

Climate Action Planning Analysis Worksheet: Montana State University (MSU)

A) Summary and Main Takeaways:

MSU goes in depth outlining how they developed a GHG inventory baseline (how it was measured, areas that are lacking, and ways that this CAP may help improve its accuracy and decrease overall emissions). This was the most robust section of the report. The plan was ambitious in its proposed biannual updates, having only made one update (2016) since the plan was first published. It was a bit ambiguous as to how the plan was developed, talking about CSAC commissioning the plan and the student sustainability center following through in creating it, but was a bit vague and could have explicitly stated this at the start of the plan. The plan discusses potential funding outlets but also states that no funding was secured at the time of the report. There was some interesting info on land stewardship as it relates to indigenous peoples stakeholder engagement, implicitly touching on climate justice. It is helpful that the plan included a glossary of terms, which, compared to other CAPs we are viewing, seems to be unique. Overall, the CAP was well written and helped establish a direction for MSU to move to reduce its GHG emissions. Though many of the proposed projects and initiatives have since been implemented, the follow through was lacking in that only one update to the plan has been published, and that was in 2016. However, this progress report did have some encouraging data on MSU's project.

INFO from KB: Our “green revolving fund” is \$200-250K per year; it is called Smart Building Initiative.

B) Potential Interviewing Questions and Curiosities:

- Question: “As of the adoption of this Climate Action Plan, the City of Bozeman was finalizing its Climate Action Plan. The following seven transportation recommendations were included in the City’s plan...” (18) – how will the Bozeman City CAP be incorporated/integrated into MSU’s?

C) Analysis Questions:

1. Does the CAP include information on creating a baseline?

Does the plan discuss its baseline? In other words, does the plan reference its natural greenhouse gas emissions (GHG) levels used to inform planning, goal-setting, and climate policy structure? There are several possibilities for setting a baseline. Some plans may focus on a single historical emissions level, while others may reference future baseline projections.

- MSU's Campus Sustainability Advisory Council (CSAC) was established (www.montana.edu/sustainability/csac.html) to advise MSU's President on sustainability and meet ACUPCC obligations, which include the:
 - periodic inventorying of GHG emissions (1)
- Beginning with a baseline GHG inventory compiled in 2009, mitigation strategies and specific emissions reduction goals are presented. (1)
- The 2009 annual baseline GHG inventory revealed that approximately 77,375 metric tons of carbon dioxide-equivalent (MT CO₂e) were emitted from MSU-Bozeman campus operations, as defined by limits provided by the ACUPCC. Of this total, approximately one third are generated by direct fuel combustion on campus, one third from purchased electricity, and one third from indirect emission sources such as transportation and solid waste. (1)
- "An interim goal of 20 percent reduction from 2009 GHG emissions by 2025 has been established." (1)
- The initial step in achieving this goal is to complete a comprehensive GHG emissions inventory. McKinstry Company was engaged by MSU to assist the CSAC in this process. McKinstry is a third-party engineering firm with demonstrated experience in GHG inventories. (3)
- It was determined that the total emissions for the 2009 reporting period were 77,375 Metric Tons Carbon Dioxide Equivalent (MT CO₂e), taking into account Scope 1, 2, and 3 emissions (see Figure 2.1). This is a higher than average emissions value when compared to many ACUPCC institutions, but includes thorough data for Scope 3, emissions that are, at this time, omitted by many other institutions. (3)
- MSU's 2009 GHG inventory was based on university data for the 2008–2009 fiscal year (July 2008–June 2009), and was calculated using the Clean Air Cool Planet Campus Carbon Calculator (CACCP) v6.4. Data was collected from a variety of sources, and some incomplete data was extrapolated to provide MSU with an estimate based on the best available data. (3)
- Through discussions with MSU, it was determined that the scope of this report would be limited to MSU activities at the Bozeman campus. (3)
- MSU is accounting for GHG emissions from all operations under its operational control, which refers to the authority to introduce and implement operating policies, and is consistent with the ACUPCC reporting guidelines. (3)
- "The initial step in achieving this goal is to complete a comprehensive GHG emissions inventory. McKinstry Company was engaged by MSU to assist the CSAC in this process. McKinstry is a third-party engineering firm with demonstrated experience in GHG inventories." (3)

- “Working with an experienced third-party for GHG audits reduces overlooked emission sources, establishes consistent methods for subsequent audits, and lends an objective approach to audit processes.” (3)
- “it was agreed that MSU would use the Operational Control Approach in determining organizational boundaries on the campus. Under this approach, MSU is accounting for GHG emissions from all operations under its operational control, which refers to the authority to introduce and implement operating policies, and is consistent with the ACUPCC reporting guide-lines.” (3)
- Well-tracked data for Scope 1 and Scope 2 were typically available for MSU-Bozeman, but some Scope 3 data, specifically other directly-financed air and ground travel, were based upon best available data, recommended conversion factors, and supplemented by estimates from other ACUPCC universities. (4)
- “An interim goal of 20 percent reduction from 2009 GHG emissions by 2025 has been established. Extensive planning and analysis is required to confidently establish further reduction milestones, and the ultimate goal of net-zero carbon emissions. Planning will continue concurrently with the implementation of early (Phase One and Two) projects during the next two to three years. Results and feedback from Phase One and Two efforts will contribute to CAP course corrections and milestone revisions, and be reported in the next (biannual) CAP release.” (4).
- MSU’s emissions presented in this report reflect a higher than average value than comparable universities on the ACUPCC website. It is important to note that many of these institutions have not reported on air travel, and many do not include comprehensive commute data. By omitting these Scope 3 emissions from the GHG reports, MSU-Bozeman total GHG emissions are approximately 43 percent lower than the 77,375 MT CO₂e reported for MSU in 2009. (4)
- “MSU is accounting for GHG emissions from all operations under its operational control, which refers to the authority to introduce and implement operating policies, and is consistent with the ACUPCC reporting guide-lines. The commitment requires that signatories report on and mitigate emissions from Scope 1 and 2 sources as well as commute and air travel from Scope 3. Comparing this inventory with peer institutions reveals that most inventories focus on required emissions sources. This inventory aims to document all MSU emissions, regardless of the required mitigation responsibilities.” (6).
- “Gross energy consumption for each utility has been tracked and compared to the gross building area increase. Electrical consumption has increased at an average rate of about 1.6 percent annually (Figure 3.1) over this time period while gross square footage has grown approximately 0.6 percent annually. Likewise, natural

gas consumption has an annual average rate of 1.3 percent over the same time span (Figure 3.2).”(8)

- The baseline emission and mitigation strategy calculations were calculated using The Clean Air-Cool Planet Campus Carbon Calculator. (10)
- “The baseline emission and mitigation strategy calculations were calculated using The Clean Air-Cool Planet Campus Carbon Calculator. This Excel workbook-based tool is designed to conduct greenhouse gas emissions inventories, project emissions into the future, and evaluate a portfolio of carbon reduction projects.” (13).
- “The GHG inventory based its calculations on 9,124,603 automobile miles and 189,376 bus miles of commuting by faculty and staff, and 9,826,713 automobile miles and 411,168 bus miles of commuting by students.”(22)
- “In FY10 MSU disposed of 1,866 tons of material at the Logan Landfill. A waste stream analysis performed by Facilities Services in 1990 indicated that recyclable materials made up at least 45 percent of the waste stream from MSU’s academic buildings and between 15-25 percent of waste from auxiliaries sources. Organic (compostable) materials made up 20 percent of waste from residential and food service areas. While these figures are 20 years old, they suggest a baseline of what can be done to reduce MSU’s waste and divert reclaimable material.” (23)

Summary: A baseline greenhouse gas inventory was conducted through the third party McKinstry Company in 2009 in preparation for MSU’s CAP. This inventory identifies Scope 1, 2, and 3 emissions, along with recommended inventory improvements, or areas where data is missing or lacking. The data for scopes 1 and 2 was easily accessible through the university. However, data for scope 3 was difficult to come by and partial data/estimates were extrapolated out in some cases. MSU’s inventory covers GHG emissions from all operations under its operational control.

2. By what measure is success tracked and reported?

Does this plan discuss how progress is tracked and reported? Does the plan reference a system that assesses its sustainability performance? Many different approaches can be used, but make sure to take note of STARS and AASHE.

- The CAP will be updated biannually to provide information on progress toward the above goals and new initiatives at MSU-Bozeman. (1)
- An interim goal of 20 percent reduction from 2009 GHG emissions by 2025 has been established. Extensive planning and analysis is required to confidently establish further reduction milestones, and the ultimate goal of net-zero carbon emissions. (1)

- A strategy of phased projects and programs, focused on maximizing MSU's ability to reduce energy consumption and reclaim energy streams presently dissipated, is presented within this document. (11)
- The preliminary assessment has been categorized in two phases based on implementation timeline, characteristics, and complexity. Phase One tactics are presently in design, construction, or implementation. The cost and economic performance of these projects are either known, or projected with a relatively high level of confidence. Phase Two tactics are identified as similar, conservation-based projects that can be implemented by applying readily available technology or that which is emerging, yet highly probable of cost effective success. (11)
- Beyond these two phases are long range tactics that will require extensive study and development but levy significant impact on MSU-Bozeman's GHG emissions. (11)
- MSU-Bozeman's efforts to control the energy usage escalation rate will be continuously adapted to achieve a maximum of 0.25 per-cent annual growth rate in total energy (including Scope 3) with an annual goal of holding a flat, or negative growth trend. (11)
- At this stage of climate planning, it becomes apparent that we are not going to conserve our way out of a carbon intensive operation. Rather a dramatic evolution in the way that MSU's campus is heated, cooled, and powered is needed. (13)
- Figure 4.2 provides an estimate of Phase Two tactics. (13)
- Presently, the energy performance contractor is in the process of developing an investment grade audit of between 300 and 400 Facility Improvement Measures. This analysis will identify those projects with the highest energy, operational, and economic effectiveness. (13)
- Figure 4.3 presents GHG emissions projections at MSU-Bozeman with Phase One and Two mitigation tactics, focusing on the 20 percent reduction by 2025. (13)
- The holistic goal is 80 percent diversion from the landfill by 2050. This will be accomplished by achieving a series of lesser but sequential goals – 25 percent reduction by 2020, 50 percent reduction by 2030, 65 percent reduction by 2040. (24)
- On importance of measuring educational outcomes: "The ACUPCC requires signatories to demonstrate and articulate plans for "actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students." This requirement is well-aligned with MSU-Bozeman's land-grant institutional mission, and will continue to be integral to future education and civic engagement activities." (27)
- As a result, inventorying current courses in sustainability (including CAP-related courses) is presently in progress, and will be available through the IoE, and in the next MSU CAP. (28)

- “[The CAP] will be revised and resubmitted every two years. Suggested revisions for the 2013 submission can be made through the MSU Campus Sustainability Advisory Council.”(p.40)
- “Continued participation in the Uncommon Sense Business Leadership for a Sustainable Future program, which establishes methodologies for tracking, reporting, and improving practices in waste management, responsible purchasing, social and community investment, inventorying GHG emissions, and improving energy, water, and transportation efficiencies...” (43).
- The 2016 greenhouse gas data was collected through MSU Facilities Services in conjunction with Sightlines, a third party consulting firm. This change in methodology may result in discrepancies between the 2009 and 2011 CAP reports and this report. (Update, 3)
- In the 2009 MSU Climate Action Plan, a goal was established to reduce total GHG emissions by 20% from 2009 levels by 2025. As of 2016, MSU has reduced its total GHG emissions by 16%, putting it on track to meet its goal by 2020. (Update 4)
- This data (Fig. 2 and Table 2) shows that MSU has reduced its GHG per FTE student by 36% from 2009 GHG levels. This puts MSU on track to meet our 2009 CAP goal of 20% reduction of total GHG emissions from 2009 levels, and its reach goal of 50% reductions from 2009 levels. (Update, 5)
- MSU has reduced its GHG per 1,000 GSF by 22% from 2009 GHG levels. This puts MSU on track to meet its 2009 CAP goal of 20% reduction of total GHG emissions from 2009 levels, and its reach goal of 50% reductions from 2009 levels. (Update, 6)
- MSU has reduced its scope 1 emissions by 16% from 2009 levels. (Update, 7)
- MSU has reduced its scope 2 emissions by 20% from 2009 levels. (Update, 8)
- MSU has reduced its scope 3 emissions by 13% from 2009 levels. (Update, 9)
- (2016 Update as a whole)
- MSU has seen significant reductions in the amount of paper it purchases through increasing the number of “paperless” operations. (Update, 12)
- MSU has reduced its total waste production by 17% per FTE from 2009 levels. (Update, 16)
- In 2016 over 19% of waste generated was diverted from the landfill (Update, 16)
- Percent waste diversion has increased 16% from 2009 through increases in MSU’s recycling and composting programs. (Update, 17)
- Overall water use in millions of cubic feet (MCF) has been reduced by 13% since 2009 (Fig. 17). Furthermore, water use has declined by 20% per 1,000 GSF (Fig. 18) and 33% per FTE (Fig. 19). (Update, 18)

Summary: The CAP set the goal to update the plan every two years. An emissions reduction goal of 20% by 2025 was also set in the CAP, indicating that extensive planning and analysis would be required to implement later, possibly more ambitious, goals. Implementation is divided

into several phases, with two early stages and one long-range stage. Emissions trajectories under different scenarios are extrapolated out to show how different projects and initiatives will help MSU reach its goals. The GHG inventory conducted for the 2016 plan update had MSU Facilities Services collecting data in conjunction with Sightlines, a third party consulting firm, which may skew baseline relations to current tracked emissions. MSU also conducts intermittent STARS reports.

3. Does the CAP set goals, strategies, or action items for implementation?

Does the plan address potential next steps for the plan to be carried out? Take note if plans mention tracking progress or improvements. Does the plan provide recommendations, contain reduction and mitigation strategies, or set interim goals to ensure implementation?

- Not Recorded Directly

4. How is the CAP funded?

Does the plan discuss funding efforts? In particular, where do sources of funding come from? Are these sources public or private entities?

- pursue renewable energy sources, offsets, and/or credits as cost-effective mechanisms become available and/or upon the State of Montana taking action to enable, support, and fund them. (1)
- The indicated capital costs, economic performance, and emissions reductions are based strictly on benchmarks extrapolated from project historical performance, forecasted technology advances, and diminished “low hanging fruit” conventional conservation opportunities. These programs are intended to indicate mid-range planning goals, and do not indicate financial obligations to specific work. (11)
- (Page 12, Phase 1 and Phase 2 mitigation tactics outlined with costs and payback period)
- Pending Board of Regents authority, this single effort may result in several million dollars of investment in energy savings, precipitating the single largest GHG reduction in the present CAP. (13)
- The economics of this project are complex as the project, while quite capital-intensive, may be timed to address substantial deferred maintenance at the time of implementation (17)
 - Closed water loop building heating system

- “Funds from the Federal Transit Administration, which are administered by the Montana Department of Transportation, help support Streamline, and reduce the amount of local funding necessary to operate the system.”(20)
- “Recycling - Operated by ASMSU and funded by student fees, recycling activities in FY10 diverted 118 tons of aluminum, steel, plastics, paper and cardboard, or about 6 percent of MSU’s waste that year.”(24)
- E-scrap - Safety & Risk Management operates an E-scrap program (implemented Jan 2009) that is funded by a fee charged on all university computer purchases (2.5 percent of the purchase price). (24)
- The Montana Made program spends 12 percent of University Food Service’s budget on food products that are grown/processed in Montana. (25)
- “The ASMSU sustainability Center is a student-funded program of the Associated Students of MSU (www.montana.edu/greenasmsu). ASMSU operates a student-run Recycling program, plans programs and events, coordinates campus recycling, waste and water-use reduction programs, hands-on student community projects, and collaborates with various campus partners to develop initiatives that enhance sustainability at MSU and engage students in the process.” (34).
- “No funding is presently identified for implementation of mitigation tactics.” (39)
- “To the extent possible, investments will be planned to complement the overall strategy of energy conservation and preparation of building systems for the integration of renewable energy sources.” (39)
- “Financial investment resulting in GHG emissions reductions will be prioritized according to the ability of options to cost effectively achieve multiple goals. For example, efforts that reduce emissions may also reduce deferred maintenance, address system deficiencies, interface with education and research, and/or achieve operational cost reductions. No funding is presently identified for implementation of mitigation tactics.” (42).
- “All infrastructure investments made will consider these criteria and capitalize on funding opportunities by: 1) leveraging existing programs, such as the IoE for curricular and staffing opportunities; 2) pursuing the establishment of a Sustainability Endowment through the MSU Foundation funding structure; and 3) investigating external funding, through government and private grants, for CAP-related activities, including curriculum development, public outreach and partnering, infrastructure improvements, and research opportunities.” (42).

Summary: Though no funding was secured when this plan was written, the following potential funding sources were identified: leveraging existing programs, such as the IoE for curricular and staffing opportunities; pursuing the establishment of a Sustainability Endowment through the MSU Foundation funding structure; and investigating external funding, through government and private grants, for CAP-related activities, including curriculum development, public outreach and

partnering, infrastructure improvements, and research opportunities. Project funding is to be prioritized towards projects that will have the highest lifetime savings, and once implemented, these savings would go towards a green revolving fund (Sustainability Endowment).

5. How did the CAP inform/engage stakeholders?

Did the plan include discussions about stakeholder involvement? Specifically, how did the plan address engaging stakeholders in participating in the CAP?

- We seek engagement and partnerships in research, education, and service to ensure that objective science information with a practical human perspective is used to envision our future and the steps necessary to achieve it. (2)
- MSU recently was awarded the Carnegie Foundation’s Community Engagement classification, a designation which recognizes an institution’s high level of outreach and collaboration with its surrounding community. (2)
- “The IoE mission, to promote interdisciplinary discovery, education, and engagement focused on a sustainable future for Montana as well as mountain regions around the world, is a strategic alignment of ongoing and future efforts at MSU-Bozeman. The IoE will coordinate climate neutrality and sustainability education, outreach and research efforts amongst undergraduate and graduate students and staff/faculty across campus and within the community.” (2)
- IoE will provide a point of contact for collaborations with other MUS institutions (including other MSU campuses, University of Montana, and tribal colleges), state and federal agencies (e.g., USGS Northern Rocky Mountain Science Center, Yellowstone National Park, Northern Region U.S. Forest Service, Bureau of Land Management), nongovernmental organizations (e.g., World Wildlife Foundation, Wildlife Conservation Society, Greater Yellowstone Coalition; Sonoran Institute), MSU Extension, communities, small businesses (e.g., Greater Yellowstone Business Partnership), corporations and foundations, and private citizens. (2)
- Research, education and outreach activities focused on sustainability range from clean energy and sustainable food production to climate change impacts and human health, and they are underway in various centers, colleges and departments at MSU. (2)
- The IoE mission, to promote interdisciplinary discovery, education, and engagement focused on a sustainable future for Montana as well as mountain regions around the world, is a strategic alignment of ongoing and future efforts at MSU-Bozeman. The IoE will coordinate climate neutrality and sustainability education, outreach and research efforts amongst undergraduate and graduate students and staff/faculty across campus and within the community (2)

- Commute Transportation — A commute survey was created and administered by ASMSU. This survey was distributed to faculty, staff and students on the MSU campus. (6)
- Several strategies for reducing commuter emissions, including increasing online course offerings, incentivizing the use of low emission transportation choices, promoting on-, or near-campus living, and increased education and outreach. (17)
- Unless someone is living on campus, a person is traveling in and through Bozeman, and perhaps even one or two counties, to get to class or employment at MSU. Therefore, it is important that the transportation component of MSU's Climate Action Plan integrate with the City's and other transportation plans/climate action plans. (18)
- "As MSU and the City of Bozeman adopt and implement their Climate Action Plans, the two entities should work together as closely as possible to take advantage of funding opportunities and other synergies that may exist."(18)
- "The City of Bozeman, the Montana Department of Transportation and others have been working to provide pedestrian connections to MSU. The Greater Bozeman Area Transportation Plan (2007 update) places a strong emphasis on integrating pedestrian facilities into the transportation network."(p.19)
- An online transportation survey of MSU students and employees conducted in 2010 identified a random sample of 1500 MSU employees and students and had approximately 500 respondents. Approximately 53 percent of respondents reported living within three miles of campus, which is similar to the 46 percent estimated from the 2007 evaluation. (19)
- If Montana State University were to actively promote car pooling, marketing could be accomplished through the MSU News email, campus newspaper, and providing links from various MSU websites to a car pool software. (21)
- In order to transition students, faculty and staff from a single occupancy vehicle (SOV) to another mode, supporting strategies are needed, which can be thought of as incentives and disincentives. (21)
- A Guaranteed Ride Home (GRH) provides commuters who regularly vanpool, carpool, bike, walk, or take transit with a reliable ride home when unexpected emergencies arise. (21)
- Raise awareness of the financial and health benefits of commuting rather than SOV driving. (21)
- MSU could use additional surveys to gauge the interest in new options such as van pools, to see if those options are worthy of future investment. (23)
- Composting - University Food Services is in the process of researching the feasibility of composting food residuals in the dining halls. (24)
- Fund the E-scrap program so that it may accept e-waste from students and on-campus residences as well as MSU departments. Consider opportunities to partner with the City/County to collect e-scrap from the community at large as well. (24)

- The ACUPCC requires signatories to demonstrate and articulate plans for “actions to make climate neutrality and sustainability a part of the curriculum and other educational experience for all students.” (27)
- MSU is therefore building upon the research and education activities already under-way at MSU (including the new EPSCoR Track 1 infrastructure grant) by developing an interdisciplinary undergraduate program in sustainability. (27)
 - Sustainability studies minor?
 - Potential for full degree path in the future?
- MSU-Bozeman strives to partner in cross-cultural education to promote sustainability and climate neutrality. Coordinated by the Native American Studies (NAS) program, numerous programs integrate sustainability, and ultimately climate neutrality, as can be learned from and taught to the Native American perspective. (28)
- Sustainability and climate neutrality are also being integrated into all MSU curricula as evidenced by new courses and new content within existing courses. In the spring of 2010, over 150 faculty from across the MSU-Bozeman campus came together to explore their common interest and desire to improve the integration of sustainability and climate-change science across the university curriculum. (28)
- “As a student organization, AIC attempts to engage in activities related to environmental awareness including recycling, highway clean-ups, and participating in campus-wide sustainability actions.”(29)
- As a land-grant university, MSU-Bozeman is especially focused on community outreach and education. Various outreach endeavors at MSU are particularly relevant to climate education and greenhouse gas reduction, as listed below: (30)
- MSU Extension Services supplies various outreach and training opportunities to Montana residents and businesses relevant to climate change. (30)
- Numerous student-led initiatives and academic programs already exist at MSU and the demand for such opportunities is growing among students and faculty. (30)
- “MSU-Bozeman strives to partner in cross-cultural education to promote sustainability and climate neutrality. Coordinated by the Native American Studies (NAS) program, numerous programs integrate sustainability, and ultimately climate neutrality, as can be learned from and taught to the Native American perspective.” (31).
- “MSU Climate Action Plan: The Sustainability Center will facilitate continuing student involvement in the development of subsequent editions of this campus Climate Action Plan (CAP).”(31)
- “MSU Extension Services supplies various outreach and training opportunities to Montana residents and businesses relevant to climate change.”(33).
- In support of the MSU-Bozeman 2011 climate action plan, this section details ongoing and developing research activities related to energy and climate change (both on and off campus). (33)

- Currently, over 65 faculty have research focused on sustainability and the environment, and nearly one-third of current research grants target environmental themes and continued growth is expected. (33)
- “ASMSU operates a student-run Recycling program, plans programs and events, coordinates campus recycling, waste and water-use reduction programs, hands-on student community projects, and collaborates with various campus partners to develop initiatives that enhance sustainability at MSU and engage students in the process.” (34).
- President Cruzado noted that in the coming months and years, Montana State University will be expanding online distance education, a vehicle that enables us to reach out and meet the diverse educational needs of students in every corner of this state. (37)
- “[The CAP] will be revised and resubmitted every two years. Suggested revisions for the 2013 submission can be made through the MSU Campus Sustainability Advisory Council.”(p.40)

Summary: MSU’s CAP deeply engages a broad range of stakeholders, including the City of Bozeman and students, faculty, and staff on campus. Sustainability issues are addressed by MSU facilities, in MSU coursework, and in MSU faculty and undergraduate research. In the development of the CAP, the surrounding communities were also engaged to gather information such as transport surveys in calculating Scope 3 GHG emissions. Plans for future engagement are additionally outlined in the plan.

6. Does the CAP mention gaps in data, uncertainties, or other challenges encountered?

Does the CAP address where data may be insufficient or unavailable? Take note of barriers to planning and implementation, uncertainties in climate projections or future emission scenarios, inconsistencies in data collection, etc.

- The CAP will be updated biannually to provide information on progress toward the above goals and new initiatives at MSU-Bozeman. (1)
 - Updated once in 2016
- At this time, MSU does not track or record air miles associated with study abroad travel. Rather than leave this value at zero, the reporting team used estimated study abroad miles based on other reporting universities based on air miles per student. This estimate will be refined in future reports at MSU develops tracking protocol to capture study abroad travel. (7)
- Various inputs were omitted from this report due to a lack of data availability. MSU acknowledges these omissions impact the accuracy of this report, and are working to

- collect these data for future reports. The future inclusion of these in-puts may or may not significantly change MSU's GHG footprint. • Paper — MSU data not available. • Wastewater — MSU data not available. (7)
- The most critical improvements need to be addressed in accurate data collection for air travel miles and commute transportation patterns. (7)
 - These future phased tactics rely on advances in conservation based systems, substantial infrastructure innovation, and the implementation of large-scale renewable energy strategies. Due to the extensive analysis required to assess the viability of these options, quantitative analysis has not been completed at this time. (11)
 - “The diverse building set at MSU will require innovative approaches to retrofit depending on the particular buildings characteristics...These buildings will require a great deal of creativity by the design team to maintain historical integrity while implementing system design that will properly condition the space at an optimal energy efficiency and enable heat removed from the building to be reclaimed into the core water system for use elsewhere in the system.”(15)
 - “While Phases One and Two combined are forecast to generate about a 20 percent reduction in MSU's 2009 baseline greenhouse gas emissions (Figure 4.3), cost and technical barriers will dramatically impede the ability to achieve significant additional savings with the same tactics.” (16).
 - Strategies to implement GHG reductions for transportation are more difficult than modifying a building (i.e., installing energy efficient windows, new heating/cooling systems, etc.), as transportation choices are based on individual choices/behaviors. (17)
 - “The long range tactics of Phase Three are conceptual and no commitment will be made to continue their development until extensive analysis is completed and funding is secured.”(17)
 - “Financial savings to the University by reducing parking lot and University street maintenance would be somewhat offset by a reduction in the number of parking permits sold.”(18)
 - Implementing and promoting car pooling is estimated to cost between \$10,000 and \$20,000 per year. MSU may be able to work with the City of Bozeman and/or other large employers in the area to help pay for the car pooling software and incentives, and to increase the number of people participating in car pools. (21)
 - Bozeman commuter project?
 - “Data for paper purchasing was not available at the time of MSU's inaugural GHG Inventory, and it is recommended that this be monitored in the future.”(25)
 - Financial investment resulting in GHG emissions reductions will be prioritized according to the ability of options to cost effectively achieve multiple goals. (39)
 - No funding is presently identified for implementation of mitigation tactics. (39)

- All infra-structure investments made will consider these criteria and capitalize on funding opportunities by: 1) leveraging existing programs, such as the IoE for curricular and staffing opportunities; 2) pursuing the establishment of a Sustainability Endowment through the MSU Foundation funding structure; and 3) investigating external funding, through government and private grants, for CAP-related activities, including curriculum development, public outreach and partnering, infrastructure improvements, and research opportunities. (39)

Summary: When the original CAP was published in 2011, it stated that updates to the plan would be published biannually. However, only one of these updates has been published, and that was in 2016. Barriers were encountered in the technology that was available for setting goals and measuring emission. For example, in 2011, there was no data on paper or wastewater, two data points that were later addressed in the 2016 update. MSU funded air miles were also not tracked at the time of this report, and gathering information on commutes was cumbersome and imperfect. Necessary technologies and techniques for building retrofits were also not fully understood in the publication of this CAP. Funding sources were also unknown at the publication of this plan, though some potential avenues were listed. A number of potential community engagement options for reducing emissions were also discussed, but these were incomplete and more just musing.

7. What purpose do the appendices serve?

How extensive is the appendices section? Take note if they include extra graphs, tables, data, methodology, further detail and explanations, information on the planning process, etc.

- Not Collected

8. Interesting notes and observations:

Does this CAP discuss anything else of interest? What observations did you make that might be of value further exploring? What about this CAP seems particularly unique or noteworthy?

- By setting a strong example through tangible progress toward net zero GHG operations, work-ing with the IoE to effectively educate, train, and graduate students in interdisciplinary sustain-ability areas (including climate change), and successfully integrating with the surrounding community and region, MSU and the MUS is poised to become a leader in transforming the world toward understanding the science of climate change and seeking solutions that result in sustainable living, choices, and

- technologies that will ultimately mitigate climate change to the degree humanity has contributed to its causation. (2)
- Climate Leadership
 - It can be argued that many Scope 3 emissions are not under direct MSU control and should therefore be excluded. Holding the university accountable for personal commute choices and habits could be argued as outside the control of the reporting institution, and should not impact its footprint. MSU believes that it is important to accurately account for all emissions resulting from university existence, and this should not exclude emissions from choices of the campus population, and are therefore included in this report. (3)
 - The commuter survey did not account for commuting via light rail or commuter rail. If and when this becomes an option for campus commuters, it should be added to the response options. (7)
 - The projects that are included in the Phase One implementation are listed in Figure 4.1. Many of these projects are presently being designed, constructed, or otherwise initiated. (13)
 - Phase Three focuses on the strategic integration of renewable energy systems, and possibly carbon sequestration tactics, with the conservation driven work of Phases One and Two. The key to a successfully integrated approach to carbon management at MSU is continual systems thinking. (13)
 - The future energy system at MSU will be a decentralized model developed around a core water loop designed to transport energy from building to building while having the capability of accepting energy from, or depositing energy to, a variety of sources. (14)
 - The following GHG projections, or ‘wedge’ dia-gram (Figure 4.5) provides a conceptual view of the results of implementing the Phases Discussed above, as well as Scope 3 mitigation tactics discussed in that section. (17)
 - With inclusion of these concepts, it is possible that MSU may be able to approach, and possibly surpass 50 percent reduction of 2009 GHG emissions. (17)
 - Therefore, student trips for employment, shopping purposes, or activities are not captured. These trips by students may create as much, or more, GHG emissions than their commutes to MSU, and should be calculated in the future. (18)
 - While it is recognized that numerous classes require hands-on (on campus) learning, commuting GHG emissions could be reduced by maximizing the number of online classes (19)
 - Montana State University made the ability to car pool easier when it switched its parking permits from a “sticker” to a “hang tag.” Multiple vehicles can be registered to a single hang tag/parking permit (20)
 - No longer the case (license plate)

- As their contents decompose under anaerobic conditions, landfills emit CO₂ as well as methane, an even more potent greenhouse gas. According to the EPA, municipal solid waste landfills were the second largest source of human-related methane emissions in the US in 2006. (23)
- “As a major research university, many faculty, staff and students are traveling to be part of conferences to learn of research, or to present research findings. Until many of these conferences embrace video-conferencing, or holding virtual conferences, there will still be a tremendous need to travel by air to these meetings/conferences.” (25).
- “Furthermore, the Montana Integrated Waste Management Act of 1991 stipulates that all State agencies and the university system shall prepare, implement, and maintain a source reduction and recycling plan that includes at minimum, “provisions for composting yard wastes and recycling office paper, cardboard, used motor oil and other materials for which recycling markets exist or may be developed.” (26).
- While this plan currently deals primarily with “technical” solutions, indigenous people have long stated that there are not only technical and practical but also “conceptual” solutions to climate change embedded in indigenous science, traditional knowledge and world view. (28)
- Includes a section on diversity: “The MSU-Bozeman campus is host to a diversity of people and cultures, internationally as well as from within Montana. MSU Native American and Native Alaskan students, staff and faculty represent numerous tribes from all seven reservations in Montana, in addition to elsewhere across North America.” (28)
- Montana State University has been granted approval to begin raising funds to build a Native American Student Center to house programs and services to enhance and improve Native student academic performance, retention and graduation. (29)
 - Is that the building currently going up by Roberts? Is it behind or on schedule?
- “At MSU-Bozeman, the high level of research activity underway in environmental areas complements a growing interest in climate change, adaptation, and sustainability among our students and faculty. MSU is therefore building upon the research and education activities already under-way at MSU (including the new EPSCoR Track 1 infrastructure grant) by developing an interdisciplinary undergraduate program in sustainability” (30).
- Continued participation in the Uncommon Sense Business Leadership for a Sustainable Future program, which establishes methodologies for tracking, reporting, and improving practices in waste management, responsible purchasing, social and community investment, inventorying GHG emissions, and improving energy, water, and transportation efficiencies; (40)
- Creation of an Office of Sustainability. Such an office, with at least one FTE hire and physical office would supply a direct liaison between students, the IoE, advising on curricular choices toward the foreseen Sustainability Certificate, pairing students

with identified research opportunities, and MSU Extension Services. This is a separate function from the ASMSU Sustainability center (described earlier), and would therefore require separate staff to perform these tasks. (40)

- Begin immediate changes in travel data acquisition in order to accurately track/audit air transportation mileage, commuter driving, and waste tracking. Specific changes in data acquisition are supplied in previous chapters of this CAP, and improved methods will be developed in the coming biennium through participation in the Uncommon Sense workshops. (40)
- Significant reduction were made in purchased electricity in 2012 when North Western Energy, the Montana public utility company that provides electricity to MSU, changed its energy portfolio to include significantly more renewable energy. (Update, 10)
- Energy efficiency and emissions reductions projects have included building and lighting retrofits, improved heating and cooling systems in buildings, installation of geothermal water heating systems, and increases in the amount of renewable energy supplied to MSU via its energy partners. Currently, approximately 25% of MSU's total energy comes from renewable sources—primarily wind and hydroelectric. (Update, 14)

Summary: This section contains a variety of information that did not fit the above designated buckets. Many of these quotes describe proposed projects that have been implemented or started in the decade since the publication of this CAP. This section also discusses the importance of Climate Justice as well as incorporating the needs and sustainable practices of indigenous people here in the MSU and Bozeman communities. Additionally, an increase in renewable energy sourcing made by NorthWestern energy was also mentioned in this section.