**Climate Insights Through Renewable Energy and Emissions Trends**

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**Objective**

To analyze the relationship between renewable energy use, CO2 emissions, temperature changes, and other environmental indicators across countries from 2000 to 2024, aiming to draw insights into climate change trends and sustainability efforts globally.

**Introduction**

This project explores a comprehensive dataset that tracks environmental indicators across multiple countries from 2000 to 2024. The variables analyzed include:

Average annual temperature (°C)

CO2 emissions per capita (tons)

Sea level rise (mm)

Annual rainfall (mm)

Population

Renewable energy percentage

Forest area percentage

Frequency of extreme weather events

These metrics help us understand the intersection of human activity, environmental degradation, and sustainability measures.

**Methods**

**1. Data Loading and Initial Exploration**

* Used pandas to load the dataset and inspect its structure.
* Initial examination of variable types and value ranges.

**2. Data Wrangling**

* Checked for null values and missing entries.
* Handled missing data through imputation or removal depending on the impact on analysis.
* Renamed ambiguous columns for clarity.

**3. Indexing and Filtering**

* Focused on select countries and global aggregates.
* Filtered years of interest: 2000 to 2024.

**Storytelling (data visualization & interpretation)**

**1. Trend Analysis**

* **Renewable Energy vs. CO2 Emissions**: A noticeable inverse correlation — countries increasing renewable energy usage generally saw declining per capita emissions.
* **Temperature Over Time**: A rising trend in average annual temperatures across almost all countries, most prominently in regions with low forest area percentages.

**2. Heatmaps and Correlations**

* A heatmap revealed strong correlations:
  + CO2 emissions positively correlated with temperature rise.
  + Renewable energy showed a negative correlation with emissions.

**3. Distribution and Comparison**

* Box plots and histograms illustrated:
  + Variability in rainfall across continents.
  + Sea level rise trends aligning with rising temperatures.

**• Conclusion or Summary of Insights**

* **Renewable Energy Matters**: Countries with significant renewable energy adoption tend to exhibit reduced CO2 emissions and slower temperature increases.
* **Global Warming is Real and Measurable**: There’s a clear rise in global temperatures and sea levels over the past two decades.
* **Forest Area is Crucial**: More forest cover is associated with better control of temperature fluctuations and improved ecological health.
* **Climate Change is Multifactorial**: Interactions between population, energy use, and environmental conservation are complex but quantifiable.

**• References**

 Kaggle Dataset: Temperature and Emissions Data

 IPCC Reports on Climate Change Trends

 World Bank Climate Data Repository

**Acknowledgements**

 Special thanks to the course instructor for guidance throughout the project.

 Gratitude to Kaggle and the dataset contributor for making such rich environmental data publicly available