2015

University of Waterloo

environmental sustainability report

Published September 2016

UNIVERSITY OF WATERLOO

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PRESIDENT'S ADVISORY COMMITTEE ON ENVIRONMENTAL SUSTAINABILITY, UNIVERSITY OF WATERLOO

The past year has been significant for sustainable development.

In September 2015, the United Nations adopted the 17 Sustainable Development Goals, with 169 imbedded targets to meet by 2030. In December, 195 countries agreed to the first universal and partially legally binding climate change agreement in Paris, committing to limit global warming to 2 degrees Celsius above pre-industrial levels and an aspirational goal of 1.5 degrees Celsius.

In Canada, there are renewed efforts at various levels of government to tackle climate change and other pressing environmental challenges. In Waterloo Region and across Ontario, growing networks of organizations are striving to become more sustainable.

Momentum is growing on campus as well. In 2015, the University of Waterloo formed the President's Advisory Committee on Environmental Sustainability to provide recommendations on the next steps for campus sustainability. The 2014 Environmental Sustainability Report from the Committee provided an overview of Waterloo's progress over the past five years.

This report is an annual update that summarizes the efforts of many individuals across the University. It focuses primarily on case studies from each impact area, with all data in the appendices.

From student groups to operations staff to dedicated researchers, members of the campus community are striving to make the University a more environmentally sustainable place to live, work, and study. This can be seen in the efforts of facilities staff to install high-efficiency light fixtures and to introduce new waste tracking systems. It appears in the consultations on a Green Office program and the feedback received at Waterloo's second-annual Eco-Summit. It is embodied in Waterloo's research on environmental sustainability topics and the opportunities for students to integrate environmental sustainability into coursework, degrees, and their careers.

A growing campus, however, presents challenges, and some indicators are trending in the wrong direction. It will require concerted, co-ordinated, and innovative planning to reduce our footprint while expanding our positive impact through teaching and research.

To achieve this, the Advisory Committee has created a draft Environmental Sustainability Policy that will serve as a foundation within the University community. This policy was proposed for adoption in 2016. The Committee also struck Academic, Operations, and Engagement Working Groups to gather a larger set of campus stakeholders to provide input towards the development of an Environmental Sustainability Strategy.

The policy and strategy will require support from across the University community in the coming months and years.

highlights

508 *courses related to environmental sustainability*

239 *faculty members conducting research related to environmental sustainability*

-11% *decrease in carbon emissions per square metre since 2010*

+20% *increase in Fairtrade certified hot beverage purchases since 2014*

-21% *decrease in water use per square metre since 2010*

about the report

By definition, sustainability means maintaining the integrated health of the environment, society, and economy for today and into the future.

The 2015 Environmental Sustainability Report highlights the University's progress on a number of environmental indicators. While the report focuses on the environmental sphere, it recognizes that there are mutually reinforcing connections with financial and social sustainability. Usage of the term "sustainability" throughout the report, however, will be focused on environmental sustainability for purposes of brevity.

about Waterloo

In just half a century, the University of Waterloo, located at the heart of Canada's technology hub, has become a leading comprehensive university with nearly 36,000 full- and part-time students in undergraduate and graduate programs.

Consistently ranked Canada's most innovative university, Waterloo is home to advanced research and teaching in science and engineering, mathematics and computer science, health, environment, arts and social sciences. From quantum computing and nanotechnology to clinical psychology and health sciences research, Waterloo brings ideas and brilliant minds together, inspiring innovations with real impact today and in the future.

As home to the world's largest post-secondary co-operative education program, Waterloo embraces its connections to the world and encourages enterprising partnerships in learning, research, and commercialization. With campuses and education centres on four continents, and academic partnerships spanning the globe, Waterloo is shaping the future of the planet.

	2010	2011	2012	2013	2014	2015
Employee and student population (FTE)	34,508	35,856	36,773	37,997	38,300	38,806
Floor area of building space (m^2)	605,953	631,823	676,439	679,513	693,399	701,737

teaching and learning

With over 500 related courses across 58 different programs, environmental sustainability is imbedded into many areas of Waterloo's curriculum.

SNAPSHOT

508
courses related to environmental sustainability

Change over time

- No change from 2014 report, as previous numbers were current as of 2015.
- 208 courses that focus on sustainability
- 300 courses that include sustainability

See Appendix A for full methodology.

HEALTH SKILLS FOR THE FUTURE

In December 2015, the School of Public Health and Health Systems at Waterloo joined 117 public health schools from around the world in a pledge to prepare students with the skills to address a new generation of public health challenges brought on by climate change. This effort, supported by the Obama administration's Health Educators Climate Commitment, encourages participating institutions to focus on how rising temperatures, extreme weather, shifting allergy seasons, food and water insecurity, and changes in the spread of infectious diseases create risks for which the next generation of health practitioners must be prepared. As part of its commitment, the School has added related curricula to its undergraduate and graduate programs.

SUSTAINABILITY IN PERFORMANCE

The Department of Drama and Speech Communication offered an exciting new course in Fall 2015. Sustainability in Performance (Drama 374) investigated how theatre, art, and activism can be profound tools for making change happen in society. Instructor Paul Cegys introduced students to perspectives of sustainability and how they merge with theories of society, economy, and ecology. Students creatively participated in two public performances based on the Paris climate change conference as a way of bringing greater awareness of climate change to the campus, and of obtaining a more nuanced understanding of the complexities of international governance regimes.

COP21

In December of 2015, 12 Faculty of Environment students, faculty, and staff travelled to Paris, France as delegates to the "COP21" United Nations climate change summit. The University of Waterloo delegation included three graduate students, two undergraduates, and two faculty/staff advisors, while one undergraduate and four graduate students participated as party delegates in support of the governments of the Republic of Kiribati and the Seychelles. The effort was supported by many student volunteers who led events and communication efforts at home during the summit.

research

Waterloo's 11 sustainability-related interdisciplinary research institutes are contributing innovative research to tackle local and global sustainability challenges.

SNAPSHOT

239 *faculty members* ***conducting research*** *related to environmental sustainability*

Change over time

- No change from 2014 report, as previous numbers were current as of 2015.
- Percent of total researchers: **19.7%**

See Appendix A for full methodology.

AFFORDABLE ENERGY FOR HUMANITY

The Affordable Energy for Humanity (AE4H) initiative launched in 2015 to address the challenges of building a sustainable energy future while eliminating energy poverty for the nearly 2.5 billion people without reliable access to electricity or basic energy services. Founded by the University of Waterloo, the Waterloo Institute for Sustainable Energy, and the Karlsruhe Institute of Technology, AE4H is an emerging international collaboration between the world's leading scientists, technology developers, and practitioners on the topic of universal energy access.

» See more at **ae4h.org**

POWERING LOW-CARBON MOBILITY

Slow advances in battery technology have hindered electric vehicles from playing a crucial role in the decarbonisation of the transportation sector. To fill this gap, researchers from the Waterloo Institute for Sustainable Energy, Waterloo Centre for Automotive Research, and Waterloo Institute for Nanotechnology are developing the next generation of energy storage. Advances include new silicon battery technology to extend the range of lithium-ion batteries by 40 to 60 percent, lithium-sulphur batteries that can theoretical last three times as long as lithium-ion, and reusing electric vehicle batteries for grid storage or other applications once they can no longer be used for cars.

» See more at **uwaterloo.ca/stories/research/automotive**

ADAPTING TO A CHANGING CLIMATE

Researchers at Waterloo continue to mobilize knowledge to help communities across Canada deal with the impacts of extreme weather from climate change. In 2015, Partners for Action worked with 18 Ontario municipalities, two First Nations communities, and 15 Conservation Authorities to evaluate flood preparedness. The Intact Centre on Climate Adaptation also launched in 2015, with programs for homeowners, businesses, and communities to identify and manage extreme weather risks. Closer to home, researchers from the Interdisciplinary Centre on Climate Change worked with Waterloo Region municipalities to translate global climate models into localized projections.

» See more at **uwaterloo.ca/climate-centre**

UNDERSTANDING INVASION

In 2015, the Faculty of Science hosted the TD Walter Bean Lecture in the Environment featuring Dr. Tom Stohlgren, Director of the National Institute of Invasive Species. As part of Dr. Stohlgren's visiting professorship, Waterloo researchers presented their work on predicting, assessing and mitigating the impact of invasive species including the bloody red shrimp, ancient red algae, 15-foot tall wetland reeds, and infamous zebra mussels that are quickly spreading across Canadian ecosystems. Innovations in handling invasive species included new software to model and predict the spread of species and alternative approaches to conservation and restoration projects.

» See more at **uwaterloo.ca/science/research/research-spotlight-invasive-species**

energy

Waterloo's energy use continues to grow. New research facilities, office spaces, and an increasing technology footprint continue to drive energy consumption. Increasing effort by all will be needed to conserve energy.

SNAPSHOT

1.62

(Intensity)
***Gigajoules** per square metre*

Intensity, per square metre

- Change from 2014: **+5%**
- Change from 2010: **+14%**

Absolute

- Total energy use: **1,131,990 GJ**
- Change from 2014: **+6%**
- Change from 2010: **+33%**

See Appendix A for full methodology.

LIGHTING THE WAY

Plant Operations led two major lighting retrofits in 2015, replacing old and inefficient bulbs in Engineering and on East Campus with more efficient bulbs and ballasts. Combined, these two retrofits reduced energy consumption by an estimated 463,000 kilowatt-hours, enough to power approximately 51 average Ontario homes for an entire year.[1]

[1] *Based on average household electricity consumption in Ontario of 37.1 gigajoules (8,805kWh). See Statistics Canada (2013).*

climate change

Waterloo's total carbon emissions increased in 2015 after dropping slightly in 2014, driven by an increase in natural gas to heat campus buildings. On an intensity basis, Waterloo's 2015 emissions remain 11% lower per square metre and 8.6% lower per capita compared to 2010 due to provincial grid changes.

SNAPSHOT

60.35 CO_2

(Intensity)
Kilograms *CO_2eq per square metre*

Intensity, per square metre

» Change from 2014: **+5.5%**
» Change from 2010: **-11%**

Intensity, per capita

» Change from 2014: **+4.1%**
» Change from 2010: **-8.6%**

Absolute

» Total emissions: **42,355,696 kg**
» Change from 2014: **+5.5%**
» Change from 2010: **+2.7%**

See Appendix A for full methodology.

EMISSIONS FACTOR UPDATE

Waterloo uses the average Ontario emissions per kilowatt hour listed in Canada's annual National Inventory Report to calculate emissions from electricity in Ontario. As a result of the latest update for 2013 and 2014, Waterloo's emissions were lower than previously reported and have been adjusted in the appendix.

R&T PARK WINS ROOKIE OF THE YEAR

After joining the Regional Carbon Initiative in 2014, tenant companies from the David Johnston Research and Technology Park worked collaboratively to compile data and develop a baseline emissions inventory for all buildings. For these efforts, the Park was awarded the Regional Carbon Initiative "Rookie of the Year" award. Park tenants further committed in 2016 to reduce their combined emissions intensity by 40% per employee by 2024.

waste

After a slight decrease in 2014, Waterloo's waste footprint increased in 2015. There has been very minor change in waste sent to landfill since 2010 on a per-capita basis, indicating a need for further engagement and support.

SNAPSHOT

73.2

(Intensity)
***Kilograms** of landfill waste per capita*

Intensity, waste to landfill per capita

- Change from 2014: **+9.1%**
- Change from 2010: **-0.9%**

Absolute

- Total waste to landfill: **2,857 tonnes**
- Change from 2014: **+10.3%**
- Change from 2010: **+11.3%**

See Appendix A for full methodology.

COMPOST COW

Campus Compost secured funding for their second compost tumbler, nicknamed the "compost cows." This allowed the student group to double their collection capacity in 2015 and expand composting into more areas of campus. Put too much on your plate? Have leftover napkins and paper plates? The cows will take almost anything that goes into your green bin at home!

KEEPING TRACK

In late 2015, Custodial Services devised a new system to track blue bin recycling across campus. Custodial staff worked with Central Stores to find average weights of blue paper and containers bins around campus and began tracking the number of bins placed out for collection. This will help fill a big gap in Waterloo's waste reporting for future years. The tracking started in Winter 2016, and is also being rolled out to Residences.

water

Waterloo's total water consumption increased slightly in 2015, but it has dropped significantly since 2013 on an intensity basis. This is excellent progress that can be built upon in the future.

REEP STORMWATER MANAGEMENT ENGAGEMENT AWARD

The University of Waterloo was the recipient of the 2015 Stormwater Management Community Engagement Award from REEP Green Solutions. This award recognized efforts to integrate stormwater management practices and increase awareness of stormwater management. Waterloo has five green roof installations on campus, three permeable pavement sites, a rainwater harvesting system in Environment 3, and multiple course offerings related to stormwater management and water infrastructure.

SNAPSHOT

14.13

(Intensity)
***Metres** cubed of water per capita*

Intensity, per capita

- Change from 2014: **+1%**
- Change from 2010: **-19%**

Intensity, per square metre

- Change from 2014: **+1%**
- Change from 2010: **-21%**

Absolute

- Total water used: **548,138 m³**
- Change from 2014: **+2%**
- Change from 2010: **-9%**

See Appendix A for full methodology.

transportation

2015 saw a slight decrease in employees travelling sustainably to campus, but Waterloo remains a hub of sustainable travel in the region with a significant number of transit, carpooling, walking, and cycling trips.

SNAPSHOT

43%

***Employee trips** by walking, cycling, taking transit or carpooling*

Change over time

» Change from 2014: **-7%**
» Change from 2012: **-1%**

See Appendix A for full methodology.

BIKE MONTH

The University geared up for summer by participating in the region-wide Bike Month campaign throughout June. Waterloo hosted a Bike Breakfast that drew out over 100 cyclists for free food and bike tune ups, and 110 staff and students joined the month-long Bike Challenge on campus. Waterloo topped the community leaderboard for participation!

grounds

Waterloo's campus is managed by integrated pest management principles that eliminate all chemical pesticides except where absolutely needed.

SNAPSHOT

100%

*South Campus grounds managed by **Integrated Pest Management***

Change over time

- Change from 2014: **0%**
- Change from 2010: **0%**

See Appendix A for full methodology.

UNIVERSITY ADVANCES SOUTH COMMONS REDEVELOPMENT

In 2015 the University hosted consultations on the South Commons redevelopment project. The South Commons is envisioned as an improvement to the green space between the Dana Porter Library, South Campus Hall, the Grad House, and the Tatham Centre. When completed, the project will become a new pedestrian-friendly entrance through the south of campus, provide outdoor seating areas, and offer improved bicycle parking.

ARTS-ENVIRONMENT GARDENS EXPAND

In 2015, the Arts-Environment Gardens expanded its newest plot thanks to funding from the Graduate Studies Endowment Fund. Located between Hagey Hall, Environment 1, and the Psychology building, the Gardens feature several themed areas that are cared for using sustainable practices and that feature non-invasive and drought-tolerant species. The "Wind Garden" was added in 2015, featuring lilies and tall grasses that will sway with the breeze, and new signs were installed to educate visitors on the philosophy and design of the gardens.

food

Waterloo's food system includes a mix of University and student-run cafeterias, restaurants, and markets. Ensuring that food systems rely on local and sustainably sourced products, and that there are proper systems to manage food disposal can improve Waterloo's direct and indirect sustainability impacts.

SNAPSHOT

79%

Fairtrade certified hot beverage purchases

Change over time

» Change from 2014: **+20%**

See Appendix A for full methodology.

FAIR TRADE

Food Services, Engineers Without Borders, and Sustainable Campus Initiative continued their progress to transition coffee and tea purchases to Fairtrade certified products. By the end of 2015, Food Services successfully sourced 100% of its coffee purchases from Fairtrade certified vendors in all non-franchise locations. All Food Services locations now include a Fair Trade tea and chocolate item, moving the campus closer to the Fair Trade Campus designation.

SNAPSHOT

18%

Food Services total purchases from local suppliers

Change over time

» Change from 2014: **+33%**

See Appendix A for full methodology.

UW CAMPUS MARKET GARDEN

The St. Paul's Community Garden rebranded in 2015 to become the UW Campus Market Garden. The student gardeners expanded production thanks to a generous donation of an additional quarter-acre of space at Steckle Heritage Farms and support from Plant Operations for a plot on North Campus. The team also engaged students in workshops on how to make canned salsa, can their own goods, and launched a weekly farmer's market in Environment 3.

NURTURING A SUSTAINABLE FOOD SYSTEM

Food Services has taken key steps across all aspects of food production through disposal. Kitchen staff have grown herbs and produce next to the University Club for three years, for use in seasonal menus and for sauces, preserves, and salsas throughout the year. The garden expanded to include fruit trees in 2015. Food Services also works with many local suppliers to reduce the transportation impacts of food production and support local industry, and launched the Farmer to Chef station in the Southside Market to utilize fresh local produce from the Elmira Produce Auction Cooperative. Food Services has expanded the available vegetarian and vegan options, which have a lower environmental footprint than meat-based options. Through improved packaging and piloting of a green bin collection system for kitchens, Food Services has also reduced the waste impact of dining at Waterloo.

student engagement

Waterloo has 13 student groups that provide opportunities for involvement in campus, community, and global environmental sustainability efforts.

EARTH HOUR

Sustainable Campus Initiative hosted an Earth Hour event in the Village 1 Great Hall to raise awareness about energy conservation and sustainability on campus. About 80 students participated in activities including plant potting, fair trade hazelnut spread making, do-it yourself crafts, and eco-trivia. Food and prizes were given out throughout the night.

ECOLOO

Sustainable Campus Initiative also ran ECOLOO in Fall 2015 to bring together campus and community groups that are engaging in sustainability. The event drew out approximately 270 students and included a vendor-style interaction with undergraduate students and the different sustainability groups, and a new competition for undergraduate students to pitch their sustainability ideas to a panel of judges. Free food and prizes were awarded to some students who visited all vendor booths at the event!

FORMULA HYBRID WINS FIRST PLACE

In 2015, Waterloo's Formula Hybrid race car team placed first in the annual Formula Hybrid International Competition. Competing against 27 other university teams from around the world, the Waterloo team took the top award and set an all-time record of 33 laps in the endurance category. Weight reduction technologies and battery advancements were two key factors that helped the team win.

WPIRG COMMUNITY GARDENS

Waterloo Public Interest Research Group (WPIRG) operates a longstanding community garden on North Campus. This budding community project has a lot to offer students who wish to grow their own food and learn the science and experience rewards of gardening. The garden is located in a park-like setting on the University's Environmental Reserve, with views of Columbia Lake, and is a wonderful place for students to understand their connection to the natural environment.

employee engagement

Many employees at Waterloo care deeply about improving the environmental footprint of the campus, and have taken efforts in their own departments to reduce their impact.

GREEN OFFICE CONSULTATIONS

Several units came together in Fall 2015 to discuss the development of a new department-based program to engage staff and faculty. These stakeholders provided input on the type of programming, resources, and coaching that could help individual departments demonstrate leadership in their day-to-day operations. The consultations resulted in the launch of the Green Office program in January 2016. Whether it is displaying proper signs to sort waste, providing reminders to turn off lights and electronic equipment, or using a green checklist to help plan events, Green Office ambassadors are already helping their colleagues work more sustainably on campus.

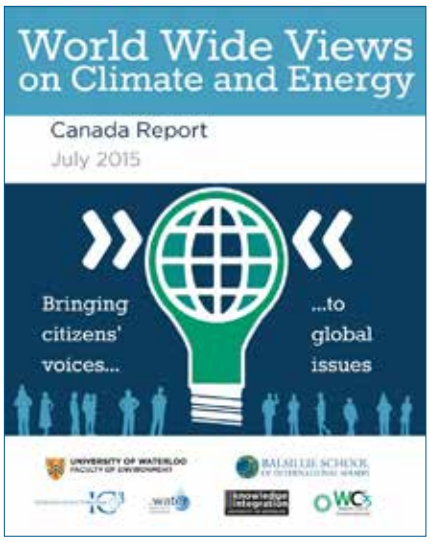
» See more at **uwaterloo.ca/sustainability/go**

community engagement

Environmental sustainability is an important pillar of Waterloo's relationship with the community. By leveraging its research expertise, student passion, and employee enthusiasm, Waterloo not only improves its own footprint, but can be a positive force for change in the places where employees and students live, work, and learn.

EARTH WEEK

As part of Waterloo's Earth Week activities, the University partnered with Waterloo Public Library to host a public lecture on climate change. Members of the community heard about the core science behind climate change, the impacts that it is already having in terms of extreme weather, and the momentum behind local and global action. Teams of students and staff also joined the City of Waterloo's Community Clean-up to tidy around Laurel Creek and the Laurel Trail.



WORLD WIDE VIEWS ON CLIMATE AND ENERGY

Waterloo's Interdisciplinary Centre on Climate Change and the Balsillie School of International Affairs led one of two Canadian sessions of the World Wide Views on Climate and Energy consultations. These were the largest-ever global citizen discussions on climate and energy issues, with over 10,000 participants from 76 countries. The results from 211 Canadian participants echo the strong global support for international climate action.

» See the infographic and findings at **uwaterloo.ca/climate-centre/wwv**

ELECTRIC VEHICLE CHALLENGE

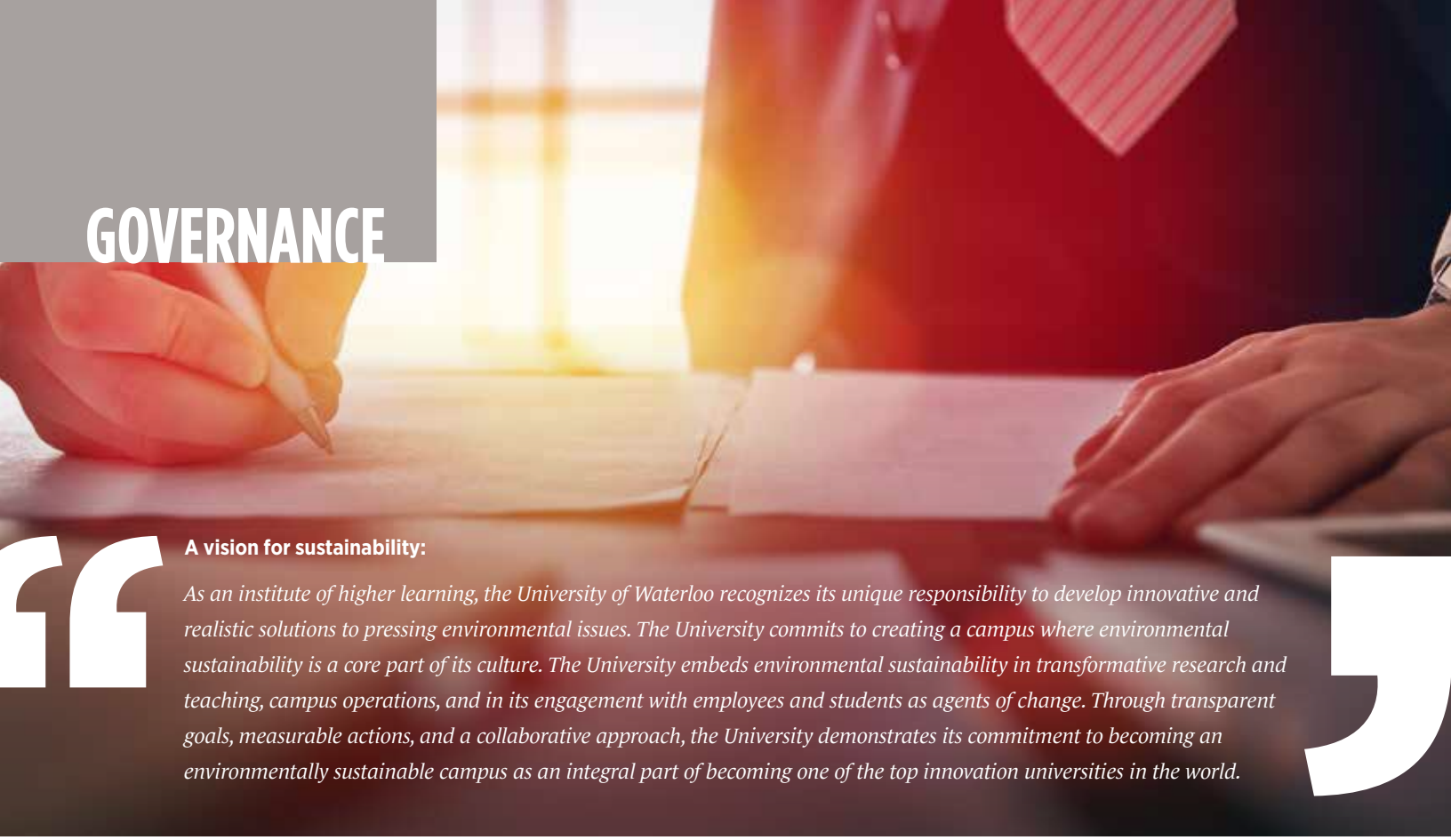
In 2012, the University of Waterloo launched the Electric Vehicle Challenge for high school students. Student teams from across Ontario design and build fully electric vehicles and compete against each other in an endurance race, gaining hands-on technical experience, design skills, and an appreciation for sustainable mobility. In 2015, the race expanded to include a fall event so that student teams could test progress on their designs from the start of the year.

» Learn more at **uwaterloo.ca/electric-vehicle-challenge/**

WATER EDUCATION IN THE COMMUNITY

How big is your water footprint? Waterloo's Earth Sciences Museum and the Students of the Water Institute Graduate Section partnered with the Waterloo Region Museum to create two displays for the Ocean Bound! exhibit highlighting personal water use and the large amount of waste from water bottles. The exhibit was open from January through May. The Students of the Water Institute Graduate Section created sculptures of sea animals made of water bottles to highlight the increasing amount of human garbage in the oceans. The Earth Sciences Museum built a giant pop bottle machine to help visualize the importance of water conservation. Afterwards, the museum loaned the display to the Waterloo Wellington Children's Groundwater Festival, attended by over 5,000 Waterloo Region and Wellington County school children.

GOVERNANCE



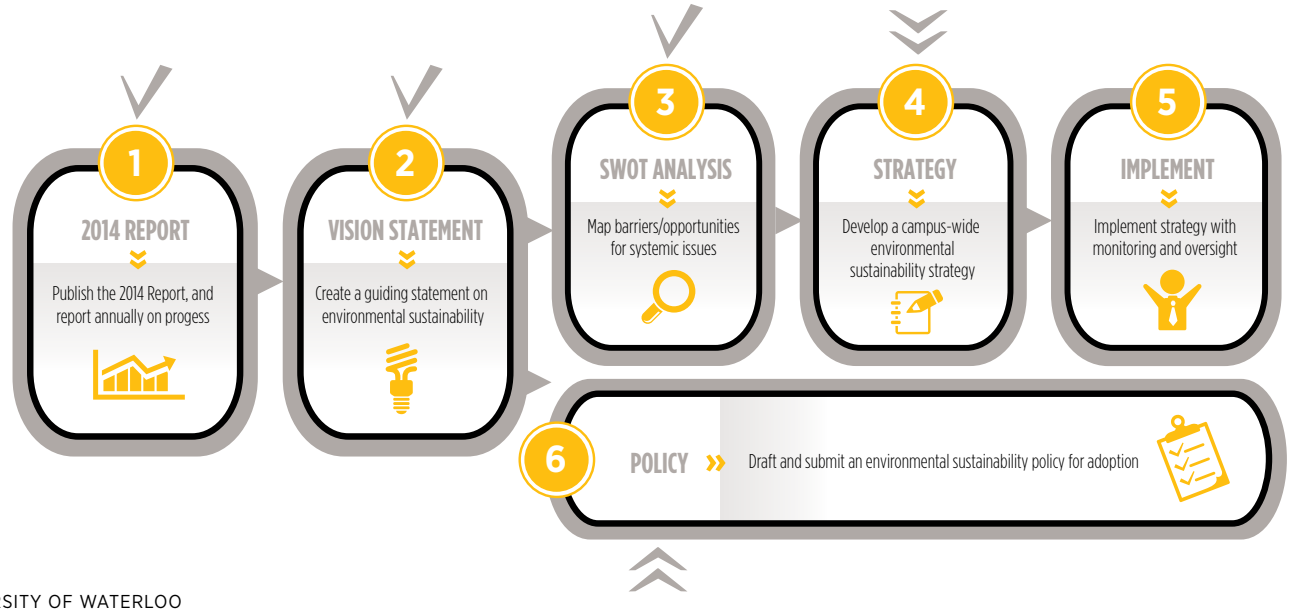
A vision for sustainability:

As an institute of higher learning, the University of Waterloo recognizes its unique responsibility to develop innovative and realistic solutions to pressing environmental issues. The University commits to creating a campus where environmental sustainability is a core part of its culture. The University embeds environmental sustainability in transformative research and teaching, campus operations, and in its engagement with employees and students as agents of change. Through transparent goals, measurable actions, and a collaborative approach, the University demonstrates its commitment to becoming an environmentally sustainable campus as an integral part of becoming one of the top innovation universities in the world.

The projects and actions within this report are commendable, and the many members of the campus community involved are helping the University shift to a more sustainable future.

However, more is needed. Looking forward, the President's Advisory Committee on Environmental Sustainability will work to advance its draft Environmental Sustainability Policy as a foundation for further action. It will simultaneously continue to work in collaboration with its Working Groups and campus community members to develop an Environmental Sustainability Strategy that sets a framework for ambitious but achievable goals.

Students, staff, and faculty can look for opportunities to provide input on this strategy in Fall 2016.



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APPENDIX A

Where possible, the report uses the recommended methodology from the Sustainability Tracking, Assessment and Rating System (STARS), developed by the Association for the Advancement of Sustainability in Higher Education.

intensity metrics

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

PER-CAPITA

Scope: All University of Waterloo campuses.

Methodology: Staff and faculty full time equivalent data was provided by Human Resources. Full time equivalent student enrollment was provided by Institutional Analysis and Planning. Full-time faculty numbers were provided by Institutional Analysis and Planning.

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

**Staff counts from Federated and Affiliated Colleges were included in per-capita calculations for waste.*

PER SQUARE METRE

Scope: All University of Waterloo Campuses

Methodology: Utility data was unavailable for the TechTown building on North Campus in 2015, part of which is used for University activities and part of which is leased. To avoid skewing the data, the area for this building is also omitted.

TOTAL FLOOR AREA (M2)	2010	2011	2012	2013	2014	2015
University of Waterloo	605,952	631,822	676,439	679,512	693,399	701,737
Conrad Grebel	7,690	7,690	7,690	7,690	9,734	9,734
Renison	—	—	—	—	—	10,379
St. Jerome's	14,372	14,372	14,372	14,372	14,372	14,372
St. Paul's	12,684	13,613	13,613	13,613	13,613	13,613

teaching and learning

NOTE: *The 2014 Report drew on the 2015/2016 Academic Calendar, so there are no changes to courses and programs.*

COURSES

Scope: 2015/2016 Academic Calendar

Methodology: The count of environmental sustainability courses arose from a scan of publically available course descriptions on the current academic calendar. Since this report focuses mainly on environmental sustainability, the STARS criteria were modified according to the definitions below. Courses were analyzed on whether they focused specifically on environmental sustainability (or one of the major themes within sustainability), or whether their primary focus was on a topic other than environmental sustainability, but they included content or an application related to environmental sustainability.

Cross-listed courses were treated as one total course and were weighted equally across the departments (i.e., 0.5 allocated to Geography & 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.
- 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 analyze the number of courses and sections offered.

Definitions:

STARS criteria define a sustainability-focused course as one in which the "primary and explicit focus is on sustainability and/or understanding or solving one or more major sustainability challenge." However, they define sustainability along the more commonly-accepted and holistic integration of economic, social, and environmental wellbeing. Since this report focuses on environmental sustainability, it modified the definitions accordingly:

- **Sustainability-Focused Courses** are courses in which the primary or explicit focus is on environmental sustainability or a thematic area related to sustainability, including: climate change, energy, water, air pollution, waste, land use, conservation/biodiversity, transportation, food, and buildings. For example, this might include courses on Sustainable Agriculture, Climate Change Mitigation, or Conservation Biology.
- **Sustainability-Related Courses** are courses where the primary focus is on a topic other than sustainability, but where there are sustainability units, modules, case studies, or assignments related to sustainability. For example, this might include a planning course where the primary focus was on infrastructure development, but also covered environmental criteria; it may have also included a course where the focus was on aquatic chemistry, but which had applications for groundwater protection and pollution control.

FACULTY	FOCUS ON SUSTAINABILITY	INCLUDE SUSTAINABILITY	TOTAL
Applied Health Sciences	6	14	20
Arts	21	27	48
Engineering	17	68	85
Environment	149	133	282
Mathematics	—	1	1
Science	15	57	72
TOTAL	208	300	508

APPENDIX A

PROGRAMS

Scope: 2015/2016 Academic Calendar

Methodology: The list of undergraduate programs available at **universityofwaterloo.ca/find-out-more** and the list of graduate programs available at **gradcalendar.uwaterloo.ca/page/GSO-Grad-Programs** were used to identify all University of Waterloo programs. Sustainability-related programs were then identified based on program descriptions on individual department websites depending on whether they referenced sustainability, environmental protection, or understanding or solving of a sustainability-related challenge.

Limitations and Exclusions:

» Many programs could be tailored or specialized to focus on a topic related to sustainability, but these were not included unless it was identified explicitly as a theme, option, stream, or application. As such, it is likely that there is an underreporting of student learning within other programs that are not counted here.

Definitions:

Since this report focuses mainly on environmental sustainability, it was more difficult to apply STARS criteria, which looks at Sustainability-Focused Programs as "interdisciplinary academic programs that concentrate on sustainability as an integrated concept, including its social, economic, and environmental dimensions." Furthermore, the STARS definition does not adequately capture the full breadth of activity that happens from a scientific and technological perspective at the University of Waterloo, with applications towards sustainability themes. As such, the definition adopted here is broader and more inclusive than would be reported through STARS:

» **Sustainability Program** is any program focused on environmental sustainability or a sustainability theme (climate change, energy, water, air pollution, waste, land use, conservation/biodiversity, transportation, food, or green buildings), or which has themes, options, streams, or applications related to sustainability.

FACULTY	UNDERGRAD	GRADUATE	PHD	DIPLOMA	TOTAL
Applied Health Sciences		1			1
Arts	1	2	1		4
Engineering	7	5	4	1	17
Environment	8	10	4	1	23
Mathematics	1	1	1		3
Science	4	3	3		10
Total	21	22	13	2	58

research

NOTE: *The 2014 Report drew on publically available profiles in 2015, so there are no changes to research profiles for the 2015 Report.*

Scope: All faculty, current information only

Methodology: The data was collected through a scan of publically available research profiles 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. conservation, 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 or PhD 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.

RESEARCH THEMATIC AREA	AHS	ARTS	ENG	ENV	MATH	SCI	TOTAL
Climate Change	2	4	13	28	2	14	63
Water	1	1	17	14	4	25	62
Energy		1	34	5	2	6	48
Land Use	5	3	11	21		5	45
Transportation			20	5			25
Biodiversity/ Conservation			2	10		9	21
Food	5		2	7		4	18
Waste			10	2		2	14
Buildings			4	3			7
Air Quality	1		2				3
Other Sustainability		9	7	16	1	2	35
Total	14	18	122	111	9	67	n/a

APPROACH/LENS	COUNT
Environmental Sciences	102
Technology	76
Policy/Governance	68
Social	55
Business/Economics	43
Health	9
Communications	8

APPENDIX A

energy

Boundary: All campuses, with Affiliated and Federated Institutions separated to the right.

Limitations and Exclusions: Billing was not available for the TechTown building on North Campus for 2015. It is expected that this will have a minor (<0.5% intensity-based difference) impact on the numbers below. Renison was unable to provide utility data for 2010-2014.

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. The resulting annual statistic was multiplied by the average degree days from 2010-2015 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 stripping out climatic drivers that are outside of the University's control.

ENERGY SOURCES	2010	2011	2012	2013	2014	2015
University of Waterloo						
Electricity (kWh)	98,960,234	106,342,165	112,486,202	115,625,012	115,530,674	122,637,268
Natural gas (m^3)	13,347,453	13,698,510	13,777,376	16,478,861	17,553,152	18,470,832
Electricity (GJ)	356,257	382,832	404,950	416,250	415,910	441,494
Natural Gas (GJ)	497,860	510,954	513,896	614,662	654,733	688,962
Total Energy (GJ)	854,117	893,786	918,846	1,030,912	1,070,643	1,130,456
Energy Intensity (GJ/m^2)	1.41	1.41	1.36	1.52	1.54	1.62
Weather Normalized Energy Intensity (nGJ/m^2)	1.47	1.42	1.51	1.46	1.40	1.61
Conrad Grebel						
Natural Gas (m^3)	164,358	169,328	154,195	199,966	204,126	172,737
Electricity (kWh)	844,579	856,478	830,056	838,633	1,017,351	1,048,290
Natural Gas (GJ)	6,130	6,315	5,751	7,458	7,613	6,443
Electricity (GJ)	3,040	3,083	2,988	3,019	3,662	3,773
Energy Intensity (GJ/m^2)	1.19	1.22	1.14	1.36	1.16	1.05
Weather Normalized Energy Intensity (nGJ/m^2)	1.25	1.23	1.26	1.31	1.05	1.04
Renison						
Natural Gas (m^3)	—	—	—	—	—	322,458
Electricity (kWh)	—	—	—	—	—	1,370,577
Natural Gas (GJ)	—	—	—	—	—	12,027
Electricity (GJ)	—	—	—	—	—	4,934
Energy Intensity (GJ/m^2)						1.63
Weather Normalized Energy Intensity (nGJ/m^2)						1.62
St. Jerome's						
Natural Gas (m^3)	253,237	273,378	246,530	268,174	311,237	284,365
Electricity (kWh)	1,554,039	1,614,937	1,516,031	1,522,308	1,531,805	1,503,989
Natural Gas (GJ)	9,445	10,197	9,195	10,002	11,609	10,606
Electricity (GJ)	5,594	5,813	5,457	5,480	5,514	5,414
Energy Intensity (GJ/m^2)	1.05	1.11	1.02	1.08	1.19	1.11
Weather Normalized Energy Intensity (nGJ/m^2)	1.09	1.12	1.13	1.04	1.08	1.11
St. Paul's						
Natural Gas (m^3)	183,773	177,073	183,417	200,258	215,077	197,636
Electricity (kWh)	988,074	1,044,080	1,042,905	1,028,593	994,622	975,019
Natural Gas (GJ)	6,854	6,604	6,841	7,469	8,022	7,371
Electricity (GJ)	3,557	3,758	3,754	3,702	3,580	3,510
Energy Intensity (GJ/m^2)	0.82	0.76	0.78	0.82	0.85	0.80
Weather Normalized Energy Intensity (nGJ/m^2)	0.86	0.77	0.87	0.79	0.77	0.79

	2010	2011	2012	2013	2014	2015
Cooling degree days	268	244	283	200	132	195
Heating degree days	3,851	4,031	3,586	4,263	4,624	4,145
Total degree days	4,119	4,275	3,869	4,463	4,756	4,340

APPENDIX A

climate change

Boundary: All campuses, with Affiliated and Federated Institutions separated to the right.

Limitations and Exclusions: Source data was not available for the TechTown building on North Campus for 2015. It is expected that this will have a minor (<0.5% intensity-based difference) impact on the numbers below. Renison was unable to provide source data for 2010-2014.

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 although they would be responsible for a portion of the waste generation.

Emissions Factors

ACTIVITY (KG CO_2EQ)	2010	2011	2012	2013	2014	2015	REFERENCE
Natural Gas (per m^3)*	1.89793	1.89793	1.89793	1.89793	1.89793	1.89793	NIR[1]
Fleet – Diesel (per L)*	2.74731	2.74731	2.74731	2.74731	2.74731	2.74731	NIR[1]
Fleet – Unleaded (per L)*	2.32551	2.32551	2.32551	2.32551	2.32551	2.32551	NIR[1]
Electricity (per kWh)	0.15000	0.11000	0.11000	0.08000	0.05000	0.0500	NIR[1]
T & D Losses (per kWh)**	0.02000	0.01600	0.01600	0.01400	0.00900	0.0090	NIR[1]
Waste (per kg)	0.19000	0.19000	0.19000	0.19000	0.19000	0.19000	SWR[2]
Water (per m^3)	0.08125	0.05875	0.05875	0.04813	0.04813	0.04813	SWR[2]

** Emission factors for natural gas and mobile combustion are changed slightly based on updated global warming potential values for Nitrous Oxide and Methane as recommended by the GHG Protocol based on the Intergovernmental Panel on Climate Change's 5th Assessment Report.*

***Reflects the loss in power between generation and consumption, and from sulfur hexaflouride and other emissions released at transformers and along distribution infrastructure.*

[1] Canada's National Inventory Report

[2] Sustainable Waterloo Region

EMISSIONS SOURCES (KG)	2010	2011	2012	2013	2014	2015
University of Waterloo						
Natural Gas Emissions	25,332,477	25,998,758	26,148,440	31,275,659	33,314,584	35,134,328
Fleet Emissions	510,225	502,669	474,123	509,699	532,051	520,290
Electricity Emissions	12,864,830	9,996,163	10,573,703	7,631,251	4,736,758	5,028,128
T & D Loss Emissions	1,979,205	1,701,475	1,799,779	1,618,750	1,039,776	1,103,735
Waste Emissions	487,800	510,365	521,204	546,963	492,205	542,836
Water Emissions	48,973	35,403	35,369	30,611	25,852	26,379
Total Emissions	41,223,511	38,744,833	39,552,619	41,612,932	40,141,225	42,355,696
Emissions Intensity (KG CO_2eq/m^2)	68.03	61.32	58.47	61.24	57.89	60.36
Emissions Intensity (KG CO_2eq/Capita)	1,194.61	1,080.57	1,075.59	1,095.16	1,048.07	1,091.47
Conrad Grebel						
Natural Gas Emissions	311,939	321,372	292,651	379,521	387,416	327,842
Fleet Emissions	—	—	—	—	—	—
Electricity Emissions	109,795	80,509	78,025	55,350	41,711	42,980
T & D Loss Emissions	16,892	13,704	13,281	11,741	9,156	9,435
Waste Emissions	—	—	—	—	—	—
Water Emissions	660	440	447	308	222	297
Total Emissions	439,286	416,025	384,403	446,920	438,506	380,554
Emissions Intensity (KG CO_2eq/m^2)	57.12	54.10	49.99	58.12	45.05	39.10
Renison						
Natural Gas Emissions	—	—	—	—	—	612,003
Fleet Emissions	—	—	—	—	—	—
Electricity Emissions	—	—	—	—	—	56,194
T & D Loss Emissions	—	—	—	—	—	12,335
Waste Emissions	—	—	—	—	—	—
Water Emissions	—	—	—	—	—	—
Total Emissions	—	—	—	—	—	680,531
Emissions Intensity (KG CO_2eq/m^2)	—	—	—	—	—	65.57
St. Jerome's						
Natural Gas Emissions	480,627	518,852	467,897	508,976	590,706	539,705
Fleet Emissions	—	—	—	—	—	—
Electricity Emissions	202,025	151,804	142,507	100,472	62,804	61,664
T & D Loss Emissions	31,081	25,839	24,256	21,312	13,786	13,536
Waste Emissions	—	—	—	—	—	—
Water Emissions	1,123	801	862	563	755	583
Total Emissions	714,856	697,296	635,523	631,323	668,051	615,487
Emissions Intensity (KG CO_2eq/m^2)	49.74	48.52	44.22	43.93	46.48	42.83
St. Paul's						
Natural Gas Emissions	348,789	336,073	348,112	380,076	408,202	375,100
Fleet Emissions	—	—	—	—	—	—
Electricity Emissions	128,450	98,144	98,033	67,887	40,780	39,976
T & D Loss Emissions	19,761	16,705	16,686	14,400	8,952	8,775
Waste Emissions	—	—	—	—	—	—
Water Emissions	1,570	910	961	872	868	849
Total Emissions	498,570	451,832	463,792	463,236	458,801	424,701
Emissions Intensity (KG CO_2eq/m^2)	39.31	33.19	34.07	34.03	33.70	31.20

APPENDIX A

waste

Boundary: All campuses, including Affiliated and Federated Institutions.

Limitations and Exclusions: Does not include information on mixed containers or paper recycling through the blue bin program, or organics recycling through the green bin program, as this data is not available. Hazardous waste includes chemical waste, printed circuit board, and biohazard waste.

Methodology: Campus Compost weighs all organics placed in the tumbler. All other totals are from weigh bills from the respective service provider.

WASTE STREAM (KG)	2010	2011	2012	2013	2014	2015
Waste to landfill	2,567,370	2,686,130	2,743,180	2,878,750	2,590,550	2,857,030
Other Solid Waste (concrete, tires)	—	—	—	—	—	5,142.83
Cardboard recycled	277,760	377,610	377,120	418,780	440,680	362,830
Fine paper recycled	153,370	118,750	132,680	113,040	116,040	101,060
Electronics recycling	52,580	17,398	54,760	38,834	34,099	72,276
Light bulbs recycled	—	—	—	1,692	1,692	2,647
Campus Compost	—	—	—	—	907	663
Batteries recycled	—	—	—	577	565	685
Other — Hazardous Waste*	13,756	16,706	14,955	15,330	15,827	15,268
TOTAL WASTE	3,064,836	3,216,594	3,322,695	3,467,003	3,200,360	3,417,602
TOTAL RECYCLED	483,710	513,758	564,560	572,923	593,983	540.161
LANDFILL PER CAPITA	73.80	74.30	73.98	75.15	67.07	73.17

** Hazardous waste is reported in this table for information purposes but is not included in the totals, as diversion rates are calculated on solid non-hazardous waste.*

water

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

Limitations and Exclusions: Source data was not available for the TechTown building on North Campus for 2015. It is expected that this will have a minor impact on the numbers below. Renison was unable to provide source data for 2010-2015.

Methodology: Source data was taken from annual billing.

WATER CONSUMPTION (M3)	2010	2011	2012	2013	2014	2015
University of Waterloo						
Total water use	602,747	602,603	602,031	636,070	537,193	548,130
Water Intensity (m^3/Capita)	17.47	16.81	16.37	16.74	14.03	14.13
Water Intensity (m^3 per m^2)	0.99	0.95	0.89	0.94	0.77	0.78
Conrad Grebel						
Total water use	8,118	7,489	7,601	6,409	4,614	6,172
Water Intensity (m^3 per m^2)	1.06	0.97	0.99	0.83	0.47	0.63
Renison						
Total water use	—	—	—	—	—	—
Water Intensity (m^3 per m^2)	—	—	—	—	—	—
St. Jerome's						
Total water use	13,822	13,633	14,674	11,695	15,685	12,124
Water Intensity (m^3 per m^2)	0.96	0.95	1.02	0.81	1.09	0.84
St. Paul's						
Total water use	19,320	15,490	16,350	18,127	18,040	17,649
Water Intensity (m^3 per m^2)	1.52	1.14	1.20	1.33	1.33	1.30

APPENDIX A

transportation

Boundary: All campuses, excluding Affiliated and Federated Institutions.

Limitations and Exclusions: Does not include any undergraduate or graduate student data. Does not include Affiliated and Federated Institutions.

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.

MODE OF TRANSPORTATION (EMPLOYEES ONLY)	2012	2013	2014	2015
Drive-alone	56%	56%	50%	57%
Transit	9%	11%	11%	9%
Walking	14%	8%	11%	10%
Carpooling	9%	15%	16%	14%
Cycling	10%	6%	7%	8%
Working from home	2%	3%	4%	2%
Other	1%	1%	1%	0%

grounds

Boundary: All campuses, excluding Affiliated and Federated Institutions.

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.

food

FAIR TRADE

Boundary: All campuses, excluding Affiliated and Federated Institutions.

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

Methodology: Data on Fair trade purchases from Food Services is based on the percent 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. As of December 2015, 100% of coffee purchases from Food Services were Fair trade certified.

HOT BEVERAGE PURCHASES	2014	2015
Fairtrade Certified	66%	79%
Not Fairtrade Certified	34%	21%

LOCAL FOOD

Boundary: All campuses, excluding Affiliated and Federated Institutions.

Limitations and Exclusions: Local food statistic does not include student-run coffee and donut shops, International News, or franchise locations. Data is not currently available for these locations. 68 out of 69 suppliers from Food Services operate out of the Greater Toronto Area and closer to Waterloo Region, but it is not possible to capture the origin of all their products. Thus, the actual local food may be higher.

Methodology: Local food purchases is based on the percentage of total food purchase 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 local and community-based, as it is unclear whether all Foodland Ontario vendors are community-based.

	2014	2015
Local food purchases	13.5%	18%

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