Environmental Sustainability Report

UNIVERSITY OF WATERLOO

2016

RELEASED OCTOBER 2017

UNIVERSITY OF WATERLOO

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INTRODUCTION

Message From The President

I am pleased to present Waterloo's 2016 Environmental Sustainability Report, which tracks our actions and progress over the past year.

As Canada's most innovative university, we apply that creative energy towards meeting a host of environmental challenges.

From academics to operations to engagement to governance, sustainability touches all aspects of our university. Waterloo's research is building a more sustainable future, and we continue to develop our strengths in critical areas. Over the past year, we secured funding and launched new research programs related to sustainable water management, green vehicles, and climate change adaptation, to name a few. With over 540 courses focused on or including sustainability, our students are also gaining the tools to tackle some of the world's most complex challenges.

Just as important, we are making efforts to ensure we exemplify sustainability practices here on campus. Employees from Food Services, facilities teams and many more areas took steps to support students and colleagues. Our Green Office program engaged 19 departments in its first year as they encouraged simple actions that reduced impact. As well, students launched exciting new programs for reusing clothes, growing food on-campus and accessing bikes.

More can be done. Our Sustainability Survey in 2016 found that 91 per cent of university members care about Waterloo's sustainability efforts, with climate change and waste management as top priorities. In early 2017, I approved Policy 53: Environmental Sustainability to address these and other issues and to build a foundation for further action.

As a next step, Waterloo's first Environmental Sustainability Strategy has been prepared, using feedback from the campus community. This will be released in the coming months and establish clear objectives across the campus.

I encourage you to join our efforts, and thank you for taking time to review our progress.

I am pleased to present Waterloo's 2016 Environmental Sustainability Report, which tracks our actions and progress over the past year.

Sincerely,

FERIDUN HAMDULLAHPUR

PRESIDENT AND VICE-CHANCELLOR
UNIVERSITY OF WATERLOO

About this Report

Framework The University of Waterloo has made efforts to align the data and indicators within this report to those of the Sustainability Tracking, Assessment, and Rating System (STARS) developed by the Association for the Advancement of Sustainability in Higher Education (AASHE).[1] Full methodology for all indicators are available in the Appendices.

Reporting term 2016 calendar year, unless otherwise noted.

Reporting boundary All University of Waterloo campuses are included, unless otherwise noted. The report indicators do not reflect information from Affiliated and Federated Institutions of Waterloo, although information is include in appendices for transparency. This report includes:

- South Campus, Waterloo, ON
- East Campus, Waterloo, ON
- North Campus, Waterloo, ON (Excluding building information from non-University buildings in the David Johnston Research and Technology Park and Northwest Campus)
- Health Sciences Campus and School of Pharmacy Kitchener, ON
- School of Architecture, Cambridge, ON
- Stratford Campus, Stratford, ON

Organizational size See Appendix A for methodology.

- 726,583.2 gross square metres (m^2)
- 40,044 full-time equivalent campus population (including students and employees)

Previous report Released September 2016 for information from 2015

Reporting cycle Annual

Contact Please address any questions about this report to the Sustainability Office (sustainability@uwaterloo.ca)

DEFINITIONS AND TERMS

CO_2e Stands for carbon-dioxide equivalent, the term used measure all greenhouse gasses according to the amount of radiative forcing they exert on the earth's climate system over 100 years, otherwise known as their "global warming potential."

Degree days Refers to a measurement of heating and cooling requirements based on the difference between outdoor and indoor temperatures. Each degree that the outdoor temperature drops below or rises above 18 degrees Celsius is summed throughout the year, and the result is used as an indicator of how weather conditions affect building energy requirements.

Diversion rate Refers to the amount of solid, non-hazardous waste that is recycled, composted, reused, or otherwise prevented from entering a landfill. It is calculated based on the amount of diverted material divided by all generated waste.

Fairtrade Refers to the certification mark issued by Fairtrade Canada for products that have been produced and verified to meet certain economic, social, and environmental standards.

Fair trade Refers to a movement based on 10 principles of responsible purchasing and management for farmers, producers, distributors, and consumers to adopt throughout their production and supply chains.

FSC Stands for the Forest Stewardship Council, a non-profit organization dedicated to responsible management of forests. The FSC certification mark is applied to wood and paper products created from responsibly managed forests.

GJ Stands for gigajoules, a unit of energy equivalent to 1,000,000,000 joules and used for comparing the energy equivalent of various energy sources.

Greenhouse gasses Refers to emissions of certain gasses that trap heat in the atmosphere and cause climate change. In the context of this report, these include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Intensity Refers to measurement of a particular environmental indicator expressed in relation to another set of organizational information, such as area, population, or revenue, in order to increase comparability between organizations.

Per capita Refers to the contribution or impact of an individual to a specific indicator. For this report, per capita includes the full-time equivalent count of all students and employees at the University of Waterloo as listed in Appendix A, unless otherwise stated.

Sustainability By definition, sustainability means maintaining the integrated health of the environment, society, and economy for today and into the future. While this report focuses primarily on environmental indicators relevant to the University of Waterloo, it recognizes that there are mutually reinforcing connections with financial and social sustainability. For brevity, the term "sustainability" will refer to environmental sustainability in this report.

At a Glance

542 COURSES
focused on or including sustainability

264 FACULTY
members researching sustainability topics

24 PARTICIPATING DEPARTMENTS
of the Green Office program

100% GROUNDS MANAGED
to integrated pest management principles

18.1% DECREASE
in carbon emissions per square metre since 2010

22.1% DECREASE
in water use per square metre since 2010

46.8% PAPER PURCHASES
with recycled content or FSC certification

41% WASTE DIVERSION RATE

47% EMPLOYEE COMMUTING TRIPS
using sustainable transportation

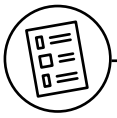
16.1% LOCAL FOOD
from Food Services total purchases

84.4% FAIRTRADE CERTIFIED
hot beverages from Food Services

FOR DETAILS, SEE EACH SECTION OF THE REPORT

Be a Part

Campus sustainability requires action and support from everyone. Here are simple tips you can use for reducing your footprint on campus and in the community.

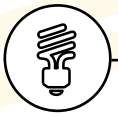


GET INFORMED

- Read the Green Guide at **uwaterloo.ca/sustainability/greenguide**
- Take a sustainability-related course as part of your studies
- Follow Waterloo's progress on Facebook or Twitter **@uwsustainable**

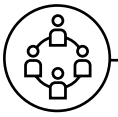
FOOD

- Red meat has a big emissions impact,[3] so try eating more high-protein beans, chickpeas, lentils, or responsibly sourced fish or poultry instead
- Look for Fairtrade certified coffee and tea on campus
- Visit the Campus Market Garden or Farm Market for fresh, local produce



ENERGY

- Turn off lights when you leave the office or residence
- Charge cell phones and electronics overnight
- Use cold water when doing laundry
- Take shorter showers
- Close sashes on fume hoods in labs



GET INVOLVED

- Join one of the many student sustainability groups on campus
- Become a Green Office ambassador for your department at **uwaterloo.ca/sustainability/go**
- Volunteer with local non-profits and community organizations

WASTE

- Read the signs on bins around campus to sort your waste
- Bring a reusable coffee mug and save 10¢ on every cup of coffee (or recycle paper cups!)
- Learn where to recycle batteries, e-waste, clothing, and textbooks, at **uwaterloo.ca/sustainability/waste**

TRANSPORTATION

- Since almost half of Waterloo Region's emissions come from transportation,[2] even reducing one day of driving can have an impact!
- Find multiple ways to get to your destination using Google Maps or **gotravelwise.ca**
- Check out campus resources at **uwaterloo.ca/sustainability/transportation**

To learn more on each of the above, visit
uwaterloo.ca/sustainability

ACADEMICS

Teaching and Learning

Waterloo continues to offer a broad range of curriculum related to sustainability. Whether looking at sustainable technologies, business practices, relevant natural sciences, or governance of sustainability issues, students have multiple opportunities to learn about sustainability challenges throughout their academic careers. Waterloo has several programs explicitly focusing on sustainability issues, including:

- Masters in Sustainability Management,
- Environment, Resources, and Sustainability
- Canada's first Master of Climate Change
- The Collaborative Water Program

SNAPSHOT

542 COURSES FOCUSED
on or including sustainability*

CHANGE OVER TIME

- Total change: **+34 courses**
- Percent change: **+6.7%**

*Out of 5,807 total courses
See Appendix B1 for full methodology

Opportunity to study and focus research on sustainability issues is also embedded across programs from all faculties, including:

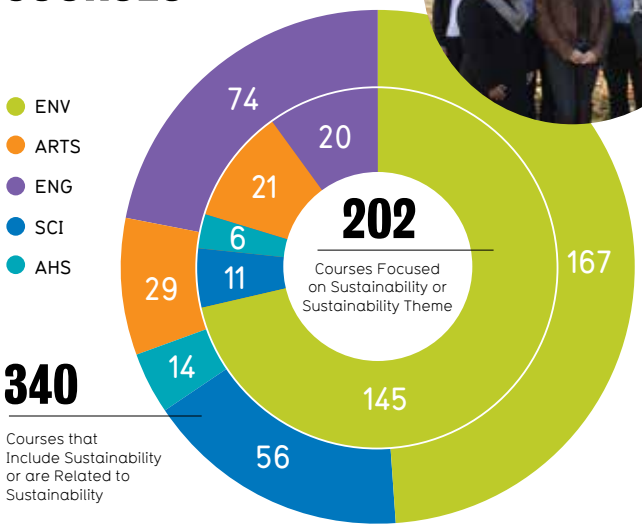
- Earth Sciences
- Environmental Engineering
- Global Governance
- Architecture
- Applied Mathematics, and more!

Growth in the number of identified courses in 2016 was based on additional input from department chairs. Previous course content was validated, and some chairs identified additional courses that had not been previously included.

SCHOOL OF ENVIRONMENT, RESOURCES, AND SUSTAINABILITY

The Department of Environment and Resource Studies rebranded in 2016 to become the School of Environment, Resources, and Sustainability (SERS). This change better reflects the department's teaching and research. It bridges the natural and social sciences, linking knowledge of resources and ecosystems with sustainability policy and governance. SERS renamed its undergraduate program to the BES in Environment, Resources, and Sustainability, and its graduate programs to the MES and PhD in Social and Ecological Sustainability.

SUSTAINABILITY COURSES



340
Courses that Include Sustainability or are Related to Sustainability

STUDENTS AT COP22

Six students from four different faculties journeyed to Marrakech, Morocco, in November 2016 to participate in the annual United Nations Climate Change summit. Students observed negotiations about the implementation of the Paris agreement, and acted as liaisons for students on campus who were interested in following the discussions. After the summit, the Interdisciplinary Centre on Climate Change hosted a panel of students and faculty to reflect on the outcomes, continued challenges, and opportunities for climate action.

Research

Waterloo faculty members are actively engaged in research across a number of sustainability-related themes. Key areas of focus include water, energy, and climate change, which align with research institutes such as the Water Institute, Waterloo Institute for Sustainable Energy, and Interdisciplinary Centre on Climate Change.

Faculty approach these issues in a variety of ways. These include research and modelling of core natural sciences, creating technological solutions, developing governance frameworks, and understanding interaction with social and economic systems. Individual researchers often deal with more than one theme using multiple approaches or applications.

The number of faculty researching sustainability-related themes increased in 2016 due to new faculty joining the University and updates to many of the public research profiles in the transition to Waterloo's new website platform.

SNAPSHOT

264 FACULTY MEMBERS

conducting sustainability-related research*

CHANGE OVER TIME

- Change from 2015: **+25 faculty**
- Percent change: **+10.4%**

*Out of 1,233 faculty
See Appendix B2 for full methodology

WATER TECH PARTNERSHIPS

In 2016, the Federal Economic Development Agency provided $12 million in funding for the Southern Ontario Water Consortium, which is located at the University of Waterloo. This funding brings together industry and academic partners with a focus on developing innovative new water technologies. These innovations include real-time watershed data collection, portable nano-sensors for field equipment, processes for removing phosphorous from wastewater, and methods of evaluating water contaminants.

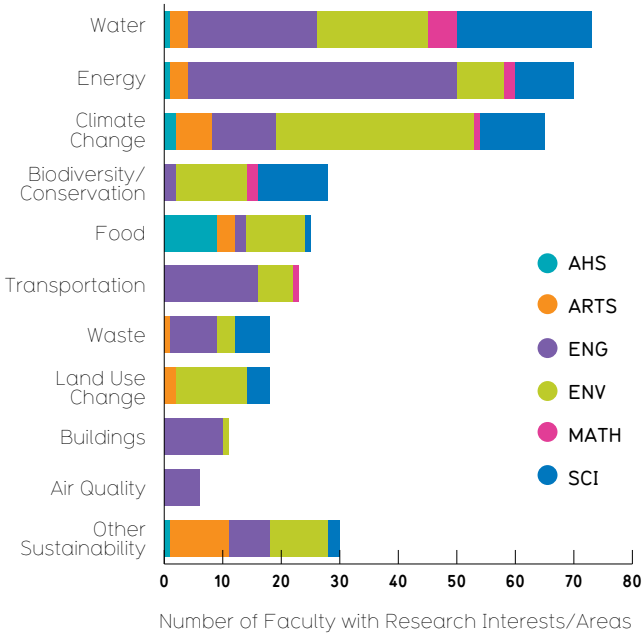
SUSTAINABLE STRATEGIES FOR MANAGING HAZARDOUS WASTE FROM MINING

Waterloo also received $5.5 million from the Natural Sciences and Engineering Research Council of Canada to create a national team of researchers to deal with hazardous mining waste in a sustainable manner. The team will help anticipate environmental problems caused by mines and develop preventative strategies that reduce contamination and remediation costs.

GAIA RESEARCH LAB

In 2016, the University of Waterloo launched its Green and Intelligent Automotive (GAIA) Research facility through a $10 million partnership with industry leaders and the federal and provincial governments. The lab has test cells for batteries, advanced powertrains, and vehicles. High capacity dynamometers allow in lab driving and motor/engine operation, which helps researchers develop new clean energy technologies for hybrid, electric, and combustion vehicles. GAIA is part of the Waterloo Centre for Automotive Research (WatCAR), which supports the research of over 130 professors across all six faculties.

FACULTY RESEARCH BY SUSTAINABILITY THEME



PREPARING FOR FLOODING

Research and expertise from the University of Waterloo are helping communities adapt to the impacts of climate change. In 2016, Partners for Action (P4A) launched a report on flood preparedness of Ontario communities. The report includes recommendations for policymakers and highlights the need for communities to drive policy change to improve flood and climate change resiliency. In addition, the Intact Centre for Climate Adaptation at Waterloo launched the Home Flood Protection Program to help homeowners reduce their risk of basement flooding and minimize damage if flooding occurs. The program received funding from the Ontario Ministry of the Environment and Climate Change and the City of Burlington.

OPERATIONS

ENERGY

Energy

Waterloo's direct energy use comes from natural gas and electricity, which can be converted into gigajoules for comparability. Main sources of energy use on campus include heating and cooling buildings, ventilation, heating water, computers and servers, laboratory equipment, lighting, and lab and research equipment.

SNAPSHOT

1.53 (Intensity) **GIGAJOULES** per square metre

INTENSITY, PER SQUARE METRE

- Change from 2015: **-3.7%**
- Change from 2010: **+8.3%**

ABSOLUTE

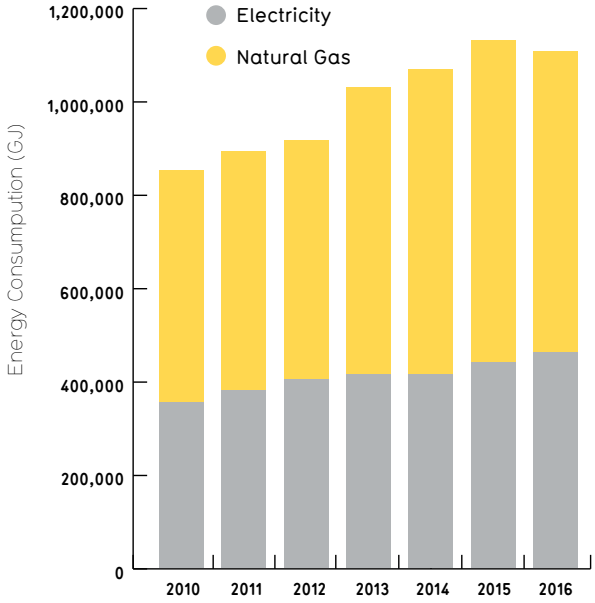
- Total energy: **1,109,399 GJ**
- Change from 2015: **-2.0%**
- Change from 2010: **+29.9%**

See Appendix C1 for full methodology

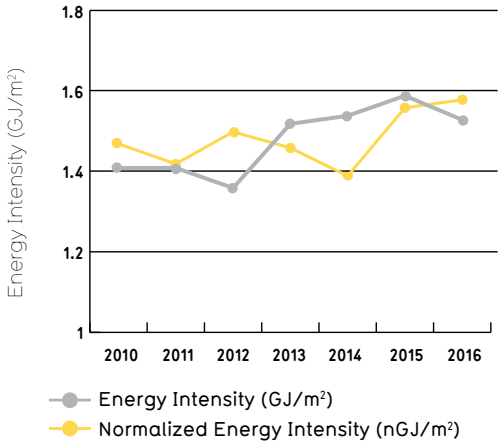
In 2016, the University of Waterloo's overall energy use fell slightly from 2015. This was largely due to a slightly milder winter, which required less heating of campus buildings and a decrease in natural gas use. This was despite an increase in Waterloo's campus area, as new buildings used additional energy.

When normalizing for weather to reflect the number of annual degree days, Waterloo's energy intensity increased slightly in 2016. This metric is useful to separate external factors such as weather from the underlying building efficiency.

TOTAL ENERGY USE



ENERGY INTENSITY PER SQUARE METRE



Climate Change

Waterloo's total greenhouse gas emissions dropped by approximately 4.8 per cent in 2016, a decrease of over 1,900 tonnes of carbon dioxide equivalent (CO_2-e). While this is encouraging, the primary reason for this change was a milder winter, requiring less energy for heating the campus.

The overall trend of emissions has been flat even though the campus has grown substantially. This, however, is primarily due to the provincial phase-out of coal power from 2010 through 2015. Excluding changes to the electricity grid, Waterloo's emissions would have increased substantially.

SNAPSHOT

54.4 (Intensity) **KILOGRAMS** CO_2-e per square metre

INTENSITY, PER SQUARE METRE

- Change from 2015: **-6.4%**
- Change from 2010: **-18.1%**

ABSOLUTE

- Total emissions: **39,512 tonnes CO_2-e**
- Change from 2015: **-4.8%**
- Change from 2010: **-1.8%**

See Appendix C2 for full methodology

SOURCES OF EMISSIONS

Waterloo currently tracks greenhouse gas emissions from Scope 1, 2, and some Scope 3 sources, as listed below. Future efforts can help quantify additional indirect emissions relevant to Waterloo, creating a fuller picture of Waterloo's climate change impacts.

Scope 1: Direct emissions

- Natural gas for heating buildings and water
- Fuel used for the campus fleet

Scope 2: Electricity indirect emissions

- Emissions from electricity used on campus but produced elsewhere

Scope 3: Other indirect emissions

- Emissions from transportation and distribution (T&D) losses across the electricity grid
- Emissions from waste sent to landfill
- Emissions from energy used for water consumption
- Emissions from employee and student commuting (not included — insufficient data)
- Emissions from business travel (not included — insufficient data)
- Emissions from product supply chain (not included — insufficient data)

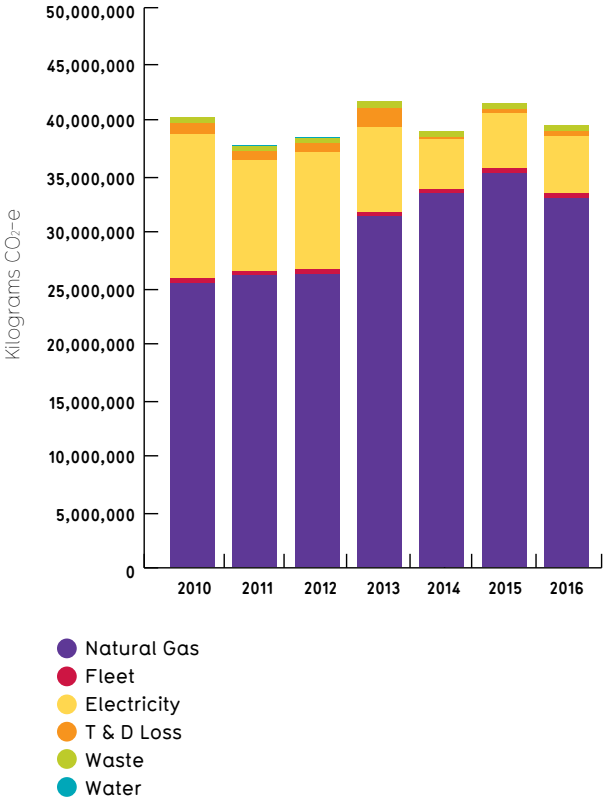
CAP AND TRADE

In 2016, the Province of Ontario launched its Cap-and-Trade program, requiring organizations to purchase permits for the carbon emissions they produce. This makes carbon emissions more expensive for organizations, encouraging emissions reductions. The University of Waterloo surpasses the emissions threshold for participation and is regulated by the program, which took effect in 2017.

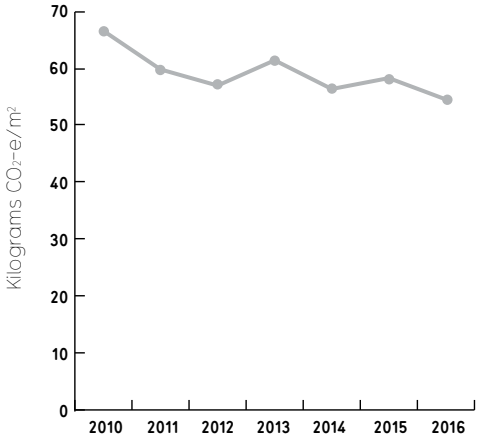
EMISSIONS FACTOR UPDATE

In 2017, Ontario made several large adjustments to its historical emission factors for carbon released from electricity production. The University of Waterloo has updated its carbon accounting accordingly. Emissions from electricity in previous reports are no longer comparable.

TOTAL EMISSIONS



EMISSIONS INTENSITY



Water

The University of Waterloo uses water in kitchens, washrooms, labs, and for heating and cooling. There has been a consistently lower water intensity and an overall decrease in water use since 2010. However, water consumption started to increase gradually beginning in 2015. Continued efforts will need to be made to support increased water efficiency.

SNAPSHOT

0.77 (Intensity) **M³ WATER** per square metre

INTENSITY, PER SQUARE METRE

- Change from 2015: **+0.9%**
- Change from 2010: **-22.1%**

ABSOLUTE

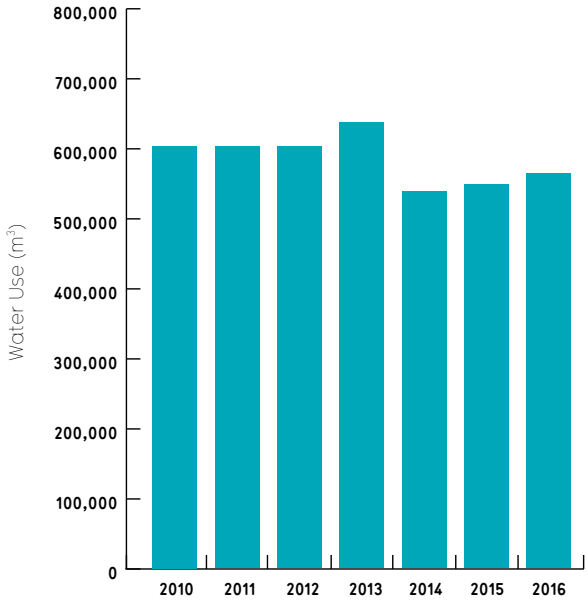
- Total water use: **563,011 m³**
- Change from 2015: **+2.7%**
- Change from 2010: **-6.6%**

See Appendix C3 for full methodology

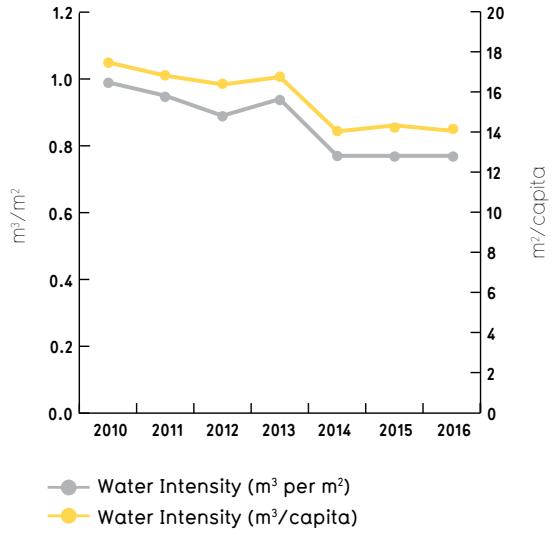
In addition, Waterloo has several stormwater management features across campus, reducing the risk of flooding and erosion. Some features include:

- Simulated wetlands and rainwater harvesting next to Environment 3
- Green roofs on Environment 3, Engineering 5, Hagey Hall, and the Quantum Nano Centre
- 3 permeable pavement installations
- Stormwater ponds and bio swales on North Campus

TOTAL WATER USE



WATER INTENSITY



Waste

In 2016, Waterloo's custodial and residence cleaning service teams began tracking all blue bins set out for weekly collection. A number of additional departments began quantifying metal recycling, yard waste, and scrap wood recycled. There remains uncertainty around blue bin, scrap wood, and yard waste recycling, and Waterloo will work to strengthen measurement of its waste streams. Based on preliminary information collected, the University of Waterloo's diversion rate (defined as the amount of waste composted, recycled, or reused divided by the total waste generated) is approximately 41 per cent.

SNAPSHOT

41% ESTIMATED diversion rate

INTENSITY, PER CAPITA

- Landfill waste per capita: **76.09 kg**
- Change from 2015: **+3.2%**
- Change from 2010: **+2.3%**

ABSOLUTE WASTE

- Total landfill waste: **3,047 Tonnes**
- Change from 2015: **+6.5%**
- Change from 2010: **+18.7%**

See Appendix C4 for full methodology

Through Waterloo's annual waste audits, it is clear that there are major opportunities to increase the amount of waste diverted from landfill. Over 40 per cent of all waste generated could be composted through an organics collection program, and more than 31 per cent of all waste sent to landfill could have been recycled through existing programs. This reflects a need for stronger programming and infrastructure to ensure students and employees recycle, and expanding programs that can capture organic waste.

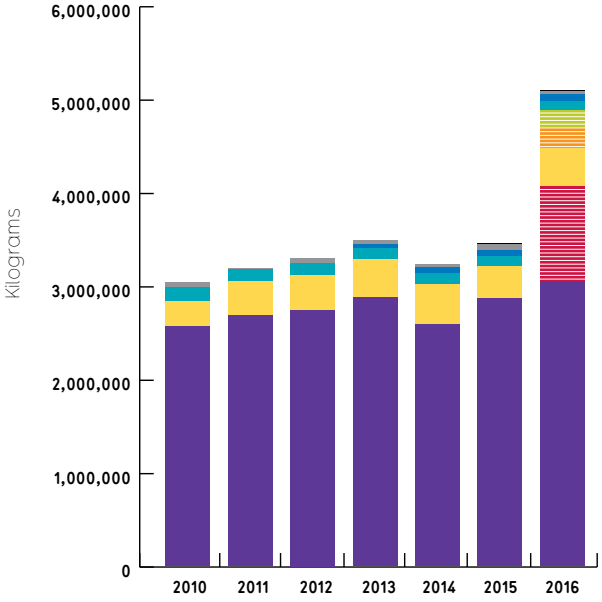
SUSTAINABLE FASHION

In fall 2016, Sustainable Campus Initiative hosted its first-ever used clothing sale. With donations collected in drop-off bins in the residences, the student group diverted a substantial amount of textiles from landfill, provided affordable clothing for other students, and raised over $2,000 in sales to help finance other on-campus projects. The student volunteers launched another sale in January 2017 and have plans to expand.

WASTE WEEK

The Sustainability Office hosted its first "waste week" campaign in fall 2016 as part of the Region-wide Waste Reduction Week. During the week, Waterloo launched six new battery collection depots in residences, the libraries, and Student Life Centre, promoted a series of challenges among Green Office participants, and engaged over 320 students and employees with a quiz on proper recycling practices.

TOTAL WASTE



Transportation

Waterloo's annual travel survey revealed an increase in the number of employees using sustainable transportation (walking, cycling, carpooling, transit, or working from home). The increase in 2016 was primarily due to more reported "work from home" responses. With five years of reported data, the commuting profile of employees appears to be fairly consistent, with weather conditions a large contributor to annual changes.

In 2016, the survey also captured student responses for the first time, intending to develop a more complete picture of travel patterns at the University. Preliminary results showed that students walked, biked, used transit, or carpooled for more than 75 per cent of trips to and from campus. However, the response rate was too low to be generalizable across the student population and will require further study in future years.

SNAPSHOT

47% **SUSTAINABLE COMMUTING**
trips by employees

CHANGE OVER TIME

- Change from 2015: **+4%**
- Change from 2012: **+4%**

See Appendix C5 for full methodology

TRANSIT INFRASTRUCTURE UNDER DEVELOPMENT

Construction on the ION light rail system continued in earnest across Waterloo Region throughout 2016. The University of Waterloo will have on-campus stations connecting Uptown Waterloo, Midtown K-W, Downtown Kitchener, Conestoga Mall, and more destinations. The ION will also increase the connection to the Health Sciences campus in Kitchener, and to the Architecture School through adapted bus rapid transit to Cambridge.

› visit **rapidtransit.regionofwaterloo.ca** for details and updates on ION

BIKE CENTRE

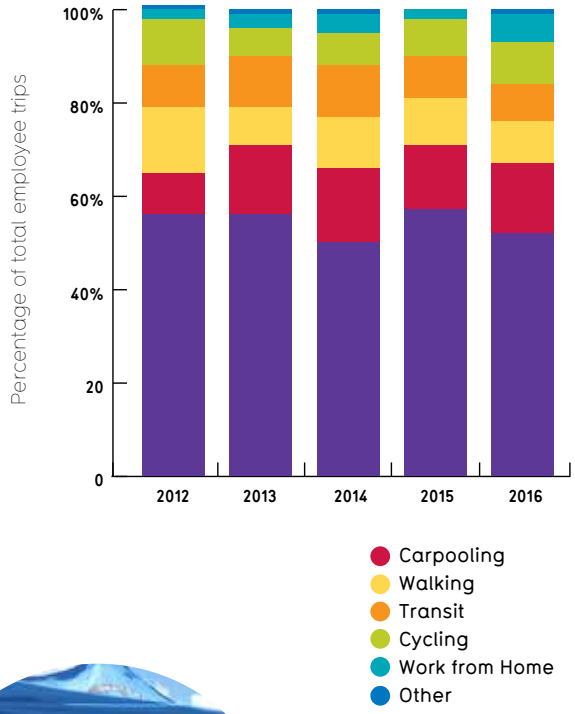
In 2016, the Federation of Students began managing the longstanding Bike Centre, which provides tools and spare parts for students and employees to do tune-ups right on campus. The Bike Centre also launched its bike rental program, renting out 40 high-quality bikes for a full term so students don't have to buy a bike and store it (or leave it behind) when they are on a co-op work term.

› See **feds.ca/slc/bike-centre** for more info!

PEDESTRIAN FRIENDLY CROSSINGS

Waterloo installed new pedestrian crossings around Ring Road to address the increased number of people moving on and off the campus by foot. These support directions of the Campus Master Plan and are located on the west and east sides of Ring Road. They require vehicle traffic to yield to pedestrians in designated areas.

EMPLOYEE COMMUTING



#BIKEWR

For the second year in a row, the University of Waterloo topped the community leaderboard for participation in Bike Month 2016. The Sustainability Office placed 750 thank-you tags on bikes around campus, hosted a bike-to-work breakfast, and encouraged a contest for campus cyclists to track their trips for a chance to win bike prizes.

Grounds

Waterloo's campus includes over 1,000 acres of land with a variety of academic, recreational, agricultural, and commercial uses. Grounds are managed according to principles of integrated pest management, where chemical fertilizers and pesticides are eliminated except where absolutely needed.

SNAPSHOT

100%* GROUNDS MANAGED

by integrated pest management

*excludes privately managed sites in the David Johnston Research and Technology Park and Affiliated and Federated Institutes of Waterloo
See Appendix C6 for full methodology.

Key ecological features of Waterloo's campus include:

- 270 acre Environmental Reserve on North Campus, surrounding Columbia Lake and open to the community
- Naturalized landscaping around the Laurel Creek, which winds through campus
- Native species tree list supports ecologically appropriate tree species
- Arts-Environment Gardens showcase seven themed plots with local and/or non-invasive species
- Campus woodlot south of the student villages functions as an important habitat and supports research on remediation and ecosystem management
- Dorney Ecology Garden supports naturalized design around the Environment buildings for study and research
- Peter Russell Rock Garden provides outdoor seating areas to enjoy wildlife, study, and see over 70 specimens of rocks and minerals, mostly from Ontario

SOUTH COMMONS

In 2016, the University completed the redevelopment of its South Commons. The new space provides a more inviting pedestrian entrance to the main campus and lots of outdoor seating for studying, eating lunch, or relaxing. The redevelopment also offers improved bike racks and a "fix-it" station with tools to pump up bike tires and do minor repairs.

Food

Food Services continued its efforts in 2016 to work with its suppliers to provide Fairtrade certified coffee. Over 90 per cent of all coffee served through Food Services is now Fairtrade certified, and all Food Services outlets include Fairtrade certified tea and chocolate bar options as well. To become a designated Fair Trade Campus, all student-run coffee shops must meet similar standards.

SNAPSHOT

84.4% of Food Services hot beverages purchases are

FAIRTRADE CERTIFIED

CHANGE OVER TIME

- Change from 2015: **+6.3%**
- Change from 2014: **+27.3%**

See Appendix C7 for full methodology

SNAPSHOT

16.1% of Food Services food purchases are from

LOCAL SUPPLIERS

CHANGE OVER TIME

- Change from 2015: **-11.1%**
- Change from 2014: **+14.3%**

See Appendix C7 for full methodology

In addition, Food Services continues to source local food where possible. Local food helps support the provincial economy, provides safe and nutritious options, and can reduce the environmental impact of transporting food over long distances. Although the reported percentage of local food decreased in 2016, this was due to Food Services evaluating across a wider range of product categories, not from a decrease in local food purchases.

SUSTAINABILITY AT SEA

Food Services has made concerted efforts to purchase seafood that bears the Marine Stewardship Council (MSC) and Sea Choice certifications, which require companies to comply with strict policies that prevent overfishing and ensure responsible aquatic ecosystem management. With over 30 per cent of global fisheries being overfished, these programs can help prevent the collapse of global fish stocks.[4] You can also look for the MSC logo, Sea Choice logo, and other symbols for responsible fishing at your local grocery store.

GROWING GOODNESS, RIGHT ON CAMPUS

UW Campus Market Garden cultivated two new growing spaces in 2016. In collaboration with Waterloo Cooperative Residence Inc., the student farmers began a small vegetable garden on Phillip Street. With support from Plant Operations, the North Campus Garden was planted for its first season. North Campus remains the Market Garden's largest plot at 530 square metres. In addition to continuing the EV3 Farmer's Market, the team launched a FoodBox Program and became involved with Sustainable Campus Initiative (SCI). Various events were held to improve student engagement, including herb preservation and seed bomb workshops.

LOTS OF BUZZ AROUND LOCAL

UW Food Services is proud to purchase organic and unpasteurized honey directly from a local bee farmer and serve it at some on-campus locations. Constantine, the owner of the bee farm, took a couple of Food Services members on a tour, showing off his healthy bees that eat from the organic fields that surround his property. They truly looked like happy workers.

PURCHASING

Purchasing

Waterloo's size means that the collective purchasing decisions of students and employees across campus can have a large impact up its supply chain. Waterloo's Procurement and Contract Services team often coordinates large bulk purchases, but all students and employees can support sustainable purchasing by looking for reputable product labels.

SNAPSHOT

46.8% of campus paper purchases use recycled or **FSC-LABELLED PAPER***

CHANGE OVER TIME

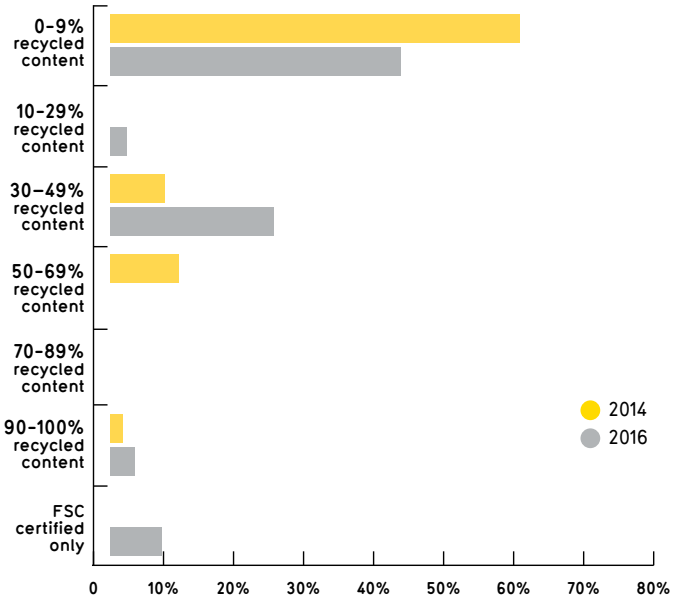
› Change from 2014: **+21.9%**

*excludes student paper purchases
See Appendix C8 for full methodology

Paper, for example, can contribute to deforestation and biodiversity loss if the raw material is not harvested sustainably. The Forest Stewardship Council (FSC) provides a certification program ensuring that paper products come from responsibly managed forests. In addition, paper produced from recycled fibres requires far less energy and material input. Recycled and FSC-labelled paper use increased on campus in 2016, although the majority of purchases remain virgin paper.

Waterloo is also in the process of gathering information on sustainable purchasing options for its cleaning products, which can have a large environmental impact during production and after disposal. It is also benchmarking purchasing of electronic equipment for EPEAT certified devices. Managed by the Green Electronics Council, EPEAT is a rating system that identifies electronic products that reduce environmental impact in their raw materials extraction, manufacturing, use, and disposal.

PAPER PURCHASING



ENGAGEMENT

ECO SUMMIT 2016

Sustainable Campus Initiative (SCI) and the Sustainability Office celebrated the third annual Eco-Summit in 2016. Over 70 attendees joined for a keynote presentation from Mike Morrice, Executive Director at Sustainability CoLab and offered feedback on campus sustainability, and participating Green Offices received their inaugural certifications.

Student Engagement

ECOLOO

In Fall 2016, SCI invited 20 vendors from the local community with sustainability-related products and services for an open house the SLC Great Hall. Food from UW Food Services and Queen's Commons Cafe were provided to those who were involved in the fair, and participants were invited to enter a draw for fair trade prizes. In addition, students were invited to pitch their ideas for an eco-friendly business.

SUSTAINABILITY WEEK

SCI also organized a week in July filled with sustainability-based activities, including: Eco Life Hacks, Fair Trade Facts event, SCI Talk, and Planting Seeds with Campus Compost. Over 150 students got to decorate their own reusable shopping bags, learn about environmentally friendly hacks and fair trade, get free fair-trade tea, and have smores while listening to a talk regarding sustainability in the music industry.

Employee Engagement

GREEN OFFICE PROGRAM

The University of Waterloo launched its Green Office program in January 2016 to engage employees in simple actions they can take around the office to reduce the University's impact. The program empowered ambassadors in each office to work with their colleagues through a common scorecard to track progress and inspire actions such as purchasing recycled paper, putting up reminders to shut off lights, and sharing guidelines for planning sustainable events and meetings. Over 30 ambassadors from 19 departments participated in 2016, with eight offices originally earning certification for reaching a certain number of points through the scorecard.

As of June 2017, the following departments are certified or have ambassadors participating:

GREEN OFFICE GOLD CERTIFIED

Green Office Gold:

- Centre for Teaching Excellence

GREEN OFFICE SILVER CERTIFIED

Green Office Silver:

- Dean of Arts/Arts Undergraduate Office
- Dean of Environment Office
- Library

GREEN OFFICE BRONZE CERTIFIED

Green Office Bronze:

- Dean of Applied Health Sciences Office
- Dean of Engineering Office
- Graduate Studies Office
- Knowledge Integration
- Political Science
- Propel Centre for Population Health Impact
- Psychology
- WatCACE/WatPD

GREEN OFFICE

Participating Departments:

- Creative Services
- Finance
- Graduate Student Association
- Information Systems and Technology
- Institutional Analysis and Planning
- School of Accounting and Finance
- School of Environment, Resources and Sustainability
- Sociology and Legal Studies
- Student Success Office
- Visitors Centre
- Water Institute
- Waterloo Institute for Sustainable Energy

To see more or to sign up your department, visit uwaterloo.ca/sustainability/GO

Community Engagement

WATERLOO REGION DECARBONIZATION FORUM

What would a low or no-carbon Region of Waterloo look like in 2050? What are the different pathways to get there? These were some of the questions posed by Heather Douglas, a professor in Philosophy and Waterloo Chair in Science and Society, during a two-day meeting of researchers, policymakers, local utility companies, civil society, and businesses in fall 2016. The decarbonization forum was an introductory conversation about the real-world technologies, policies, and strategies necessary to dramatically reduce Waterloo Region's carbon intensity. The facilitated discussion sparked important conversations among attendees and developed preliminary roadmaps that community partners and local governments are using to explore next steps.

› For details see **wise.uwaterloo.ca/decarbonization_forum**

WORLD WETLANDS DAY

For the fourth consecutive year, the Ecohydrology Research Group at the University of Waterloo organized activities recognizing World Wetlands Day on February 2. The day featured an afternoon reception and poster session highlighting research ranging from field experiments to restoration strategies from students of both the University of Waterloo and Western University. The afternoon was followed by a sold out public lecture about reclaiming, using, and protecting wetlands, featuring professor Jos Verhoeven from Utrecht University in the Netherlands.

PUBLIC LECTURES

Multiple areas of the University of Waterloo host public events to bring exciting sustainability research and expertise into the community. Some highlights and major events from 2016 included:

Creating sustainable cities from the ground up — lessons from Disney research:

TD Walter Bean Lecture in Environment featured Dr. Ben Schwegler, Senior Vice President and Chief Scientist at Walt Disney Imagineering Research and Development

› hosted by the Faculty of Engineering

WISE public lecture series:

featured a number of local and visiting experts on sustainable energy technology, policy, and economic topics

› hosted by the Waterloo Institute for Sustainable Energy

Water and sustainability:

RBC Distinguished Lecture featured Dr. Jay Famiglietti, professor at the University of California, Irvine and Senior Water Scientist at the NASA Jet Propulsion Laboratory

› hosted by the Water Institute

Comparing climate change policy networks:

featured Dr. Tuomas Ylä-Anttila, professor at the University of Helsinki

› hosted by the Waterloo Institute for Complexity & Innovation

Pursuing sustainability:

Environment Lecture Series featured William Clark, professor at Harvard University's John F. Kennedy School of Government

› hosted by the Faculty of Environment

GOVERNANCE

As the previous sections illustrate, sustainability action occurs across many areas of campus. These efforts are critical to changing behaviours, increasing involvement, building a culture that embraces sustainability, and developing sustainable infrastructure.

Waterloo is also establishing policies and practices to better integrate sustainability into institutional decision-making to support existing actions and address areas of opportunity.

FORMAL POLICIES, MEMBERSHIPS, PRACTICES, AND COMMITMENTS

Internal:

- Policy 53: Environmental Sustainability (New 2017)
- New buildings are designed to LEED Silver, although they do not receive certification
- High efficiency lighting retrofits mandated during construction and renovation
- Chemical pesticides are eliminated except where absolutely necessary
- Centralized office printers are defaulted to double-sided printing
- Campus Master Plan includes sustainability aspects as defining features of campus development

External:

- Signatory to 2009 Council of Ontario Universities Pledge, Ontario Universities, Committed to a Greener World
- Member of the Regional Sustainability Initiative, managed by Sustainable Waterloo Region
- Member of TravelWise, managed by the Region of Waterloo and Sustainable Waterloo Region
- Member of the Association for the Advancement of Sustainability in Higher Education

SUSTAINABILITY SURVEY

In fall 2016, the President's Advisory Committee on Environmental Sustainability (PACES) asked members of the University for feedback on next steps for campus action through an online survey and a series of open houses. With over 1,150 survey responses and 100 open house attendees, students and employees from all areas of the University affirmed the need for progress on campus and provided insight on key focus areas. PACES used this feedback in the development of Waterloo's first Environmental Sustainability Strategy, which is going through consultation for approval.

Findings include:

91% care about Waterloo's **SUSTAINABILITY EFFORTS**

77% **WOULD LIKE TO LEARN MORE** about sustainability while at Waterloo

77% thought climate change and waste management should be priorities for campus

TOP PRIORITIES:

- Climate change
- Waste reduction
- Sustainability research
- Sustainable transportation
- Sustainability in curriculum

AREAS OF OPPORTUNITY

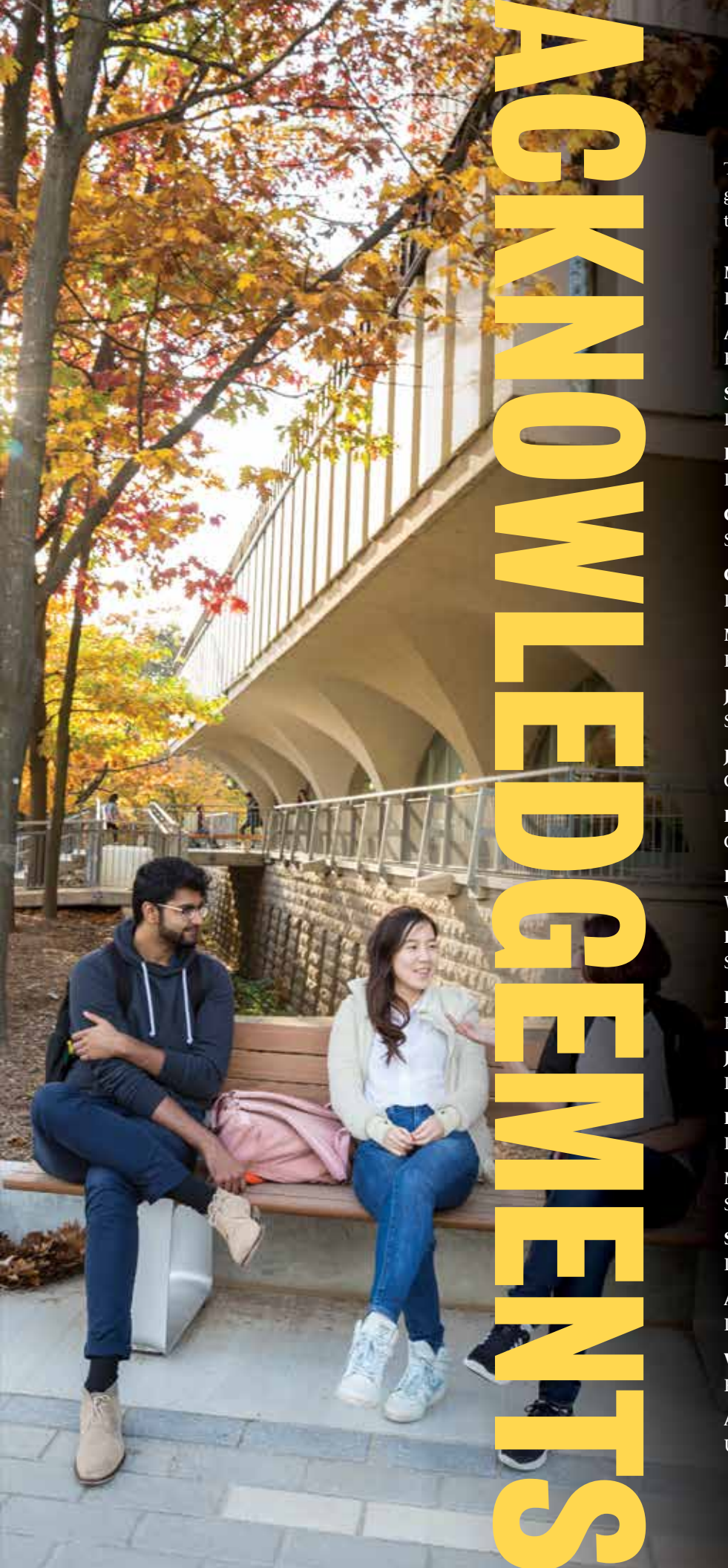
<50% consider themselves well-informed about **SUSTAINABILITY ISSUES**

<30% thought Waterloo has increased their understanding of **SUSTAINABILITY**

POLICY 53

PACES also engaged various governance committees in the development of Waterloo's first formal policy on environmental sustainability. Policy 53 was approved in Winter 2017, and establishes core principles for campus sustainability that will guide future strategy and action plans. The full policy is available on the Secretariat's Website.

› Read the policy: **uwaterloo.ca/secretariat/policies-numerical-order**



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APPENDIX A

The following underlying data was used to calculate intensity-based changes within the University for each year.

A1 – Campus Population

Scope: 2010-2016

Boundary: All University of Waterloo Campuses

Methodology: Human Resources provided full-time equivalent staffing information. Full-time equivalent (FTE) student enrollment was provided by Institutional Analysis and Planning. Full-time faculty members were provided by Institutional Analysis and Planning.

	2010	2011	2012	2013	2014	2015	2016
Full time faculty	1,023	1,063	1,115	1,139	1,174	1,211	1,233
Faculty and staff (FTE)	4,969	5,059	5,207	5,367	5,444	5,603	5,719
Undergraduate students (FTE)	25,888	26,962	27,529	28,423	28,675	29,004	29,997
Graduate Students (FTE)	3,651	3,835	4,037	4,207	4,181	4,199	4,328
TOTAL CAMPUS FTE, UW ONLY	34,508	35,856	36,773	37,997	38,300	38,806	40,044
Staff, University Colleges (FTE)*	281	296	306	309	326	312	309

*Staff counts from Renison, St. Paul's, and Conrad Grebel were included in per-capita calculations for waste.

A2 – Campus Area

Boundary: All University of Waterloo Campuses

Methodology: Plant Operations provided a total floor area for all University of Waterloo facilities. Federated and Affiliated University Colleges provided similar data for respective facilities.

Limitations and exclusions: Area for the University of Waterloo is provided by Plant Operations. Areas for Federated and Affiliated Institutions of Waterloo are provided by relevant facilities staff.

TOTAL FLOOR AREA (M^2)	2010	2011	2012	2013	2014	2015	2016
University of Waterloo	605,952	631,822	676,439	679,512	693,399	713,782	726,583
Conrad Grebel	7,690	7,690	7,690	7,690	9,734	9,734	9,734
Renison	10,375	10,375	10,375	10,375	10,375	14,148	14,148
St. Jerome's	14,372	14,372	14,372	14,372	14,372	14,372	26,223
St. Paul's	12,684	13,613	13,613	13,613	13,613	13,613	13,613

Explanation of changes: Previously reported area numbers for the University of Waterloo in 2015 have been updated to highlight more accurate information about building completion. This will lower the intensity metrics for 2015 by approximately 1.7 per cent.

A3 – Weather

Methodology: Information on degree days was retrieved from Environment Canada's historical weather database using the "Kitchener/Waterloo" data set based on temperatures that are above or below 18 degrees Celsius.[5]

	2010	2011	2012	2013	2014	2015	2016
Cooling degree days	268.50	244.30	283.10	200.00	132.00	195.70	290.40
Heating degree days	3,851.40	4,031.60	3,586.70	4,263.60	4,624.00	4,145.80	3,859.00
Total Degree days	4,119.90	4,275.90	3,869.80	4,463.60	4,756.00	4,341.50	4,149.40

APPENDIX B

B1 – Teaching and Learning

Scope: 2015/16 – 2016/17 Academic Calendars

Methodology: In previous years, the course inventory was compiled based on publically available course descriptions within the undergraduate and graduate calendars, with a specific emphasis on environmental sustainability. This year, the Sustainability Office also reached out to department chairs for academic units which offered these identified courses, to verify or modify the course inventory. The definitions provided by AASHE STARS criteria were provided to chairs to determine whether the course content met those criteria, which are provided below.

Cross-listed courses were treated as one total course and were weighted equally across the departments (i.e., 0.5 allocated to Geography and Environmental Management and 0.5 allocated to Earth Sciences for a shared course).

Limitations and exclusions:

- Course descriptions are not exhaustive, and it is possible that there are many more courses that have units, modules, or case studies related to environmental sustainability that were not included in the description. Further analysis could be conducted by looking at course syllabi.
- Some department chairs did not respond to request for validation, in which case the original inventory was used. Approximately 81 per cent of courses were verified. Future efforts can be made to ensure departmental verification of remaining courses.
- Special Topics courses were normally excluded from the count, unless the description provided a list of specific topics that could be related to environmental sustainability.
- The academic calendar lists all courses that are available at the University of Waterloo, but does not indicate whether they were actually scheduled. Further analysis could be done through the Quest system to analyse the number of courses and sections offered.

Definitions:

STARS defines courses as follows:

Sustainability-Focused Courses are courses in which the primary and explicit focus is on sustainability and/or on understanding or solving one or more major sustainability challenge. This includes:

- Foundational courses in which the primary and explicit focus is on sustainability as an integrated concept having social, economic and environmental dimensions. Obvious examples include Introduction to Sustainability, Sustainable Development, and Sustainability Science, however courses may also count if their course descriptions indicate a primary and explicit focus on sustainability.
- Courses in which the primary and explicit focus is on the application of sustainability within a field. As sustainability is an interdisciplinary topic, such courses generally incorporate insights from multiple disciplines. Obvious examples include Sustainable Agriculture, Architecture for Sustainability, and Sustainable Business, however courses may also count if their course descriptions indicate a primary and explicit focus on sustainability within a field.
- Courses in which the primary focus is on providing skills and/or knowledge directly connected to understanding or solving one or more major sustainability challenges. A course might provide knowledge and understanding of the problem or tools for solving it, for example Climate Change Science, Renewable Energy Policy, Environmental Justice, or Green Chemistry. Such courses do not necessarily cover "sustainability" as a concept, but should address more than one of the three dimensions of sustainability (i.e. social wellbeing, economic prosperity, and environmental health).

Courses that include sustainability refers to courses that are primarily focused on a topic other than sustainability, but incorporates a unit or module on sustainability or a sustainability challenge, includes one or more sustainability-focused activities, or integrates sustainability issues throughout the course. While a foundational course such as chemistry or sociology might provide knowledge that is useful to practitioners of sustainability, it would not be considered to be inclusive of sustainability unless the concept of sustainability or a sustainability challenge is specifically integrated into the course. Likewise, although specific tools or practices such as GIS (Geographical Information Systems) or engineering can be applied towards sustainability, such courses would not count unless they incorporated a unit on sustainability or a sustainability challenge, included a sustainability-focused activity, or incorporated sustainability issues throughout the course.

	FOCUS ON SUSTAINABILITY OR SUSTAINABILITY THEME		INCLUDE OR RELATE TO SUSTAINABILITY	
	2015/16	2016/17	2015/16	2016/17
Applied Health Sciences	6	6	14	14
Arts	21	21	27	29
Engineering	17	20	68	74
Environment	149	145	133	167
Math	–	–	1	–
Science	15	11	57	56
GRAND TOTAL	208	202	300	340

Explanation of changes: Changes were based on feedback from academic department chairs that may have identified courses no longer offered, new courses added, courses that met the above definitions but were not previously included, or courses that were previously included but that chairs felt did not actually meet those definitions based on deeper knowledge of course content.

B2 – Research

Scope: 2015-2016

Boundary: All University of Waterloo

Methodology: Information was gathered from a scan of public research descriptions listed on each department's website. It was attempted to search for keywords or concepts focused on environmental sustainability or research that addressed a particular environmental sustainability problem. Faculty were identified based on both thematic areas (i.e. biodiversity, climate change, energy) and approach (i.e. science, technology, governance) where possible. Some faculty may have research spanning a number of thematic areas and using multiple approaches, so the categories are not mutually exclusive.

Limitations and exclusions:

- The scan only included permanent faculty, and did not include adjunct faculty or lecturers.
- The scan did not include masters, PhD, or postdoctoral research.
- In some cases, faculty members did not have a link to their research areas, making it impossible to identify whether research was related to environmental sustainability.

› In several cases, there was difficulty distinguishing research that had multiple applications. In such cases, the faculty member was included if their profile specifically referenced applications to environmental sustainability or sustainability thematic areas. It is possible that some research was excluded because this reference was not made explicit, and there was insufficient disciplinary knowledge to make an implicit connection.

Terminology varied considerably across disciplines. It is possible that research topics were included or excluded from misinterpretation of language.

2015 BY THEMATIC AREA (239 FACULTY MEMBERS IN TOTAL)

RESEARCH THEMATIC AREA	APPLIED HEALTH SCIENCES	ARTS	ENGINEERING	ENVIRONMENT	MATH	SCIENCE
Climate Change	2	4	13	28	2	14
Water	1	1	17	14	4	25
Energy	–	1	34	5	2	6
Land Use	5	3	11	21	–	5
Transportation	–	–	20	5	–	–
Biodiversity/Conservation	–	–	2	10	–	9
Food	5	–	2	7	–	4
Waste	–	–	10	2	–	2
Buildings	–	–	4	3	–	–
Air Quality	1	–	2	–	–	–
Other Sustainability	–	9	7	16	1	2

2016 – (264 FACULTY MEMBERS IN TOTAL)

RESEARCH THEMATIC AREA	APPLIED HEALTH SCIENCES	ARTS	ENGINEERING	ENVIRONMENT	MATH	SCIENCE
Water	1	3	22	19	5	23
Energy	1	3	46	8	2	10
Climate Change	2	6	11	34	1	11
Biodiversity/Conservation	–	–	2	12	2	12
Food	9	3	2	10	–	1
Transport	–	–	16	6	1	–
Waste	–	1	8	3	–	6
Land Use Change	–	2	–	12	–	4
Buildings	–	–	10	1	–	–
Air Quality	–	–	6	–	–	–
Other Sustainability	1	10	7	10	–	2

Explanation of changes: A number of researchers identified in 2015 no longer work at the University, and new faculty members have joined, creating some turnover in research areas. Many department pages also went through redevelopment with the transition to a new website, updating some research profiles.

APPENDIX C

C1 – Energy

Scope: 2010-2016

Boundary: All campuses, with Affiliated and Federated Institutions of Waterloo separated below.

Methodology: All data is taken from monthly or annual billing statements for actual consumption. To account for variation in weather, energy intensity was normalized by calculating the energy use in gigajoules per degree day for each year using conversion tables provided by the National Energy Board.[6] The resulting annual statistic was multiplied by the average degree days from 2010-2016 and divided by the gross floor area of building space for each year. Read alongside total metered usage, this can help understand the energy intensity of campus while accounting for weather conditions that are outside of the University's control.

	2010	2011	2012	2013	2014	2015	2016
UWATERLOO							
Electricity (kWh)	98,960,234.47	106,342,164.74	112,486,201.70	115,625,012.23	115,530,674.21	122,637,268.00	128,580,422.33
Electricity (GJ)	356,256.84	382,831.79	404,950.33	416,250.04	415,910.43	441,494.16	462,889.52
Natural Gas (m^3)	13,347,452.60	13,698,509.98	13,777,376.19	16,478,861.00	17,553,152.20	18,511,959.00	17,331,087.70
Natural Gas (GJ)	497,859.98	510,954.42	513,896.13	614,661.52	654,732.58	690,496.07	646,449.57
Total Energy (GJ)	854,116.83	893,786.22	918,846.46	1,030,911.56	1,070,643.00	1,131,990.24	1,109,339.09
Energy Intensity (GJ/m^2)	1.41	1.41	1.36	1.52	1.54	1.59	1.53
Normalized Intensity (nGJ/m^2)	1.47	1.42	1.50	1.46	1.39	1.56	1.58
CONRAD GREBEL							
Electricity (kWh)	844,579.00	856,478.00	830,056.00	838,633.00	1,017,351.00	1,048,290.73	1,081,616.73
Electricity (GJ)	3,040.48	3,083.32	2,988.20	3,019.08	3,662.46	3,773.85	3,893.82
Natural Gas (m^3)	164,358.00	169,328.00	154,195.00	199,966.00	204,126.00	172,737.00	166,884.00
Natural Gas (GJ)	6,130.55	6,315.93	5,751.47	7,458.73	7,613.90	6,443.09	6,224.77
Total Energy (GJ)	9,171.04	9,399.26	8,739.68	10,477.81	11,276.36	10,216.94	10,118.59
Energy Intensity (GJ/m^2)	1.19	1.22	1.14	1.36	1.16	1.05	1.04
Normalized Intensity (nGJ/m^2)	1.24	1.22	1.26	1.31	1.04	1.04	1.07
RENISON							
Electricity (kWh)	1,227,933.00	1,218,498.00	1,241,843.00	1,310,817.00	1,371,553.00	1,425,948.00	1,562,102.00
Electricity (GJ)	4,420.56	4,386.59	4,470.63	4,718.94	4,937.59	5,133.41	5,623.57
Natural Gas (m^3)	205,337.00	217,543.00	199,081.00	255,412.00	249,491.00	322,459.00	244,625.00
Natural Gas (GJ)	7,659.07	8,114.35	7,425.72	9,526.87	9,306.01	12,027.72	9,124.51
Total Energy (GJ)	12,079.63	12,500.95	11,896.36	14,245.81	14,243.61	17,161.13	14,748.08
Energy Intensity (GJ/m^2)	1.13	1.16	1.11	1.33	1.33	1.21	1.04
Normalized Intensity (nGJ/m^2)	1.17	1.17	1.23	1.27	1.19	1.20	1.08
ST. JEROME'S							
Electricity (kWh)	1,554,039.00	1,614,937.00	1,516,031.00	1,522,308.00	1,531,805.00	1,503,989.00	2,176,519.00
Electricity (GJ)	5,594.54	5,813.77	5,457.71	5,480.31	5,514.50	5,414.36	7,835.47
Natural Gas (m^3)	253,237.85	273,378.36	246,530.70	268,174.76	311,237.57	284,365.41	293,816.00
Natural Gas (GJ)	9,445.77	10,197.01	9,195.59	10,002.92	11,609.16	10,606.83	10,959.34
Total Energy (GJ)	15,040.31	16,010.79	14,653.31	15,483.23	17,123.66	16,021.19	18,794.81
Energy Intensity (GJ/m^2)	1.05	1.11	1.02	1.08	1.19	1.11	0.72
Normalized Intensity (nGJ/m^2)	1.09	1.12	1.13	1.03	1.07	1.10	0.74
ST. PAUL'S							
Electricity (kWh)	988,074.00	1,044,080.00	1,042,905.00	1,028,593.00	994,622.00	975,019.35	1,053,243.11
Electricity (GJ)	3,557.07	3,758.69	3,754.46	3,702.93	3,580.64	3,510.07	3,791.68
Natural Gas (m^3)	183,773.80	177,073.72	183,417.11	200,258.51	215,077.81	197,636.93	169,879.55
Natural Gas (GJ)	6,854.76	6,604.85	6,841.46	7,469.64	8,022.40	7,371.86	6,336.51
Total Energy (GJ)	10,411.83	10,363.54	10,595.92	11,172.58	11,603.04	10,881.93	10,128.18
Energy Intensity (GJ/m^2)	0.82	0.76	0.78	0.82	0.85	0.80	0.74
Normalized Intensity (nGJ/m^2)	0.85	0.76	0.86	0.79	0.77	0.79	0.77

Explanation of changes: An increase in campus space for the University of Waterloo resulted in a net increase in electricity consumption. A relatively mild winter resulted in a decrease in natural gas consumption for heating. Normalized weather is also updated based on average degree days inclusive of 2016.

C2 – Climate Change

Scope: 2010-2016

Boundary: All campuses, with Affiliated and Federated Institutions of Waterloo separated below.

Methodology: Source data was taken from annual billing and calculated against relevant emissions factors. Since the University of Waterloo collects all waste on campus in aggregate, emissions related to waste are recorded under the University's section and omitted from the Affiliated and Federated Institutions of Waterloo although they would be responsible for a portion of the waste generation.

Waterloo uses the emissions factors provided by the Province of Ontario through Canada's National Inventory Report to the United Nations Framework Convention on Climate Change. The Province updates electricity emissions annually for the period three years previous, and provides an estimate for the period two years previous. The province also updated historical emission factors in the 2017 National Inventory, requiring changes to previously reported emissions for electricity and transmission and distribution losses.

Emissions are classified below based on the scopes developed in the Greenhouse Gas Protocol.[7]

EMISSIONS FACTORS

	UNIT	2010	2011	2012	2013	2014	2015	2016
Natural Gas*	$kgCO_2-e/m^3$	1.89831	1.89831	1.89831	1.89831	1.89831	1.89831	1.89831
Water**	$kgCO_2-e/m^3$	0.08750	0.06250	0.06250	0.05000	0.02500	0.02688	0.02688
Waste***	$kgCO_2-e/kg$	0.19000	0.19000	0.19000	0.19000	0.19000	0.19000	0.19000
Electricity**	$kgCO_2-e/kWh$	0.13000	0.09300	0.09300	0.06500	0.03800	0.0400	0.0400
Transmission and Distribution Losses**	$kgCO_2-e/kWh$	0.01000	0.00700	0.00700	0.01500	0.00200	0.0030	0.0030
Fleet – Unleaded Fuel*	kg CO_2-e/L	2.32571	2.32551	2.32551	2.32551	2.32551	2.32551	2.32551
Fleet – Diesel Fuel*	kg CO_2-e/L	2.74973	2.74973	2.74973	2.74973	2.74973	2.74973	2.74973

* From Canada's 2017 National Inventory Report – Part 2[8]

** From Sustainable Waterloo Region's Water Emissions Guidance Paper[9]

*** From Sustainable Waterloo Region's Waste Emissions Guidance Paper[10]

**** From Canada's 2017 National Inventory Report – Part 3[11]

UNIVERSITY OF WATERLOO

	SCOPE 1		SCOPE 2	SCOPE 3					
	Natural Gas Emissions ($kgCO_2-e$)	**Fleet Emissions** ($kgCO_2-e$)	**Electricity Emissions** ($kgCO_2-e$)	**T & D Loss Emissions** ($kgCO_2-e$)	**Waste Emissions** ($kgCO_2-e$)	**Water Emissions** ($kgCO_2-e$)	**Total Emissions** ($kgCO_2-e$)	**Emissions Intensity** (kg CO_2-e/m^2)	**Emissions Intensity** ($kgCO_2-e$/ Capita)
2010	25,337,616	510,372	12,864,830	989,602	487,800	52,740	40,242,962	66.41	1,166.19
2011	26,004,032	502,807	9,889,821	744,395	510,365	37,663	37,689,083	59.65	1,051.12
2012	26,153,745	474,237	10,461,217	787,403	521,204	37,627	38,435,433	56.82	1,045.21
2013	31,282,003	509,836	7,515,626	1,734,375	546,963	31,804	41,620,606	61.25	1,095.37
2014	33,321,342	532,204	4,390,166	231,061	492,205	13,430	38,980,408	56.22	1,017.77
2015	35,141,455	520,431	4,905,491	367,912	542,836	14,731	41,492,855	58.13	1,069.24
2016	32,899,794	515,197	5,143,217	385,741	560,158	15,131	39,519,239	54.39	986.90

CONRAD GREBEL

	SCOPE 1		SCOPE 2	SCOPE 3				
	Natural Gas Emissions ($kgCO_2$-e)	**Fleet Emissions** ($kgCO_2$-e)	**Electricity Emissions** ($kgCO_2$-e)	**T & D Loss Emissions** ($kgCO_2$-e)	**Waste Emissions** ($kgCO_2$-e)	**Water Emissions** ($kgCO_2$-e)	**Total Emissions** ($kgCO_2$-e)	**Emissions Intensity** (kg CO_2-e/m^2)
2010	312,003	-	109,795	8,446	-	710	430,954	56.04
2011	321,437	-	79,652	5,995	-	468	407,553	53.00
2012	292,710	-	77,195	5,810	-	475	376,191	48.92
2013	379,598	-	54,511	12,579	-	320	447,009	58.13
2014	387,495	-	38,659	2,035	-	115	428,304	44.00
2015	327,909	-	41,932	3,145	-	166	373,151	38.33
2016	316,798	-	43,265	3,245	-	199	363,506	37.34

RENISON

	SCOPE 1		SCOPE 2	SCOPE 3				
	Natural Gas Emissions ($kgCO_2$-e)	**Fleet Emissions** ($kgCO_2$-e)	**Electricity Emissions** ($kgCO_2$-e)	**T & D Loss Emissions** ($kgCO_2$-e)	**Waste Emissions** ($kgCO_2$-e)	**Water Emissions** ($kgCO_2$-e)	**Total Emissions** ($kgCO_2$-e)	**Emissions Intensity** (kg CO_2-e/m^2)
2010	389,793	-	159,631	12,279	-	889	562,593	52.41
2011	412,964	-	113,320	8,529	-	729	535,543	49.89
2012	377,918	-	115,491	8,693	-	634	502,736	46.83
2013	484,851	-	85,203	19,662	-	512	590,228	54.98
2014	473,612	-	52,119	2,743	-	236	528,710	49.25
2015	612,127	-	57,038	4,278	-	249	673,692	47.62
2016	464,374	-	62,484	4,686	-	266	531,811	37.59

ST. JEROME'S

	SCOPE 1		SCOPE 2	SCOPE 3				
	Natural Gas Emissions ($kgCO_2$-e)	**Fleet Emissions** ($kgCO_2$-e)	**Electricity Emissions** ($kgCO_2$-e)	**T & D Loss Emissions** ($kgCO_2$-e)	**Waste Emissions** ($kgCO_2$-e)	**Water Emissions** ($kgCO_2$-e)	**Total Emissions** ($kgCO_2$-e)	**Emissions Intensity** (kg CO_2-e/m^2)
2010	480,724	-	202,025	15,540	-	1,209	699,499	48.67
2011	518,957	-	150,189	11,305	-	852	681,303	47.40
2012	467,992	-	140,991	10,612	-	917	620,512	43.18
2013	509,079	-	98,950	22,835	-	585	631,448	43.94
2014	590,826	-	58,209	3,064	-	392	652,490	45.40
2015	539,814	-	60,160	4,512	-	326	604,811	42.08
2016	557,754	-	87,061	6,530	-	292	651,636	24.85

ST. PAUL'S

	SCOPE 1		SCOPE 2	SCOPE 3				
	Natural Gas Emissions ($kgCO_2$-e)	Fleet Emissions ($kgCO_2$-e)	Electricity Emissions ($kgCO_2$-e)	T & D Loss Emissions ($kgCO_2$-e)	Waste Emissions ($kgCO_2$-e)	Water Emissions ($kgCO_2$-e)	Total Emissions ($kgCO_2$-e)	Emissions Intensity kg CO_2-e/m^2)
2010	348,860	-	128,450	9,881	-	1,691	488,881	38.54
2011	336,141	-	97,099	7,309	-	968	441,517	32.43
2012	348,183	-	96,990	7,300	-	1,022	453,495	33.31
2013	380,153	-	66,859	15,429	-	906	463,347	34.04
2014	408,285	-	37,796	1,989	-	451	448,520	32.95
2015	375,176	-	39,001	2,925	-	474	417,577	30.67
2016	322,484	-	42,130	3,160	-	501	368,275	27.05

C3 – Water

Scope: 2010-2016

Boundary: All campuses, with Affiliated and Federated Institutions of Waterloo separated below.

Methodology: Source data was taken from annual billing for all locations.

	2010	2011	2012	2013	2014	2015	2016
UWATERLOO							
Total water use	602,747.22	602,603.22	602,031.00	636,070.00	537,193.00	548,138.00	563,011.00
Water Intensity (m^3/capita)	17.47	16.81	16.37	16.74	14.03	14.13	14.06
Water Intensity (m^3 per m^2)	0.99	0.95	0.89	0.94	0.77	0.77	0.77
CONRAD GREBEL							
Total water use	8,118.00	7,489.00	7,601.00	6,409.00	4,614.00	6,172.00	7,402.00
Water Intensity (m^3 per m^2)	1.06	0.97	0.99	0.83	0.47	0.63	0.76
RENISON							
Total water use	10,164.00	11,670.00	10,140.00	10,230.00	9,440.00	9,270.00	9,890.00
Water Intensity (m^3 per m^2	0.95	1.09	0.94	0.95	0.88	0.66	0.70
ST. JEROME'S							
Total water use	13,822.00	13,633.00	14,674.00	11,695.00	15,685.00	12,124.00	10,856.00
Water Intensity (m^3 per m^2)	0.96	0.95	1.02	0.81	1.09	0.84	0.41
ST. PAUL'S							
Total water use	19,320.00	15,490.00	16,350.00	18,127.00	18,040.00	17,649.00	18,641.00
Water Intensity (m^3 per m^2)	1.52	1.14	1.20	1.33	1.33	1.30	1.37

C4 – Waste

Scope: 2010-2016

Boundary: All campuses, including Affiliated and Federated Institutions of Waterloo.

Limitations and exclusions:

- Does not include information on mixed containers or paper recycling through the blue bin program from 2010-2015, or organics recycling through the green bin program, as this data is not available even though recycling programs existed.
- Hazardous waste includes chemical waste, PCB, and biohazard waste.
- The numbers below do not include waste and recycling from the University of Waterloo's annual Canada Day celebration.

Methodology: Information was collected according to the following methods:

- Campus Compost weighs all organics placed in the tumbler.
- Garbage, hazardous waste, cardboard, batteries, scrap metal, paper, light bulbs, and e-waste numbers are all based on weigh bills provided by the respective service provider.
- Garbage at the Stratford, Kitchener, and Cambridge campuses do not receive weigh bills, but the hauler supplies an industry standard for weight per cubic yard, which is multiplied against the number of bin pickups. This is included in the aggregate garbage total for 2016, but was absent in previous years.
- Containers and mixed papers recycling is based on bin counts conducted by Custodial Services and Residence Cleaning Services. Staff develop weekly reports of the number and fullness of recycling bins that have been placed out for collection, which are multiplied by average weights for those bins. Numbers for 2016 were extrapolated for the full year after bin counting began on main campus (Winter term) and in Residences (Spring term). There is a wide range of uncertainty in this methodology, but it does provide a better picture of recycling activity.
- Scrap untreated wood and brush are processed into mulch on North Campus and reused in gardens. To estimate weight, staff conducted a visual inspection of the approximate number of cubic yards of wood and brush collected, and third-party auditors retained by the University to conduct its annual waste audit multiplied this against industry standards for weight. There is a wide range of uncertainty in this methodology.
- Yard waste such as grass clippings and leaves is processed in compost windrows on North Campus and reused in gardens. To estimate weight, staff conducted a visual inspection of the approximate number of cubic yards of yard waste collected, and third-party auditors retained by the University to conduct its annual waste audit multiplied this against industry standards for weight. There is a wide range of uncertainty in this methodology.

All values in kilograms unless noted

WASTE STREAM	2010	2011	2012	2013	2014	2015	2016
Waste to landfill	2,567,370.00	2,686,130.00	2,743,180.00	2,878,750.00	2,590,550.00	2,857,030.00	2,948,200.00
Other Solid Waste (concrete, tires)	–	–	–	–	–	5,142.83	98,800.00
TOTAL LANDFILLED	**2,567,370.00**	**2,686,130.00**	**2,743,180.00**	**2,878,750.00**	**2,590,550.00**	**2,862,172.83**	**3,047,000.00**
Landfill Intensity per capita	73.80	74.30	73.98	75.15	67.07	73.17	75.51
Scrap wood and brush	–	–	–	–	–	–	*1,030,900.00*
Cardboard recycled	277,760.00	377,610.00	377,120.00	418,780.00	440,680.00	362,830.00	401,730.00
Yard Waste	–	–	–	–	–	–	*227,300.00*
Blue bin recycling	–	–	–	–	–	–	*183,844.40*
Paper recycled	153,370.00	118,750.00	132,680.00	113,040.00	116,040.00	101,060.00	95,100.00
Metal Recycling	–	–	–	48,216.87	59,311.74	63,947.45	84,449.83
Electronics recycling	52,580.04	17,398.46	54,760.00	38,834.81	34,099.30	72,276.00	22,946.36
Campus Compost	–	–	–	–	907.19	663.00	959.00
Batteries recycled	–	–	–	3,740.00	3,673.00	5,080.00	6,656.00
Light bulbs recycled	–	–	–	1,692.00	1,692.00	2,647.70	3,640.80
Total Diverted	**330,340.04**	**395,008.46**	**431,880.00**	**511,263.68**	**540,363.22**	**507,444.15**	**2,146,270.79**
Diversion Intensity per capita	9.50	10.93	11.65	13.35	13.99	12.97	53.19
SOLID NON-HAZARDOUS DIVERSION RATE	**-**	**-**	**-**	**-**	**-**	**-**	**41.33%**
Hazardous Waste (PCB, Bio-waste, Chemical Waste)	13,756.00	16,706.00	14,955.00	15,330.00	15,827.00	15,268.00	17,002.00
Hazardous Waste — Liquid Chemical (L)	2,286.00	35,195.00	37,787.00	39,631.00	28,000.00	31,856.00	37,986.00

Explanation of changes: Change in the amount of waste being diverted was due to the University establishing tracking over additional streams of waste, such as yard waste, scrap wood and brush, blue bin recycling, and scrap metal. "Other Solid Waste" had been underreported in previous years, but is corrected in 2016 based on supplementary waste bins provided for site-specific needs, such as demolition waste, concrete, or miscellaneous waste from research. Similarly, garbage weights from Stratford, Cambridge, and Kitchener campuses are underreported prior to 2016 due to lack of information.

C5 – Transportation

Scope: 2010-2016

Boundary: All University of Waterloo.

Methodology: A survey was hosted through the TravelWise program and promoted to all employees in the fall to avoid biasing summer or winter weather conditions. Employees were asked to select their primary mode of transportation, as well as describe the mode of transportation used while commuting to the University over the past week. The 2016 survey received 692 employee responses, creating a strong sample (approximately 3.5 per cent confidence interval at 95 per cent level of confidence).

PERCENT OF EMPLOYEE TRIPS BY MODE OF TRAVEL

VALUES	2012	2013	2014	2015	2016
Drive Alone	56%	56%	50%	57%	52%
Carpooling	9%	15%	16%	14%	15%
Walking	14%	8%	11%	10%	9%
Transit	9%	11%	11%	9%	8%
Cycling	10%	6%	7%	8%	9%
Work from home	2%	3%	4%	2%	6%
Other	1%	1%	1%	0%	1%

Explanation of changes:
2016 saw a much larger number of employees indicate that they worked from home during the survey period. This is not driven by any policy changes and is likely part of annual fluctuations in the survey reporting period, not indicative of a sustained underlying shift in travel patterns.

C6 – Grounds

Boundary: All campuses, excluding Affiliated and Federated Institutions of Waterloo.

Limitations and exclusions: Does not include privately managed property (i.e. agricultural fields, Research and Technology Park businesses) not managed by the University of Waterloo.

Methodology: Operations staff evaluated whether University grounds met the following criteria, as presented by the Sustainability Tracking, Assessment, and Rating System Version 2.0:

INTEGRATED PEST MANAGEMENT (IPM):

- Uses least-toxic chemical pesticides
- Minimizes use of chemicals, and
- Use of chemicals only in targeted locations and only for targeted species

SUSTAINABLE LANDSCAPE MANAGEMENT:

- Integrated Pest Management
- Plant stewardship – protecting and using existing vegetation (e.g. through the use of a tree care plan), using native and ecologically appropriate plants, and controlling and managing invasive species
- Soil stewardship – organic soils management practices that restore and/or maintain a natural nutrient cycle and limit the use of inorganic fertilizers and chemicals
- Use of environmentally preferable materials – utilizing reused, recycled and local and sustainably produced landscape materials
- Hydrology and water use – restoring and/or maintaining the integrity of the natural hydrology by promoting water infiltration, minimizing or eliminating the use of potable water for irrigation, and protecting/restoring riparian, wetland, and shoreline habitats and lost streams
- Materials management and waste minimization – composting and/or mulching waste from groundskeeping, including grass trimmings
- Snow and ice management – implementing technologies or strategies to reduce the environmental impacts of snow and ice removal

It was determined that all grounds were managed according to the criteria of Integrated Pest Management. Many, but not all, of the criteria for Sustainable Landscape Management were met.

C7 – Food

FAIR TRADE

Scope: 2014-2016

Boundary: All campuses, excluding Affiliated and Federated Institutions of Waterloo.

Limitations and exclusions: Fair trade statistic does not include student-run coffee and donut shops, International News, or franchise locations. Information is not currently available for these locations.

Methodology: Information on fair trade purchases from Food Services is based on the per cent of all hot beverage products — including coffee, tea, and hot chocolate — that have Fairtrade certification. Percentage is based on dollar value of the purchases between Food Services and the vendor. Almost all coffee purchased through Food Services is now Fairtrade certified. Fairtrade Campus designation requires that all coffee served be Fairtrade certified, at least three Fairtrade certified teas be available wherever tea is served, and at least one Fairtrade certified chocolate bar be available at all locations selling chocolate bars. Since Food Services still provides some non-Fairtrade certified teas in addition to the three required teas, the total Fairtrade certified amount has not reached 100 per cent even though the campus is positioned well for a Fairtrade Campus designation.

	2014	2015	2016
Fairtrade certified hot beverages	66%	79%	84%

LOCAL FOOD

Scope: 2014-2016

Boundary: All campuses, excluding Affiliated and Federated Institutions of Waterloo.

Limitations and exclusions: Local food statistic does not include student-run coffee and donut shops, International News, or franchise locations.

Methodology: Local food purchases is based on the percentage of total food purchases that have the Foodland Ontario designation. Percentage is based on dollar value of the purchases between Food Services and the vendor. Note that this is different than the STARS definition of being within 250 miles, although there is a strong overlap since the majority of agricultural land in Ontario is within this limit. In 2016, Food Services expanded the number of product categories being counted (for example, pop) as part of this number to better align with STARS criteria.

	2014	2015	2016
Local food purchases	13.5%	18%	16.1%

Explanation of changes: Although overall local food purchasing did not decrease, Food Services classified against a greater number of products, which caused the relative percentage of local food to decrease.

C8 – Purchasing

Scope: 2014-2016

Boundary: All University of Waterloo, excluding Affiliated and Federated Institutions of Waterloo

Limitations and exclusions:

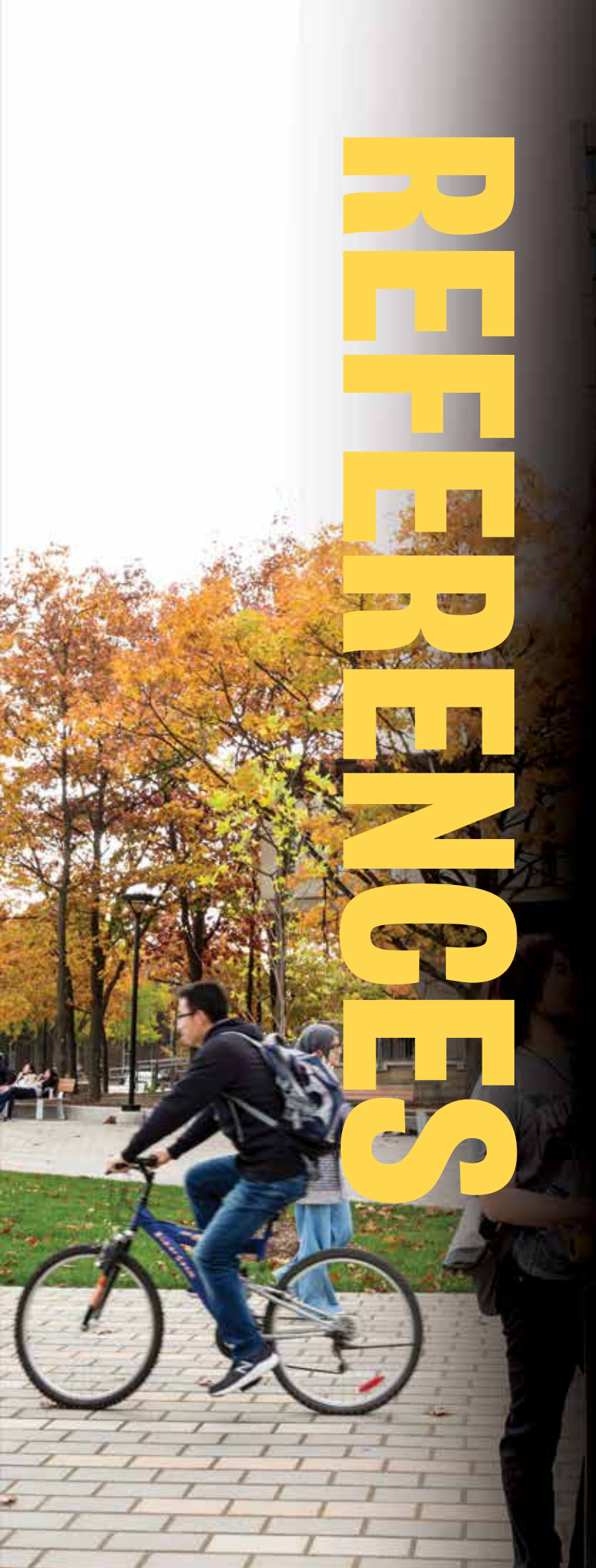
- This does not include paper purchased and used by students, or through on-campus services such as Retail Services
- Paper purchases through Staples were not included in 2014 due to lack of data availability.
- Office departments that purchase paper from a supplier other than Staples or Procurement and Contract Services are not included in 2014 or 2016, as no tracking systems or information are available
- Information for 2015 was not available

Methodology: STARS criteria for paper classifications were given to Waterloo's main paper supplier, who provided a breakdown of which overall paper purchases that fit within each recycling tier. Staples also provided information for all paper products purchased on University of Waterloo accounts from departments around campus, which were evaluated against the same criteria.

	2014	2016
0–9% recycled content	75.1%	53.2%
10–29% recycled content	–	3%
30–49% recycled content	10%	29.9%
50–69% recycled content	12.6%	–
70–89% recycled content	–	–
90–100% recycled content	2.3%	4.4%
FSC certified only	–	9.5%

Explanation of changes:

In 2016, new information from Staples increased the amount of paper purchases included in the total. While this inclusion only increased total paper purchases by 12%, many departments do purchase FSC certified paper, which caused an increase in the FSC certified only category.



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