



Dalhousie University

# SUSTAINABILITY PROGRESS REPORT FOR CAMPUS OPERATIONS

2010–2020



Office of  
Sustainability

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### ACKNOWLEDGEMENTS

*The involvement of many people helped make the changes documented in this report from students, departmental staff, senior leadership, Board members, and faculty, to outside consultants, contractors, architects, engineers, and others in our community. Thank you to community and government partners who have supported sustainability initiatives across our four campuses.*

*The Sustainability Progress Report for Campus Operations is prepared by [The Dalhousie Office of Sustainability](#).*



## SUMMARY

This wraps up the third and final public sustainability progress report for the ten-year operational Sustainability Plan: 2010-2020. Two early reports covered periods from 2010-2013 and 2014-2017. This report summarizes overall trends in the last decade, identifies key performance indicators (KPI) results during the periods of 2018-2020, and outlines areas for focus for the next decade.

For the 2018-2020 reporting period, the most ambitious (Phase 3) targets were set. Targets have been met or partially met (Table 1). Focus on the next decade of operational action continues to accelerate efforts on consumption reduction, biodiversity loss, and climate action (Photo 1). A more intentional and specific focus on equity, diversity, and inclusion (EDI) strategies will be deployed (Table 2).

The focus of this report is on operational sustainability action; however, it is worth noting the multitude of sustainability action across campuses including student-led activities, research, teaching, and governance. A few examples include [Research Services adoption of the UN Sustainability Development Goals \(SDGs\)](#) as a focus for research, the [Faculty of Agriculture adoption of the SDGs as a planning framework](#), action of multiple student societies such as the [DSU Sustainability Office](#), [Loaded Ladle and Bike Centre](#) and the public lecture series of the [College of Sustainability](#). Through the Sustainability Tracking Assessment Rating System ([STARS](#)) reporting, broad university sustainability action is captured.



Photo 1. Annual Dump and Run charity event.

**Table 1. Key performance indicator results**

<b>Indicators</b>	<b>Result (output and outcomes)</b>	<b>Targets (2018-2020)</b>	<b>Final Status</b>
<b>Increased diversion of solid, liquid, and hazardous waste</b>	The total diversion rate from the landfill in 2019-2020 is 64% without considering wood ash. The AC biomass co-generation system produces waste wood ash that is used as a farm fertilizer. If ash amounts are used in tonnage totals, the diversion rate is 71%.	70%	Achieved and Partially Achieved
<b>Reduce electricity, fuel, and water consumption per person</b>	All campuses combined energy consumption shows a 23% reduction per person. Water consumption on the Halifax campuses was reduced from 2009-2010 baseline by a total reduction of 68% per person.	20%	Achieved
<b>Reduce greenhouse gases (GHG)s</b>	Scope 1 and 2 GHGs were reduced by 28% against the baseline year and reduced by 35% per person.	50%	Partially Achieved
<b>Increase renewable energy supply on campus</b>	Six solar photovoltaics systems, two solar thermal systems, two solar air systems, one ground source heat pump field, and one biomass co-generation district energy system have been installed. Of all the fuel and electrical energy consumed and produced on Dalhousie campuses, 10% comes from renewable energy sources.	15-20%	Partially Achieved
<b>Increased travel (commuting and business) through sustainable modes</b>	A number of new transportation demand management programs and strategies have been implemented. A 5% drop in “drive alone” commuting was recorded. Many external factors such as transit accessibility, housing availability, distance from campus, family responsibilities, safe facilities, and costs, drive commuter choices.	15% (drive alone)	Partially Achieved
<b>Enhanced urban biodiversity</b>	Five rain gardens were implemented on the Halifax and AC campuses along with eight green roof systems on four newly constructed buildings.  Since the tree replacement guideline was established in 2012, 215 Trees were removed related to construction equalling (4,656 cm of biomass) and 736 Trees were added (3,841 cm of biomass) with some additional tree plantings left to do for 2021. Invasive species numbers were reduced.	Assessed against the Natural Environment Plan objectives	Some targets achieved, more research
<b>Buildings achieve green building certification</b>	The nine buildings built since 2010 are certified Leadership in Energy and Environmental Design (LEED) Gold or Silver. This represents 17% of the building space in Halifax campuses or 14% of all building space of all campuses (Halifax and the AC). If LEED buildings and full building retrofits are included this represents 33% of Halifax buildings and 29% of all building space of all campuses (Halifax and the AC).	30% of buildings	Partially Achieved

Indicators	Result (output and outcomes)	Targets (2018-2020)	Final Status
<b>Sustainable food offerings</b>	At campus dining halls, several awareness programs are offered, including seasonal menus and sourcing food from local farmers, tray-less dining; offering fair trade products (coffee, tea, chocolate) and offering MSC certified fish, and purchasing more whole foods for preparation on site. Produce from the on-campus Chef's garden is used at the dining halls at the Agricultural campus. On average, 25% of all food purchases (franchises, vending, catering, and dining halls) are from local (defined as Maritimes) and third-party certified (e.g. Marine Stewardship Council, Organic, Fair Trade sources). Approximately 38% of purchases are plant-based foods.	Assessed against the Plan	Partially Achieved
<b>Major planning, policy, reporting, and products incorporate sustainability concepts and criteria.</b>	A number of plans, reports, and programs have been created: <ul style="list-style-type: none"> <li>• Ten sustainability related plans</li> <li>• 14 policies and design guidelines</li> <li>• Sixty-two reports</li> <li>• Participation in 13 committees and networks</li> <li>• Six behavioural and engagement programs and campaigns</li> <li>• Outreach through education programs and presentations – 19,434 people reached</li> <li>• Analytical software tools and dashboards were developed and over 70 new building level meters have been installed</li> <li>• Participation in International ratings (STARS, Times Higher Education)</li> </ul>	Assessed at each Phase	Achieved
<b>Sustainability is reflected as a core concentration in the University curriculum at the undergraduate and graduate level</b>	Sustainability as a core concentration is reflected in over 290 courses across faculties on campus up from 230 identified in 2017.	Assessed at each Phase	Core programs offered at the undergraduate and graduate level.
<b>Positive student and employee experience</b>	Annual engagement of employees and students through programs and initiatives. In the last decade — the Office worked directly with over 870 students.	Assessed at each Phase	Strong engagement, areas identified for future action.

\*Baseline year is 2009-2010.

**Table 2. Next decade of priority sustainability operational action**

<b>Policy and Planning</b>	<b>Behavioural Programs</b>	<b>Monitoring</b>	<b>Projects</b>
Policy and Plan review – Update existing policies, plans and guidelines.	Maintain and enhance key existing programs such as the Employee Sustainability Leadership program, ReThink for a Sustainable Campus (Photo 2), and the Employee Bus Pass program.	Enhanced building energy modelling and EMIS analytics using existing data to focus in on strategies for new construction and existing buildings.	On and off-site renewable energy projects that substantially advance carbon emission reductions and community benefits.
Creation of new operational Sustainability Plan for the next decade.	Implementation of green labs and special events program.	Supporting departments to advance their sustainability goals through monitoring and advice such as moves towards more plant-based diet options.	Reducing waste volumes and the contamination of divertible materials in the waste stream.
Examination of climate adaption options such as low emitting back-up power.	Program for addressing carbon impacts of University travel through local carbon offset program with EDI co-benefits.	Expanded participation in international sustainability ranking programs.	Enhance biodiversity goals and cultural values across campus.
Update of the green building policy and strategies to achieve net zero existing and new building.	Enhanced experiential and internship opportunities for students through existing and new sustainability and environmental related courses.	Public annual progress reporting.	Maintain and enhance existing comprehensive energy and water programs including implementation of flagship projects.





Photo 2: Smart Trip Safe Commute Campaign posters

## KEY PERFORMANCE INDICATOR RESULTS

The 2010 Operational Sustainability Plan outlined eleven key performance indicators and three phases of targets over a ten-year period. Targets are escalating with the most ambitious outlined for this 2020 reporting period. In the last decade, Dalhousie's student population grew by roughly 10% and building square footage by 5%. Dalhousie and partners invested over \$98 million in 65 plus sustainability related projects on campus, resulting in over \$3.6 million in cost savings/avoidance. The Office of Sustainability works with government and community partners and leveraged \$8.5 million in in-kind and grant funding.

## TARGET: INCREASED DIVERSION OF SOLID, LIQUID, AND HAZARDOUS WASTE (PHASE 1: 55%; PHASE 2: 65%; PHASE 3: 70%)

**Target achieved and partially achieved**

**2018-2020 reporting period:** Student researchers continued to work with the office on projects related to universal waste management, organics waste reduction, and data quality analysis. The Office continues to provide annual support for the DUMP and RUN charity event co-organized with Saint Mary's University, which serves hundreds of community member and raises thousands of dollars for charity. Waste education materials were developed including videos and guidance documents for construction and demolition (C&D) sorting. Enhanced annual tracking of waste data revealed targeted opportunities for improvement. The creation and implementation of a recycling (C&D) depot, as part of the IDEA Project was realized (Photo 3). An on-site organic in vessel compost unit was donated to the AC and is being used for manure management and research.

**Figure 1. Diversion from the landfill.**

Halifax				AC		
2013-2014 (baseline)*	2017- 2018	2018- 2019	2019- 2020	2017- 2018	2018- 2019	2019- 2020
60%	62%	62%	64%	55%	63%	65%
50%						

\* 60% uses bill and audit data as the University hadn't purchased a weigh scale at that time. 50% is based on bill data only. Percentages does not include wood ash.



**Photo 3. Construction and Demolition (C&D) depot at Sexton campus**



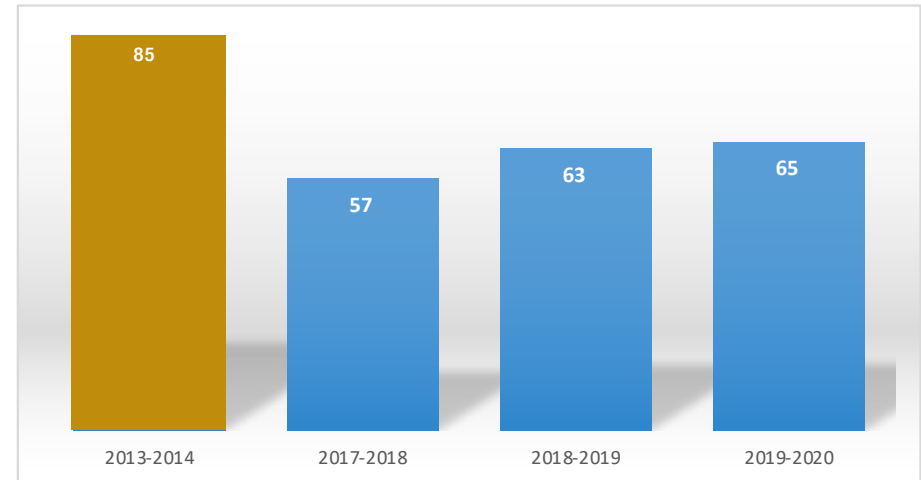
**In the last decade:** Major projects, plans and community engagement efforts have been successful in increasing the diversion rate from the landfill for all campuses and reducing the per person consumption in Halifax (Figure 1 & 2). The per person consumption is lower in 2016-2017 due to the higher reported C&D diversion activities during that year. The total diversion rate from the landfill in 2019-2020 is 64% without adding wood ash. The AC biomass co-generation system produces waste wood ash. This ash receives testing and labelling as a fertilizer product. The ash is trucked to a local farm and is used as fertilizer. If ash amounts are used in tonnage totals, the diversion rate of over 70% is met (Figure 3).

Consumption data from the AC is bill data from the hauler. The per person consumption is significantly higher on the AC compared to Halifax based on a full year bill analysis of 2019-2020. Further investigation revealed plant matter from greenhouses going into organics bins and the industry average used for billing may be higher than campus trends. Further detailed waste audits will be conducted to assess the situation further.

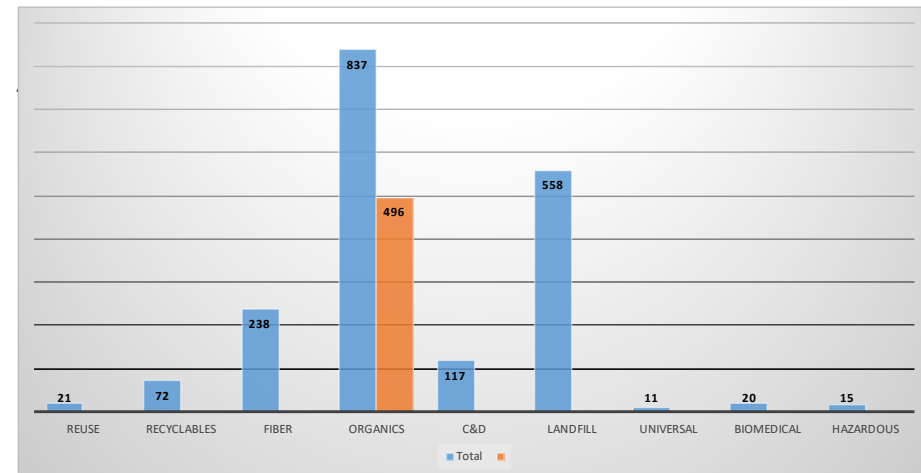
Major initiatives with the Office and by departments such as Facilities Management (FM), Procurement, and Environment Health and Safety (EHS) have been effective in making change. In addition, a number of departments such as Legal Services, Financial Services, Ancillary Services and Information Technology Services (ITS) implemented process improvements reducing paper consumption.

Waste management audit methods, guides, plans, reports, and guidelines have been published. The creation of a University waste committee helps to engage key departments. A major project the “Big Switch” was implemented based on five years of planning and included standardized waste signage and bins and the removal of excess garbage bins (over

**Figure 2. Halifax campuses per person reduction by tonnes.**



**Figure 3. Diversion from the landfill by waste stream by tonne.**



*\*Note: Orange column is organic tonnage without wood ash and the blue column is organics with wood ash.*

4000) across all campuses. In Halifax, FM changed management operations to bring all solid waste material to the warehouse and began weighing it on a newly purchased scale. This decreased illegal dumping at building dumpsters, realigned collection capacity and signage, increased removal of contaminants in organics and recyclables streams, and enhanced data quality all helping to drive down landfill disposal rates.

New recycling programs were implemented for universal waste streams such as batteries, electronics, and fluorescent bulbs. EHS implemented new tracking and protocols for hazardous and biomedical waste. Campus and building audits continue to be used to identify problem areas and for educational and engagement purposes. Ongoing educational videos, quizzes, lectures, presentations, program and events are used to increase understanding of topics such as reduction strategies and proper sorting. The procurement department continues to offer a surplus goods program. In Dalhousie's Purchasing Policy, sustainability criteria are outlined as guidance for university purchasers. Commodity specific focused work has had sustainability criteria added and evaluated for individual Request for Proposals and Tender documents.

Through the decade, detailed analysis has been conducted on waste management streams, invoices, and reporting information. Through this research, it is noted that scale data represents the highest quality data, where as bill data is often using an "industry standard" that can range higher than scale or audit data. Dalhousie through its management and reporting efforts now have higher quality data for many streams for reporting and management purposes.

Through recent data analysis efforts, waste management tracking sheets have been organized into a comprehensive framework of categories including:

- Reuse: Dump and Run event, Surplus Goods
- Recyclables: Blue bag material including refundables, Lab extruded poly-styrene (EPS) from select buildings, refundables used for student activities
- Fiber: Paper, Cardboard
- Organics: Food, Yard, Cooking Oil, Manure\*, Wood Ash
- C&D: Mixed, Metals, Aggregate, Wood
- Garbage (Landfill): Garbage waste, Mattresses
- Universal: Batteries, Electronics, White Goods, Fluorescent bulbs, Paint
- Biomedical: Follows management and classification according to regulation.
- Hazardous: Follows management and classification according to regulation.

\*Note: AC farm uses manure on campus fields. The manure tonnage is not counted in the overall tonnage figures.

Additional KPIs have been developed beyond diversion from the landfill including waste per person, waste reduction year over year, monthly stream weights, and disposal cost per stream per tonne. Food service, residences, and laboratory activities drive a lot of waste volume. Further research on indicator robustness is underway.

# REDUCE ENERGY (ELECTRICITY AND FUEL) AND WATER CONSUMPTION PER PERSON

(PHASE 1: 5%; PHASE 2: 15%; PHASE 3: 20%)

## Target was met

Several variables impact utility consumption such as space type (e.g. lab buildings are far more energy intensive per square foot than academic buildings), weather, occupant density, space changes, square footage, and construction projects.

**Electricity:** Electricity is used for functions such as lighting; heating (e.g. heat pumps), ventilation, and air conditioning (HVAC) systems; chilling (large electrical chiller); appliances and equipment. Newer buildings tend to have more power needs for items such as plug loads. Some buildings use more electricity for heating (heat pump) versus older steam-based heating systems. The average electricity reduction per person for Halifax campuses was 15% compared to the baseline (Figure 4) and all campuses 13% (Figure 5). The per person electricity consumption is higher at the AC related to a lower population density per square foot. In 2018, there was a fire at the AC campus taking a building offline. In the same year, a biomass cogeneration project came on line increasing some electricity consumption for new plant functions such as air quality controls and pumping hot water (Photo 4). Some energy efficiency measures have reduced the overall electricity consumption when considering the impact of the new biomass co-generation system.

Figure 4. Electricity usage kWh per person (Halifax Campuses).

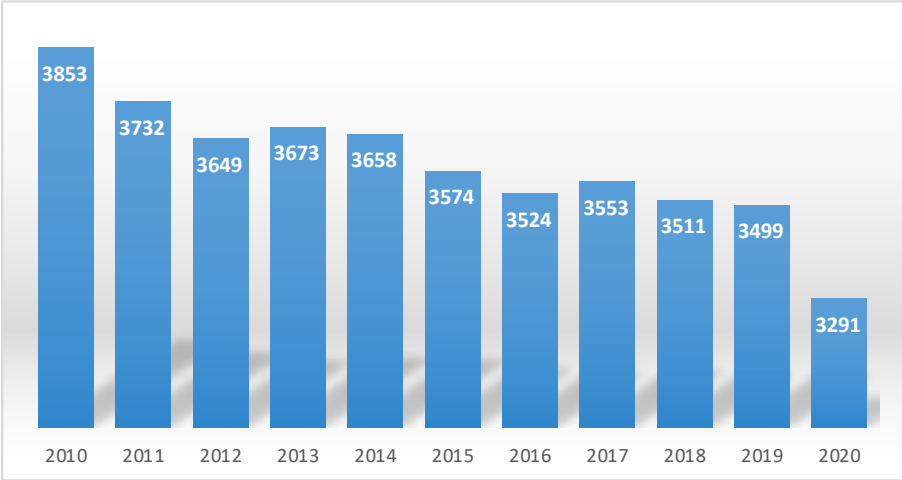
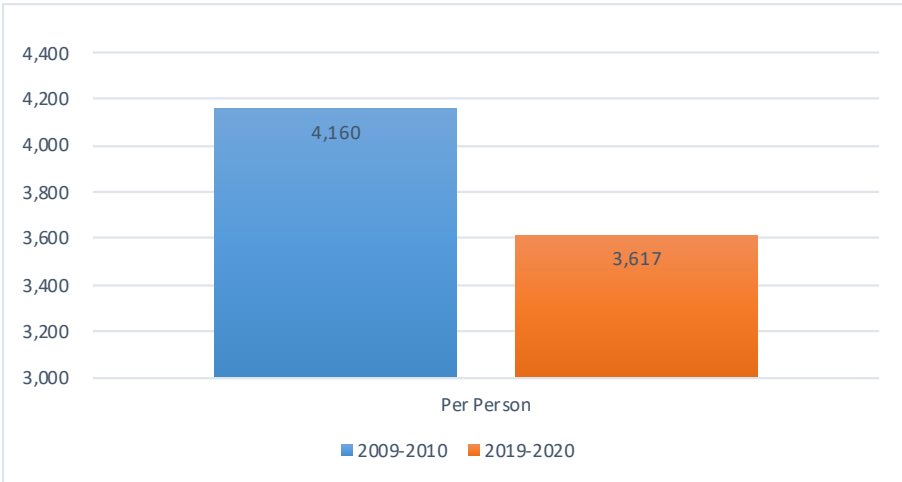


Figure 5. Electricity usage kWh per person (Halifax and AC).





**Fuels:** Over 95% of all Dalhousie campuses structures (Halifax and Agriculture campuses) are on a District Energy (DE) system. Natural gas is used at the Halifax Central Heating Plant to make steam which is sent to buildings for heating at the Studley and Carleton campus. The steam line from the Carleton Campus to Sexton Campus has been replaced with a hot water line. Some buildings also receive cooling through a central chilled water loop. At the AC, a biomass co-generation system is used to create heat for heating and electricity generation which is exported to the grid. The distribution system was converted to hot water. On campuses, fuel (diesel, propane, light fuel oil, and natural gas) is used for back-up generators, kitchen cooking, lab equipment, heating, humidification, and some cooling (large steam chiller). The average reduction per person for Halifax campuses was 23% compared to the baseline (Figure 6) and all campuses 27% (Figure 7). Energy used for electricity production is not included as the import of electricity is included. A comprehensive approach to utility project implementation has been developed and is ongoing (Photo 5).



Photo 4. High efficiency pumps being installed

Figure 6. Fuels reduction kWh per person (Halifax campuses).

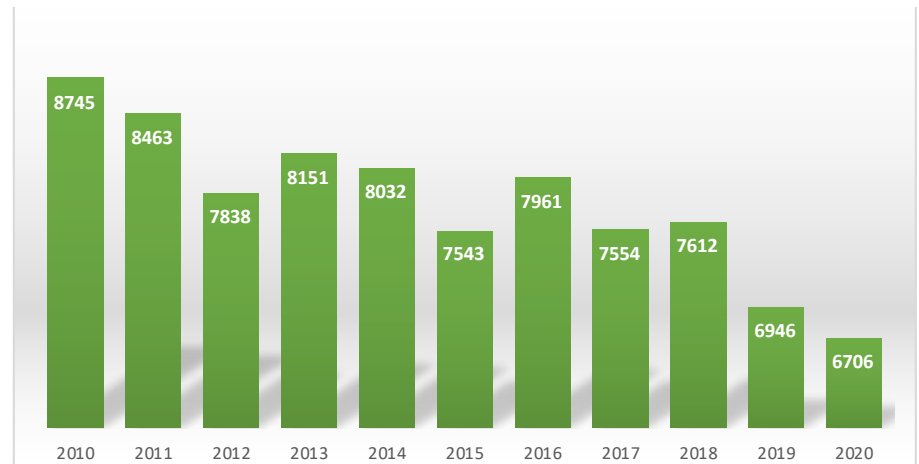
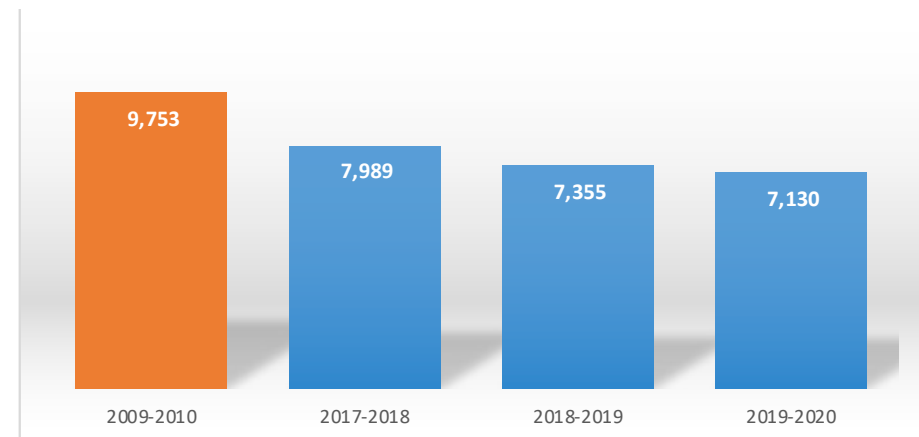


Figure 7. Fuels reduction kWh per person (Halifax and AC).



## Dalhousie Energy/Water Management Program

<p><b>Major Project Initiatives (\$5 million +) Deep Retrofits &amp; New Construction</b></p> <p>High energy and water efficiency standards and controls implemented through collaboration between Capital Project and Office of Sustainability (OS)</p> <p>Green Building Standards (e.g. LEED Gold or higher for new buildings since 2010. Looking at next level for existing and new construction (net zero ready).</p>	<p><b>Minor Projects (\$5 million below)</b></p> <p>Energy and water efficiency embedded within Minor Projects through consultation between OS and project teams.</p>
<p><b>Sustainability Projects (mostly Energy and Water related). Can be Major or Minor.</b></p> <p>Project funding secured by Office of Sustainability (e.g. Grants, Utility Savings model, Departmental contribution)</p> <p>Projects most often managed by Facilities Management (FM) for the Office.</p>	<p><b>Ongoing Optimization Projects</b></p> <p>Collaboration between Operations and Office of Sustainability to identify and implement lower cost / no cost energy initiatives.</p> <p><b>Annual Energy Project Allocations</b></p> <p>Energy allocations provided by Planning department. Projects developed and implemented through collaboration within Energy Committee - consisting of various FM team members and OS.</p>

Photo 5. Energy and water management project approach

All campuses combined energy consumption comparing the baseline year to 2009-2010 shows a 23% reduction per person (Figure 8) and 14% total reduction (Figure 9).

Figure 8. Total energy reduction kWh per person (Halifax and AC).

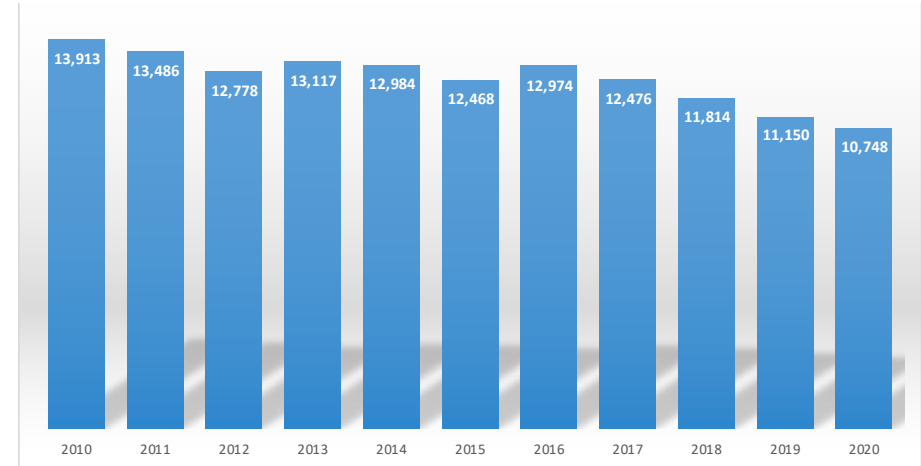
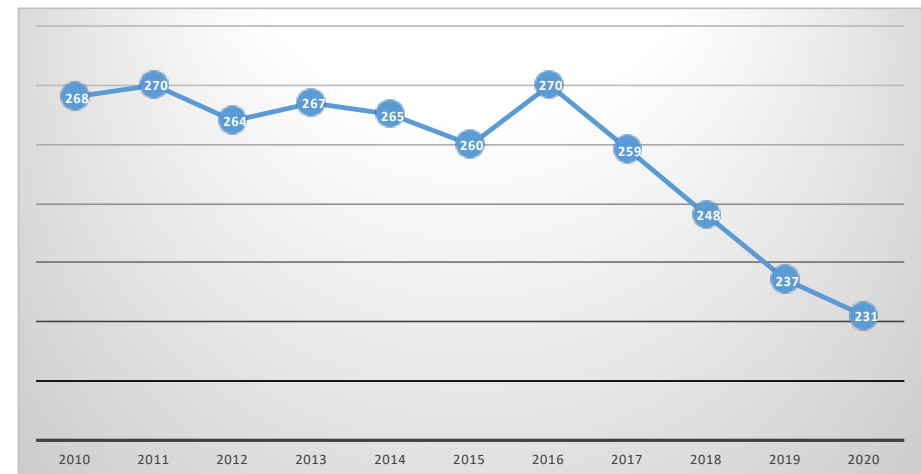


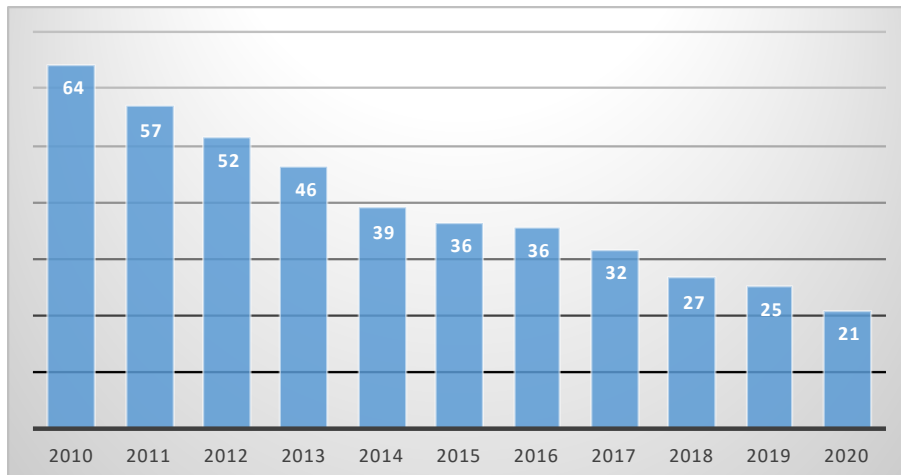
Figure 9. Total energy reduction GWhe (Halifax and AC).



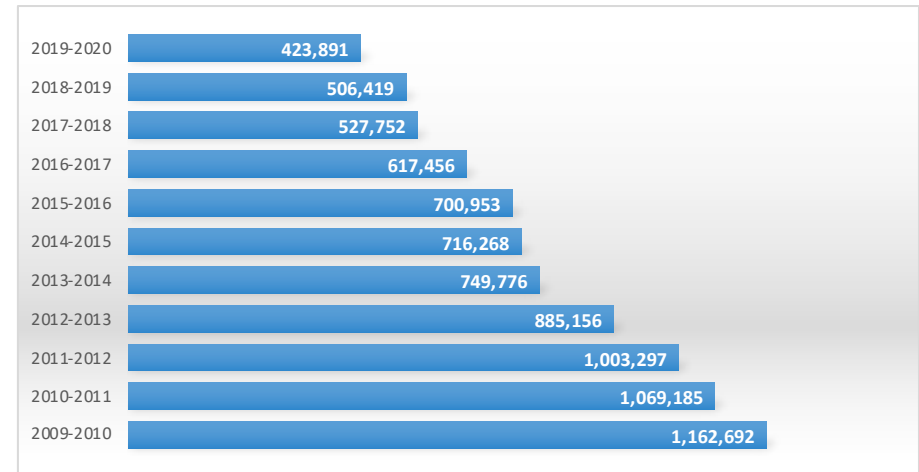
**Water:** On campus, potable water is used for fixtures (faucets, toilets, urinals, showers); laundry and kitchen use (there are seven commercial kitchens at the Halifax campuses and one kitchen at the AC), water-cooled equipment, process water (ex. cooling towers and research like the Aquaculture and Aquatron facilities), and the pool.

Water consumption on the Halifax campuses was reduced from 2009-2010 baseline by a total reduction of 68% per person (Figure 10) and 64% in absolute consumption (Figure 11). At the AC, the campus switched from well water to town water for most functions except for the aquaculture facility that uses well water. A full year of consumption was recorded in 2018 which also coincided with the Cox fire (water was used on the fire) and a once through water cooling system was upgraded. (Figure 12).

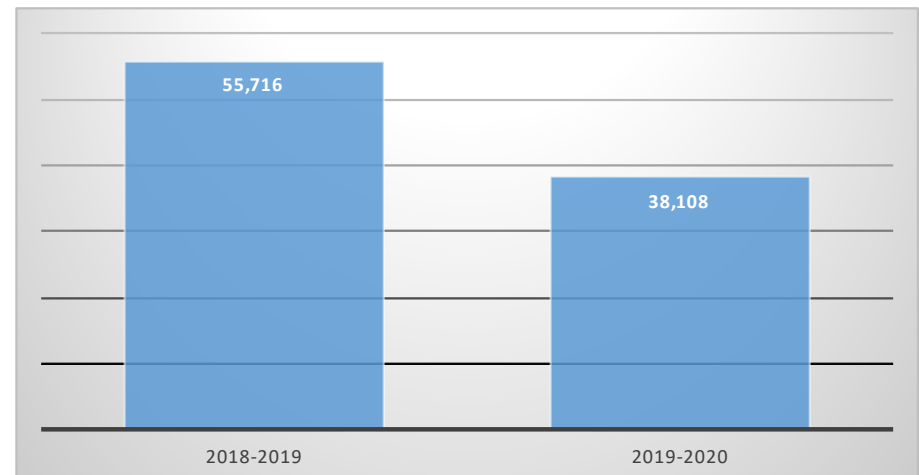
**Figure 10. Total water reduction per person/m3 (Halifax and AC).**



**Figure 11. Water consumption in m3 (Halifax Campuses).**



**Figure 12. Water consumption in m3 (AC).**





**2018-2020 reporting period:** Regarding water action, five engineering students worked with the office on campus rain water cistern optimization strategies. A water turbine study was completed, and two distilled water systems upgrades are in the final stages. Facilities renewal projects such as cooling towers upgrades and department initiatives such as server centralization have resulted in water savings. Once-through water cooling used to cool research equipment at Sexton campus was replaced with geo-exchange cooling.

Completed energy projects included ventilation optimization, lighting and solar installation, recommissioning, steam pipe insulation, full building retrofits, district energy upgrades, high efficiency pumping, data centre cooling, heat recovery and controls optimization. Annual behavioural programs on water and energy reduction initiatives are implemented in residences and on-going monitoring is used to identify problems and opportunities.



*Photo 6. Celebrating the Efficiency NS Bright Business Engagement award.*

**In the last decade:** numerous projects, studies, and optimization initiatives have been completed including:

- Campus wide-lighting projects from bulb switch outs to ballast, fixture and lamp replacements.
- Campus-wide fridge-freezer exchange programs.
- ITS projects related to server replacement and data centre cooling upgrades.
- Steam pipe insulation projects.
- Recommissioning projects.
- Full building deep retrofits.
- Solar and rain water installations.
- Energy Management Information Systems (EMIS) and building metering installations.
- Kitchen and research equipment upgrades reducing water and energy.
- Campus-wide water fixture upgrades.
- House insulation, water fixtures, and heating upgrades.
- Campus-wide hot water tank wraps and building and house programmable thermostats.
- Compressed air leakage study and fixes.
- District energy systems conversions such as oil to natural gas and steam to hotwater.
- Ventilation controls, heat recovery, heat pump technology and set-backs.
- Water technology filtration upgrades, recirculation, and switching sources for cooling.

On average, 10-15, projects are in implementation stages each year as others are being planned. Dalhousie has received two Efficiency NS awards for energy work: (2013) Bright Star Award and the (2019) Bright Business Engagement (Photo 6).

## REDUCE GREEN-HOUSE GASES (GHGS) (PHASE 1: 10%; PHASE 2: 20%; PHASE 3: 50%)

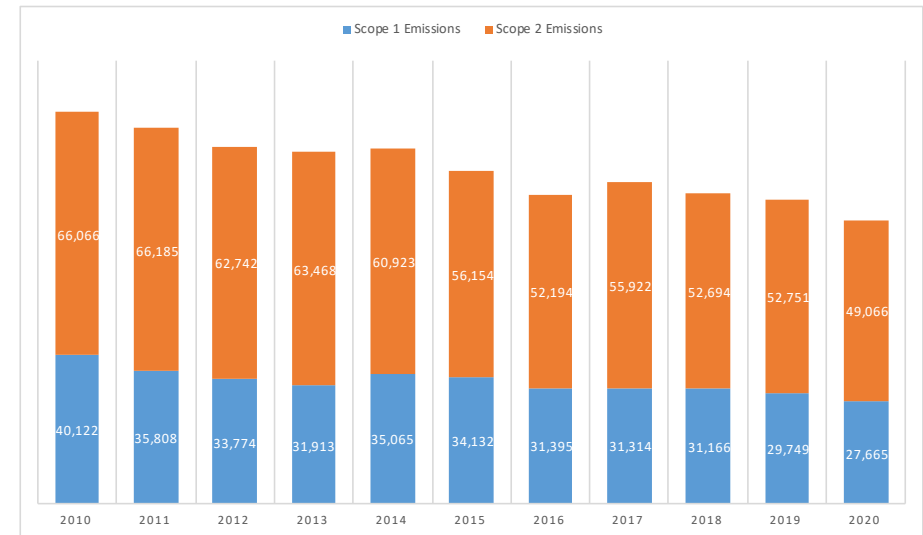
### Target was partially achieved

Ambitious phase 3 targets set for climate action did not fully materialize due to required implementation of a Halifax district energy co-generation project and electrical grid reductions. Some of these actions are underway but all will not be realized by 2020. Additional targets and strategies have been added to the 2nd version of the University Climate Change Plan to keep up the ambitious pace of action that is needed to meet climate goals. Scope 1 and 2 GHGs were reduced by 28% (Figure 13) and reduced by 35% per person (Figure 14).

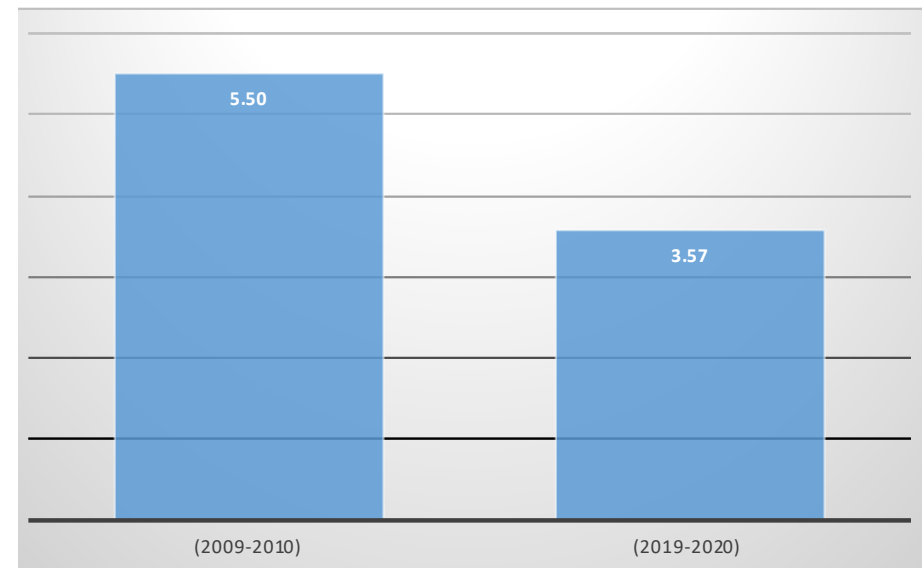
**2018-2020 reporting period:** A number of energy efficiency projects and renewable energy projects were implemented including a hot-water biomass co-generation system, ground-source heat pumps, and solar photovoltaics. Adaptation strategies such as green roofs, tree planting, and other storm water management solutions were actioned. Studies and plans were released including the 2nd version of the University Operational Climate Change Plan, a report on the examination of land protection as a carbon offset opportunity, and an examination of life cycle emission implications of a number of fuels.

**In the last decade:** Dalhousie has released two Operational Climate Change plans and designed and released annual GHG reports. Millions of dollars in climate action projects have been implemented in the areas of renewable energy, transportation demand management, fuel switching, and energy efficiency. A number of adaptation project have been implemented including green roofs, rain gardens, rain water cisterns, and other storm water management techniques.

**Figure 13. GHG reduction per tonne for Scope 1 & 2 emissions (Halifax and AC).**



**Figure 14. Total GHG reduction per person per tonne (Halifax and AC).**



## INCREASE RENEWABLE ENERGY SUPPLY ON CAMPUS

(PHASE 1: PLAN AND PILOT; PHASE 2: 5%; PHASE 3: 15-20%)

### *Target partially met*

Renewable energy refers to energy that comes from natural resources such as sunlight, the earth, the sea, and wind, and organic sources.

**2018-2020 reporting period:** A major transformation of the district energy system at the AC occurred. Through this project the steam distribution system has been replaced with a district hot water system which is 25-30% more energy efficient. The old wood biomass steam boiler has been replaced with a biomass fired based thermal oil heater. The thermal oil heat moves a 1 MW turbine used to create electricity. This efficient organic rankine cycle (ORC) system is a first installation of its kind at a University campus in North America. Process thermal energy is used for heating the campus (Photo 7).

A new air emissions management system was added along with two fuel storage cells. High efficiency pumps have also been added to circulate hot water and smart meters and controls are installed to monitor and optimize plant performance. The majority of biomass (over 80%) is sawmill residue from a local mill. There are smaller amounts of clean wood waste and research fuels (chips from selective forest harvests through local forestry cooperatives and an agreement for willow) (Photo 8).

As part of the IDEA Project at Sexton campus, a 60 borehole geo-exchange field provides a heat source/heat sink not only to the IDEA and Design Buildings but also to nearby buildings. The field is situated in the Sexton soccer field. Each bore hole is drilled 500 feet deep. 469 solar photovoltaics (PV) panels are mounted on the IDEA and Design building roofs converting solar light to electricity. The system has the capacity to generate 150 kW of DC power and to deliver 125kW of AC power through its inverters. The PV



*Photo 7. Organic Rankine Cycle system at the AC.*



panels are ballasted mounted at 10° angle to maximize energy production while minimizing shading between rows of panels. An educational video captures details on these and other features of the IDEA Project (Photo 9).

**In the last decade:** On Dalhousie campuses, six solar photovoltaics systems (Photo 10), two solar thermal systems, two solar air systems, one ground source heat pump field, and one biomass co-generation district energy system has been added. A renewable energy master plan has been developed for the AC and solar suitability studies for the Halifax campuses. Planning work has started on off-site renewable energy power purchase agreement options as the university energy density and limited campus space requires off-campus solutions.

Of all the fuel and electrical energy consumed and produced on Dalhousie campuses, 10% comes from renewable energy sources (biomass and solar). The AC district energy system reduced the need for some renewable energy with the efficiency of the system. Phase Two plans are in development for utilization of more waste heat.



Photo 8. Visit to the willow field.

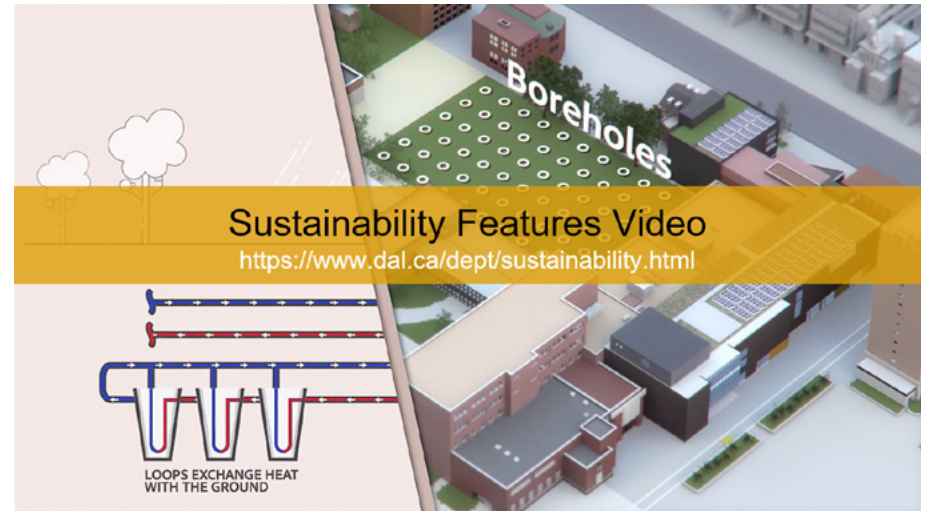


Photo 9. IDEA project educational video.



Photo 10. Solar PV panels on the Emera IDEA building.

## INCREASED TRAVEL (COMMUTING AND BUSINESS) THROUGH SUSTAINABLE MODES (PHASE 1: TDM PLAN AND PILOT; PHASE 2: 5% (OF DRIVE ALONE); PHASE 3: 15% OF DRIVE ALONE)

### *Target partially met*

**2018-2020 reporting period:** A SMART Trip commuter awareness campaign was developed and implemented through posters, LCD screens, websites, and direct email. Annual programs such as the Employee Bus Pass and Bike Week were actioned along with the completion of annual reports such as the commuter survey and parking lot reports. Electric vehicle stations were implemented on Sexton campus and an EV administrative manual was created. Indoor and outdoor bike parking was added on Sexton and Studley campuses and a shared multi-path through Sexton campus was implemented. An End-of-Trip facilities guide and abandoned cycling program was produced and actioned. A 5% drop in “drive alone” commuting was recorded. Many external factors such as transit accessibility, housing availability, distance from campus, family responsibilities, safe facilities and costs, drive commuter choices.

**In the last decade:** A number of new programs, centres, reports, plans, and infrastructure have been developed. A transportation demand management plan and updates were created along with active transportation guidelines. A Campus Bike Centre was created and initially managed by the Office of Sustainability and now is managed by a student society. Seven indoor bike rooms, some with showers and lockers, were created as part of new construction projects and 894 indoor and outdoor bike spaces were added to all campuses. An annual commuter survey and parking lot report were established to guide decisions. Dalhousie signed up to the Halifax Smart Trip program which includes access to a guaranteed ride home program and the employees bus pass program (Photo 11). Each year, presentations, campaigns, and events are held for activities such as Bike Week and the

Commuter Challenge. Reports and guides on End-of Trip facilities, ride share, cycling infrastructure, electric vehicle infrastructure, and bus shelters were created. A bus shelter was relocated for better access based on boarding research. A safe commute campaign and trip planning services were implemented.



Photo 11. Employee Bus Pass Program



## ENHANCED URBAN BIODIVERSITY

PHASE 1: TDM PLAN AND PILOT; PHASE 2: 5% (TARGET: ASSESSED AGAINST PLAN);

PHASE 3: (TARGET: ASSESSED AGAINST PLAN)

### *Some Targets Achieved – Ongoing Action*

**2018-2020 reporting period:** Students worked on tree replacement program efforts and key performance indicator information. All 17 trees that came down for the IDEA project are replaced with an equal amount of biomass planted on Dalhousie campuses equalling 178 trees of 5 cm caliper. Some of this wood was used to make benches for the IDEA and Design buildings. The bulk of the benches were made from maple, with the pattern accents in red oak. The extensive green roof, located on the Design building, provides biodiversity, heat island, and stormwater benefits. The roof contains five inches of growth medium, and sedum plantings (Photo 12).

**In the last decade:** A campus tree inventory and bird count was conducted, a University Natural Environmental Plan was created and updated design guidelines, and a tree replacement guideline was established. If a tree is taken down for campus infrastructure projects, the equivalent biomass should be replaced. Five rain gardens were implemented on the Halifax and AC campuses along with eight green roof systems on four newly constructed buildings. Some areas on campus were intentionally left to naturalize.

Since the tree replacement guideline was established in 2012, 215 trees were removed related to construction equalling (4,656 cm of biomass) and 736 trees were added: (3,841 cm of biomass) with some additional tree plantings left to do for 2021. Over 20 Norway Maples were removed (invasive species) and natives like red and sugar maple added.



*Photo 12. Green Roof on the Richard Murray Design Building.*



The Faculty of Management, Science, and Agriculture use the campus grounds as places for learning, teaching, research and hands-on-projects through courses like Landscape Architecture, Urban Forestry, Environmental Science and Biology. In 2018, The Faculty of Management

led a campus tree event to plant 200 trees for Dalhousie's 200-year anniversary. The AC is well known for their diversity of gardens, established the Bicentennial Botanical Garden (Photo 13). The Faculty of Science is leading an outdoor ecolab classroom development.



*Photo 13. Dalhousie Agricultural Campus Botanical Garden*



## BUILDINGS ACHIEVE GREEN BUILDING CERTIFICATION STATUS

PHASE 1: (TARGET: ALL NEW BUILDINGS) PHASE 2: (TARGET: 10% OF EXISTING BUILDINGS);  
PHASE 3: (30% OF EXISTING BUILDINGS).

### *Target Partially Achieved*

Green building can have many benefits including lower total cost of ownership, improving workplace well-being, reducing environmental and health impacts, demonstrating reputational and community leadership, and supporting teaching and research.

**2018-2020 reporting period:** Three new buildings were constructed and are striving for LEED® (Leadership in Energy and Environmental Design) Gold (Fitness Centre) and potentially LEED Platinum (Emera IDEA and Richard Murray Design buildings). A full building energy performance contract of the Tupper Building was completed in this period.

**In the last decade:** Since 2010, nine buildings have been built (Mona Campbell, Life Science Research Institute, Steele Ocean Science, LeMarchant Place, Wallace McCain Learning Commons, Collaborative Health Education, Fitness Centre, Emera IDEA and Richard Murray Design). Buildings achieved LEED Gold or Silver standards. Two major existing science buildings (LSC and Tupper) have undergone multi-million dollar full building energy performance upgrades. The nine new buildings are certified under the LEED program. This represents 17% of the building space in Halifax campuses or 14% of all building space of all campuses (Halifax and the AC). Third-party certification for the full building energy retrofits and

other building retrofits were examined. At the time a path was chosen to upgraded Dal design standards and practice for existing buildings. If LEED buildings and full building retrofits are included, this represents 33% of Halifax buildings and 29% of all building space of all campuses (Halifax and the AC).

In the next decade, opportunities will be explored for existing buildings such as Energy Star Certification (not currently available for University buildings) and other systems along with reviews and recommendations for new construction.

Throughout the nine new Dalhousie buildings and full building retrofits several new initiatives and features have been implemented. [Educational tours, maps, videos, signage and overview documents](#) are used to provide ongoing education and engagement. Examples of strategies include:

- Sustainable sites: electric car charge stations, end-of-trip indoor and outdoor facilities, green roofs, white roof, naturalized vegetative areas, and permeable concrete.
- Water efficiency: rain water cisterns, low-flow fixtures, and eliminating once through water cooled equipment.

- Energy and Atmosphere: geo-exchange (ground source heat pumps), solar strategies (air heating-solar wall, hot-water heating - solar thermal, electricity generation – solar photovoltaics and battery storage), variable refrigerant flow (VRF) heat-recovery heat-pump system, high efficiency equipment and systems, triple-pane windows and higher than normal envelope insulation, LED lighting, active chilled beams, assembly water and air testing (Photo 14), measurement and verification, and enhanced commissioning.
- Materials and Resources: Carbon cure concrete block, FSC certified wood, bubble deck construction, deconstruction and salvage, and other local and recycled content products.
- Environmental Quality: Low VOC furniture and products and air quality sensors and testing.
- Innovation and Design: tree re-use (tree on site were used for furniture in the building and the biomass was replaced), green cleaning, educational tours, videos, signs, dashboards, sessions and information sheets.

In 2019, Dalhousie received the Green Building Pioneer award from the Atlantic Chapter of the Canada Green Building Council.



*Photo 14. Air Leakage Testing at the IDEA Building*

## SUSTAINABLE FOOD OFFERINGS

### PHASE 1: (COMPREHENSIVE PLAN) PHASE 2: (ASSESSED AGAINST PLAN); PHASE 3: (ASSESSED AGAINST PLAN).

**2018-2020 reporting period:** The Office supported student work at the DSU Market each year for the last three years. Staff worked with food services staff on tracking local, third-party certified, plant based and community-based purchases. The two departments worked on waste management reduction projects such as a reusable mug pilot program (Photo 15). New local products were procured including blueberries and breads.

**In the last decade:** Dalhousie released the Sustainable and Healthy Food Framework. The Framework outlines progress made to date, highlights and specific values, focuses of action, and targets for further action. The University participates in the Sustainability Tracking Assessment Rating System (STARS) for universities and colleges. As part of the STARS program, Dalhousie tracks and reports publicly on local, third-party, and community-based and plant based food purchases percentages and on other aspects of food and dining services.

At campus dining halls, several awareness programs are offered, including seasonal menus and sourcing food from local farmers. As part of the Farm to Table program the food services team meets with local farmers who are also invited to meet the Dalhousie community at the dining halls. Other programs include tray-less dining; offering fair trade products (coffee, tea, chocolate); MSC certified dining halls in Halifax, eliminating trans-fats, and purchasing more whole foods for preparation on site. Produce from the on-campus Chef's garden is used at the dining halls at the Agricultural campus.

On-campus student groups have been actively taking actions on food sustainability. The Loaded Ladle is a registered levied Dalhousie Student Union society that aims to provide affordable, diverse, fresh, and healthy food. The Dalhousie Student Union runs a food bank on the Halifax campus and a farmer's market and food box program. Campus gardens in both Halifax and at the Agricultural campus aim to bring people together and provide educational opportunities surrounding sustainable food systems.

On average 25% of all food purchases (franchises, vending, catering, and dining halls) are from local (defined as Maritimes), third-party certified (e.g. Marine Stewardship Council, Organic, Fair Trade sources). There are higher percentages of local food purchases based on certain commodities like produce and between different food services such as dining halls versus retail in season. Local percentages are higher in dining halls. Approximately 38% of purchases are related to plant-based foods.



Photo 15. Resuable mug pilot at the Killam library.

## MAJOR PLANNING, POLICY, REPORTING, AND COMMUNICATION PRODUCTS INCORPORATE SUSTAINABILITY CONCEPTS. PHASE 1, 2, 3 TARGET (QUALITATIVE ASSESSMENT AT EACH PHASE).

### **(Target: Achieved)**

The Office of Sustainability engages with students, staff and faculty in on-campus projects, develops and spearheads utility and renewable projects, develops plans and policies, and delivers communications and education initiatives. In the last decade, a number of plans, policies/guidelines, reports, committees and councils have been developed (Table 3.).

Six behavioural and engagement programs and campaigns have been developed and implemented to engage residence populations, departmental staff, and general campus populations (Photo 16.). Social media platforms were developed and are updated including websites, twitter and facebook and presentations and lectures that are provided on and off campus every year (Table 4).

Monitoring and reporting programs have been subscribed to and are in a state of continuous improvement. In the last three years, an Energy Management Information Systems Plan (EMIS) was developed and software and hardware inventories were created. The third phase of the building utility metering program is underway. Dalhousie University is a Chartered participant of the International Sustainability Assessment Rating Systems (STARS). Every three years, Dalhousie submits over 67 credits of information on sustainability operations, curriculum, research and engagement for rating. Dalhousie's current STARS rating is Gold. The next submission is due by April 2021.

**In the last decade:** An EMIS plan was developed; analytical software tools and dashboards were created, integrated and purchased; and over 70 new building level meters have been installed in all campuses to provide 15 min. interval data for electricity and thermal energy. System level metering has also been added in new construction. Existing water meters at Halifax campuses were fitted with devices to enable data to be integrated into campus software. Additional water meters for the AC campus are planned for installation.

Annual reports for the Office are created and presented to the Board Capital Projects and Facilities committee and to the President's Advisory Council on Sustainability.

**Table 4. People reached through social media, surveys and presentations in last reporting period and decade.**

	<b>2018-2020 (last three years)</b>	<b>2010-2020 (last decade)</b>
Educational events and presentations	6,735	19,434
Communications vehicles (facebook, website, annual survey, twitter)	55,571	152,156



**Table 3. Plans, Policies, Guidelines, Reports, Committees and Network Participation (2010-2020)**

Plans <a href="#">(link)</a>	Policies and Guidelines <a href="#">(link)</a>	Reports/Thesis <a href="#">(link)</a>	Committees/Networks <a href="#">(link)</a>
<ul style="list-style-type: none"> <li>• Sustainability Plan (2010)</li> <li>• Climate Change Plan V.1 (2010), V.2. (2019)</li> <li>• Transportation Demand Management Plan (produced by IBI – 2011) updated action plan (2016)</li> <li>• Campus Energy Master Plan – (produced by MCW 2012)</li> <li>• AC Renewable Energy Plan – (Produced by CBCL – 2014)</li> <li>• Natural Environment Plan (2014)</li> <li>• Sustainable and Healthy Food Framework (2015)</li> <li>• Waste Management Plan (2015)</li> <li>• Energy Management Information Systems Plan (2018)</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainability Policy (2009)</li> <li>• Sustainability Statement of Principles (2009)</li> <li>• Sustainable Building Policy (2010)</li> <li>• Sustainability aspects built into FM Design guidelines (4)</li> <li>• Idle Free guidelines (2010)</li> <li>• Green Cleaning Policy (2011, updated 2013, 2017)</li> <li>• Paper Policy (2013)</li> <li>• Water Pledge (2013)</li> <li>• Vehicle Share and Green Fleet (2014)</li> <li>• Sustainable Procurement &amp; Food (2018)</li> <li>• Organics Management (2019)</li> </ul>	<ul style="list-style-type: none"> <li>• Annual GHG reports (started in 2010) – 10</li> <li>• Annual Sustainability and Commuter Reports (started in 2010) – 10</li> <li>• Annual Parking Lot Reports – (started in 2013) – 7</li> <li>• Waste – 10 reports on laboratories, management options, auditing and analysis methodology, C&amp;D, expanded polystyrene recycling, universal waste, organics reduction, plastics reduction</li> <li>• Transportation – 7 reports on bus shelters, AT infrastructure, bike loans, EV infrastructure management, TDM audits</li> <li>• Climate Change– 5 reports and publication on climate modelling and planning, carbon off sets, life cycle fuel emissions</li> <li>• Energy and Water – 8 reports on cooling options, commercial kitchens, renewable energy systems, building performance and energy efficiency strategies</li> <li>• Social purchasing and procurement – 2</li> <li>• Behavioural – 2</li> <li>• Green Cleaning – 1</li> </ul>	<ul style="list-style-type: none"> <li>• President's Advisory Council on Sustainability (2008 – ongoing)</li> <li>• Ad-Hoc Climate Change Committee (2009 – 2011)</li> <li>• Ad-Hoc Natural Environment Committee (2012 – 2014)</li> <li>• Ad-Hoc Food group (2014 – ongoing)</li> <li>• AC Sustainability Committee (2013 – ongoing)</li> <li>• Waste Committee (2015 – ongoing)</li> <li>• Energy Committee (2014 – ongoing)</li> <li>• Participation in University Transportation and Security committee – ongoing</li> <li>• Ad-Hoc Co-Chair Sustainability and Environmental Self Study group (2019 – 2020)</li> <li>• Participation in four networks: <ul style="list-style-type: none"> <li>• Atlantic Universities and Colleges Sustainability Network (AUCSN)</li> <li>• Northeast Campus Sustainability Consortium</li> <li>• Atlantic Chapter of the Canada Green Building Council</li> <li>• Canadian Alliance of University and Colleges Sustainability Professionals (2010 – 2018)</li> </ul> </li> </ul>
Ten Plans *(Both AC and Halifax campus master plans have sustainability aspects incorporated).	14 Policies and Design Guidelines	62 reports and one published journal article *does not include reports from class assignments on multiple topics.	Participation in 13 committees and networks

## SUSTAINABILITY IS REFLECTED AS A CORE CONCENTRATION IN THE UNIVERSITY CURRICULUM AT THE UNDERGRADUATE AND GRADUATE LEVEL

*(Target: Core programs offered at the undergraduate and graduate level – Assess at each phase.)*

Sustainability as a core concentration is reflected in over 290 courses across faculties on campus up from 230 identified in 2017. Undergraduate and graduate programs with multiple courses includes programs such as the School for Resource and Environmental Studies, International Development Studies, Environmental Engineering, Environmental Science, and the College of Sustainability. Programs in traditional disciplines across Dalhousie (e.g. Law, Planning, Biology, Agriculture, etc.), have added courses and certificates that address environment and sustainability issues. The College of Sustainability provides sustainability related major and minor opportunities to undergraduates in seven programs across five Faculties along with a Sustainability Leadership certificate. The College curriculum incorporates team teaching, problem-based and experiential learning, hands-on internship opportunities, and a weekly public lecture series.

Some sustainability courses and community co-operative education opportunities have an action-oriented focus, such as: Campus as a Living Lab; Community as a Living Lab, Management Without Borders; hands-on internships, and fourth-year sustainability and engineering capstone classes.



*Photo 16. Education tour at the landfill.*

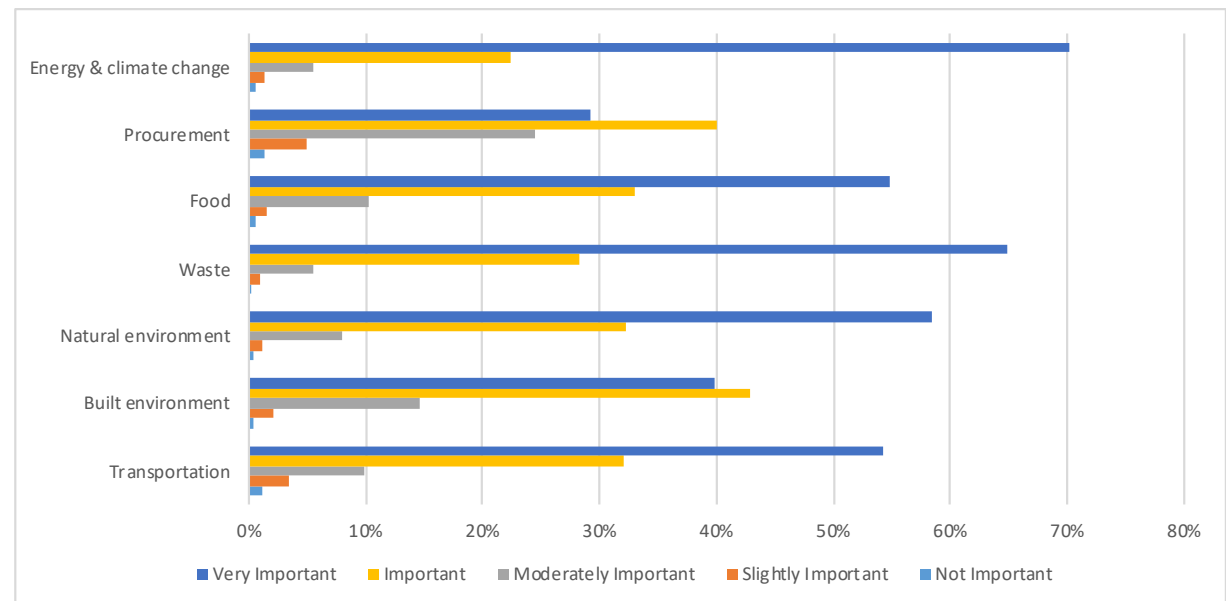
# POSITIVE STUDENT AND EMPLOYEE EXPERIENCE

*(Target: Assessed each phase through qualitative and quantitative measures)*

The Office of Sustainability collects annual survey data to capture feedback from students and employees. This data is used to identify emerging issues, gauge success, and improve on programs. The Office of Sustainability's annual survey collects data, on average, from 1800-3500 students and employees each year.

From the January 2020 survey, respondents identified priority emphasis on climate action and waste efforts, food, transportation, and built environment followed by procurement (Figure 15)

Throughout the year, the Office worked directly with many students through internships, coop placements, staff hires, class work and thesis involvement (Photo 17). In the last three years, the Office worked directly with over 241 students and 870 students over the last decade.



**Figure 15. Importance of sustainability initiatives.**

## FUTURE PLANS

In the last decade, significant progress has been made in planning, monitoring, and program delivery resulting in positive change. Many targets have been met, although some of the most ambitious phase 3 targets have not been reached in 2020, but are in reach in the next couple of years.

Through the experiences of a decade of action, research, and engagement, we have identified specific focuses for the next decade including continual action on pressing issues such as climatic change. How we do our work will be intentionally shaped by principles such as equity, diversity and inclusion (EDI) and student engagement. Key areas of focus include:

- On and off-site renewable energy projects that substantially advance carbon emission reductions and community benefits.
- Enhanced building energy modelling and EMIS analytics using existing data to focus in on strategies for new construction and existing buildings.
- Examination of climate adaption options such as low emitting back-up power.
- Update of the green building policy and strategies to achieve net zero existing and new buildings.
- Sustainability goals and strategies articulated in new campus master plans.
- Continuation of robust utility, behavioral and transportation demand, reduction, and conservation programs.
- Use purchasing strategies to advance sustainability and EDI goals through directed programs.
- Development and implementation of green labs and sustainable events program to reduce impact of resource consumption.
- Program plan for addressing carbon impacts of University travel

through local carbon offset program with EDI co-benefits.

- Critical examination and management changes related to single use materials (e.g. waste and food).
- Reducing waste volumes and the contamination of divertible materials in the waste stream.
- Move to low and no emission fleet transportation through supportive programs.
- Enhance biodiversity goals and cultural values across campus.
- Enhanced experiential and internship opportunity for students through existing and new sustainability and environmental related courses.
- Supporting departments to advance their sustainability goals such as moves towards more plant-based diet options.



Photo 17. Office of Sustainability summer students.





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