

Climate Change Analyses: A Comprehensive Exploration of Nitrous Oxide, Methane, and CO2 Emissions Trends Across Nations (1990-2023)

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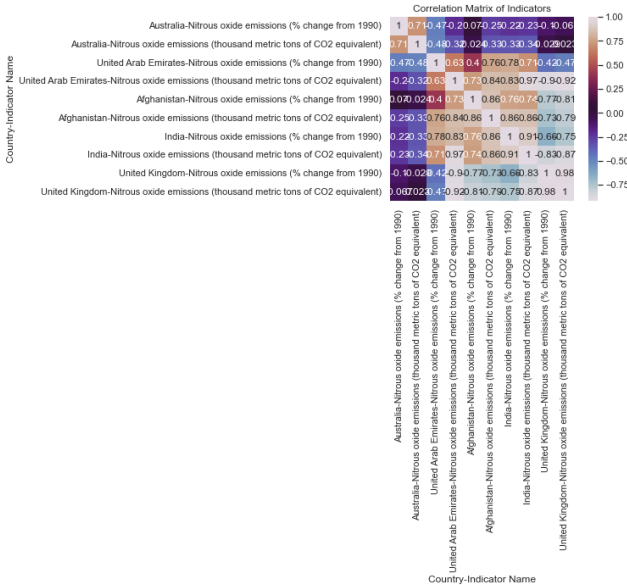
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Git Link: <https://github.com/akarshanalupurakkalanjanasudhan98/ADS1-ASSIGNMENT-STATISTICS-AND-TRENDS.git>

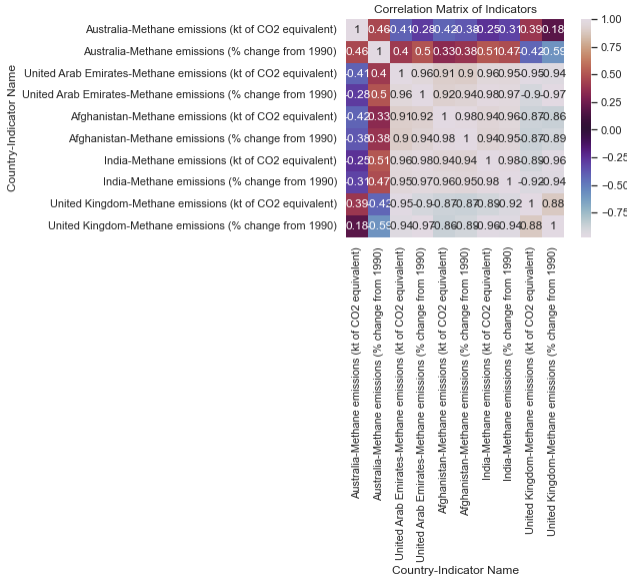
Abstract: This comprehensive study delves into the dynamic trends of key greenhouse gases, namely nitrous oxide, methane, and CO2 emissions, across selected nations from 1990 to 2023. Statistical analyses reveal nuanced patterns, such as the percentage change and absolute emission levels, shedding light on the environmental impact of countries like Australia, the United Arab Emirates, Afghanistan, India, and the United Kingdom. The exploration includes pie charts for CO2 emissions in 1995 and 2005, highlighting shifts in global contributions. Additionally, line plots illustrate the temporal evolution of greenhouse gas emissions, while bar plots dissect CO2 contributions from solid and liquid fuel consumption. This multi-dimensional analysis provides valuable insights into the intricate dynamics of climate-altering emissions on a global scale.

A Comparative Analysis of Nitrous Oxide and Methane Trends Across Nations (1990-2023):

The provided statistical summaries illuminate key trends in nitrous oxide and methane emissions across select countries and globally. Focusing on nitrous oxide emissions' percentage change from 1990, Australia experienced a mean increase of 2.60%, with substantial variability ranging from a decrease of 18.18% to an increase of 29.60%. United Arab Emirates displayed a higher mean increase at 44.40%, ranging from 7.81% to 129.22%. Similar patterns persisted for Afghanistan, India, the United Kingdom, and globally.



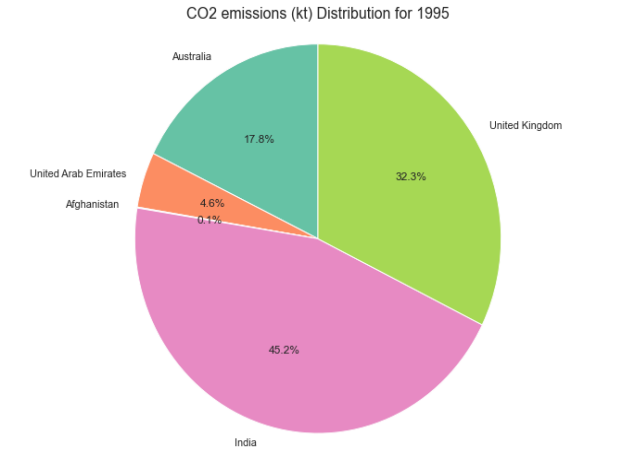
Shifting to absolute nitrous oxide emission levels, Australia averaged 77,228.67 thousand metric tons, with a notable range from 54,100.00 to 108,700.00. The United Arab Emirates exhibited a lower mean of 1,241.67 thousand metric tons, ranging from 510.00 to 2,030.00. Consistent trends emerged across other countries and globally.



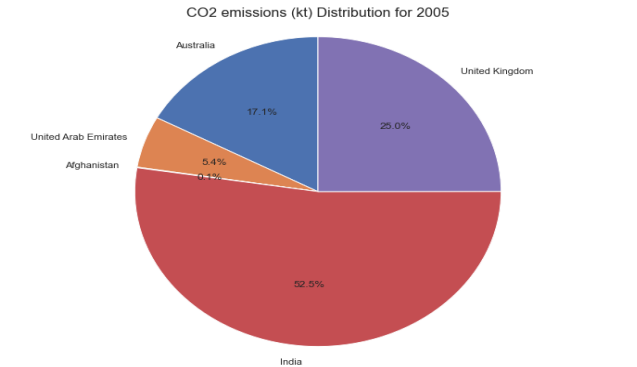
Transitioning to methane emissions, Australia's mean was 136,739.00 thousand metric tons, varying from 114,900.00 to 166,110.00. In the United Arab Emirates, the mean was 30,777.67 thousand metric tons, ranging from 16,460.00 to 49,800.00. Percentage changes in methane emissions demonstrated similar diverse patterns.

Dynamic Trends in CO2 Emissions: A Comparative Analysis of Selected Countries (1995-2005):

The pie charts depict the distribution of CO2 emissions (in thousand metric tons) for selected countries in the years 1995 and 2005. In 1995, India emerged as the highest contributor with 737,860.00 kt, constituting approximately 39.8% of the total. The United Kingdom followed closely with 526,810.00 kt, contributing around 28.5%.



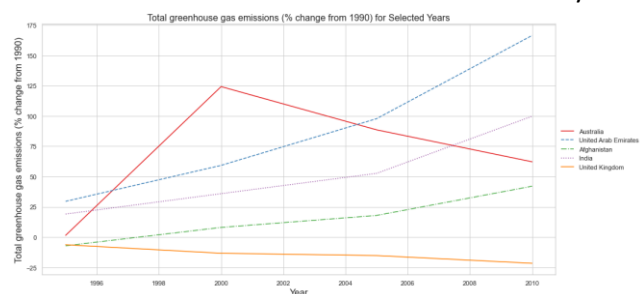
Conversely, Afghanistan had the lowest emissions at 1,240.00 kt, making up roughly 0.1%. In 2005, India maintained its leading position with 1,136,469.97 kt, representing about 41.3%, while Afghanistan remained the lowest contributor at 1,550.00 kt, around 0.1%.



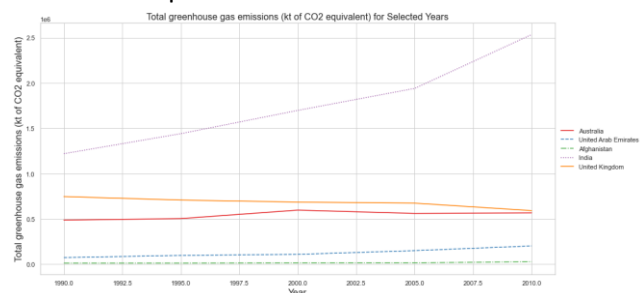
Temporal Trends in Greenhouse Gas Emissions: A Comparative Analysis for Selected Countries (1980-2010):

The provided line plot displays the evolution of two greenhouse gas emission indicators, namely "Total greenhouse gas emissions (% change from 1990)" and "Total greenhouse gas

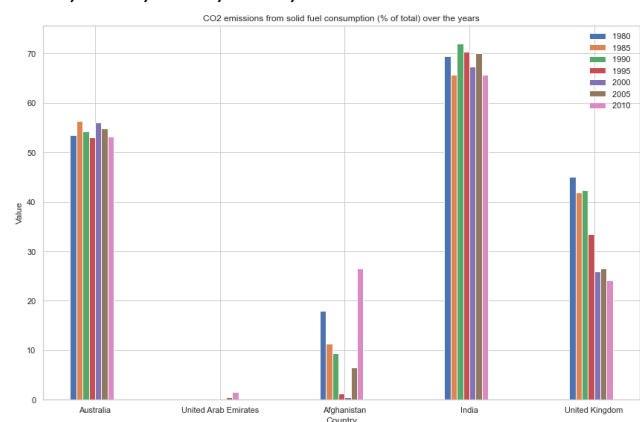
emissions (kt of CO₂ equivalent)," for selected countries over the years 1980 to 2010. Each line in the plot represents a specific country, and the x-axis denotes the years.



For example, focusing on "Total greenhouse gas emissions (% change from 1990)" in 1980, Australia had a value of 53.49%, indicating a 53.49% increase in greenhouse gas emissions compared to the levels in 1990. In contrast, the United Arab Emirates showed no emissions from solid fuel consumption in 1980 for this particular indicator.

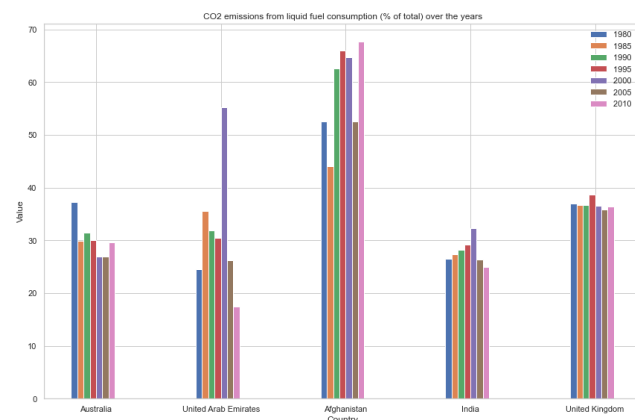


Temporal Evolution of CO₂ Emissions: Solid vs. Liquid Fuel Consumption Percentage Contributions Across Selected Countries (1980-2010): The bar plot presents the distribution of CO₂ emissions from both solid and liquid fuel consumption as a percentage of the total emissions for selected countries over the years 1980, 1985, 1990, 1995, 2000, 2005, and 2010.



In terms of CO₂ emissions from solid fuel consumption, Australia exhibited a relatively consistent contribution, fluctuating from approximately 53.49% in 1980 to 53.26% in 2010. The United Arab Emirates consistently showed

negligible values of 0.0%, indicating minimal reliance on solid fuel. Afghanistan's contribution ranged from around 17.92% in 1980 to 26.52% in 2010. India demonstrated a decline from 69.52% in 1980 to 65.67% in 2010, while the United Kingdom experienced a notable decrease from 45.04% in 1980 to 24.14% in 2010.



Regarding CO₂ emissions from liquid fuel consumption, Australia's contribution ranged from about 37.28% in 1980 to 29.64% in 2010. The United Arab Emirates displayed a decline from 24.44% in 1980 to 17.40% in 2010. Afghanistan showed an increase from 52.50% in 1980 to 67.71% in 2010. India's contribution ranged from 26.51% in 1980 to 24.88% in 2010, and the United Kingdom remained relatively stable, ranging from 37.02% in 1980 to 36.39% in 2010. These insights underscore the evolving dynamics of fuel-related emissions across the selected countries during the specified years.

Conclusion:

the comparative analysis of nitrous oxide, methane, and CO₂ emissions across selected countries from 1990 to 2023 reveals multifaceted patterns and trends. The examination of percentage changes and absolute emission levels provides a nuanced understanding of each nation's environmental impact. Notable shifts in global carbon emissions contributions over the years are underscored by pie charts, emphasizing the dynamic nature of these trends. The temporal evolution of greenhouse gas emissions, as depicted in line plots, showcases fluctuations and variations, offering insights into countries' individual trajectories. The bar plots further dissect CO₂ contributions from solid and liquid fuel consumption, highlighting evolving dynamics in emissions sources.