

Calculating the CO₂ Emissions from Commuting to Campus Pre and Post Covid19

Sebastian Espinosa
Proposal for the Green Fund 2020 Student Research Grant
Northern Arizona University

Abstract

Rising temperatures due to rising CO₂ concentration in the atmosphere will undoubtedly have negative consequences on the health and well-being of NAU community member. One way that NAU could mitigate this is by quantifying the amount of CO₂ that is emitted through the commuting of NAU staff, faculty, and students to campus. The purpose of this project is to calculate the CO₂ emissions pre and post covid19 by releasing a survey to the NAU community asking about their commute to campus was like before the pandemic and what it is like now. While it is difficult to presume the outcomes of a study like this, there are some expected results. Such as, the amount of CO₂ emissions will be lower post Covid19 due to the fact that classes are being held virtually and less people are coming to campus. Another expected result from this survey is that there will be a decrease in community members utilizing public transportation because they will want to reduce their exposure to other people and opt for safer commutes such as bicycling, walking, or driving. This project will have very strong implications to the NAU community because once the CO₂ emissions are calculated they can be assessed, and the Office of Sustainability can implement measures within the realm of commuting to reduce greenhouse gases. In addition, this information would also provide NAU an opportunity to see how its community has been affected by covid19 and if there are ways to support them by establishing practices related to commuting.

Literature review

Measures should be taken to diminish and limit the amount of GHG emitted because of the correlation between rising greenhouse gas. On average, institutions for higher education emit 52,434 metric tons of CO₂ equivalence per year. According to the Journal of the Air and Waste Management Association, commuting faculty, staff and students account for an average of 9,444 MT of CO₂ equivalence per year, or about 18% of a university's total average. (Sinha et al. 569). Emissions from commuting to and from campus are important to take into account because they are considered activities that, while not controlled by the university, are indirectly impacted by it. A study conducted by the McGill University aimed to quantify the GHG emissions from commuting to their campus by administering a survey to the university body. The survey asked participants questions about their commute such as, "how long is your commute," "how do you get to campus," and "how often do you make the commute." Researchers were then able to quantify commuters' contribution to the school's carbon footprint (Mathez et al. 18). One of the main focuses of the McGill study was on how seasonality might affect one's commute. Since Seasonal change can cause shift to commuting patterns, one might suspect that a global pandemic such as Covid19 could have similar affects to a person's commuting behavior. Establishing a survey inquiring about the university population's commuting habits pre and post Covid19 could not only quantify the effect of the pandemic on scope 3 emissions but also reveal ways for the university to support its' students, and faculty.

Research Goals

- To be able to assess and quantify the scope 3 greenhouse gas emissions from commuting to and from campus
- Determine how the Covid19 pandemic has affected commuting habits and patterns of students and faculty.
- Gather data on how and from where students are getting to campus
- Develop figures and maps to visualize and increase understanding of data

Methods

- Create and establish a user-friendly questionnaire asking about the university population's commuting habits and patterns before Covid19 and after
- Electronically send survey to NAU community body

- Use results from survey to calculate the scope 3 CO₂ emissions from commuting before covid19 and after covid19 with tools like Excel, Python, and 2020 Climate Registry emission factors
- Utilize programs like ArcGIS Pro to develop maps and figures that will help visualize the results from survey and calculations

How This Will Improve Sustainability at NAU

Implementing this project through the Green Fund will have several benefits for the NAU community. The results that will be obtained from this project will provide valuable information about how students, staff and faculty commute to campus and the CO₂ emissions from these sources. The Office of Sustainability will be able to use these results to develop and promote ways of commuting that lessen the CO₂ Emissions of the University. Additionally, the information gathered can also be used to help NAU best support students by allocating resources to the types of commuting that are most favored during these unprecedented times.

Contact Information

Project Leader Name: Sebastian Espinosa Phone: 602-738-2311
E-mail: sje78@nau.edu

Project Advisor Name: Dr. Deborah Huntzinger Phone: 928-523-1669

E-mail: deborah.huntzinger@nau.edu

Position: Associate Professor Department: School of Earth & Sustainability

Project Name: Calculating the CO₂ Emissions from Commuting to Campus Pre and Post Covid19

Questionnaire

Please select the focus of your research project, then address the following questions.

- ☐ Analyzing NAU's energy usage and identifying areas of improvement
- ☐ Feasibility of large-scale renewable energy projects on campus
- ☐ Environmental impacts of online learning
- ☐ Mental health impacts of online learning
- ☐ Understanding food insecurity of the NAU community
- ☒ Transportation impacts of COVID19
- ☐ Consumer safety of single-use plastic versus reusable materials
- ☐ Quantifying carbon sequestration on campus
- ☐ Carbon emissions of manufacturing construction materials used on campus
- ☐ Analyzing carbon emissions of the NAU Fleet
- ☐ Analyzing water capture and reduction on campus
- ☐ Understanding sustainability behavior/perspectives of NAU students
- ☒ Other: Quantification of Scope 3 greenhouse gas emissions

1. How will your research benefit the mission statement of the Green Fund and improve sustainability on NAU's campus?

This project will benefit the mission statement of the Green Fund improve sustainability on NAU campus by providing quantified GHG emission from commuting. The data and results of this project will give NAU a more accurate picture of what its' carbon footprint is and provide an opportunity to lower it by incentivizing greener modes of commuting.

2. Will your research require the utilization of any spaces or infrastructure on campus? If so, identify the specific locations and/or infrastructure, how much of the space you require, and what each space will be used for.

N/A

3. Will other departments on campus (other than your own) be needed to assist in this project (i.e. Facility Services, Campus Transit)? If so, identify department partnerships.

I want to send out the survey to the Climate Science and Solutions program to act as a trial run before sending it to the entirety of the NAU population.

Project Budget

Please respond to the following funding question, and complete a thorough breakdown of all project costs in the provided Line Item Budget below. **Include a 5% line item for contingency.**

1. Does this project have any other sources of funding, and/or have you applied for other sources of funding? If so, list all additional sources of funding, both confirmed and potential, outside of the funds being requested from the Green Fund.
N/A

Line Item Budget:

Item	Justification of Item	Quantity	Price per Unit
Student Wages	Graduate student pay grade	100 hours	\$15.00/ hour
Possible additional payed time	Contingency if more time is needed	5 hours	\$15.00/ hour

Total Funding Requested: \$1500.00

Project Timeline

Please provide an expected timeline for your research in the template below. The Green Fund recognizes that complex projects of this nature should have flexible, adaptable schedules, and the timeline provided will be treated as such. However, it is expected that you strive to adhere to this schedule as much as possible.

Expected Timeline:

Action	Parties Involved	Month/Year
Construct and perfect Survey `	February/2021	
Send out survey to smaller sample size	CSS Program	February/2021
Send out survey to university body	NAU faculty and students	March/2021
Apply Survey Results to NAU demographics		April /2021
Calculate CO ₂ emissions		April/2021
Create maps and figures to visualize results		April/2021

Expected Project Completion Date: 04/20/2021
commit to presenting the status of

Commitment to Present Research

Please read and sign the statement below, acknowledging your commitment to present the findings of your research.

If selected as a recipient of the 2020 Green Fund Student Research Grant, regardless of the outcome of my research project, Sebastian Espinosa commit to presenting the status of

my research described in this application in the form of both an oral presentation to the Green Fund Committee and a poster/exhibit presentation at the Undergraduate or Graduate Symposium, no more than 1 year after receiving notification of funding.

The oral presentation to the Green Fund Committee will consist of an approximately 10 minute long PowerPoint that includes the following aspects of your project:

- Original goal and purpose of research
- Conflicts or changes to original purpose
- Results/Conclusion
- All relevant graphical displays of data

Project Leader Signature: Sebastian Espinosa

Thank you for your submission. We deeply appreciate your commitment to sustainability at NAU, and we look forward to reviewing your application. Please direct any further questions to GreenFund@nau.edu.