R Programming Assignment Data Exploration and Visualization

DATASET:

The data of Renewable Energy Production of All countries from the year 1990 to 2015 is chosen for Analysis along with the respective population and GDP of each Countries. The previously mentioned data's are all merged into a single dataset for Analysis. All the Data sets have been sourced from World Bank Data. The data is supplied to the world bank by its member nations. Therefore, the quality of data depends upon the country's performance. World Bank gathers data with the aim of achieving a poverty free world. Also, for helping developing countries with Sustainable growth, Capital management and Advisory Services for governments.

Datasets Used:

- Energy From Renewable Sources in %: This dataset contains the percentage of renewable energy production of each country with respect to their total energy production from 1960 to 2015.(source: https://data.worldbank.org/indicator/EG.ELC.RNWX.ZS)
- Population Dataset: This dataset contains the population growth of each country from the year 1960 to 2021.(source: https://data.worldbank.org/indicator/SP.POP.TOTL?view=chart)
- Energy production from Renewable Sources KWH: This dataset sows the electricity production of countries from renewable sources from the year 1960 to 2015 (source: https://data.worldbank.org/indicator/EG.ELC.RNWX.KH?view=chart)
- World GDP: This data set contains the GDP growth of every country in the world in US Dollars from the year 1960 to2020
  (source: https://data.worldbank.org/indicator/NY.GDP.MKTP.KD?view=chart)

DATA TIDYING:

- The datasets are loaded into R studio and converted into their respective dataframe and all he insufficient above head spacing and column names are removed in *Section1.*
- The raw data is then wrangled in *Section2* using the tidyverse library in R. only the desirable columns are taken and the year values in column headers are pivoted to a single column to create a tidy dataset. The similar process is carried out in *section2.1, section2.2, section2.3, Secion2.4* of the code with minor changes with respect to the particular data set.
- In *Section3* all the tidied datasets are merged using Country Name, Country Code, Year as the common factor to create a tidy dataframe for Visualization purposes

DATA VISUALIZATION:

The merged dataframe in *Section3* is the only data used for visualization. The data is plotted with various plots in *ggplot2* of the tidyverse library and the visualizations and findings are as follows:

- Renewable energy production of the world in 2015 (*Section4.1*)

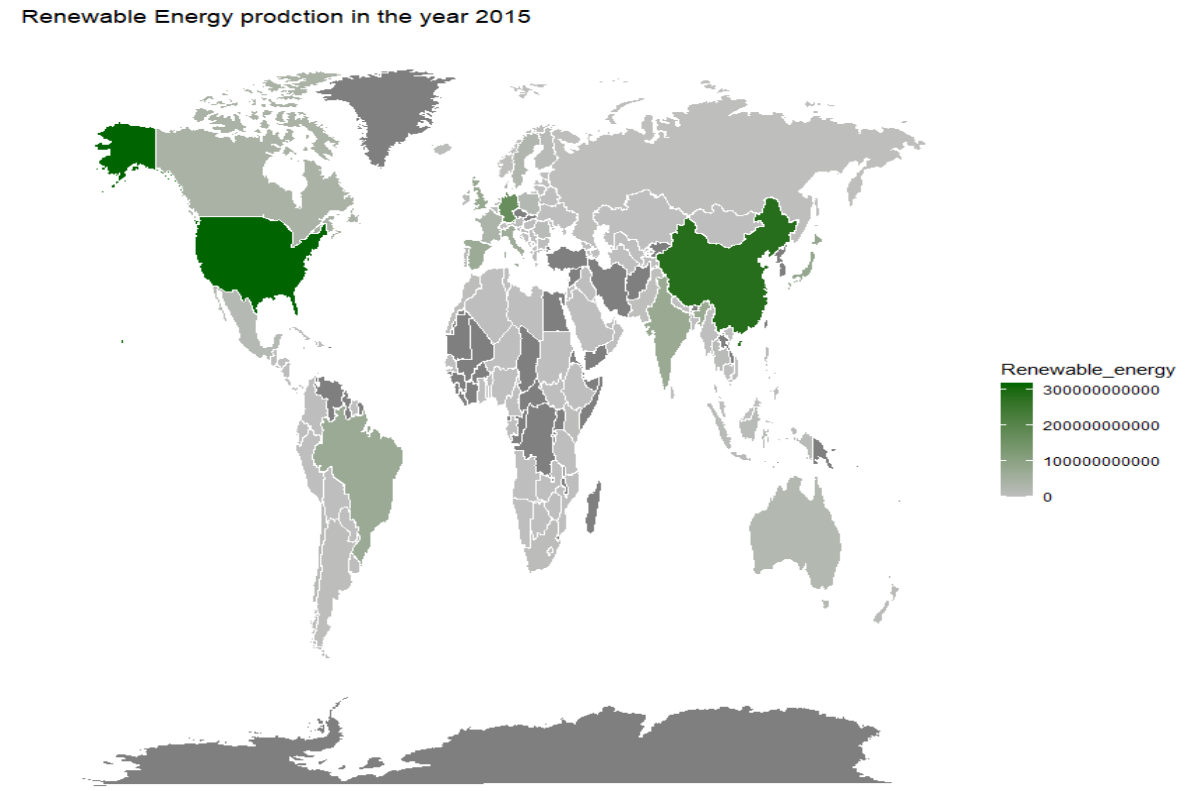

figure:1

The map in figure:1 is the Total renewable energy production of the world in the year 2015.
The dark grey regions in the map indicate the data of hose countries where not available in the dataset. In figure1 it is clearly visible that countries like United States of America and china are leading producers of renewable energy in 2015 followed by Denmark,United kingdom, Brazil,Japan and India. Whereas, Countries like Russia, Australia and most countries in the African continent are not Producing significant amount of energy from renewable sources.

- World GDP VS Renewable energy production from 1990 to 2015 (*Section4.2)*

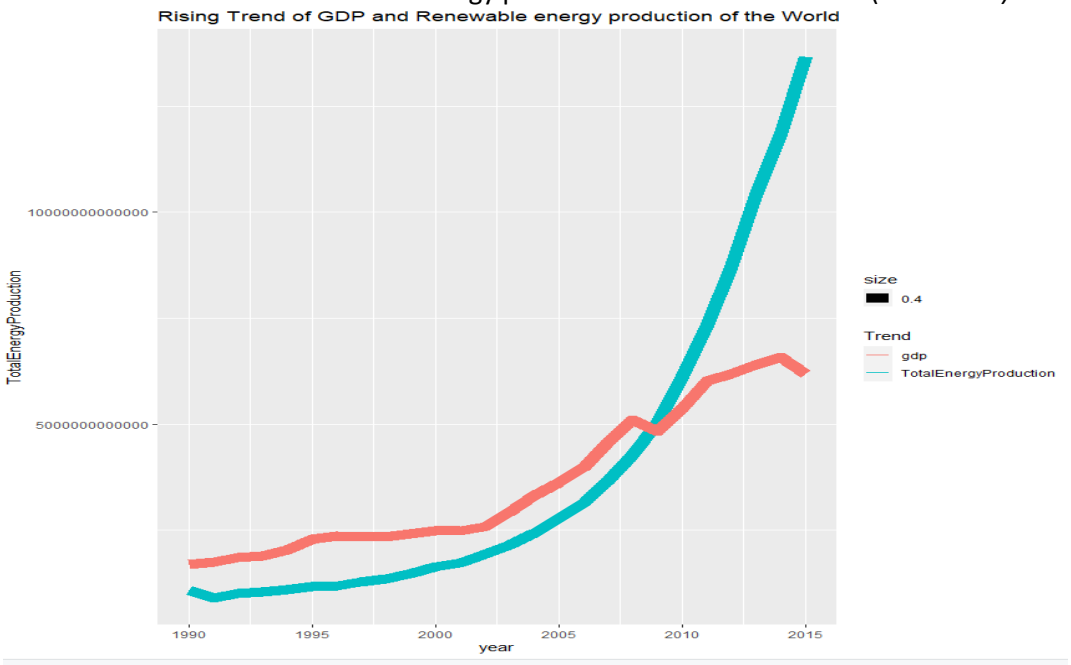

Figure:2

The Trend visualized in *figure:2* is the rise in rate of production of renewable energy in the world with respect to the flow of world GDP. It is clearly seen that energy production from renewable sources has an exponential growth from the year 2005 onwards. It can also be seen that the GDP and Renewable energy production has a similar increase till 2006. From 2007 onwards both the trends does not show any correlation. Hence, it can be suggested that GDP and renewable energy production are not closely interrelated.

- Countries with highest Renewable Energy production Ratio (Section4.3)

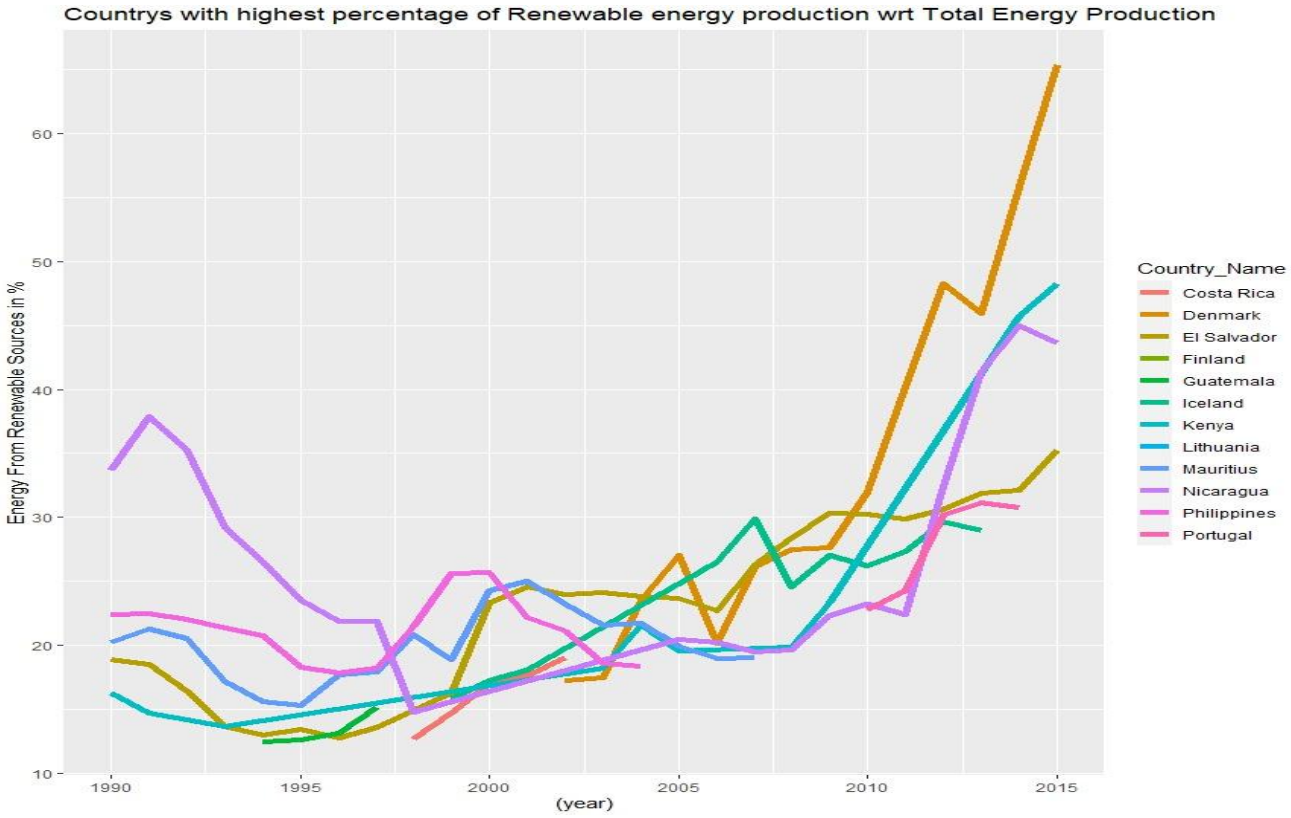

Figure:3

The line graph in *figure:3* portrays countries with highest production of energy from renewable sources with respect to their total energy production from 1990 to 2015. It can be seen that the trend of energy production is mostly in an increasing manner with respect to time flow. Denmark is topping the charts with the highest ratio of renewable energy production ratio with an exponential growth from 2007 onwards. It can also be seen that some countries like Mauritius are leading the charts till 2006 but later on their production ratio declined and is not charted.

- Countries GDP VS Renewable Energy production (*Section4.4)*

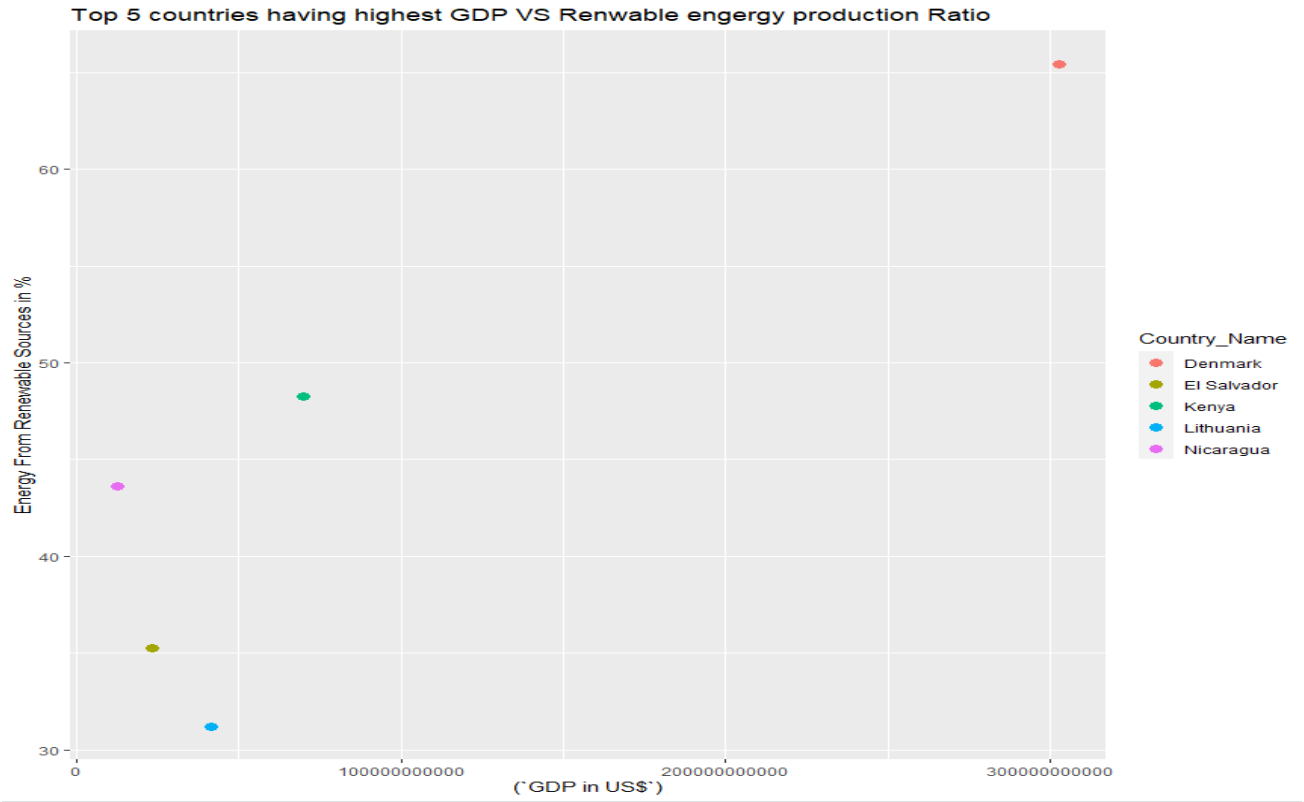

Figure:4

The scatter plot in *figure:4* shows the renewable energy production countries with respect to their GDP, the top 5 countries with highest GDP vs Renewable energy production is plotted. It is clearly visible that Denmark had the highest ratio of GDP vs Energy production from Renewable source. Furthermore, it can be suggested that world powers like United States of America, China, United Kingdom are not in the Top 5 category even though they have high Renewable energy production rate.

- Correlation between Population and Renewable Energy Production (*section4.5)*

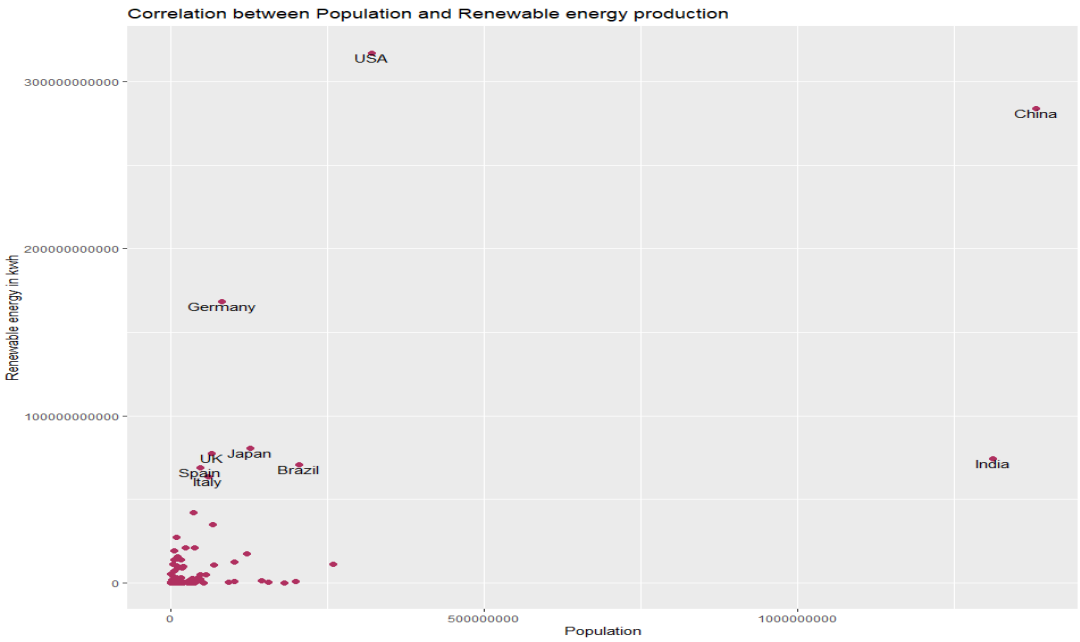

figure:5

The scatter plot in *figure:5* plots the renewable energy production with respect to Population of the major Renewable energy producing countries. It is clearly evident from the plot that even though India has high renewable energy production rate, but it still isn't producing enough renewable energy for all of its population. Whereas China is able to meet the population and production ratio.

CONCLUSION:

From the analysis of world Renewable energy production data, It can be concluded that:

- USA, UK, China, India and Denmark are the leading producers of Renewable energy in the world. Whereas, developed countries like France, Australia and Russia have Very less production rate.
- It can be suggested that GDP and renewable energy production are not closely interrelated as their rate of flow of GDP and renewable energy production loses its correlation after 2016.
- Even though USA, Chine and India have high production of renewable energy, but countries like Denmark has the highest renewable energy ratio with respect to total energy production rate.
- USA and China are able to keep up with the demand of renewable energy production for its population, but India has failed to do so.