MONTANA STATE UNIVERSITY CLIMATE ACTION PLAN

PROGRESS REPORT

MONTANA STATE UNIVERSITY
OFFICE OF SUSTAINABILITY

TABLE OF CONTENTS

INTRODUCTION

Montana State University developed its first Climate Action Plan (CAP) in 2009 as part of its commitment to the American College and University Presidents' Climate Commitment (ACUPCC). As a signatory to the ACUPCC, MSU has made a commitment to reduce its greenhouse gas (GHG) emissions from campus operations, and ultimately achieve the goal of carbon neutrality.

In its Climate Action Plan, MSU assesses its GHG emissions and introduces strategies for reducing these emissions. The purpose of this progress report is to publicly communicate the efforts made since the previous CAP report in 2011 and to highlight those areas where MSU has seen success as well as areas needing continued improvement.

The goals and strategies put forth in the original Climate Action Plan in 2008 have provided guidance for the integration of sustainability into campus operations and strategic plans across campus. In this report we will highlight many of the ongoing projects and initiatives resulting from this integration and their effects.

DATA COLLECTION AND ANAYLSIS

The initial GHG analysis done in the 2008 fiscal year was done by McKinstry Company, a third party engineering firm with experience in GHG inventories using the Clean Air Cool Planet reporting structure. The 2016 greenhouse gas data was collected through MSU Facilities Services in conjunction with Sightlines, a third party consulting firm. This change in methodology may result in discrepancies between the 2009 and 2011 CAP reports and this report. All emissions values used in this report are derived using the new Sightlines methodology. Fiscal year '14 and '15 data for several GHG sources was extrapolated from fiscal year '16 data (i.e. Study Abroad Air Travel).

Transportation data was gathered through the Western Transportation Institute (WTI) transportation survey which was administered in 2016. Data is reported on a fiscal year basis. A fiscal year lasts from June to July of the following year (i.e. June 2008—July 2009 is fiscal year 2009). This report was compiled by the MSU Office of Sustainability in coordination with MSU Engineering and Utilities and Sightlines.

GREENHOUSE GAS (GHG) EMISSIONS

TOTAL GHG EMISSIONS

In the 2009 MSU Climate Action Plan, a goal was established to reduce total GHG emissions by 20% from 2009 levels by 2025. As of 2016, **MSU has reduced its total GHG emissions by 16%**, putting it on track to meet its goal by 2020.

Fig. 1

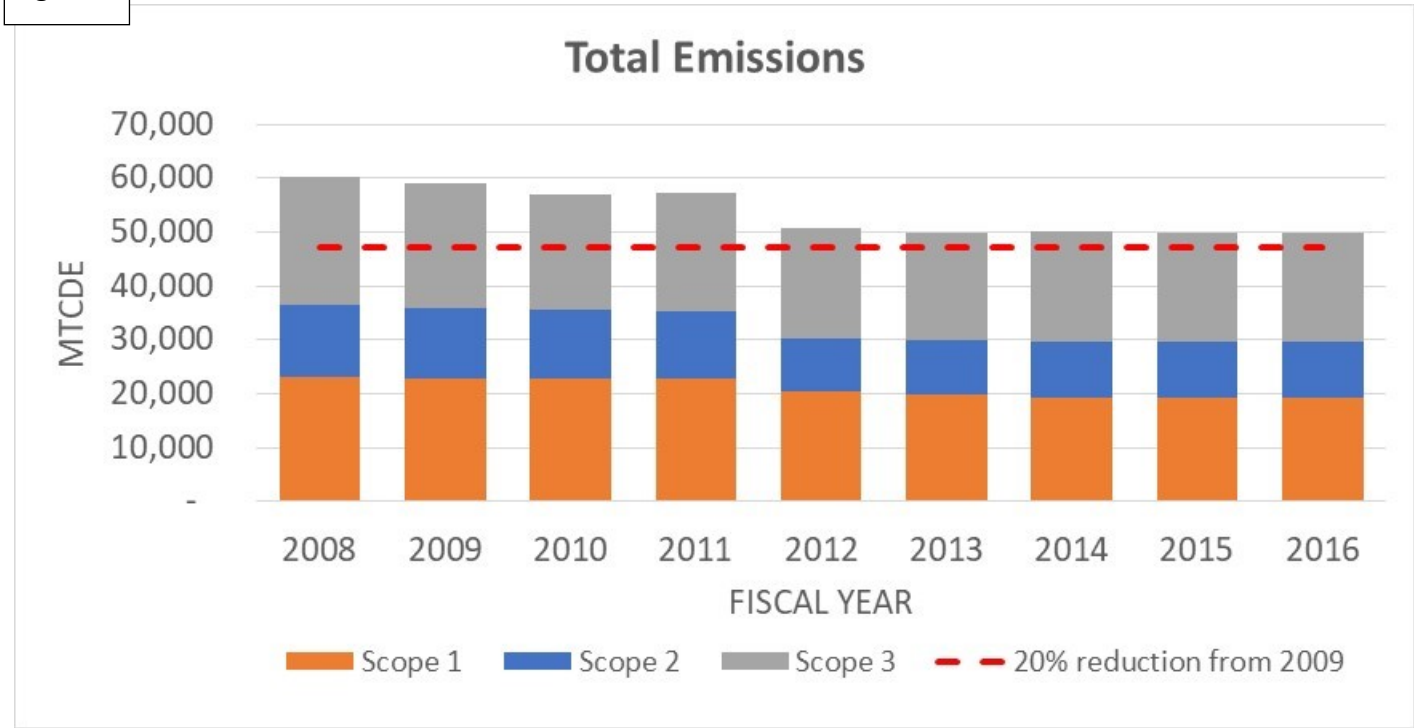


Table 1

Total Emissions		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Gross Emissions										
Scope 1	MTCDE						19,907	19,419	19,418	
Scope 2	MTCDE						10,136	10,295	10,295	
Scope 3	MTCDE						19,674	20,336	20,262	
Total Gross Emissions	**MTCDE**						**49,717**	**50,050**	**49,975**	
Net Emissions										
Offsets	MTCDE				-		-	-		
Total Net Emissions	**MTCDE**						**49,717**	**50,050**	**49,970**	

GREENHOUSE GAS (GHG) EMISSIONS

TOTAL GHG EMISSIONS PER FULL TIME EQUIVALENT (FTE) INDIVIDUAL

To account for increasing GHG emissions resulting from an increase in the number of students, faculty, and staff attending MSU, total GHG emissions are calculated as a ratio of emissions to full time equivalent (FTE) occupant. This data (Fig. 2 and Table 2) shows that **MSU has reduced its GHG per FTE student by 36% from 2009 GHG levels**. This puts MSU on track to meet our 2009 CAP goal of 20% reduction of total GHG emissions from 2009 levels, and its reach goal of 50% reductions from 2009 levels.

Fig. 2

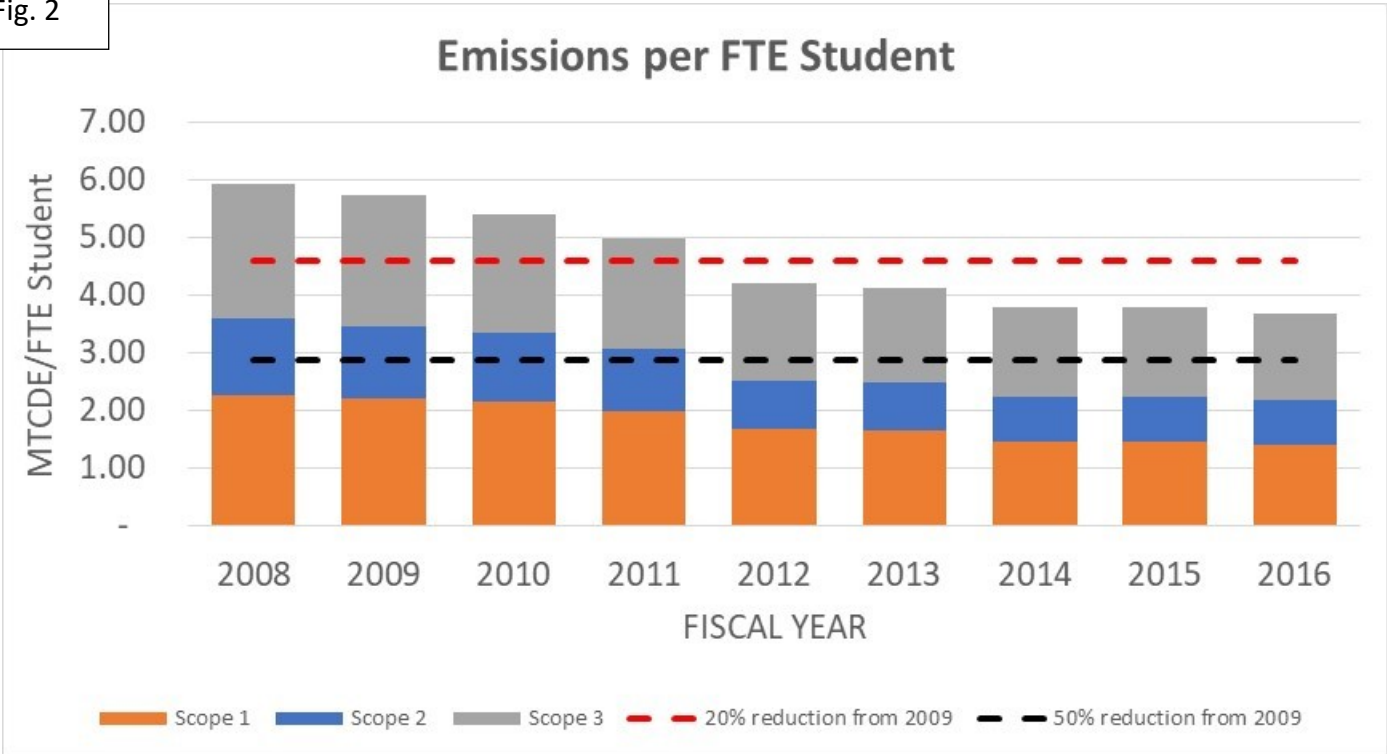


Table 2

Emissions per FTE Student		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Gross Emissions										
Scope 1	MTCDE						1.65	1.47		
Scope 2	MTCDE						0.84	0.78		
Scope 3	MTCDE						1.63	1.54		
Total Gross Emissions	**MTCDE**						**4.13**	**3.79**		
Net Emissions										
Offsets	MTCDE						-	-		
Total Net Emissions	**MTCDE**						**4.13**	**3.79**		

GREENHOUSE GAS (GHG) EMISSIONS

TOTAL GHG EMISSIONS PER 1,000 GROSS SQUARE FEET (GSF)

To account for increasing GHG emissions resulting from an increase in the total building square footage (GSF) of MSU, total GHG emissions are calculated as a ratio of emissions per 1,000 GSF. This data (Fig. 3 and Table 3) shows that **MSU has reduced its GHG per 1,000 GSF by 22% from 2009 GHG levels**. This puts MSU on track to meet its 2009 CAP goal of 20% reduction of total GHG emissions from 2009 levels, and its reach goal of 50% reductions from 2009 levels.

Fig. 3

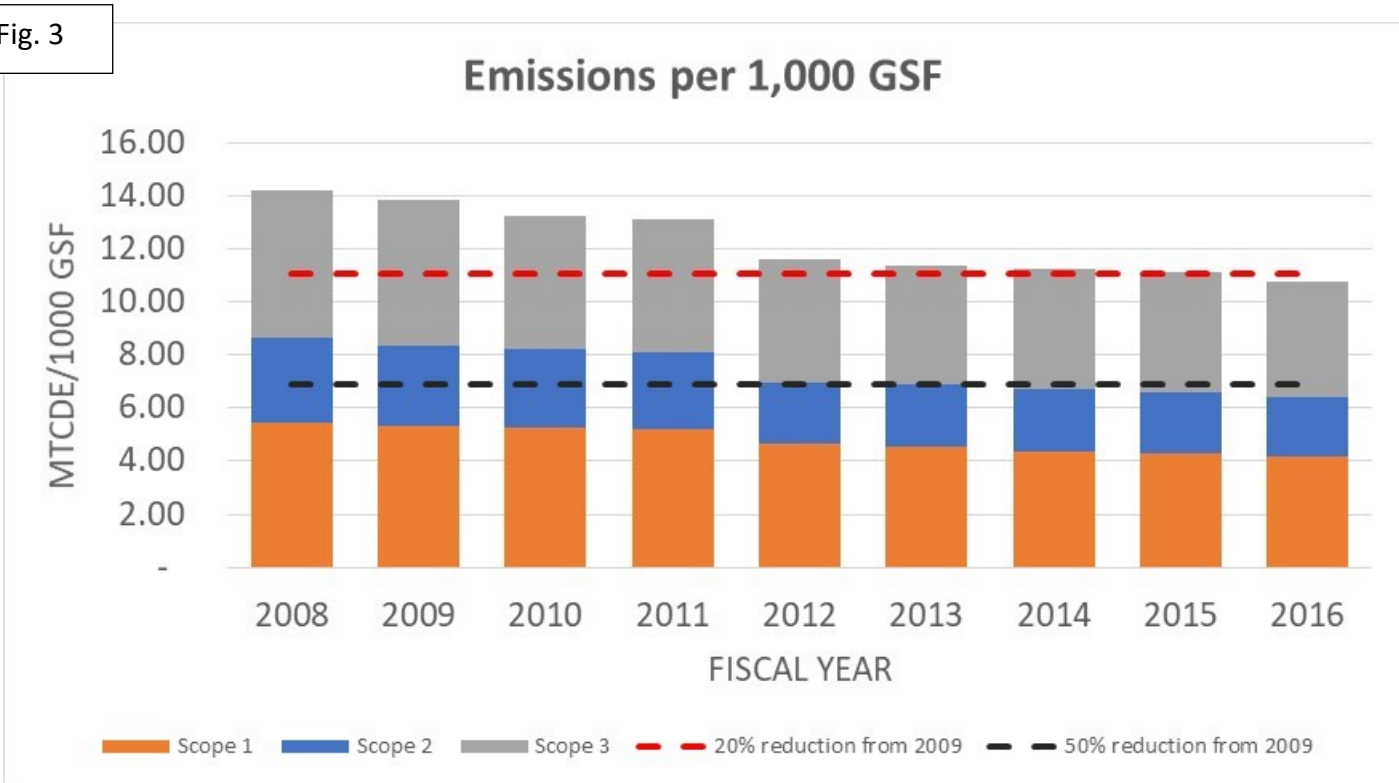


Table 3

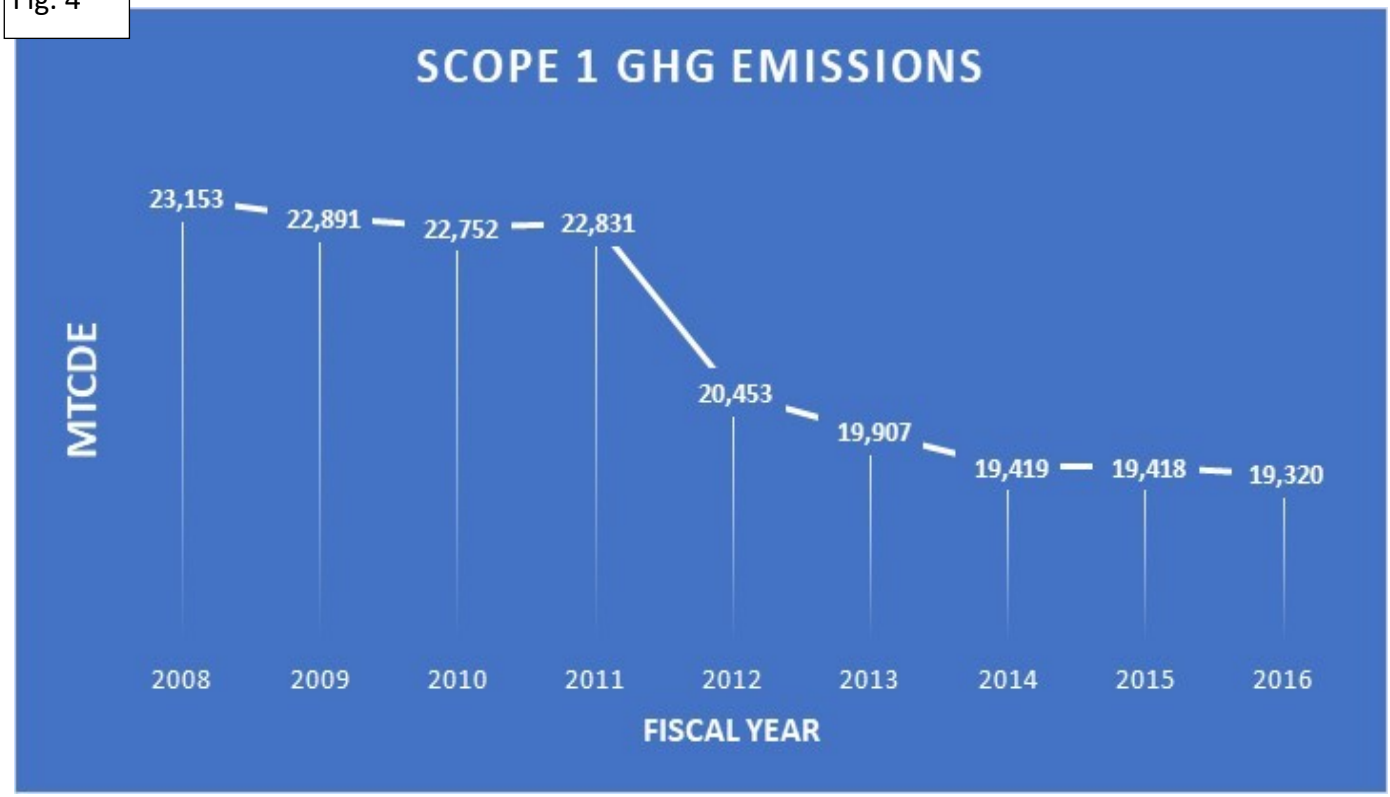
Emissions per 1,000 GSF		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Gross Emissions										
Scope 1	MTCDE	5.46	5.35	5.29	5.22	4.68	4.55	4.37	4.32	4.18
Scope 2	MTCDE	3.16	3.01	2.97	2.88	2.27	2.32	2.32	2.29	2.23
Scope 3	MTCDE	5.57	5.47	5.00	5.01	4.63	4.50	4.58	4.51	4.38
Total Gross Emissions	**MTCDE**	**14.19**	**13.83**	**13.25**	**13.10**	**11.58**	**11.37**	**11.26**	**11.11**	**10.78**
Net Emissions										
Offsets	MTCDE	-	-	-	-	-	-	-	(0.00)	(0.00)
Total Net Emissions	**MTCDE**	**14.19**	**13.83**	**13.25**	**13.10**	**11.58**	**11.37**	**11.26**	**11.11**	**10.78**

GREENHOUSE GAS (GHG) EMISSIONS

SCOPE 1 EMISSIONS

Scope 1 emissions are defined as those emissions occurring directly from sources owned or controlled by the institution. For Montana State University this includes: onsite utilities, direct transportation, other on campus stationary, and agriculture. MSU's main source of scope 1 emissions is on-site cogenerated electricity and steam produced from the burning of natural gas. As can be seen in Fig. 2, **MSU has reduced its scope 1 emissions by 16% from 2009 levels**. Strategies identified to reduce scope 1 GHG emissions overlap with strategies to reduce scope 2 GHG emissions. These strategies were laid out in the 2009 and 2011 Climate Action Plans as a three phase approach to mitigating emissions. More information on these strategies can be found under the Scope 2 section of this progress report.

Fig. 4



GREENHOUSE GAS (GHG) EMISSIONS

SCOPE 2 EMISSIONS

Scope 2 emissions are defined as indirect emissions generated from the production of electricity purchased by the university. At Montana State University 96% of electricity is purchased from offsite sources (NorthWestern Energy) and 4% is produced on site through cogeneration at the MSU steam plant. As can be seen in Fig. 3, **MSU has reduced its scope 2 emissions by 20% from 2009 levels**.

Scope 1 & 2 reduction strategies include:

Phase 1:

- Student Union Building lighting and HVAC retrofit
- Exterior pole mount lighting retrofit
- Exterior building lighting retrofit
- Resource conservation culture program
- Additional building HVAC and lighting retrofits

Phase 2:

- Auxiliary Services Energy Performance Contract
- NW District Energy Plant

Phase 3:

- Integration of renewable energy systems and carbon management strategies
- Core water loop development for district-wide heat recovery

*More information on Scope 1 and 2 reduction strategies can be found in sections 4.1-4.3 of the 2011 CAP report

Fig. 5

GREENHOUSE GAS (GHG) EMISSIONS

SCOPE 3 EMISSIONS

Scope 3 emissions are defined as other indirect emissions occurring from other activities of the institution, but are not from sources owned or controlled by the institution. For Montana State University scope 3 emissions include: air travel, faculty and staff commuting, student commuting, solid waste, waste water, and purchased paper. As can be seen in Fig. 4 below, **MSU has reduced its scope 3 emissions by 13% from 2009 levels**.

Scope 3 GHG reduction strategies include:

- Increase on or near campus housing
- Increase the number of courses offered online
- Modernization of campus fleet vehicles
- Increase bicycle infrastructure
- Increase outreach and education efforts for sustainable commuting
- Increase the frequency of public transportation and number of route options
- Support carpooling incentive programs
- Encourage more online meetings and trainings
- Implement a composting program and increasing recycling on campus

* More information can be found on Scope 3 reduction strategies in section 4.4 of the 2011 CAP report

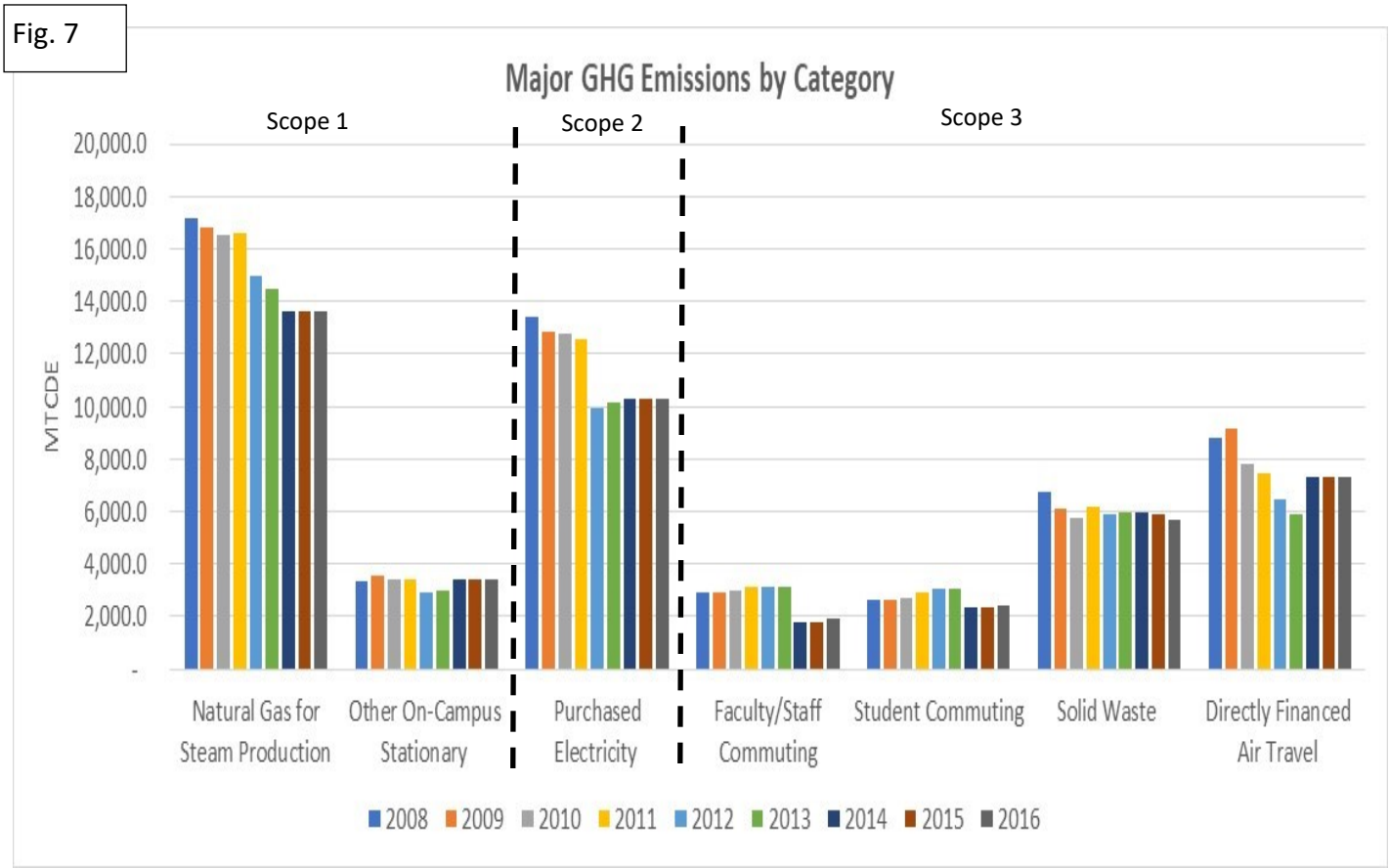
Fig. 6

GREENHOUSE GAS (GHG) EMISSIONS

MAJOR GHG SOURCES

Major sources for GHG emissions at MSU are primarily onsite steam production, purchased electricity, and directly financed air travel (Fig. 7 and 8). All major GHG emissions sources have reduced since the initiation of the CAP in 2009, with the exception of other on-campus stationary†. Significant reduction were made in purchased electricity in 2012 when NorthWestern Energy, the Montana public utility company that provides electricity to MSU, changed its energy portfolio to include significantly more renewable energy.

Fig. 7



GREENHOUSE GAS (GHG) EMISSIONS

MAJOR GHG SOURCES CONTINUED

Fig. 8

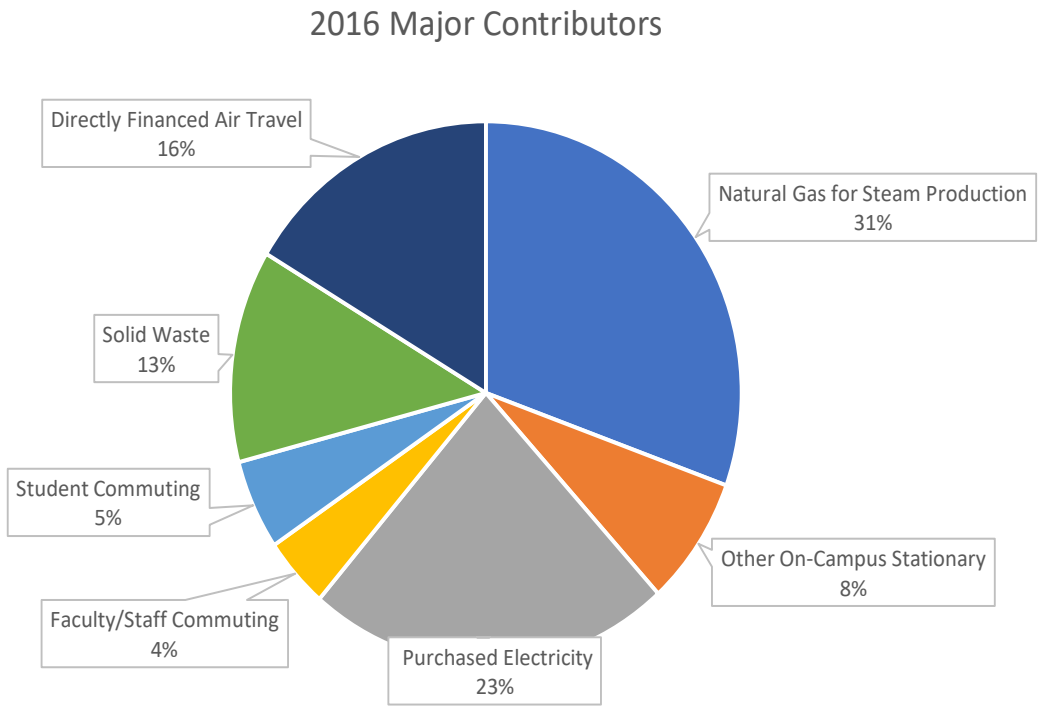


Table 4

		Scope 1		Scope 2	Scope 3			
Year		Cogen Steam	Other On-Campus Stationary	Purchased Electricity	Faculty/Staff Commuting	Student Commuting	Solid Waste	Directly Financed Air Travel
FY2008	MTCDE	17,176.4	3,371.8	13,428	2,911.5	2,615.7	6,776.1	8,798.6
FY2009	MTCDE	16,850.2	3,541.7	12,876	2,951.3	2,655.4	6,096.7	9,151.3
FY2010	MTCDE	16,545.2	3,440.1	12,762	2,998.5	2,712.0	5,784.0	7,808.8
FY2011	MTCDE	16,576.0	3,426.5	12,593	3,103.7	2,949.0	6,197.1	7,447.0
FY2012	MTCDE	14,957.2	2,897.0	9,942	3,127.7	3,080.5	5,924.3	6,471.6
FY2013	MTCDE	14,489.7	2,968.4	10,136	3,127.2	3,079.9	5,960.4	5,877.2
FY2014	MTCDE	13,633.6	3,438.5	10,295	1,765.4	2,324.0	5,937.9	7,339.1
FY2015	MTCDE	13,633.6	3,438.4	10,295	1,764.4	2,322.7	5,866.3	7,339.1
FY2016	MTCDE	13,633.6	3,438.4	10,295	1,894.9	2,393.8	5,656.6	7,339.1
% Reduction (from 2009)		21%	-2%	23%	35%	8%	17%	17%

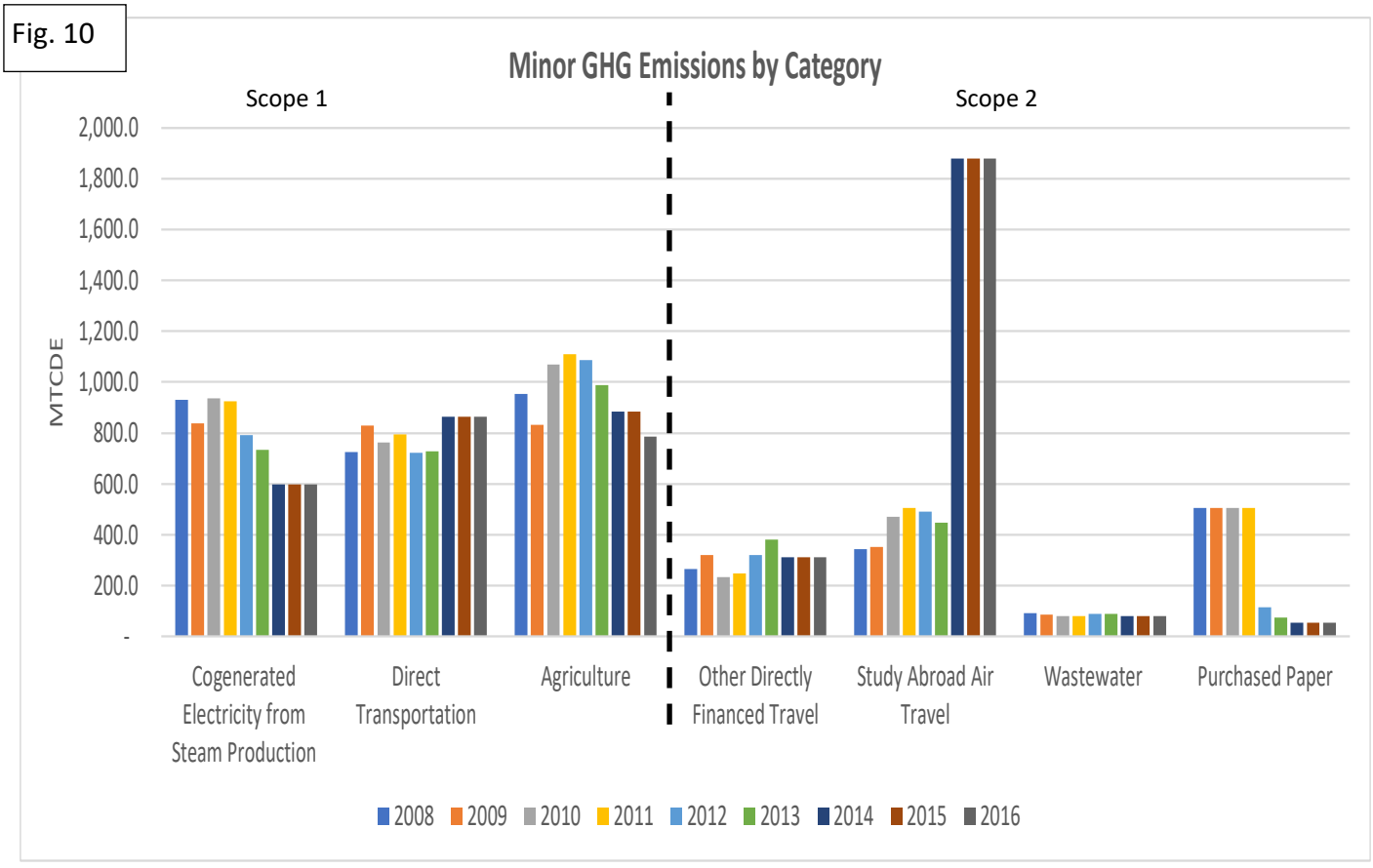
GREENHOUSE GAS (GHG) EMISSIONS

MINOR GHG SOURCES

********** This page is incomplete and requires further discussion**

Minor sources for GHG emissions at MSU are primarily study abroad air travel, agriculture, and direct transportation. MSU has seen significant reductions in the amount of paper it purchases through increasing the number of "paperless" operations.

Fig. 10



GREENHOUSE GAS (GHG) EMISSIONS

MINOR GHG SOURCES CONTINUED

Fig. 10

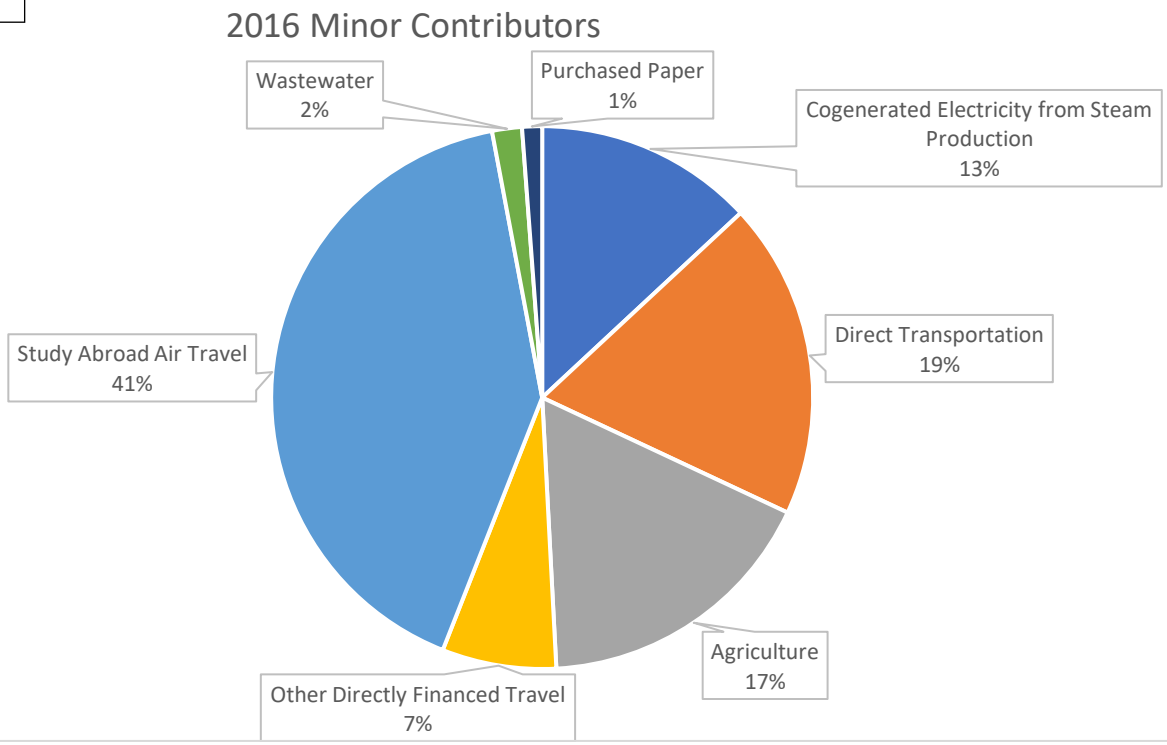


Table 5

		Scope 1			Scope 2			
Year		Cogen Electric	Direct Transportation	Agriculture	Other Directly Financed Travel	Study Abroad Air Travel	Wastewater	Purchased Paper
FY2008	MTCDE	929.0	724.1	952.0	263.8	344.3	92.2	504.2
FY2009	MTCDE	838.0	828.1	833.1	320.6	352.1	84.5	504.2
FY2010	MTCDE	935.1	763.4	1,068.3	233.5	471.5	79.7	504.2
FY2011	MTCDE	923.9	795.4	1,108.8	249.1	506.5	81.0	504.2
FY2012	MTCDE	791.4	722.0	1,085.5	320.5	491.1	87.8	114.6
FY2013	MTCDE	734.7	726.4	988.1	381.3	448.7	90.2	74.4
FY2014	MTCDE	598.7	863.5	884.2	311.8	1,877.1	81.4	54.5
FY2015	MTCDE	598.7	863.1	884.2	311.7	1,877.1	81.4	54.5
FY2016	MTCDE	598.7	863.1	786.6	311.7	1,877.1	81.4	54.5
% Reduction (from 2009)		36%	-19%	17%	-18%	-445%	12%	89%

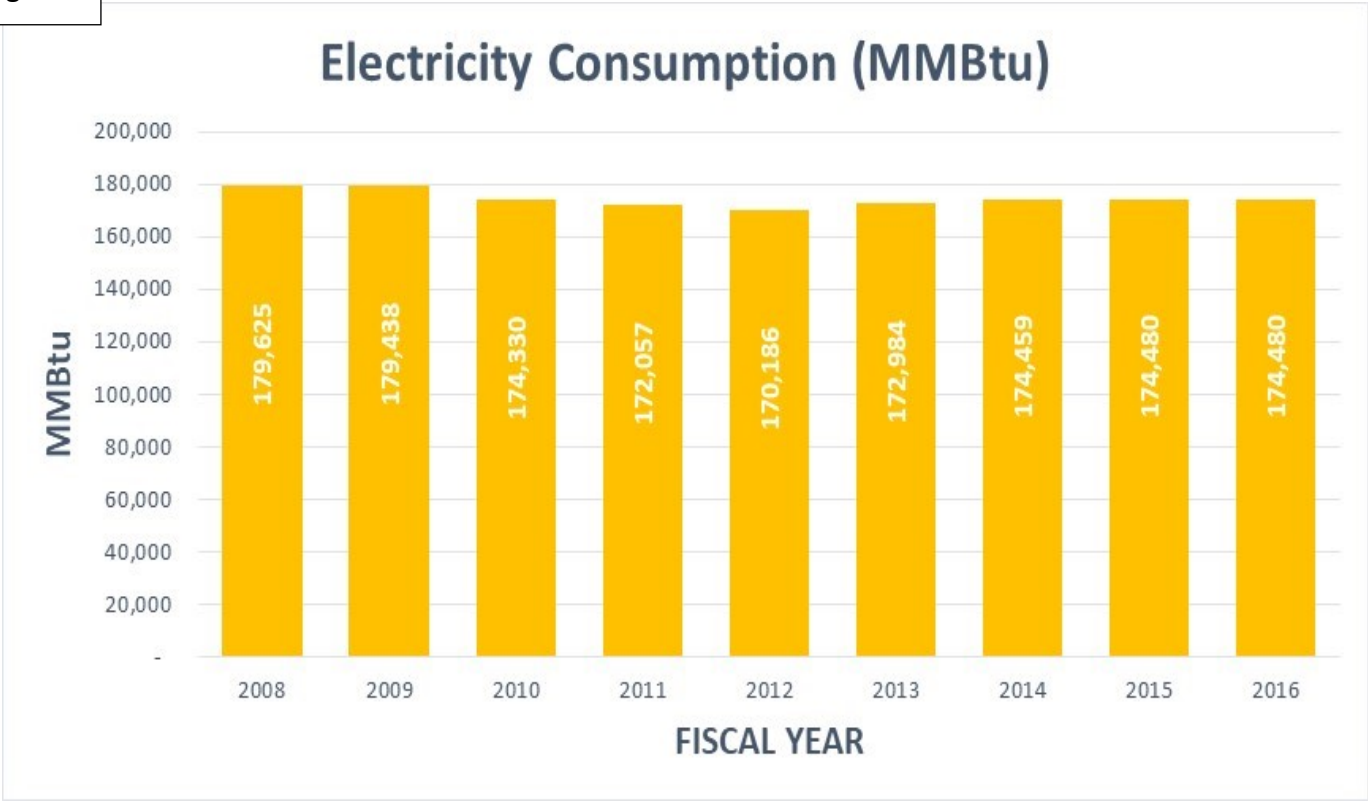
ENERGY CONSUMPTION AND CONSERVATION

UNIVERSITY ENERGY CONSUMPTION

Energy consumption and conservation is an important component to meeting MSU's GHG reduction goals and in improving its overall campus environmental impact. Electricity consumption affects both GHG emissions from purchased electricity, as well as electricity cogenerated from the production of steam (which accounts for approximately 5% of electricity used on campus). Both of these emissions sources are considered scope 1 sources and have decreased since 2009. Here we can see that total electricity consumption has remained mostly constant (Fig. 11), however, when looking at energy consumption per 1,000 GSF (Fig. 12) and per FTE (Fig. 13) MSU's energy conservation efforts have resulted in a decrease in the amount of energy being used per occupant and per 1,000 GSF as MSU continues to grow.

Energy efficiency and emissions reductions projects have included building and lighting retrofits, improved heating and cooling systems in buildings, installation of geothermal water heating systems, and increases in the amount of renewable energy supplied to MSU via its energy partners. Currently, approximately 25% of MSU's total energy comes from renewable sources—primarily wind and hydroelectric.

Fig. 11



ENERGY CONSUMPTION AND CONSERVATION

UNIVERSITY ELECTRICITY CONSUMPTION

MSU has reduced its energy consumption per 1,000 GSF by 10% (Fig. 12) and 25% per FTE (Fig. 13) from 2009 levels.

Fig. 12

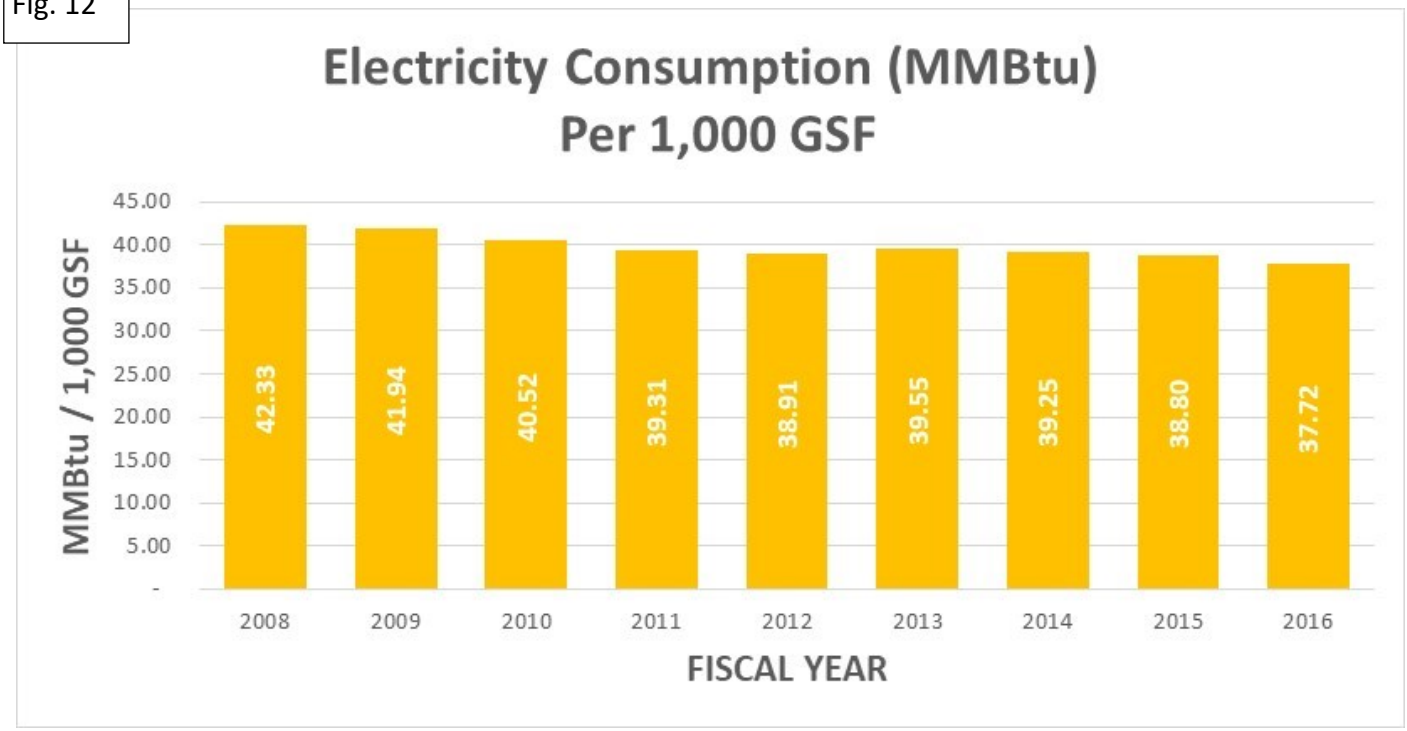
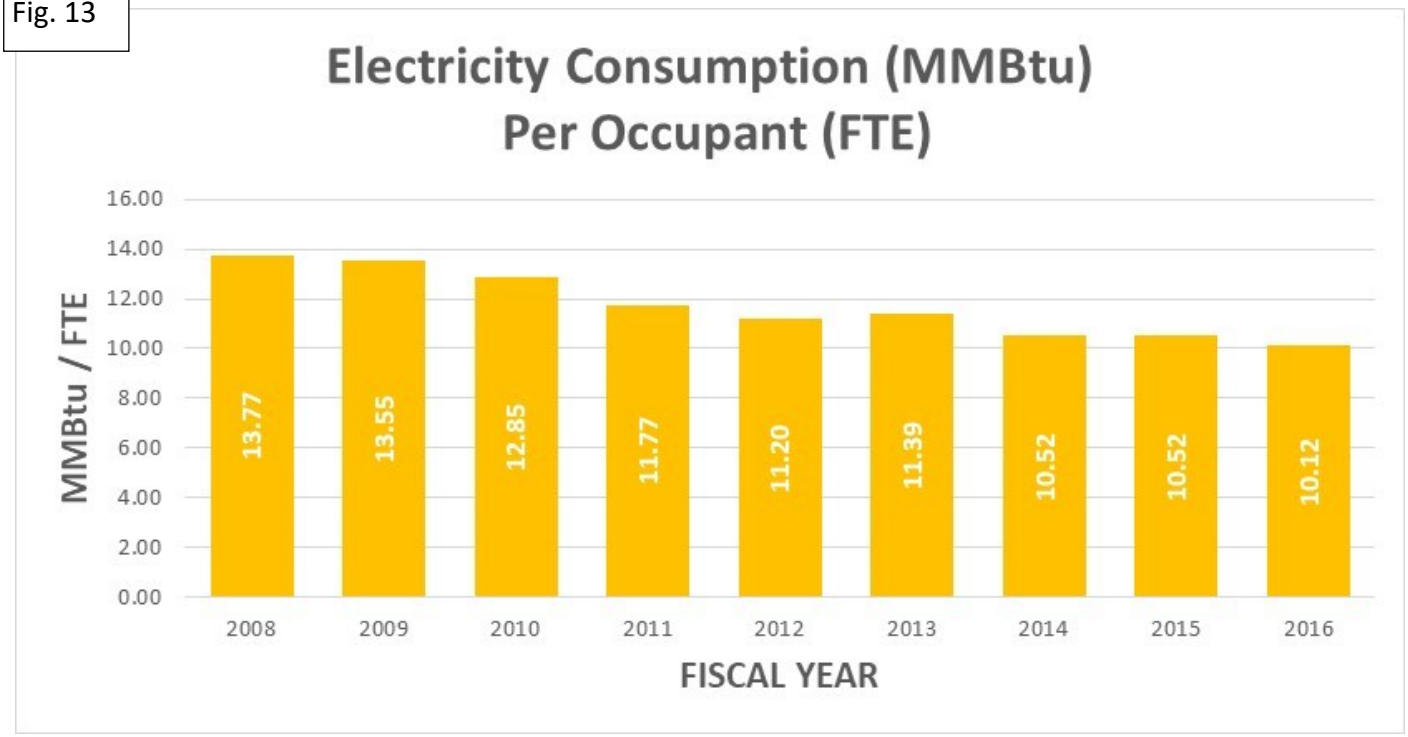


Fig. 13



WASTE DIVERSION AND REDUCTION

UNIVERSITY WASTE DIVERSION

Waste diversion and reduction strategies are another core component to greenhouse gas reduction strategies. Solid waste is one of the major sources for GHG emissions on the MSU campus (Fig. 7). **MSU has reduced its total waste production by 17% per FTE from 2009 levels**. Additionally, MSU has grown its recycling and composting programs to ensure that less of the waste that is created makes it to the landfill. **In 2016 over 19% of waste generated was diverted from the landfill (Fig. 15)**. MSU Safety & Risk Management operates an E-Scrap program for the campus. This program is paid for by a fee charged on all university computer purchases (a percentage of purchase price). For this reason they only accept MSU property for E-Scrap recycling. The observed decrease in weight composted (Fig. 14 and Table 6) is due to a transition in compost site location resulting in a temporary pause in collection.

Fig. 14

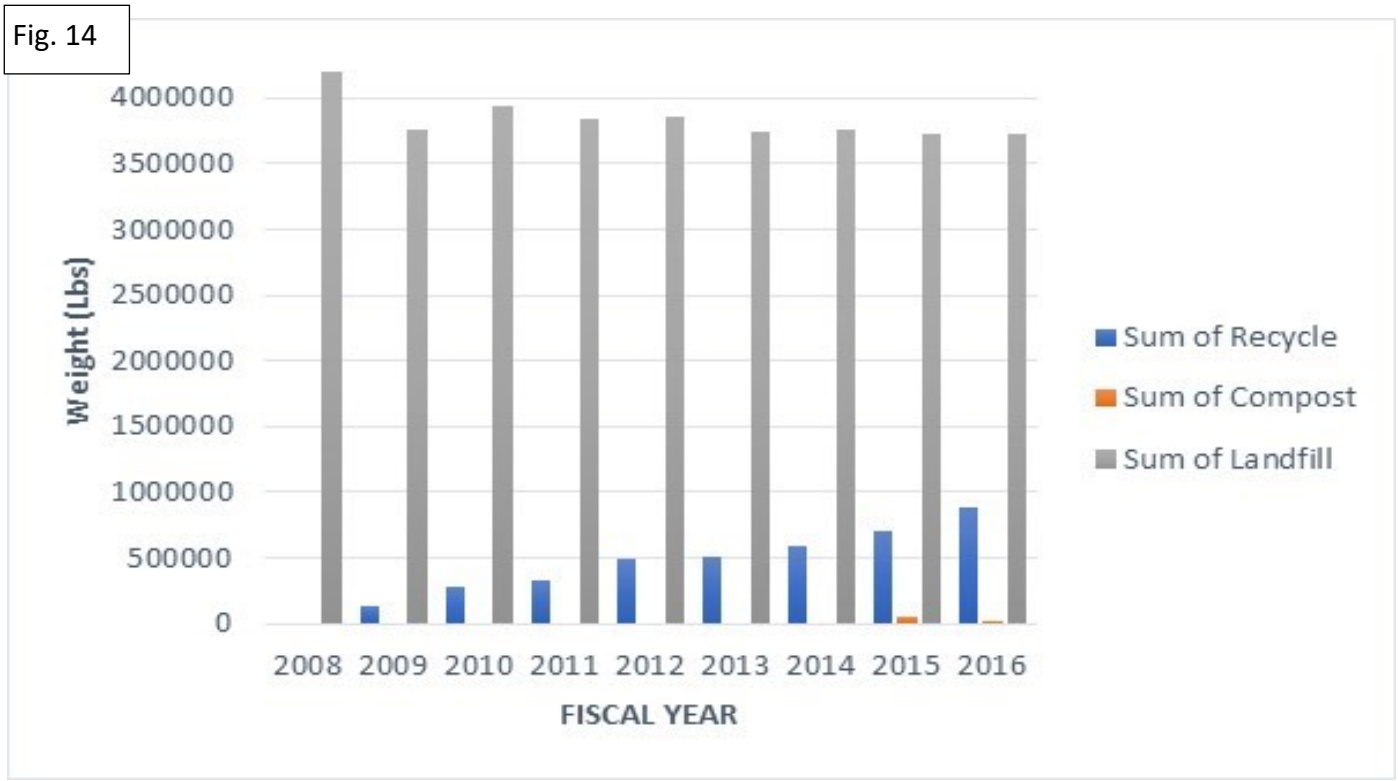


Table 6

Year		Recycling	Compost	Landfill
FY2008	lbs	0	0	4199430
FY2009	lbs	131918	0	3752656
FY2010	lbs	288125	0	3931800
FY2011	lbs	327933	0	3849200
FY2012	lbs	494526	0	3864040
FY2013	lbs	503133	0	3741491
FY2014	lbs	595040	0	3756140
FY2015	lbs	705456.5	54374	3724890
FY2016	lbs	892558	2681.5	3734490

WASTE DIVERSION AND REDUCTION

UNIVERSITY WASTE DIVERSION

Percent waste diversion has increased 16% from 2009 through increases in MSU's recycling and composting programs. Additionally, MSU's Culinary Services Division has worked in conjunction with student organizations to decrease the amount of food wasted in dining halls by consumers.

Fig. 15

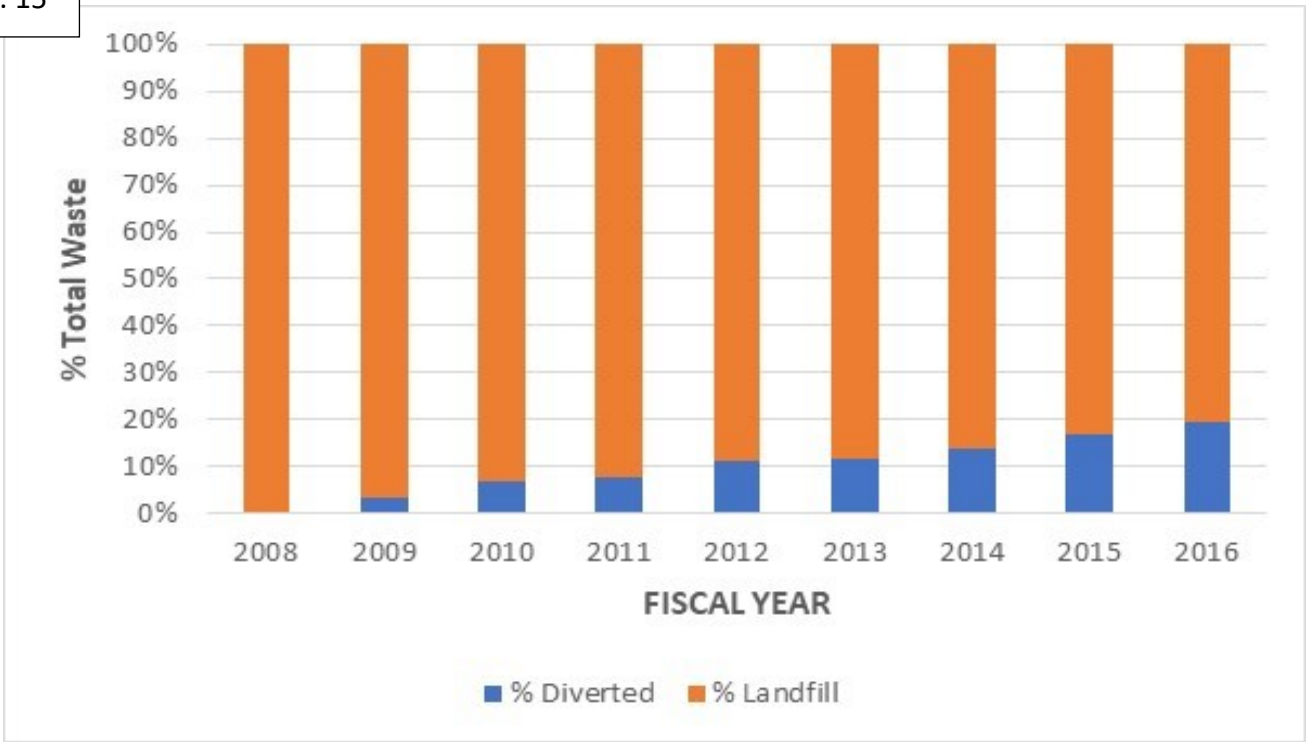


Fig. 16

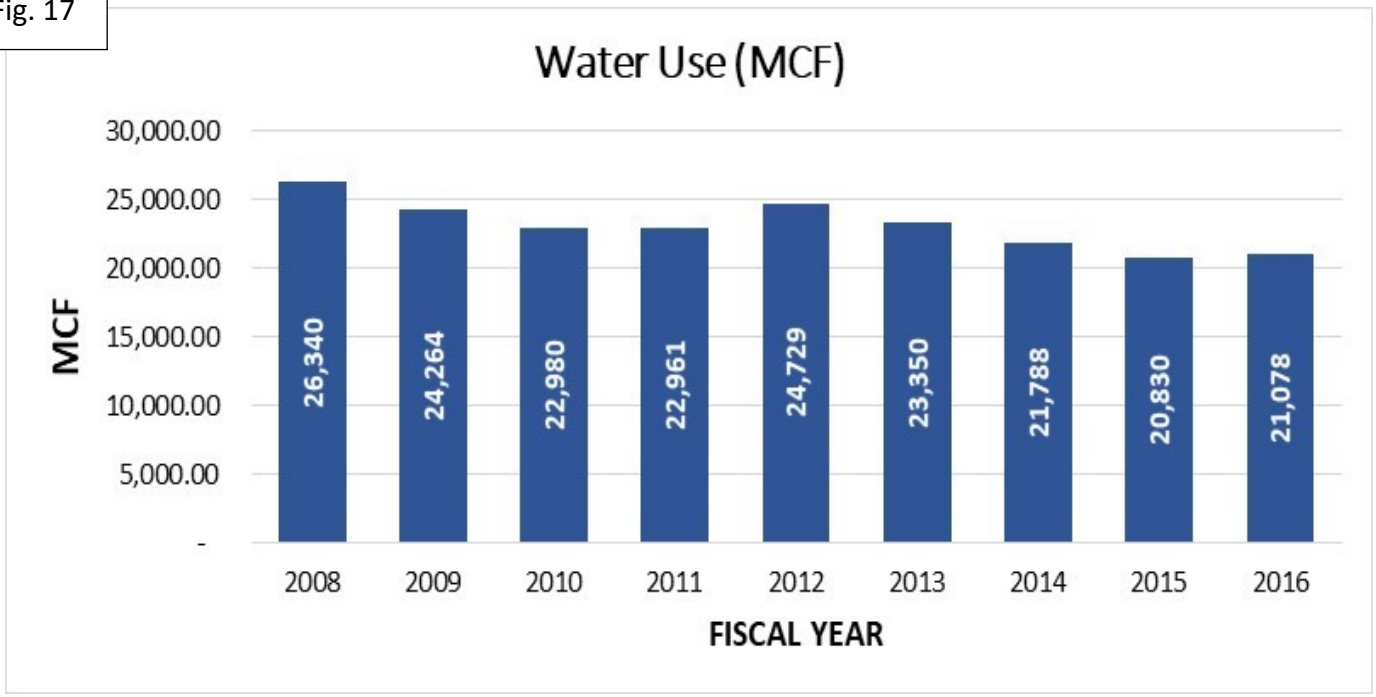
WATER CONSUMPTION AND CONSVERATION

UNIVERSITY WATER CONSUMPTION

Water consumption and conservation plays an important role in both reducing MSU's scope 2 GHG emissions through wastewater and reducing its overall environmental impact. **Overall water use in millions of cubic feet (MCF) has been reduced by 13% since 2009 (Fig. 17**). Furthermore, **water use has declined by 20% per 1,000 GSF (Fig. 18) and 33% per FTE (Fig. 19)**.

Efforts to improve water use efficiency and decrease consumption have included updating and retrofitting fixtures in residence halls and improved grounds management practices. Although MSU makes up a significant portion of the Bozeman population, the university is only responsible for 9% of total water usage in the city.

Fig. 17



WATER CONSUMPTION AND CONSERVATION

UNIVERSITY WATER CONSUMPTION

Fig. 18

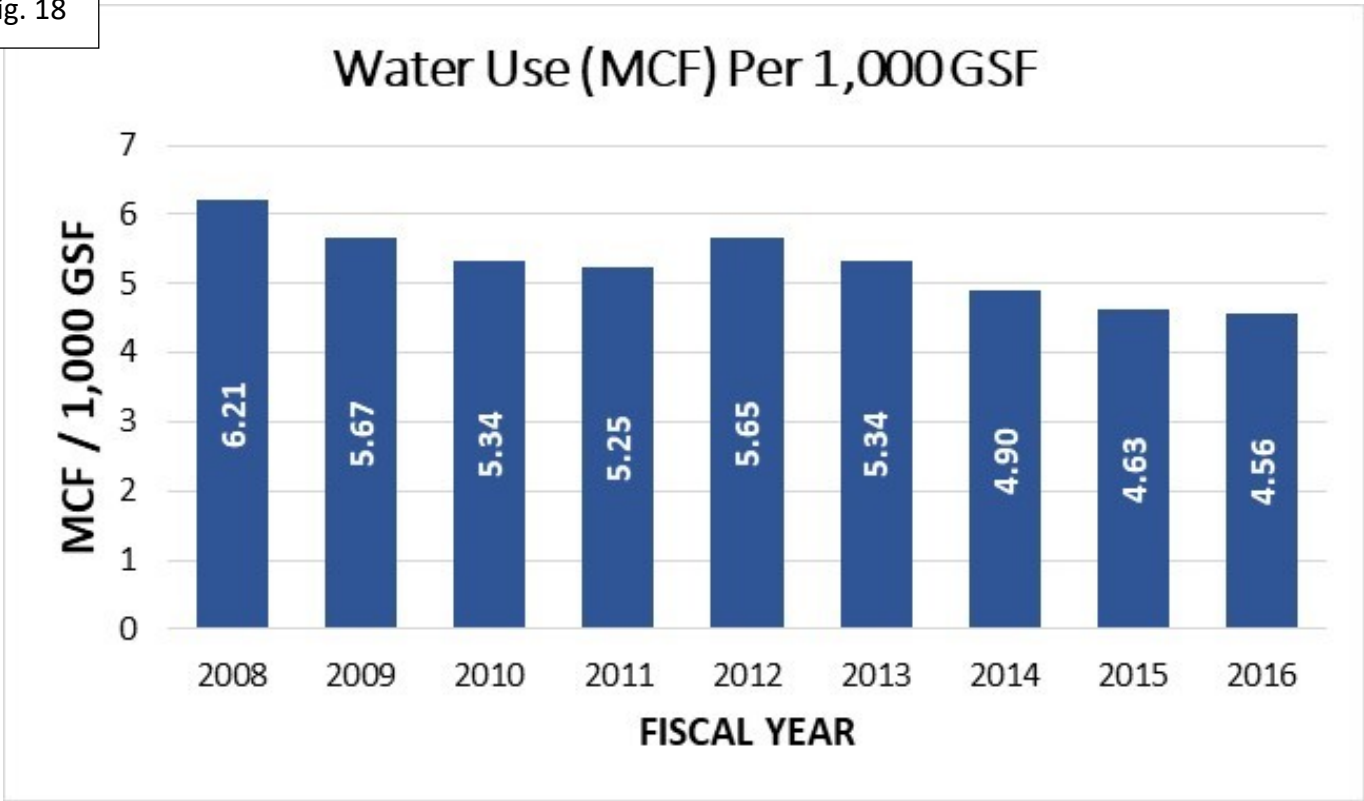
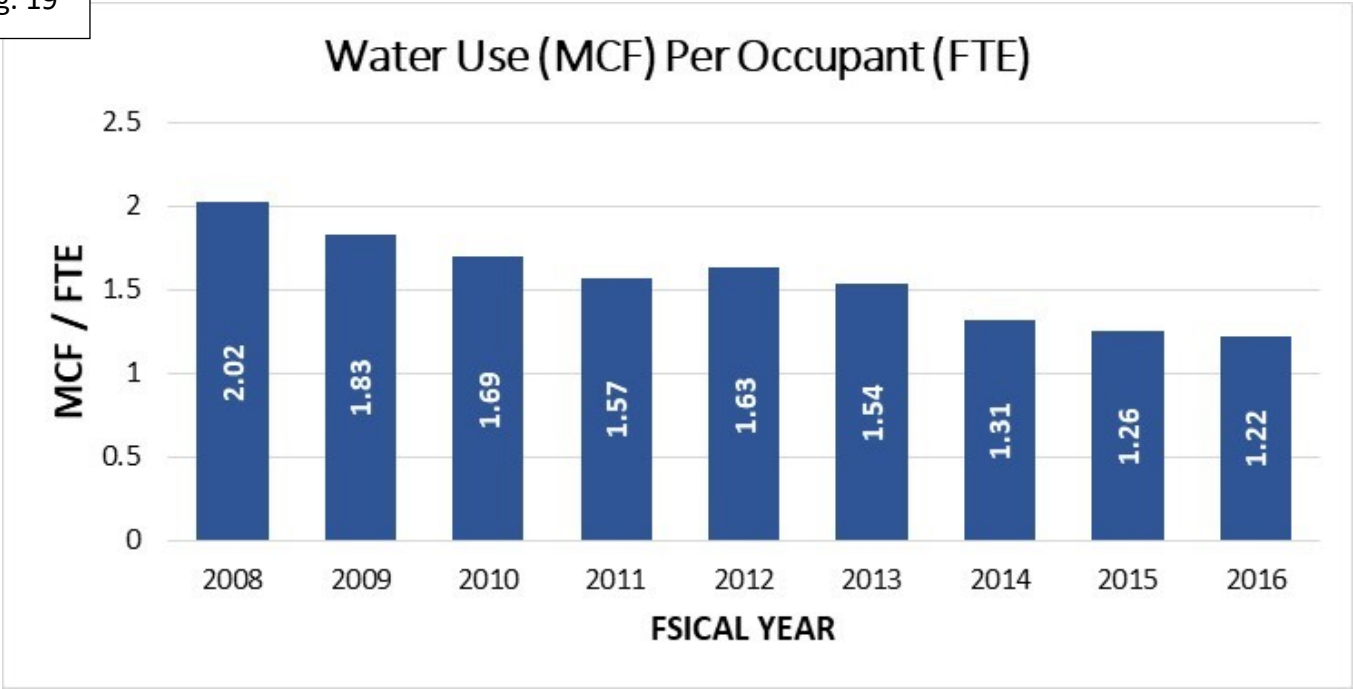


Fig. 19



TRANSPORTATION

UNIVERSITY COMMUTE MODAL SPLIT

Modal split is divided into four categories: carbon free which includes all non-motorized methods of transportation (i.e. bike, skateboard, etc.), driving alone, carpooling, and taking the bus. The results are divided into three user groups: students, staff, and faculty. Among all three user groups the proportion of users utilizing more environmentally friendly transportation options has increased since 2009. All three user groups play a significant role in contributing to MSU's scope 3 GHG emissions (Fig. 7 & 8).

Efforts to reduce emissions from transportation at MSU have included a range of strategies such as improving bicycle infrastructure, increasing the number of classes and trainings offered online, and improving public transportation options through increasing route frequency and areas served.

Fig. 20a

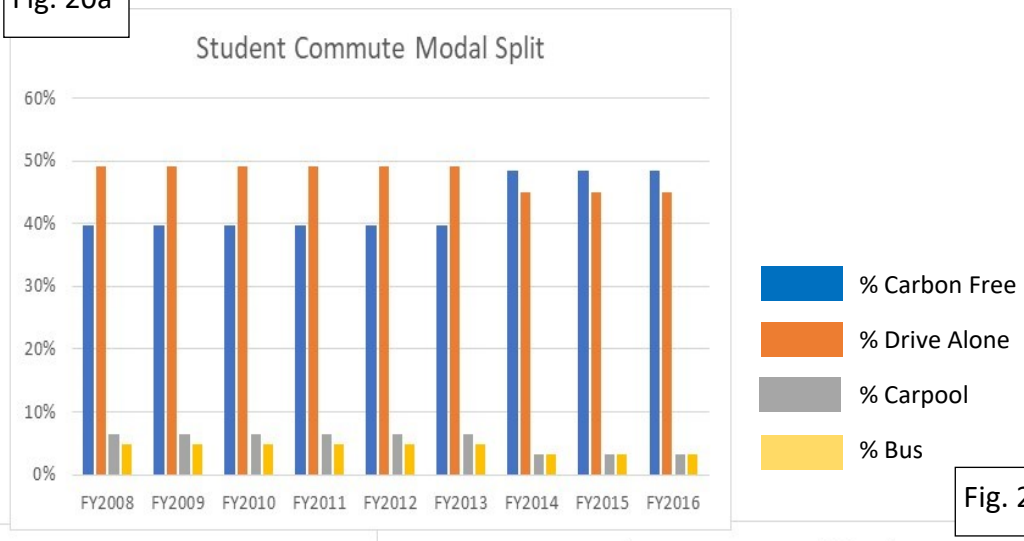


Fig. 20b

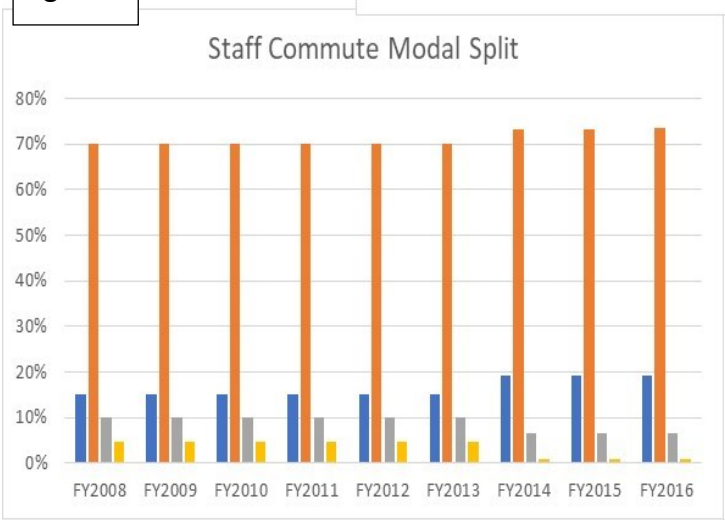


Fig. 20c