GLOBAL EMISSION
Data visual analysis using R

1. Introduction:

Global change has long been the biggest problem of all countries. One of the most obvious pieces of evidence is climate change. Most scientist claim it for the greenhouse gas. Since the 1800s, burning fossil fuels (such as coal, oil, and gas) has produced heat-trapping gases, which has been the primary cause of climate change. The heat from the sun gets trapped on Earth because of greenhouse gas production. Nowadays, the rate of global warming is presently higher than it has ever been. In this project I will use visualization data to analyze biggest CO2 emitters across the globe, the relationship between GPD and green house emissions, and how emissions changing over the years.

2. Data description:

The data is a part of Emissions Database for Global Atmospheric Research of the European Commission team. It has 12 variables with 8385 observations from all countries over the world through the years of 1970 and 2012. The variables used in this data are country, year, the amount of emission by types and the amount of emission by sectors both calculated in kilotons of CO2, ratio of emission per GDP, ration of emissions per capita.

The overview of dataset is shown below.

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Rows: 8,385
Columns: 12
$ Country                          <chr> "Afghanistan", "Afghanistan", "Afghanistan", "Afghanistan",
$ Year                             <int> 1970, 1971, 1972, 1973, 1974, 1975, 1976, 1977, 1978, 1979,
$ Emissions.Type.CO2               <dbl> 2670, 2630, 2180, 2310, 2520, 2720, 2800, 2780, 2780, 2700,
$ Emissions.Type.N2O               <dbl> 1820, 1850, 1810, 1830, 2190, 1930, 1870, 1990, 3690, 2990,
$ Emissions.Type.CH4               <dbl> 12800, 12900, 11900, 11600, 12800, 12800, 12800, 13000, 125
$ Emissions.Sector.Power.Industry  <dbl> 0.06, 0.06, 0.12, 0.17, 0.21, 0.21, 0.24, 0.38, 0.27, 0.30,
$ Emissions.Sector.Buildings       <dbl> 0.58, 0.58, 0.46, 0.57, 0.77, 0.59, 0.48, 0.43, 0.41, 0.48,
$ Emissions.Sector.Transport       <dbl> 0.23, 0.23, 0.27, 0.24, 0.24, 0.29, 0.24, 0.30, 0.30, 0.35,
$ Emissions.Sector.Other.Industry  <dbl> 0.07, 0.07, 0.05, 0.02, 0.03, 0.02, 0.02, 0.03, 0.03, 0.05,
$ Emissions.Sector.Other.sectors   <dbl> 0.53, 0.53, 0.61, 0.47, 0.65, 0.58, 0.63, 0.73, 0.60, 0.56,
$ Ratio.Per.GDP                    <dbl> 1.557705, 1.517670, 1.357590, 1.307901, 1.425016, 1.383556,
$ Ratio.Per.Capita                 <dbl> 0.000000, 0.000000, 0.000000, 0.000000, 0.000000, 0.000000,
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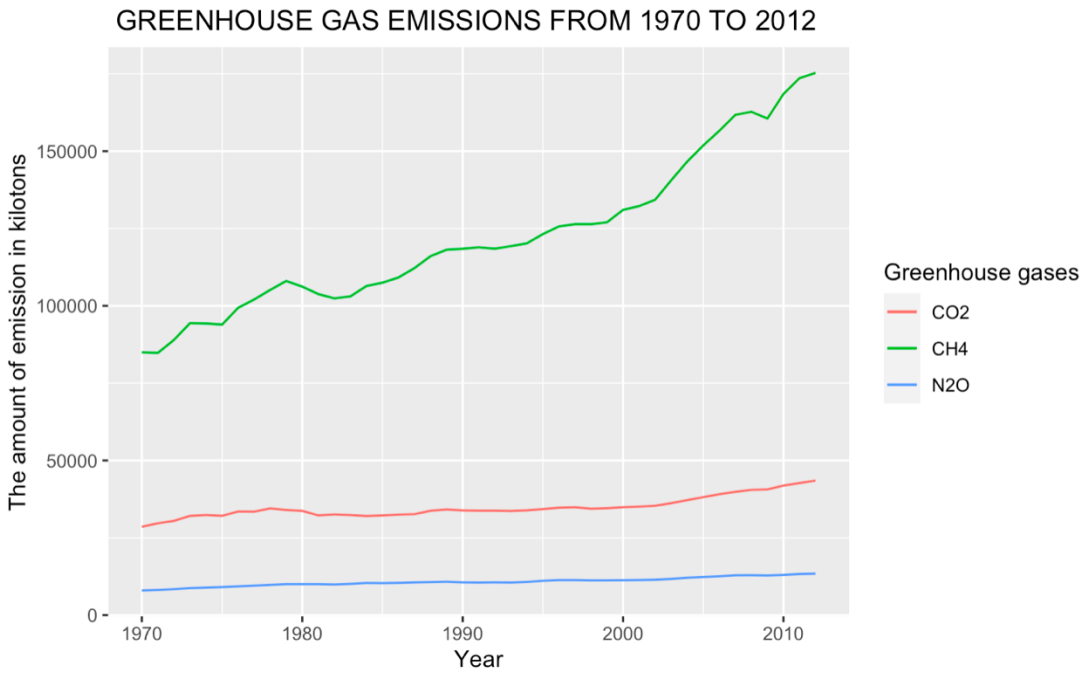
The link for the csv file: https://think.cs.vt.edu/corgis/csv/emissions/

3. Analyzation:

a. The biggest emitters across the globe:

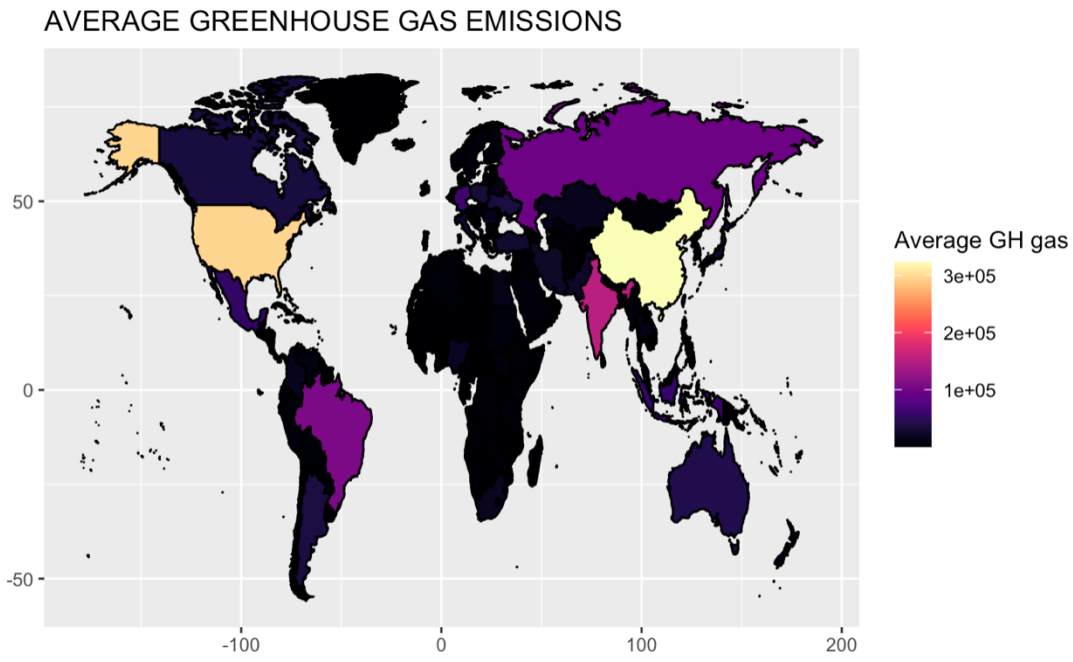
i. Types of emissions through 1970 to 2012:



The line chart is clearly shown the positive trend of all greenhouse gases from 1970 to 2012. The amount of CH4 gas has the fastest speed with the increase from about 85000 kilotons in 1970 to 175000 kilotons in 2012. The CH4 is double its

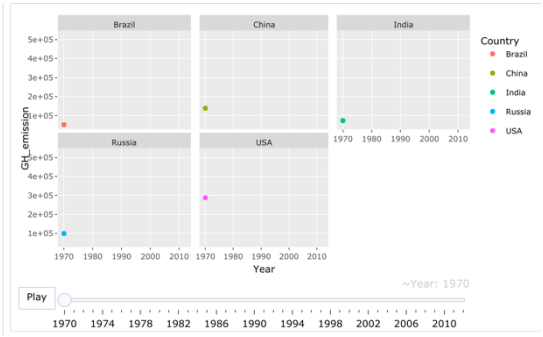
emission just in 42 years. Methane (CH4) is emitted during the production and transport of coal, natural gas, and oils. The second largest emission is CO2 which is claimed by the natural sources, the respiration of human, ocean, decomposition. The last is N2O gas, which is claimed by the agriculture, land use, combustion of fossil fuels

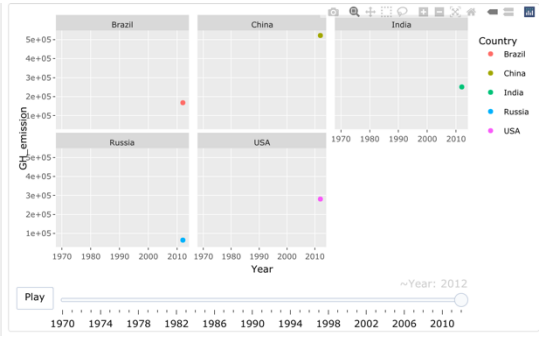
ii. Average greenhouse emissions around the world:



The world map above illustrates the average greenhouse emissions. The lightest the country is the highest emission it produces. It's obviously that China is the highest emitter with the average of over 300000 kilotons, then follows by the United States with about 280000 kilotons, and the next 3 biggest emitters are India, Russia, and Brazil.

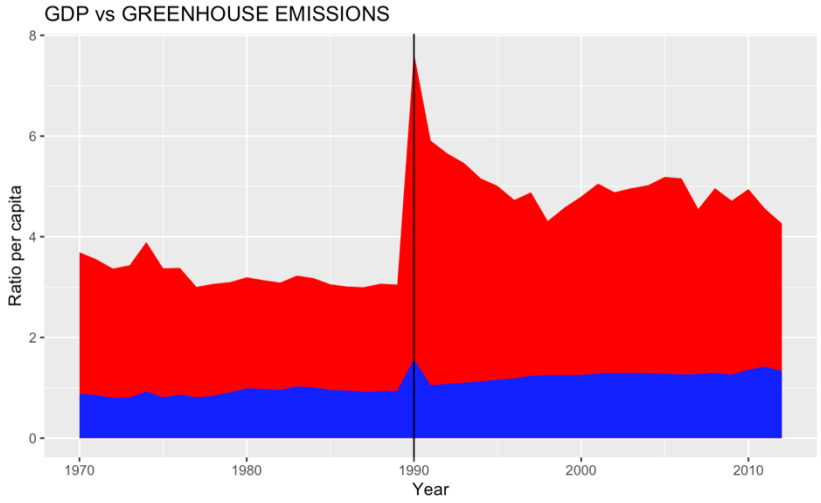
iii. Analyze the top 5 countries that have the highest emissions:





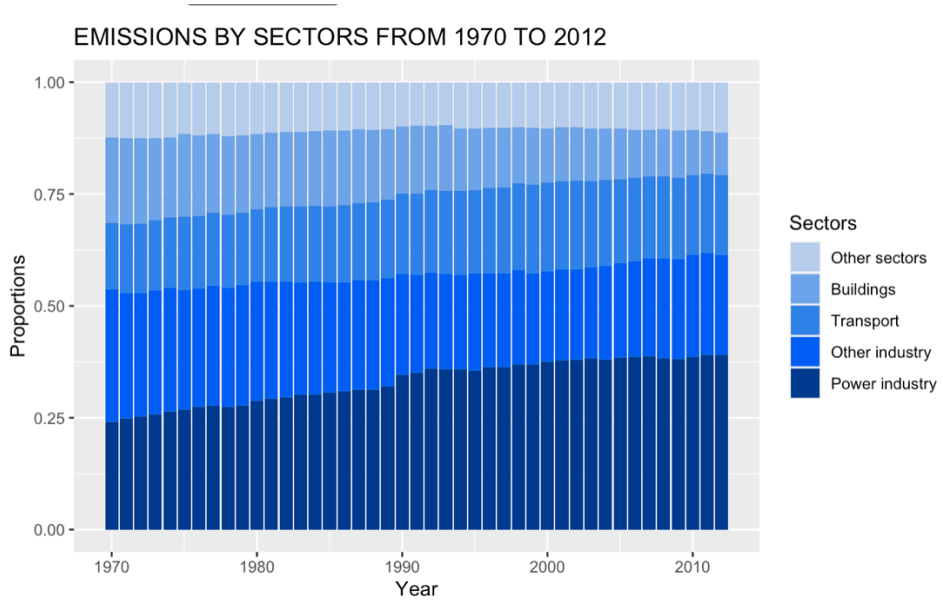
As analyzing in the map above, this animated plot visualizes the top 5 countries that have the highest emissions. At the beginning of 1970, the United States had the highest emissions, then followed by China, Russia, India, and Brazil. Things has changed over year. At the end of the timeline, in 2012, China's emission increased rapidly and be the highest, then follows by the United States, India, Brazil, and Russia.

b. The relationship between GPD and greenhouse emissions



The area chart above shows the ratio of GDP per capita in the blue area, and the ratio of emissions per capita in the red area. The red area is bigger than the blue area which means the emissions ratio is higher than the GDP ratio. It seems to be that every high peak the GDP is, there is also an increase of emissions. As illustrating in the chart, 1990 is the year of highest GDP ratio, and the emissions ratio also be the highest in the same year. It can be concluded that there is a positive relationship between GDP and the greenhouse emissions.

c. The emissions changing over the years



According to the previous visual chart, we know that the greenhouse emissions keep increasing by years. In this chart, I will analyze the emissions by sector proportions. It can be seen from the chart above that the two dark blue areas have the highest number of about 50% proportion contribute to the increasing of greenhouse gases. That means the power industry and the other industry are the most in charge for the emissions. The other sector that also contribute for the increasing follow by transport, buildings, and other sector.