CO2 Emissions Investigation

DNSC 6211: Programming for Analytics

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Abstract

Climate change is now at the front of public policy efforts of many western European countries. A fierce debate is currently going on between climate deniers and climate alarmists on whether climate change is man made and what is the extent of human contributions to the changes that are taking place in the world climate.

Contents

1 Introduction

You will almost certainly start with an introductory description of the topic that you investigated in your assignment. Discuss any goals, motivation, or examples of the subject; the key is to provide the reader with any information that is necessary to understand why your topic was worth investigating. This descriptive section should also allow the reader to understand the subsequent detail sections on the subject. Limit this to 250 words.

2 Background

Most of the public policy solutions are targeting reductions of CO2 emissions as a solution to keep the world a livable place for future generations. This is why we will use CO2 emission statistics from the World Bank as a proxy for pollution Questions we are interested in answering are: 1. Who are the worlds largest polluters in both absolute and per capita terms? 2. What impact does the use of fossil fuel and renewable energy use have on CO2 emissions? 3. What impact do CO2 emissions have on life expectancy on various countries around the world? 4. What can GDP/CO2 per capita tell us about the efficiency of various industrial processes around the world?

3 Method

Who are the largest polluters, is there a relationship between CO2 emissions and the economic, health and urbanization indexes presented in the **Project Structure** section.

3.1 Workflow

Download the indicators from World Bank using wbdata API directly into a pandas data frame Construct a new column by dividing GDP and CO2TOTL (GDP produced per 1000 metric tons of CO2 emissions) Write the new data frame to a MySQL server Read data from MySQL to an R data frame Use the R data frame to construct plots, and graphs Use R-Shiny for presentation, reading data into two data analysis tools (Bar Graph explorer, and Dual dynamic axis scatter plot.

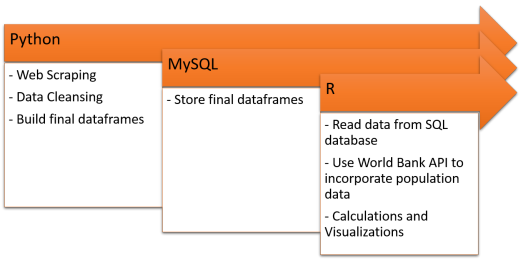

Figure 1: Work Flow

3.2 Project structure

All data is downloaded from the World Bank using wbdata python API I downloaded:

1. CO2 emission per capita
2. CO2 emissions total
3. Gross domestic product
4. Life Expectancy
5. Renewable energy percentage of total energy consumption

3.3 Data Analysis

1. **Figure 1** Largest per capita emittors of CO2 are presented above, as expected large fossil fuel producers dominate the chart
2. **Figure 2** Largest total polluters presented above. The biggest countries by GDP and population are present in this chart
3. **Figure 3** Proprietary Index GDP/CO2 per capita. Is an interesting index for human energy use
4. **Figure 4** Plotting GPD vs CO2 per capita, some positive correlation exists
5. **Figure 5** Plotting Life Expectancy vs CO2 per capita, strong positive correlation can be observed
6. **Figure 6** Plotting renewable energy vs CO2 per caipta, inverse correlation can be observed
7. **Figure 7** Plotting renewable energy vs CO2 per caipta, inverse correlation can be observed

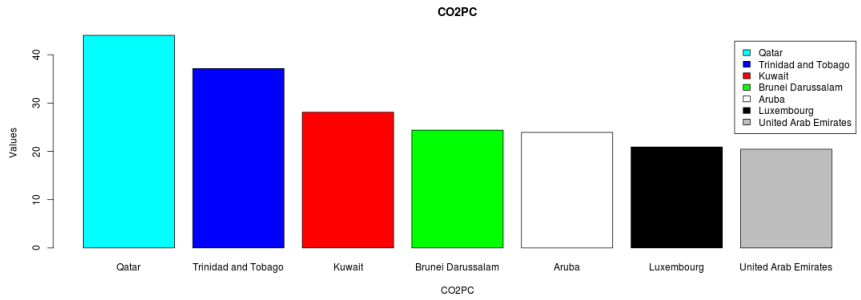

Figure 2: Carbon Emissions per capita

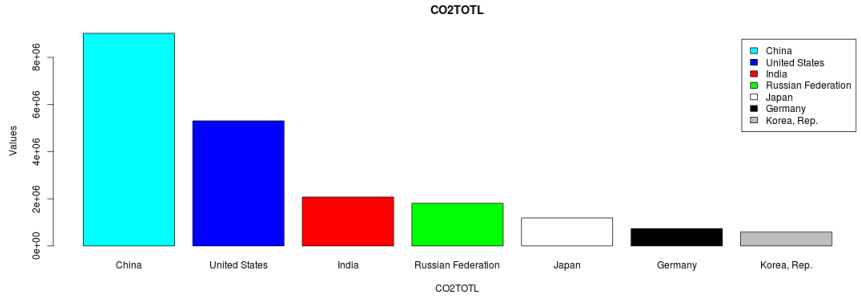

Figure 3: Carbon Emissions Total

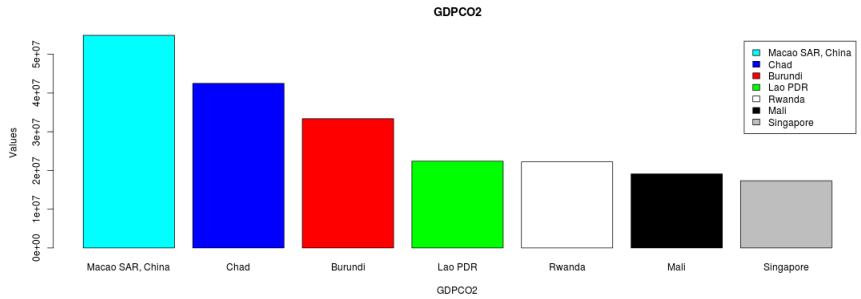

Figure 4: GPD / CO2 Per Capita 1

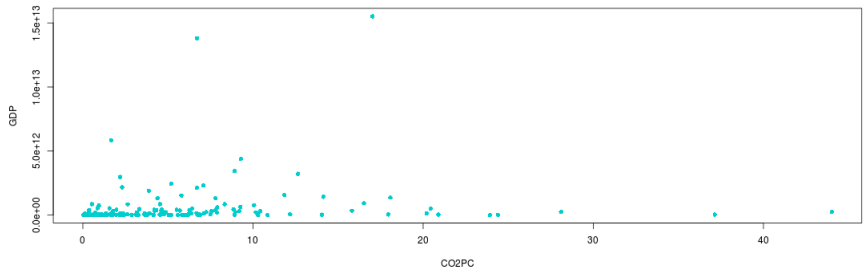

Figure 5: GPD vs CO2 Per Capita

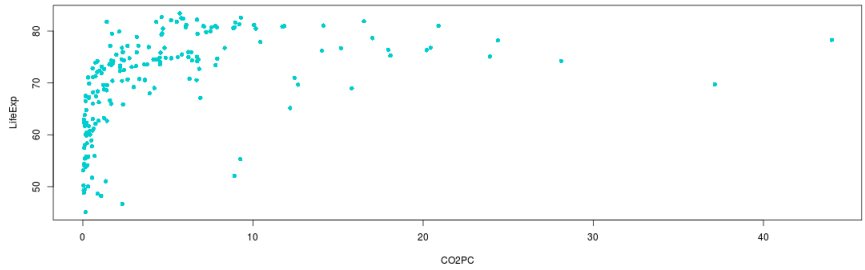

Figure 6: Life Expectancy vs CO2 Per Capita 1

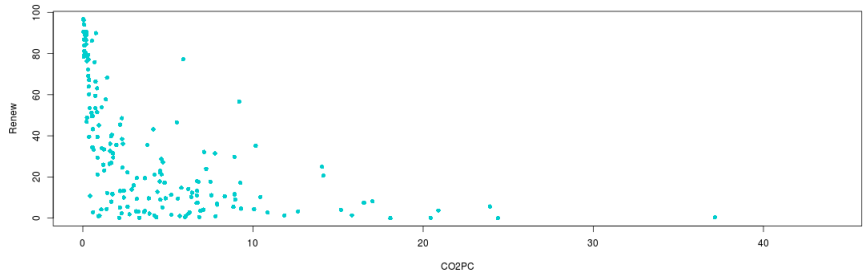

Figure 7: Renewable Energy Percentage of Total vs CO2 Per Capita 1

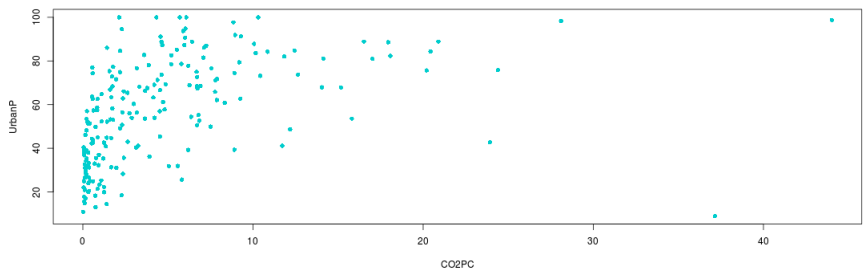

Figure 8: Urban Population Percentage of Total vs CO2 Per Capita 1

4 Discussion

My observation are: 1. Increase in renewable energy generation does lead to a decrease in CO2 emissions per capita 2. GDP/CO2PC could be developed into a good indicator of how industrialized a country is if combines with other factors such as renewable energy use

4.1 Learnings

I learned that LifeExp is positively correlated to CO2 per capita emissions which means that there are other factors that are more important for the overall health of a countries population than pollution

4.2 Challenges

I would have loved to work with other indicators but I could not find a more granular break down of energy use per country. I believe that CO2 emissions and other energy usage can be used to help countries develop quicker and jump the industrialization stage

5 Conclusion

1. As we can see from our analysis CO2 emissions can be reduced by increased usage of renewable energy
2. Positive correlation between CO2 emission per capita and GDP,Urban Population Percentage and Life Expectancy underline the importance availability of energy has on the modern life
3. There are still countries in the world where a lot of wealth generation relies on human energy