Lab Week 2: Carbon Footprints, Carbon Uptake by Trees' Leaves, and Campus Tour Overview

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PART I. CARBON UPTAKE EXERCISE

1. Estimating carbon uptake of a deciduous tree during the growing season

   Assumptions

   (a) Tree type [0.5pt] :
   London Plane Tree

   (b) What is the surface area of a typical leaf? (cm2) [0.5pt] :
   $122.5 cm^2$

   (c) Roughly how many leaves do you estimate are on a typical tree? [0.5pt]
   720 leaves

   (d) What is your estimate of the carbon uptake of a single tree? (g/day) [0.5pt]
   $122.5 \frac{cm^2}{leaf} * 0.005 \frac{g/cm^2}{day} * 720 \text{ leaf} = 44.1 \frac{g}{day}$

   (e) Convert (d) to kilograms per day [0.5pt]
   0.0441 kg/day

2. Estimating the carbon exhalation of a person.

   Assumptions:

   (a) How many liters of CO2 are exhaled with each breath you take? [0.5pt] Hint: (volume of an average breath) X (CO2 in breath)
   $\frac{1}{2} * \frac{0.04}{100} = \frac{2}{1000} = 0.0002 \frac{L*CO2}{breathe}$

   (b) How many breaths per minute do you take? [0.5pt]
   11

   (c) How many breaths per day do you take? [0.5pt]
   $11 * 60 * 24 = 15840 \frac{breathe}{day}$

   (d) How many liters of carbon dioxide do you exhale each day? [0.5pt] Hint: = (breaths per day) X (liters of CO2 per breath)
   $15840 \frac{breathe}{day} * 0.0002 \frac{L*CO2}{breathe} = 3.168 \frac{L*CO2}{day}$

   (e) What is the weight of this many liters of carbon dioxide? (kg) [0.5pt] Hint: The density of carbon dioxide is 0.00187 kg / liter.
   $3.168 \frac{L*CO2}{day} * 0.00187 \frac{kg}{L} = 0.00592 \frac{kg*CO2}{day}$

(f) What is the amount of carbon exhaled by one person? (kg/day) [0.5pt] Hint: To convert from CO2 to carbon, multiply by 0.2727

$0.00592 \frac{kg*CO2}{day} * 0.2727 \frac{kg*C}{kg*CO2} = 0.00161 \frac{kg*C}{day}$

3. How many trees do you need to support one person? [0.5pt]

   Hint: Divide line 1.2(f) by line 1.1(e)

   $\frac{1.2(f)}{1.1(e)} = \frac{0.0441 \frac{kg*C}{day}}{0.00161 \frac{kg*C}{day}} = 27.4$ trees

4. about how many trees would be needed to uptake your household carbon footprint? (2pt)

   $\frac{66 \frac{kg*C}{year}}{0.00161 \frac{kg*C}{day}} = 40990$ trees

PART II. ENVIRONMENTAL FOOTPRINTS (4pt total)

1. What is your household carbon footprint (HFC) in metric tons CO2eq/year? Are you surprised by your results? How do they compare with the national HCF averages, or even zipcode average, if applies? What is the highest component of your HCF? Also use these results for running the hypothetical calculation in I.4 (p.2)

   The HFC for my household is 26 CO2eq/year. It is lower than the average HCF in both urban cores and suburbs, which is surprising to me. It could be because I live in high density living and that Berkeley accommodates for low HCF. The highest component of my HCF was my food, which I expect since food currently has a fundamentally large carbon footprint.

2. Assess what does the CoolClimate Network tool capture well, and what does it fail to capture for estimating carbon footprints per households? (2pt)

   The CoolClimate Network tool gives a very good estimate of the Household Carbon Footprint per each individual. It splits your footprint up into 6 different types of carbon producing activities. It fails to capture this value with respect to the institutions around us that make us produce what do we do in the first place. It could factor in policy and give us extra information.