Climate Change Mitigation in a Diverse and Threatened Appalachia

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Introduction

In recent years, the highest causes of death have been heart disease and vehicle-related accidents, but in the future, mother nature could become a killer. Increasing carbon emissions from human activities, including industry and travel, have contributed to harmful impacts across the globe. This project focuses on carbon emissions and temperatures across Appalachia. With temperatures rising rapidly, climate change has become a widely accepted and recognized problem among scientists. These climate effects impact the plants, animals, and humans who live in Appalachian communities. The goal is to better understand and mitigate climate change and its effects.

Background

Atmospheric concentrations of carbon dioxide (a greenhouse gas) have risen 16% since 1995. This has contributed to global warming by about 1.8°F from 1901 to 2016. This warming, with projections of continued warming, will have a disproportionate negative influence on already underserved regions, like Appalachia. To better understand climate change on a community-wide scale, we integrated data from HOBO sensors, nearby weather stations, and CO2 emissions databases. Temperature change is a direct product of CO2 emissions, which must be reduced to mitigate atmospheric temperature increases. This analysis was necessary to understand how to best mitigate atmospheric temperature increases through community activities such as planting trees.

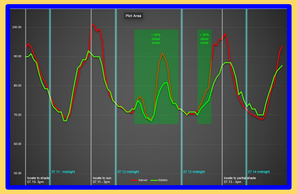

Figure 1: Sensor and weather station data from Huntsville, AL

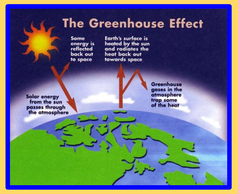

Figure 2: Greenhouse Effect diagram

Materials and Methods

Materials

1. Hobo MX Pendant Temp
2. Solar Radiation Shield (model 06054)
3. A smart device with the HOBO app
4. Weather station historical data
5. DARTE emissions dataset

Method

1. Observe standards for data collection (e.g. use radiation shield in sunlight and sensor height, times for logging)
2. Deploy sensor in different locations in our communities (e.g. shaded and sunny areas)
3. Retrieve and download data from sensors
4. Analyze sensor data with other data sources (e.g. emissions and weather station)

Results

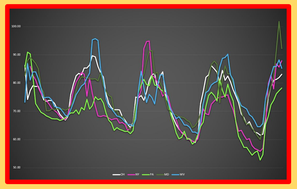

Figure 3

Northern Data

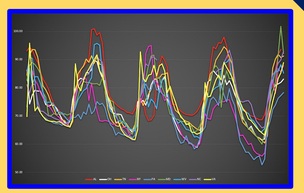

Figure 4

All Data Recorded

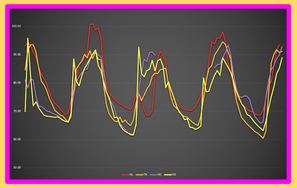

Figure 5

Southern Data

The data in figures 3-5 were collected in hourly intervals for 4 days using the HOBO sensor. Figure 6 shows carbon emissions from the past 10,000 years and an inset graphic from the last 250 years. Figure 7 contains examples of some locations where the data sensors were placed. Table 1 shows the carbon emissions from different locations in the Appalachian Region.

These data show that the ambient temperature is lower when the object is placed in a shady area compared to a place with direct sunlight. These, as well as weather conditions, effect temperature. Table 1 shows carbon emissions in several locations across Appalachia.

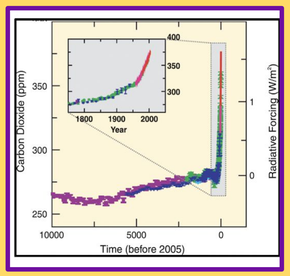

Figure 6: Global atmospheric carbon

Figure 7: Data collection areas

State	County	1997 yearly km2 kilotons CO2 emissions (DARTE)	2017 yearly km2 kilotons CO2 emissions (DARTE)	Trend	County-wide kilotons CO2 emissions (DARTE)
WV	Wirt	15	15	no change	20,144
NC	Alexander	150	200	up	55,966
OH	Perry	10	10	no change	71,855
PA	Clarion	400	300	down	313,212
VA	Rockbridge	500	500	no change	336,938
TN	Campbell	150	500	up	415,646
NY	Steuben	400	250	down	628,103
MD	Washington	250	300	up	932,184
AL	Madison	300	500	up	1,919,480

Table 1: Carbon emissions from across the Appalachian region

Conclusions

The Climate Science Modeling and Communication group demonstrated through their data gathering that planting trees is a step that mitigates climate change in two ways: (1) by reducing local temperatures through tree coverage and (2) by removing carbon dioxide from the atmosphere. This project aimed to associate the rise in temperatures due to climate change with the group's local conditions. The data confirmed that shade is a key factor in reducing heat. Plants also remove carbon dioxide from the atmosphere. By planting trees in our communities we can help reduce the effects of climate change.

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