

TRENT

SUSTAINABILITY

Summer
2018

Trent University
will foster sustainability,
in its environmental, social
and economic dimensions,
on our campuses and in
all aspects of our work.



CELEBRATING SUCCESS,
SETTING DIRECTION



LAND ACKNOWLEDGEMENT

Trent University's Symons Campus is built in Nogojiwanong, within the Treaty and Traditional Territory of the Mississauga Anishinaabeg. We give thanks to the First Peoples for their care and teachings about our earth and our relations. We hope that the ideas in the forthcoming pages are a reflection of the traditional values of walking carefully on Mother Earth and acknowledging our place in the world. We are grateful for the opportunities First Peoples have brought to Trent to learn together, shaping an institution where interdisciplinary learning is central. The Trent Community is better for the continued enlightenment arising from this gift. Miigwetch.

ALL TRENT
STUDENTS WILL
TAKE A HALF
COURSE THAT
INCLUDES
INDIGENOUS
CONTENT.



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SUSTAINABILITY AT TRENT UNIVERSITY

CELEBRATING SUCCESS, SETTING DIRECTION

Trent University is rooted in sustainability; in its studies, research and action. As Trent continues to foster world-renowned teaching and research in this field we also continue to align campus operations to the values of sustainability.

Trent University's mission, as outlined in the Strategic Mandate Agreement (SMA) with the Province(2017-20), emphasizes and strengthens our commitment to "foster sustainability, in it's environmental, social and economic dimensions, on our campuses and in all aspects of our work."

Leading by example and making changes for the environment is what Trent University was built on. In fact, it is part of the initial vision for the institution. Ron Thom, the architect charged with designing Trent, brought together a vision that included a core campus without vehicle traffic; a "walking campus." Seeking to reflect local heritage he chose local materials such as red brick and limestone to construct the campus. He endeavored to protect and naturalize the campus and provide a design that could remain adaptable to change. He even envisioned meeting future energy needs, in part, with solar generation.

AS A PROMINENT LEADER IN INSTITUTIONAL SUSTAINABILITY, TRENT WILL:

- continue to foster world-class teaching and research in environment and sustainability
- continue to advance integrated management for sustainability in campus operations to reduce environmental impacts
- continue to develop experiential learning opportunities for students in sustainability-related programs
- continue to engage with the community, seeking partnerships that support reduced, collective environmental impacts

We are proud that these green ideals were integrated more than a half-century ago as the basis for Trent. Now, Trent offers over 300 sustainability focused or related courses at both the undergraduate and graduate levels, more than 70% of research grants are aligned to this value, we have more than 30km of hiking trails and host more than 20 environment and sustainability-themed campus groups.

As a green institution, Trent has a responsibility to align operations with teachings. This report is titled celebrating success, setting direction; embracing the historical focus on environment and sustainability and our unique path forward.

Trent University's targets for 2018-2020 are to:

- decrease Scope 1 emissions by 10% in 2018 and in 2019
- maintain 80% resource recovery and reduce overall waste generated by 5% in 2018 and in 2019
- host an open sustainability forum and conduct a sustainability survey in 2018 and 2019
- enhance student engagement in and out of the classroom
- develop an updated, community informed plan for late 2020

To identify actions that will support the pathway to success, this report will expand on four main areas – Academics, Research, Operations and Community with the aim to look at past performance, current efforts and future opportunities in each area.

 **Going Forward:** Trent intends to use this plan to establish a basis for future reductions in carbon emissions and to unify our path forward in the continued integration of sustainable practices in campus operations. To increase engagement and foster the opportunity for comments/suggestions Trent will host an annual open forum and an online survey to recalibrate the values and perceptions of the Trent Community on the focus and implementation of the plan. The plan primarily serves to set overarching goals of authentic sustainability, leaving room for consultation and adaptation of specific actions. This outreach will start in November 2018, repeat in 2019 and the feedback received will inform the scheduled 2020 update. We will then continue with annual engagement with the intention to update our plan again in 2025.

Annual updates on emissions reductions will be provided by the Sustainability Office with indications of progress. Reports of milestones, such as achieving Provincial or federal targets or significant reductions will be highlighted. Additional metrics such as, but not limited to natural gas consumption, electricity use, locally sourced food, waste diversion, policy development will also be highlighted in an annual summary.



TEACHING & LEARNING

In 1964 Trent university bought a boat, named it the Turtle, and set off to better understand the natural world and human impacts on it.

Today Trent's School of the Environment provides a centralized hub of environmental and sustainability research and academic excellence. This centre brings together the many related disciplines necessary to understand the challenges that our natural systems face today. Having established the Environmental & Resource Studies program in 1971, Trent has expanded and developed related programs, now offering:

- Bachelor of Environmental Science/Studies (B.E.S.S.)
- Ecological Restoration (B.Sc.)
- Environmental Chemistry (B.Sc.)
- Environmental & Resource Science/Studies (B.A. or B.Sc.)
- Environmental Geoscience (B.Sc.)
- Geography (B.A. or B.Sc.)
- Indigenous Environmental Studies (B.A. or B.Sc.)
- Sustainable Agriculture and Food Systems (B.A. or B.Sc.)
- Water Sciences (B.Sc.)
- Environmental and Life Sciences (M.Sc.)
- Environmental and Life Sciences (Ph.D.)
- Sustainability Studies (M.A.)

With approximately 60% of Trent's expansive campus naturalized, students in environmental programs experience outdoor labs and on-campus field trips in a campus-as-a-lab model

of course delivery. Many courses such as The Edible Campus and Greening the Campus: Restoring and Sustaining Green Infrastructure offer the campus as an opportunity for students to learn. Additional acreage on campus is designated for agriculture purposes for students in the Sustainable Agriculture and Food Systems program to gain valuable experiential learning.

Students gain experience from the grey infrastructure on campus as well. Courses such as Greening the Campus: Reimagining Use of the Built Environment, Organizational Sustainability, Energy, Science and Technology, and Local Waste Management Issues challenge students to look at their campus to assess environmental impacts and improve sustainability practices. Experiential learning is at the forefront of such courses encouraging the use of campus examples, facilities staff expertise, personal observation and data collection to help students also develop a practical foundation.

Going forward, as Trent continues to advance campus sustainability, the potential to enhance student experience will continue to be incorporated. Trent, through our SMA with the Province, identified teaching and research in areas of the environment and sustainability as key areas for growth. Trent has numerous academic endeavors at various stages of development including a new program in Climate Science and Policy, a course on Professional Sustainability, a doctorate in Sustainability Studies and Canadian Research Chairs in both Indigenous Environmental Science and Studies and in Aquatic Science. Students at Trent will continue to be provided with the experience needed to bring effective solutions for sustainability into the workforce.





RESEARCH

Trent is known around the globe for research in climate, environment and sustainability-related issues. In fact, over 70% of Trent's 2016/2017 research grants were aligned with research in these areas.

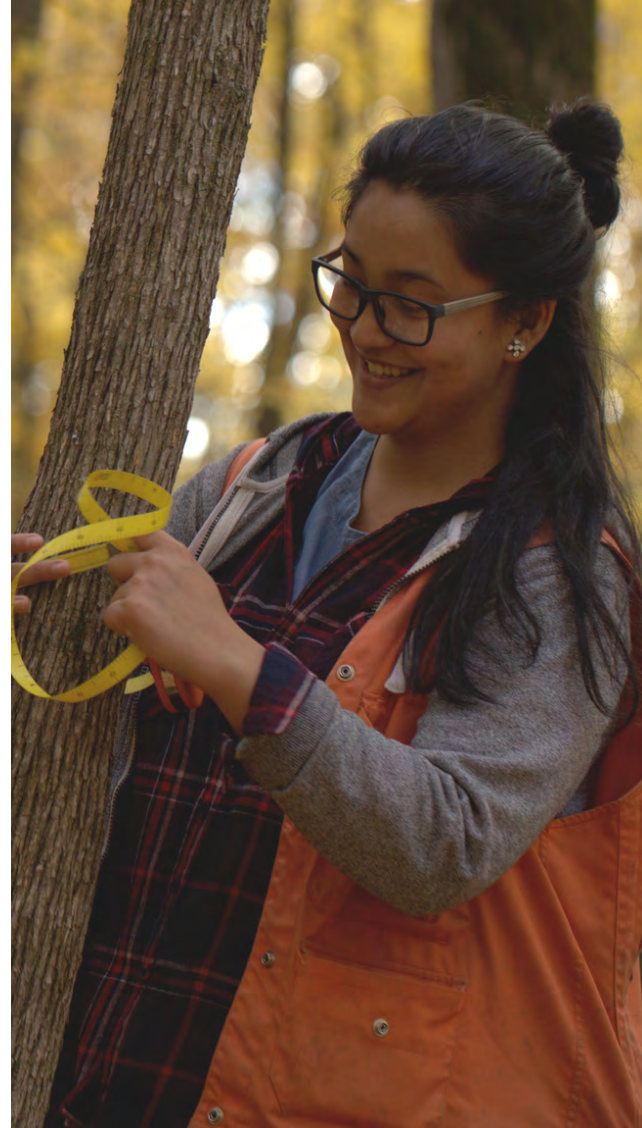
Research projects such as Carbon Dioxide Fluxes on Arctic Tundra, Linking Behavioural and Landscape Ecology of Hybridization in Mammals, and Understanding the Effects of Climate Change and Industrial Development on Contaminant Processes and Exposure in the Canadian Arctic Marine Ecosystem: How Can We Prepare? are contributing to worldviews on the environmental crisis of today and the potential for solutions.

Trent's broad foundation of environmental research attracts many organizations to collaborate on furthering collective understanding of issues relating to sustainability. Just a few examples of these are (with more extensive details provided in appendix A: Research Initiatives, Centres, and Institutes.):

- Trent Centre for Biomaterials Research
- Trent Water Quality Centre
- The Power Lab Project (carbon capture)
- Trent Indigenous Environmental Studies & Sciences Institute
- The Sustainable Agriculture Research Working Group
- Communicating Conservation Science Research Group

Going forward Trent will continue to nurture existing partnerships and work to develop new ones that advance our knowledge of environment and sustainability issues and solutions.

Cleantech Commons at Trent is a partnership between the City of Peterborough and Trent University. As a research and innovation park focused on water, clean and greentech, its focus is supporting start-up businesses from Trent or the community, attracting new businesses to the Peterborough Region, providing experiential learning and future jobs for students, contributing to the regions' economic vitality and promoting research partnerships at Trent University - all striving to find solutions for a healthier planet.



CAMPUS OPERATIONS

Campus operations cover many aspects relating to sustainability such as waste management, renovation/construction, food services, transportation, fleet, cleaning, purchasing and building heating and cooling systems (HVAC). Because technologies, practices, and opportunities to reduce environmental impact are changing rapidly this section relies on a process of continuous improvement.

To enhance Trent's green teaching and research Facilities strives for top environmental performance and to make important campus connections for students. Each year students complete assignments critically assessing various operational aspects of campus through coursework and via the Sustainability Office. Through this experiential learning, they gain more in-depth knowledge of campus efforts to operate in a more sustainable way and offer suggestions for next steps.

TRENT EMITS
35% LESS
GREENHOUSE
GASES THAN
AN AVERAGE
ONTARIO
UNIVERSITY.



Trent has done a commendable job, working with a small team, to be well-positioned as a leader in sustainability. With many operational successes to celebrate, Trent is in the process of mainstreaming these efforts as all institutions face tougher challenges to operating more efficiently, with less impact on the environment. While Trent is performing well in this area, to dive deeper, Facilities will perform a gap analysis of the integration of campus sustainability in operations to determine where improvements can be made.

Going Forward Trent will continue to improve and will continue to assess opportunities and provide support to students looking to gain a deeper understanding of how sustainability can be integrated into the operations and maintenance of an organization. The following sections highlight some operational successes and areas for improvement.

POLICY

Institutionalization of sustainability has started through policy development. Sections such as purchasing and waste management demonstrate an advanced integration of sustainability with the benefit of policy and procedures. The following policies support staff on campus to better identify opportunities to include sustainability in their day-to-day activities and support sustainable campus operations.

- Fair Trade Purchasing Policy for Apparel at Trent, 2006
- Purchasing Policy for Fair Trade Certified Products, 2008
- Policy on Single Unit Bottled Water at Trent University, 2010
- Environment and Sustainability Policy, 2014
- Policy on Environmentally Sustainable Procurement, 2017 (replaced 1995 Environmental Procurement Policy)
- Policy on Resource Recovery and Waste Diversion, 2017

Going forward: Further development in campus policy will provide Trent staff and faculty with clear and consistent direction on the integration of sustainability in operations. It was identified in the Policy on Environment and Sustainability that several policies guiding the consistent integration of sustainability into decision making were necessary.

PURCHASING

The 1995 Policy on Environmentally Sustainable Procurement was updated in 2017 to include very specific guidelines for sustainability criteria in purchasing documents. It provided an overview of credible environmental labels that could guide staff, provided sample language to use in cases where such options are unknown, assigning a minimum evaluation of 10% to assess the product and/or the supplier for environmental commitment, and lastly directed staff to seek assistance from the Sustainability Office for special cases where unique criteria may need consideration.

Going Forward: The Sustainability Office and Purchasing department will continue to work closely on the implementation of this policy and work together to update procedures as opportunities arise.

RESOURCE RECOVERY

Trent University is a clear leader in recovering valuable materials from the waste stream through effective waste management. In 2017 Trent achieved over 80% waste diversion from landfill, assessed in third-party waste audits.

Trent offers a comprehensive, campus-wide recycling system paired with a well-developed composting program. A recent expansion to campus recycling included two specialty "Deep Diversion

Stations", offering the Trent Community opportunities to divert materials such as coffee pods, pens/markers, plastic film, and wrappers (candy bar, etc).

The Sustainability Office supports the efforts of Facilities through annual education efforts, during orientation week and throughout the year and through auditing. Trent also has a partnership with Community Living Trent Highlands, focused on waste diversion, called bluboxing@trent that provides on-campus volunteer opportunities for people living with intellectual disabilities. More details on this program and other programs Trent relies on to reduce and divert waste generated on campus can be found in Appendix B: Waste Reduction Efforts.





Going forward: Trent will continue to look in earnest at campus waste profiles and strive to reduce waste on campus and divert as much as possible from going to landfill. The five main areas of focus will be:

- complete implementation of Kick the Can classroom waste program
- work to further reduce cardboard on campus
- continued work in food services to reduce waste at the source
- increase diversion of organic materials
- continue to improve resource recovery at Trent's Durham Campus

FLEET VEHICLES

In 2017 Facilities Management purchased our first electric fleet vehicle. Trent will pursue funding to replace end-of-life vehicles with electric when service requirements permit and work to establish convenient vehicle charging on-campus for fleet and public use.

TRENT
ACHIEVED 80%
WASTE
DIVERSION IN
2017, 33 YEARS
AHEAD OF
PROVINCIAL
TARGET.





TRANSPORTATION

There are many ways to get to Trent. With easy access from local trail systems and dedicated bus lines to campus, most students choose to either bus or cycle.

Busing

In the 80's Trent was one of the first institutions to provide an integrated a transit pass to students. Trent now sees more than 50,000 buses to campus a year and extends the discounted transit pass for purchase to all staff, faculty, and on campus partners. Busing is one of the most convenient modes of transportation to campus.

In 2017 Trent expanded the integrated transit pass to include students registered in as few as 1.5 credits and to students at the Durham campus.

Cycling

Trent's Symons campus is connected to two main trails, the Rotary Greenway Trail connecting from the south and the Lakefield Greenway Trail connecting from the north.

Once on campus cyclists find lots of places to lock their bikes with over 300 bike spaces and showers available in the Life and Health Sciences Building and in Blackburn Hall.

Trent also provides space on campus to the Community Bike Shop who offer bike maintenance and repair instruction. A self-serve bike repair station, provided by B!KE, is also available near the Athletics Centre.



Going forward: Trent is currently part of a local multi-stakeholder group called Peterborough Coalition for Active Transportation and Transit, PCATT, which looks at access and supports for low-impact transportation. Trent will continue to support this initiative. Areas identified for improvement at Trent are:

- improved signage on campus
- improved access for cyclists at the main entrance to Trent including an extension of the multi-use trail to the entry intersection and its alignment to West Bank Drive and signs to the on-campus trail
- covered bike storage options.

Additionally, Trent will benefit from a study to determine current modal split to better inform further development of support for low-carbon transportation to campus.


STUDENTS AT
TRENT HAVE
HAD AN
INTEGRATED
TRANSIT PASS
SINCE THE
1980'S.



CONSTRUCTION AND RENOVATION

Trent University has two LEED-certified projects on campus –the Life and Health Science Building and the addition to the Athletics Centre. Trent strives to highlight the benefits of these projects to students through online information and in-place information panels.

More recent projects such as the Student Centre and the Bata Library renovation have built-in elements of efficiency and sustainability such as LED lights, a green wall, and energy efficiency equipment.

 **Going forward:** Trent will benefit from a design standard for the institution. This would provide clarity and consistency as projects develop, often on tight timelines. Implementing a thoughtful standard that advances Trent's values of sustainability and supports GHG emissions reduction targets will be critical to Facilities Management in future projects.

LAND USE PLANNING

The development of the Trent Lands and Nature Areas Plan through 2018-2020 will guide the future of our Nature Areas and the evolution of a holistic campus that balances environment, education, innovation and vibrant student life. This Plan will be the Symon's Campus master plan, designed to enhance the pursuit of our mission: to be a place of transformative learning with a focus on environmental stewardship, social justice, and community development.

Using an 'overall sustainability' approach, this plan will ensure Trent University's vision is actioned in conjunction with the stewardship of natural heritage features and their inter-related functions while retaining more than half of Trent lands as natural areas and green space. The Plan will assist the University in achieving its vision of a 'sustainable and inspiring campus community, thoughtfully integrating the natural and built environments, with vibrant spaces to learn, innovative, be active and live'.

ENERGY EFFICIENCY

Trent is moving aggressively toward a more efficient campus. With a \$15.5M energy retrofit program currently underway, Trent is striving to be a top performer in campus efficiency. Historically, Trent has made a conscious effort to use energy efficiently. An energy performance contract, similar to today's was implemented in the 1980's. Efficiency measures in the 1990's included retrofitting lights and installing a Building Automation System (BAS) to monitor energy use for improved efficiency. Today there is more opportunity and a greater understanding of the need to reduce. Since 2014 Trent, Peterborough and Durham campuses combined have reduced the use of natural gas by 22% and electricity by 13%. Further reduction is anticipated by 2019.

Going Forward: Trent is currently commissioning an energy dashboard that will provide better data on building energy performance than ever before. This will provide the Sustainability Office with more detailed information on when and where energy is being used to better inform opportunities for further reductions. An added benefit of the dashboard will be greater access to project data for students.


Figure 1. Trent's GHG emissions in the context of Federal and Provincial Reduction Models (See Appendix C. for calculations.)

TARGET DATE	2030	2050
CANADA'S GHG EMISSIONS TARGETS	Reduce emissions by 30% below 2005 levels	Reduce emissions by 80% below 2005 levels
ONTARIO'S GHG EMISSIONS TARGETS	Reduce emissions by 37% below 1990 levels	Reduce emissions by 80% below 1990 levels
ALIGNING TRENT UNIVERSITY'S TARGETS	Target operating emissions level: Federal - 4,416t Provincial - 2,475t	Target operating emissions level: Federal - 1,262t Provincial - 786t

EMISSIONS REDUCTION

The Federal and Provincial governments are asking universities to find deep reductions in emissions. Figure 1. shows how Trent's emissions fit within the context of each model. With Trent's 2017 emissions at ~6,478t compared to ~3,927t in 1990, significant changes will have to be made.

In a typical year, natural gas use is responsible for ~85% of campus emissions. Significantly reducing natural gas reliance is an involved change and requires thoughtful planning and investment in facilities. To continue to reduce Trent's emissions we are using a three-pronged approach. The first is to always bear in mind, when planning construction and retrofits, the ultimate implementation of more systems using electricity. The second is to continue increasing efficiency in the interim, ensuring that changes made now will be compatible with a predominantly electrified campus in the future. The third is to look to renewable energy systems and campus generation ultimately allowing Trent to achieve a low carbon model. Appendix D. GHG Reduction Strategies outlines current projects that will reduce more than 700t by the end of 2019 and projects that will be considered as funding becomes available. Trent will strive to secure funding and meet Federal and Provincial targets.



Going forward: To accelerate success in achieving a low carbon campus, and striving to stabilize energy rates, Trent will assess the feasibility of an embedded utility, or micro-grid, on campus. This project would be analogous to the current energy performance contract however instead of guaranteeing energy savings, the third party would provide energy from a renewable source, located on campus, at a guaranteed rate.

Trent will ensure that all campus projects include screening for GHG impacts and integrated reduction strategies. Understanding that technology and opportunities are changing quickly, Trent intends to be adaptable and to not constrain by adhering too stringently to the specifics of this plan, but more so to the overarching intent to reduce as the earliest opportunities arise.



FOOD

Trent's Symons campus is located in Peterborough, a City with a thriving local and organic food movement. It is no surprise that when campus focus groups were held in 2013, in preparation for a new food services contract, that the overwhelming feedback directed increased sustainable options. This allowed the university to build sustainable features into the new contract and to establish a Sustainability Food Services Sub Committee. This committee meets monthly during the academic year to discuss issues relating to sustainable food. Some successes are outlined in Appendix E. Sustainability in Food Services.

Trent has nine food providers on campus with some notable examples of sustainable best practices. The Seasoned Spoon, a predominantly local/organic campus café, partners with the Trent Vegetable Gardens, a campus farming levy group, to engage student staff and volunteers in growing, harvesting, preparing, preserving and storing food on campus.

TRENT FOOD
SERVICES SAW
A 90%
DECREASE IN
DISPOSABLE
TAKE-OUT
CONTAINERS IN
ONE SEMESTER.



A portion of this produce is grown on a green roof located on the Environmental Science Building and stored in a root cellar on campus. The Ceilie, Trent's campus pub, supports local, independent suppliers and strives to feature sustainable products. Planet North is a locally focused, vegetarian café in Trent's Athletics Centre.

Trent manages campus cafeterias in a management fee model – allowing more control over sustainability elements. Trent included several Key Performance Indicators (KPIs) for local food in our current contract with Chartwells. All KPIs have been exceeded. Goals were based on annual procurement of ingredients for food prepared on campus and set based on distance from campus. Fifty percent of food was to be sourced within Ontario and in 2017 54% was achieved. Goals were also set for within 250km, at 35%, and within the Kawartha Region at 2% with Trent achieving 42% and 4% respectively.

Trent Food Service is continuously looking for ways to improve the sustainability of our campus food systems. In 2017/2018 they hosted a campaign to inspire travel mug use. To help the Trent community establish the habit, free coffee was given away to anyone using a travel mug. Trent also saw a 90% decrease in single-use take-out containers in 2017 due to a student-led surcharge of one dollar each. EcoTrays and reusable plates are the first choices on campus.

Going forward: Trent will continue to foster feedback through the Sustainability Food Services Sub Committee, strive to further reduce waste and bring more sustainable food options to the Trent Community. Trent Food Services will be working with Trent students from farms in Ontario to showcase food from their farms as a featured menu item.



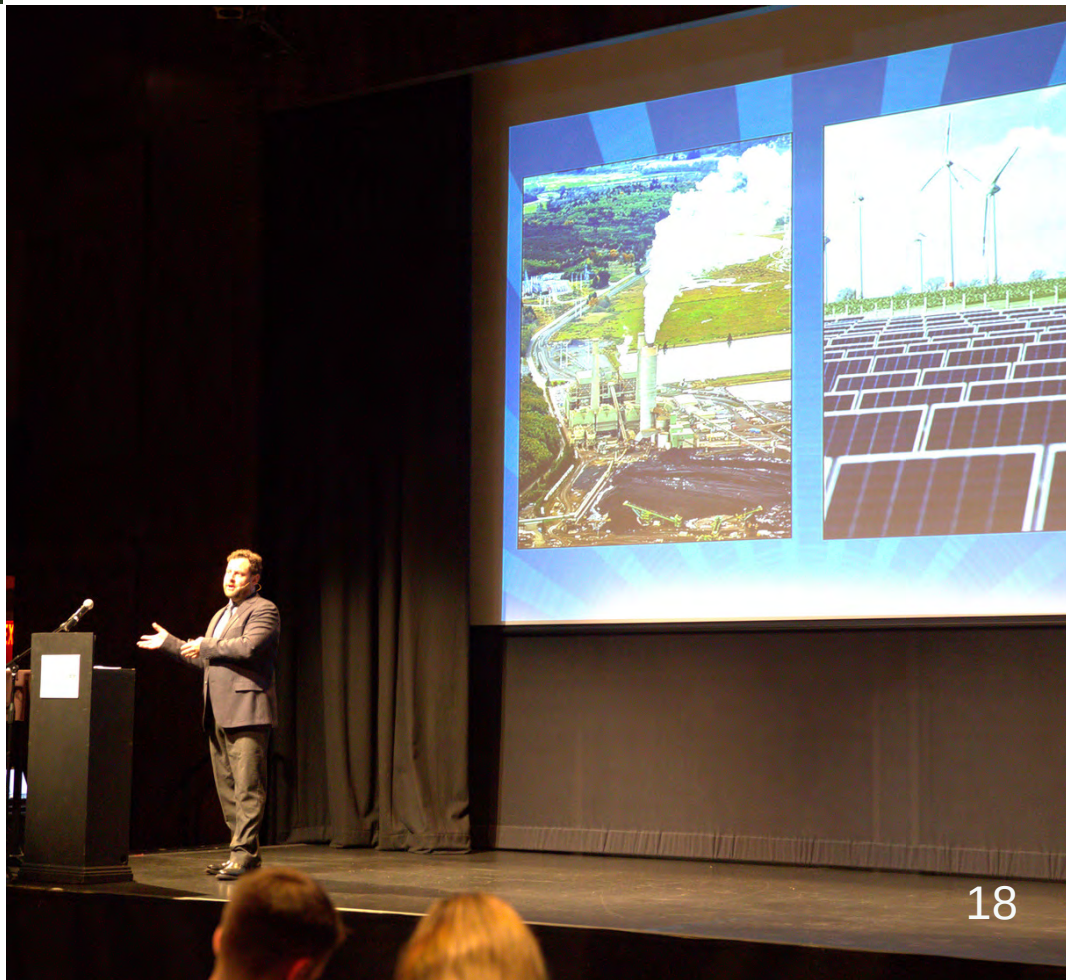
THE TRENT MARKET
GARDEN IS A
STUDENT FARMING
INITIATIVE ON
CAMPUS THAT SELLS
PRODUCE TO CAMPUS
CAFETERIAS AND
OFFERS A CSA
PROGRAM.

COMMUNITY

The engaged, dedicated and knowledgeable community at Trent can be credited for Trent's green foundation. Many initiatives start with staff and students. Trent's annual commuter challenge is offered through the local Shifting Gears Program and is fostered on campus by staff. The recent expansion to Trent's recycling program is a student-led initiative as was the campus ban on water bottles in 2010. This approach is common at Trent.

Trent has an impressive range and number of student groups on campus working toward the improved understanding of sustainability. Some notable examples are the Seasoned Spoon, a campus cafe that also offers skills development seminars such as canning, or making goods like yogurt, kombucha or soap. Trent students also operate a campus apiary, extending annual harvesting invitations to the Trent Community.

TRENT WAS
THE 4TH
UNIVERSITY IN
ONTARIO TO
ACHIEVE FAIR
TRADE
STATUS.



Sustainable Trent (ST) is a foundational green student group. With an annual levy, ST works with students across campus to assess and improve understanding and advocacy of sustainability-related issues. The Green Team challenges students to take a critical look at the campus and design projects aimed at addressing a particular sustainability issue. The student(s) who win this competition are awarded \$5000 for project implementation. Additionally, student government on campus has greened their structure, embedding a position dedicated to representing the integration of sustainability in each of the five college cabinets as well as in the Trent Central Student Association (TCSA).

Trent faculty, students, and staff reach out to the Peterborough community to work collaboratively on projects such as establishing Sustainable Peterborough and working closely with Peterborough Green Up and the City of Peterborough. Trent was integral to the recent UN designation of the Kawarthas and surrounding area as a Regional Centre of Expertise on Education for Sustainable Development. In Durham, students partner with the Region on capstone projects relating to climate change adaption.

Going Forward: Trent will look to enhance these partnerships, to provide transparency in the continued pursuit of reduced campus impact and broaden connections beyond the campus. As a local leader, it is essential that Trent also offer a progressive example of a low-carbon model – matching practice with teaching philosophy. Trent's SMA (2017-20) outlines these partnerships and collaborations as an important element of Trent's mission.



SETTING DIRECTION

Trent is fortunate to have such a sound foundation in sustainability. We celebrate the many green aspects that have taken decades to develop – things that could not easily be put in place if they were not already established.

Foundational aspects such as our academic programs, research, nature areas, student engagement, purchasing and waste management practices are well developed. The culture of being ‘green’ at Trent bleeds into many aspects of how the university operates on a daily basis. This culture has fostered grassroots efforts such as the ‘swap shop,’ to reuse office furniture and other items on campus; staff working with volunteers to collect second-life paper; Graduation Green Pledge (pictured right), eliminating the use of polystyrene, a \$1 fee for single-use food containers and our students leading change with a bottled-water ban.

Trent’s SMA (2017-20) describes “environmental sustainability (creating environmentally friendly solutions to contemporary problems, fighting climate change, etc.)” as an “overarching goal of Trent and our community”.

This plan has outlined areas where we will continue to build on our strengths but also



commits to actions what will achieve greater integration of environmental sustainability on campus and a low-carbon campus mindset consistent with the Ontario Climate Change Action Plan and the Pan Canadian Framework on Clean Growth and Climate change. Appendix E. Summary of Successes and Direction provides highlights.

It is time to celebrate our achievements as a leader in advancing sustainability and environmentalism and use this as the jumping off point for going forward – celebrating success, setting direction.

APPENDIX A: RESEARCH INITIATIVES, CENTRES AND INSTITUTES

The following research initiatives, centres, and institutes are focused on conservation, responsible resource development, pollutant elimination/bioremediation or contributing to building a low-carbon economy. All interface with industry and have “doors open” opportunities for student experiential learning or future career placements.

1. The sustainable agriculture research working group:

- Developing sustainable agricultural practices contributing to healthy, local foods production. Research has multiple environmental benefits in carbon sequestration, improved water systems & management and GHG reduction in food value chains.
- Trent researchers work with a variety of agri-food tech companies, local producers and associations including the Grain Farmers of Ontario on research projects.
- Trent runs an experimental farm and we also enable student experiential opportunities in student projects – the Trent Market Gardens, Apiary Club and Roof-top vegetable gardens and a student-run vegetarian cafeteria on campus all use Trent lands and facilities.

2) Bio-based materials and green chemistry (Trent Centre for Biomaterials Research):

- A major industry applied research collaboration in the utilization of vegetable oils in the development of a variety of bio-products and green chemicals which replace petrochemical products.
- A new major research initiative in phase-change materials development has great potential for energy storage applications and energy reduction (GHG reduction).

3) Trent Water Quality Centre, the Vreugdenhil lab, the Power lab, the School of the Environment research labs and the Mining industry:

- Ten Trent researchers are working with mining companies in projects related to capturing toxins, recapturing high-value metals from tailings ponds, sequestering carbon, environmental monitoring and bioremediation.
- Two research projects with industry have major carbon-capture potential – the Power lab project which uses biotic processes to expedite calcium carbonate production in mine tailings (sequestering massive amounts of atmospheric carbon) and Vreugdenhil project which converts waste carbon (wood waste or pet-coke waste from refineries) into useful activated carbon which is used in water and air filtration systems.

4) Remote sensing and environmental monitoring research initiative:

- An interdisciplinary research group which investigates methods to improve the efficiency, reduce the costs and carbon footprint of environmental monitoring activities by using new remote sensing and aerial evaluation techniques utilizing drones or satellites.
- New technologies for monitoring species at risk (e.g. woodland caribou migrations).

5) Canadian Environmental Modelling Centre:

- Multi-disciplinary research on critical issues and research questions about chemical pollutants, climate change, carbon release and capture, and environmental policy.

6) Sustainability Studies MA program:

- Research that will improve the understanding of environmental sustainability, economic prosperity, and social responsibility; a special emphasis on the creation, development and enhancement of social enterprises and supporting sustainable development.

7) Trent Indigenous Environmental Studies & Sciences Institute:

- Research, education, and outreach fostering conservation and responsible resource development and enhanced collaboration between companies and indigenous communities.

8) Natural Resources DNA Profiling and Forensics Centre and the Institute for Integrated Conservation Biology:

- Focus on conservation and the utilization of wildlife and plants genetics research to monitor the health of ecosystems; special emphasis on monitoring species at risk.

9) Communicating Conservation Science Research Group:

- With a mission to improve the ability to translate conservation science to the public and policy-makers, activities include compelling storytelling linking science to non-science through narratives, images, and conversations in order to re-frame the way environmental issues are communicated.

APPENDIX B: WASTE REDUCTION EFFORTS

- 2017/2018 travel mug campaign saw more than 12,000 free coffees given out to travel mug users. The eight-week program was designed to instill the habit of carrying a travel mug, offering free coffee at most campus cafeterias and outlets to anyone with a travel mug.
- Trent emphasizes reduction in the use of wasteful, single-use items such as coffee cups, water bottles, and take-out containers. The default set-up for printers is for all printing to duplex, not relying on users to remember or know how to use this feature.
- Course calendars are no longer printed and provided to all students. This information is now available online and anyone wishing to obtain a hard copy must request that one is printed for them for a fee. Moving to online service/forms is saving paper across the institution.
- Trent initiated a surcharge on single-use take-out containers of \$0.50. Students on The Sustainability sub-committee of the Food Services Advisory Committee recommended that this fee increase to \$1. With the combined effort of the reusable take-out container and adding 23 the increased fee for single-use take-out containers, single-use take-out container use reduced by 90% within one semester.
- Food services outlets across campus offer incentives and discounts for those who remember their travel mugs.
- In 2007 Trent, established a partnership with Community Living Trent highlands through a 3-year Trillium grant. This partnership was the foundation of the campus program now known as blueboxing@trent where individuals living with intellectual disabilities join and contribute to the Trent Community through their volunteer efforts. The blueboxing@trent program volunteers raise awareness about diversion on campus, collect Trent's batteries and printer cartridges for recycling and are supporting the new Deep Diversion Stations on campus.

APPENDIX C: GHG CALCULATIONS/CONSIDERATIONS

Emissions can be complicated and data can become a limiting factor, especially when aligning with historical baselines chosen by the Provincial and Federal governments. In the interest of clarity and transparency, this section outlines the data used by the Sustainability Office to make recommendations for reductions.

Overall, Trent is taking the approach of using absolute annual emissions - this simplifies the process and is ultimately what needs to reduce. For this iteration of the plan, we are not going beyond Scope 1 and 2 while we understand and respect that work to account for Scope 3 is needed. Target setting is all based on absolute emissions.

The following table shows raw data and emissions factors used.

GHG Inventory Component	1990	2005	2014	2017
<i>Electricity Purchased (kWh)</i>	8,851,269	10,988,934	24,685,334	21,386,570
<i>Purchased Electricity Emissions Factor (gCO₂e/kWh)</i>	220	230	40	40
<i>Electricity Generated (kWh)</i>	8,105,185	11,099,411	n/a	n/a
<i>Generated Electricity Emissions Factor (gCO₂e/kWh)</i>	0	0	n/a	n/a
<i>Natural Gas Purchased (m³)</i>	998,031	1,912,590	3,383,558	2,635,905
<i>Natural Gas Emissions Factor gCO₂e/m³)</i>	1,902	1,902	1,899	1,899
<i>Heating Oil (L)</i>	5,182	4,911	4,675	4,774
<i>Heating Oil Emissions Factor (gCO₂e/L)</i>	2,755	2,755	2,762	2,762
<i>Estimated Fugitive Emissions (t)</i>	No data	No data	No data	236
<i>Estimated Fleet Emissions (t)</i>	No data	No data	No data	125

Several assumptions have been made to allow for comparisons to historical years.

- the "1990" data is the total of data for May 1990 - April 1991, these were journal entries made by Trent staff at the time. The remainder of natural gas utility data for this period has been recorded by the Sustainability Office from original bills.
- no record for fuel oil was available for 1990, the average litres of fuel oil from the years 2002-2009 was used to estimate.
- Trent operated the Stan Adamson Power House until 2012. Our records showed that in 2005 Trent generated 11,099,414kWh, however, we do not have generation data for 1990. To estimate the SO used the average portion supplied in known years (1971-1977 and 2002-2009) of 47.8% of consumption. This was applied to the total electricity used by the campus from May 1990 - April 1991.
- Electricity generated by the SAPH has an emissions factor of zero because all electricity used by the facility is included in Trent's main campus electricity data.
- The 2017 GHG inventory includes estimates for fleet and fugitive emissions, which are not available in previous years. As well, it was an inventory requirement of the GGRP funding to include Scope 2 for Natural Gas. This is not common practice and will not appear in other inventories.

The following table is the Greenhouse Gas Inventory for 1990, 2005, 2014 and 2017.

	Emissions Source	1990	2005	2014	2017
<i>Scope 1</i>	Natural Gas	1899	3,638	6427	5007
	Heating Oil	14	13	13	13
	Fleet	No data	No data	No data	125
	Fugitive	No data	No data	No data	235
<i>Scope 2</i>	Electricity	1,947	2,527	987	920
	Natural Gas	67	128	227	177
<i>Total GHG Emissions</i>		3,927	6,306	7,654	6,478

To provide context for the Trent Community on how Trent is doing in terms of GHG emissions and emissions reduction we standardized our data for one example. In 2017, the Ministry of Advanced Education and Skills Development, through a funding call, provided a list of Ontario Universities and their emissions. This list was based on Scope 1. The total for all Ontario Universities was 476,398t and Trent's portion was 5502t. Pairing this with full-time equivalent student data from the Council of Ontario Universities with the Ontario total at 410,086 and Trent at 8,039, we calculated, at an average Ontario University, the emissions intensity measured in tonne/FTE was 1.16 and at Trent, it was 0.68.

APPENDIX D: GHG REDUCTION STRATEGIES

Trent University is well on the way to responsible emissions reductions. We have achieved reductions of more than 15% since 2014 and expect that achievement to increase to approximately 30% after our funded, short-term GHG reductions strategies are in place. In order to ready ourselves for continued improvement and achievement of Federal and Provincial reduction targets, the SO had the path to a low-carbon campus assessed. The following set of tables demonstrate one way Trent could become an ultra-low impact campus, should funding to do so become available in the future. Trent's short-term strategy reflects projects that are planned and funded. The mid and long-term strategies would require funding and there has been no correction for time made to cost estimates or GHG factors.

Table 1. Summary of Short, Mid and Long-term Strategies to Achieve Federal and Provincial GHG Reduction Targets.

<i>Demonstrating a path to a low-carbon campus</i>	Annual Greenhouse Gas Emissions estimate (tonnes)	Federal and Provincial Reduction Target Milestones
<i>Current GHGs, 2017</i>	6,478	
<i>Projected Annual GHGs with Short-term strategies implemented (by 2020)</i>	5,656	
<i>Projected Annual GHGs with Mid-Term strategies Implemented (2020-2030)</i>	2,424	<ul style="list-style-type: none"> • Meet Federal and Provincial 2030 reduction targets
<i>Projected Annual GHGs with Long-term Strategies Implemented (2030-2050)</i>	569	<ul style="list-style-type: none"> • Meet Federal and Provincial 2050 reduction targets

Table 2. Short-Term GHG Reduction Strategies.

Short – term GHG Reduction Strategies (all reductions in tonnes)	Annual GHG Reduction	GHG Reduction by 2020	GHG Reduction by 2030	GHG Reduction by 2050	Total Strategy Cost (M\$)	Trent Contribution (M\$)
<i>DNA/CSB Demand Based Ventilation</i>	515	1,030	6,180	16,480	1.22	0.46 (0.74, GGRP)
<i>Gzowski Occupancy-based ventilation</i>	7	14	84	224	0.16	0 (0.19 GGRP)
<i>Otonabee Residence/Athletics domestic hot water</i>	28	56	336	896	0.71	0.71
<i>Building Envelop Improvements, various buildings</i>	116	232	1,392	3,712	0.3	0 (0.3, GGRP)
<i>Blackburn Boiler Replacement</i>	13	26	156	416	0.38	0.38
<i>Variable Speed Pumping (ESS, CSB, ESC & SC)</i>	10	20	120	320	0.43	0.43
<i>Roadway lighting to LED</i>	4.5	9	54	144	0.4	0.4
<i>Replace Chillers - ESS</i>	7.5	15	180	480	1.5	1.5
<i>Athletics Pool Mechanical</i>	8	16	96	256	0.075	0.075
<i>Air Handler Replacement (SC, LEC & CC)</i>	113	226	1,356	3,616	0.64	0.64
Totals	822	1,644	9,864	26,304	5.8	4.6 Trent, (1.23 GGRP)

Table 3. Mid-Term GHG Reduction Strategies.

<i>Mid-term GHG Reduction Strategies (2020-2030)</i> <i>(all reductions in tonnes)</i>	Annual GHG Reduction	GHG Reduction by 2020	GHG Reduction by 2030	GHG Reduction by 2050	Total Strategy Cost (M\$)	Trent Contribution (M\$)
<i>Lead Electric Boiler with PV/Battery Generation</i>	138	0	690	3,450	4.3	Funding dependant
<i>Heat Recovery – CC, LEC and OCA</i>	472	0	2,360	11,800	19	Funding dependant
<i>Science Complex Lab/Fume hood Air System</i>	315	0	1,575	7,875	0.8	Funding dependant
<i>Controls Optimization</i>	840	0	4,200	21,000	26.3	Funding dependant
<i>Heat Pump (ground or water sourced heat pump system)</i>	1,467	0	7,335	36,675	26.6	Funding dependant
<i>Totals</i>	3,232	0	16,160	80,800	77	n/a

Table 4. Long-Term GHG Reduction Strategies.

<i>Long – term GHG Reduction Strategies (2030-2050) (all reductions in tonnes)</i>	Annual GHG Reduction	GHG Reduction by 2020	GHG Reduction by 2030	GHG Reduction by 2050	Total Strategy Cost (M\$)	Trent Contribution (M\$)
<i>HVAC Redesign using VRF Technology</i>	10	0	0	100	2.1	Funding dependant
<i>Variable Speed Chillers and Heat Recovery Chillers</i>	42	0	0	420	3.4	Funding dependant
<i>Fuel Conversion – NG to electric</i>	1,454	0	0	14,540	15.4	Funding dependant
<i>Domestic Hot Water Reduction</i>	71	0	0	1,775	1.1	Funding dependant
<i>Building Envelope Upgrades</i>	172	0	0	4,300	12.3	Funding dependant
<i>Fuel Optimization Upgrade – replace inefficient NG equipment</i>	46	0	0	1,150	0.9	Funding dependant
<i>Variable Speed Pumping</i>	10	0	0	100	1.1	Funding dependant
<i>Specialized Systems – greenhouse, environmental chambers and Fume hoods</i>	23	0	0	230	0.2	Funding dependant
<i>Kitchen Exhaust</i>	27	0	0	270	1.4	Funding dependant
Totals	1,855	0	0	18,550	37.9	n/a

APPENDIX E: SUSTAINABILITY IN FOOD SERVICES

Trent Food Services is continuously working to integrate improved sustainability practices into their operations. The following are some examples of their work.

- An initiative started by the student-led Sustainability & Fair Trade Working Group, a \$1 charge for clamshells and boats was implemented to help decrease the use of takeout containers and increase sustainable eating practices
- Began a residence red bin dish-collection program to reduce the amount of missing dishes and in turn decrease new dishes purchased, as well as the use of takeout containers
- Track how meals and beverages leave our dining halls, in an Ecotray, on China or in a takeout container or paper, China or travel mug in order to measure our sustainability success or where they may be room for improvement
- We support a Green Plates and Green Mugs rental program for student groups on campus
- Incorporated a local menu at Gzowski, featuring local Yorkshire Valley chicken, Empire Cheese cheese, Sticklings bread and Trent Market Garden vegetables
- Some of the suppliers we purchase from locally include Kawartha Dairy, Pepsico, Quaker, Trent Market Garden, Sticklings, Yorkshire Valley, Empire Cheese and Martin's Farm
- Most catering events use China dishes
- Chartwells won a \$500 Local Hero award for October 2017 local food initiatives. The money will be donated to Brock Street Mission, "a shelter for homeless men that operates in conjunction with Cameron House a shelter for homeless women over 24"
- In partnership with Chartwells, Trent won a 2017 Chartwells Campus Project grants which assists in funding a student-led, foodservice-related sustainability initiative on campus. The money will be used to install a sink in the new student centre in which students can wash their travel mugs, free travel mug giveaways and free coffee giveaways when guests use their own reusable travel mugs. The intent of this initiative is to assist individuals on campus with creating a habit of carrying and using their travel mugs in place of disposable paper cups.
- Plastic cups, reusable cutlery, Ecotrays and China plates, bowls and mugs are available across campus in order to support a more sustainable eating environment
- The Lug-a-Mug program offers a stamp every time a guest uses a reusable mug for their Electric City coffee. When a guest receives 9 stamps, they get their beverage FREE
- The Electric City Coffee Club, a reusable mug program, allows guests to purchase a larger, 16 oz mug \$5 and receive their coffee for the price of a small coffee (12 oz)

- A monthly No Fry Day has been incorporated into our menu, in which all dining halls turn off their deep-fryers (Thai Express excluded) and offer healthy alternatives to every-day options
- Over 4,000 lbs of produce from Trent Market Garden was purchased & used by Trent Foodservices from 2015-2017
- Reusable Eco trays are available at all dining locations on campus in order to assist with sustainable eating practices

APPENDIX F: SUMMARY OF SUCCESS/DIRECTION

	Success	Direction
<i>Teaching</i>	<ul style="list-style-type: none"> • first Environmental Science Program in Canada • more than 300 sustainability-related courses • all students must take course with indigenous content 	<ul style="list-style-type: none"> • further development in environment and sustainability course/programming offerings • further development of on-going campus experiential learning
<i>Research</i>	<ul style="list-style-type: none"> • Meaningful contribution to global views on climate change • >70% of research budget spent on sustainability-related projects 	<ul style="list-style-type: none"> • Support increased efforts in environment, climate change and sustainability research • Foster global collaborations
<i>Operations</i>	<ul style="list-style-type: none"> • Early adoption of practices such as UPass, bottled water ban, Fair Trade status, and Sustainability Office • 35% lower GHG emissions than average Ontario University (per student FTE) • ranked 73rd in the World Green Metric 	<ul style="list-style-type: none"> • Set emissions reduction targets to reduce Trent's impact on climate change • Continue institutionalization of integrated sustainability management • Support experiential learning through campus greening
<i>Community</i>	<ul style="list-style-type: none"> • Local engagement such as Champion Member of Sustainable Peterborough • Involvement in the UN designation of Regional Excellence in Sustainable Development • International engagement such as the International Environmental Institute 	<ul style="list-style-type: none"> • Enhance support for local sustainability efforts • Continue engagement with partners for capacity building and increased understanding/impacts • Support University/College networks seeking to advance environmental performance of institutions