

# **EXPLORING CLIMATE AND ENERGY TRENDS:** **AN IN-DEPTH ANALYSIS**

## **Abstract:**

This analysis addresses the imperative issue of climate change by investigating the interplay in five countries. Focusing on key indicators and the study employs Python tools for data processing and visualization. The findings add to a more thorough knowledge of the global sustainability concerns by highlighting the significance of taking environmental factors into account.

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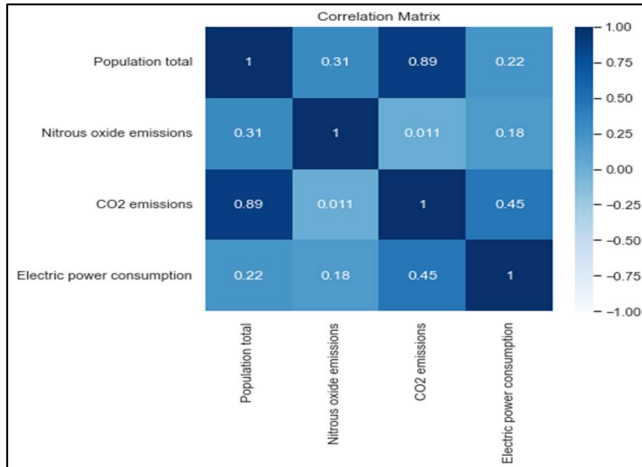
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Git hub Link: <https://github.com/Aswinisiva/ADSI-2-Statistics-and-trends>

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

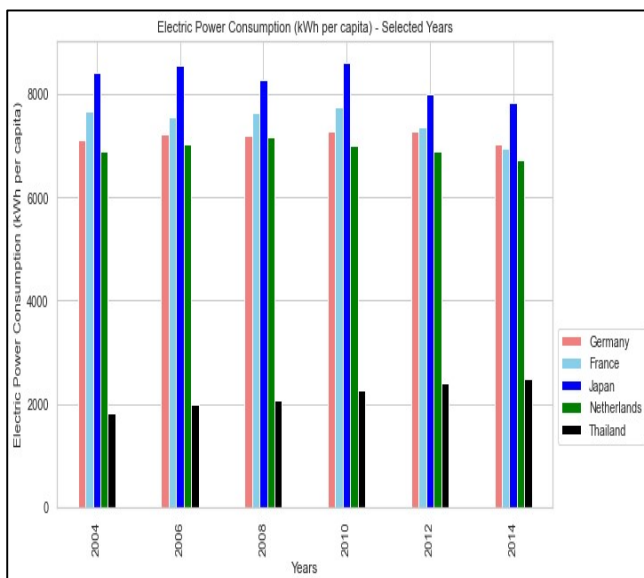
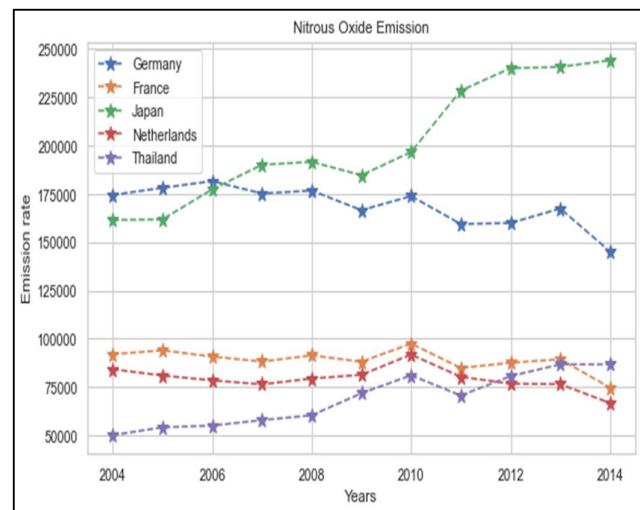
## INTRODUCTION

Understanding the economic and environmental dynamics of many nations is essential in the age of globalisation. The population, nitrous oxide emissions, CO<sub>2</sub> emissions from the burning of gaseous fuels, and electric power consumption are the main environmental indicators that are analysed in this extensive analysis, which covers five countries: Germany, France, Japan, the Netherlands, and Thailand. The data sheds light on the countries' contributions to climate change and covers the years 2004 to 2014.



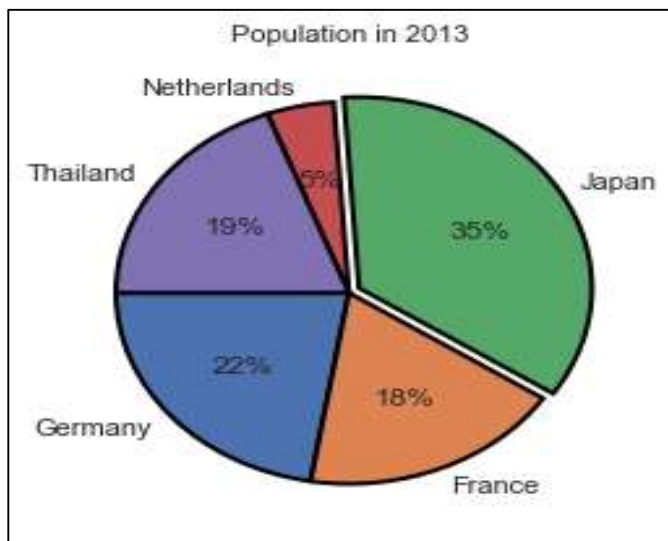
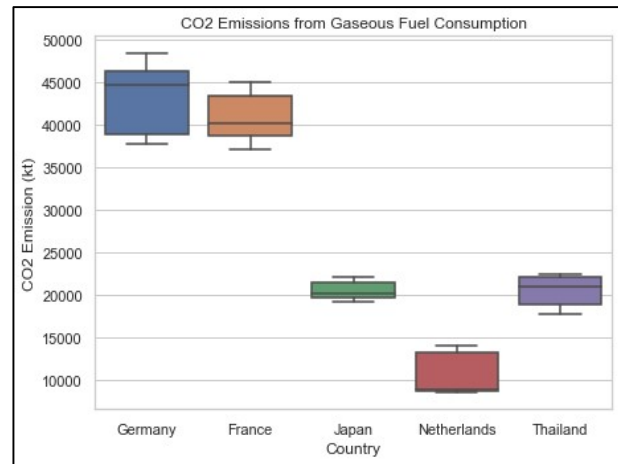
Positive correlations between population size and nitrous oxide as well as carbon dioxide emissions with  $r=0.89$ . Larger populations tend to coincide with higher emissions. Japan, with a high population density, has a greater emission rate and electricity consumption. However, limited correlations between population growth and electric power consumption imply that factors beyond population size influence energy demand. CO<sub>2</sub> emissions and electric power consumption are positively correlated with  $r=0.45$ . This implies that Germany with higher carbon dioxide emissions.

Nitrous oxide emissions are a significant environmental concern, contributing to climate change. The analysis highlights the potential nitrous oxide emissions. High nitrous oxide emissions in Japan signals a potential environmental challenge or increased industrial activity with its observed population growth. Countries with stable emission rates, such as France, and Netherland demonstrate consistent population trends. Germany exhibits a fluctuating pattern in Nitrous Oxide Emission. peaks in 2008 and experiences a notable decrease afterward. Thailand's significant emission decline implies effective policies, showcasing a successful transition to cleaner energy sources.



Japan with highest population witness an increasing trend in Nitrous Oxide Emission, also sees a rise in Electric Power Consumption over years, while Germany and France demonstrate stability in emissions despite changes in consumption. The Netherlands is a promising example of sustainability because of its capacity to effectively reduce emissions through lower energy consumption. Thailand's noteworthy decrease in emissions in spite of rising power use is indicative of successful environmental policy. Nations experiencing both rising emissions and energy consumption may need to reassess their energy strategies and collaborating on sustainable energy solution contribute to a global reduction in environmental impact.

CO<sub>2</sub> emission in Germany is associated with increased population trend. It exhibits a moderate spread of CO<sub>2</sub> emissions, with a slight skewness toward higher values. Japan with highest population and Nitrous oxide emission shows a broader spread of CO<sub>2</sub> emissions, indicating variability in gaseous fuel consumption. The presence of outliers on both ends suggests diverse emission levels within the observed period. Netherlands maintains consistent lower CO<sub>2</sub> emissions, and nitrous oxide emission suggesting successful efforts in adopting greener technologies or policies.



The pie chart for the year 2013 offers a snapshot of population distribution among selected countries. Japan's population remains relatively stable, with limited fluctuations during the analysed timeframe experience increase in Nitrous oxide emission and electric power consumption. It presents unique population dynamics, characterized by a distinct demographic landscape. Germany despite with moderate population manage to maintain higher level of CO<sub>2</sub> emission while stabilize electric consumption. France, and the Thailand showcase demographic stability, aligning with the broader European trend of moderate population growth and emissions.

Japan's nitrous oxide emissions in yields a skewness of 0.5213. The data distribution's asymmetry is measured by skewness. The distribution is skewed to the right when the skewness is positive, indicating that the right side's tail is longer or fatter than the left. This implies a little propensity for somewhat above-average nitrous oxide emissions. A value of -1.3010 is found for the kurtosis. Kurtosis calculates the distribution's "tailedness" in the data. A distribution that differs from the normal distribution in having flatter peaks and thinner tails is indicated by a negative kurtosis. This indicates that there are fewer extreme values, or outliers, in the distribution of nitrous oxide emissions in Japan as compared to a normal distribution.

## **CONCLUSION**

Finally, the indicator wise investigation highlights the complexities of the interactions between demographic and environmental indicators for the selected countries reveal a nuanced understanding of their interrelationships. While there is a broad tendency that links economic progress and population growth to higher emissions, the data also identifies success stories. Certain countries, such as the Netherlands and Thailand, demonstrate the possibility for successful decoupling by implementing good environmental legislation and adopting sustainable practices. Notably, Germany and France exhibit relatively stable emission levels, suggesting potential implementation of sustainable practices. Japan with increased population indicates diverse emission levels and electricity consumption indicates facing challenges. Moreover, the correlation heatmap provides Positive correlations between population size and emissions, as well as between population and electric power consumption. The moderate positive correlations between nitrous oxide and carbon dioxide emissions imply some degree of parallel increase, emphasizing the need for holistic strategies. This realisation highlights the significance of personalised methods and worldwide collaboration in addressing environmental concerns in varied socioeconomic circumstances.