Habitat

Ecosystem

Presented by Sandra Haro

CARBON EMISSIONS & AIR QUALITY

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"CAN PREDICTIVE MODELS BE DEVELOPED TO FORECAST AIR QUALITY AND OZONE LAYER DEPLETION BASED ON CURRENT EMISSION TRENDS?"

ETL SETUP AND IMPLEMENTATION

MAIN CHALLENGES

Transform:

- A lot of cleaning to consider in order to merge the tables (remove null values, duplicate columns, renaming columns for clarity, and uniform casing)
- Had to make sure each column name used “__” in place of spaces to be readable in SQL

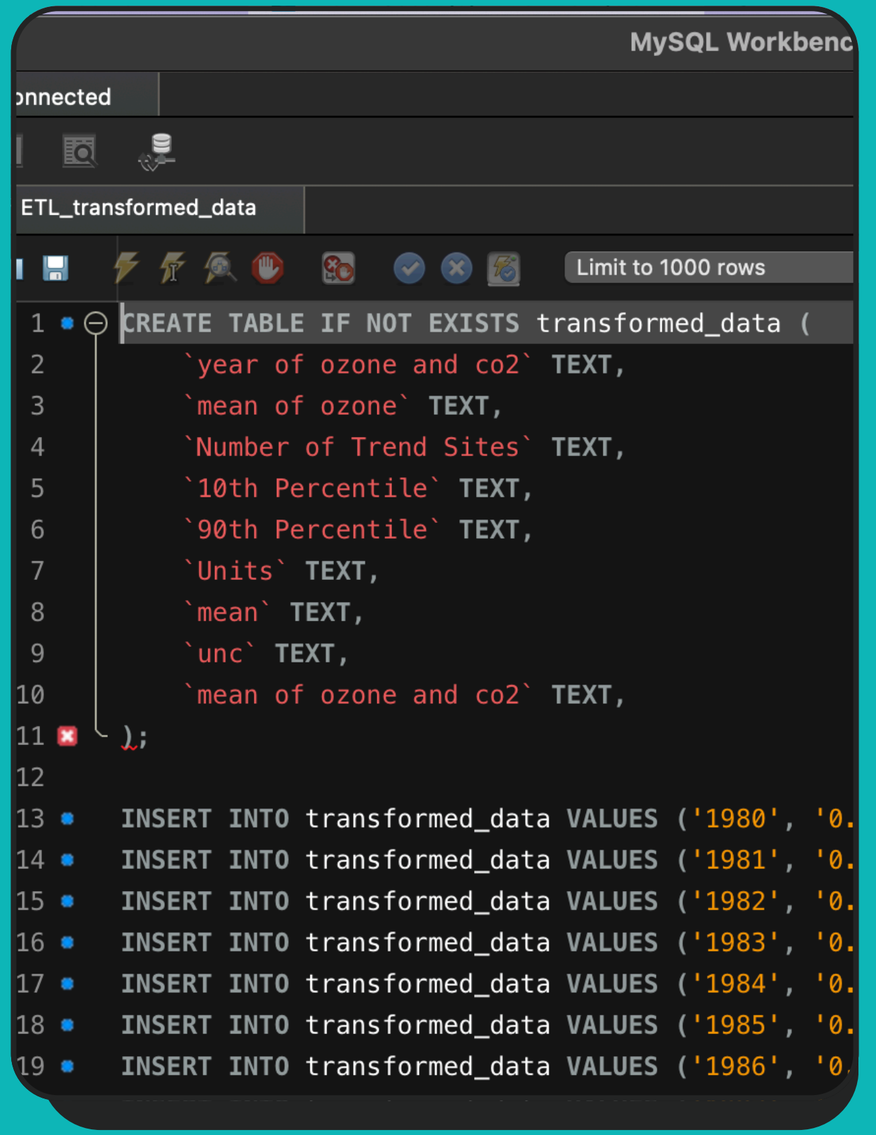
Load:

- Had to make sure the written SQL commands appended the last line so that it was “TEXT” instead of “TEXT,” since the extra comma was irregular→instead of making it the same ending for each column line, we used a for loop with an embedded if, else statement to fix the last line

Changing the Load Step to **Convert** final file from .db file to .sql file to make it compatible with MySQL Workbench

KEY TAKEAWAYS

- Using the Python logging library to document our work and get descriptive errors when we made mistakes, helped us in identifying where we went wrong
- Became familiar with the many different ways to go about making an ETL process because our only prior experience was the first project
- Transforming and cleaning the data showed that there are a lot of intricacies required when moving from one language to another



MAIN FINDINGS

1. Very strong negative correlation (r = -0.92) between global U.S. carbon dioxide emissions and ozone air quality levels. (Fig. 1)

There is robust evidence that anthropogenic greenhouse gases (GHGs), such as carbon dioxide, indirectly slow ozone catalytic cycles through “large radiative cooling”.

2. Highest recorded ozone value occurred in 1988. (Fig. 2)

The U.S. Environmental Protection Agency’s (EPA) 1988 annual report indicated that this spike in lower stratosphere ozone levels was due to a combination of industrial activity, as well as hot, dry weather and stagnant conditions which are highly conducive to peak ozone levels. Nationally, 1988 was the third hottest summer since 1931, and in some places, was the hottest summer in almost 60 years. (p.80).

EXAMINING THE DATA

https://www.epa.gov/air-trends/ozone-trends

3. Ozone concentration ranges have dipped below the national standard since 2012. (Fig. 2)

According to NASA, this is due to the presence of human-produced gasses such as CFCs (chlorofluorocarbons) that are produced through manmade coolants (such as those required for refridgerators, AC units, etc.)

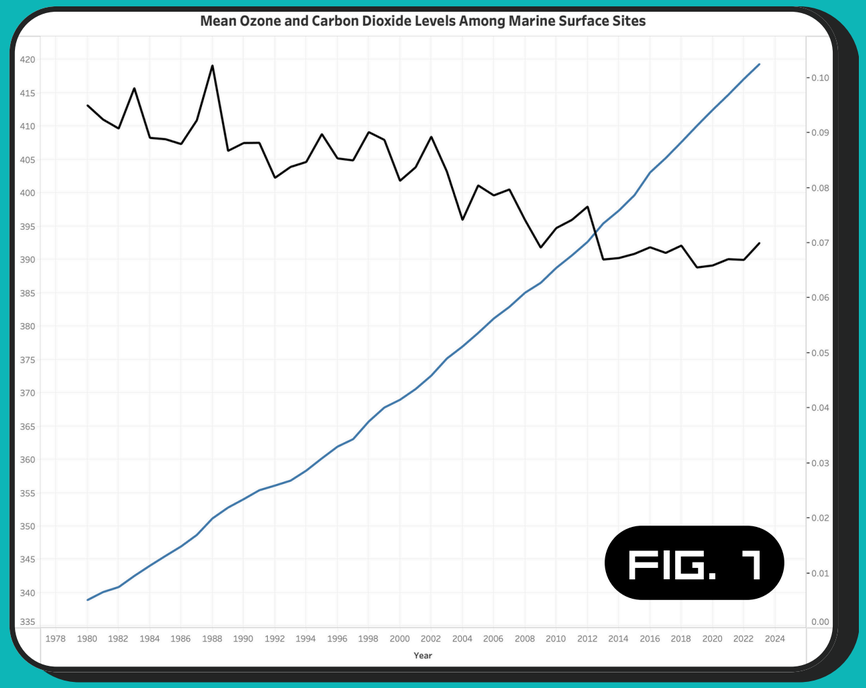


FIG. 1

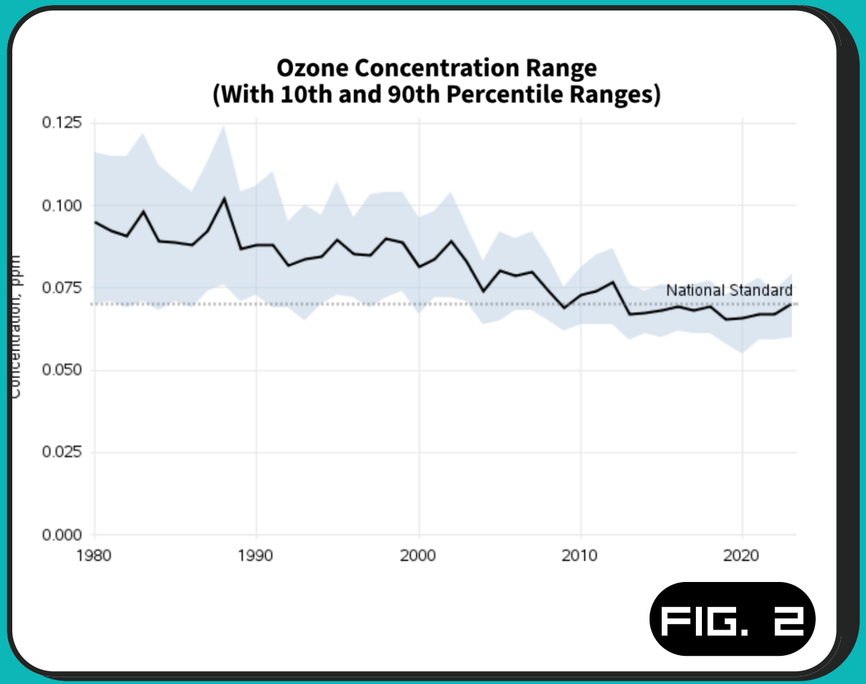


FIG. 2

LIMITATIONS AND FUTURE INQUIRIES

POSSIBLE OVERSIGHTS:

Data Limitations:

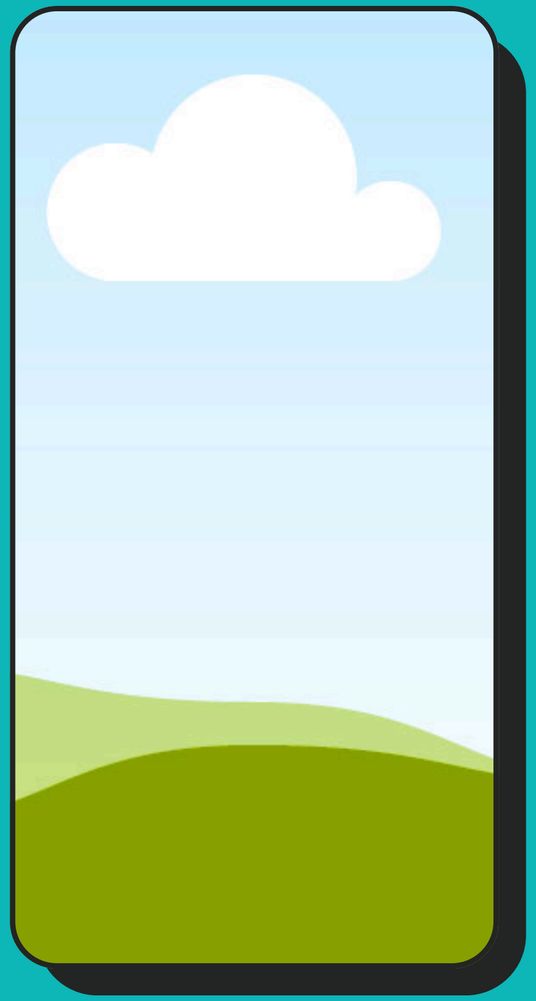
- Recorded CO2 levels were based on *global* estimates, while the ozone quantities were established utilizing data from *national* sites that remain unspecified in the dataset. Data based solely on trends in the U.S. may not be entirely reflective of global trends. Because of this, we may be missing crucial information regarding ozone trends in the greater globe, as well as regionally in the U.S.
- Though ozone levels in the lower stratosphere are highly interrelated, and at the very least, partially reflective of ozone concentrations in the upper stratosphere (i.e., the “ozone layer”), ozone gasses in the lower stratosphere are much more likely to interact with the man-made chemical compounds (chlorine and/or bromine) that contribute to ozone depletion, which are particularly prevalent in marine areas, as well as high-temperature areas (EPA). This may be reflected in the data.

FUTURE INQUIRIES

- As it stands, there is still much to investigate on this topic---perhaps expanding on how marine life is affected by the existence of ozone in specific bodies of water globally and/or nationally, as well as how CFCs and greenhouse gases correlate with ozone quantities in both the lower and upper stratosphere.

GOOGLE CLOUD STORAGE

- Created a MySQL instance with a unique Instance ID and password.
- Connected the instance to MySQL Workbench for data loading.
- Adjusted the ETL process to convert .db files to .sql format.
- Created a bucket in Google Cloud Storage to store data.
- Fixed database selection in the code to enable successful data upload.
- Successfully imported transformed data from the Google Cloud Storage bucket into the SQL instance.



CHALLENGES FACED:

- Initially struggled to open a `.db` file in MySQL Workbench.
- Needed to modify the ETL process to save the data as a `.sql` file.
- Encountered issues uploading the `.sql` file to the Google Cloud Storage bucket due to not selecting a database in the code.

THANK YOU SO MUCH!

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