Cal Poly Pomona Carbon Footprint Analysis

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Kellogg Honors College Capstone Project

Introduction & Background

As awareness of the impact greenhouse gas (GHG) emissions have on the global climate grows various parties, organizations, and nations are making an effort to analyze their own carbon footprints and find ways to reduce them. In 2007 the California State Polytechnic University, Pomona (CPP) released a GHG Emissions report that summarized the University's anthropogenic GHG emissions for the fiscal years 1995-2005. That report served as a baseline to compare the changes in the University's GHG production in future years. In 2009 CPP released its Climate Action Plan which set a goal of achieving climate neutrality by 2030 and followed up with progress reports in 2012, 2014, and 2016.

The original report and updates use the Clean Air-Cool Planet (CA-CP) Campus Carbon Calculator which was initially chosen because it had a proven track record at other large universities. CA-CP is a non-partisan, nonprofit organization and their calculator is consistent with the Greenhouse Gas Protocol and World Resources Institute as required by the President's Climate Commitment which was signed in 2007. The CA-CP Carbon Calculator is a MS Excel spreadsheet used as a template for organizations to determine their carbon footprint. The basic process for determining an organization's carbon footprint is to collect all of the necessary data, convert the data into the appropriate units, apply carbon emission conversion factors which are unique to each different greenhouse gas and source type, then to convert all of the non-carbon dioxide emissions into eCO_2 by applying additional conversion factors. This spreadsheet has all of the base work completed so all the organization needs to do is determine and fill in the input factors. With this being said, some of the data required can be difficult to determine and various approximations and assumptions are often required.

Objective & Study Area

The objective of this project was to determine the carbon dioxide equivalent (eCO_2) for the CPP Campus during its 2013-2014 fiscal year which runs from July 1st to June 30th. It built off of the data provided in the 2015 GRG report (which studied the 2013-2014 CPP fiscal year) and utilizes additional information from previous reports, campus resources, and other research papers to more accurately determine the University's carbon footprint. In some cases, when data could not be found, assumptions were made. The data used includes emissions that are a direct result of sources owned or controlled by the institution, indirect emissions from outside sources generated by activities occurring within the institution's boundaries, and indirect emissions related to other operations of the institution.

The study considers the operations of Cal Poly Pomona and its affiliates, Cal Poly Pomona Foundation, and Associated Students, Inc. (ASI) which all operate out of the Cal Poly Pomona campus. The study area includes the main Cal Poly Pomona Campus with the exception of the Innovation Village which is leased out by CPP Foundation and operated by private enterprises. Additionally, off-campus property owned or leased by the University has been excluded but is estimated to make up less than 5% of the institutions total annual GHG emissions.

Data

Scope 1: Emissions Created by University owned or controlled sources.

Stationary Combustion:
- Natural Gas: 95,271 MMBtu
- LPG (Propane): 159 gallons

Direct Transportation: Resources used by the University's Fleet
- Gasoline: 65,648 gallons
- Diesel: 10,946 gallons
- B20: 7,524 gallons

Refrigerants & Chemicals:
- HCFC-22: 60 lbs
- HFC-134a: 15 lbs

Agricultural Sources:
- 80 beef cows
- 35 swine
- 35 goats
- 60 sheep
- 110 horses

Scope 2: Indirect emissions that are a consequence of activities taking place within organizational boundaries.

Purchased Electricity: 42,190,175 kWh

Scope 3: All other Indirect Emissions

Faculty/Staff Commuting: (1208/1410 commuters)
- **Average Faculty Commute Distances:** 25 miles (alone), 20 miles (carpool)
- **Faculty Trip Distribution:** 90% Drive alone, 9% carpool, and 1% ride their bikes
- **Average Staff Commute Distance:** 18 miles (alone and carpool)
- **Staff Trip Distribution:** 70% drive alone and 30% carpool

Student Commuting:
- **Average Student Commute Distance:** 13 miles (alone/Carpool); 16 miles (bus)
- **Student Trip Distribution:** 63% drive alone, 16% walk, 11% carpool, 6% ride the bus, and 4% bike

Financed Outsourced Travel:
- **Air Travel:** 2,770,724 miles
- **Reimbursable Automobile Miles:** 370,488 miles

Study Abroad Travel: 2,131,748 miles

Solid Waste Generated: 4,596 Tons

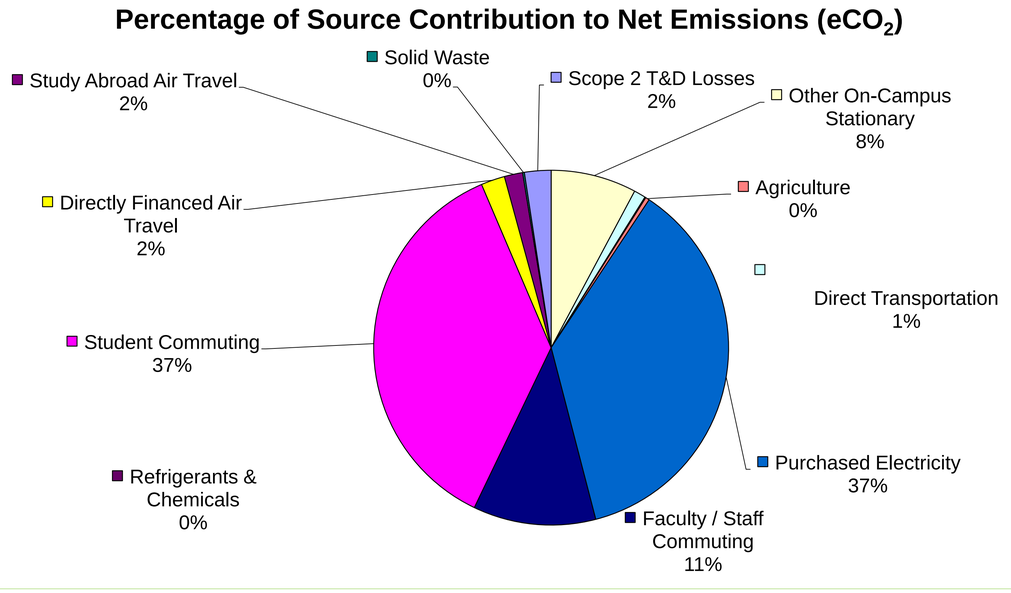
Total Waste Refuse: 3,535 Tons

Mitigation Data: Sources of data that reduces the University's net carbon impact.
- On-Campus Compositing: 1,257 Tons

Normalization and Contextual Data:
- **Campus Size:** 1,438 Acres
- **Building Space:** 4,930,501 sq. ft.
- **Full-Time Students:** 19,425
- **Part-Time Students:** 3,076
- **Post baccalaureate Students:** 1,558
- **Students living on campus:** 3,588
- **Campus Faculty:** 1208
- **Campus Staff:** 1410

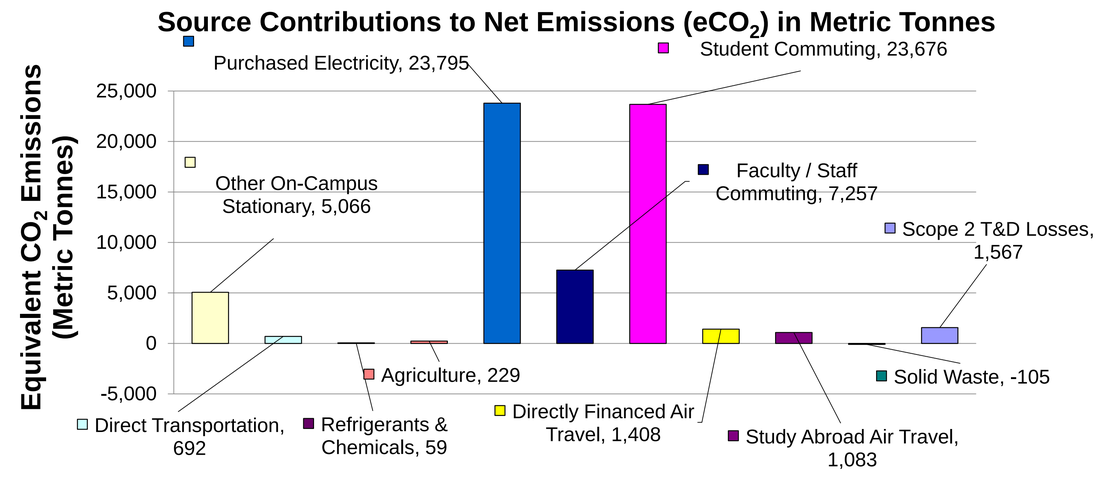
Exclusions: The energy required and carbon output of the following: Transport/treatment of water and the production of food, paper, and other resources used on campus.

* This list shows the most significant data and excludes or groups low-impact data sets.



Data Assumptions and Considerations

Scope 1: All Scope 1 data was obtained from resources on campus and no assumptions were made.
Scope 2: Purchased electricity includes the offsets from CPP energy production on campus as well as the energy used to charge electric vehicles and the University's fleet.
Scope 3: Multiple assumptions made and described below.
Faculty/Staff Commuting:
Population: The values were provided in the 2015 GHG inventory. This inventory however did not include faculty commuter data for the summer. To obtain what is thought to be a conservative estimate for total faculty commuting emissions based off of the available data, 50% of the average yearly faculty, 604, was averaged into the dataset.
One-Way Trips/Week: Data for the 2013-2014 fiscal year was not found and the 2015 GHG inventory used the value of 5 for faculty. The faculty value was changed to be 8 which is slightly conservative compared to the value determined in the 2009 GHG Emissions Report based on a faculty survey. The staff value was left at 10 although the average value determined in previous reports was slightly lower than this.
Trip Distribution: Staff and faculty trip distribution data for the 2013-2014 fiscal year was not found and the 2015 GHG inventory used percentages of 0 for staff bus use, biking, and walking. Faculty values provided in the 2015 GHG inventory include 90% driving alone, 9% commuting, and 1% biking. These values may not be accurate as no confirming sources were located but they are thought to be acceptable. Previous reports and studies show the percentages of faculty and staff using alternative transportation modes to be less than 1%.
Student Commuting:
Population: The GHG inventory reports excluded summer school student commuting information. Obtaining the summer school headcounts for the 2013-2014 fiscal year was difficult, potentially because the school transitioned to using full-time-equivalent student counts in 2006 and then changed how they reported summer enrollment numbers in 2009. From 2000-2009 it was determined that the percentage of students attending summer school ranged from 30-40% of the same year average enrollment. Aiming for a conservative estimate for the summer 2014 enrollment this project used .4 x 21600, to determine what is thought to be a conservative number of 8,640 students. These additional students were averaged into the dataset to obtain the summer commuting emissions.
One-Way Trips/Week: Data for the 2013-2014 year could not be found and the 2015 GHG inventory used the overly conservative value of 10. This was changed to be 8 which was still slightly conservative compared to the values determined in the 2009 GHG Emissions Report which were based off a survey of students. Previous studies determined the commute distance was larger but the 2013-2014 average distance of 13 miles was confirmed with on-campus resources.
Student Transportation Type: Although data for the 2013-2014 year could was not found the 2015 GHG inventory data appeared to be valid after comparing to other sources.
Financed Outsourced Travel: Provided by campus resources, no changes made.
Study Abroad Travel: Provided by campus resources, no changes made.
Waste Data: The waste report for the 2013-2014 year was not found. Reports were found for the 2011-2012 and 2014-2015 fiscal years. The 2014-2015 data was used as it was conservative compared to other estimates and this source makes up a small portion of overall eCO_2 .
Normalization and Contextual Data: Data obtained from various campus resources and was not adjusted.



Results & Discussion

This project found the University's total estimated net carbon equivalent emissions to be 62,931.9 metric tonnes with the major contributors being student commuting, faculty/staff commuting, and purchased electricity. It makes sense that these are the greatest contributors to the University's carbon footprint because the majority of students, faculty, and staff all commute and a significant amount of electricity is required to keep equipment and facilities operating. These results are lower than the 63,608 metric tonnes estimate found in the original 2015 GHG report which was submitted on the 2013-2014 fiscal year but they are reasonably close. This is due to the fact that changes made to the original data increased emissions in some areas but reduced them in others. Although Cal Poly Pomona had grown in physical size and population relative to 2009, its carbon footprint estimates have decreased compared to the 65,008 metric tonnes estimate of eCO_2 found in that year. This shows the University is on the right path to reducing its Carbon Footprint. However this report and the GHG reports submitted by CPP are still neglecting multiple sources and factors which affect its net carbon footprint and although consistent reporting procedures allow for the best year to year comparison, they do not provide the most accurate results. A problem faced when collecting and reviewing data for this project is thought to be connected to the University's domain name change in 2014. Multiple links to reports and other documents in the .csupomona.edu domain did not register in the .cpp.edu domain.

Future Work

- Obtain sample population survey data specific to the study year for the most accurate transportation emissions results.
- Consider every source that changes over the course of the study year by averaging the values.
- Determine the quantities of products sold and used on campus such as pencils and estimate the eCO_2 produced during their creation.
- Estimate the eCO_2 produced in the transportation of water from its origin to Cal Poly Pomona and determine a weighting factor so that the appropriate amount of eCO_2 is applied to CPP's carbon footprint.
- Estimate the eCO_2 produced during the construction of all CPP infrastructure and distribute it over an estimated lifetime.

References

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