Multiple Factor Regression Analysis of Vegetation Changes and Land Degradation in Drylands

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Desertification (vegetation reduction) is a form of land degradation in drylands, which is a term that encompasses sub-humid areas. According to National Geographic, desertification is a severe environmental crisis that may affect about 2 billion people living in the drylands and could displace an estimated 50 million people by 2030. In this report, longitudinal, secondary research is conducted. The purpose of the study is to use a novel statistical approach (multiple factor regression) to quantify the effect of various factors, including drought, precipitation, CO2 emissions, forest area, and electrical energy consumption, on the vegetation cover of multiple regions and outline measures to increase the vegetation cover. More than 67 gigabytes of geospatial data are extracted from the Advanced Very High-Resolution Radiometer (AVHRR), Terraclimate, and other official sources. Multiple statistical and machine learning techniques are used for analysis. The tools used for the study are Python and its data science libraries, such as Numpy, Cartopy, Scipy, Scikit-learn, and Matplotlib. The effect of each factor, including drought, precipitation, CO2 emissions, forest area, and electrical energy consumption on land degradation and vegetation in various regions around the world from 1995 to 2015 is quantified using multiple factor regression analysis and described with linear and logistic curves and prediction intervals. Electrical energy consumption was found to be the most impactful factor, followed by CO2 emissions and drought. Region-specific strategies to combat desertification are also discussed in the report. Inhibiting desertification is essential for eco-safety, biodiversity, human health, and sustainable development.

Awards Won:
Third Award of $1,000