Applied Data Science 1 Assignment 2: Statistics and Trend

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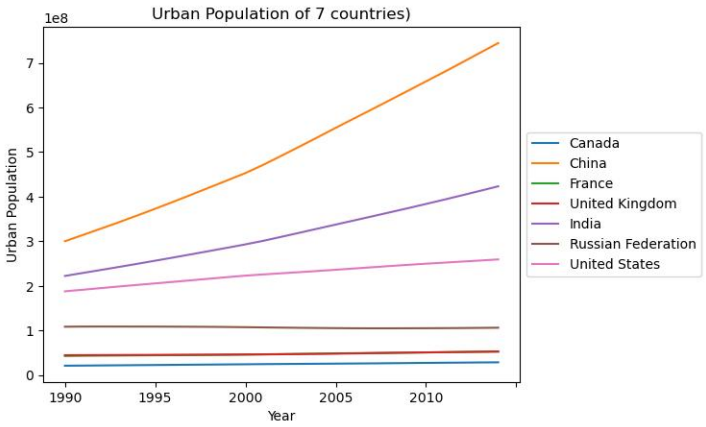
Github Link: https://github.com/Albertnsude/ADS2Assignment2statisticsandtrends

TOPIC: Statistical Analysis of Climate Change Indicators and Factors in Developed Countries Of the World Using World Bank Data: Trends, Correlations, and Possible Solution

ABSTRACT:

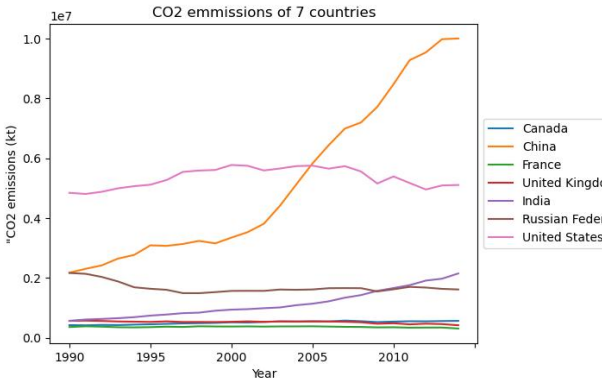
Climate change is a world global issue with serious adverse effects that have far-reaching implications, and comprehending the relationship between various indicators is crucial in addressing the challenge of climate change, which has worldwide consequences. This analysis investigates the factors affecting climate change in seven countries, namely the United States, China, India, the United Kingdom, the Russian Federation, France, and Canada. The analysis uses five indicators: urban population, CO2 emissions, electricity production from nuclear sources, electricity production from oil sources, and renewable energy consumption. The statistical properties of each indicator are analysed and visualized to show the trends and relationships between the indicators. A correlation heat-map is also used to show the correlation between some indicators and which gave an insight on the possible solutions to address climate change. The data was collected from the World Bank database and covers the period from 1990 to 2014. I used Python programming language and its data analysis libraries such as Pandas, Matplotlib, and Seaborn to analyze and visualize the data.

Chart 1: EVOLUTIONAL DRIFT IN URBAN POPULATION



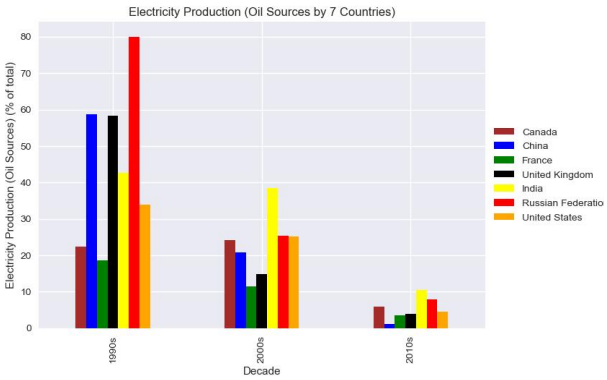
The line plot depicts the statistical indices of the urban population for all countries during the period 1990 to 2014, showing an increase in urbanization. China had the highest increase, with the number of urban residents rising from around 295 million to over 750 million. This growth in urban population might have played a part in boosting the economies of these countries, as cities usually serve as hubs of economic activity and subsequent rise in energy consumption, which in turn can contribute to an increase in CO2 emission as seen in the graph below.

CHART 2: CO2 EMISSIONS TRENDS



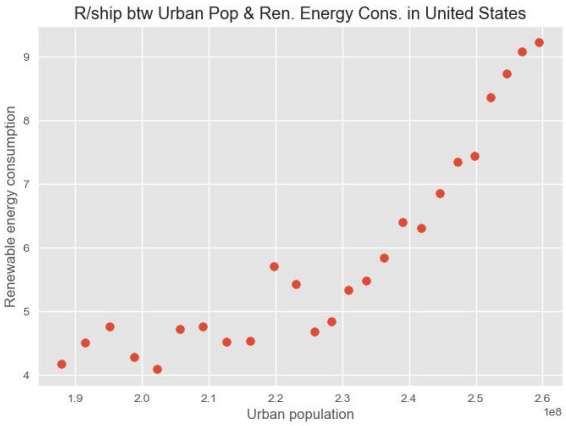
The graph indicates that, during the period from 1990 to 2014, CO2 emissions increased for all selected countries, except for Russia and Germany. Among the countries, China had the highest increase in CO2 emissions, which rose from roughly 2.85 billion metric tons in 1990 to over 9.9 billion metric tons in 2014 due to high usage of coal in energy production for industrialization purpose which have played a part in the economic growth of the nation. It also underscores the environmental consequences of their development.

CHART 3:**PERCENTAGE OF ELECTRICITY PRODUCED FROM FOSSIL FUEL**



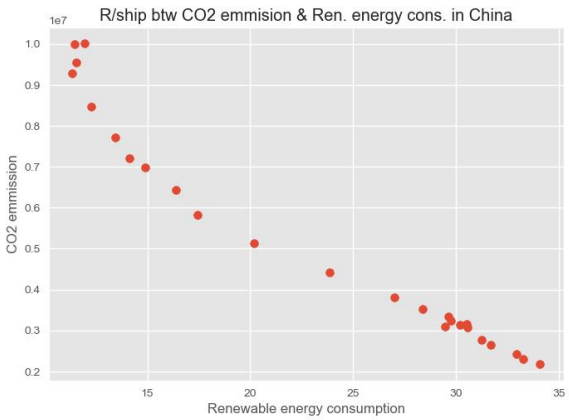
The grouped bar chart displays the percentage of electricity generated from oil sources in these countries over three decades. Russia has over 70% reliance on fossil fuels which have resulted in negative environmental impacts of the country, thereby causing an adverse and significant disadvantages to climate due from the increased CO2 and greenhouse gas emissions emanating from burning fossil fuels. It also reinforces their dependence on fossil fuels, hindering the shift towards more sustainable energy sources.

CHART 4: CORRELATION BETWEEN THE CO2 EMISSION AND URBAN POPULATION IN UNITED STATES



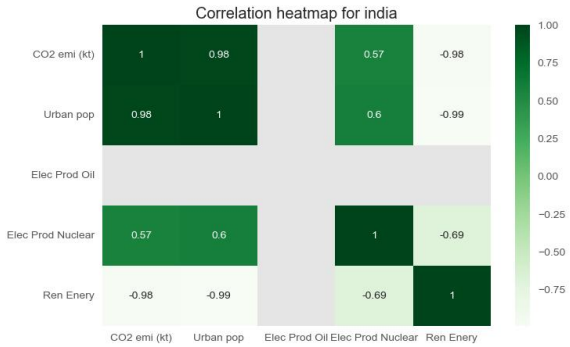
The analysis shows that there is a strong linear relationship and positive correlation between CO2 emissions and urban population in the United States and also upward trend over the 24 year-period. This indicates that policy interventions aimed at reducing greenhouse gas emissions in the United States must take into account the impact of urbanization. .

CHART 5: CORRELATION BETWEEN THE CO2 EMISSION AND RENEWABLE ENERGY CONSUMPTION IN CHINA



The scatter plot shows that there is a negative correlation between CO2 emissions and renewable energy consumption in China. This indicates that policy interventions aimed at reducing greenhouse gas emissions in China should focus on promoting renewable energy sources. Strategies such as increasing the use of solar, wind, and hydro power, promoting energy-efficient buildings, and improving energy efficiency in industry may be effective in reducing emissions and promoting sustainable development in China.

CHART 6: THE HEATMAP FOR INDIA



The heatmap for India shows that there are significant positive correlations between CO2 emissions and electricity production from oil sources, as well as between electricity production from oil sources and urban population. This indicates that the increase in urban population may be contributing to the increase in CO2 emissions, as cities tend to be centres of economic activity and energy consumption, which may rely on oil sources. On the other hand, there is a negative correlation between renewable energy consumption and CO2 emissions, suggesting that an increase in renewable energy use could help mitigate the impact of CO2 emissions on the environment.

Based on the analysis of the data, there are several possible solutions that could be implemented to address the issues. Possible solutions to address climate change include but not limited to these. Countries should

- Reduce dependence on fossil fuels by increasing the use of renewable energy sources.
- Improve energy efficiency by implementing policies that reduce greenhouse gas emissions.
- Promote sustainable lifestyles and developmental pathways that can reduce their adverse environmental impact.
- Approach and address climate change vigorously and foster collaborations and cooperation to tackle this global challenge.