



GREENHOUSE GAS INVENTORY FISCAL YEAR 2018

Executive Summary

As part of Kennesaw State University's (KSU) commitment to resource conservation, sustainability, and fiscal responsibility, KSU's Office of Campus Planning and Sustainability completes an annual greenhouse gas (GHG) inventory. The 2018 inventory is the seventh such inventory conducted for KSU and the third inventory post-consolidation between KSU and Southern Polytechnic State University (SPSU). This inventory reflects the impact of KSU's operations, including utility consumption, travel, commuting habits, and waste generation and disposal, on greenhouse gas emissions.

This inventory shows KSU's operations contributed 118,637 metric tons equivalent of carbon dioxide to the atmosphere in fiscal year 2018. This appears to be a nine percent increase over the 2017 GHG inventory; however, it appears the 2017 inventory undercounted the student commuting data. The data is mostly on par with 2016 GHG inventory, despite an increase in enrollment. The report shows KSU generated 3.69 metric tons equivalent of carbon dioxide per student, compared with 3.46 in 2017, 4.67 in 2016, and 4.77 in 2014.

Purchased electricity is the main driver of KSU's greenhouse gas emissions. This accounts for 43 percent or 50,252 metric tons equivalent of carbon dioxide. Student commuting is the second largest driver of greenhouse gas emissions; it accounts for 33 percent or 38,780 metric tons equivalent of carbon dioxide. This was the first year we were able to add partial food data. Based on the data provided, food accounts for less 876 metric tons equivalent of carbon dioxide, less than one percent of KSU's total operational impact.

About KSU

KSU is a dual-campus university due to a 2015 consolidation with Southern Polytechnic State University. The two campuses are 10 miles apart and are both located near highway I-75 in north metro Atlanta. The northern campus, referred to as Kennesaw campus, is the larger of the two campuses and offers a more traditional liberal arts experience. The southern campus, referred to as the Marietta campus, is smaller; this campus serves as the STEM campus, with engineering, architecture, and computer science. The two campuses consolidated as one university in fall 2016. This is KSU's third inventory post-consolidation.

KSU is a public college and is the third-largest university in Georgia; its fall 2018 enrollment was 32,147 students, measured as full-time equivalents. While KSU is primarily a commuter school, we house 5,080 students on-campus and we are actively developing plans to build more on-campus housing. Additionally, local apartments provide housing for at least 4,000 students near campus.

Campus Boundaries

The first step in any greenhouse gas inventory is defining the boundaries of the institution to delineate where to source operational data. KSU includes in its boundaries all buildings owned or operated by the University or by the KSU Foundation. (For the purposes of this report, KSU will mean both KSU and the KSU Foundation, unless stated otherwise.) Included in our inventory are academic buildings, offices, dining facilities, athletic buildings, a gym, a library, parking decks, and residence halls. Due to the diverse ownership structure, it was at times difficult to get all operational data; however, we worked in good faith to ensure the data was comprehensive. Our boundaries correlate with those identified in the publicly available campus maps; these are located on-line at <http://www.kennesaw.edu/maps/>.

In addition to these two campuses, KSU offers select classes in Paulding County and near Cobb Galleria. Due to the fact that we neither own nor operate these buildings, this data is excluded from the inventory.

Greenhouse Gas Calculations

The greenhouse gas inventories measure different sources of greenhouse gas emissions. These sources are referred to as "scope one, scope two, and scope three" emissions. The Greenhouse Gas Protocol defined the different sources and created this as an international standard for reporting.

Scope one emissions come from sources owned or controlled by the reporting entity. Scope one emissions include on-site fossil fuel combustion (such as natural gas), renewable energy production, refrigerant management, fertilizer use, and fleet fuel consumption.

Scope two emissions come from purchased electricity, heat, or steam. KSU purchases electricity from Georgia Power, Marietta Power and Water, and Cobb County EMC. The GHG inventory takes into account the fuel blend used by the utilities. If KSU's utilities were to rely exclusively on coal to create electricity, for example, this would create higher emissions for KSU than if KSU's utilities used nuclear or a blend of renewable energy.

Scope three emissions come from sources not owned or directly controlled by the institution, but directly related to the institution's operations. Scope three emissions include commuting by students, staff, and faculty, study abroad and work travel, solid waste, wastewater treatment, and office paper. Food also falls under Scope three emissions; 2018 is the first we were able to include partial food data in our analysis.

KSU Sustainability staff collected operational data across multiple departments, including Facilities, the Foundation, Auxiliary, Housing, and Athletics. KSU Sustainability staff compiled that data and then imported it into the Sustainability Indicator Management and Analysis Platform (SIMAP), an on-line greenhouse gas calculator developed by the University of New Hampshire. This tool is located at <https://unhsimap.org/home>. This tool is recognized by Second Nature and is utilized by many peer colleges throughout the U.S.

Operational Data: Sources, Owners, and Methodologies for Calculations

A summary of data sources and the responsible department for each emission source is listed below. Emission sources marked with an asterisk (*) were calculated based on a series of assumptions, versus on verifiable data (such as receipts). Raw operational data from 2016, 2017, and 2018 is included in Table Four. Detail on both the assumptions and the calculations is below the table.

Table 1: Data Sources and Owners		
Emission Source	Data Sources	Data Owners
Scope 1		
Natural Gas	Monthly utility bills.	Plant Operations, Facilities The Foundation Housing & Residence Life Athletics
Solar PV*	Estimates based on system size.	Plant Operations, Facilities
Fleet (gas, diesel)	Gas purchases for fleet vehicles, golf carts and other equipment, and the Big Owl Bus.	Auto Shop Building Services, Facilities Transportation
Fertilizers	Fertilizer purchases for landscape and grounds crew.	Landscape and Grounds, Facilities
Refrigerants	Storage log.	Mechanical, Electrical and Plumbing; Facilities
Scope 2		
Electricity	Monthly utility bills.	See "Natural Gas."
Scope 3		
Commute*	Estimates based on number of parking permits sold relative to KSU population and estimated daily vehicle miles travelled, based on city or county of origin for students, staff and faculty.	Transportation Housing (for residential students) Human Resources
Travel*	Reimbursement for mileage travelled (receipt-based); estimates based on rental car trips, air travel, and study abroad.	Travel Study Abroad
Waste	Tonnage reports from waste contractors.	Buildings Services, Facilities Housing Athletics
Compost	Tonnage reports from contractors for food waste, grounds, and cooking oil.	Dining Services Landscape & Grounds
Wastewater	Monthly utility bills.	See "Natural Gas."
Office Paper*	Estimates based on data provided by printing company (RICOH) and Procurement.	RICOH Procurement
*Notes items which were estimated based on assumptions versus on verifiable data.		

As noted above, data for four emissions sources were developed based on estimates versus on verifiable data, such as record logs and receipts. These sources were Solar PV generation, commuting, travel, and office paper purchases.

Solar PV: Marietta campus hosts a 15-Kw solar PV system. This is split into a both ground-mounted system near the Engineering Technology Center building and a rooftop system on top of the Engineering Technology Center building. KSU does not currently track the monthly or annual generation data from the system inverters. However, we plan to begin tracking and publicly reporting on generation data as part our general sustainability outreach.

Estimates were based on the calculations from the National Renewable Energy Laboratory, which takes into consideration systems size, geographic location, and amount of sun received annually.

Commuting: KSU is a commuter school with limited alternative commute options such as biking, walking, or public transportation. Commuting is also one of the largest contributors to KSU's greenhouse gas emissions. However, unlike in other parts of the inventory, we lack accurate data on commuting habits and thus rely on a series of calculations and assumptions to calculate the greenhouse gas emissions associated with commuting.

To make these calculations for students, we looked at the following known facts directly and indirectly related to commuting:

- Full-time equivalent enrollment for fall 2018 (32,147)
- Number of parking permits purchased by off-campus students (21,392)
- Students living on-campus: 5,080
- Students living in apartment complexes near campus: 4,037
- County of origin data for all students (based on permanent address at time of application – i.e. typically tied to their parents' address).
- City of origin data for all staff and faculty (based on permanent address at time of application)

KSU sustainability staff estimated the number of miles one would travel from each city or county to arrive at campus. We then estimated the percentage who would drive to Kennesaw campus or to Marietta campus, based on actual numbers attributed to each campus. We assumed any student whose permanent address would have him or her driving more than fifty miles one-way would have relocated to the Cobb area and we assigned him or her a Cobb address.

Based on these calculations, we assumed students had an average one-way commute of 14 miles. We also assumed students drove to campus an average of three days per week for 42 weeks per year. These estimates only applied to students who lived off-campus. We then estimated the percentage of trips made by car, bike, bus, or by foot and estimated mileage for each commute. Raw data for these estimates is included in Table 5.

For staff and faculty estimates, we followed the same methodology, with a few key differences:

- a. Mileage calculations were made at the city-level, versus the county level.
- b. Staff were assumed to drive to campus an average of 4 times per week, 48 weeks per year.
- c. Faculty were assumed to drive to campus an average of 3 times per week, 42 weeks per year.
- d. We assumed city of origin data was accurate, regardless of miles per commute except when it reflected an out-of-state destination. In those cases, we assumed the individual had relocated to Cobb County.

Travel: University travel covers regional trips in personal vehicles, business travel by plane or rental car, and student study abroad by plane. While we have detailed records for miles travelled by personal vehicle, we developed calculations for all other types of travel.

For rental vehicles, we took the final cost and multiplied it by the IRS reimbursement rate for personal vehicle mileage. For plane travel (both business and study abroad), we guessed the airport travelled to (typically choosing

the capital city, unless other information was available) and calculated mileage using the on-line tool Air Miles Calculator (airmilescalculator.com). In some cases, we estimated multi-city routes.

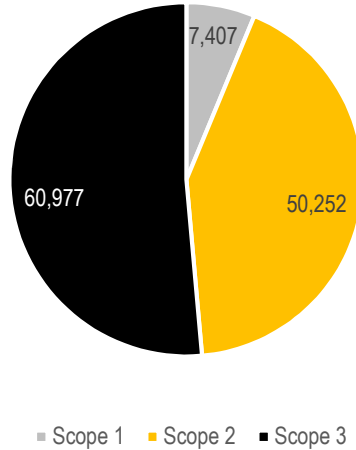
Office Paper Purchase: RICOH and Procurement provided estimates of the number of units of paper purchased.

GHG Emissions Data

The SIMAP carbon calculator measures KSU's carbon footprint based on reported operational data. Scope three emissions contributed over half of all emissions (51%), while scope two contributed 42% of the emissions generated. Scope one emissions accounted for 6 % of the emissions attributed to KSU operations. The top three drivers of emissions are:

1. Electricity – scope 2 – 43%
2. Student commuting – scope 3 – 33%
3. Natural Gas – scope 1 – 5 %

Graph 1: Greenhouse Gas Emissions, measured in Metric Tons Carbon Dioxide Equivalent



In 2016, KSU consolidated with Southern Polytechnic State University, creating a dual-campus experience and increasing enrollment exponentially. As a result of this consolidation, KSU is now the third largest public university in Georgia. Additionally, our actual enrollment continues to outpace projected enrollment, although we are making policy changes to allow us to better control our enrollment going forward.

Graph 2: Emissions 2014-2018

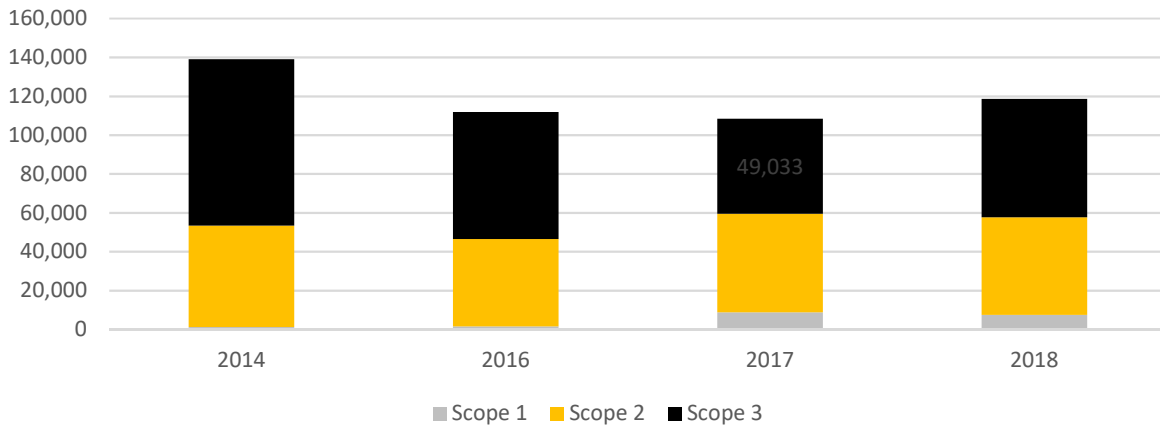


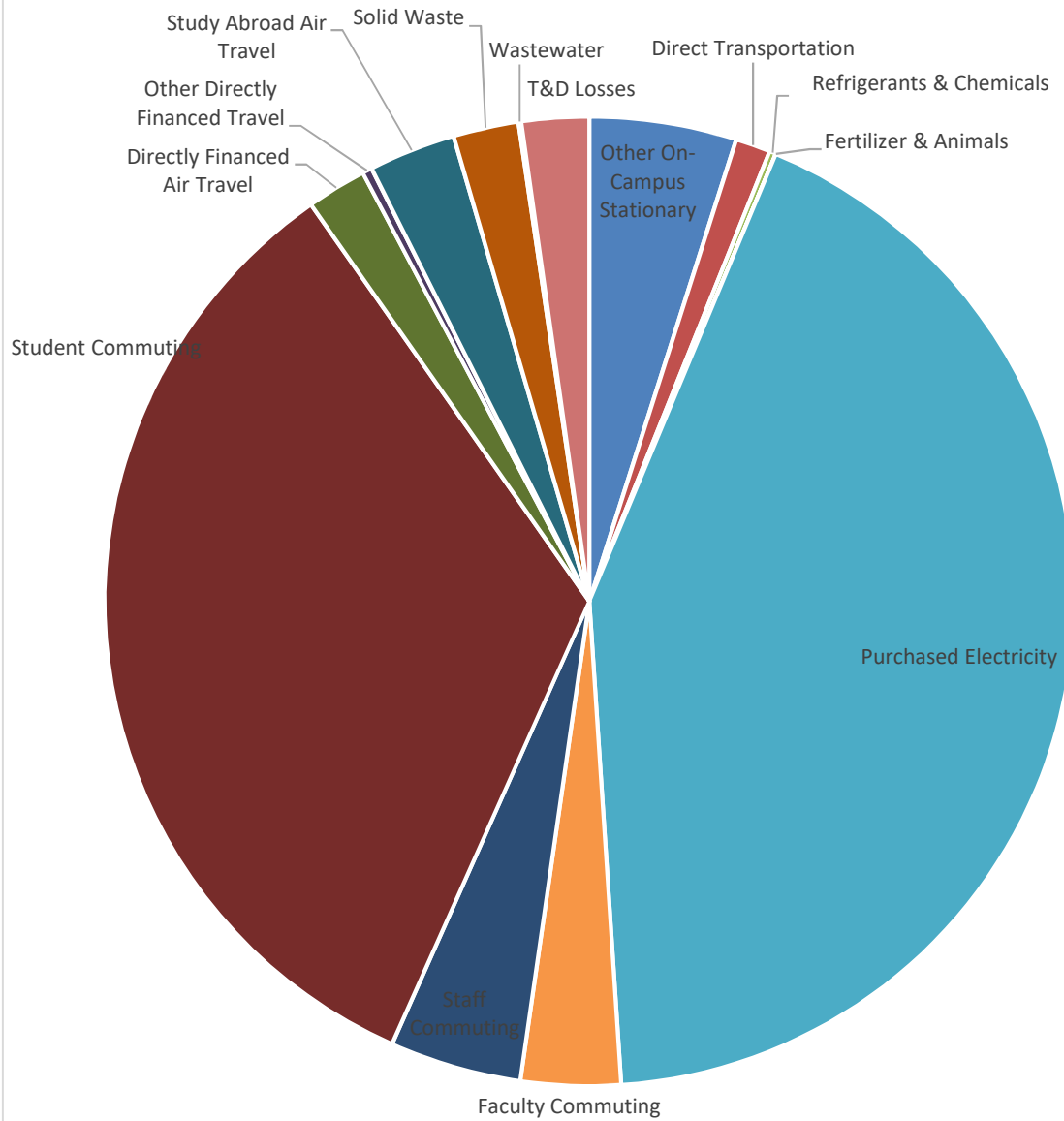
Table 2: Emissions by year and Scope (measured in Metric Tons equivalent of Carbon Dioxide Equivalent	FY 2014	FY 2016	FY 2017	FY 2018
Scope 1	1,130.35	1,432.05	8,736	7,407
Scope 2	52,198.65	45,072.12	50,681	50,252
Scope 3	85,746.62	65,308.34	49,033	60,977
Total emissions, by year	139,075.62	111,812.51	117,943	118,637
Emissions per full-time student	4.77	4.67	3.46	3.69

FY 2014 data includes total emissions from KSU and SPSU prior to consolidation; FY 2016, FY 2017, and FY 2018 data represent post- consolidation KSU.

Table three and graph three, below, show the break-down of greenhouse gas emissions by activity, such as commuting, electricity purchases, solid waste disposal

Table 3: Greenhouse Gas Emissions by source, measured in Metric Tons Carbon Dioxide Equivalent				
<i>Source</i>	<i>Methane</i>	<i>Carbon Dioxide</i>	<i>Nitrous Oxide</i>	<i>Total</i>
Scope One Emissions				
Other On-Campus Stationary	14.32	5,755.41	3.41	5,773.13
Direct Transportation	2.36	1,357.59	11.82	1,371.77
Refrigerants & Chemicals	0.00	0.00	0.00	257.17
Fertilizer & Animals	0.00	0.00	5.40	5.40
Scope Two Emissions				
Purchased Electricity	111.45	49,994.2	196.31	50,251.96
Faculty Commuting	19.93	3,814.80	79.56	3,914.29
Staff Commuting	26.29	5,042.29	104.99	5,173.58
Student Commuting	199.86	38,569.44	798.71	39,568.00
Directly Financed Air Travel	0.58	2,343.14	7.96	2,351.68
Other Directly Financed Travel	1.94	368.39	7.73	378.06
Study Abroad Air Travel	84	3,400.54	11.55	3,412.93
Solid Waste	2,573	0.00	0.00	2,573
Wastewater	0.00	0.00	101.57	101.57
T&D Losses	5.90	2,643.68	1.04	2,650.62
Fppd	0	876.34	0	876.34

Graph 3: GHG Emissions, by Source



- Other On-Campus Stationary
- Direct Transportation
- Refrigerants & Chemicals
- Fertilizer & Animals
- Purchased Electricity
- Faculty Commuting
- Staff Commuting
- Student Commuting
- Directly Financed Air Travel
- Other Directly Financed Travel
- Study Abroad Air Travel
- Solid Waste
- Wastewater
- T&D Losses

Operational Data

Below is the raw operational data for 2016, 2017, and 2018. The raw data allows easier comparisons across years, especially for relevant departments.

Emission Source	Unit of Measurement	2016	2017	2018
Natural Gas	therms	1,018,427	1,391,083	1,085,516
Solar PV	kWh	-	21,849	21,849
Fleet (gas, diesel)	gallons	145,851	113,176	134,259
Fertilizers	pounds	4,430	3,146	4,600
Refrigerants	pounds	256	297	271
Electricity	kWh	73,104,936	95,914,913	94,767,236
Commute		See Table 5.		
Travel		See below.		
<i>Study Abroad</i>	passenger miles	9,513,129	5,842,374	7,074,634
<i>Business Travel: Air</i>	passenger miles	4,509,600	4,975,988	4,874,776
<i>Business Travel: Car</i>	vehicle miles	1,517,212	846,511	1,005,345
Waste	tons	932	863	830
Compost	pounds	762	501,200	1,086,096
Wastewater	gallons	-	225,565,555	209,099,559

Commute	Student*		Faculty		Staff	
	%	Miles**	%	Miles**	%	Miles**
Bike	2%	1	1%	10	1%	6
Walk	16%	1				
Carpool					1%	15
Bus	15%	2	1%	20	1%	20
Personal Car	67%	13	98%	19	97%	15

*Student commute excludes students who live on campus (and therefore do not “commute” in the traditional sense.
 **Miles are calculated one-way per SIMAP instructions.

Emission Reduction Action Plan

The greenhouse gas inventory is an important part of KSU’s sustainability efforts as it helps us to evaluate the impact of different programs and initiatives over time in reducing greenhouse gas emissions. It is also helpful to compare raw operational data year-to-year to measure the impact at that level.

Measurement alone does not make a difference. Below is summary of planned and on-going initiatives to further reduce our emissions in each of the key areas categories.

Natural Gas	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Monitor natural gas use on a monthly basis using utility bills. • Use conservation tools and management strategies outlined in our Energy Management Plan.
<i>Planned</i>	<ul style="list-style-type: none"> • Develop energy and water dashboards for all sub-metered data and increase use of this tool for real-time energy management. • Develop an energy management plan for Kennesaw campus.
Solar PV	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Maintain 15 kW solar PV installation on Marietta campus. • Explore opportunities to cost-effectively deploy more solar across KSU.
<i>Planned</i>	<ul style="list-style-type: none"> • Monitor solar generation on a monthly basis and share data via energy / water dashboard.
Fleet vehicles (gas and diesel purchases)	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Encourage staff to use the Big Owl Bus when travelling between campuses. • Promote no-idling policy.
<i>Planned</i>	<ul style="list-style-type: none"> • Purchase more fuel-efficient vehicles as replacement needs arise
Fertilizers	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Follow integrated pest management strategies and limit use of mulch and other fertilizer.
<i>Planned</i>	<ul style="list-style-type: none"> • No changes.
Refrigerants	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Follow written procedures on refrigerant management
<i>Planned</i>	<ul style="list-style-type: none"> • Conduct cross-campus procedure review. • Conduct bi-annual reporting to monitor leaks and prioritize equipment replacement, as needed. • Update design guidelines so new equipment purchases comply with intent of Kigali Accord.
Electricity	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Monitor natural gas use on a monthly basis using utility bills. • Use conservation tools and management strategies outline in our Energy Management Plan.

<i>Planned</i>	<ul style="list-style-type: none"> • Develop energy and water dashboards for all sub-metered data and increase use of this tool for real-time energy management. • Develop an energy management plan for Kennesaw campus. • Develop Operational Standards for both campuses. • Conduct educational outreach activities to drive behavioral change.
Commute	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Recent changes to permits incentivizes students, staff, and faculty to pick an alternative commute. Continue to evaluate fee structure options. • Continue to evaluate routes and modify to serve on-campus and off-campus users.
<i>Planned</i>	<ul style="list-style-type: none"> • Increase promotion of public transit options, including the planned 10X route. • Increase promotion of telework and compressed work week options.
Travel	
<i>Ongoing</i>	<ul style="list-style-type: none"> • N/A
<i>Planned</i>	<ul style="list-style-type: none"> • Explore options for students to purchase carbon offsets as part of study abroad program on a voluntary basis.
Waste	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Offer single-stream recycling throughout campus. • Host recycling for special events, such as cardboard-recycling at move-in, swap shop at move-out, and pumpkin launch.
<i>Planned</i>	<ul style="list-style-type: none"> • Implement recycling education program at student, staff and faculty level. • Install recycle across America standardized recycling labels on the Marietta campus under a pilot program and measure impact.
Compost	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Collect food waste from dining services, convert to composts, and return to Hickory Grove Farm in closed-loop system. • Collect green waste and send to Hickory Grove Farm.
<i>Planned</i>	<ul style="list-style-type: none"> • N/A
Wastewater	
<i>Ongoing</i>	<ul style="list-style-type: none"> • Monitor water use on a monthly basis using utility bills.
<i>Planned</i>	<ul style="list-style-type: none"> • Develop energy and water dashboards for all sub-metered data and increase use of this tool for real-time water management. • Measure impact of Net Blue program for new construction.
Office Paper	
<i>Ongoing</i>	<ul style="list-style-type: none"> • N/A
<i>Planned</i>	<ul style="list-style-type: none"> • Work with UITS and RICOH to make double-sided printing standard. • Work with procurement to promote purchases of recycled paper.

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- Institutional Research: Dominique Foster
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- Travel: Sandy Cagliani and Heather Mead

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