel Fantazy	Business Administration
Understanding the legitimacy gap: Re-conceptualizing meaningful engagement in environmental assessment	Patricia Fitzpatrick	Geography
Winnipeg VegFest	Jason Hannan	Rhetoric, Writing and Communications
Various projects on freshwater fish (elevated carbon dioxide) and wood frogs (bitumin exposure)	Caleb Hasler	Biology
High Performance computing framework for GCM-driven climate simulation with the routing model WATROUTE	Christopher Henry	ACS
Therapeutic Steroids from Canola Oil Waste	Paul Holloway	Biology
Effects of microplastic exposure on Medaka	Judith Huebner	Biology
Remediation of toxic metal contaminated soils using organic and inorganic amendments	Srimathie Indraratne	Environmental Studies
THE IMPACT OF OIL PRODUCTION ON TRADITIONAL LIVELIHOOD: THE CASE OF FANTI PEOPLE IN SHAMA IN THE WESTERN REGION OF GHANA	Kwabena Kesseh	MA student - Indigenous Governance
Phosphorus release from alkaline soils to floodwater under simulated spring snowmelt conditions	Darshani Kumaragamage	Environmental Studies

Research Project	Research Lead	Department
Greening the organic chemistry laboratory: A comparison of microwave-assisted and classical nucleophilic aromatic substitution reactions	Devin Latimer	Chemistry
City E-Government as an Enabler of Sustainable Communities	Hanuv Mann	Business Administration
Innovative Climate Change Storytelling	Ian Mauro	Geography
Bringing Indigenous Worldviews into Policy and Legislation on Traditional Knowledge and Biodiversity	Gabriel Nemoga	Indigenous Studies
Wa Ni Ska Tan: a cross-regional research alliance on the implications of hydro development for environments and Indigenous communities in Northern Canada	Melanie O'Gorman	Economics
Impacts of cattle grazing on the proliferation of foxtail barley in wet meadow rangelands	Rafael Otfinowski	Biology
1) Assisted migration field experiment, and 2) Forest community composition and climate change	Andrew Park	Biology
Mergers in Nonrenewable Resource Oligopolies and Environmental Policies	Amrita Ray Chaudhuri	Economics
Social Learning for Community Resilience and Indigenous Food Security: Case Studies from Manitoba	Shailesh Shukla	Indigenous Studies
Using geoindicators to prioritize regional wetland locations for flood attenuation in Manitoba's Red River Basin	Joni Storie	Geography
Deep learning convolutional neural network to classify satellite images of Manitoba in terms of its land-use/land-cover (LULC) for GeoManitoba	Christopher Storie	Geography
Multicentury reconstruction of streamflow for the Abitibi River basin and estimation of future climate changes impacts	Jacques Tardif	Biology/Environmental Studies
Pilot Project to Assess Methodology for Identifying Brood Trees for Prioritized Rapid Removal for Dutch Elm Disease	Richard Westwood	Environmental Studies
Individuals, energetics and infectious disease	Craig Willis	Biology
Elucidation and predication of fate, speciation, and transformation processes for polar contaminants of emerging concern in wastewater-impacted environments	Charles Wong	Chemistry/Environmental Studies