FAMOSA CREW - FALL 2018

What is the Relationship Between Location and Air Quality?

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I) Introduction

Air pollution is the deadliest form of pollution (World Bank, 2016) and costs the U.S. government $131 billion in 2011 (Washington Post, 2016). The U.S is currently “Critically Insufficient” in managing the level air pollution (Climate Action Tracker, 2018). The effect of air pollution on humans in urban areas is detrimental. Air pollution is responsible for 1 in 9 deaths worldwide (EDF, 2018).

The Famosa Slough is a wetland located in San Diego. The slough is a 37 acre wetland that is connected to the San Diego river,the main source of water and nutrients in San Diego. The slough is home to many plants and animals, including migrating birds who stop to rest and eat. Wetlands like the Famosa Slough are considered green spaces. Green spaces are valued at 147.8 billion in the U.S. (Project Evergreen, 2018).The slough is located in the middle of a residential area and local citizen activist group, Friends of the Famosa Slough, supports the slough’s restoration and maintenance. The slough, and other green spaces like it, help provide necessary air filtration to the city that helps improve air quality (EPA 2018).

The objective of our study of Famosa Slough will be to measure the air quality in different areas of San Diego. This will result in examining which area of San Diego have the highest and lowest levels of air pollution, and how the community is affected. We predict that the Famosa Slough will have low air pollution, while more urban areas will have air higher pollution.

II) Methodology

Independent Variable

The independent variable is the locations that researchers will be measuring around San Diego and the Famosa Slough. Researchers look at four main areas of San Diego: Urban and dense: Downtown; residential, spread out and housing: Point Loma; green/aquatic: Famosa Slough; and bay/industrial: NTC bay.

Dependent Variable

The dependent variable is the measurement of carbon dioxide. The machine that will be used is a Desktop Carbon Dioxide Monitor and Data Logger which measures in parts per million (ppm). Parts per million is a term used in chemistry to indicate a very low concentration of solution meaning it can detect a small amount of a substance, in this case carbon dioxide, in the air.

Control Variables

The control variables are the time of day, the days that researchers record readings, and the locations around San Diego. Researchers will also measure only on days that have pleasant weather (sunny weather and low wind) and on weekdays to maintain consistency of traffic level. Researchers will allow for 10 minutes at each location, therefore have enough time to measure the air quality.

Confounding Variables

The confounding variables that can occur will be the challenges that the group faces: any human error could also mess up the results. Traffic jams, unpredictable human abundance and researcher's breathing/presence can interfere with the CO2 readings. The time it takes to calibrate the CO2 monitor can interfere with research, as well as the portable charges being unable for use.

Sample Size

The sample size is 10 readings taken at either the same or different sites. Each of the locations will be in San Diego with varying distances from the slough. The readings will be taken between 1pm and 3pm on a weekday. Each measurement should have an average of 10-15 minutes gap between them. All outdoor measurements will be at least 50 feet from any building and with no cover e.g. trees, cars,

tents, etc. Locations may be referenced on the map (Page 5). The map highlights the four main locations of the study. Specific details of the locations can be found in Independent Variable (Page 3).

Materials

- ❑ Two Carbon Dioxide Meters- Autopilot, Desktop CO2 Monitor & Data logger
- ❑ Chart (page 5)
- ❑ Writing utensil
- ❑ Notebook to take down or compare notes
- ❑ Map (example page 5)
- ❑ Portable Charger
- ❑ Personal Cars, Trolly or other transportation

Primary Research Methods

A. Prior to departure check the weather for the week to make sure that there will be no rain so that each of the readings are as accurate as possible. Schedule readings on a non-holiday weekday to get most consistent results. Print out Individual Data Collection Sheet (Page 7).
B. Make sure that each site is easily accessible and is outdoors.
C. Data collection at each site will include:
    a. Measure the distance from where the reading is taken to the nearest building and street
    b. Calibrate the Carbon Dioxide Meter
        i. Press the menu button and pressing the down button to move the cursor until it is under the CALI and hold enter for three seconds,
        ii. The machine will take ~20 minutes to calibrate. This can be done before the experiment.
    c. Find spot to take measure away from as many confounding variables as possible (i.e pedestrians, cars, etc.) or anything that might interfere with the data.
    d. Take the first measurement
        i. Connect the meter to a powersource (portable battery or outlet), which will turn on the machine.
    e. After the machine has turned on, record first number displayed on screen.
    f. Wait 10 minutes before recording the second reading.
    g. Record the result of both readings in the Individual Data Collection Sheet (Page 7)
    h. Repeat steps C-E for second test.

i. Write down the times each measurement is taken.

j. Repeat steps 1-3 for each site.

D. Take two measurements near a residential area, one where there are plenty of houses and no nearby green spaces: Point Loma.

E. Take two measurements at a green/aquatic space: Famosa Slough. Make sure to monitor weather from at least three days before to make sure there is no rain interference.

F. Take two measurements from bay/industrial areas: NTC park or San Diego Airport.

G. Take two measurements from urban areas where there is a lot of tall buildings and a dense population: Downtown San Diego.

H. Once all the data is collected, compile it into the chart on page 7.

Locations

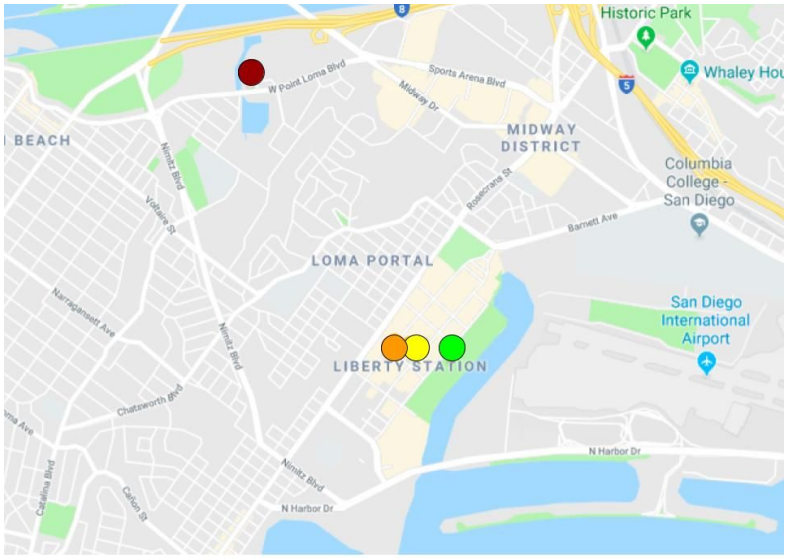


Figure 1: Describe a bit and then include color key that you have below.

1. Red-Famosa Slough (green/aquatic)
2. Orange-High Tech High (residential)
3. Yellow-Liberty Station (urban/dense)
4. Green-NTC Park (bay/industrial)

1. **Sample Data Sheet**

	Recorded CO_2 (ppm)	Estimated Distance From Building	Time of Reading	Pictures
Urban Reading One				
Urban Reading Two				
Residential Reading One				
Residential Reading Two				
Bay/Industrial Reading One				
Bay/Industrial Reading Two				
Green/aquatic Reading One				
Green/aquatic Reading Two				

2. Individual Data Collection Sheet

Date:_____

Team Names:_____

Location_____

Data

Time	CO2 Measurement 1 (ppm)	Time	CO2 Measurement 2 (ppm)

III. Results

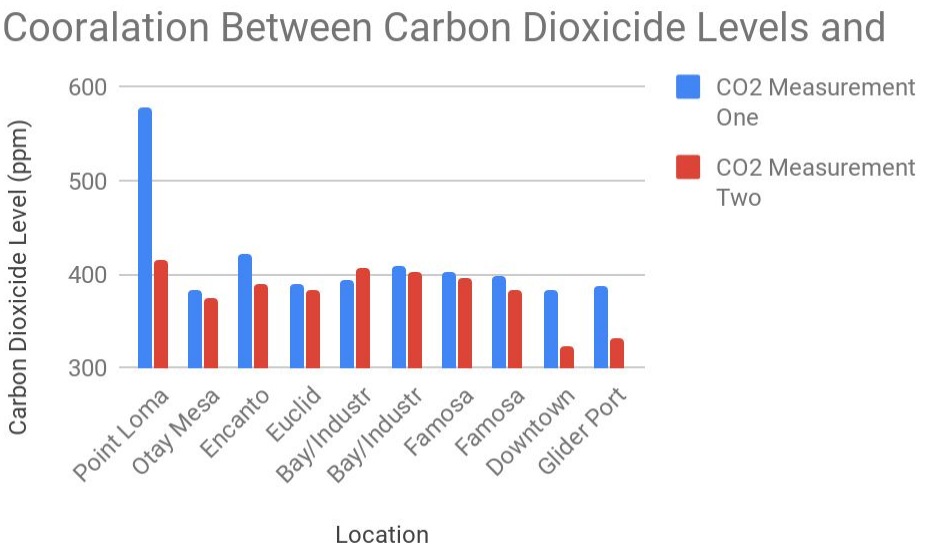


Figure 1: Findings represented by location and the correlating level of carbon dioxide (ppm).

This study references data collected at separate times over the course of one and a half weeks. Each location fell into one of four categories: urban (dense), suburban (housing), green/aquatic (wetlands), and bay/industrial (airport). The two measurements were taken exactly ten minutes apart from one another.

Numbers represented in this section are measured in part per million (ppm). The range is 0-1500 but the normal healthy range is 250-400 ppm with spikes attributed to vehicle interference or industrial pollution.

The first data set was conducted in Point Loma (suburban). The first reading was taken at 6:37 pm and the second was taken at 6:47pm . This is where the largest spike in the data was recorded. The first reading was 577 ppm and the second was 415 ppm.

The second data set was conducted in Otay Mesa (suburban). The first reading was taken at 7:07 pm and the second was taken at 7:17 p.m. The first reading was 382 ppm and the second was 374 ppm.

The third data set was conducted in Encanto (suburban). The first reading was taken at 2:21 pm and the second was taken at 2:31 p.m. The first reading was 421 ppm and the second was 390 ppm.

The fourth data set was conducted in Euclid (suburban). The first reading was taken at 3:00 pm and the second was taken at 3:10 p.m. The first reading was 390 ppm and the second was 384 ppm.

The fifth data set was conducted in NTC (bay/industrial). The first reading was taken at 2:08 pm

and the second was taken at 2:18 p.m. The first reading was 394 ppm and the second was 407 ppm.

The sixth data set was conducted in NTC (bay/industrial). The first reading was taken at 1:54 pm and the second was taken at 2:04 p.m. The first reading was 409 ppm and the second was 403 ppm.

The seventh data set was conducted in Famosa Slough (green/aquatic). The first reading was taken at 1:37 pm and the second was taken at 1:47 p.m. The first reading was 402 ppm and the second was 395 ppm.

The eight data set was conducted in Downtown (urban). The first reading was taken at 1:53 pm and the second was taken at 2:03 p.m. The first reading was 382 ppm and the second was 322 ppm.

The ninth data set was conducted at the Famosa Slough (green/aquatic). The first reading was taken at 2:07 pm and the second was taken at 2:17 p.m. The first reading was 399 ppm and the second was 382 ppm.

Finally, the tenth data set was conducted in at Torrey Pines Gliderport (green/ aquatic).The first reading was taken at 1:37 pm and the second was taken at 1:47 p.m. The first reading was 388 ppm and the second was 332 ppm.

The data ranges from 577 and 322 ppm. The average was 397.4 ppm which is only 2.6 less the the highest part of the healthy range. There were no outliers in this data.

IV. Discussion

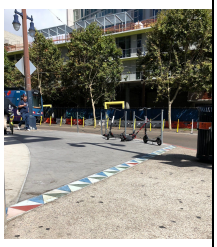
The purpose of this experiment was to examine that the air quality in and around the Famosa Slough was better than the air quality farther from the slough. Researchers predicted that the air quality in and around the Famosa Slough would have better than air quality in other places. This was not supported with experimental results. This is possible because the Slough is in the middle of a dense?residential commercial area.

The slough may not be large enough to make a noticeable impact on the air quality of the area around it since it is a small wetland. According to the data, the slough is similar to the majority of the other locations, specifically the residential and urban areas. Four other locations have similar readings of high 300s to low 400s. This is could be due to similar surroundings and activity. The residential and commercial area around the slough could affect the wetland.

The findings demonstrate that aviation activity and proximity to dense urban communities, impact the carbon dioxide readings of Point Loma. The residential Point Loma, which surrounds the slough, was considered to be the outlier and had a 27% increase from the closest measurement.. This could be due because of the impact that humans have in natural areas, which include dog walking or creating non trails in the Famosa Slough. As well as everyday activities like driving can create smog to release in the air. (San Diego Union Tribune, 2018)

In conclusion, the hypothesis was incorrect. The measurements at the Famosa Slough were similar to those of industrial, urban, and residential locations. There may have been some errors because the time and date difference may have affected the level of carbon dioxide in the air. However, there were no outliers shown in the data meaning that most of the data was not interfered with extremely A future study could take all of the data on one day at the same time to have the most accurate reading. The study could also measure the level of carbon dioxide at rush hour and late at night to get what human interference actually contributes and have been conduct. This finding is significant because it shows the impact of increased human pollution and the levels of dangerous carbon dioxide. The data is important because it shows the correlation between natural population and air quality. As air quality can affect lives greatly (Damian, 2018), the importance of monitoring the level of it is very potent.

V. Research Photos

Site 1	Site 2	Site 3	Site 4	Site 5
				
Site 6	**Site 7**	**Site 8**	**Site 9**	**Site 10**
				

VI. Works Cited

Loria, Kevin. “Earth Has Crossed a Scary Threshold for the First Time in More than 800,000 Years, and It Could Lead to Tens of Thousands of Deaths.” *Business Insider*, Business Insider, 9 May 2018, www.businessinsider.com/how-atmospheric-carbon-dioxide-affects-health-2018-5.

Bergeron, Louis. “Study Links Carbon Dioxide Emissions to Increased Deaths.” *Lack of Brain Protein Causes Sleeping Disorder Narcolepsy in Humans: 9/2000*, 3 Jan. 2008, news.stanford.edu/news/2008/january9/co-010908.html.

intischApr, Eli. “EPA: Carbon Dioxide Is a Danger to Human Health.” *Science | AAAS*, American Association for the Advancement of Science, 11 Dec. 2017, www.sciencemag.org/news/2009/04/epa-carbon-dioxide-danger-human-health.

Airthings. “Carbon Dioxide - What Is It and How Does It Impact Your Health.” *Airthings*, airthings.com/what-is-carbon-dioxide/.

"Carbon Monoxide Poisoning." *Centers for Disease Control and Prevention*, Centers for Disease Control and Prevention, 26 Oct. 2016, ephtracking.cdc.gov/showCoRisk.action.

Schroeder, Lauryn. "Interactive Map Shows Which San Diego Areas Have the Worst Air Quality." *Sandiegouniontribune.com*, The San Diego Union-Tribune, 1 Feb. 2018, www.sandiegouniontribune.com/news/data-watch/sd-me-ozone-map-20180130-story.html#.

"Economic Benefits of Wetlands." *Epa.gov*, www.epa.gov/sites/production/files/2016-02/documents/economicbenefits.pdf.

Narayan, Siddharth, et al. "The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA." *Nature News*, Nature Publishing Group, 31 Aug. 2017, www.nature.com/articles/s41598-017-09269-z.

Digiteers. "Welcome to Famosa Slough." *Friends of Famosa Slough*, Friends of Famosa Slough, 2015, www.famosaslough.org/index.htm.

"Cost and Health Consequences of Air Pollution in California." *RAND Corporation*, www.rand.org/pubs/research_briefs/RB9501/index1.html.

"History of Famosa Slough." *OB Rag*, 26 Mar. 2018, obrag.org/2018/03/history-of-famosa-slough/.

"The Effects of Air Pollution on Human Health." *Sustainability for All*, www.activesustainability.com/environment/effects-air-pollution-human-health/.

Source. "Why Does San Diego Have Such Bad Air Quality?" *San Diego Free Press*, 2 Nov. 2016, sandiegofreepress.org/2016/11/san-diego-air-quality/.

"Economic Benefits of Green Spaces." *Project Evergreen*, Project Evergreen, 13 June 2016, projectevergreen.org/resources/economic-benefits-of-green-spaces/.