"Climate Change: Greenhouse Gas (Co2) Emissions and Temperature Trends in Rathaus area of konstanz"

1) Introduction

The Rathaus area of Konstanz, Germany, is witnessing notable changes in its climate, including altered weather patterns and rising temperatures. These changes are largely driven by Greenhouse gas emissions , particularly carbon dioxide (CO_2). The aim of this project is to investigate the relationship between carbon dioxide emissions and temperature trends in the Rathaus area. In particular, we try to answer the question: How do greenhouse gases (CO_2) affect climate change in the Rathaus area of Konstanz?

To find the answer to our query, we have examined historical data on temperatures and CO2 levels to look for trends and relationships. By doing this, we expect to learn more about how greenhouse gasses, in particular CO2, create an affect in local climate change.

The motivation for this study came from the need to understand how human activities influence environmental conditions at a local level.

2) Used Data

The output data of our analysis is the result of merging two datasets: temperature data and CO_2 emissions data. Below is a description of the structure and meaning of the merged data.

Table: Structure and Meaning of the Data Table

Column Name	Structure of Data
Date	The date on which the data was recorded.
t	The temperature value in degrees Celsius.
Quelle_temp	The source of the temperature data, which is the Stadt Konstanz, Abt. Datenmanagement und Statistik.
Time_temp	The time at which the temperature data was recorded.
eco2	The CO_2 emission level in parts per million (ppm).
Quelle_co2	The source of the CO_2 data of Stadt Konstanz, Abt. Datenmanagement und Statistik.
Time_co2	The time of recorded CO_2 emission .

3) Analysis

Methodology

We have conducted the analysis using a series of data visualization techniques in order to explore the relationship between CO_2 emissions and temperature trends. We have taken the following steps:
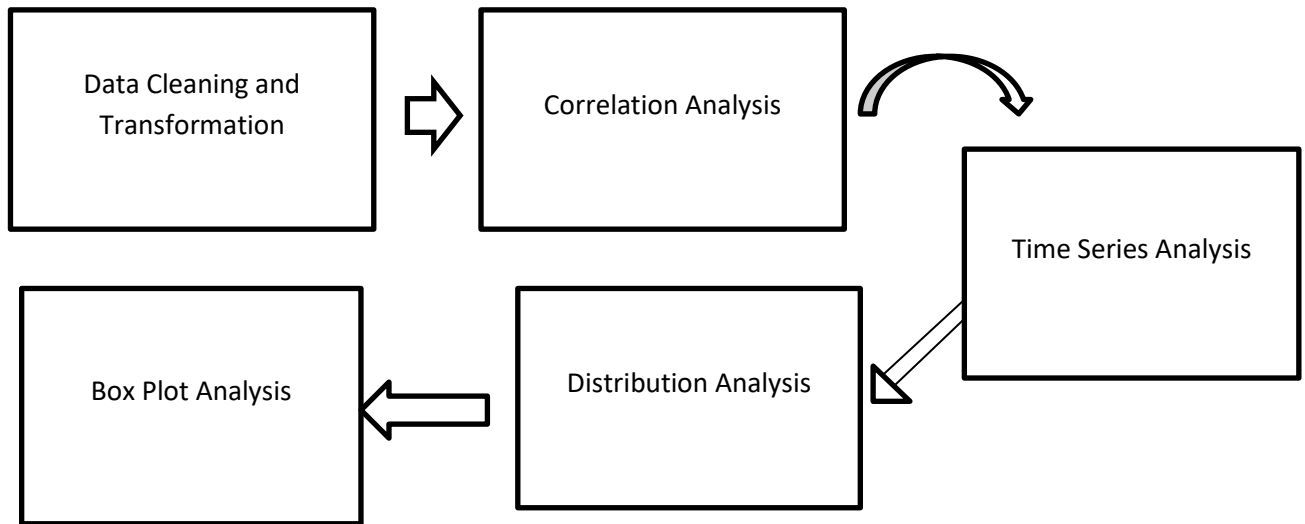

Figure 01: Steps taken to visualize the analysis

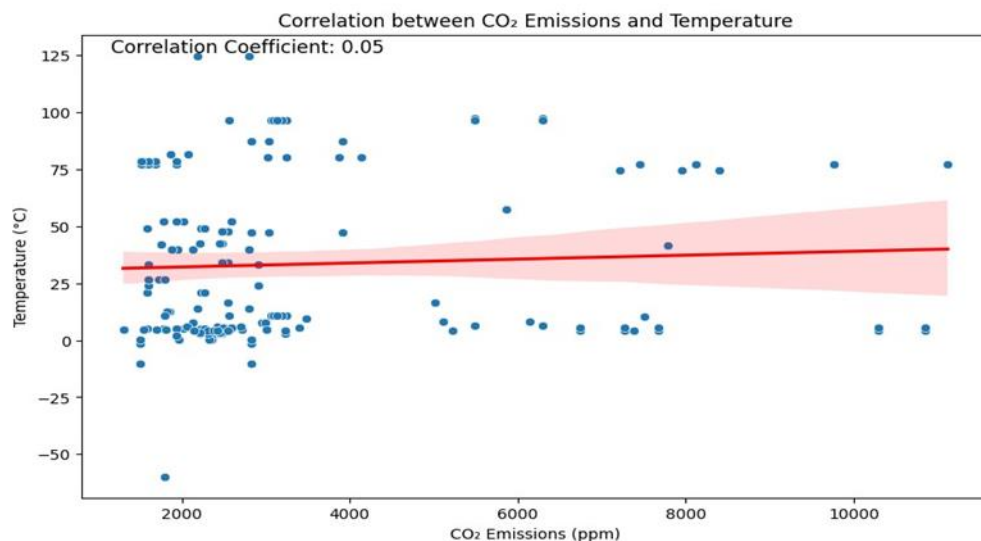## Results:

1. **Correlation Analysis**:

Figure 02: Correlation between CO_2 Emissions and Temperature

The scatter plot with the regression line in Figure 02 shows correlation coefficient: 0.05 which is a very weak positive correlation between CO_2 emissions and

temperature. This plot indicates that there is no significant linear relationship between the two variables.
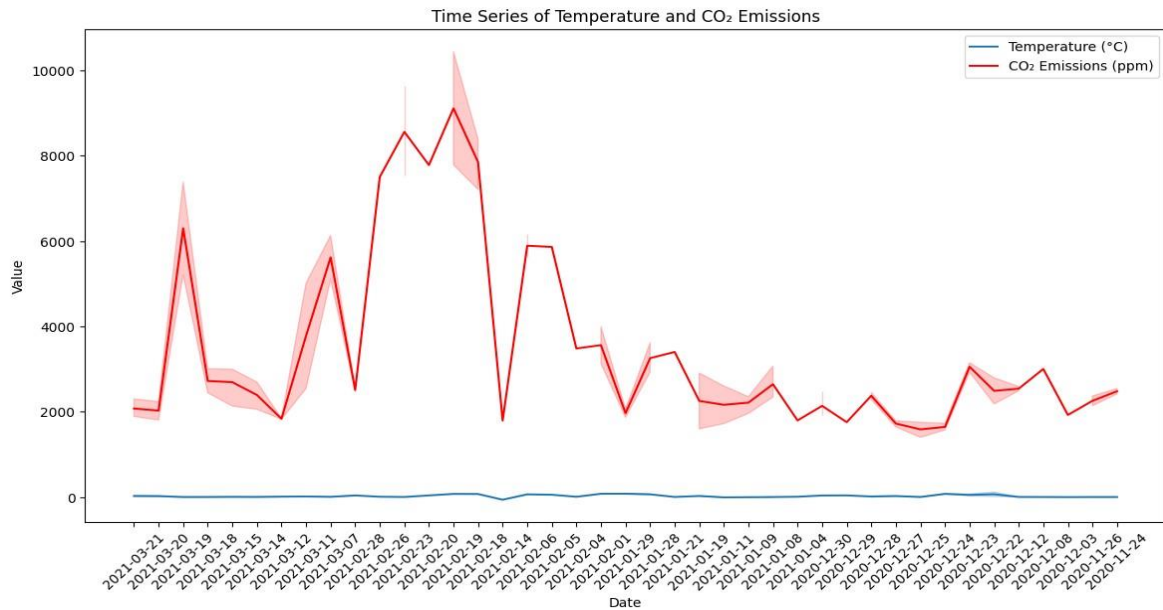
2. **Time Series Analysis:**

Figure 03: Time Series of Temperature and CO_2 Emissions

Figure 03 indicates that there are noticeable fluctuations in CO_2 emissions, but the temperature remains relatively stable over the same period. By observing this Time series we can say that there may not be a direct causal relationship between Temperature and CO_2 Emissions in this dataset.
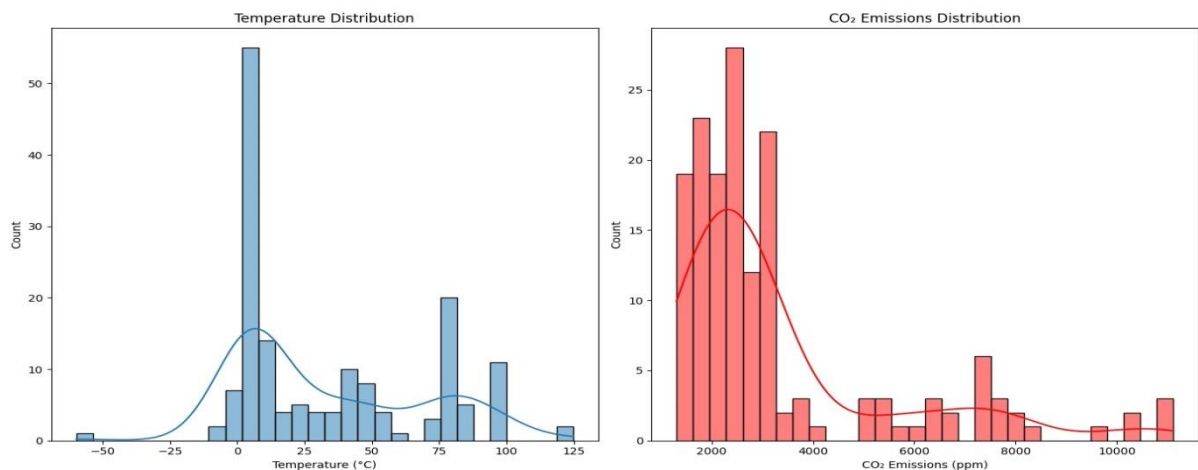
3. **Distribution Analysis:**

Figure 04: Temperature and CO_2 emissions Distribution

In Figure 04 in the left histogram we can observe that the temperature distribution is more spread out, with a peak around the lower range. Where as in the right histogram tells that CO_2 emissions are highly skewed, with most values concentrated at the lower end.
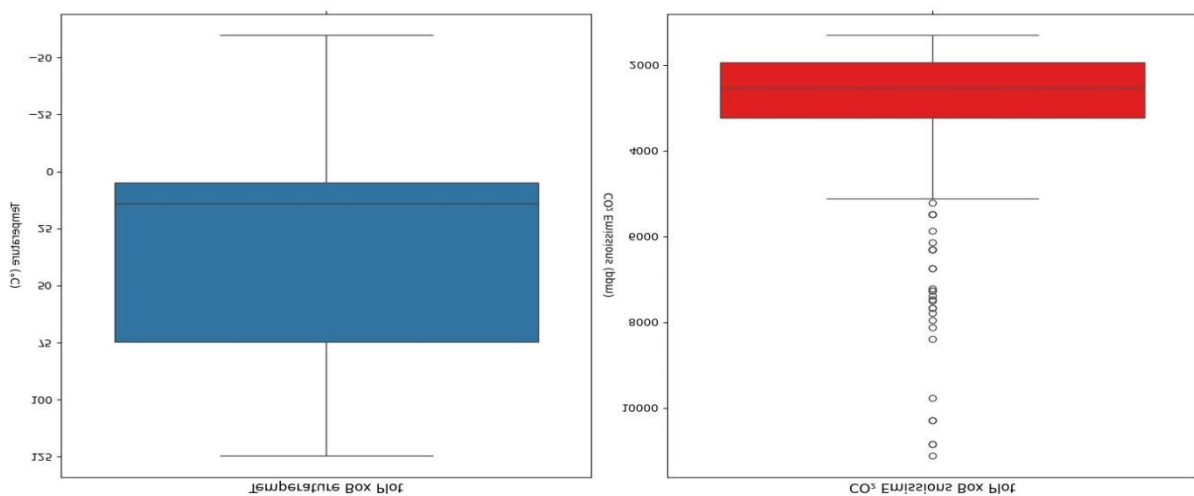
4. Box Plot Analysis:

Figure 05: Box Plot of Temperature and CO₂ Emissions

From the Figure 05 we can observe that CO_2 emissions have a large number of outliers at the higher end, while temperature data has fewer outliers and a more consistent spread.

4) Conclusions

From our analysis, we can conclude that there is a weak positive correlation between CO_2 emissions and temperature in the Rathaus area of Konstanz. However, this correlation is not strong enough to suggest a direct relationship based on the data we have. Therefore, we can say that there is no significant linear correlation between CO_2 emissions and temperature trends in this area. The temperature appears to remain relatively stable despite fluctuations in CO_2 emissions. This indicates that other factors might be influencing temperature changes, and the direct impact of CO_2 emissions on local temperature seems minimal in this specific dataset.

Limitations:

However, it is important to consider the limitations of this study. The analysis does not account for other greenhouse gases or climatic factors that may influence temperature.

Future studies:

In Future we need to include other greenhouse gases to check the temperature trends.

5) References:

Dataset References:

Greenhouse Data https://offenedaten-konstanz.de/dataset/co-werte-konstanz

Temperature Data https://offenedaten-konstanz.de/dataset/temperaturwerte-konstanz