1 Introduction

1.1 Background

This project investigates how rural and urban population sizes correlate with CO2 emissions and temperature increases. Urban areas, with higher consumption and waste generation, indirectly drive CO2 emissions through increased demand for food and products. Rural areas, through their direct involvement in agriculture, contribute to emissions via farming practices, land use changes, and resource management. Analyzing demographic and environmental data will reveal patterns that can inform sustainable agricultural practices and climate policies.

1.2 Motivation

Understanding the distinct contributions of rural and urban areas to CO2 emissions and temperature increases is crucial as the global population grows. This project aims to provide insights for policymakers to develop strategies that balance population growth with environmental sustainability, promoting resilient agricultural practices and effective climate adaptation measures.

2 Data Sources

2.1 Data Source 1

Data URL: https://www.kaggle.com/datasets/alessandrolobello/agri-food-co2-emission-dataset-forecasting-ml Data Type: CSV

The dataset playing a key role in my project because of its accuracy and detailed research.The agricultural CO2 emission dataset was created by merging and reprocessing approximately a dozen datasets from the Food and Agriculture Organization (FAO) and the IPCC. This comprehensive dataset is used for analysis and forecasting. It shows that agri-food emissions contribute around 62% of global annual CO2 emissions, highlighting the significant impact of the agri-food sector on climate change and the need for sustainable practices.

2.2 Data Source 2

Data URL: https://www.kaggle.com/datasets/chitrakumari25/smart-agricultural-production-optimizing-engine Data Type: CSV This dataset give us following factors like climate change, population growth, and food security concerns have pushed the industry to adopt innovative approaches for improving crop yield. The COVID-19 crisis has further highlighted agriculture's vulnerabilities, emphasizing the need for efficiency and sustainable practices to meet global food demands

2.3 Data Structures

Our datasets are in tabular CSV formats. It shows how temperature and CO2 emission tends to increase since 1990. In my notebook, I also show corelation between CO2 and temperature and how different agriculture industries and population contribute in the emission of CO2.

Dataset Features: Rice Cultivation: Emissions from methane released during rice cultivation. Crop Residues: Emissions from burning or decomposing leftover plant material after crop harvesting. Manure Management: Emissions from managing and treating animal manure. Manure applied to Soils: Emissions from applying animal manure to agricultural soils. Manure left on Pasture: Emissions from animal manure on pasture or grazing land.

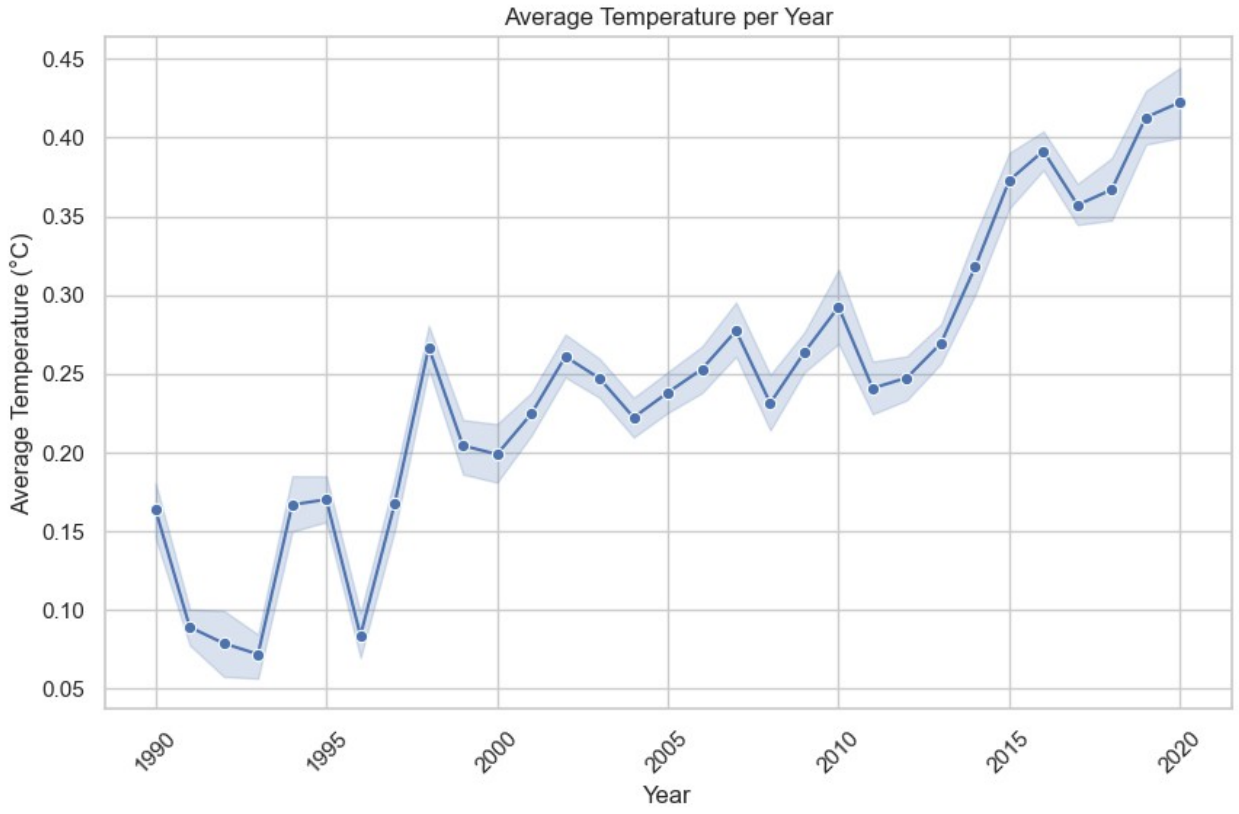
3 Analysis

3.1 Methods:

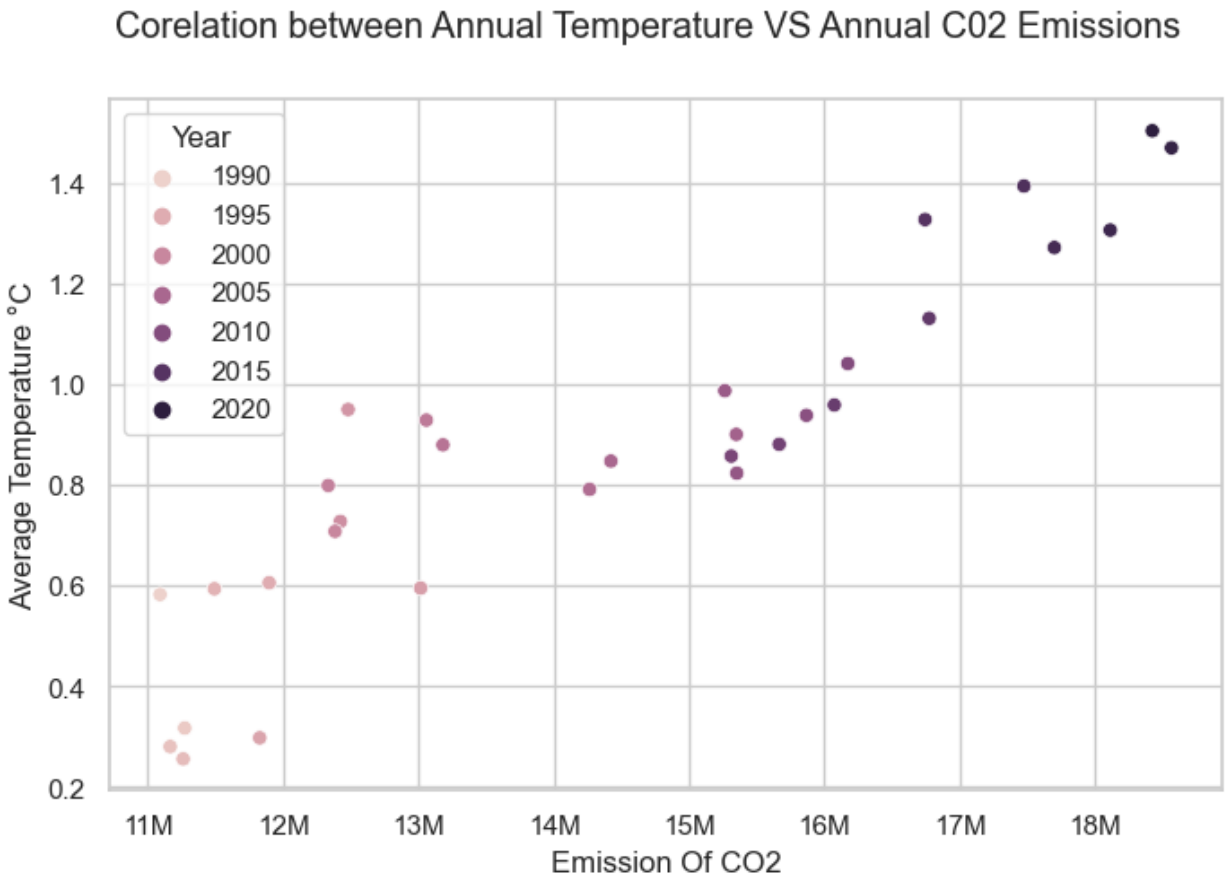
At first, I am executing my shell file which is pipeline.sh. This shell file converting my Data-Exploration.ipynb into Data-Exploratio.py extention and then execute Data-Exploration.py file. In Data-Exploration.py, I am removing unnecessary column which I am not going to use in this project, clean the data if necessary. Join two columns and generating a new one. After data munging, I am storing my file into Sqlite database. The tests.sh this shell script first cleans any pre existing output database files and verify clean up and execute pipeline.sh file again. after doing this our automation has been implemented. At the end, I also implemented CI, everytime when I try to push anything it will going to be executed and check either everything sucessfully executed or not.

3.2 Results & Interpretation:

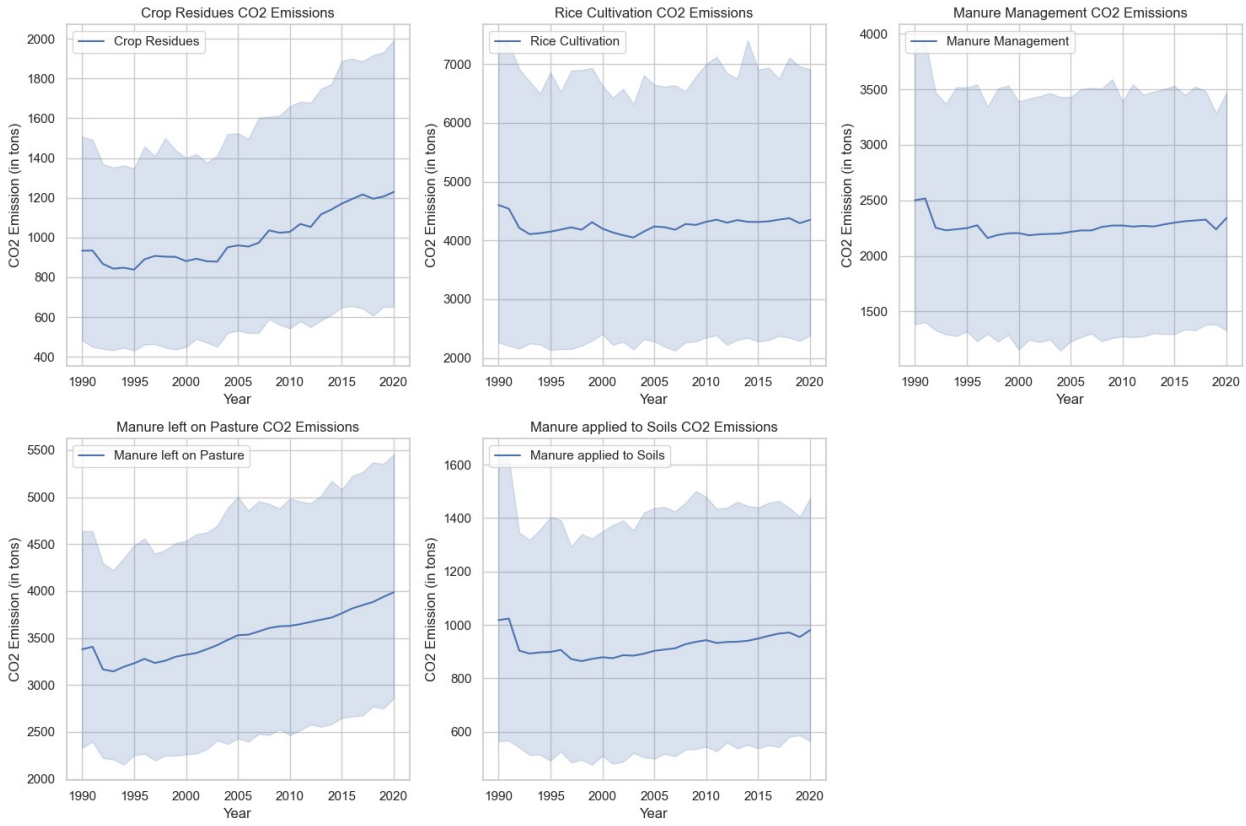
Since 1990, global temperature increases are driven by methane, nitrous oxide, and fluorinated gases. Deforestation and industrial activities emit large amounts of greenhouse gases. Agriculture releases methane and nitrous oxide, while transportation and energy production burn fossil fuels. Urbanization increases emissions, and feedback mechanisms, like reduced albedo from melting ice, further accelerate warming.

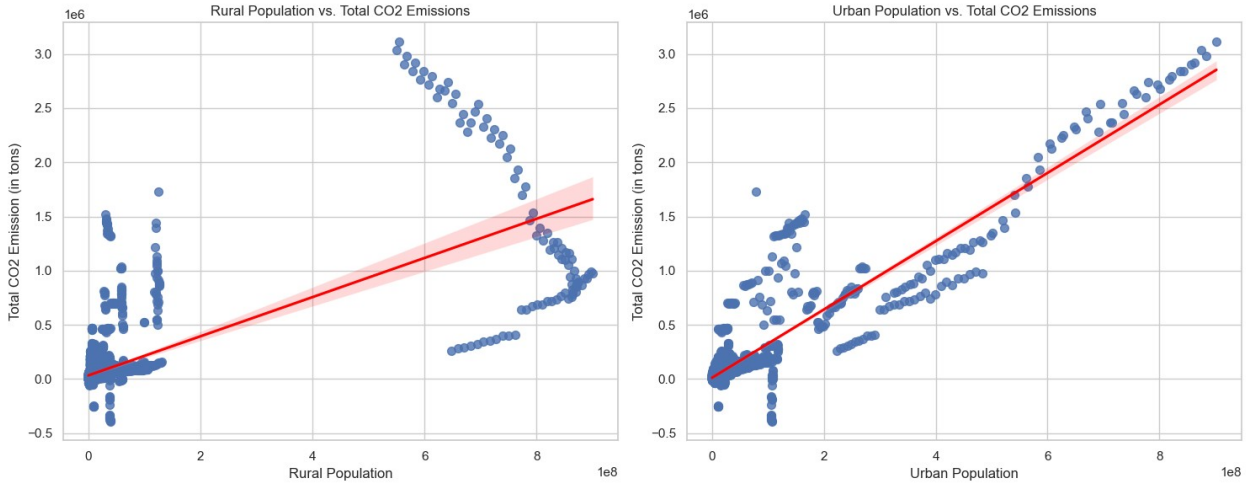


As we can see that Emission of CO2 and temperature both are highly corelated with each other. It means that if the emission of CO2 increases temperature also increases. Now lets find out which industry contribute more in the emission of CO2.



Rice cultivating produces highest CO2 emission among others and it produces constanty same amount emission since 2005 and in second catagory we have Manure left on Pasture and Crop Residue where the tend is going upward.





It shows the positive relationship between population and emission of CO2. If the population tends to increase emission of CO2 also increases

4 Conclusion

Addressing rising CO2 emissions amidst global population growth and its impact on temperature requires a holistic approach. Urban populations, with higher consumption, drive

agricultural emissions indirectly through increased demand. Conversely, rural populations directly influence emissions through farming practices and land use.

Effective mitigation involves prioritizing sustainable agriculture and climate-smart policies. This includes promoting efficient resource use, adopting advanced farming technologies, and optimizing land management to reduce carbon footprints. Educating urban and rural communities can foster environmentally-responsible behaviors.

Policy initiatives should balance feeding a growing population with environmental stewardship, incentivizing low-carbon farming and investing in renewable energy. Collaboration across sectors is crucial for achieving a sustainable balance between human prosperity and environmental health.