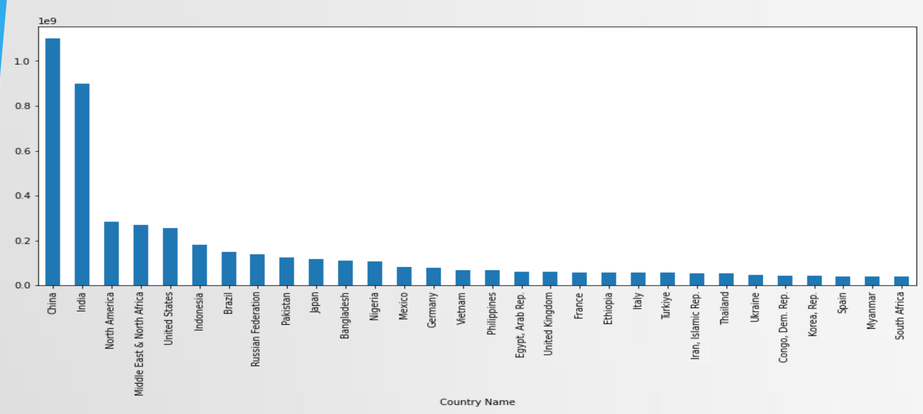
Energy Analysis on World Countries

Introduction

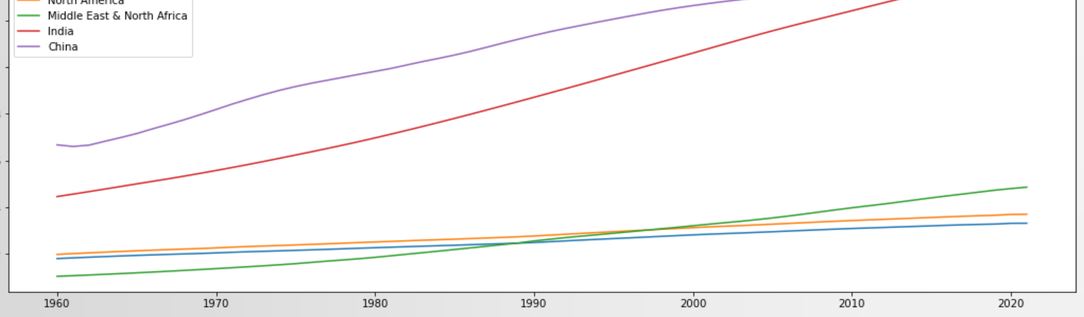
Coal, natural gas, nuclear power, hydroelectricity, and different renewable sources including wind, solar, and geothermal energy are only a few of the major energy sources used in the generation of electricity globally. Countries and regions use different combinations of these sources, with some largely reliant on a single one while others use a variety. For example, China, the largest global power producer, primarily relies on coal for its electricity generation, whereas many European countries have been actively transitioning to greater utilization of renewable energy sources. In this project, we will examine the electricity production methods employed by different countries globally, utilizing the World Bank dataset spanning from 1960 to 2021.

Analysis

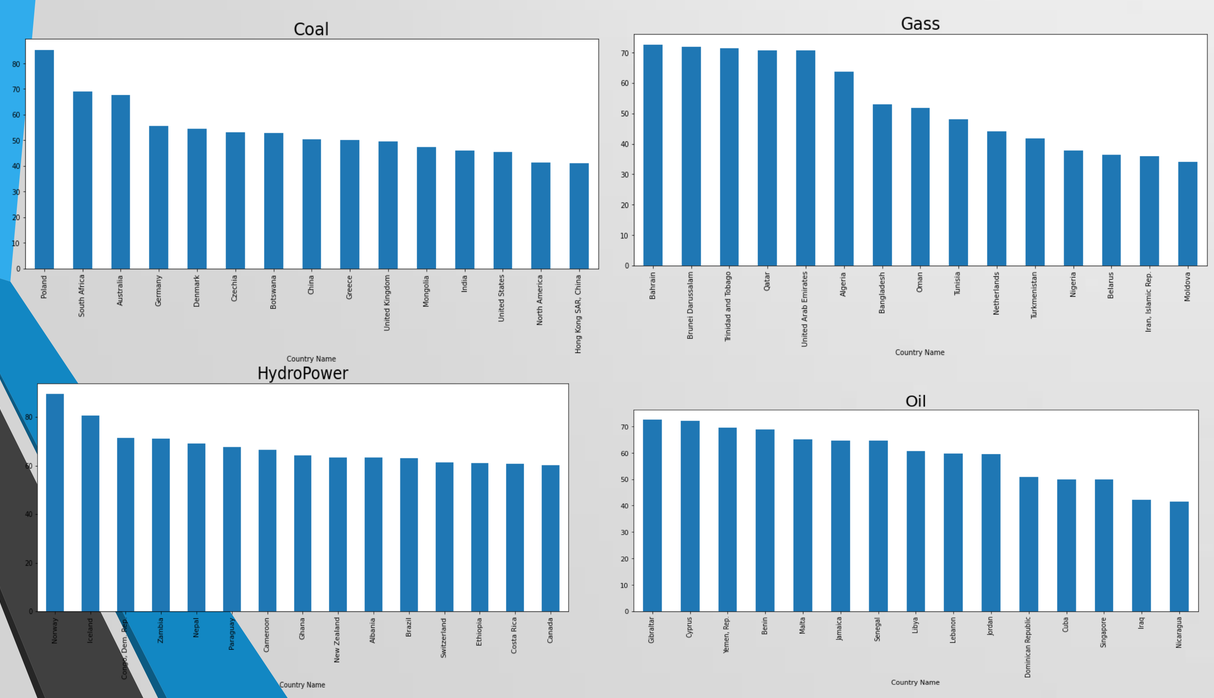
Prior to examining electricity production, I first analyzed the countries with the highest population. The graph depicting this information is presented below.



The change in population is given below.

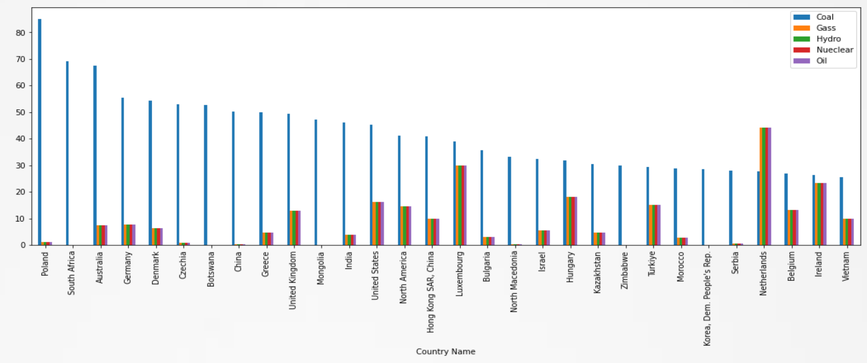


China and India have experienced significant population growth. Now, let's explore the leading countries utilizing various non-renewable sources for electricity production.

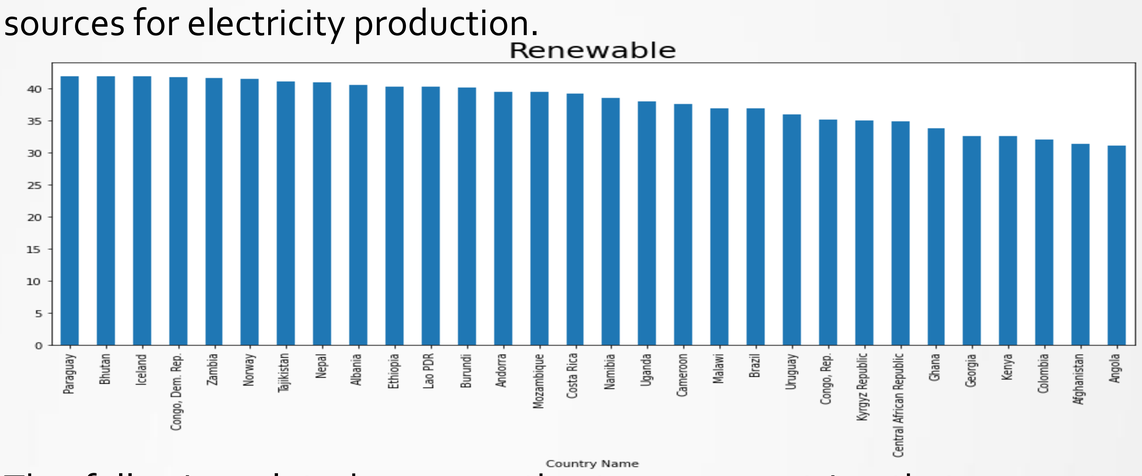


Based on these plots, it is evident that countries employ varying proportions of different energy sources for electricity generation.

Now, let's examine which energy source is the most commonly utilized for electricity production..



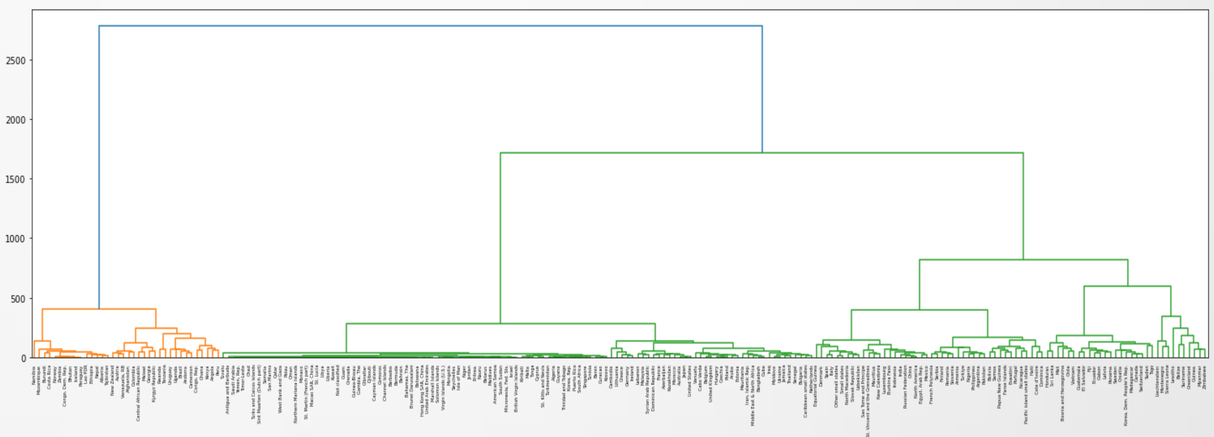
Let's explore the countries that predominantly rely on renewable sources for electricity production.



The following plot showcases the top 30 countries that generate a significant portion of their electricity from renewable sources.

Clustering

Subsequently, clustering was performed to group countries with similar patterns in their usage of renewable sources for electricity production into the same cluster. The corresponding plot is provided below.



These findings were obtained through hierarchical clustering. Additionally, I employed K-means clustering on the same dataset to create clusters. The top 10 countries in each cluster are listed below.

CLuster 1	CLuster 2	CLuster 3	CLuster 4
Afghanistan	Belize	Argentina	Angola
Albania	Guinea	Armenia	Austria
Andorra	Greenland	Burkina Faso	Bosnia and Herzegovina
Burundi	Liechtenstein	China	Bolivia
Brazil	Lesotho	Cote d'Ivoire	Canada
Bhutan	Myanmar	Dominica	Switzerland
Central African Republic	Montenegro	Denmark	Chile
Cameroon	Sierra Leone	Egypt, Arab Rep.	Ecuador
Congo, Dem. Rep.	Suriname	Spain	Fiji
Congo, Rep.	Zimbabwe	Finland	Gabon

Conclusion

In conclusion, the analysis revealed a global landscape of electricity production with a mix of energy sources including coal, natural gas, nuclear power, hydroelectricity, and renewable sources. While China heavily relied on coal, many European nations showcased a shift towards renewable energy. The study also identified clusters of countries based on their usage of renewable sources, emphasizing the importance of sustainability in electricity production. Overall, this analysis provides valuable insights into the diverse approaches employed by countries worldwide and the growing prominence of renewable energy in the global energy mix.

Repository URL: https://github.com/saminamushtaq/ADS1-Ref-Def-rework-assignment-3-40/tree/main