

Carbon Footprint

DUE: Rough draft Tues. Jan. 18 in mentor lab; Final version Tues. Jan. 25 (50 points total), on paper, in class

Overview: For this assignment you will create a report (4-6 pages of text, excluding graphs and tables) about your activities that contribute most prominently to carbon dioxide (CO₂) and other greenhouse gas release into the atmosphere. This will include your direct consumption of fossil fuels, for instance, when you drive, take a bus, or heat your residence, as well as secondary sources such as when you own a car or eat meat (as greenhouse gases are released in manufacturing cars or raising livestock). You will need to make estimates of some of your activities and their impact, and in your report you will explain how you made your estimates as well as your assumptions. Your report will communicate your results in writing, tables, and graphs. Finally, you will introduce and discuss your results in the context of the recent United Nations Climate Conference in Cancún, Mexico. You will draw on and cite outside references, including at least two concerning the recent United Nations Climate Conference in Cancún. (More details below.) Your paper should conform to guidelines in the syllabus (e.g. double-spaced, 12 point font, 1" margins).

Learning objectives: This assignment is designed to help students:

- Think critically about how to make estimates, collect data, analyze results (critical thinking and inquiry)
- Better understand political difficulties in addressing climate change, especially the interaction with economic growth and development, past, present, and future (critical thinking and inquiry)
- Practice numerical calculations and representing data in graphs and table (quantitative literacy)
- Practice prescriptive and analytical writing skills (communication)
- Reflect on how economic circumstances and resource availability vary greatly between countries and cultures (diversity of human experience)
- Appreciate how news events are reported from different perspectives (critical thinking and diversity of human experience)
- Reflect on how personal decisions impact the larger society and environment, and the ethical issues this raises (ethical responsibility)

Before Writing Your Report:

- Do some research on the idea of carbon footprints, carbon dioxide (and other greenhouse gases) release into the atmosphere, and its relationship to resource consumption. In particular, investigate what happened (or did not happen) at the recent United Nations Climate Conferences in Cancún. Your report should have at least two sources directly related to the Cancún meeting with clearly different perspectives. At least one of them should be from an established news source outside of the U.S. In addition, research the average per capita carbon footprint of the US and at least one developing country. Be sure to comment on whether or not these footprints have been changing in recent years, and if so what are the trends. The idea is for you to frame (both in your introduction and discussion) your individual carbon footprint results in the context of the recent efforts by

countries to agree on specific targets for reducing carbon dioxide (and other greenhouse gas) emissions. Find information from reliable sources, but for this assignment they do not have to be academic research papers.

- Look through and experiment with the online carbon footprint calculator at <http://www.carbonfootprint.com/calculator.aspx> in order to start gathering the necessary data to calculate your footprint. You will necessarily have to make some rough estimates. Be sure to explain your reasoning and methods behind these estimates in your methods section.

Your Report Should Contain the following sections in this order, each with a clear heading. Do NOT combine sections and please think carefully about what goes in each section. For instance, resist the temptation to discuss your results in the results section. Present them in the Results section; discuss them in your Discussion section.

- **An abstract** that summarizes (briefly) the findings in your report (e.g. your main contributions to atmospheric CO₂ and the main points in your discussion). Mention these main points in your abstract, but do not explain them here. Your abstract should be limited to 200 words and should stand on its own as a summary. It may be a good idea to write this last. Abstracts generally do not have citations and should focus mostly on your results and your main discussion points.
- **An introduction** that helps the reader understand what is coming in your report and why it is important. Include some motivation and framing for your report, especially how knowing one's carbon footprint might be important in the context of recent efforts to agree on reduction targets in the recent Cancún meeting. The introduction is the actual start of your paper (not the abstract), so you should again summarize your main findings and points. After reading your introduction, the reader should have a good idea of what is coming and the framework in which it is set. Be sure to properly cite information sources.
- **A methods section** where you explain how you estimated the numbers you used in calculating your carbon footprint, including any assumptions you made. A skeptical reader using your methods section should be able to recreate your results. Be sure you provide enough information for them to do so. This section should include how you decided the values used in the online carbon footprint calculator. Below are more instructions on how to make your estimates. You may find bullets useful in this section.
- **A results section** where you report on your carbon contribution from various activities. Your results section should include at least one table listing your estimated annual CO₂ contributions from the following categories: home, flights, car (and motorcycle if relevant), bus and rail, secondary contributions, and total. If you do not fly or use public transportation these categories may have a value of zero. Your results section should also contain at least two figures:
 - o A pie chart showing the percentage of your total contribution from each of the categories in your table (see above). Display the percentage or ton values for each section.
 - o A column or bar graph comparing your estimated CO₂ contributions to averages in the US, the world, and the developing country you chose to research. If

possible compare these for each of the activities listed in your table (see above).
Use tons as your units, not percentages.

You can enter your data into a spreadsheet (e.g. Excel) to create your graphs as we have covered in mentor session. Label each table and graph with a number and include a short caption or legend. Be sure you explain your results in text that is part of your results section, and that refer to your numbered tables and graphs. Lastly, be sure your graphs are easily readable in black and white (as well as color if you choose).

- **A discussion section** where you discuss your results. Here you explain what the results mean to you. Be sure to tell your reader about anything that surprised you, anything you learned by doing these calculations, and whether or not you are inspired to change any of your habits or behaviors. Whether you plan to change any behaviors or not, you should discuss what changes would hypothetically reduce your CO₂ emissions the most and where, based on your habits and lifestyle, would changes be easiest and hardest for you to make. You can use the footprint calculator to play around with different scenarios. Your discussion should also include your thoughts on your energy consumption and emissions in the context of the recent UN Climate Conference in Cancún, targets for reductions, and current averages for the US, world, and developing countries.
- **A reference section** where you include a properly formatted reference for all your sources, including those on Cancún and course materials (e.g. Kolbert text).

Some Practical Instructions:

- You will be using the online calculator at [carbonfootprint.com](http://www.carbonfootprint.com/calculator.aspx) to calculate your carbon footprint. The calculator is here: <http://www.carbonfootprint.com/calculator.aspx>. The calculator lists emissions at the bottom of each page. If you make a mistake on a page use the “remove” link and then use the calculate button again. Especially where you may have multiple listings (e.g. flights), it is important to verify the final calculations. Note that this website is designed for an international audience, but gives results in the context of your individual state and country. It uses British English so, for instance, the word “petrol” is used instead of “gas” and tons is spelled “tonnes”. Also, as most of the world is on the metric systems, these are metric tons. US units are included for your entries. Be sure you select the proper units from the dropdown lists and that you enter total amounts for an entire year.
- For some items you will have to enter you best estimate of a numerical value. To help you in being objective you will often need to divide the year into different categories, estimate the amount for each category, and then calculate your final result accordingly. For instance, we will be using the calendar year 2010 where most of the year you lived somewhere else besides campus. For those months you will need to do your best to find out the utility bills and your individual share. For your time on campus, you will need to estimate the degree to which your consumption has changed.

Here are a few examples.

- o Suppose you lived at home before coming to PSU and you want to calculate your electricity use during this period.

- If you have access to the electric bills, this is easy. Add up the kilowatt hours for the time you lived at home, and then divide by the number of people in your family. Your results are in kilowatt hours.
 - If you don't have access to the electric bill, you might split the months into cold ones (Nov. through Mar.) and warmer ones (Apr. through Oct.). Next discuss with your family how much your household typically paid for electricity in cold months and how much in warmer months. Then calculate the total electric bill for the months you lived at home. Your results are in US dollars.
 - Depending on which method you use above, you will need to estimate your usage in the residence halls for the last months of 2010 and add those on to your total (either kilowatt hours or dollars).
 - Be sure in your Methods section you explain how you got your total, including how you estimated your use in the Residence Hall.
- Suppose you typically took a bus to school or work before moving to campus. You would divide the period into days you took the bus and days you were off. Then to calculate your yearly miles (or kilometers) riding the bus you would multiply the miles (kilometers) of one day's roundtrip times the number of bus riding days in the year. Enter your results in miles (or kilometers).
 - You do not need to explain everyday details such as that you entered the numbers into a calculator or spreadsheet—just give the logic behind your calculations.
 - For calculating Secondary emissions there are qualitative questions about your habits. You DO NOT need to explain your answers to these questions in your methods section.
- Start each section where the previous one ended—do not waste paper by starting sections on their own page. Graphs and tables should be readable, but not take up too much space. They also need appropriate labels, units, and brief captions. Please put them close to where they are referred to in your writing rather than all at the end.

Grading Rubric:

Carbon Footprint Grading Sheet	Score
Rough draft was ready for review; gave peer review feedback (5 pts)	
Abstract: captures main points (5 pts)	
Intro: points the way, general info on problem, info and citations re Cancún (10 pts)	
Methods: explains your assumption, calculations and extrapolations (10 pts)	
Results: personal carbon footprint for various activities, text refers to labeled table and 2 graphs with required comparisons (10 pts)	
Discussion: results meaning; compare to US, world, and developing country; framed in context of Cancún (10 pts)	
TOTAL out of 50	
Comments: (see comments on papers) (two diverse sources on Cancún; one non-US)	