



[Association of Fossil Fuel Consumption and Greenhouse Emissions in Member Countries of the United Nations]

Author 1: [Mr.] [Radin] [Ahmadian], [Hunter College High School]

Keywords: [Greenhouse Emissions];[Fossil Fuels]; [Clean Energy]

ABSTRACT

[Introduction: There are many debates on whether the use of fossil fuels is what causes the greenhouse gas emissions and global warming. This study hypothesized that countries with higher fossil fuel consumption will tend to have higher greenhouse gas emissions and countries that use clean electricity will tend to have lower emissions. **Methods:** Data values for 39 countries were evaluated from the United Nations Statistical Division's Energy Statistics Database (UNSD). The variables of study were consumption levels of motor gasoline, natural gas, crude petroleum, coal, wind energy, thermal energy, solar energy, and emissions of CH₄, CO₂, HFC, N₂O, PFC, and SF₆. Four secondary variables which were the sum of other variables in the study were created. The fossil fuels were defined as two different variables with and without including the consumption of natural gas. The clean electricity variable was the sum of the production of solar electricity, nuclear electricity, wind electricity, and thermal electricity. In total, seven regression models were created. Total emissions was the response variable in all seven models. The explanatory variables of the models were: fossil fuels, clean electricity, motor gasoline, natural gas, wind electricity, and thermal electricity. **Results:** Our univariable regression analysis with fossil fuels (with natural gas) as the explanatory variable and total emissions as the response variable showed a moderately strong positive linear relationship (r of 0.869 and r^2 of 76.6%). In the second regression analysis defined with fossil fuels (without natural gas) as the explanatory variable and total emissions as the response variable, we found that there is a very weak linear relationship ($r=-0.138$). In the next regression analysis, we found that the explanatory variable of clean electricity was strongly and positively associated with the total emissions ($r=0.935$). The relationship between the two variables was not linear. After further analysis and transformations, a power law model was found to be a good fit for the data ($\hat{y} = 70.3072x^{0.748}$). A moderately strong positive relationship was found in a regression analysis with the explanatory variable of motor gasoline consumption and total emissions as the response variable. Again even though the correlation coefficient was high at .925, the residual plot showed that the data did not have a linear relationship and a power law model was found to be a better fit ($\hat{y} = 109.901x^{0.911}$). Regression analysis with natural gas consumption as the explanatory variable and total emissions as the response variable found a very weak negative relationship with correlation coefficient 0.115. Regression analysis where wind electricity was the explanatory variable and total emissions the response variable showed a moderately weak positive linear relationship with r value of 0.467. **Conclusion:** Our analysis points to the fact that greenhouse gas emissions are a multi-factorial phenomenon. Each country has a different percentage of production of each fossil fuel and alternative energy source. Fossil fuels could be clean if technology like CO₂ capture is used. Even though a relationship between greenhouse emissions and fossil fuel consumption exists, it is not absolute.]