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7PAM2000-0901-2023 - Applied Data Science 1

Statistics And Trends

"Indicators and Insights: Unveiling Statistical Trends"

GitHub Repository link: https://github.com/Amulya07534776064/ADS1-ASSIGNMENT2

Data Source Link: https://databank.worldbank.org

The relationship between carbon dioxide (CO2) emissions, forest cover, and arable land percentage in a country is intricately linked to environmental sustainability and climate change. CO2 emissions, primarily from industrial activities and the burning of fossil fuels, contribute significantly to the greenhouse effect, leading to global warming. Forest cover plays a crucial role in mitigating these emissions, as trees absorb CO2 during photosynthesis. Therefore, countries with higher forest cover tend to act as carbon sinks, helping to offset carbon emissions. Additionally, the extent of arable land is vital for food production and agricultural sustainability. Striking a balance between CO2 emissions, maintaining or increasing forest cover, and preserving arable land is essential for fostering a sustainable environment. Effective land-use policies and conservation efforts are key components in addressing this complex interplay and promoting a harmonious relationship between human activities and the natural environment.

Here, we first identify the countries with the highest and lowest percentages of Co2 emission, forest land and arable land and then try assessing the impact of each of these factors on the others.

Co2 Emission (kg per PPP$ of GDP)

It was found that the top 10 countries emitting the highest average Co2 over the years were Turkmenistan, Uzbekistan, Russian Federation, Ukraine, Kazakhstan, Mongolia, China, Europe & Central Asia, Palau and Belarus in the descending order.
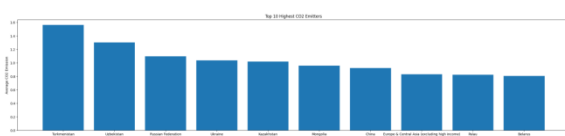
It was found that the top 5 countries emitting the least average Co2 over the years were Somalia, Uganda, Burundi Country, Central African Republic and Chad.
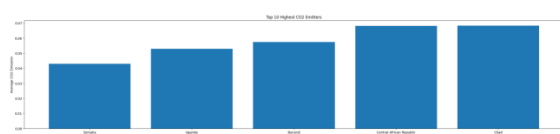

Next, I tried assessing the condition of Turkmenistan over the years. It was found that the Co2 emission has been consistently decreasing over the past decade and has been recorded the lowest in the year 2022. This might be due to the global warming awareness

and green revolution rules imposed on the industries in the context.
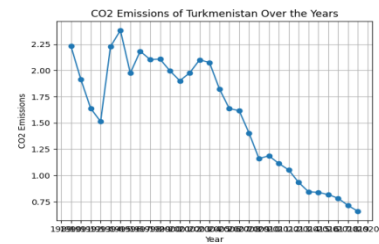
Forest Area

It was found that average percentage forest cover was the highest in Sunname, Guyana, Gabon Country, Equatorial Guinea and Micronesia, Fed. Sts. in the descending order and was the lowest in countries Gibraltar, Qatar, Nauru, Monaco and Greenland in the ascending order.
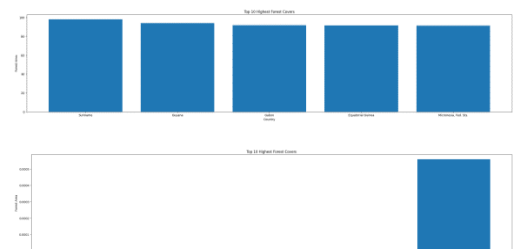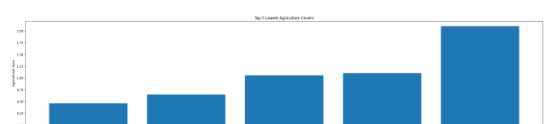

Arable Land

The top 5 countries with the highest percentage land for agriculture and irrigation are Uruguay, Mongolia, Kazakhstan, South Africa and Lesotho.
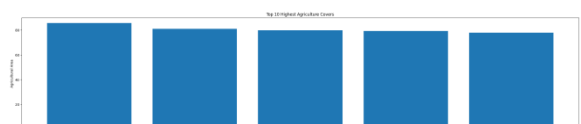

Suriname, Greenland, Turks and Caicos Island, Bahamas and Papua New Guinea are the countries with the least percentage arable land in ascending order.


Correlation

We selected 10 countries from different continents for investigating these factors related to climate change and their impact on each other. The figure below shows the average Co2 emission for these 10 countries from year 1990 to 2019 in five year increments.

Average CO2 Emissions for Selected Countries (1990-2020)
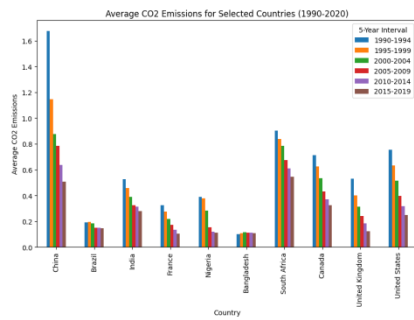
From 1990 to 1994, China had the highest Co2 emission that is 1.67%, followed by South Africa that had 0.90%. While the Co2 emission in China has decreased over the years and reached 0.52% in years 2015-2019, South Africa though has moved to the first position as it reached 0.54%.

Average % Forest Cover for Selected Countries (1990-2020)
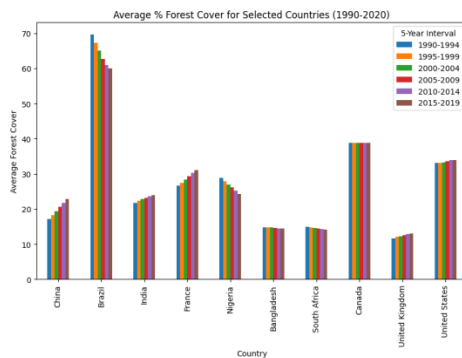
From 1990 to 1994, Brazil had the highest percentage forest land that is 69.55%, followed by Canada with 38.84%. While Canada has been consistent at the same percentage over the years, the forest cover percentage in Brazil has reduced to 59.97% in 2015-2019, however keeping it the first in world even then. Table below shows Co2 emission and Forest Cover for China and India from 1990 to 2019 with five increments.

Years	China		India	
	Co2 Emission	Forest Cover	Co2 Emission	Forest Cover
1990-1994	1.67	17.16%	0.52	21.75%
1995-1999	1.15	18.21%	0.45	22.37%
2000-2004	0.87	19.35%	0.38	22.90%
2005-2009	0.78	20.61%	0.32	23.20%
2010-2014	0.63	21.78%	0.31	23.60%
2015-2019	0.50	22.82%	0.27	24.10%

Therefore, the percentage increase in forest land for China from 1990-1995 to 2015-2019 is approximately 33.02%, and for India, it is approximately 10.80%. Therefore, the percentage decrease in CO2 emissions for China from 1990-1995 to 2015-2019 is approximately 70.06%, and for India, it is

approximately 48.08%. For China, correlation between CO2 Emission and Forest Cover is −0.965 and for India is -0.989. Observing the pattern for China and India, we see that as the forest land increases, the Co2 emission decreases, reaffirming that higher forest cover tend to offset carbon emissions.

Average % agriculture Cover for Selected Countries (1990-2020)
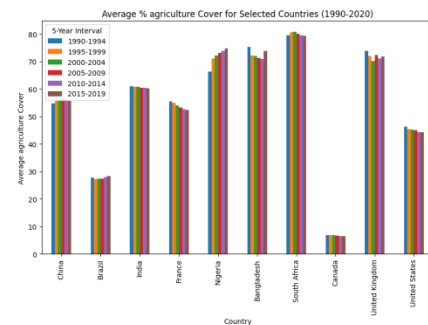
South Africa has the highest arable land over the years. In 1990-1994 the arable land percentage in China was 54.80% and it increased to 55.62% in 2015-2019 while in India it was 61.01% and decreased to 60.31. There has not been a major change in the arable land cover despite the decrease in Co2 and increase in forest land cover or vice versa. This shows that arable land is not very correlated to the other two factors. The below three graphs show the trend of Co2 emission, forest cover and arable land cover respectively for the selected countries.

CO2 Emissions of Selected Countries Over the Years

Forest Cover of Selected Countries Over the Years

Arable Land of Selected Countries Over the Years
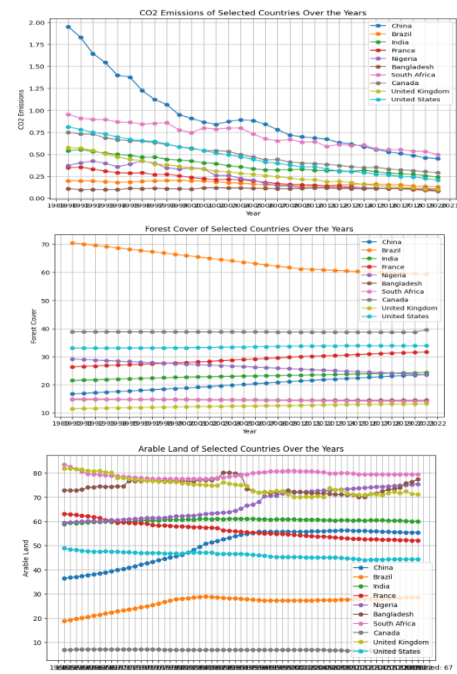
Brazil has shown a decrease in the forest cover in the past years. This is because of climate change, wild fires infrastructure and industries but also because forests

are cut down for agriculture and we see that in the arable cover graph where Brazil shows an increase over the years.