

# ANALYSIS OF CLIMATE CHANGE WORLD BANK DATA

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**Abstract:** *This study analyzes World Bank data from 1990 to 2020 across 11 countries to investigate correlations between socio-economic factors and greenhouse gas emissions. Findings highlight China's dominant emission rates linked to urbanization, shifting energy use, and increased GDP. Urban migration significantly impacts emissions, while diverse trends in arable land and forest cover underscore varied environmental policies. India's unique negative correlation between agriculture methane production and energy use contrasts with the USA's reliance on nonrenewable sources. Understanding these correlations provides insights for targeted climate change mitigation strategies amidst complex socio-economic dynamics globally.*

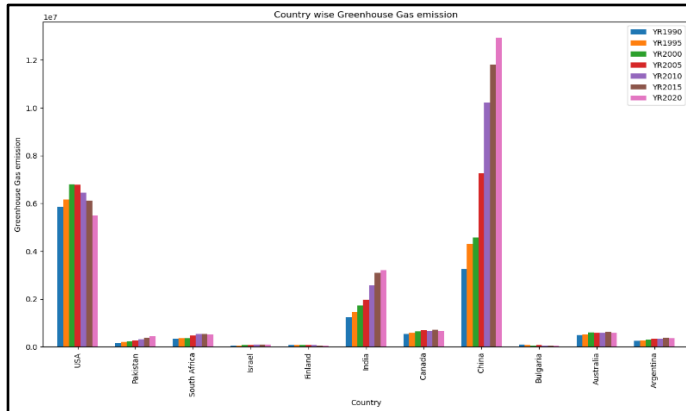
**Source:** <https://data.worldbank.org/topic/climate-change>.

**GITHUB REPOSITORY:** <https://github.com/Amudalapallyparimala24/Applied-Data-Science>

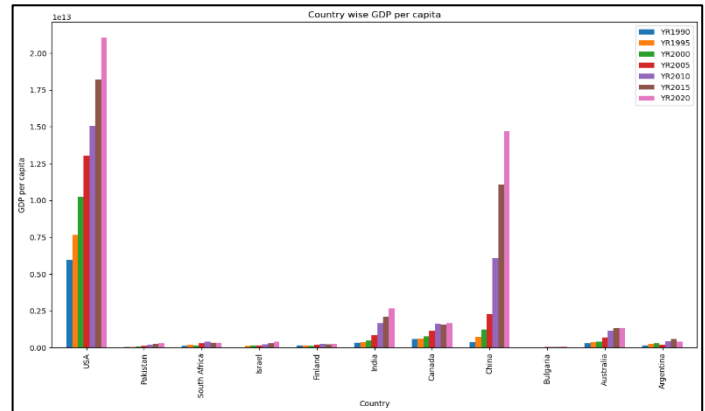
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## Analysis of Climate Change World Bank Data

Climate change has always been one of the major concerns worldwide. That's why it is necessary to ascertain the factors affecting it. For this analysis we have taken data for 11 countries from World bank data repositories from 1990 to 2020. Some of the severe factors that were researched are GDP, Total Population, Urban growth, CO<sub>2</sub> emissions, Arable land, forest covered land and other consumption and biogas production factors.



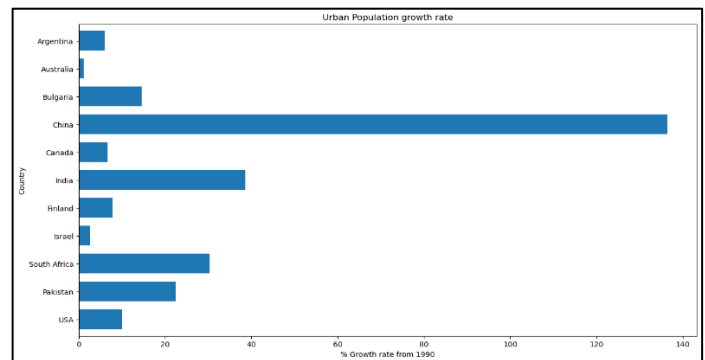
The bar plot above indicates the country wise greenhouse gas emissions of the 11 countries between the year 1990 and 2020 with a 5-year gap. From the plot China emits the maximum greenhouse gas in 2020 of 12.94 Mn kt of CO<sub>2</sub> eq. followed by USA and India.



From the above graph GDP for countries like China, India and USA have increased significantly over the last few years compared to other countries. This is because more of finished goods are being produced over the last few years as people migrated from rural to urban areas increasing the GDP of the economy and increased finished goods have led to increased consumption pattern which in turn increases the greenhouse gas emissions. The correlation plot of China also states a negative relation between methane production and CO<sub>2</sub> emission justifying above conclusion.

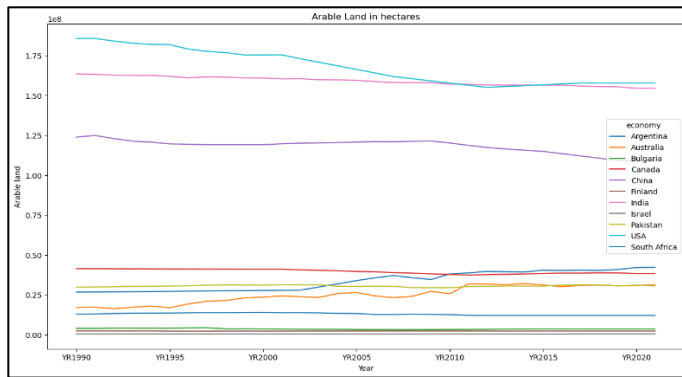


From the correlation matrix above it can be clearly seen that in China factors like electricity power consumption, energy use, CO<sub>2</sub> emissions, GDP per capita, Urban Population % and Population growth directly impacts the increase in greenhouse gas emissions. From the above matrix it can be concluded that as more and more people shifted from rural to urban areas, the urban population increases, the energy consumption patterns of people increase with high power consumption and energy use as people shifted from methane-based energy usage in rural areas and this change in lifestyle pattern increases the greenhouse gas emissions.

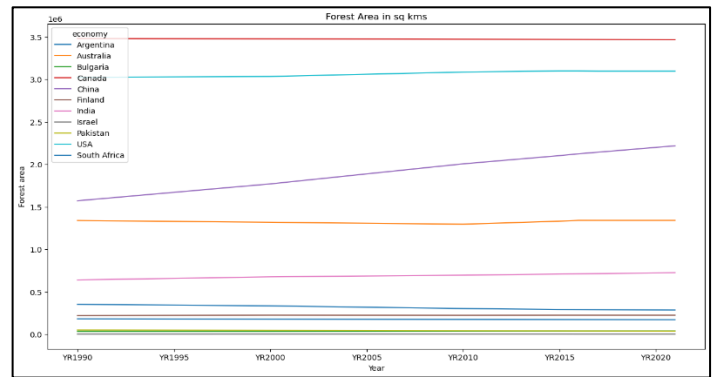


The above plot shows the growth rate of population in Urban areas (as a percentage of total population of the respective country). This is obtained by taking 1990 urban population as the base and finding the growth in 2021.

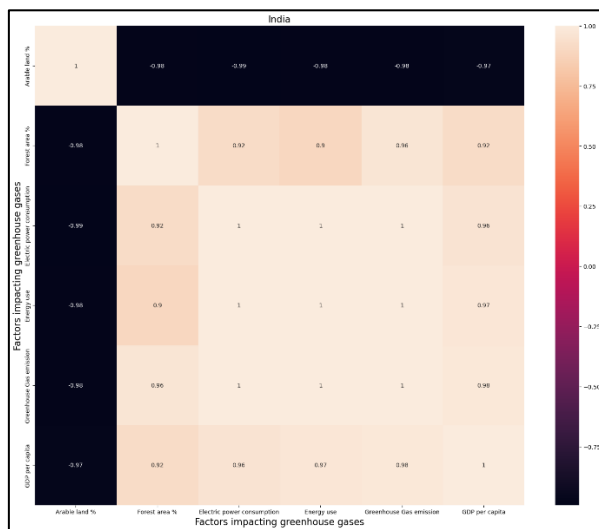
As we can see from the above horizontal plot China is the country that has seen the most migration of people from rural to Urban areas almost an increase of 136% of the total population that it initially has in 1990. This is followed by countries like India (39%) and South Africa (31%). Thus, from the result we can conclude that in China most of the increase in greenhouse gas emission is because most people have migrated from rural to urban areas and due to the changing consumption pattern and lifestyle.



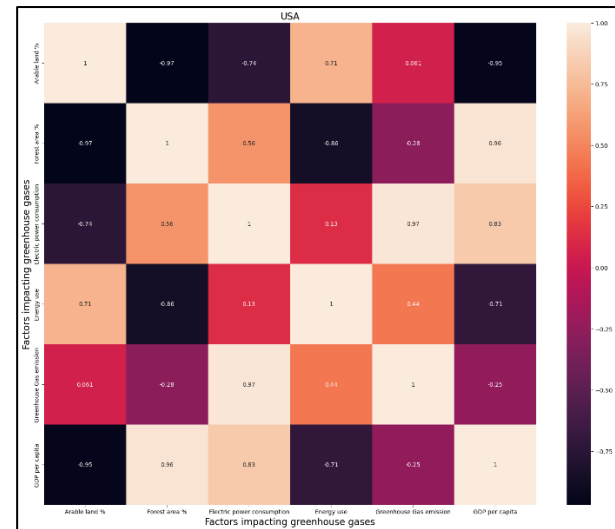
The above graph indicates the arable land in hectares. It is seen over the course of 32 years the arable land has declined due to the growing urban population. The highest decline of land is seen for USA (15%) followed by China (12%) and Bulgaria (9%).



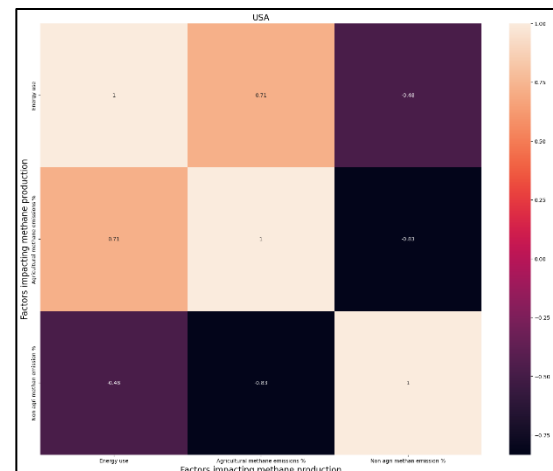
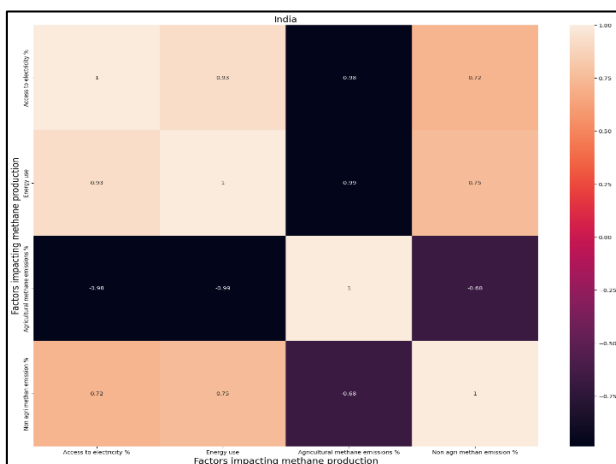
From the plot we see that the forest area has no major changes to total land area of countries from 1990 till 2022. The maximum deforestation is seen in Pakistan with a decline of 26% followed by Argentina (19%) and South Africa (6%). China surprisingly has growth of forest by 41%.



The heatmap of India shows a negative correlation between Arable Land % against other factors. But greenhouse gas emission is highly correlated to all other factors. From before we have seen that methane production decreases the emission of CO<sub>2</sub>. In the below correlation plot we have tried linking methane production with other relevant parameters. Agriculture methane production is negatively related to energy use & electricity.



The heatmap for the USA above shows a negative correlation with Arable Land and Energy Use while a positive correlation with GDP per capita. This is true in case the use of nonrenewable sources is depleted for providing energy sources. To check the methane production linkage with other



parameters we see below plot.

Methane emission in USA is positively dependent on energy use unlike as in India.