Carbon Dioxide Emissions versus Sequestration

A comparative Study

Jamal Thompson, Jose Brunard, Cassandre Celus, Cassandra Hyppolite
and the students of Julius Buh-Mbi's 11th grade Chemistry class.
GK-12 Brooklyn College: City as lab , It Take A Village Academy (ITAVA)

Abstract

An investigation was conducted to determine whether the amount of CO_2 emitted by humans and cars is in balance with the amount of CO_2 that can be sequestered by local trees. To do this, two areas in two different neighborhoods were selected, one on the blocks surrounding ITAVA, and the other just south of Prospect Park (Fig 1). To gather data, tape measures were used to get the circumference and apparent height of the trees on the selected blocks. The weight of the tree was then calculated, along with how much CO_2 each can sequester. Then, categories were created to separate cars into 5 types, based on size and gas mileage. Each block was observed for 15 minutes, where each car was counted and categorized. From this data, the average amount of CO_2 being emitted by each car on each block was calculated. Finally, Census data was used to determine the population density of the selected areas, to determine the average amount of CO_2 being emitted by humans. Humans show practically no impact compared to cars. Through analysis of the data, it was determined that the trees more than make up for the amount of CO_2 being emitted by cars and humans. The two neighborhoods showed about the same proportion of CO_2 being emitted versus being sequestered. However, many other factors were not taken into account, including idle cars, electricity production, different traffic patterns, and would significantly add to the amount being sequestered.

Study Area

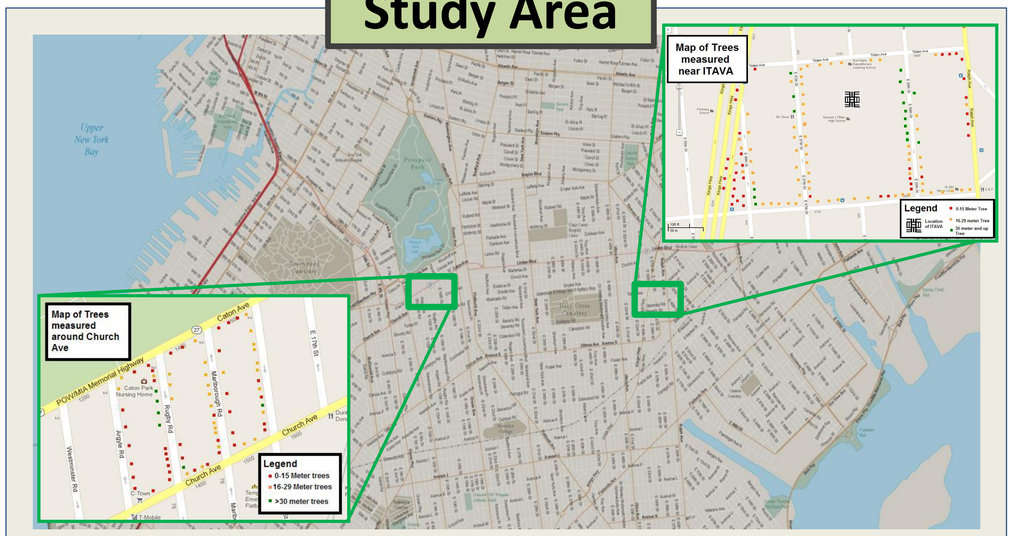
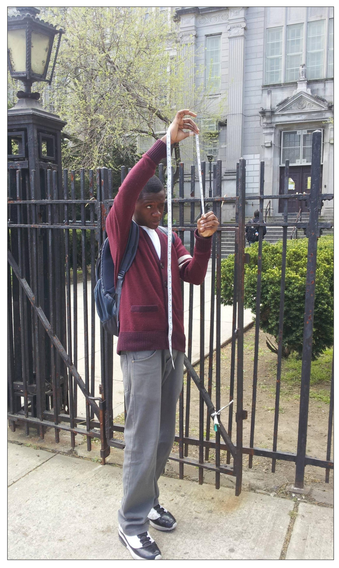
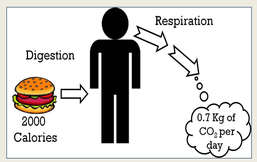


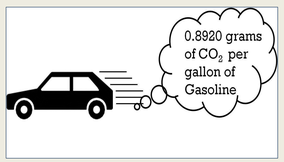
Figure 1: Map of Brooklyn, NY where data was collected. The two sites are represented by the green squares, and the accompanying maps are detailed locations and relative sizes of all the trees the were measured, as well as the blocks where cars were counted.

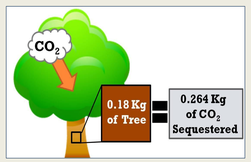


Methodology

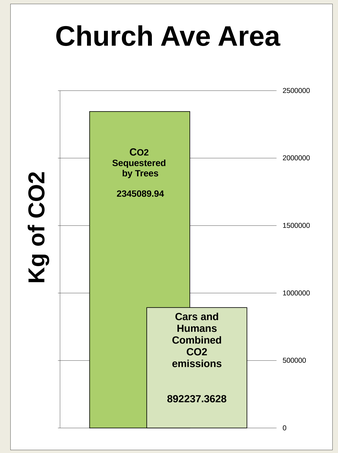
Tape measures were used to measure the apparent height and the circumference of the trees. With these measurements the weight of the tree was calculated. The sequestration rate used for the trees was 0.246kg of CO_2 per 0.18kg of the tree. Cars were then separated into five categories based on size and mileage: Small cars, SUV's/Vans, Box trucks, Busses and Semi-Trucks. To calculate emissions, each block was measured. Using the length of the block and the mileage of the car, the amount of gasoline used up on one block was found. On average, cars emit about 0.8920 kg of CO_2 per gallon of gasoline. Using the gallons of gasoline emitted by each car on each block, the amount of CO_2 was found for each car type on the length of each block. Then, all the cars were added together to calculate the total CO_2 from every car on that block in 15 minutes. To figure out the daily rate, the total was multiplied into 24 hours. Finally, census data was obtained for the population density in each area to figure out the CO_2 emissions from humans. Based on a 2000 calorie diet, humans emit 0.7kg of CO_2 per day.







Results



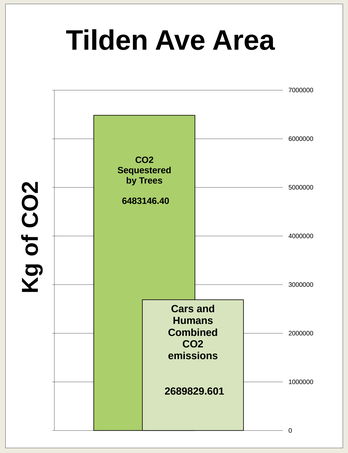


Figure 2: Graphs representing the data gathered in each of the study areas.

Conclusions

The results of the study concluded that the amount of CO2 that is being emitted by humans and cars in both measured areas were far from reaching the amount that the trees are able to sequester (Fig 2). However, many factors were not taken into consideration. Examples include idling cars, electricity production, as well as differing traffic patterns. Most of the car data was collected in the middle of the day when traffic is usually much lower than rush hour. Also, trees that were on private property were not taken into account which would add to the amount being sequestered. Therefore, it can be assumed that the actual amount of CO2 that is being emitted in the area would be much higher, and would pose a greater threat to the environment than what was found in this study. Suggestions for future study include survey the cars during different times of day to include a more accurate average of emissions, and to try and come up with a way to determine how much CO2 is emitted for the production of electricity in the prospective areas.

Acknowledgements

We Would like to thank Julius Buh-Mbi, Marina Vinitskaya, Remy Rovelli, Malgorzata Frik, Nicole Barbier, Savon Blount, Shener Dumervil, Melissa Leggard, Roodby Lapointe, Stanley Mentor, JeanPhilippe Pierrelouis, Marg Ely Stpierre, Michelle O'dea, Louise Hainline, Micha Tomkiewicz.
Supported by GK-12 "City as Lab" NSF-DGE 0638718