Niagara College Canada

APPLIED DREAMS.

Niagara College

Carbon Project Annual Report

2015-2016

NIAGARA SUSTAINABILITY INITIATIVE

The CarbonProject

July 2016

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1.0 Introduction

Through Niagara Sustainability Initiative's (NSI) proven approach, which engages organizations in setting and achieving greenhouse gas reduction targets, members of the Carbon Project are able to minimize their environmental impact while improving their financial bottom line; a two-fold accomplishment. **Niagara College is currently a Committing Member of the Carbon Project and has set a 10-year absolute reduction target of 20 percent below 2009-2010 levels (Milestone 4).**

As one of NSI's original members, Niagara College has committed to calculate and measure its corporate carbon footprint and invest in emission reduction strategies. The purpose of this report is to present the 2015-2016 greenhouse gas (GHG) inventory.

Additional statistics related to benchmarking between the Carbon Project members have been included this year. A project score has also been added, in order to recognize effort through participation, consistency and results. **Niagara College scored well overall, achieving a Carbon Project letter grade of B-.** Both the College and NSI recognize that opportunities for further improvement present themselves each year. As such, NSI has identified a number of recommendations within the "Moving Forward" section.

As an educational institution and Carbon Project member, Niagara College holds a unique position. Niagara College is able to engage students and staff in both horizontal and vertical decision making on sustainability. The Niagara College Office of Sustainability has made great strides in energy reduction projects in this past year such as:

- **Awareness campaign "Turn it Off":** engaged students to switch off unused lights through education and communication pieces.
- **The installation of lighting controls on all three campuses in the Niagara Region**: Motion sensors with embedded daylight harvesting were installed in all main hallways and classrooms at the Niagara-on-the-Lake campus. Previously, the hallway lighting remained in operation at all times due to lack of switches. Additional control was added through programmable lighting in the cafeteria, gymnasium and library. A similar project was completed at the Niagara Falls campus and is currently 50% complete at the Welland campus.

This is the fifth year that Niagara College has been measured their carbon footprint within the Carbon Project. The baseline year is set to 2009-2010 to coincide with other corporate goals.

2.0 Scope of Inventory

This report describes the corporate carbon footprint of Niagara College between April 1, 2015 and March 31, 2016. Standards set out in the *International Greenhouse Gas Protocol* were followed to determine Niagara College's corporate carbon inventory. According to these standards, emission-generating activities are classified under three scopes. Of all the members within the Carbon Project, the College reports on the widest range of carbon emitting activities within the three scopes of emissions, including:

Scope 1: All GHG emissions resulting from direct combustion.

- Gas & Stationary Combustion
- Fleet & Mobile Combustion

Scope 2: Indirect GHG emissions from consumption of purchased electricity.

- Purchased Electricity

Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, and others.

- Waste
- Water
- Business Travel (both vehicle and flights)

This report also outlines the waste emissions results, which were excluded from the 2014-2015 annual report and backtracked waste data, which has been adjusted using new emission sequestration factors acquired manually from the *Environment Canada GHG Calculator for Waste Management*.

3.0 Inventory

Niagara College's 2015-2016 carbon inventory was calculated using the carbon accounting software, HARA also known as Verisae, provided by NSI through Sustainability CoLab. This tool is used by many target-setting carbon reduction programs across Ontario including the Regional Carbon Initiative in Waterloo, Carbon613 in Ottawa and Green Economy Kingston.

The corporate carbon inventory totals 5,135.50 tonnes of CO2e (tCO_2e). The final total after subtraction of purchased offsets is 4839.53 tCO_2e, representing an increase of 146.97 tonnes (3.1%) from Niagara College's 2009-2010 baseline emissions of 4,686.5 tCO^2e. The largest contributor to the total inventory was Scope 1 (60%), with stationary combustion of natural gas emitting 3123.1 tCO_2e and vehicle fleet emitting 86.76 tCO_2e (Table 1, Figure 1). Electricity consumption is the second highest emissions source (32%), the same proportion as last year and contributes to 100% of Scope 2 emissions, adding 1,645.87 tCO_2e to the inventory. A small portion of the College's carbon inventory is also derived from Scope 3 emissions (5%) with business travel and water contributing 275.94 tCO_2e and 3.86 tCO_2e respectively (Figure 1). Within business travel, flights accounted for more than 80% of this category. Additionally, Niagara College's stellar waste diversion program resulted in net greenhouse gas sequestration of -1,051.61 tCO_2e below what would have resulted from traditional landfill disposal.

Table 1: Niagara College's Corporate Carbon Footprint 2015-2016.

Scope 1		Scope 2		Scope 3		Carbon Offsets	
Fleet Vehicles (tCO_2e)	86.76	Electricity Consumption (tCO_2e)	1,645.87	Employee Commuting (tCO_2e)	-----	Purchased Carbon Offsets	296.00
Stationary Combustion (tCO_2e)	3,123.10			Business Travel (tCO_2e)	275.94		
				Waste (tCO_2e)	-1051.61		
Refrigerants (tCO_2e)	-----			Water (tCO_2e)	3.86		
Total (tCO_2e)	3,209.86	Total (tCO_2e)	1,645.87	Total (tCO_2e)	-771.81	Total ($tCO2e$)	296.00

Within the timeframe of this inventory, Niagara College's monthly emissions followed a similar pattern to previous years, experiencing the highest emissions levels from November to March, influenced most significantly by emissions from natural gas combustion for facility heating. January reported the highest monthly emissions at 625.56 tCO_2e, followed closely by February at 615.16 tCO_2e (Figure 2). These peaks in emissions are closely associated with the heating of facilities during the cold winter months. Other emissions activities have very minimal influence on the monthly trends as compared to natural gas at Niagara College, either because they are reported annually, in the case of Fleet Vehicles and Waste or make up a small proportion of the overall carbon footprint (Business Travel and Water).

Figure 1: Niagara College's total 2015-2016 emissions produced by activity type (tCO_2e) and scope (percentage).

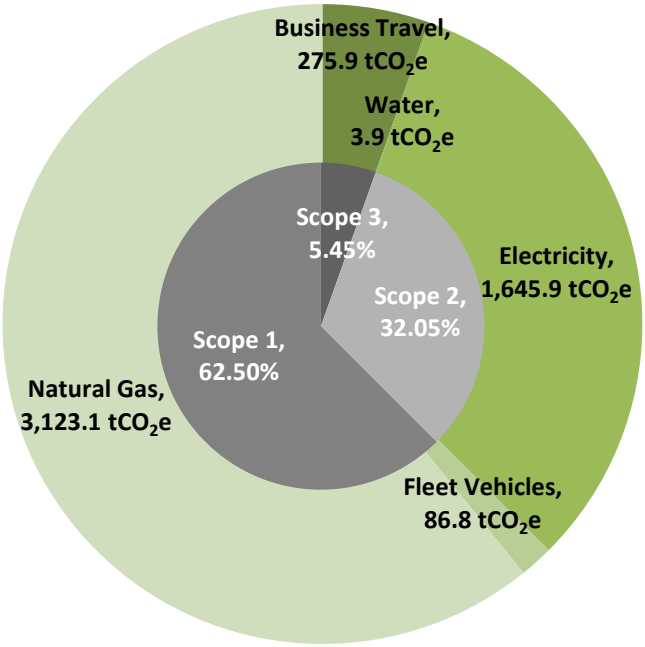
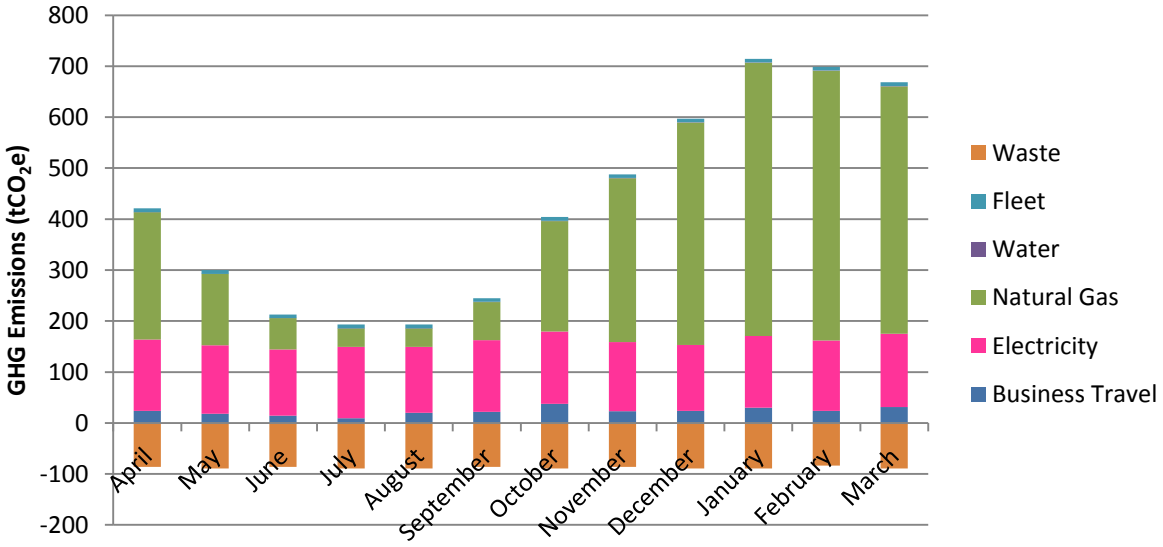


Figure 2: Niagara College's monthly emissions (tCO_2e) per month by activity type including sequestered emissions from waste management.



Emissions associated with electricity consumption had a secondary impact on monthly fluctuation; however, these emissions remained relatively constant throughout the reporting year, ranging from 144.05 tCO_2e in March 2016 (maximum) to 129.48 tCO_2e in December of 2015 (minimum).

Niagara College has seen success in minimizing energy use in the summer months. The average monthly emissions are 81.59% lower in June-August than they are between January-March. Emissions from Business Travel noticeably fluctuate throughout the reporting year. These emissions are greatest in October (37.48 tCO2e) due to increased air travel and drop to 9.23 tCO_2e in July. Water use is highest in March, with a margin of less than 0.5 tCO_2e from the month with the lowest water usage in June (Figure 2).

3.1 Carbon Sequestration and Offsetting

The College's Wine Visitor and Education Centre (WVEC) and Rankin Technology Centre are certified carbon neutral buildings on the CSA Clean Projects Registry. To maintain the carbon neutral status -296.00 tCO2e were purchased to offset unavoidable emissions from these facilities in 2015-2016. The offsets purchased are "ISO 14064-2 Verified Emissions Reductions", achieved through Walker Environmental Group's landfill gas recovery project. This year, the 296 tCO2e purchased offsets contributed to 37.56 percent of the total reductions observed (Figure 3 and Figure 5). Niagara College may continue to purchase carbon offsets, which can contribute up to 49 percent of their total emissions reduction goal as part of the Carbon Project.

Additionally, the carbon sequestration determined by diversion of waste away from landfill was determined to be -1051.61 tCO_2e less than what would have resulted without the waste diversion programs. These sequestered greenhouse gas emissions are Scope 3 emissions and under the current Carbon Project framework cannot be used to contribute to the College's emissions reduction goal as the sequestration calculated must be attributed to the waste haulers. Furthermore, the sequestered emissions calculated are not third party verified, a requirement of consideration as an offset under the greenhouse gas protocol (GHG Protocol, 2009). However, the measurement of these sequestered gasses is an indicator of the positive indirect emissions reductions achieved by the College. The annual waste emissions inventory is further explored in the "Waste Emissions Results" section that follows.

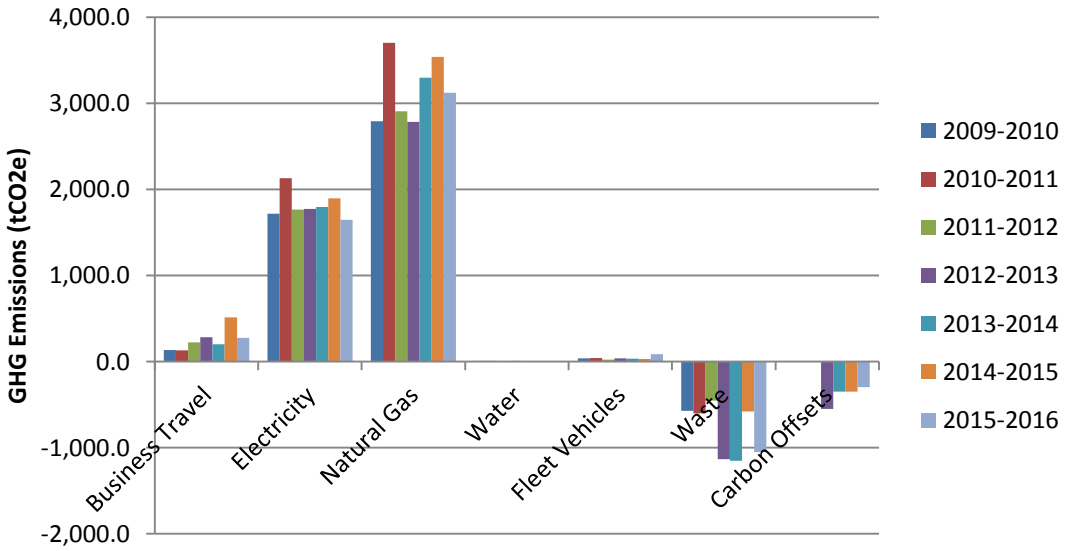
Niagara College has requested that the carbon emissions avoided from renewable power generation be calculated. The Carbon Project manually calculation the emissions offsets from the on-site solar panels. The total kilowatt hours (kWh) generated by Niagara College's solar panels during the 2015-2016 period was 141,871.38 kWh. The emission factor for electricity generation in Ontario is 41 gCO2e/kWh. The GHG emission avoided by Niagara College's renewable energy project is 5.82 tCO2e.

3.2 Year by Year Comparison

Figure 4 shows total annual produced, sequestered and offset emissions from the baseline year of 2009-2010 to the current inventory year of 2015-2016 by associated activity type. From its baseline year, Niagara College has seen decreases in emissions from Electricity but increases in Natural Gas, Business Travel, and Fleet Vehicles. Emissions sequestered from Waste have been up and down. Notably, the College has made a conscious decision to decrease the amount of purchased offsets over time. Encouragingly, success has been seen over the last year as decreased emissions have been observed from all activity types besides Fleet Vehicles.

In this latest carbon inventory, the institution's emissions have decreased by 842.1 tCO_2e or 14.1% from 5977.6 tCO_2e to 5135.5 tCO_2e since the 2014-2015 year. Figure 5 depicts the offsets purchased by the College over the timeframe of 2009-2010 to 2015-2016. Figure 6 shows the total carbon inventory including purchased offsets, showing a net increase from 2009-2010 by 153 tCO_2e. The College is currently 1090.3 tCO_2e above its target in absolute terms.

Figure 3: Total annual emissions trends by activity type for the years 2009-2010 to 2015-2016.



In 2012, the college achieved a significant reduction in emissions to 4881.1 tCO_2e. Unfortunately, maintaining this rate of emission reduction has proven challenging and carbon emissions rose steadily in the following three reporting years. This year, Niagara College has seen the first reduction in absolute emissions since 2012 (Figure 4). **Niagara College's emissions reduction target, set under the Carbon Project Framework is a 20 percent absolute reduction from baseline (2009-2010) which would equal 3749.2 tCO_2e by 2019-2020. Currently, Niagara College is approximately 1090.3 tCO2e above its target.**

Figure 4: Niagara College's total annual emissions (tCO_2e) from 2009-2010 to 2015-2016.

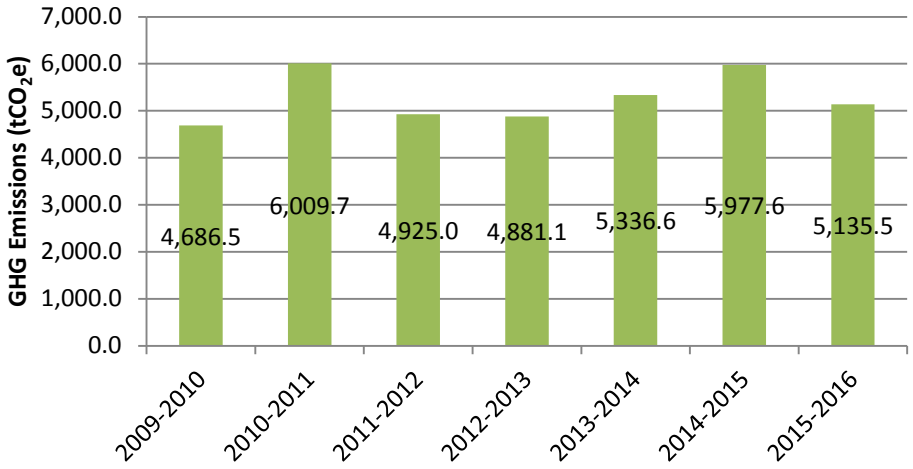


Figure 5: Niagara College's Total purchased offsets per year from 2009-2010 to 2015-2016.

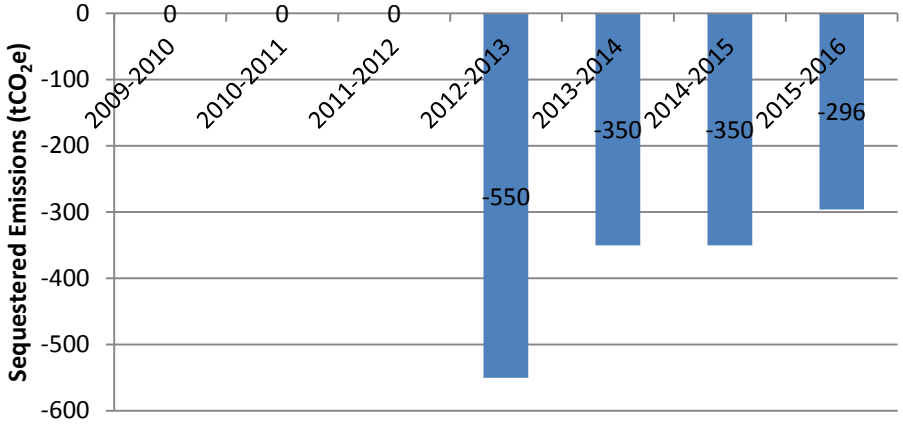
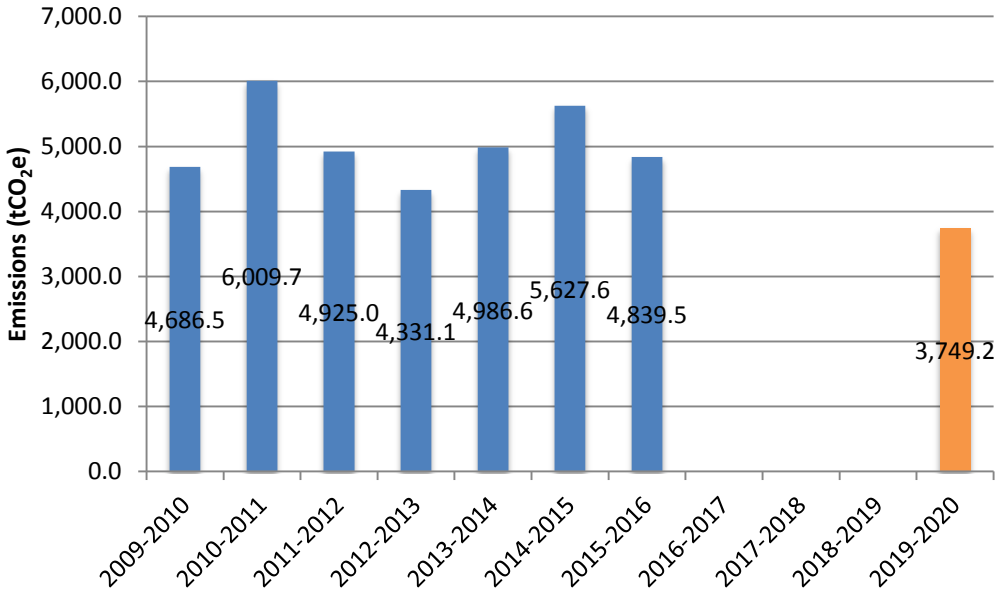


Figure 6: Niagara College's total emissions including purchased offsets measured to date. The orange bar indicates the 2019-2020 carbon reduction target.



4.0 Waste Emissions Results

Through an exceptional waste diversion program, Niagara College sends a majority of its waste to composting and recycling facilities. The remainder is sent to landfills with gas-recovery systems in place. As a result, the emissions sequestered from Niagara College's waste have been calculated and represent the emissions reduced as compared to traditional landfilling practices.

Through significant effort from both the staff at Niagara College's Office of Sustainability and Niagara Sustainability Initiative's Carbon Project, the data from Niagara College's waste audit reports have been combined into the categories as outlined in Figure 7: compost, landfill (with gas-recovery), recycled concrete, recycled e-waste, recycled paper, recycled plastics, recycled scrap metals and recycled wood. The emission factors required to perform the calculations were extracted from the *Environment Canada GHG Calculator for Waste Management*. The emission factors of similar materials were combined and averaged into the aforementioned categories for simplicity.

Calculating the emissions from waste is a complicated process, and varies widely dependent on the type of material, the method of disposal and the industry for reuse or repurposing. Transportation of materials to and from waste management facilities also factors into the equation, although its significance is slight in comparison to the other variables. The time the material spends in landfill as well as the decomposition rate of different materials requires consideration as well. Due to the complicated nature of calculating emissions released and sequestered from the handling of waste, generalizations were made when combining the emission factors from similar materials (OWMA, 2015).

The results showed that, in 2015-2016, a total of 1051.6 tCO_2e were avoided or sequestered due to the waste diversion practices at Niagara College. Figure 7 breaks down the activities that contributed to the total emissions reduction from waste. The greatest reductions were achieved through recycling of paper (43%), followed by recycled metal scraps (30%), and recycled plastics (14%).

These emissions reductions were observed through the waste stream, a scope 3 ("indirect, other") emissions category as defined by the GHG Protocol. These emissions reductions therefore, are associated to the waste hauler and not to the College. Although they occurred as a result of efforts made by Niagara College waste diversion program, the emissions and sequestration occur off site. By this definition, the emissions reductions cannot be used at this time towards an emissions reduction goal in the Carbon Project.

It is still valuable to measure and report waste diversion data as the waste management industry and its sequestration potential will likely have a role to play in Ontario's Cap and Trade system in the coming years. It is unclear how these emissions reductions credits or offsets may be attributed to produces or customers of the waste haulers.

The emissions sequestered through waste diversion at Niagara College over the past seven years has fluctuated greatly depending on the composition and the amount of each waste stream recorded annually (Figure 8).

Figure 7: Breakdown of proportion of waste emissions reduction by waste diversion method.

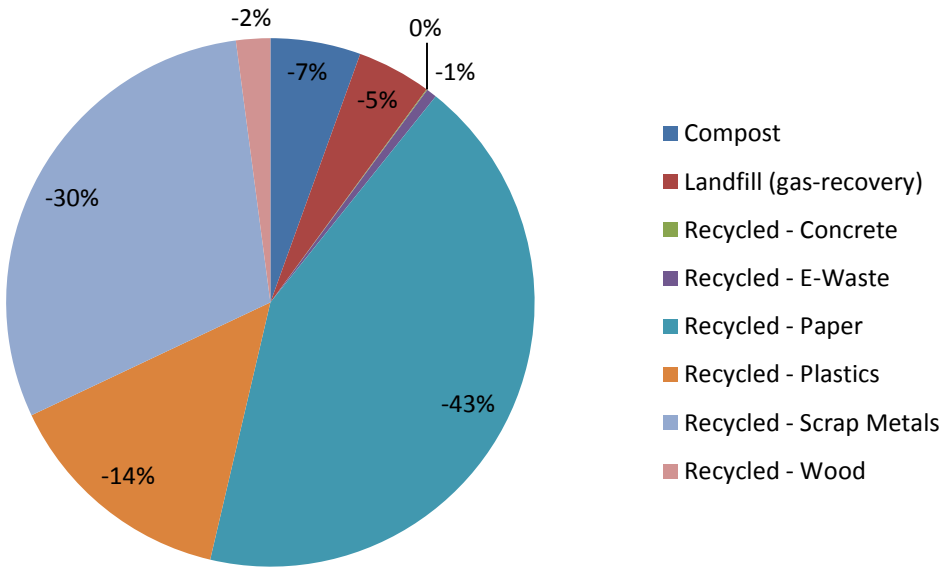
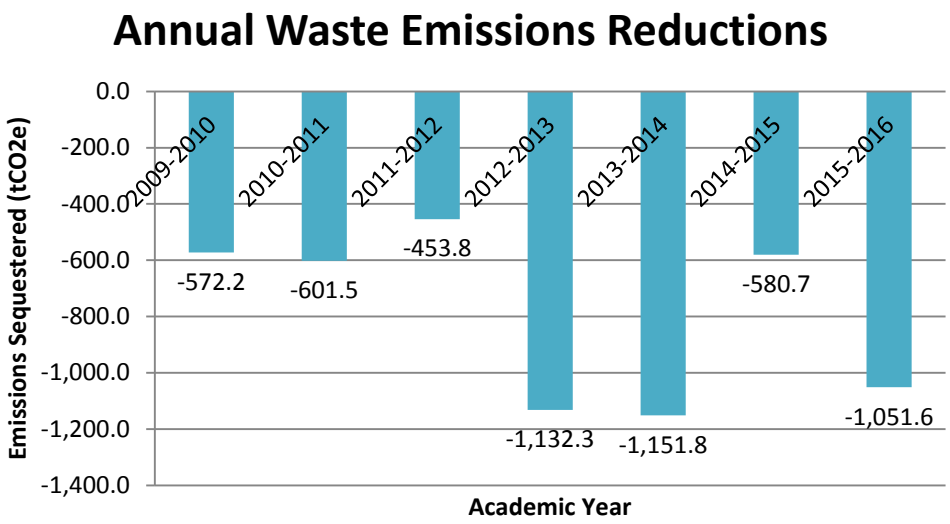


Figure 8: Annual waste emissions reductions resulting from Niagara College's waste diversion program.



5.0 Weather Normalization

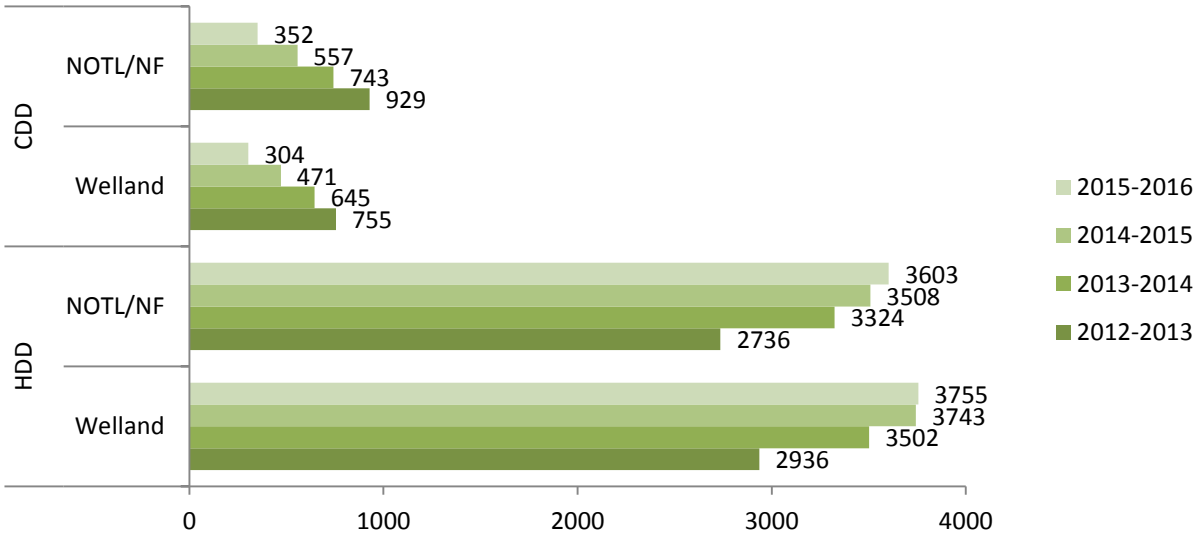
5.1 Heating Degree Days and Cooling Degree Days

Heating Degree Days, Cooling Degree Days (CDD) refers to the demand for energy needed to cool indoor air to human comfort levels. CDDs were not compared in the linear regression against electricity emissions at Niagara College's campuses because the College's electricity use trend is relatively constant year round. There is little correlation between weather and electricity use on a monthly basis, due to the fact that electricity is not exclusively used for building cooling. This is unlike natural gas, which is used primarily for building heating.

The graph below (Figure 9) tracks the HDDs and CDDs at all three campuses since 2012-2013, Niagara Falls (NF) and Niagara-on-the-Lake (NOTL) have been grouped together because of their similar climates. HDDs have increased in number and CDD have decreased in number annually since the 2012-2013 reporting year.

From 2012-2013 the number of CDDs at NOTL/NF has fallen by 62%, from 929 to 352 and at Welland it has decreased by 43%, from 755 to 304. While in the same timeframe HDDs have risen by 31% in NOTL/NF, from 2736 to 3603 and in Welland the growth has been 27%, from 2936 to 3755. However, in the past year HDDs have increased at a slower pace, with only an 8 point advance in the City of Welland. Despite the more extreme weather patterns, Niagara College was able to decrease their use of both electricity and natural gas in 2015-2016, as compared to the previous year.

Figure 9: Heating Degree Days and Cooling Degree days recorded over the past four years in Niagara-on-the-Lake (NOTL), Niagara Falls (NF) and The City of Welland.



5.2 Linear Regression Analysis

A linear regression analysis was performed for all three campuses; Niagara-on-the-Lake, Niagara Falls and Welland, in order to compare monthly emissions associated with facility heating and locally observed Heating Degree Days (HDD) for 2015. The weather can have a substantial influence on natural gas and electricity consumption of an operation. Heating Degree Days is a measure of how many degrees and for how many days a building requires heating, based on outdoor temperatures. In order to calculate HDD, a chosen "balance point temperature" must be determined, this the temperature at which the building requires no heating or cooling in order to maintain human comfort levels. Monthly HDD at the balance point of 16.5°C were collected at Welland Weather Station and compared with Welland campus' natural gas consumption, while the HDDs for Niagara-on-the-Lake (NOTL) were used for both the Niagara Falls and NOTL campus as the statistics gathered from The Weather Network website for both municipalities mirrored each other. Where data was not available on The Weather Network website, HDD and CDD data was collected from www.degreedays.net.

The results show that natural gas usage closely follows the trend of HDDs in all three cases. The R^2 value indicates the strength of the correlation between HDD and natural gas emissions; the closer this value is to 1 the more efficient the energy management system. Niagara College's Niagara-on-the-Lake campus achieved an R^2 score of 0.95 (Figure 10), indicated a highly efficient energy management system. Based of this linear regression analysis, Niagara College's NOTL campus has the highest efficiency of any other facility or combined facilities of a member in the Carbon Project. The Niagara Falls and Welland campuses scored equally with an R^2 of approximately 0.80 (Figure 11, 12). The equation of the trend line can be used to calculate the expected energy use from HDD for a given period per facility.

Figure 10: Linear regression analysis for Niagara-on-the-Lake Campus

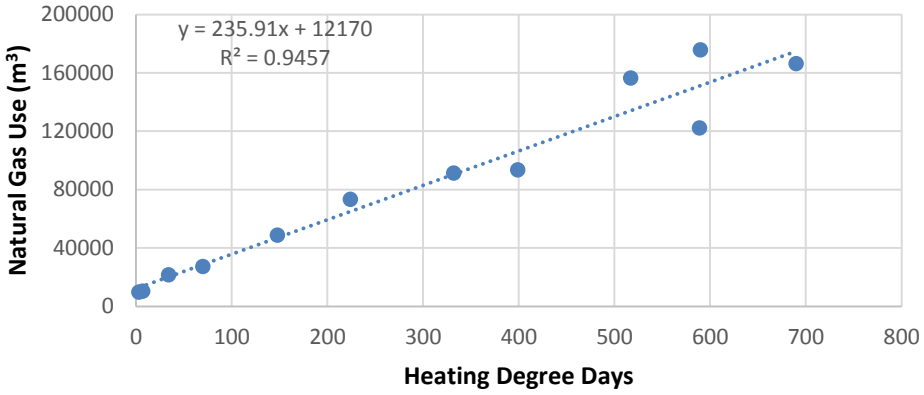


Figure 11: Linear regression analysis for Niagara Falls Campus

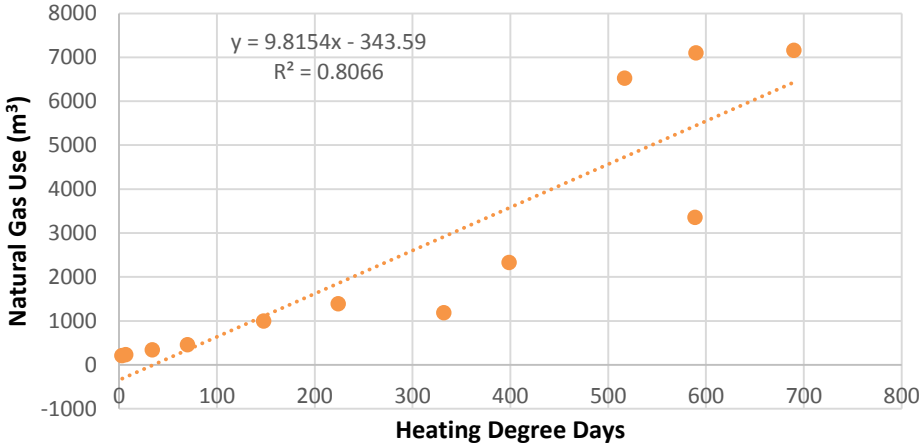
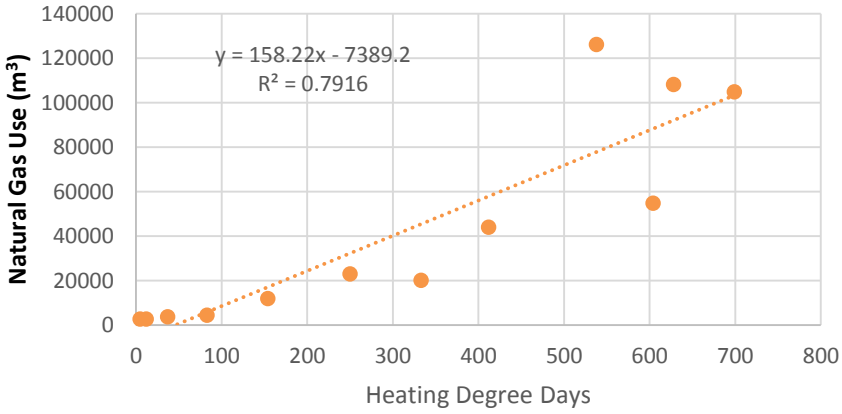


Figure 12: Linear regression analysis for Welland Campus



It should be noted that this year's linear regression analysis compared the natural gas used at a facility in cubic meters (m^3) with the number of HDDs per month in the year, while last year's linear regression analysis compared the emissions in tonnes of carbon dioxide equivalents (tCO_2e) from the use of natural gas with the HDD days. Thus the analysis results from the 2014-2015 report are not directly comparable to the results found below. This methodology was used as natural gas, rather than carbon emissions from natural gas use are more directly linked in the analysis to HDDs. Therefore this new methodology, eliminates the additional elements of emission factors and global warming potential, which changes over time and geographic regions.

Although linear regression is a useful tool to analyze the relationship between the weather and energy usage associated with heating, it is important to be cautious of the limitations, which include:

- Results are most accurate when the period of time is constant in length such as a day or week. Months, which have varying number of days, can cause inaccuracies.
- Additionally, the analysis above estimates a constant balance point of 16.5°C for simplicity, while in reality, building heating and cooling is not constant. Temperature regulation is intermittent and set to meet occupancy hours. The more irregular the consumption data, the greater the inaccuracies become.

6.0 Carbon Project Benchmarking and Grade

The carbon intensity of all Carbon Project members was calculated using two metrics: (1) tonnes of carbon dioxide equivalent emissions per 1000 square feet of heated space and, (2) tonnes per full-time employee (FTE). The results from this assessment demonstrate a fairly strong correlation between annual tCO_2e emissions and intensity. The square footage used was 1,138,270 square feet. The number of full-time employees used was 1859.

Niagara College scored at 4.51 tCO2e/1000 square feet as compared to the best score of members in the project which was 1.70 tCO2e/1000 square feet. For the second metric, the College scored 2.67 tCO2e/FTE as compared to the best score in the network which was 1.65 tCO2e/FTE. The benchmark indicates that Niagara College does utilize their space efficiently but that there is room for improvement (Table 2).

A third metric was added specifically for Niagara College; total emission per Heating Degree Days. The College scored 1.88 tCO2e/HDD in 2015-2016. This metric can be used as a benchmark for future years. However there is a limitation to this metric in that the total emissions from all three campus' was compared with the HDD from the city with the lowest recorded (NOTL) HDDs. This was chosen to produce a conservative estimate. However, the total emissions also include emissions from electricity which are not directly implicated by weather patterns. Thus the application of this intensity metric should be done so cautiously, with all limitations considered.

Table 2: Emissions intensity benchmark score as compared to the best score in the Carbon Project.

Emissions Intensity	Niagara College	Best Score
Total emissions (tCO2e) per 1000 square feet.	4.51	1.70
Total emissions (tCO2e) per full-time employee	2.76	1.65
Total emissions (tCO2e) per HDD	1.88*	N/A

All intensity metrics used the emissions total excluding reductions from offsets for the calculation.
*The total emissions from all three campus' was compared by the HDDs experienced in NOTL.

This year, a new letter grade score has been introduced for the first time for all Carbon Project members. This letter grade is called the "Carbon Project Score" and was calculated based on three criteria: Participation, Reporting and Results. All three categories were individually scored out of 100 and given equal weightings to determine the final letter grade. **Niagara College's Carbon Project Score for 2015 is B-.** This grade indicates that the College is an active and engaged member of the Carbon Project. The organization reports its data in detail, although because of the amount of data involved, much assistance is required from NSI. The carbon emissions results at the college are positive but there is still much more work that needs to be done for the institution to reach its carbon reduction target.

Table 3: Niagara College's Carbon Project Score by criteria and letter grade.

Criteria	Score	Letter Grade
Participation	100	**B-**
Reporting	80	
Results	60	

7.0 Moving Forward

Within the Carbon Project, Niagara College has been an outstanding member, not only focused on their own success but also supporting the efforts of others across Ontario through shared resources and stories. Moving forward, the following recommendations have been made for the College. NSI hopes to encourage continuous improvement, and provide support to Niagara College as they work towards their 20% absolute reduction target set for 2019-2020. The guidelines of "Measure, Manage and Mitigate" have been used to breakdown the next steps with respect to Niagara College's carbon footprint.

7.1 Measure

Niagara College has been reporting under the Carbon Project since the 2011-2012 year and set their baseline in line with other corporate goals to 2009-2010. They continue to improve data collection annually. The following recommendations have been made to ensure more accurate and relevant data collection and quantification of the carbon footprint, recognizing that a sound carbon footprint is the basis of a good carbon reduction strategy:

Collective data entry: ensure other staff (i.e. those outside the Office of Sustainability??) are aware of the purpose of the data collection process and the requirements for timely, correct and complete data –

specifically for vehicle business travel and flights. A communication notice and a streamlined excel sheet or form as part of an official process can ensure all responsible parties can contribute productively to data collection. Streamlining this data collection process will ease the time and resources required of the Sustainability Coordinator during the reporting season.

Quantifying tree canopy and forest cover: precedence has been set within the Carbon Project to measure tree forest cover and estimate sequestered emissions. It is recommended that the College complete an inventory of trees on their property and consider the potential to include the sequestration properties of these trees within its carbon inventory.

7.2 Manage

Through continuous measurement and awareness, Niagara College has a clear understanding of the emissions they produce. Opportunities always exist to better manage energy use of an existing facility and business operation. Through analyzing structural and behavioural tendencies within the facilities, NSI can identify better management practices and to help Niagara College work with what they have on an on-going basis. Recommendations made with regards to each scope include:

Scope 1

PR campaign to promote student feedback: Niagara College currently provides a platform for students and staff to give feedback on comfort levels of specific heated spaces through an online website. Staff can place a FMS ticket request in the online system or they can call the Administrative Assistant to the Director of Facilities – in both cases the HVAC technicians will address the temperature issues at each respective campus.

This method could be very effective in managing the heat of the building if utilized regularly. It is recommended that Niagara College and the Office of Sustainability increase efforts to bring awareness and engagement to this online tool.

Thermal Imaging Analysis: a study of the building envelope will reveal areas that need improvement or where heat is escaping.

Scope 2

Energy Audit: a detailed energy audit can be performed on all areas of the campuses. Since Niagara College operates three campuses with several buildings on each, the audits can break down the facilities into smaller segments. NSI suggests that the College use their eager and educated students to perform the audits as part of a large project. The auditors can submit a report to each department as well as to facilities which outlines the areas that use energy but also where the management of energy can be improved. For instance, a detailed audit could identify smaller areas where lights or electronics are powered on but under-used.

Lighting Retrofits: Niagara College is already replacing old inefficient light bulbs with newer ones. NSI suggests that this practice continue until they are 100% converted (NC Annual Survey, 2016).

Scope 3

Water collection barrels: As a combined effort between the Sustainability department and the Horticulture department, NSI recommends the College collect rainwater and recycle water wherever possible. This will become increasingly more important as extreme weather begins to increase in the region due to climate change (TRCA, 2011).

Offsetting Business Travel: An unavoidable emissions source for the College is business travel and flights. In order to achieve the reductions needed within this category, it is recommended that the College take advantage of offsets, which are commonly offered through flight carriers, or in general through the purchase of verified offsets on the market.

7.3 Mitigate

A meaningful carbon reduction plan helps an organization to meet business objectives, while maintaining commitment to environmental protection over the long term. There have been many projects implemented at Niagara College that have seen success and recognition. NSI recommends the following new green projects to help Niagara College mitigate further emissions:

Renewable Energy: Investing more in renewable energy projects will allow the College to mitigate emissions from their two greatest activities: the combustion of natural gas and the purchase of electricity. Solar and wind projects have already been implemented. The expansion of these existing projects, as well as exploration of new technologies like geothermal which would directly reduce the need for heating using natural gas, could produce viable returns on investment. The cost of renewable energy is forecast to continue to decrease (IEA, 2015).

Increasing Tree Canopy: This is a long-term project that would provide substantial mitigation against the risks of climate change. Trees act as a carbon sink that removed carbon from the atmosphere, slowing the rising global temperatures. Adding tree cover is not only in the interest of climate change mitigation, but also improves wildlife habitat and aesthetics.

8.0 Summary

Niagara College is an engaged and ambitious sustainability leader within the Carbon Project and the region. This past year, the college introduced many new projects to reduce emissions and have seen results in building efficiency and cost savings. The College's Office of Sustainability has worked closely with NSI staff to measure their carbon footprint, which totalled **5,135.50 tonnes of CO2e (tCO_2e)** from April 2015 to March 2016. **With the subtraction of the purchased offsets the total is 4839.53 tCO_2e. This year, the organization's emissions decreased by 842.1 tCO_2e from the previous year. However, the organization's emissions have increased since baseline by close to 147 tCO_2e since the baseline year of 2009-2010.** Consequently, the institution must continue to seek reduction strategies, in order to achieve their 20 percent absolute reduction target by 2019-2020. Within this report, several opportunities for improving the measurement, management, and mitigation of carbon emissions have been presented. We encourage Niagara College to take even more ambitious steps to reduce emissions now and in the future.

9.0 Works Cited

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