APPLIED DATA SCIENCE 1 ASSIGNMENT

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Visualization & Statistical Analysis of Climate Change

ABSTRACT:

The analysis examines the interrelation between various factors and their impacton climate change in six selected countries from different continents. The factors investigated include electricity access, PFC gas emissions, CO2, renewable power output, population growth, elevated urban land area, and natural gas power generation. The analysis identifies a positive correlation between population growth and CO2 emissions, and highlights the need for countries to shift towards renewable energy sources and reduce their natural gas production. The data indicates that countries with higher access to electricity are causing more CO2 emissions, and that urbanization and construction are contributing to CO2 emissions in some countries. The analysis emphasizes the urgent need for effective action towards reducing carbon footprint and implementing sustainable energy policies to combat climate change.

**GitHub Link:**

[**https://github.com/pt22aap/ADS-pav-assignment-30.git**](https://github.com/pt22aap/ADS-pav-assignment-30.git)

**World Data Bank Link:**

<https://data.worldbank.org/topic/climate-change>

For this analysis 6 countries from different continents were selected and the interrelations of the following factors on climate change were investigated: Electricity Access, PFC gas emissions, CO2, Renewable Power output, Population growth, Elevated urban land area and Natural gas power generation.

A correlation between the factors and their causes was found in the analysis.

Chart, bar chart

Description automatically generatedChart

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Chart

Description automatically generatedBased on available data from 1990 to 2015 in five-year increments, the bar graph above indicates CO2 gas emissions by countries. As seen on the plot, the USA produces the largest amount of greenhouse gas emissions and has seen a downward trend with accelerated rates which is promising. Population growth (plot on the right) directly affects emissions. Both bar charts indicate a positive correlation.

According to the correlation heatmap for Japan above, the growth in the population was responsible for the increase in CO2 emissions due to the use of liquid fuels. This can be deduced from the highly positive correlation between these features.

"CO2 Gas Emissions" and "Population Growth" charts also show Malaysia and UAE have upward trends, which is alarming and should be addressed.

The following table demonstrates the surge of electricity production from natural gas between 1990 and 2015. It is clear that population growth has played a role in this increase. As we attempt to build a greener world, Malaysia is the only country that has reduced such production, while other countries should shift their efforts towards renewable energy sources. Unfortunately, natural gas production also produces vast amounts of contaminated water and requires large areas of land clearing; both of which are detrimental and should be reduced.

|  |  |  |  |
| --- | --- | --- | --- |
| **Country** | **1990** | **2005** | **2015** |
| United States | 14.861957 | 18.33801 | 31.94216 |
| Japan | 19.989258 | 21.58779 | 39.58721 |
| Singapore | 29.796799 | 74.39876 | 95.02925 |
| Malaysia | 58.985526 | 66.87431 | 46.60312 |
| United Arab Emirates | 96.893764 | 97.86483 | 98.52551 |

Chart, bar chart

Description automatically generatedChart, line chart

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As we plot access to electricity with CO2 emissions, we can observe that countries with medium and higher access to electricity, such as Malaysia, USA and Japan, are causing more CO2 emissions at alarming rates.

South Africa, despite having less access to electricity, emits more CO2, which indicates that it is not implementing its Renewable Energy production well (chart on the right confirms) and should focus more on the Green Energy Agenda.

Chart, bar chart, waterfall chart

Description automatically generated

According to the stacked bar graph of the combined CO2 Emissions (L + S) data, Japan & USA are the major contributors to global warming. South Africa's emissions exceed those of Singapore & Malaysia combined.

Singapore is rapidly approaching UAE in terms of renewable electricity output and the UAE tops the list of countries with the most renewable electricity output.

With only 30% of its electricity coming from renewable sources, the US is in the bottom three. Big countries such as the USA should be leaders in renewable energy.

Chart, treemap chart

Description automatically generated

The UAE heatmap shows a high correlation between the increase in elevated urban areas and CO2 emissions, both liquid and solid, and especially solid emissions. The rapid construction and urbanization can be attributed to this. Additionally, UAE needs to cut its natural gas production. Access to electricity is also positively correlated with emissions.