

# **MSU Scope 3 Emissions White Paper**

## PSCI 492: Independent Study

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May 2022



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# Executive Summary

Multi-stakeholder representation including students, faculty, & administrators, as well as public transparency in institutional planning and procedural development is vital to producing the outcomes that science demands in order to “limit global warming to close to 1.5°C”.<sup>1</sup> Montana State University (MSU) with its focus on undergraduate research has produced much of the research that corroborates the impacts of climate change. In fact MSU’s own Cathy Whitlock, Regents Professor, Fellow, and former Director of the Montana Institute on Ecosystems contributed to the 2021 Greater Yellowstone Climate Assessment.<sup>2</sup> Acting on the knowledge MSU produces as a Carnegie R1 Research Institution, MSU has an opportunity to play a key role in teaching the importance of transitioning our economy and culture away from fossil fuel dependence and towards a cleaner, greener future. Montana faces major climate-related shifts locally; with increased temperatures leading to drought, extensive forest fires, decreased snowpacks, and decreased agricultural viability<sup>3</sup>. As the single largest employer in the county, and as the state’s Land Grant University, MSU has a unique responsibility to the local community and state to reduce its greenhouse gas (GHG) emissions in an effort to mitigate the greater climate challenges that are exacerbated by a continuation of the status quo.

In addition, MSU can use its carbon reduction and climate action planning as a learning opportunity for the campus and the state to showcase innovative examples of strategies and policies. GHG Emissions are broken up into three categories as defined by the EPA: Scope 1 (direct from facilities and institutional vehicles), Scope 2 (purchased electricity), and Scope 3 (includes for example, travel and commuting, waste disposal, goods and services, or transport and distribution).<sup>4</sup> The EPA describes Scope 3 emissions as, “the result of activities from assets not owned or controlled by the reporting organization, but that the organization indirectly impacts in its value chain”.<sup>7</sup> Any GHG emissions not within the university’s Scope 1 & 2 emissions are encapsulated within the broader Scope 3 category (see Figure 2).

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<sup>1</sup> H.-O. Pörtner, et al. IPCC, 2022: Summary for Policymakers. In: *Climate Change 2022: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press.

<sup>2</sup> Whitlock, Cathy. “Greater Yellowstone Climate Assessment.” *CLIMATE, CLIMATE VARIABILITY, AND CLIMATE CHANGE IN THE GYA*, June 2021, [https://www.gyclimate.org/sites/default/files/files/GYCA\\_June2021\\_FullReport\\_ch2.pdf](https://www.gyclimate.org/sites/default/files/files/GYCA_June2021_FullReport_ch2.pdf).

<sup>3</sup> Kunkel, K.E. “State Climate Summaries 2022.” Montana - State Climate Summaries 2022, 1 Jan. 1970, <https://statesummaries.ncics.org/chapter/mt/>.

<sup>4</sup> Environmental Protection Agency. “Greenhouse Gases at the EPA.” EPA, Environmental Protection Agency, 6 Aug. 2021, <https://www.epa.gov/greeningepa/greenhouse-gases-epa>.

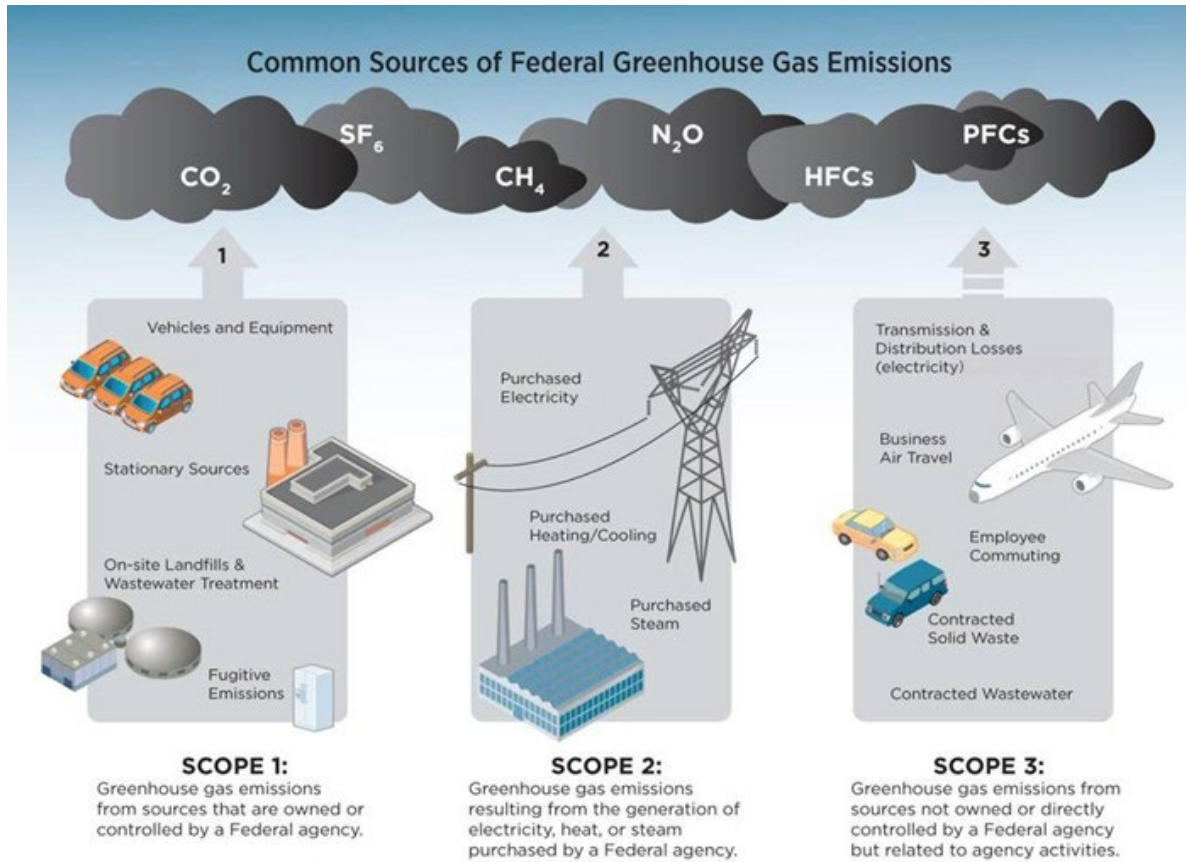


Figure 2: Common Sources of Federal Greenhouse Gas Emissions.<sup>7</sup>

## GHG at MSU by Scope and Category: FY 2019

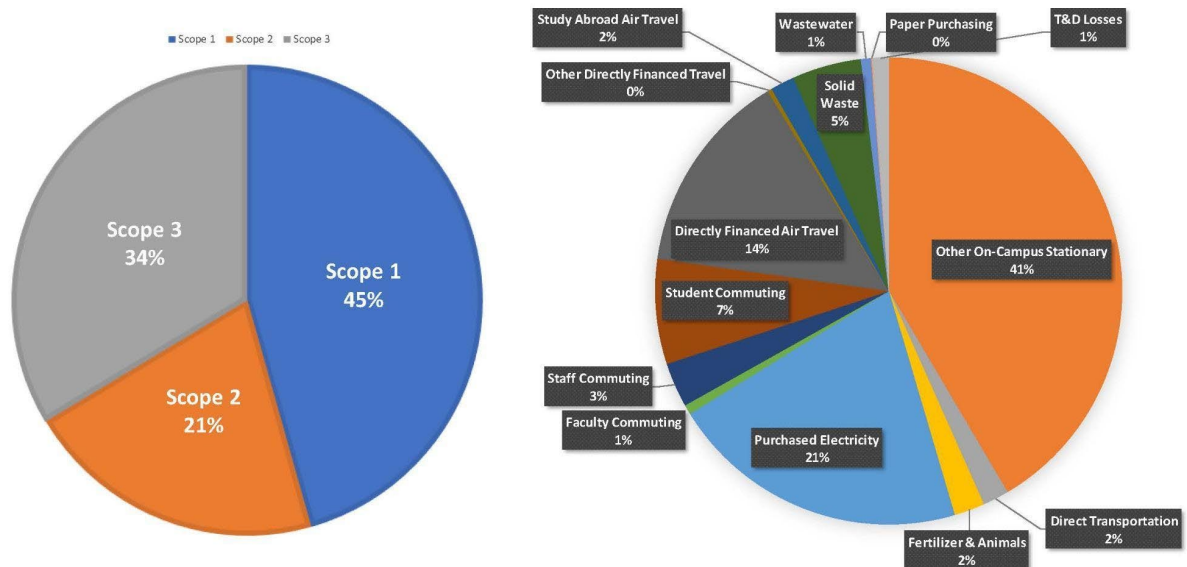


Figure 3: Montana State Universities 2019 Emissions Portfolio per MSU Office of Sustainability.

Current Scope 3 emissions accounting does not include upstream or downstream costs for food, educational materials, building materials, non-university funded air travel, athletic travel, and clubs or sports travel, thus Scope 3 will become an even larger institutional focus in the forthcoming years. Scope 3 accounts for 34% of MSU's GHG emissions (see Figure 3). However, one key difference between Scopes 1 & 2 and Scope 3 is that the former has an accurate & well documented data-set. Because of the extensive umbrella that Scope 3 envelops as well as the relative newness of GHG reporting, the category as it stands currently is likely severely under-reported both at MSU and across the country. This means that one of our first objectives was to identify which specific categories, emissions, & programs fall under MSU's Scope 3, and then to develop a methodology for quantifying the amount of Scope 3 emissions MSU is responsible for, so that we had a baseline from which to start our reduction strategy. From December, 2021 to May, 2022 the students on the Scope 3 Taskforce; consisting of Knoll, Musar, and Nosler developed recommendations for MSU based on case studies of other institutions addressing Scope 3 emissions. The area of focus for Knoll was Air Travel, which currently represents 16% of the university's total emissions. The lack of accuracy and breadth in the status quo data-set indicates that upon improved accounting this figure will significantly rise above 16%. Musar investigated Commuting and Parking, with the two categories inherently linked and emissions from commuting totaling 11%; likely being underrepresented as well. Nosler focused on Education and Outreach that is inherent in all university activities and would provide students, faculty, and staff opportunities to impact sustainability efforts. Wide engagement of the campus community is fundamental to addressing the Montana State Universities Climate Emergency stated by both Faculty Senate and Student Senate<sup>5 6</sup>. A common theme across all of Scope 3 is that in order to achieve annual carbon reductions, the MSU community will need to fundamentally shift the lens that it views the world through. While Scopes 1 & 2 deal largely with operational issues and changing inputs/outputs, Scope 3 is primarily a behavioral and cultural category that relies on the collective action of the entire university community.

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<sup>5</sup> Watson, Bradford. "December 8, 2021 Minutes." Montana State University: Mountains and Minds, 10 Dec. 2021, [https://www.montana.edu/facultysenate/minutes/december\\_8\\_2021\\_minutes.html](https://www.montana.edu/facultysenate/minutes/december_8_2021_minutes.html).

<sup>6</sup> Weber, Liz. "Climate Action Progressing at Montana State University." Bozeman Daily Chronicle, 26 Sept. 2021, [https://www.bozemandailychronicle.com/news/montana\\_state\\_university/climate-action-progressing-at-montana-state-university/article\\_76d7c44e-b29e-59f2-bd63-7771bdd23bb2.html](https://www.bozemandailychronicle.com/news/montana_state_university/climate-action-progressing-at-montana-state-university/article_76d7c44e-b29e-59f2-bd63-7771bdd23bb2.html).

Below is a representation of the Sustainability Framework in its current state.

- MSU Institutional Goal: Carbon Neutral by 2040
- MSU Institutional Goal: Zero Waste by 2035 with diversion rate of 90%
- MSU Institutional Goal: STARS Platinum by 2035 (85 pt minimum, with 27.16 more pts needed)
- STARS Silver currently (57.84 pts)
- Three-year reporting cycle to STARS, which is currently expired and public emissions data only available through 2016.<sup>7</sup>
- Climate Emergency Declarations from MSU Faculty Senate<sup>8</sup> and the ASMSU Student Senate.<sup>9</sup>
- Student/Community-led calls for immediate action e.g., MSU Campus Climate Coalition, Sustainability NOW, Bill McKibben at MSU, Sunrise Bozeman, Citizens Climate Lobby
- Sustainability Framework contains long-term goals, but lacks short and medium term benchmarks and metrics for success.
- Private and undisclosed Campus Sustainability Advisory Committee (CSAC) meetings that are without publicly available minutes. Student representation is limited to student fellows, who are publicly unknown. This committee dictates the direction of sustainability planning and programs and is vital for sustainability efforts.<sup>10</sup>

## Montana State University

Bozeman, MT, US

Rating	Score	Valid Through	Liaison	Submitted	Executive Letter
Silver - expired	57.84	Feb. 18, 2022	KRISTIN BLACKLER	Feb. 19, 2019	<a href="#">Download</a>

Figure 1: Most current 2019 STARS report using data from FY 2014-2016

<sup>7</sup> Blackler, Kristin. "Montana State University OP-1: Greenhouse Gas Emissions." *Greenhouse Gas Emissions | Montana State University | Scorecard | Institutions | STARS Reports*, 19 Feb. 2019, <https://reports.aashe.org/institutions/montana-state-university-mt/report/2019-02-19/OP/air-climate/OP-1/>.

<sup>8</sup> Senate, Faculty. "Approved Initiatives and Statements." *Montana State University: Mountains and Minds*, 8 Dec. 2021, <https://www.montana.edu/facultysenate/approvedinitiativesandstatement.html>.

<sup>9</sup> Student Engagement, Office of. "Initiatives." *Montana State University: Mountains and Minds*, 2021, <https://www.montana.edu/engagement/initiatives.html>.

<sup>10</sup> Haggerty, Julia. "Campus Sustainability Advisory Committee." *Montana State University: Mountains and Minds*, 2021, <https://www.montana.edu/csac/>.

## Recommendations for Montana State University

The following recommendations are proposed to increase the efficacy, access to base-line information, and capacity of the Office of Sustainability and the various Scopes' Task Forces.

**Recommendation #1:** Annually improve & expand the scope, accuracy, and collection methodology of the data

**Recommendation #2:** Create a specific campus-wide revolving green fund with fiscal details that are reported annually to support student, staff, and faculty engagement with sustainability focused campus projects and carbon reduction investments

**Recommendation #3:** Publicly celebrate & make transparent and publicly available all data, goals, accomplishments, events, and institutional engagement opportunities associated with sustainability and climate action planning.

**Recommendation #4:** Institutionalize the Scope 1, 2, & 3 Task Forces under the Office of Sustainability as permanent committees and increase the scope of their authority and access to University-wide personnel/data

**Recommendation # 5:** Increase inter-taskforce communication as well as communication with the Office of Sustainability

**Recommendation #6:** Increase funding to the Office of Sustainability and the Scope 1, 2, & 3 Task Forces

**Recommendation #7:** Create a sustainability University Core requirement

**Recommendation #8:** Expand the accounted-for value chain of MSU's Scope 3 reporting to represent a more holistic GHG profile, including but not limited to: non-university funded air travel, athletic department air/ground travel, purchased goods & services, MSU & MSUAF investments, the transportation & distribution of goods, and dining hall food.

**Recommendation #9:** Adhere to the spirit of the Montana Sunshine Laws and promote student and public opportunities for engagement on committees and task forces such as CSAC, Scopes 1-3, and the MSU Alumni Foundation.

**Recommendation #10:** Update the 2011 Climate Action Plan and include specific annual benchmarks and metrics.

**Recommendation #11:** Implement annual & comprehensive sustainability surveys engaging topics ranging from opinion polls, commuting and parking behavior, air travel patterns, educational engagement, and campus sustainability needs assessments.



# Section 1. Commuting and Parking

## **Background:**

Commuting and Parking are inherently linked practices and need to be addressed simultaneously to mitigate growing greenhouse gas emissions from commuting due to expanding urban context and growing student body. The influence of parking policy on commuter behavior is highly consequential on the methods of commuting primarily enacted. Having a relatively inexpensive parking pass with limited flexibility and more spots than even current demand accounts for induces single use commuting usage. Access and knowledge of alternative options is critical to expanding our public transportation use. We will examine four universities to examine how they have used parking and commuting policies to influence Scope 3 emissions reductions.

## **Data Issues:**

Addressing the current frailties in collection of commuter data is critical. In March of 2022, the Office of Sustainability conducted a commuter survey, the first since 2018. This should greatly clarify the image of our current commuting practices. However, the current publicly available data shows a grim situation, in which vast opportunity for improvement is available. There appears to be a decline in overall carbon emissions, although these are produced by a strange decline in overall distances traveled by faculty, staff, and students in between FY 2013 and FY 2014 (see Figure 4). This however, is certainly not the trend we are seeing in our urban envelope due to the growth and rising housing expenses in Bozeman. We are likely to see increases in travel distances from the latest survey, which generally coincides with more single occupancy vehicle commuting.

Faculty Commuting		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
<b>Faculty Commuting - Trips/Week</b>										
Faculty Commuters	#	702	720	767	815	844	844	752	752	819
One-Way Trips/Week	#	7	7	7	7	7	7	7	7	7
Total Commuter Trips/Week	Trips	4,860	4,985	5,310	5,642	5,843	5,843	5,203	5,203	5,668
Weeks/Year	Weeks	42	42	42	42	42	42	42	42	42
<b>Faculty Commuting - Trip Distribution (% Trips by Mode)</b>										
Faculty % Carbon Free	%	21%	21%	21%	21%	21%	21%	37%	37%	38%
Faculty % Drive Alone	%	70%	70%	70%	70%	70%	70%	62%	62%	61%
Faculty % Carpool	%	3%	3%	3%	3%	3%	3%	1%	1%	1%
Faculty % Bus	%	6%	6%	6%	6%	6%	6%	0%	0%	0%
Faculty % Light Rail	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Faculty % Commuter Rail	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Faculty % Total	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>Faculty Commuting - Trip Distance (Miles per One-Way Trip for Each Mode)</b>										
Carbon Free	Passenger Miles	2	2	2	2	2	2	1	1	1
Drive Alone	Vehicle Miles	11	11	11	11	11	11	5	5	5
Carpool	Vehicle Miles	11	11	11	11	11	11	2	2	2
Bus	Passenger Miles	4	4	4	4	4	4	-	-	-
<b>Staff Commuting</b>										
<b>Staff Commuting - Trips/Week</b>										
Staff Commuters	#	2,188	2,212	2,229	2,295	2,300	2,300	2,633	2,633	2,823
One-Way Trips/Week	#	8	8	8	8	8	8	8	8	8
Total Commuter Trips/Week	Trips	17,061	17,251	17,384	17,899	17,935	17,935	20,530	20,530	22,016
Weeks/Year	Weeks	42	42	42	42	42	42	42	42	42
<b>Staff Commuting - Trip Distribution (% Trips by Mode)</b>										
Staff % Carbon Free	%	15%	15%	15%	15%	15%	15%	19%	19%	19%
Staff % Drive Alone	%	70%	70%	70%	70%	70%	70%	73%	73%	74%
Staff % Carpool	%	10%	10%	10%	10%	10%	10%	7%	7%	7%
Staff % Bus	%	5%	5%	5%	5%	5%	5%	1%	1%	1%
Staff % Light Rail	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Staff % Commuter Rail	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Staff % Total	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>Staff Commuting - Trip Distance (Miles per One-Way Trip for Each Mode)</b>										
Carbon Free	Passenger Miles	3	3	3	3	3	3	1	1	1
Drive Alone	Vehicle Miles	11	11	11	11	11	11	6	6	6
Carpool	Vehicle Miles	11	11	11	11	11	11	8	8	8
Bus	Passenger Miles	14	14	14	14	14	14	2	2	2
<b>Student Commuting</b>										
<b>Student Commuting - Trips/Week</b>										
Student Commuters	#	7,615	7,730	7,926	8,633	9,035	9,035	9,897	9,897	10,200
One-Way Trips/Week	#	7	7	7	7	7	7	7	7	7
Total Commuter Trips/Week	Trips	56,217	57,071	58,512	63,737	66,705	66,705	73,066	73,066	75,303
Weeks/Year	Weeks	35	35	35	35	35	35	35	35	35
<b>Student Commuting - Trip Distribution (% Trips by Mode)</b>										
Student % Carbon Free	%	40%	40%	40%	40%	40%	40%	48%	48%	48%
Student % Drive Alone	%	49%	49%	49%	49%	49%	49%	45%	45%	45%
Student % Carpool	%	6%	6%	6%	6%	6%	6%	3%	3%	3%
Student % Bus	%	5%	5%	5%	5%	5%	5%	3%	3%	3%
Student % Light Rail	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Student % Commuter Rail	%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Student % Total	%	100%	100%	100%	100%	100%	100%	100%	100%	100%
<b>Student Commuting - Trip Distance (Miles per One-Way Trip for Each Mode)</b>										
Carbon Free	Passenger Miles	2	2	2	2	2	2	2	2	2
Drive Alone	Vehicle Miles	6	6	6	6	6	6	5	5	5
Carpool	Vehicle Miles	6	6	6	6	6	6	5	5	5
Bus	Passenger Miles	8	8	8	8	8	8	2	2	2

Figure 4 STARS accounting data from the Office of Sustainability FY2008-2016<sup>11</sup>

<sup>11</sup> STARS, AASHE. "Montana State University OP-1: Greenhouse Gas Emissions." *Greenhouse Gas Emissions | Montana State University | Scorecard | Institutions | STARS Reports*, 2019, <https://reports.aashe.org/institutions/montana-state-university-mt/report/2019-02-19/OP/air-climate/OP-1/>.

**Peer Institutions:**

**Cornell University:**

<b>University Location:</b> <b>Ithaca, New York</b>	<b>Student Population:</b> <b>21,000</b>	<b>STARS Rating:</b> <b>Platinum</b>
<b>City Population:</b> <b>31,000</b>		<b>Land Grant University</b>

- Emergency Punch Pass
  - This program<sup>12</sup> helps to mitigate some of the fears around not having the ability to commute to school by car if critically necessary. Ten times a semester, a non-permit holder can park on campus for free with enforcement done using license plate recognition (LPR) technology. This simple measure has shown to dramatically decrease the total demand for passes and helped bring alternative modes of commuting up to 83%.<sup>13</sup>
- Carpool/ RideShare
  - Discounting of parking permit fees for carpooling groups. If you are a member of a carpooling group, you cannot hold an independent parking pass. Fees are calculated by the number of participants in the carpool (see Figure 5).<sup>14</sup> Three or more carpooling members on a permit can result in having a free pass. Carpooling permit prices are designed to be highly motivational for students and with 3 or more members resulting in a free permit. This is enforced by blocking the sale of parking passes to individuals signed up in carpool groups and checked using LPR technology.
- Parking Quantity
  - Parking on Cornell’s campus is limited, and prices are used to discourage single occupancy vehicle use. Limiting space allocation for parking has also opened up more areas of campus for development of buildings and greenspace.

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<sup>12</sup> Cornell, University. “Ride & Car Sharing.” *Sustainable Campus*, 7 May 2022, <https://sustainablecampus.cornell.edu/campus-initiatives/transportation/ride-car-sharing>.

<sup>13</sup> Cornell University, Sustainability. “Transportation.” *Sustainable Campus*, 2022, <https://sustainablecampus.cornell.edu/campus-initiatives/transportation>.

<sup>14</sup> Sustainability, Office. “RideShare Permit Rates: Facilities and Campus Services.” *RideShare Permit Rates | Facilities and Campus Services*, 2022, <https://fcs.cornell.edu/departments/transportation-delivery-services/parking/getting-around/rideshare/rideshare-permit-rates>.

# RideShare Permit Rates

## Fee Chart

### Annual RideShare Permit Fees and Privileges (rate as of July 1)

Perimeter Tier *	2 Person w/tax	3+ Person w/tax	Permit Privileges*
RS Perimeter RideShare	No-Fee	No-Fee	Valid in permit-restricted parking spaces signed for A, E, ME, O, R, WE.
Mid Tier *	2 Person w/tax	3+ Person w/tax	Permit Privileges*
C, HH	\$209.62	No-Fee	Valid in letter designation on permit and Perimeter and Outer Tier areas.
G	\$387.12	No-Fee	Valid in letter designation on permit and Perimeter and Outer Tier areas.
Central Tier *	2 Person w/tax	3+ Person w/tax	Permit Privileges*
D, J, L, N, P, U	\$440.60	No-Fee	Valid in letter designation on permit, night/weekend areas, FLEX areas up to two hours, student resident lots, and Mid, Perimeter, and Outer Tier areas. Can request 30 minute loading permit from booth.
Z	\$287.52	No-Fee	Valid in letter designation on permit, night/weekend areas, FLEX areas up to two hours, student resident lots, and Mid, Perimeter, and Outer Tier areas. Can request 30 minute loading permit from booth.

\* Work in zone and/or eligibility requirements must be met.

Figure 5: RideShare Permit Fee structure at Cornell University, with major incentives for 3+ carpool groups.<sup>15</sup>

### Kansas State University:

<b>University Location:</b> <b>Manhattan, Kansas</b>	<b>Student Population:</b> <b>25,760</b>	<b>Public Facing Climate Plan</b>
<b>City Population:</b> <b>55,920</b>		<b>Land Grant University</b>

<sup>15</sup> Sustainability, Office. "RideShare Permit Rates: Facilities and Campus Services." *RideShare Permit Rates | Facilities and Campus Services*, 2022, <https://fcs.cornell.edu/departments/transportation-delivery-services/parking/getting-around/rideshare/rideshare-permit-rates>.

- Extensive Bike Paths
  - Campus has numerous bike pathways, many of which are bike only sections of the road with separation from vehicular traffic and pedestrians. Bike parking with coverings to keep bikes dry has been a prioritized design to support bike commuting even during the harsher winter months.
- Campus Centric Bus Routes
  - Cross campus bus routes connect the extremities of campus to its core, which contains a major transfer station for the communities' bus service. These routes promote students living in student housing on the extremities of campus to take a short SOV trip across campus for classes.

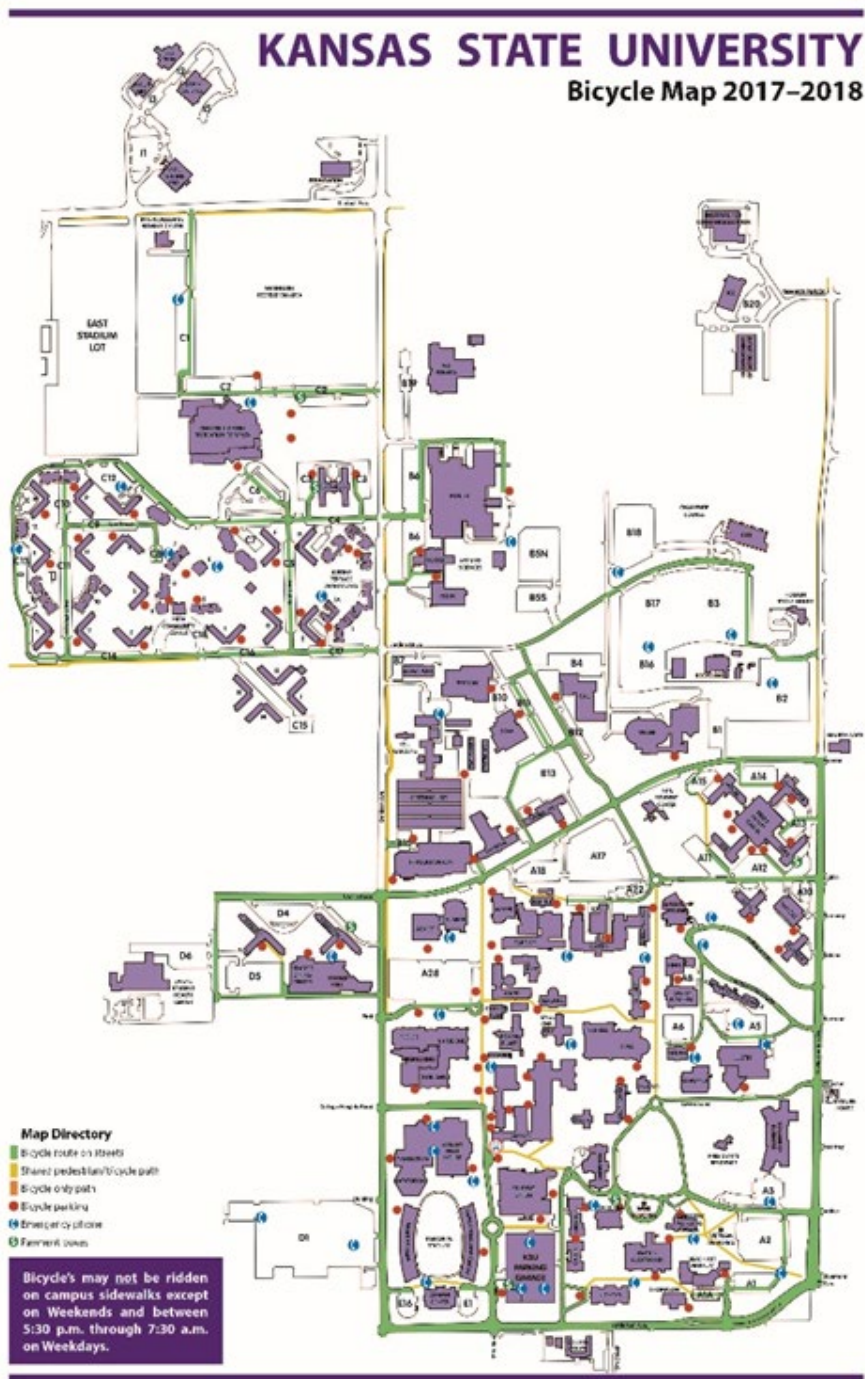


Figure 6: Kansas State University bike map.<sup>16</sup>

<sup>16</sup> *Map Directory*. [www.k-state.edu/parking/BikeMap.pdf](http://www.k-state.edu/parking/BikeMap.pdf). Accessed 2 May 2022.

## University of California- Berkeley:

<b>University Location:</b> <b>Berkeley, California</b>	<b>Student Population:</b> <b>45,057</b>	<b>STARS Rating:</b> <b>Platinum</b>
<b>City Population:</b> <b>120,463</b>		<b>Land Grant University</b>

- Decreased Parking Spots
  - From 2009 to 2014, Berkeley decreased its available stock of parking spots from 6,952 down to 5,700.<sup>17</sup> These reductions were promoted in an effort to reduce demand for driving. This effort has resulted in 45.1% of employees and 92.4% of students using alternative methods of travel to campus.
- Funding for Alternative Travel
- Berkeley provided students with free bus fare, although MSU faces different logistical challenges the outcomes can be similar. MSU's continued and expanded financial support for Streamline could provide more routes or more frequent routes to meet community needs.

Figure 7. Reasons for alternative mean of transportation<sup>18</sup>

### Carsharing:

- Car Sharing
  - Limits the number of needed parking spots dramatically, reduces congestion, and provides expanded access to non-vehicle owners. Faculty and Staff benefit due to requiring less mileage reimbursement forms, providing a means of easily gaining comprehensive mileage reporting to get a sense of demand. Allows staff, faculty and students to run errands during the day that may be car dependent without needing to commute to campus from home, hold a parking pass, or risk ticketing.<sup>19</sup>

<sup>17</sup> Study, Case, and Lingyu Mou. *Sustainable Parking Policy Impact on Student Parking Experience and Equity Issue*. 2018.

<sup>18</sup> Study, Case, and Lingyu Mou. *Sustainable Parking Policy Impact on Student Parking Experience and Equity Issue*. 2018.

<sup>19</sup> Study, Case, and Lingyu Mou. *Sustainable Parking Policy Impact on Student Parking Experience and Equity Issue*. 2018.

## University of Cantabria, Spain:

<b>University Location:</b> <b>Cantabria, Spain</b>	<b>Student Population:</b> <b>13,635</b>	<b>Sustainability Research</b>
<b>City Population:</b> <b>581,641</b>		<b>Public University</b>

- Surveys

- The research paper, “A methodology to promote sustainable mobility in college campuses”<sup>20</sup> with a case study of the University of Cantabria. This project lays out the categories of questioning for a survey that are used to assess our sustainability characteristics.

- The university group they belonged to (Students, PAS, PDI)
- Origin and destination of journey
- Most frequently used mode of transport
- Time of day when the journey is most commonly made

If the car is the most commonly used mode:

- Parking place
- Occupation
- Time required to find a parking place
- Time the car is left at the parking place

If the bus is the most commonly used mode:

- Average waiting time, walking time to the bus stop and from the bus stop to final destination
- Score given for the public transport connection between home and the campus (Very good /Good/Regular/Bad/Very bad)

## Themes for commuter surveys at the University of Cantabria.<sup>21</sup>

- Incentivizing non-private car users

- In coordination with increasing the cost of parking on campus to promote alternative modes of travel, increasing incentives for non-permit holders could be another step to increase alternative commuting.
- Through this survey, a case example of interest emerged. In 2016 Delta Dental of Washington implemented a commute program which included an app for easy

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<sup>20</sup> “University Car Sharing and Hourly Car Rental- Enterprise CarShare.” *Www.enterprisecarshare.com*, [www.enterprisecarshare.com/us/en/programs/university.html](http://www.enterprisecarshare.com/us/en/programs/university.html). Accessed 2 May 2022.

<sup>21</sup> dell’Olio, Luigi, et al. “A Methodology to Promote Sustainable Mobility in College Campuses.” *Transportation Research Procedia*, vol. 3, 2014, pp. 838–847, 10.1016/j.trpro.2014.10.061. Accessed 22 May 2019



access to commuting options, daily charges for parking with deductions to paycheck only on days they parked on campus, bonuses for alternative modes of transit and telecommuting, free parking for vanpool and reduced carpool charges, and free transit cards.<sup>22</sup> The results were dramatic and showed the ability of institutions to incentivize behavior that works in the best interest of both the business and its employees.

Since starting its MyCommute program, DDWA has achieved the following (Luum, 2017):

- A 60 percent reduction in the drive-alone rate, down to 15 percent post-move.
- A 100 percent participation rate in the MyCommute program.
- Four new vanpools.
- Retention of 100 percent of employees after moving from the old office to the new office.

DDWA improved commuting results.<sup>23</sup>

## Montana State University Policy Recommendations

Montana State University parking and community leaves much to be desired in the way of sustainable practices. Our bus ridership has major possibilities for improvement with a mere 2% of the population using this mode. The parking strategy could use a paradigm shift from maximizing parking pass sales to promoting carpooling and alternative modes of transportation through its pay structure. Further, specifying the parking pass from only in semester long sales increments could improve our diversion from single occupancy vehicle commuters to alternative modes. This could include a monthly pass, a winter pass, or even daily passes.

Currently, one of the major institutional challenges for MSU Parking Services is employment. We can attack this from a couple angles, increasing employment or decreasing managed stock. I would recommend prioritizing a decrease in managed stock and increasing the cost to incentivize other modes of travel more prominently. SOV commuting is by far the simplest means of commuting, but also has the greatest institutional and environmental impact.

MSU faces a major challenge, the expansion of our urban footprint. Increased population of both MSU and Bozeman, increasing urban sprawl and increases in housing prices pushing people further away from campus are all contributing to an increase in Scope 3 commuting emissions. The institution faces many tough choices in decreasing our overall carbon footprint. For commuting, expanding the availability of alternative modes of transit, such as promoting

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<sup>22</sup> dell'Olio, Luigi, et al. "A Methodology to Promote Sustainable Mobility in College Campuses." *Transportation Research Procedia*, vol. 3, 2014, pp. 838–847, 10.1016/j.trpro.2014.10.061. Accessed 22 May 2019

<sup>23</sup> "Expanding Traveler Choices through the Use of Incentives: A Compendium of Examples - 4. Applying Incentives to Shift Mode of Travel - FHWA Office of Operations." *Ops.fhwa.dot.gov*, ops.fhwa.dot.gov/publications/fhwahop18071/ch4.htm. Accessed 2 May 2022.

carpooling permits, access to streamline, and improving biking infrastructure both on and around campus. To achieve many of these goals the institution will need to take a greater role in the politics of our city and county.

- **Recommendation 1:**
  - Emergency parking punch pass. 10 per semester to alleviate anxiety about not carrying a parking pass.
- **Recommendation 2:**
  - Monthly parking passes to minimize the number of students using parking passes in months with better weather.
- **Recommendation 3:**
  - Car sharing for the dorms and faculty to limit spots needed.
- **Recommendation 4:**
  - MSU's continued and expanded financial support for Streamline to provide more routes or more frequent routes to meet community needs.
- **Recommendation 5:**
  - Paradigm shift from selling the most parking passes to limiting the demand for parking.
- **Recommendation 6:**
  - Carpooling based price reductions for parking and increasing prices for SOV passes.
- **Recommendation 7:**
  - Expanded bike paths both on campus and in the neighboring community.
- **Recommendation 8:**
  - Campus shuttle service to limit cross campus driving.
- **Recommendation 9:**
  - Incentives packages for non-parking permit holders, such as free coffee, campus meals or events.
- **Recommendation 10:**
  - Annual longitudinal Parking and Commuting surveys to see trends in the community

## Section 2. Air Travel

### **Background:**

As the third largest source of total GHG emissions, mitigating & off-setting air travel will have to be a key area of focus if MSU is serious about achieving carbon neutrality by 2040. In fiscal years 2014, 2015, and 2016; MSU identified 19,104,199 annual miles traveled between students studying abroad and faculty/staff traveling to conferences. It is odd that the number of miles traveled is exactly the same three years in a row. The director and project coordinator for the Office of Sustainability are both new to MSU within the last 5 years; therefore it is important to note that the inaccurate data for fiscal years 2014-2016 is not the responsibility of current staff members. However, there is a lack of publicly disclosed data for fiscal years 2017, 2018, 2019, 2020, and 2021; in the future we hope to see a quicker turn-around as it pertains to making that data available to the public.

The current dataset held by the Office of Sustainability has two categories: “Directly Financed Faculty/Staff Air Travel” and “Study Abroad Travel”. Within the first category, there are two statistics included: total miles traveled and the equivalent estimated GHG emissions for fiscal years 2008-2016. Within the second category, there are three statistics included: total miles traveled, the equivalent estimated GHG emissions, and the number of students studying abroad for fiscal years 2008-2016. There is no representation in the data for athletics, specific athletic departments, specific academic departments, specific administrative departments, non-study abroad student travel, visitors (speakers, faculty, and prospective students), the origin & destination of flight, the flight class, or the purpose of the travel.

Outsourced Travel		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
<b>Directly Financed Air Travel</b>										
Faculty / Staff	Miles	15,309,851	16,850,833	14,825,330	14,651,688	12,732,784	12,182,775	15,213,115	15,213,115	15,213,115
Students	Miles	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>Miles</b>	<b>15,309,851</b>	<b>16,850,833</b>	<b>14,825,330</b>	<b>14,651,688</b>	<b>12,732,784</b>	<b>12,182,775</b>	<b>15,213,115</b>	<b>15,213,115</b>	<b>15,213,115</b>

<b>Study Abroad Travel</b>										
Air	Miles	599,038	648,379	895,147	996,617	966,232	930,172	3,891,084	3,891,084	3,891,084
Students Studying Abroad	Count	54	61	80	86	89	87	397	397	397
<b>Total Study Abroad Miles</b>	<b>Miles</b>	<b>599,038</b>	<b>648,379</b>	<b>895,147</b>	<b>996,617</b>	<b>966,232</b>	<b>930,172</b>	<b>3,891,084</b>	<b>3,891,084</b>	<b>3,891,084</b>

GHG Emissions		FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016
Directly Financed Air Travel GHG	MTCDE	8,798.6	9,151.3	7,808.8	7,447.0	6,471.6	5,877.2	7,339.1	7,339.1	7,339.1
Other Directly Financed Travel GHG	MTCDE	263.8	320.6	233.5	249.1	320.5	381.3	311.8	311.7	311.7
Study Abroad Air Travel GHG	MTCDE	344.3	352.1	471.5	506.5	491.1	448.7	1,877.1	1,877.1	1,877.1
<b>Total Outsourced Travel</b>	<b>MTCDE</b>	<b>9,406.7</b>	<b>9,824.0</b>	<b>8,513.7</b>	<b>8,202.6</b>	<b>7,283.3</b>	<b>6,707.2</b>	<b>9,528.0</b>	<b>9,527.9</b>	<b>9,527.9</b>

Figure Y: Outsourced Travel STARS from the Office of Sustainability | FY2008-2016<sup>11</sup>

*Status Quo Methodology for Calculating Miles Traveled & GHG Emissions:*

- Currently the Office of Sustainability receives a spreadsheet from University Business Services that includes dollar amounts of each flight paid for by the university & the fiscal year. Miles traveled are calculated by dividing \$/(average cost per mile). SIMAP recommends a conversion factor of 18.88 cents per mile as per the Bureau of Transportation Statistics. The total “miles traveled” figure is then plugged into SIMAP, a carbon and nitrogen-accounting platform, which outputs the total emissions number. The calculation of miles traveled by dividing \$/(average cost per mile) is an imperfect, at best, way of determining how many miles the university is responsible for. Determining the actual miles traveled and then inputting that figure into SIMAP, rather than adding an additional filter to run calculations through, would decrease the dilution of the final GHG emissions number.

In summary, as the University of Toronto states, “Quantifying the air travel scope 3 emissions is a key infrastructural need to set the context for the scale of emissions that is being discussed. Without a reliable and efficient method to quantify these emissions, the climate impact of [MSU’s] air travel and effectiveness of any future programming cannot be demonstrated.”<sup>24</sup>

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<sup>24</sup> Azhari, Ahmed, et al. The University of Toronto, Toronto, 2020, Addressing University of Toronto’s Business-Related Scope 3 Air Travel Emissions. <https://sustainability.utoronto.ca/wp-content/uploads/CECCS>

**Peer Institutions & Other Resources:**

**The University of Toronto:**

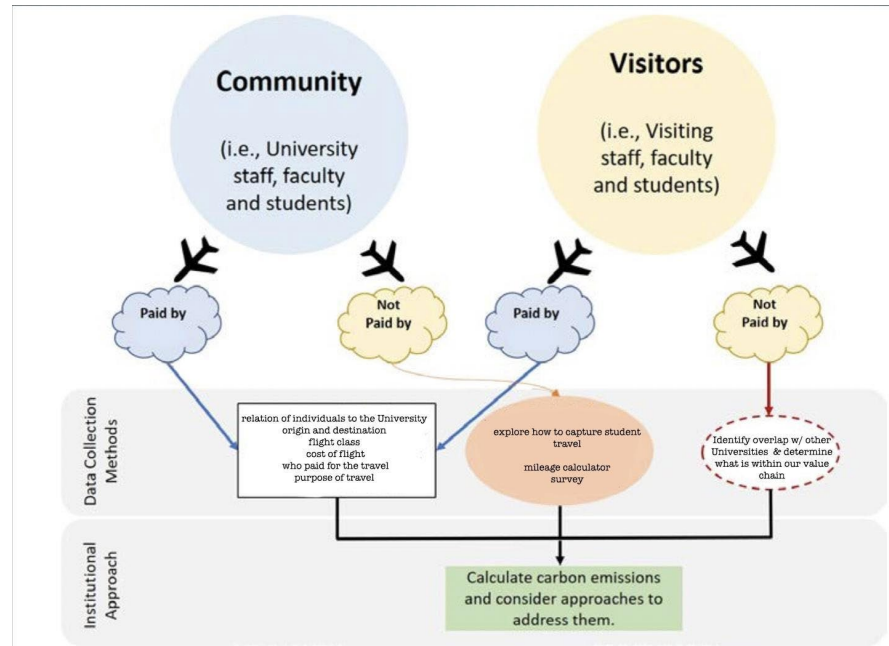
<b>University Location:</b> <b>Toronto, Canada</b>	<b>Student Population:</b> <b>95,055</b>	<b>Sustainability Rating System:</b> <b>UN Sustainable Development Goals</b>
<b>City Population:</b> <b>2.93 million</b>		<b>Operating Budget:</b> <b>\$2.99 billion</b>

- **Air Travel Mitigation Charge:**
  - This program applies to all air travel by the President, Vice-Presidents, Assistant VicePresidents, and Deans, as well as other senior leadership in their offices including senior administrative staff and all Vice-Provosts, Vice-Deans, and Associate Deans.
  - All covered air travel was assessed an air travel carbon mitigation charge as follows. “[U of T] **Air Travel Emissions Mitigation charge for short/medium-haul flights:** [\$11.83 USD] per North American round-trip flight (double for business class at \$23.66). [A short or medium- haul flight qualifies as] less than a 6-hour direct flight or less than 2,299 miles one-way. The penalty to shorter distance flights in this range was considered reasonable as they result in larger emissions per mile traveled and often have more low-carbon alternatives available, such as travel by train or bus, and easier video conferencing capacity (e.g. similar time-zones). [U of T] **Air Travel Emissions Mitigation charge for long-haul flights:** [\$51.25 USD] per round trip flight beyond North America (\$102.51 for business class). The majority of the destinations outside of North America fall into the long-haul flight category.”<sup>24</sup>
- **Reducing Miles Traveled:**
  - Mitigative strategies to limit or discourage unnecessary travel include but are not limited to:
    - 1) the elimination of same-day return flights,
    - 2) reducing flying for one-night stays,
    - 3) reducing group travel,
    - 4) favoring direct flights over lay overs,
    - 5) requiring University personnel to travel by Economy Class only.
  - “Eliminating same-day return flights and one- night stays, for example, can result in financial savings as well as time savings for the traveling individual. In these cases, the individual spends more time and energy in traveling than in face-to-

face meetings. Reducing group travel helps avoid redundant emissions, unless the presence of more than one person has significant work benefits. Direct flights should be favored over indirect routes since indirect flights waste more fuel for multiple take-offs and landings, generating more emissions. Travel by Economy class is also favorable because the emissions per person are lower.”<sup>24</sup>

- **Defining The Value Chain:**

- The University of Toronto identified two main categories of air travel: University Community and University Visitors. University Community refers to faculty, staff, and students who work for or attend the university. University Visitors refers to visiting staff & faculty attending conferences, academics or public figures



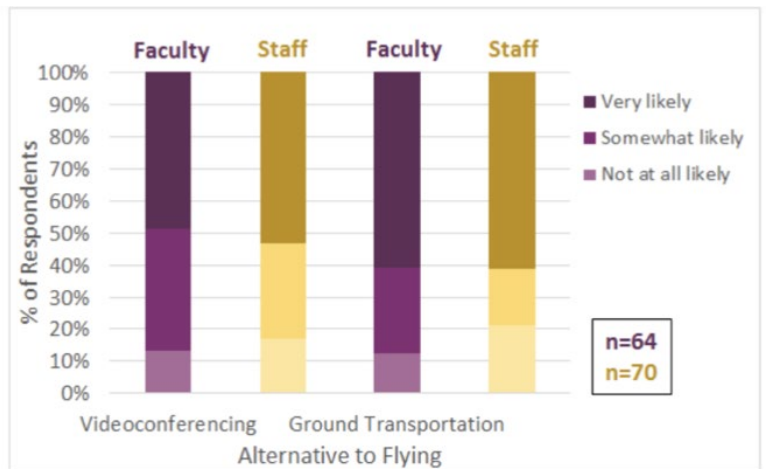
speaking at events, and students who visit the university for example on a tour. These two main categories are then further broken down into the Paid By and Not Paid By categories. Paid By refers to air travel paid for directly by the university. Not Paid By refers to air travel that is either reimbursed or out of the pocket of the traveling individual. One issue that arises is overlap between universities for traveling faculty, in that case other higher education institutions & MSU will need to explore how to determine what travel is within who’s value chain. A full Scope 3 inventory would include accounting for all of the above mentioned categories.<sup>24</sup>

**The University of Washington:**

<b>University Location:</b> <b>Seattle</b>	<b>Student Population:</b> <b>60,440</b>	<b>STARS Rating:</b> <b>Gold</b>
<b>City Population:</b> <b>724,305</b>		<b>Operating Budget:</b> <b>\$1.13 billion</b>

- **Faculty & Staff Survey (UW):**

- A survey conducted by UW measuring the “likelihood of using alternatives to air travel” gives insight into how university personnel feel about shifting conferencing to either video conferencing or ground transportation. “Because videoconferencing and taking ground transportation for shorter trips (under 300 miles) are two key alternatives to flying, we asked respondents about their likelihood of using these modes in lieu of flying. Most faculty (49%) and staff (53%) reported being ‘very likely’ to use videoconferencing as an alternative to flying. However, during our interviews several respondents noted person-to-person interactions that cannot be replaced by videoconferencing, such as interacting with colleagues and small talk while grabbing a cup of coffee between sessions.”<sup>25</sup>



**Figure 13, stated likelihood of using alternatives to air travel**

<sup>25</sup> Mickelson, Brian, et al. The University of Washington, Seattle, Washington, 2016, *University of Washington Air Travel: A Sustainable Path Forward*. <https://green.uw.edu/files/docs/final-report-uw-air-travel.pdf>

## Conferencing Study | “Changing Scientific Meetings For The Better”:

It is recognized that not all conferences provide the same opportunity-cost regarding the prioritization of virtual conferencing. Additionally it is understood that in-person conferencing affords a unique opportunity to network with other career professionals.

The following excerpts from a study published in the *Nature Human Behaviour Journal*, set the context for how the nature of academic conferencing & institutional expectations of faculty intersects with MSU’s GHG emissions inventory.

“Conference attendance accounts for 35% of a researcher’s footprint. In hosting hundreds to thousands of researchers, conferences produce substantial air-travel-related CO2 emissions, comparable to the global annual per capita CO2 emissions in many countries, as well as large amounts of other waste in the form of promotional items. The overwhelming majority of conferences are not environmentally sustainable and lack clear green strategies or climate policies. Clearly, the scientific community that is supposed to understand the problem better should contribute to reducing their travel-related CO2 emissions.”<sup>26</sup>

“At many institutions and disciplines, scholars are granted tenure and promotions based in part on the number of their research presentations at professional conferences. As postdoctoral and tenure-track jobs are scarce in many academic disciplines, early career researchers face mounting pressure to attend conferences to network with potential colleagues. Changes can also be expected in funding and promotion requirements so that academics on tenure-track do not have to choose between delivering an international talk and receiving a grant or tenure promotion.”<sup>26</sup>

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<sup>26</sup> Sarabipour, S., Khan, A., Seah, Y.F.S. *et al.* Changing scientific meetings for the better. *Nat Hum Behav* 5, 296–300 (2021). <https://doi.org/10.1038/s41562-021-01067-y>



## Harvard University:

<b>University Location:</b> <b>Cambridge, Massachusetts</b>	<b>Student Population:</b> <b>35,276</b>	<b>Sustainability Rating System:</b> <b>Climate Registry's General Reporting Protocol for the Voluntary GHG Reporting Program</b>
<b>City Population:</b> <b>116,632</b>		<b>Operating Budget:</b> <b>\$5 billion</b>

- *"Climate Solutions Living Lab" Course:*
  - A three credit course aimed towards "students from multiple disciplines (law, business, engineering, policy, public health) who together design and study practical solutions for reducing the use of fossil fuels in the U.S. and abroad."<sup>27</sup>
  - Course projects help Harvard and other universities meet their carbon reduction goals. There is a special emphasis on projects which are replicable and scalable. Examples of projects enabled through the course include: "1) preserving 150,000 acres of forest land owned by a native village in Alaska, 2) paying farmers to reduce their use of nitrogen-based fertilizers, 3) enabling businesses or other organizations to claim credit for the emissions reduced by implementing energy-efficiency measures in Rhode Island public schools, and creation of a revolving investment fund for investing in regional renewable-energy projects."<sup>28</sup>
  - The course "immerses cross-disciplinary teams of students in hands-on research to design feasible, practical, scalable projects for reducing at least 50,000 metric tons of greenhouse gas emissions annually, while allowing nonprofit and for-profit organizations to legitimately claim credit for those emissions reductions as offsets."<sup>28</sup>

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<sup>27</sup> Harvard University. "Climate Solutions Living Lab." *Course Catalog | Harvard Law School*, 2022, <https://hls.harvard.edu/academics/curriculum/catalog/default.aspx?o=70768>.

<sup>28</sup> Durrant, Colin. "Living Lab Course Works to Find Practical Solutions to Carbon Emissions." *Harvard Gazette*, Harvard Gazette, 21 Nov. 2017, <https://news.harvard.edu/gazette/story/2017/11/harvard-living-lab-course-works-to-find-practical-alternatives-to-carbon/>.

## Utah State University:

<b>University Location:</b> <b>Logan Utah</b>	<b>Student Population:</b> <b>27,426</b>	<b>STARS Rating:</b> <b>Silver</b>
<b>City Population:</b> <b>48,565</b>		<b>Land Grant University</b>

- **Air Travel Mitigation Charge:**
  - A flat fee of \$10 is assessed to all university-sponsored air travel. For the first year, the president's office paid all the fees, estimated at \$50,000. Thereafter over the next decade each department will transition to being responsible for paying its own fees. All funds raised by the mitigation charge go towards funding “on-campus projects that reduce USU’s carbon footprint.”<sup>29</sup>
- **No First Class Flying:**
  - Pursuant to section “2.1.1.4 Commercial Aircraft” of USU’s “*University Policy 515: Travel* - Allowable air transportation costs are limited to those fares less than first class as supported by an itemized receipt.”<sup>30</sup>
- **Estimating Miles Flown:**
  - “The agencies track the travel using the departure and arrival three digit airport codes. The total air travel using state travel agencies was downloaded onto a spreadsheet (approximately 8,000 flight records) and the actual mileage for each individual flight was calculated.”<sup>31</sup>
  - USU uses the Greenhouse Gas Inventory Calculator (volume 5.0) developed by Clean Air - Cool Planet (CA-CP) specifically for universities. “Using the CA-CP Calculator, activity data (e.g., therms of natural gas, kilowatt hours of electricity, number of commuters, miles of air travel) are multiplied by an emissions factor (e.g., kg CO2/kWh, kg CH4/kWh) to yield emissions for each activity by specific type of greenhouse gas.”<sup>31</sup>
- **Estimating Student Miles Flown:**

<sup>29</sup> Belmont, Patrick. “President Cockett Commits to Reducing USU’s Greenhouse Gas Emissions.” *Land & Environment*, Utah State University, 9 Mar. 2020, <https://www.usu.edu/today/story/president-cockett-commits-to-reducing-usus-greenhouse-gas-emissions>.

<sup>30</sup> Vice President for Business and Finance. *University Policy 515: Travel*, Utah State University, 2 June 2021, <https://www.usu.edu/policies/515/515.pdf>.

<sup>31</sup> Albrecht, Stan, et al. *Climate Action Plan*. Utah State University, 2010, <https://www.usu.edu/sustainability/files/documents/2010capfinal.pdf>.

- Utah State University, just as MSU does not track student air travel. “However... research provided data from other institutions that track student travel, relative to faculty and staff travel, was applied to USU. Based upon this research, it was determined that student travel is approximately 20% of faculty and staff travel.”<sup>31</sup> If MSU properly accounted for the student travel within its community value chain, air travel emissions would certainly be even higher than what is currently reported.

**Air Miles Calculator:**

The website *airmilescalculator.com* uses Vincenty's formula, which “calculates the distance between latitude/longitude points on the earth’s surface, using an ellipsoidal model of the earth”<sup>32</sup> to output the distance in miles between different airports around the world.

<p><b>Calculate Flight Distance</b></p> <p>Search by airport name, city or IATA airport code.</p> <p>Origin</p> <p> Bozeman Yellowstone International Airport</p> <p>Stopover</p> <p> Denver International Airport</p> <p>Destination</p> <p> New York John F. Kennedy International Airport</p> <p>Calculate Distance <span style="background-color: green; color: white; padding: 2px;">+</span> <span style="background-color: red; color: white; padding: 2px;">-</span></p>	<p><b>Search Airport</b></p> <p>Search by airport name, city or IATA airport code.</p> <p>Airport</p> <p> Search Airport</p> <p>Search Airport</p>	<p><b>Search Airline</b></p> <p>Search by airline name or IATA airline code.</p> <p>Airport</p> <p> Southwest Airlines</p> <p>Search Airline</p>
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Shortest flight path: Bozeman Yellowstone International Airport (BZN) – Denver International Airport (DEN) – New York John F. Kennedy International Airport (JFK).

**Bozeman to Denver distance (BZN-DEN)**

524 Miles	844 Kilometers	456 Nautical miles
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**Denver to New York distance (DEN-JFK)**

1626 Miles	2616 Kilometers	1413 Nautical miles
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**In Total**

2150 Miles	3460 Kilometers	1868 Nautical miles
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<sup>32</sup> airmilescalculator.com

## Conferencing Study | “Academic Air Travel Has A Limited Influence On Professional Success”:

A study published in *Science Direct: Journal of Cleaner Production* in July, 2019 assessed air travel behavior at The University of British Columbia by aggregating travel data from university personnel. The following excerpt explains how the authors collected air travel miles in order to study behavioral trends in how university personnel travel. This is a great example of how to calculate the total miles traveled figure without using a cost of flight converter. Of most importance, pay attention to the 8% uplift factor and the radiative forcing multiplier.

The following information for each flight was collected and input into a database: “name (later anonymized), date, TR form number, cost, ticket class, length of trip (in number of overnight stays), airport codes, primary and secondary purpose, and additional information (number of flight segments)”. Next using the airport codes, the “distance between the airports was calculated using greater circle distance and an 8% uplift factor was applied to account for additional distance traveled for holding patterns, etc., as recommended by the BEIS.”<sup>33</sup>

BEIS is an acronym for the **United Kingdom’s Department for Business, Energy and Industrial Strategy**. The following text comes from the *2020 BEIS Greenhouse gas reporting | conversion factors report*: “To compensate for planes not flying using the most direct route (such as flying around international airspace and stacking)... all factors include the distance uplift of 8%... If users did not previously include the distance uplift, then they should re baseline their historical dataset”<sup>34</sup>

“Finally, in our calculations, we include the radiative forcing multiplier of 1.9 to account for the additional net warming influence of high-altitude emissions.”<sup>33</sup> For more information on radiative forcing, see footnote.<sup>35</sup> To provide further context; SIMAP recommends a radiative forcing multiplier of 2.7<sup>36</sup>, which is based on IPCC data (see below).<sup>37</sup> SIMAPS’ emissions calculation is “*Passenger miles \* air travel CO2 emissions factor \* radiative forcing factor*”<sup>36</sup>

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<sup>33</sup> Wynes, Seth, et al. “Academic Air Travel Has a Limited Influence on Professional Success.” *Journal of Cleaner Production*, Elsevier, 12 Apr. 2019, <https://www.sciencedirect.com/science/article/pii/S0959652619311862?via=ihub#bib7>.

<sup>34</sup> Department For Business, Energy, & Industrial Strategy. “Greenhouse Gas Reporting: Conversion Factors 2020.” *Energy and Climate Change: Evidence and Analysis*, Gov. UK, 2020, [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/891105/Conversion\\_Factors\\_2020\\_-\\_Condensed\\_set\\_for\\_most\\_users.xlsx](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/891105/Conversion_Factors_2020_-_Condensed_set_for_most_users.xlsx).

<sup>35</sup> Science Direct . “Radiative Forcing.” *Radiative Forcing - an Overview | ScienceDirect Topics*, 2022, <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/radiative-forcing>.

<sup>36</sup> SIMAP. “Air Travel Emissions.” *Resources*, SIMAP, 2022, <https://unhsimap.org/cmap/resources/air-travel>.

<sup>37</sup> IPCC. “Aviation and the Global Atmosphere .” *REPORTS - SPECIAL REPORTS*, IPCC, 2022, <https://archive.ipcc.ch/ipccreports/sres/aviation/index.php?idp=71>.

### 6.2.3. Alternative Indexing of Aviation's Climate Impact-RF Index

“A new alternative index to measure the role of aviation in climate change is introduced here: the radiative forcing index (RFI), which is defined as the ratio of total radiative forcing to that from CO<sub>2</sub> emissions alone. Total radiative forcing induced by aircraft is the sum of all forcings, including direct emissions (e.g., CO<sub>2</sub>, soot) and indirect atmospheric responses (e.g., CH<sub>4</sub>, O<sub>3</sub>, sulfate, contrails). RFI is a measure of the importance of aircraft-induced climate change other than that from the release of fossil carbon alone. **RFI ranges between 2.2 and 3.4** [for aviation technologies]. Thus, aircraft-induced climate change with RFI > 1 highlights the need for a thorough climate assessment of this sector as performed here. For comparison... the RFI for all human activities is about 1; for greenhouse gases alone, it is about 1.5, and it is even higher for sectors that emit CH<sub>4</sub> and N<sub>2</sub>O without significant fossil fuel use.”<sup>37</sup>

By the end of the study the data that was collected contained 1769 trips taken by 997 individual travelers, totaling 3018.81 tCO<sub>2</sub>e. “Two hundred and eight of the travelers were faculty, Research Associates, or Instructors in the eight units, and they were responsible for 47% of the total air travel emissions from the sample. Guests to UBC comprised 22% of all individuals in the sample and 41% of professors (assistant, associate, or full)... The primary purpose of most trips was for conferences (60%), with the remainder attributed to fieldwork (16%), university business (6%), lectures (5%) or other miscellaneous and unreported purposes (13%). Air travel trips that could be categorized as avoidable – same day return, one night long-haul trips, or short distance – comprised 5–10% of all trips in the samples”.<sup>33</sup> This data is super valuable as it allows the university to see exactly what & who is accountable for what % 's of air travel emissions and then make informed decisions about which departments and individuals to target in its reduction strategy.

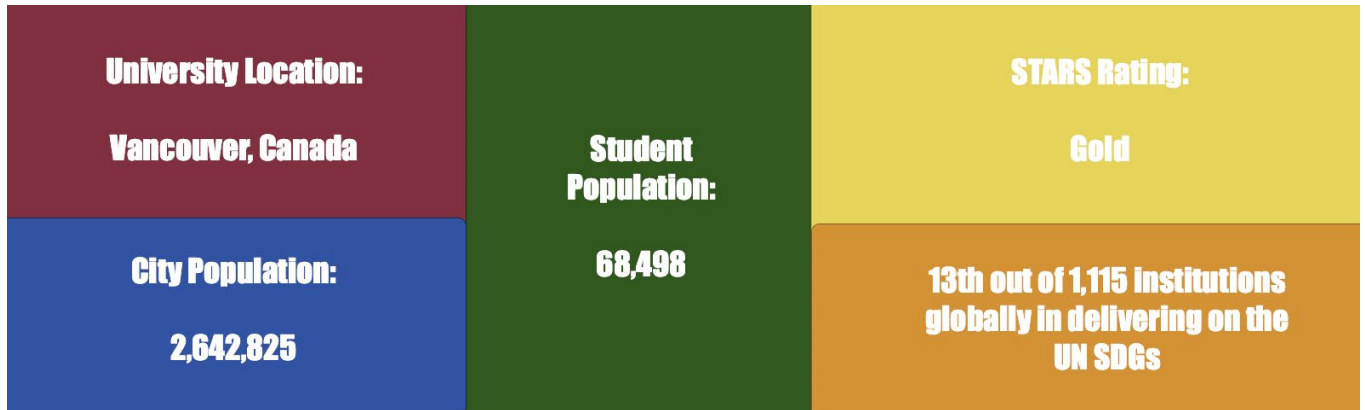
In terms of the specific emissions breakdown: “graduate students (M = 2.44 tCO<sub>2</sub>e) and post-doctoral students (M = 2.49 tCO<sub>2</sub>e) in the sample had lower mean emissions than Associate Professors (M = 5.40 tCO<sub>2</sub>e) or Professors (M = 7.52 tCO<sub>2</sub>e).”<sup>33</sup>

Perhaps most interesting from this study is what it reveals about the correlation between traveling to conferences and academic career success. “Neither total citations, nor citations normalized by academic age and authors per paper had a correlation with trips taken, distance traveled, or emissions from air travel. Finally, we expected that increased air travel would allow for greater collaboration with other academics, and that there might be a relationship between the average number of authors per paper listed on a researcher’s publications and their aviation emissions, but the correlation was not significant.” Although overall the study did not find statistical significance to indicate a negative/positive correlation, the results did indicate that there likely was “some threshold of individual air travel [that] may be necessary for success at a university, or for the success of research in general, but the threshold is very likely below that of prolific flyers.”<sup>33</sup>

**Key Take-aways:**

- “Replacing higher class tickets with Economy tickets was found to be the most significant professional air travel mitigation measure at UBC, with the potential to reduce overall air travel emissions attributed to the university by 7.8%.”<sup>33</sup>
- “There is room for at least high-emitting academics to decrease their business air travel emissions without suffering negative consequences to their publication output.”<sup>33</sup>
- The data collection, calculations, & survey conducted with the university personnel at UBC provide a great case study for how a more holistic data-set & analysis can help MSU understand its unique situation better.

**University of British Columbia:**



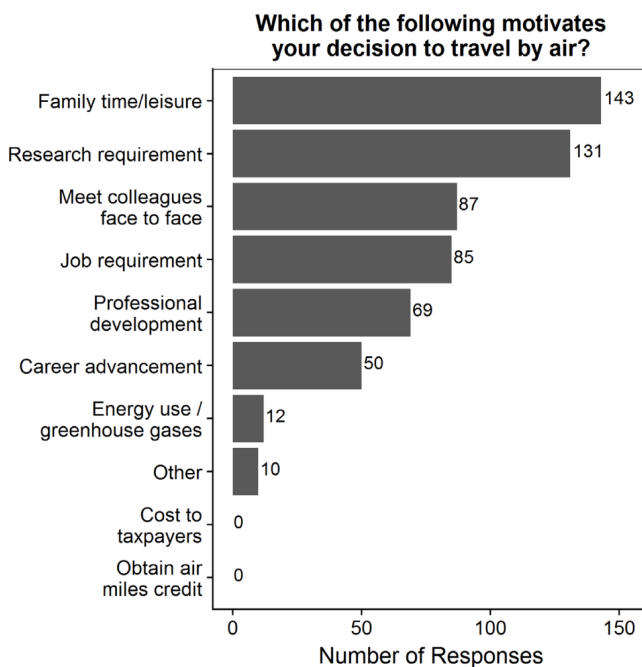
In order to increase accuracy and account for the average extra space occupied by higher class seating, UBC uses different emissions factors for economy, economy plus, business, and first class.<sup>38</sup>

<sup>38</sup> Wynes, Seth, and Simon D. Donner. *Addressing Greenhouse Gas Emissions from Business-Related Air Travel at ...* University of British Columbia, July 2018, [https://www.researchgate.net/profile/Simon-Donner/publication/326608117\\_Addresssing\\_Greenhouse\\_Gas\\_Emissions\\_from\\_Business-Related\\_Air\\_Travel\\_at\\_Public\\_Institutions\\_A\\_Case\\_Study\\_of\\_the\\_University\\_of\\_British\\_Columbia/links/5b58a829458515c4b244b919/Addresssing-Greenhouse-Gas-Emissions-from-Business-Related-Air-Travel-at-Public-Institutions-A-Case-Study-of-the-University-of-British-Columbia.pdf](https://www.researchgate.net/profile/Simon-Donner/publication/326608117_Addresssing_Greenhouse_Gas_Emissions_from_Business-Related_Air_Travel_at_Public_Institutions_A_Case_Study_of_the_University_of_British_Columbia/links/5b58a829458515c4b244b919/Addresssing-Greenhouse-Gas-Emissions-from-Business-Related-Air-Travel-at-Public-Institutions-A-Case-Study-of-the-University-of-British-Columbia.pdf).

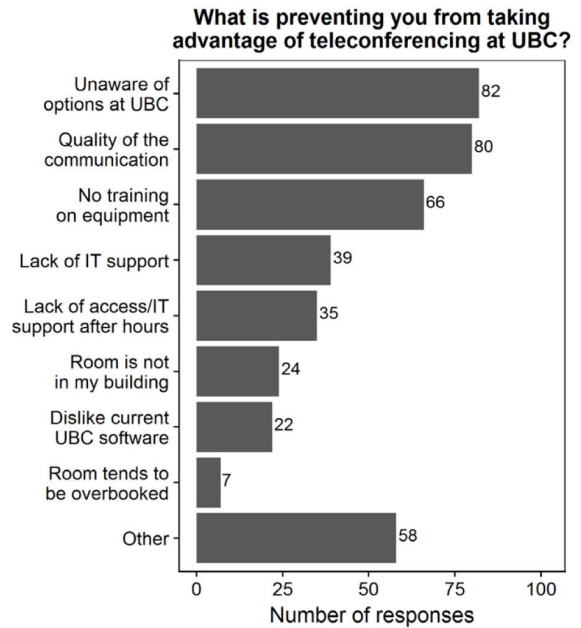
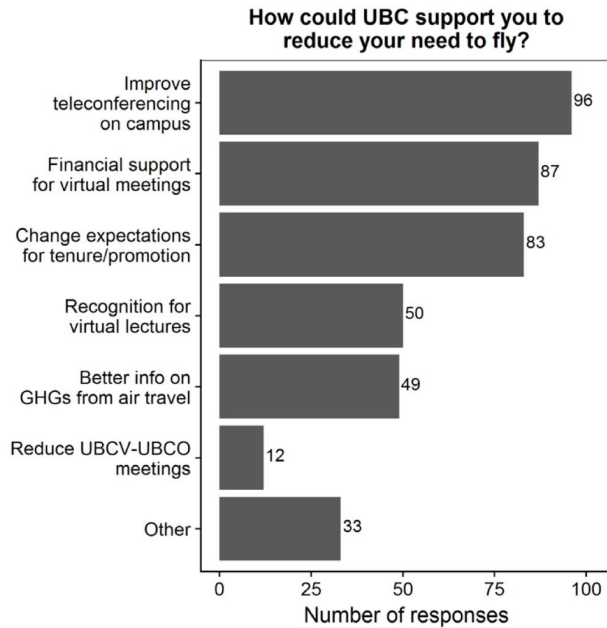
<b>Table 1: Emission factors for business-related air travel (kg CO<sub>2</sub>e/passenger km)</b>			
<b>Class</b>	<b>Long Haul</b>	<b>Medium Haul</b>	<b>Short Haul</b>
<b>Economy</b>	0.14678	0.16508	0.27867
<b>Economy plus</b>	0.23484	0.24761	
<b>Business</b>	0.42565		
<b>First</b>	0.58711		

- *Emissions Estimation vs. Status Quo Reporting | UBC Academic Air Travel Study:*
  - “The estimated campus-wide air travel emissions are 2.1 to 2.5 times greater than that reported in UBC’s Carbon Neutral Action Reports, which similarly use expenditures to extrapolate from UBC Travel office data, because this study considers class of ticket and disproportionate warming influence of high- altitude emissions from aircraft.”<sup>38</sup>
  - If this study is any indication, MSU’s actual air travel emissions are likely much higher than is currently reported. Especially once properly taking into account different emissions factors, uplift factors, radiative forcing factors, and using greater circle distance or Vincenty’s formula to more accurately account for miles traveled.

- *Survey on travel attitudes:*



“210 people completed the survey: roughly half (49%) of the respondents were male, 146 (70%) were faculty (including emeriti and teaching faculty), 23 were graduate students, 9 were staff, and 6 were post-doctoral fellows. The response rate is estimated at a minimum 3%, based on the 146 faculty respondents out of 5,003 faculty working at UBC. The relatively low response rate may be due to the competing demands on faculty time as well as the difficulty reaching all units; of the 66 academic units contacted about the survey, only 41 confirmed sharing the survey with the faculty.”<sup>38</sup>



## Montana State University Air Travel Policy Recommendations

- **Recommendation #1:** Strengthen the scope & accuracy of annual Air Travel data collection and analysis (adapted from the University of Toronto)
  - A complete data-set for MSU should include: flight mileage, date of flight, relation of traveling individual to the University, origin & destination of flight, flight class, cost of flight, who paid for the travel, the purpose of the travel, and a carbon emissions calculation.
  - The relation of an individual to the University includes the department to which they belong as well as where they fall within the adapted diagram in the University of Toronto section of this document.
  - The existing data-set does not represent mileage accounted for by the athletic department. This should be remedied and mileage from student athletics, as well as each individual athletic department, should be separately accounted for and reported.
- **Recommendation #2:** Improve the calculations for total miles traveled and GHG emissions
  - For each flight, all traveling personnel should provide University Business Services with the following information within 7 days of the departure date: originating airport, layover/s airport/s, destination airport, and total miles traveled.



- In order to calculate the total miles they traveled on a particular trip, university personnel will use [airmilescalculator.com](http://airmilescalculator.com).
- University Business Services should provide the Office of Sustainability with the following information for each flight: cost, traveling individual, academic/university department, date, miles traveled, and the origin/layover/destination information provided by the traveling individual.
- Once the Office of Sustainability receives the above-mentioned data from University Business Services, the total miles traveled number should be input into SIMAP in order to calculate total GHG emissions.
- Per the UBC conferencing study, an uplift factor of 8% should be applied to the total miles traveled number and a radiative forcing factor of either 1.9 or 2.7 should be used in SIMAP to account for the intensity of emissions resulting from air travel.
- **Recommendation #3:** Institute an Air Travel Mitigation Charge (adapted from Utah State University & the University of Toronto)
  - A flat fee of \$10 will be assigned to all university sponsored air travel.
  - The president's office will pay all fees for year 1.
  - Thereafter, each department will be responsible for its travel.
  - All funds raised from this program will go towards a revolving green fund which enables sustainability based campus projects & research, including a living lab program.
  - A specialized charge will apply to the President, Vice Presidents, Deans, & other senior leadership.
    - [\$11.83 USD] per short/medium haul round-trip flight (double for business class at \$23.66)
    - [\$51.25 USD] per long-haul round trip flight (\$102.51 for business class)
- **Recommendation #4:** Expand & Support Virtual Conferencing:
  - Faculty, staff, and students will perform an internal cost-benefit analysis when considering whether or not to attend a conference virtually or in person. If the same objectives can be achieved virtually as in person, then virtual attendance should take precedence.
  - MSU should explore ways to expand virtual conferencing and overcome the limitations to virtual conferencing that can sometimes make it a second choice.
- **Recommendation #5:** Encourage departments to update their Role & Scope documents to reflect equal prioritization of virtual & in person conferencing toward annual review & promotion/tenure evaluations.

- This will help shift the incentive structure at MSU and allow faculty to feel like they can choose to attend conferences virtually when in-person attendance is not necessary and/or does not yield a positive cost benefit analysis.
- **Recommendation #6:** Initiate an annual Faculty & Staff Survey (Adapted from the University of Washington & the University of British Columbia)
  - A survey of faculty and staff should be conducted measuring their perceived likelihood of using alternatives to air travel (virtual conferencing & ground transportation).
  - The survey should be modeled after the UBC survey and should also ask the following questions: Which of the following motivates your decision to travel by air? How could MSU support you to reduce your need to fly? What is preventing you from taking advantage of teleconferencing at MSU?
  - The survey should also ask faculty & staff what concerns, suggestions, or comments they might have regarding conferencing. This would loop university personnel into the policymaking process, giving them a chance to help draft the framework; as well as provide useful feedback which will help new conferencing policy satisfy all stakeholders.
- **Recommendation #7:** Establish policies that promote additional mitigation strategies (Adapted from the University of Toronto, Utah State University & The University of British Columbia)
  - Eliminating same day return flights
  - Reducing flying for one-night stays
  - Reducing group travel when unnecessary
  - Favoring direct flights over layovers
  - No First Class Flying
- **Recommendation #8:** Campus as a Living Laboratory (Adapted from Harvard)
  - Per MSU's latest STARS report, the university already meets the criteria for a living Laboratory.
  - Instead of out-sourcing carbon offsets to companies, which frankly more often than not, don't do what they say, MSU should offset a portion of its air travel emissions by expanding its living lab program to encourage & fund student led research looking at innovative ways to offset carbon.
  - This could look like a 3 year graduate program modeled after Harvard's "Climate Solutions Living Lab"; or it could even just involve expanded student research in other areas, such as Arizona State's tree grove living biology lab.
  - Money raised from an air travel mitigation charge & the creation of a green fund could be potential sources of the funding for an expanded living lab program.
- **Recommendation #9:** Re-adopt the Fall 2020 semester & finals schedule

- One way to reduce student travel to and from Bozeman would be to change the structure of thanksgiving break. Instead of going home for thanksgiving and then back to Bozeman for finals, finals should finish right before thanksgiving and then thanksgiving break should be wrapped into winter break.
- MSU did this in the Fall of 2020 to mitigate the transmission of Covid-19.<sup>39</sup> That exact first semester schedule (August 17 - November 25) should be re-adopted permanently to mitigate the amount of air and ground travel that students have to undertake.
- On May 15, 2020 MSU acknowledged the decrease in travel that would result from this new semester schedule, stating “the adjusted dates eliminate the need for students, faculty and staff travel between the Thanksgiving holiday and the conclusion of the semester.”<sup>38</sup> Less travel = less emissions.

## Section 3 Education

### **Background:**

Montana State University (MSU) is Montana’s Land Grant institution with an obligation to serve the people and lands of Montana using the best available science to assure health, sustainability and economic stability. Universities should be leaders in the search for truth, social justice, and innovation, and should operate in a manner that is in the best interests of their students, faculty, staff, administration and broader community.

Montana State University has published numerous statements that endorse taking immediate, rapid and sustained action to address the climate crisis including the following:

“(MSU) inspires people to engage with the university to improve the human prospect through excellence in education, research, creativity and civic responsibility.” “We care for and conserve the human, economic, physical and environmental resources entrusted to us.” “(MSU’s) research and creative activity demonstrates impact on the state’s and the world’s pressing challenges.” “We care for and conserve the human, economic, physical and environmental resources entrusted to us.” “Montana State University will

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<sup>39</sup> <https://www.montana.edu/health/coronavirus/archived-comms/20211/new-dates-for-2020-21-academic-year>

foster four Grand Challenges of Montana responsive to regional and global needs: Caring for our environment.”<sup>40</sup>

College [administrators say](#) surging numbers of students are pursuing environmental-related degrees and careers; A [2020 Univ. of S CA survey](#) found that 64% of undergraduate students are “very interested” in on-campus sustainability. The [United States Bureau of Labor Statistics](#) projects that employment opportunities for environmental scientists and “related specialists” will grow 8% over the next 10 years, a rate much faster than growth in other industries and pay ranges are notably above overall median income levels. A [2021 Pew Research](#) report found that Gen Z (up to age 25) is overwhelmingly worried about climate change: 76% of them say that it’s one of their biggest societal concerns, while 37% make it their number one concern. Data from the [Yale Program on Climate change Communication](#) show that most Montanans (65-81%) across the state agree that schools should teach about the causes, consequences, and potential solutions to global warming.

According to SOS Earth, “Our 2020 global survey discloses that students are concerned about climate change and want to see this reflected in their education”<sup>41</sup> and “92% (of students) agree that sustainable development is something which all universities and colleges should actively incorporate and promote.”<sup>41</sup>

According to Cambridge International's Global Perspectives survey with over 11,000 participating students aged 13 to 19, “there is a clear desire from students to learn about global issues in school, with 97% of U.S. students agreeing that it is important to do so. However, two in five U.S. students (40%) also said that they don't learn about their most important global issue in school but think it would be beneficial if they did, high compared to a global average of 31%.”<sup>17</sup> Furthermore, “students in the U.S. believe climate change is the single biggest issue facing the world today, with 39% saying this in the survey.”<sup>42</sup>

The Carbon Leadership Forum is also a resource aims to provide a high-level overview of embodied carbon and why it is an important consideration for policymakers.”<sup>43</sup>

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<sup>40</sup> MSU Office of the Provost, Mission & Core Themes: <http://www.montana.edu/accreditation/mission.html>; MSU Planning Council Strategic Plan: <https://www.montana.edu/strategicplan/>

<sup>41</sup> “Students, Sustainability, and Education.” SOS Earth, <https://sos.earth/survey-2020/>

<sup>42</sup> “New Survey Reveals 39% of U.S. Students Believe Climate Change the Most Pressing Issue Facing the World Today.” Cision: PR Newswire, <https://www.prnewswire.com/news-releases/new-survey-reveals-39-of-us-students-believe-climate-change-the-most-pressing-issue-facing-the-world-today-301014613.html>

<sup>43</sup> “Embodied Carbon 101.” Carbon Leadership Forum <https://carbonleadershipforum.org/embodied-carbon-101/>

Montana State University has ambitious goals, and few specific policies which reflect commitment to these goals.

**Peer Institutions:**

**Colgate University:**

<b>University Location:</b> <b>Hamilton, New York</b>	<b>Student Population:</b> <b>3,228</b>	<b>STARS Rating:</b> <b>Gold</b>
<b>City Population:</b> <b>4,059</b>		<b>Operating Budget:</b> <b>\$1,219,259</b>

- Colgate has been on the front lines of sustainability at higher education institutions for years. Colgate’s commitment to sustainability permeates both the university’s academic mission and its operation”<sup>44</sup>.
- One of their 13 explicit goals for students attending Colgate is to “Respect nature and the diversity of life on earth: recognize their individual and collective responsibilities for the stewardship of the earth’s resources and the natural environment”<sup>45</sup> which is advertised almost front and center on the university webpage. In April of 2019, Colgate’s Bicentennial year, the University became the first higher education institution in New York State to achieve carbon neutrality.<sup>37</sup> “Many academic courses at Colgate provide students with the opportunity to think critically engage issues in sustainability.”<sup>45</sup>
- One of the core requirements at Colgate is Scientific Perspectives on the World, which requires students to engage with the reality of human impact on the physical environment.

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<sup>44</sup> “Sustainability.” *Sustainability* | Colgate University, <https://www.colgate.edu/about/sustainability>.

<sup>45</sup> “The 13 Goals of a Colgate Education.” *Colgate University*, <https://www.colgate.edu/academics/13-goals-colgate-education>.

### College of the Atlantic:

<b>University Location:</b> <b>Bar Harbor, Maine</b>	<b>Student Population:</b> <b>350</b>	<b>STARS Rating:</b> <b>Gold</b>
<b>City Population:</b> <b>5,089</b>		<b>Tuition:</b> <b>\$44,280</b>

- COA is an example of higher education taking sustainability seriously. “Sustainability is central to just about everything we do” and “College of the Atlantic became the first college to go carbon-neutral in 2007. Since then, [our] approach has evolved toward engaging students in a comprehensive, experiential educational approach to all aspects of sustainability and eliminating our reliance on fossil fuels.”<sup>46</sup>
- Addressing sustainability integrated in curriculum, “Sustainability is never far from the surface, wherever you make your academic home at the college.”<sup>47</sup>
- COA was at the top of the Sierra Club’s Cool Schools ranking in 2016, 2017, and 2019 due to their high STARS rating and synthetic data. The Sierra Club uses independent researchers to build their Cool Schools list, and to make the list

### University of California Berkeley:

<b>University Location:</b> <b>Berkeley, California</b>	<b>Student Population:</b> <b>45,057</b>	<b>STARS Rating:</b> <b>Platinum</b>
<b>City Population:</b> <b>120,463</b>		<b>Land Grant University</b>

- UC Berkeley recently assessed the cumulative promotion of sustainability in their interdisciplinary course list. “Following UC Berkeley’s reception of a Platinum Rating in

<sup>46</sup> “Environmental Commitment.” · *College of the Atlantic*, <https://www.coa.edu/about/environmental-commitment/>.

<sup>47</sup> “Sustainability in the Curriculum.” · *College of the Atlantic*, <https://www.coa.edu/about/environmental-commitment/sustainability-in-the-curriculum/>.

the Sustainability, Tracking, Assessment & Rating System, the UC Berkeley Office of Sustainability aimed to further explore UC Berkeley’s role as an institute of higher education in promoting the United Nations Sustainable Development Goals (SDGs).<sup>48</sup> The initiative had very positive results, “the Sustainability Course Inventory narrowed down the UC Berkeley full course list from 6854 courses to 3221 courses that have a sustainability connection.”<sup>48</sup> That is nearly half of all courses offered at UC Berkeley instructing with relation to one of the United Nations’ Sustainability Development Goals.

- Tracking the course list is important, but comparing it to the UN’s SDGs sets a standard to drive curriculum development towards truth, specificity, and applicability.<sup>49</sup>

**Utah State University:**

<b>University Location:</b> <b>Logan Utah</b>	<b>Student Population:</b> <b>27,426</b>	<b>STARS Rating:</b> <b>Silver</b>
<b>City Population:</b> <b>48,565</b>		<b>Land Grant University</b>

- “Several units on campus have established key programs in community outreach. USU’s Wellness Program promotes local organic food, drinking water from reusable containers, and alternative transportation choices. The Service learning Program integrates hands-on sustainability projects as part of the educational experience. Extension personnel partner with local, state, and federal governmental agencies to deliver educational programs addressing issues such as water conservation, native gardening, and energy.”<sup>50</sup> The Climate Action Plan at USU, drafted in 2010, is one of the most comprehensive examples of good data, data application, and education campaigns that address achievable goals.
- These initiatives are similar to those at MSU, however strict adherence to goals and methods has allowed USU to see positive results.
- “Between 2007 and 2021, USU's emissions have decreased almost 28%.”<sup>51</sup>

<sup>48</sup> Wu, Britney. *UC Berkeley’s Sustainability Curriculum & the UN Sustainable Sustainable Development Goals*. [https://sustainability.berkeley.edu/sites/default/files/sdg\\_course\\_list\\_final.pdf](https://sustainability.berkeley.edu/sites/default/files/sdg_course_list_final.pdf).

<sup>49</sup> “Sustainable Development Goals.” *United Nations*, <https://sdgs.un.org/goals>

<sup>50</sup> “Climate Action Plan.” · *Utah State University*, <https://www.usu.edu/sustainability/files/documents/2010capfinal.pdf>

<sup>51</sup> “Greenhouse Gas Steering Committee.” *Utah State University*, <https://www.usu.edu/sustainability/council/ghg-committee#:~:text=Between%202007%20and%202021%2C%20USU's,is%20still%20an%20ambitious%20target.>

- USU has very complete, public, SIMAP data guiding their climate-oriented decisions.<sup>52</sup>

## Montana State University Education Policy Recommendations

<b>University Location:</b> <b>Bozeman, Montana</b>	<b>Student Population:</b>  <b>16,841</b>	<b>STARS Rating:</b>  <b>Silver</b>
<b>City Population:</b>  <b>53,293</b>		<b>Land Grant University</b>  <b>Operating Budget:</b> <b>\$235.4 million</b>

- Recommendation 1: Sustainability imaging.
  - Publicly display sustainability successes and failures around campus.
  - This should include, but will not be limited too, carbon labeling.
- Recommendation 2: Improve Scope 1, 2, and 3 data by publicizing the collection methods of said data, gathering metadata, and annually reporting all GHG data.
- Recommendation 3: Develop and implement annually a comprehensive survey for all campus stakeholders (students, staff, and faculty) on commuting, air travel and general sustainability knowledge, attitudes, and behavior.
- Recommendation 4: Integrate sustainability into departmental and Core 2.0 curriculum requirements.
- Recommendation 5: Pressure the MSU Alumni Foundation to publicly disclose all investments and major funds associated with and used by the University and to divest from fossil fuels.
- Recommendation 5: Initiate annual sustainability, carbon emissions, and climate action plan reporting.

<sup>52</sup> "Utah State University." *SIMAP*, [https://unhsimap.org/public/institution/645?graph\\_type=line&op=Change](https://unhsimap.org/public/institution/645?graph_type=line&op=Change)