MONT 105N – Analyzing Environmental Data
First Writing Assignment
Due: no later than 5:00pm on Friday, February 28

Background

Since our class has taken on the analysis of the "carbon footprint audit" data, many of our assignments will be based on various stages of this, building up to the projects we present at the EarthLab final event toward the end of the semester. (Exactly how and when that will take place is still under development.) This means, as I said last fall, that we all need to be ready for a fair amount of *improvisation* as the semester progresses. This means, for instance, that the assignment I called "Paper 1" on the original tentative course schedule will actually be more of a *technical report* on some next calculations with the data. This will involve some research, some work with this data, and then writing up the results in a standard format. The due date has also been moved one week later, to Friday, February 28. Note: The first journal collection is also due that day, but you should have been working steadily on that since the start of the semester, ...

How this will work

First, recall that we have data for 125 out of the total of roughly 160 students in the Natural World Cluster seminars. This is a response rate of 78%, which is actually not bad at all for an "effectively voluntary" survey of this kind(!) [1] Since we don't have data for 22% of the people, we will need to use the data we do have to estimate things like the total time spent showering, the total number of meals at which meat was eaten, etc. for the whole cluster. *You will need to take this into account as you think how to answer the questions posed for your team.*

For this assignment, you will work in *four teams* of four people each:

Team 1: Christian, Matthew B., Augusta, and Margo
Team 2: Jack, Tom, Kate, and Matt V.
Team 3: Sean, Maggie, Robert, and Owen
Team 4: Brooke, Caroline, Sinead, and Ming

Each team will analyze one of the items from the first section of our big data set:

Team 1: The electric devices information (row 6 of each page of the master data spreadsheet) – you'll first want to determine the overall five-number summary, mean, and SD of the number of electric devices for the whole week. (Recall the first-phase teams did this for their assigned days; you'll want to do the same sort of calculations for the whole

[1] I say "effectively voluntary" since even though the professors did do a fair amount of cajoling to get students to respond, to my knowledge, there were no penalties if they did not do so.

week.) Then you'll need to estimate an average amount of electric energy being used per person per day based on how much electric energy different types of devices (e.g. mini-refrigerators, desk lamps, floor lamps, computers, etc.) draw in a day. This will take some research. The College buys a contract with its electric power supplier that essentially means we pay for the equivalent amount of *hydroelectric power* generated by plants in Canada. These plants effectively have *zero carbon emissions* that can be attributed to the direct generation of electricity. For the purposes of reporting, this means that the College also has effective zero carbon emissions for the electric power we use. One interesting question to ask is how much better this is compared to the New England average of 1009.92 lb/Megawatt-hour carbon emissions for all sources of electric power from sources that include coal-fired, and natural gas-fired electric power plants. How much electricity would be we using if we were getting our electric power from New England average sources? Do this calculation for your estimated cluster-wide total for the week, then the per person per day figure.

Team 2: The information on meat eaten at meals (row 12 of each page of the master data spreadsheet) – you'll first want to determine the overall five-number summary, mean, and SD of the number of meals with meat per day per person for the whole week. (Recall the first-phase teams did this for their assigned days; you'll want to do the same sort of calculations for the whole week.) Next you will need to determine the carbon footprint of average servings of various types of meat. This will take some research, but this sort of information is widely available in many places. Since we don't have any information about what types of meat people at each meal, you will need to come up with an appropriate *weighted average* of these to represent the carbon footprint of one meat meal for one student. You will need to think about this and justify the estimate you use. Estimate the total carbon footprint of the meat eaten by all the students in the cluster for the whole week, then the footprint per person per day.

Team 3: The information on lengths of showers (row 10 of each page of the master data spreadsheet) – you'll first want to determine the overall five-number summary, mean, and SD of the length of showers for the whole week. (Recall the first-phase teams did this for their assigned days; you'll want to do the same sort of calculations for the whole week.) Recall the numbers on this row of the spreadsheet are the total numbers of minutes spent showering. You will next compute the total number of minutes spent showering for all students across all 7 days of the week. You will want to determine two types of information from this. First, how much total water is being used this way per person per day? Robert learned that the type of shower head used on his floor in the residence has a flow rate of 2.5 gallons of water per minute. Let's take that as a reasonable estimate for *all* of the shower heads. Next, let's try to estimate the carbon footprint of warming the water for showers to a comfortable level. How much energy does it take to raise a gallon of water from 50° F to a comfortable temperature of $110^\circ F$ for a hot shower? I think that's a reasonable estimate for what most people would use for a shower; most people don't like cold showers for the obvious reasons, and not everyone likes extremely hot showers either! (For instance, a shower water temperature of $120^\circ F$ would cause skin burns in under 5 minutes.) Are the hot water

heaters in the residence electric? gas-fired? What would be the carbon footprint of that energy source if we were using the New England average electric power? (See description for Team 1's question above!) Do this as a total, then per person per day.

Team 4: The information on single-use plastic containers (row 14 of each page of the master data spreadsheet) – – you'll first want to determine the overall five-number summary, mean, and SD of the number of containers for the whole week. (Recall the first-phase teams did this for their assigned days; you'll want to do the same sort of calculations for the whole week.) Also estimate the total number of containers used by all the students in the cluster. Next, you will need to make a reasonable estimate about the carbon footprint of one of these containers. I expect that almost all of these containers that were reported were plastic water or soda bottles and that almost all of them were 20 oz. size plastic containers (or at least the size would average out to that). If you think we should consider other sizes or other types of containers too, than that is fine, but you will need to come up with reasonable estimates for how much plastic is contained in all of them. Look up how much plastic is contained in a 20 oz. water or soda bottle and what the carbon footprint is of manufacturing and distributing them. This will take some research, but you should be able to find good figures in many different places. Report your findings as a total carbon equivalent value for the whole cluster for the whole week, and also as an individual figure per person per day.

The technical report

Please write up your findings as a "technical report" in a Google Doc. This should end up being roughly 4 to 5 pages. Please try to have all team members contribute to the write-up.

Important Note: Please *do not* write a narrative stating "we did this and then we did that, and then ... ." The report should give your final results and conclusions, backing up what you say in detail.

Follow this outline, including section headings *exactly as here*:

1. *Introduction* – state the question(s) you will consider (this can be a restatement of your team's assignment as above, but in your own words, and incorporating any changes or additions you decide to make along the way)
2. *The Data* – Describe how and when your data was collected
3. *Assumptions and Additional Information Used* – All of these topics will require you to gather some information related to the resource you are working with. Give the sources you consulted, justify why you think they are reliable, and clearly state any assumptions you are making.
4. *Calculations* – Indicate all the calculations you did and show in detail how the carbon footprint figures asked for in your team's assignment were derived.
5. *Discussion* – What conclusions do you draw from your calculations. How might what you did here factor into our EarthLab presentation or final event?