SUSTAINABLE GATEWAY

Gateway Technical College Greenhouse Gas Emissions Inventory Report FY 2018

In fulfillment of the Second Nature Climate Leadership Commitments

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Contents

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Executive Summary

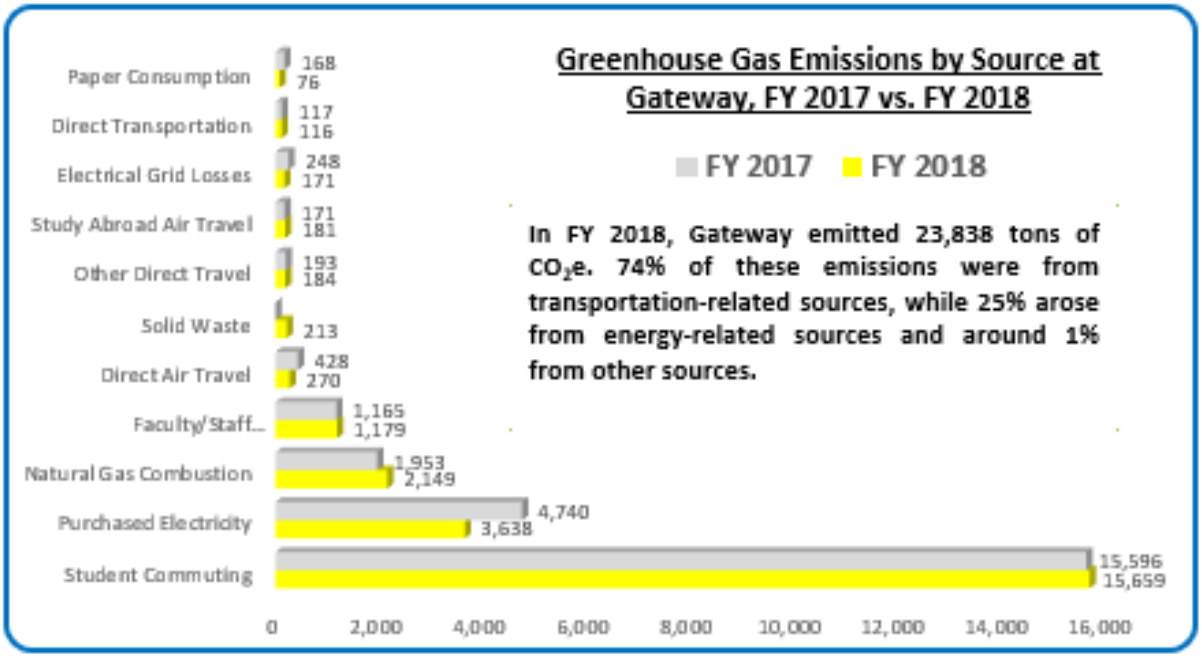
This report is Gateway Technical College's Greenhouse Gas (GHG) Inventory for fiscal year (FY) 2018. This is the *seventh* such inventory, with previous ones performed for the fiscal years 2009, 2010, 2011, 2014, 2016 and 2017. These inventories quantify the impact of Gateway's operations on GHG emissions and serve as baselines and progress reports for future reduction strategies as the institution progresses toward its goal of carbon neutrality. The report is a key component of Gateway's participation in the American College and University Presidents' Climate Commitment (ACUPCC), signed in 2009, and Second Nature's Climate Commitment, signed in 2015.

A GHG inventory provides a critical benchmark against which Gateway tracks progress towards reducing its environmental footprint.

The inventory provides a broad overview of Gateway's greenhouse emissions and breaks down emissions into the following categories: transportation, non-vehicular energy use, landscaping and solid waste. Technical concepts such as "scopes", background on primary greenhouse gases and global warming potential are explained.

The inventory of greenhouse gas emissions revealed that Gateway Technical College emitted a total of approximately **23,838 metric tons of carbon dioxide equivalents (MT CO2e) in FY 2018**. This amount represents all GHG emissions, i.e. in Scope 1, Scope 2 and Scope 3.

Of these emissions, 74% originated from transportation-related sources and 25% from energy-related sources and 1% from other sources. The emissions by source are illustrated in the graph on the following page.



Student commuting, at 63%, composed the largest source of total GHG emissions, followed by purchased electricity at 15% and natural gas combustion at 9%.

The figure 23,838 MT CO_2e for FY 2018 represents a 4% decrease in total GHG emissions (all scopes) vs. FY 2017, when 24,771 MT CO_2e were emitted from the operations of Gateway Technical College.

The 4% decrease realized in 2018 GHG emissions occurred at the same time that Gateway experienced a 0.6% increase in FTE over the period, i.e. to 4,563 FTE in FY 2018 from 4,537 FTE in FY 2017.

Limiting the emissions to Scope 1 and Scope 2 only – a metric for measuring Gateway's direct reduction efforts – the college experienced an emissions reduction to 5,903 MT CO_2e in 2018 from 6,811 MT CO2e in 2017, a 12% year-over-year decrease.

The following table comparing GHG inventories since 2009 was performed for both total emissions (Scopes 1, 2 & 3) and those emissions over which Gateway has the most control (Scopes 1 & 2 only), as well as annual and cumulative changes in emissions over time.

TOTAL GHG EMISSIONS PER YEAR 2009 - 2018 (with exceptions)						
FY	Emissions Scopes 1, 2 & 3 (MT CO_2e)	Year over year change in %	Cumulative Change in %	Emissions Scopes 1 & 2 (MT CO_2e)	Year over year change in %	Cumulative Change in %
2009	34,900	--	--	10,544	--	--
2010	32,000	- 8%	- 8%	9,606	- 9%	- 9%
2011	31,826	- >1%	- 9%	9,634	+ < 1%	- 9%
2014	30,009	- 6%	- 14%	9,031	- 6%	- 14%
2016	26,182	- 13%	- 25%	7,502	- 17%	- 29%
2017	24,771	- 5%	- 29%	6,811	- 9%	- 35%
2018	**23,838**	**- 4%**	**- 32%**	**5,903**	**- 12%**	**- 44%**

To provide additional context to an institution's GHG emissions, normalizing them by FTE is a common practice. This enables comparisons between institutions. The following table summarizes emissions per FTE in each of Gateway's GHG inventory to date.

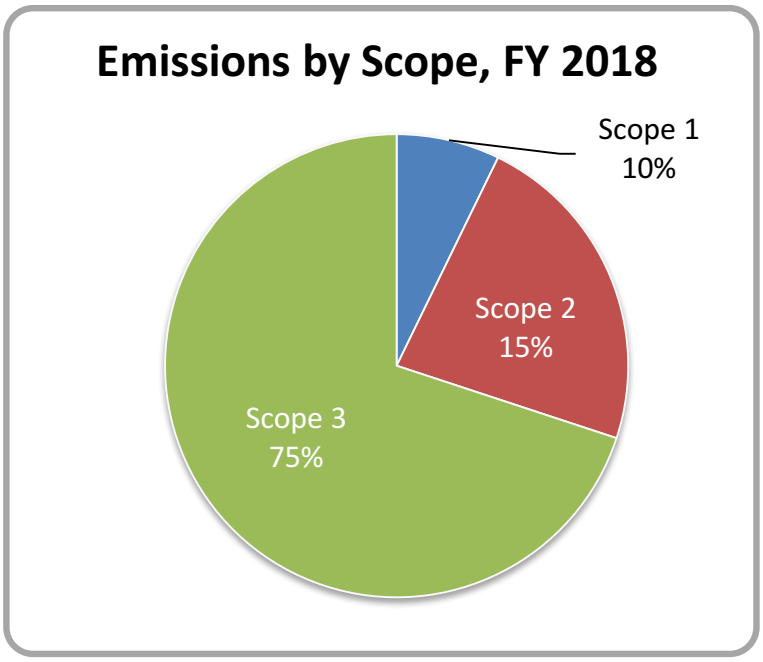
NORMALIZED EMISSIONS PER FTE 2009 - 2018 (with exceptions)			
Year	FTE	MT CO_2e per FTE (Scopes 1, 2 & 3)	MT CO_2e per FTE (Scopes 1 & 2)
2009	5,188	6.7	2.0
2010	5,985	5.3	1.6
2011	6,382	5.0	1.5
2014	5,419	5.5	1.7
2016	4,783	5.5	1.6
2017	4,537	5.5	1.5
2018	4,563	5.2	1.3

It is an achievement for Gateway to maintain declining levels of per-FTE emissions in the face of a stable FTE level vis-à-vis the previous fiscal year.

Gateway has also achieved steady decline in GHG emissions per unit of facilities space, even as institutional footprint has grown, as outlined in the following table.

NORMALIZED EMISSIONS PER 1000 SQ. FEET OF SPACE 2009 - 2018 (with exceptions)		
FY	Physical Space (sq. ft.)	MT CO_2e per 1000 sq. ft. (Scopes 1 & 2)
2009	856,092	12.3
2010	783,356	12.2
2011	793,611	12.0
2014	836,260	10.8
2016	859,358	8.1
2017	858,794	7.9
2018	874,694	6.7

Continuing with past trends, the largest sources of emissions at Gateway were in the categories over which it has least control (Scope 3), while the smallest sources of emissions were in categories over which it has most control (Scope 1).



Transportation is GHG emissions source that is difficult to reduce given that Gateway is a commuting-heavy institution that partakes in a great deal of travel for both business- and learning-related activities. GHG emissions were relatively stable overall in this area.

The category of non-vehicular energy emissions – i.e. from combustion of natural gas and electricity utilization – is where Gateway shines brightest. The table below documents these reductions in both consumption and GHG emissions.

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NON-VEHICULAR ENERGY EMISSIONS 2009 - 2018 (some years excluded)						
Year	MMBtu of natural gas (MT CO_2e)	kWh of electricity (MT CO_2e)	Total MT CO_2e	annual % reduction	Heating Degree Days	Cooling Degree Days
2009	n/a (2,185)	n/a (8,359)	**10,544**	n/a	6,962	n/a
2010	42,141 (2,229)	10,526,288 (7,299)	**9,527**	- 9.6%	6,236	n/a
2011	42,935 (2,271)	10,494,754 (7,277)	**9,547**	+ < 1%	6,849	n/a
2014	44,728 (2,378)	9,546,266 (6,557)	**8,935**	- 6.4%	7,926	711
2016	38,267 (2,031)	8,549,804 (5,392)	**7,432**	- 16.8%	5,909	719
2017	36,728 (1,953)	8,274,098 (4,740)	**6,693**	- 9.9%	5,810	1,132
2018	39,763 (2,149)	7,093,452 (3,638)	**5,787**	- 13.5%	6,586	791

In 2018, Gateway realized a 14% year-over-year reduction in kilowatt-hours of electricity consumed which resulted in a nearly 23% reduction in GHG emissions for this emissions source. This reduction is the equivalent to unhooking 110 average homes from the electrical grid (US-EIA, 2017). Gateway experienced a slight increase in the emissions from natural gas combustion due to a cold winter.

Taking a historical view, over the period 2009-2018, Gateway has achieved a voluminous 44% reduction in non-vehicular GHG emissions. The major share of these reductions arose from the 33% reduction in the acquisition of electricity since 2010. The 3.4 million kilowatt-hours of electricity that are longer needed in 2018 to power Gateway's operations (vs. 2010) are enough to supply 319 average U.S. homes.

Gateway receives a boost in its GHG reduction efforts from the 'greening' of the electrical grid, which is moving away from more carbon-intensive fuels like coal and towards greener sources like natural gas and renewable sources.

During FY 2018, the solar arrays at Gateway jointly supplied 14,948 kWh of electricity. While his figure represents a 12% decline in kWh compared to FY 2017, it made up the same 0.2 % percent share as the previous year.

Reflecting back and planning for future success, the 44% reduction that Gateway has achieved in reducing Scope 1 and Scope 2 emissions place the goal of carbon neutrality by 2030 in reach, at least for Gateway operations: just 493 MT CO_2e per year of reductions are needed. New tools coming to the SIMAP platform will support that effort, and following Second Nature's lead in the development of building community resilience organizations, or CROs, will add a qualitative element to Gateway's sustainability initiatives. The goal with CROs is to build strong, resourceful communities that can survive and thrive in the face of a changing climate and other challenges that lie ahead.

Introduction

The impetus for implementing the greenhouse gas inventory originated in 2009 when Gateway Technical College President Bryan D. Albrecht signed the American College and University Presidents' Climate Commitment (ACUPCC), which was affirmed when in 2015 when Albrecht signed Second Nature's Climate Leadership Commitment, of which Gateway is a charter signatory. Through these actions, President Albrecht acknowledged on behalf of Gateway that the changing global climate is one of the defining challenges of the 21st Century, and that higher education has an obligation to take a leadership role in addressing that challenge.

The ACUPCC and Second Nature recognize the unique responsibility that institutions of higher education have as role models for their communities and in educating the people who will develop the social, economic and technological solutions to reverse global warming and help create a thriving, civil and sustainable society. Gateway also seeks to enable students to benefit from the economic opportunities that will arise because of solutions they develop.

Taking a leadership stance on climate action will benefit Gateway in numerous ways, such as reducing long-term energy costs, attracting excellent students and faculty, attracting new sources of funding and increasing goodwill among all stakeholders, especially the local communities it serves.

Doing its part, Gateway has committed to creating a plan to achieve carbon neutrality, i.e. emitting zero net greenhouse gases, by 2030. To achieve this goal, an important tool for periodically quantifying its greenhouse gas emissions is a greenhouse gas inventory.

The roadmap that outlines the path to achieving carbon neutrality is A Sustainability Plan for Gateway Technical College (2016), released in 2012 and updated in 2016, which contains the measures the college has taken and will take toward a more sustainable future for the institution, its communities and the people and businesses that it serves.

Wisconsin Technical College System

Gateway Technical College is an integral part of the Wisconsin Technical College System (WTCS), whose mission is to help Wisconsin residents obtain the training they need to compete in today's global job market. WCTS operates 54 campus locations in 16 college districts throughout the state. Approximately 315,000 students enroll in technical colleges each year, with the equivalent of 66,000 full-time students enrolled in career programs (WTCS, 2018).

In fulfillment of its mission, WTCS is a significant consumer of natural resources and energy. Mindful of this fact, WTCS has long taken a leadership role and "walked the talk" in the advancement of sustainability and green practices. Wisconsin's technical colleges are providing leadership in the advancement of sustainability and green practices by 1.) Offering a growing number of renewable energy and energy efficiency career programs; 2.) Infusing sustainability into a wide range of traditional occupational education programs; and 3.) Integrating energy-efficient and sustainable practices into the colleges' own operations.

This leadership role inspired five system members to join the original ACUPCC commitment and perform GHG inventories: Gateway, Lakeshore Technical College, Madison Area Technical College, Milwaukee Area Technical College and Western Technical College. Later, only three WTCS institutions, Gateway, Western and Milwaukee Area Technical College joined the 2016 Second Nature Climate Leadership Commitment and continue to develop annual GHG reports.

While past reports have contained a comparison of GHG emissions among these three WTCS institutions, only Gateway has data for 2018.

Methodology for Greenhouse Gas Inventory

Overview

The purpose of a greenhouse gas inventory like this one is twofold. First, it provides a critical benchmark against which Gateway can track progress towards reducing its environmental footprint. Second, it provides reliable data that help Gateway's policy makers perform informed strategic planning to this end.

This report represents Gateway's seventh inventory of greenhouse gases emissions, covering the period FY 2018 (July 1, 2017 – June 30, 2018). Previous greenhouse gas inventories covered the periods FY 2009, FY 2010, FY 2011, FY 2014, FY 2016 and FY 2017. Each report has followed guidelines established by Second Nature.

The consolidation methodology used to determine organizational boundaries is the Operational Control Approach. As such the measurement of greenhouse gases was limited to emissions from operations directly under Gateway's control. Emissions were included from Gateway's three campuses - in Elkhorn, Kenosha, and Racine - as well as the Horizon Center in Kenosha and iMet (formerly CATI) facilities in Sturtevant. Furthermore, although the LakeView Advanced Technology Center in Pleasant Prairie and the Burlington Center are owned, respectively, by the Kenosha Unified and Burlington school districts, these facilities are included in the inventory, where data permit, due to Gateway's operational role.

To efficiently compile, manage and analyze Gateway's greenhouse gas emissions data, the Sustainability Indicator Management & Analysis Platform – or SIMAP – was utilized (University of New Hampshire, 2019). The cloud-based tool was chosen because it is endorsed by Second Nature and is compliant with the guidelines from the Intergovernmental Panel on Climate Change (IPCC), the United Nations organization dedicated to providing a scientific basis for organizations to develop informed climate-related policies (IPCC, 2018). Furthermore, SIMAP enables advantages such as importing and long-term storage of GHG data, advanced reporting capabilities and sharing among stakeholders, among others.

In early 2019, data from all pre-2017 GHG inventories that utilized Second Nature's now obsolete Campus Carbon Calculator Excel spreadsheet tool were migrated to SIMAP. Now multi-year reports can be developed using SIMAP.

Data for this current inventory were collected from February to April 2018 and cover the following categories:

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Institutional data	Energy	Transportation	Solid waste	Paper
Budget Student population Physical size	Purchased electricity Natural gas combustion Renewable energy generation	University vehicle fleet Employee air & ground travel Student study-abroad air & ground travel Student/faculty/staff commuting miles	Landfill waste with methane (CH_4) recovery Landfill waste without methane (CH4) recovery	System-wide paper consumption

Data was supplied from a variety of sources including official college reports for institutional and budget-related data (Gateway Technical College , 2018), WE Energies billing statements for energy consumption data, an online survey for commuting data and internal reports from administration staff for fleet and travel-related information. The vendors Waste Management and Advanced Disposal provided data documenting the amount of solid waste and recycled materials generated by Gateway.

To enable comparison across emissions categories, emissions of all four reported greenhouse gases are reported in Metric Ton Carbon Dioxide Equivalents (MT CO_2e). A metric ton is equivalent to 1000 kg, or 2204.6 lbs.*

The inventory was coordinated by James Gray of Natural Capital Solutions, East Lansing, Mich.

Emissions by Scope: A Comparison of Inventory Reports

Second Nature requirements and the SIMAP tool utilize a concept from the Greenhouse Gas Protocol (WBSCD, 2015), called "scopes", which are categories of emissions based on the level of responsibility an organization has for them. Besides helping organizations to understand its operational boundaries, the scopes concept also helps avoid the double counting of emissions by more than one organization.

The three scopes are defined as follows:

Scope 1	"…direct GHG emissions occurring from sources that are owned or controlled by the institution, including: on-campus stationary combustion of fossil fuels; mobile combustion of fossil fuels by institution owned/controlled vehicles; and fugitive emissions [such as refrigerants]."

* In common usage in the United States, the word "ton" typically refers to the "short ton", a unit of mass equal to 2000 lbs., or 907.2 kg. In this report, the metric ton is utilized when discussing the mass of carbon dioxide equivalents while solid waste is reported in short tons by the waste haulers.

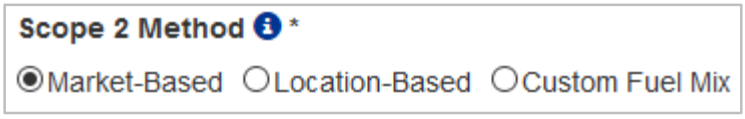
Scope 2	"…indirect emissions generated in the production of electricity consumed by the institution."
Scope 3	"…all other indirect emissions, including those generated from commuting to and from campus, institution air travel, waste disposal, the production of purchased products, and more."

In this inventory for 2018, emissions from the required Scope 1 are slightly underreported or uncertain in the following categories:

1. Fertilizer data from the Horticulture program was not available
2. Data from fugitive refrigerants – potentially hydrochlorofluorocarbons (HCFCs), perfluorocarbons and/or sulfur hexafluoride (SF_6) – were not available due to logistical constraints
3. Combustion of natural gas and electricity consumption at the LakeView Advanced Technology Center were estimated due to lack of data

Reporting for Scope 2 emissions beginning with FY 2017 is now more accurate because Second Nature now permits a more accurate "market-based" method of counting emissions from electricity generation. The upshot is that Scope 2 emissions are now calculated from two resource mixes: the local eGRID and the sources from which We Energies purchases electricity to supplement its own generation – not just the former as before.

The market-based method for Scope 2 emissions on the SIMAP platform is found on this box in the RESULTS tab:



Reporting to Second Nature requires the market-based method, and this is the default setting in SIMAP.

In the optional Scope 3, the following emissions data were collected: solid waste, commuting for students, faculty and staff, college-financed air and rail travel for staff, reimbursed automobile mileage, study-abroad air and bus travel and paper consumption.

Primary Greenhouse Gases

Gateway's inventory of emissions includes three gases covered under the Second Nature Climate Leadership Commitments and Intergovernmental Panel on Climate Change (IPCC) guidelines (2015), namely carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). These greenhouse gases make up the vast majority of Gateway's greenhouse gas emissions. As mentioned above, Gateway's emissions of refrigerants were not reported in this inventory. Characteristics of these gases are as follows:

Carbon dioxide (CO_2): a naturally occurring atmospheric gas that has increased significantly in concentrations during the Industrial Age due to anthropogenic (human-caused) activities. The main causes of increased CO_2 emissions include the burning of fossil fuels (oil, natural gas, coal, etc.) and changing land use patterns such as loss of natural forests and prairies, which hold vast reserves of carbon in the form of biomass.

Methane (CH_4): this potent greenhouse gas is emitted into the atmosphere during the production of coal, natural gas and petroleum. Large amounts are also produced in landfills as organic waste decomposes. Livestock and agricultural practices are other significant sources.

Nitrous oxide (N_2O): also very potent, nitrous oxide is produced in a wide range of activities, including the burning of fossil fuels and agricultural and industrial activities.

Fluorinated gases: some of the most potent greenhouse gases, these include hydrochlorofluorocarbons (HCFCs) and sulfur hexafluoride (SF_6). In a campus setting, fluorinated gases are utilized in refrigeration and air conditioning equipment. Sulfur hexafluoride is utilized in the transmission of electricity through the power grid (US-EPA).

Global Warming Potential

The concept of global warming potential (GWP) is a relative measure of the quantity of heat that a greenhouse gas maintains in the atmosphere. Each gas possesses a value that compares the amount of heat maintained by a certain amount of the gas in question to the amount of heat maintained by a similar amount of carbon dioxide. For instance, methane has a GWP of 25, meaning that 1 ton of methane emissions have 25 times more impact on global warming than 1 ton of carbon dioxide emissions. GWP values are from the IPCC 5th Assessment Report, which is typically abbreviated "AR5" (IPCC, 2015).

Global Warming Potential (GWP) & Atmospheric Lifetimes of Primary Greenhouse Gases

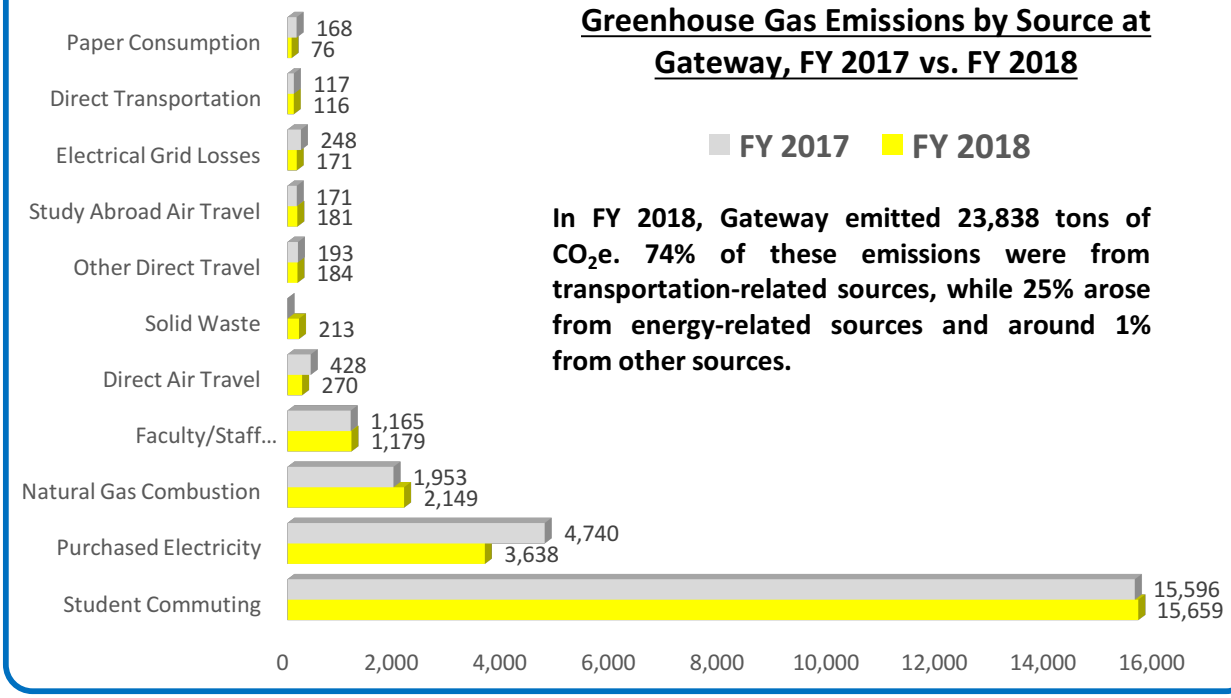
Greenhouse Gas	Global Warming Potential (GWP) over 100-year interval	Atmospheric Lifetime (in years)
Carbon dioxide (CO_2)	1	50-100
Methane (CH_4)	28	12
Nitrous oxide (N_2O)	265	121
HFC-134A	1,300	13
Sulfur Hexafluoride (SF_6)	23,500	3,200
Source: UNFCCC IPCC Fifth Assessment Report (AR5)		

Inventory Results

Summary

The inventory of greenhouse gas emissions revealed that Gateway Technical College emitted a total of approximately **23,838 metric tons of CO_2e in FY 2018**. This amount represents all GHG emissions, i.e. in Scope 1, Scope 2 and Scope 3.

The emissions by source are illustrated in the graph below.



The most significant source of emissions was transportation, which produced 74% of emissions.

After transportation, the non-vehicular energy category – encompassing purchased electricity, losses of electricity during its transmission through the electrical grid and combustion of natural gas - at 25%, makes up most of Gateway's remaining emissions. Around1% of emissions originate from paper consumption and solid waste.

Emissions by category and their percentage of the total are outlined in the following table.

EMISSIONS BY SECTOR (2018)		
Source	Emissions (MT CO_2e)	Percent of total
Student commuting	15,659	66%
Purchased electricity	3,638	15%
Natural gas combustion	2,149	9%
Faculty/Staff Commuting	1,179	5%
Direct Air Travel	270	> 1%
Solid Waste	213	> 1%
Other Direct Travel	184	> 1%
Study Abroad Air Travel	181	> 1%
Electrical Grid Losses (Transmission & Distribution, "T & D")	171	> 1%
Direct Transportation	116	> 1%
Paper Consumption	76	> 1%
Refrigerants	n/a	n/a
Wastewater	n/a	n/a
Fertilizers (from Horticulture)	n/a	n/a
TOTAL GHG EMISSIONS	23,838	100%

The top three sources of GHG emissions in FY 2018 were student commuting at 66% of total emissions, followed by purchased electricity (15%) and natural gas combustion (9%).

Because Gateway has less control over commuting by students, staff and faculty, an examination of emissions from Scope 1 and Scope 2 – those emissions over which Gateway institution exerts the most control – is insightful. In 2018, Gateway emitted a total of 5,903 MT CO_2e in Scope 1 and Scope 2

combined. This subset of emissions more accurately reflects the institution-based efforts towards carbon neutrality than the measurement of all three scopes.

Comparison with Previous GHG Reports

The figure of 23,838 MT CO_2e for FY 2018 represents a 4% decrease in total GHG emissions (all scopes) from FY 2017, when 24,771 MT CO_2e were released from the operations of Gateway Technical College.

This reduction in 2018 emissions is commensurate with the coincident 0.6% decline in FTE, i.e. to 4,563 FTE in FY 2018 from 4,537 FTE in FY 2017.

Limiting the emissions to Scope 1 and Scope 2 only, the reduction to 5,903 MT CO_2e in 2018 from 6,811 MT CO_2e in 2017, represents a 12.1% year-over-year decrease.

The following table is a comparison of emissions for all GHG reporting years performed to date, by scope (Scopes 1, 2 & 3 vs. Scopes 1 & 2), as well as by year-over-year change (in percent) and cumulative change in GHG emissions (in percent).

TOTAL GHG EMISSIONS PER YEAR 2009 - 2018 (with exceptions)						
Year	Emissions Scopes 1, 2 & 3 (MT CO_2e)	Year over year change in %	Cumulative Change in %	Emissions Scopes 1 & 2 (MT CO_2e)	Year over year change in %	Cumulative Change in %
2009	34,900	--	--	10,544	--	--
2010	32,000	- 8%	- 8%	9,606	- 9%	- 9%
2011	31,826	- >1%	- 9%	9,634	+ < 1%	- 9%
2014	30,009	- 6%	- 14%	9,031	- 6%	- 14%
2016	26,182	- 13%	- 25%	7,502	- 17%	- 29%
2017	24,771	- 5%	- 29%	6,811	- 9%	- 35%
2018	23,838	- 4%	- 32%	5,903	- 12%	- 44%

During the period FY 2009 to FY 2018, Gateway achieved a gradual reduction totaling 32% of overall emissions (i.e. Scopes 1, 2 & 3) and an even more definitive 44% of combined Scope 1 & 2 emissions. This 44% reduction over the nine-year period following the pioneer FY 2009 GHG inventory equates to an annual emissions reduction average of 4.9%.

To provide additional context to an institution's GHG emissions, normalizing them by FTE is a common practice. This enables comparisons between institutions. The following table summarizes emissions per FTE in each of Gateway's GHG inventory to date.

(continued on following page)

NORMALIZED EMISSIONS PER FTE 2009 - 2018 (with exceptions)			
Year	FTE	MT CO_2e per FTE (Scopes 1, 2 & 3)	MT CO_2e per FTE (Scopes 1 & 2)
2009	5,188	6.7	2.0
2010	5,985	5.3	1.6
2011	6,382	5.0	1.5
2014	5,419	5.5	1.7
2016	4,783	5.5	1.6
2017	4,537	5.5	1.5
2018	4,563	5.2	1.3

For FY 2018, each FTE was responsible for 5.2 MT CO_2e of emissions in Scopes 1, 2 & 3 in the context of Gateway operations. Limiting the count to Scopes 1 & 2, each FTE was responsible for 1.3 MT CO_2e of emissions.

It is a noteworthy achievement for Gateway to maintain declining levels of per-FTE emissions in the face of a stable FTE level vis-à-vis the previous fiscal year.

More impressive still is the steady decline in GHG emissions per unit of facilities space. Historical normalized GHG emissions in MT CO_2e per 1000 square feet of facilities space for Scope 1 and Scope 2 – since these are closely related to facilities operation – are outlined in the table below:

(continued on following page)

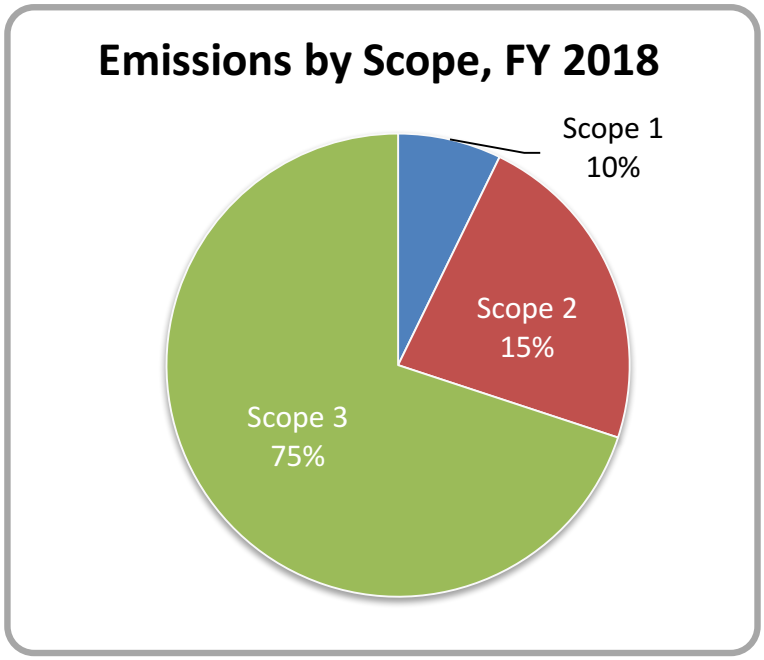
NORMALIZED EMISSIONS PER 1000 SQ. FEET OF SPACE 2009 - 2018 (with exceptions)		
FY	Physical Space (sq. ft.)	MT CO_2e per 1000 sq. ft. (Scopes 1 & 2)
2009	856,092	12.3
2010	783,356	12.2
2011	793,611	12.0
2014	836,260	10.8
2016	859,358	8.1
2017	858,794	7.9
2018	874,694	6.7

Gateway has achieved a reduction in MT CO2e per 1000 square feet of facilities space for each GHG inventory report, and for FY 2018, this value was reduced by 15% in the face of a 2% increase in physical space.

Emissions by Scope

Recall that Scope 1 includes direct GHG emissions occurring from sources that are owned or controlled by the institution; Scope 2 includes indirect emissions generated in the production of electricity consumed by the institution, including losses from inefficiencies in the electricity grid; and Scope 3 encompasses all other indirect emissions and are optional to include.

Continuing with past trends, the largest sources of emissions at Gateway were in the categories over which it has least control (Scope 3), while the smallest sources of emissions were in categories over which it has most control (Scope 1). As depicted in the figure below, 73% of emissions were in Scope 3 (up from 73% last year); 19% in Scope 2 (down 4% from last year) and 10% in Scope 1 (up 2% from last year). These figures are trending towards a substantially smaller share of emissions in Scope 2, a slightly larger share in Scope 3 and a slightly smaller share in Scope 1.



Gateway vs. Wisconsin Technical College System Peers

As a system, the Wisconsin Technical College System (WTCS) has conceded some of its original climate leadership role. Now only three WTCS campuses – Gateway Technical College, Milwaukee Area Technical College and Western Technical College – from a total of sixteen participate in the Second Nature Climate Leadership commitment. Earlier WTCS participants – Madison Area Technical College and Lakeshore Technical College – are no longer reporting regularly, an unfortunate development given the WTCS's original and prominent climate leadership role. Swimming against this trend is Gateway, which has clearly strengthened its climate leadership role where others have fallen behind.

Meanwhile, more activity is evident in the University of Wisconsin System, which now has six (of twenty-six) campuses reporting to Second Nature.

In the past, this report has featured comparisons with WTCS peers. However, as of this writing, only Gateway has completed a GHG inventory for FY 2018.

Transportation Emissions Inventory

Introduction

As a commuter institution with dispersed campuses and no on-campus housing, the reduction of greenhouse gas emissions related to transportation represents the greatest challenge to achieving the goal of carbon neutrality. Although transportation is the largest source of emissions, Gateway exerts direct control only over its own assets. Creativity and positive incentives will be required to reduce emissions in this category.

Key Findings

Transportation accounted for 74% of Gateway's greenhouse gas emissions in 2018, the greatest source. Furthermore, this sector created the greatest quantity of emissions in not just carbon dioxide but also the greenhouse gases methane and nitrous oxides, as well. The breakdown in the transportation sector is outlined in the table below.

TRANSPORTATION GHG EMISSIONS BY SECTOR (FY 2018)			
Source	Emissions (MT CO_2e)	% Change from 2017	Percent of all GHG emissions
Student commuting (Scope 3)	15,659	+ > 1%	66%
Faculty/staff commuting (Scope 3)	1,179	1%	5%
Directly financed air travel (Scope 3)	270	- 37%	1%
Other (non-air) college-financed travel (Scope 3)	184	- 5%	>1%
Study abroad air travel (Scope 3)	181	- 6%	>1%
Vehicle fleet (cars, trucks, aircraft, etc.) (Scope 1)	116	- >1%	>1%
TOTAL SECTOR EMISSIONS	**17,590**	**+ >1%**	**74%**

Compared with the previous 2017 GHG inventory, overall emissions in the transportation sector rose less than 1% in 2018.

As in the previous three GHG inventories, student commuting remains the predominant source of transportation-related emissions, followed distantly by employee commuting. These two commuting sources combined comprise 71% of sector GHG emissions and showed a minor increase over last year.

Minor decreases in emissions were reported in directly financed air travel, other directly financed travel (auto mileage, rail, charter bus, etc.), study abroad air travel and the vehicle fleet though each of these categories compromised less than 1% of sector GHG emissions.

To understand the commuting habits of students and employees, an online commuting survey was performed. It was determined that 97% of faculty and staff utilized personal vehicles alone, while 1% each walked, utilized a carpool or commuted via bicycle. Of students meanwhile, 95% utilized personal vehicles alone, while 2% either walked or used public bus and 1% commuted via carpool.

The average student using a private vehicle commuted 38 miles to and from campus and made the trip 4.0 times per week. Employees made trips of a similar length an average of 4.7 times per week, with faculty commuting to campus 40 weeks and staff commuting 45 weeks per year.

Data Collection for Transportation

Gateway Fleet

Gateway maintains a dispersed, decentralized fleet of vehicles, including maintenance vans, vehicles in the public safety programs (police, fire, EMT) and airplanes in the aeronautics program, among others. Estimates of quantities of aviation and automotive fuels were derived by from purchase data provided by the accounting staff and online historical fuel price tools (AFS, 2019).

Because the aviation fuel utilized by Gateway, i.e. Avgas LL100, is not present in the SIMAP platform, a custom emissions factor from the U.S. EPA was entered into the tool (2018).

Here it should be noted that the fuel utilized by service providers or contractors to Gateway was not included in this inventory.

Commuting Survey

A total of 423 students and 300 employees completed the online survey.

Associates from Research, Planning, & Development assisted with development, delivery and compiling of the survey.

College-funded air and ground travel, study-abroad air travel

College-funded air and ground travel, as well as study abroad air travel, were calculated from accounts receivable and PCard records. Air miles were calculated from flight segments utilizing an online air mileage calculator (Frequent Flyer Services, 2019).

Flight, mileage and both automotive and aviation fuel information were obtained from the Purchasing Agents. Additional assistance for study abroad flights was provided by the International Education Office.

Non-Vehicular Energy Emissions Inventory

Introduction

Non-vehicular energy is the second-largest source of greenhouse gas emissions at Gateway. The principal greenhouse gases associated with the production of energy include carbon dioxide, nitrous oxide and methane.

Gateway generates emissions from the generation of non-vehicular energy in two ways:

- On-site natural gas combustion for on-site heating and hot water (both in Scope 1)
- The purchase of electricity from the utility company (Scope 2)

Emissions for purchased electricity depend on the mix of fuels used in electricity generation. The US-EPA maintains the Emissions & Generation Resource Integrated Database (eGRID), a comprehensive inventory of environmental attributes of electric power systems. Gateway's service provider, Wisconsin Electric Power Corporation (dba We Energies), is connected to the RFC West (RFCW) eGRID Subregion, whose fuel mix was as follows in 2016, the latest available data:

Fuel	Percent of generation resource mix in RFCW eGRID Sub-region (2016)
Coal	49.8%
Nuclear	27.6%
Natural gas	16.7%
Wind	3.2%
Biomass	2.0%
Hydro	0.9%
Other fossil fuels	0.7%
Source: US EPA **(2017)** *Values for fuels <0.5% are not included.	

In calculating emissions for Gateway's electricity purchases, the SIMAP platform takes this resource mix into account and applies the US EPA eGRID data on electricity generation. The reductions in energy consumption are compounded by the fact that the electrical grid is becoming less GHG-intensive, with coal being rapidly replaced by natural gas, a less carbon intensive fossil fuel, and renewable energy sources, primarily wind, biomass and, to a lesser extent, hydro and solar.

In addition, SIMAP allows the option to consider the mix of fuels that the local utility WE Energies purchases from other electricity providers. This more accurate "market-based" method of counting Scope 2 emissions from electricity generation – as opposed to the "location-based method", which only considers the electricity generation mix found within the boundaries of the eGRID. Reporting to Second Nature requires the market-based method.

Gateway also generates electricity from renewable sources that do not generate GHGs, including photovoltaic (PV) solar and small wind turbines located on the campuses. Of these, only PV solar is tracked.

Key Findings

In 2018, Gateway was responsible for 5,787 MT CO_2e of emissions related to non-vehicular energy, a 14% decline from the previous fiscal year. The key source of this drastic decline originated from a significant decline in the consumption of electricity.

Of the GHG emissions in this category, 2,149 MT CO_2e, or 37% of the total, originated from the combustion of 39,763 MMBtu of natural gas for on-site heating and hot water, while 3,638 MT CO2e, or 63% of the category total, originated from consumption of 7.09 million kilowatt-hours of purchased electricity. The table below compares non-vehicular GHG emissions for all inventories to date.

(continued on following page)

NON-VEHICULAR ENERGY EMISSIONS 2009 - 2018 (some years excluded)						
Year	MMBtu of natural gas (MT CO_2e)	kWh of electricity (MT CO_2e)	Total MT CO_2e	% reduction	Heating Degree Days	Cooling Degree Days
2009	n/a (2,185)	n/a (8,359)	**10,544**	n/a	6,962	n/a
2010	42,141 (2,229)	10,526,288 (7,299)	**9,527**	- 9.6%	6,236	n/a
2011	42,935 (2,271)	10,494,754 (7,277)	**9,547**	+ < 1%	6,849	n/a
2014	44,728 (2,378)	9,546,266 (6,557)	**8,935**	- 6.4%	7,926	711
2016	38,267 (2,031)	8,549,804 (5,392)	**7,432**	- 16.8%	5,909	719
2017	36,728 (1,953)	8,274,098 (4,740)	**6,693**	- 9.9%	5,810	1,132
2018	39,763 (2,149)	7,093,452 (3,638)	**5,787**	- 13.5%	6,586	791

In 2018, Gateway realized a 14% year-over-year reduction in kilowatt-hours of electricity consumed which resulted in a nearly 23% reduction in GHG emissions for this emissions source. This reduction is the equivalent to taking 110 average homes[2] off the electrical grid (US-EIA, 2017).

These reductions were offset somewhat by an 8% year-over-year increase in natural gas combustion to 39,763 MMBtu, which resulted in a corresponding 10% rise in GHG emissions for this category.

This 2018 GHG inventory now includes utilities data for the SIM City House, whose utilities billing was previously paid by the Gateway Foundation. These contributions added less than 1% to the total utilities' consumption.

Long-term Trends

Taking a historical view, over the period 2009-2018, Gateway has achieved a voluminous 45% reduction in non-vehicular GHG emissions. The major share of these reductions arose from the 33% reduction in the acquisition of electricity since 2010. The 3.4 million kilowatt-hours of electricity that are longer needed in 2018 to power Gateway's operations (vs. 2010) are enough to supply 319 average U.S. homes.

GHG emissions from combustion of natural gas is a more nuanced story. This sector trended downward in 2016 and 2017, followed by an uptick in 2018. To gain insights into this category, Heating Degree Days were added to the table above.

[2] The U.S. Energy Information Administration (US-EIA) estimates that the average American home consumes 10,766 kilowatt hours of electricity annually.

Simply put, heating degree days are a measure of how much (in degrees), and for how long (in days), the outside air temperature stayed below a base temperature. Basically, the colder the outside air temperature, the more energy it takes to heat a building (Bromley, 2009).

The winters for the FYs 2016 and 2017 were relatively mild, followed by a colder 2018, which increased demand for natural gas. The table demonstrates how natural gas consumption has reliably risen during years with colder winters and fallen during years with warmer ones.

Renewable energy continues to play a minor but important role by reducing the amount of electricity purchased from the utility provider. During FY 2018, the solar arrays at the Horizon Center, Kenosha Campus, iMET and Racine Campus jointly supplied 14,948 kWh of electricity, around 0.2% of Gateway's annual total, the same percentage as in the preceding year. However, this amount was a 12% decline from FY 2017, due to reduced performance from the solar installations at the Horizon Center and iMET.

Losses from the Electrical Grid

The SIMAP platform quantified the GHG emissions that arose from the losses, or inefficiencies, affiliated with the transmission and distribution of electricity, a.k.a. "T&D losses". Technically T&D losses are Scope 3 emissions for Gateway that are primarily attributable to the electricity provider, We Energies. Nevertheless, as the consumer of the energy, Gateway is primarily responsible for these energy-related emissions. Fortunately, as Gateway's electricity purchases fall, the concurrent T&D losses compound the GHG reductions in this category.

In 2018, T&D losses amounted to 171 MT CO_2e in Scope 3, which add nearly 5% to the 'official' Scope 2 GHG emissions related to the production of electricity supplied to Gateway.

Data Collection

The Second Nature inventory model offers the ability to input energy data from two categories:

1. Purchased electricity & purchased steam/chilled water
2. On-campus stationary sources

Gateway does not purchase steam or chilled water, nor does it operate a co-generation plant, nor does it perform other types of combustion of fossil fuels besides natural gas. Purchased electricity data was entered per annual kilowatt-hour consumed. On-campus stationary sources include fuels purchased by the college other than gasoline or diesel fuel used in vehicles. Natural gas totals were input into this category per annual MMBtu (million BTUs) consumed.

Gateway does use small amounts of diesel fuel to power equipment, such as generators. Data for the consumption of these fuels is not tracked separately.

Data for electricity and natural gas consumption were received in the form of an annual Energy Utilization Report from the directors of building services, which in turn are compiled from We Energies billing

statements. This report contained data from all Gateway facilities, including the SIM House facility for the first time.

Landscaping Emissions Inventory

Introduction

The application of nitrogen-containing fertilizers results in the emission of nitrous oxides, which are highly potent greenhouse gases.

Key Findings

In pre-2017 GHG inventories, landscaping activities were the source of 0.02% of Gateway's total emissions. This amount has been virtually eliminated due to the elimination of turf-related fertilizers on Gateway's campuses.

Data Collection

Confirmation of the elimination of turf-related fertilizers was confirmed by the director of building services for the Kenosha campus.

Data for fertilizers applied in the context of the Horticulture Program were not available and are therefore not included in this inventory.

Solid Waste Emissions Inventory

Introduction

Significant greenhouse gas emissions will arise from the disposal of solid waste mainly from the methane produced from the decomposition process in landfills. The quantity of landfill methane, a more potent GHG than carbon dioxide, can be reduced through capture and either flaring or combusting to generate electricity, both of which result in carbon dioxide rather than methane emissions.

Gateway utilizes two waste removal service providers, Waste Management (Kenosha, Racine, Sturtevant) and Advanced Disposal (Elkhorn, Burlington). Waste Management's landfill captures methane and generates electricity; Advance Disposal's no longer performs any methane capture.

Key Findings

In FY 2018, Gateway disposed of approximately 277 short tons of solid waste, with 213 short tons going to a methane capture landfill and 64 short tons going to a non-methane capture landfill.

The GHG impact of this solid waste for FY 2018 was 213 MT CO2e.

Meanwhile, Waste Management reported collecting 84 tons of recyclables for a diversion rate of 23%. Advanced Disposal reported collecting 27 tons of recyclables for a diversion rate of 30%.

Data Collection

Gateway's contacts at Waste Management and Advanced Disposal provided detailed data on solid waste generation and recycling for Gateway by location for FY 2018.

Looking Back, Moving Forward

Nine years after its initial 2009 GHG inventory, Gateway as an institution continues to drive down GHG emissions at a double-digit clip. This success demonstrates Gateway's long-term commitment to sustainability because the lowest hanging fruit was picked long ago. If Gateway can maintain reductions seen in FY 2018 – e.g. a 12% year-over-year reduction in combined Scope1 and Scope 2 emissions - the ultimate goal of carbon neutrality by 2030, at least for Gateway's operations, is looking ever more realistic.

To date, a cumulative 44% reduction in Scope1 and Scope 2 emissions has been realized, leaving 493 MT CO2e per year of needed reductions between now and 2030. For FY 2019, this translates to a mere 8% reduction in emissions.

Here are a few recent developments that should instill optimism into the Gateway team that they can achieve their carbon neutrality goals.

First, thanks to a recent data migration project, all GHG data is now hosted on the SIMAP platform, which will further solidify GHG management into everyday business processes. Similarly, the author of this report has noticed that Gateway employees are now well-versed in the collection of GHG data for which they are responsible.

Second, SIMAP will soon offer additional new "Tier 2 Level" solution that will provide a suite of new tools for comparing "business as usual" and alternate-scenario footprint trajectories as well as for developing and evaluating projects that result in maximum GHG reductions.

And finally, Second Nature is moving to support organizations in their quest to improve quality of life in a world with a changing climate by building community resilience organizations, or CROs (see www.gocros.org). Second Nature is placing greater emphasis on protecting our water, energy, food, natural resources, and social connections, i.e. our basic human needs. When a community can sustain these locally, this is true resilience and community sufficiency. CROs have the potential to build strong, resourceful communities that can survive and thrive in the face of a changing climate and other challenges that lie ahead (Second Nature, 2019).

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