WORLD RENEWABLE ENERGY CONSUMPTION (2012-2022) AND FORECASTING

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Kaggle: https://www.kaggle.com/datasets/pralabhpoudel/world-energy-consumption/code
GitHub Repository: https://github.com/Samara1122/Renewable-Energy-Consumption

Spectrum of Renewable Energy Consumption

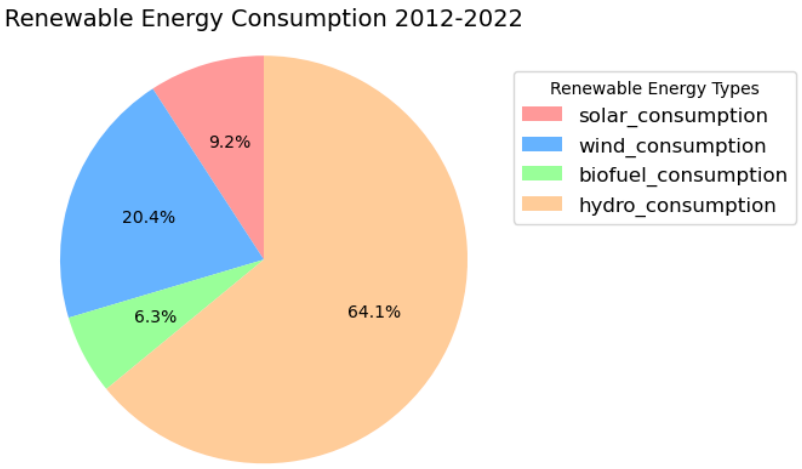

Fig 1. Pie Plot

The pie chart represents the distribution of distinct types of renewable energies like solar, wind, biofuel, and hydro consumption. It highlights that hydro consumption takes the lead with percentage of is 64.1% followed by wind, solar and biofuel consumptions.

Renewable Energy Consumption Across Continents

The box plot compares the renewable energy across continents of Asia, Europe, and North America. High value of median and large value of interquartile range of Asia suggest that it has most significant and fluctuated consumption of energy. North America and Europe show more stability but has overall lower consumption giving them opportunity to grow more in renewable energy consumption areas.

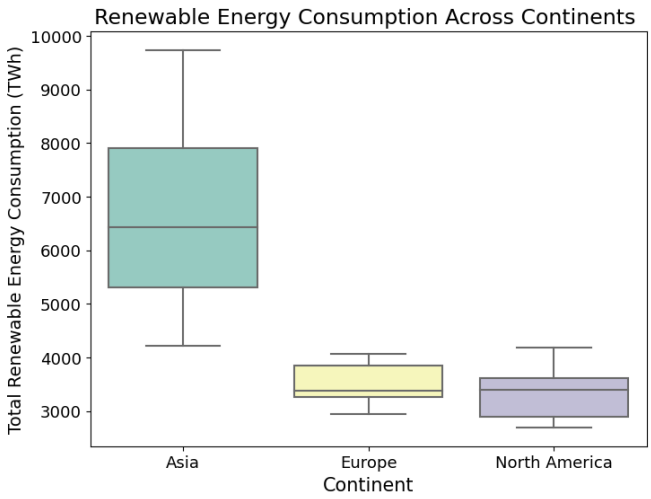

Fig 2. Box Plot

Fitting and Forecasting Analysis Over Time

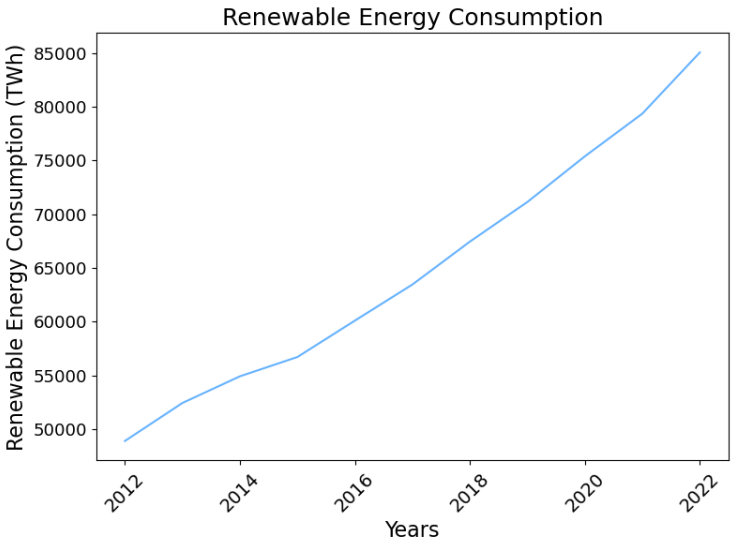

Fig 3. Line Plot

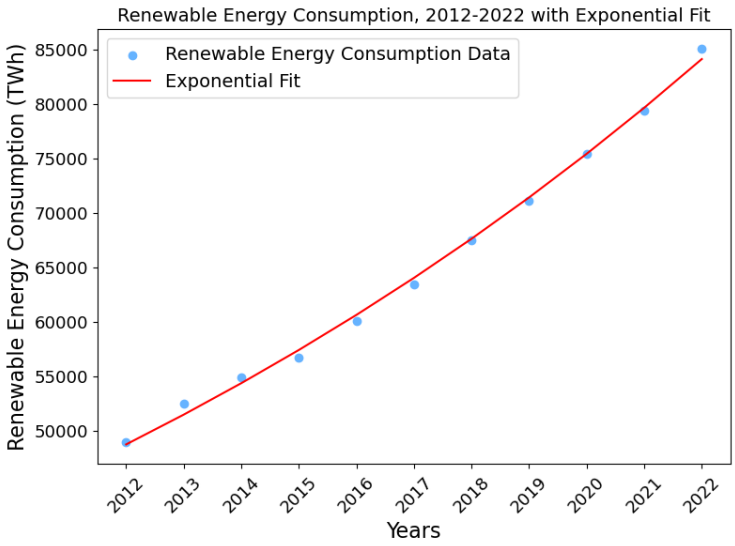

Fig 4. Fitting Plot

The line plots show the consistent and upward trend of overall renewable energy consumption from 2012 to 2022. Exponential mathematical model is used to fit and forecast the data and it predicts that by 2032 overall renewable energy consumption will be around 220000 TWh. It predicts that more promising and environmental beneficial energy solutions are going to transform global energy dynamics.

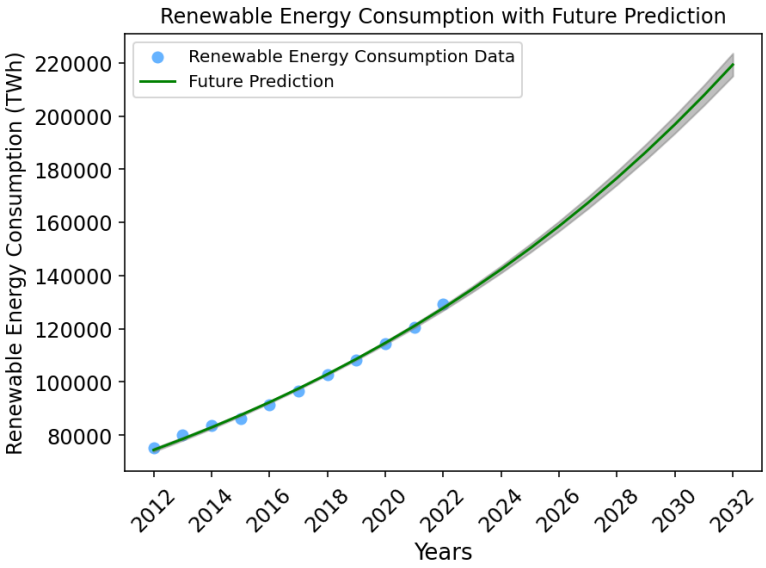

Fig 5. Prediction of Fitting

Statistical Moments

	Mean	Median	Standard Deviation	Kurtosis	Skewness
solar_consumption	3.1e+01	2.7e-02	1.7e+02	145	11
wind_consumption	7.8e+01	4.8e-01	3.3e+02	85	8.0
biofuel_consumption	3.2e+01	7.0e-01	1.1e+02	43	5.9

hydro_consumption	6.5e+02	5.6e+01	1.5e+03	18	3.9
year	2.0e+03	2.0e+03	14	0.0135	-0.79
population	4.8e+08	3.9e+07	1.1e+09	14	3.6

Clustering

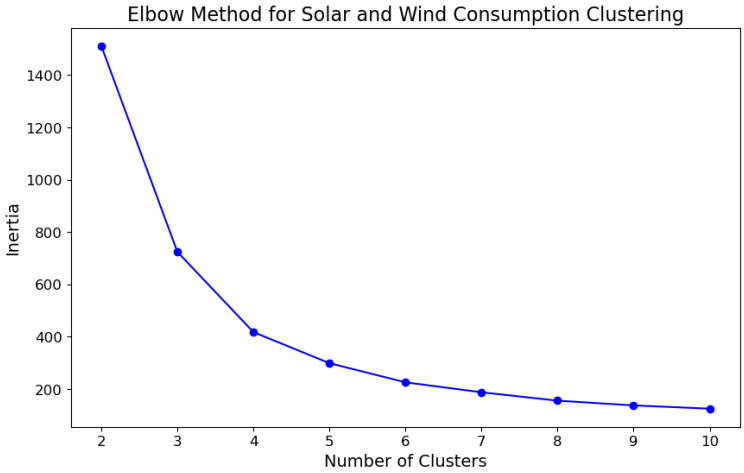

Fig 6. Elbow Chart

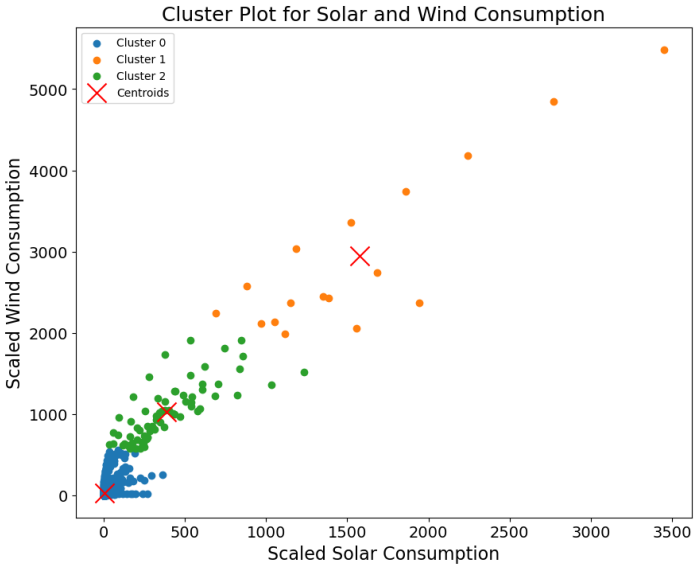

Fig 7. K-Means Clustering

K-Means Clustering made 3 distinct clusters based on scaled wind and solar consumptions. Silhouette score is highest for 2 clusters 0.95554 followed by 3 clusters scores = 0.93931. Most appropriate number of clusters by examining with coding are 3.

- Cluster 0 is in blue and grouped tightly and present on lower axis indicate lower consumption of both solar and wind energy.
- Cluster 1 is in orange is spread out and higher on y-axis that means high wind consumption and moderate solar consumption.
- Cluster 2 is in green is populated and gives more entities and high solar consumption compared to wind consumption.

Conclusion

- Hydroelectric power is dominant among all other renewable consumption 64.1%.
- Asia is leading in consumption of renewable energy.
- Statistical values show high values of skewness and kurtosis of solar and wind consumption suggesting good potential of increasing in these areas.
- K-Means clustering suggest 3 different patterns of renewable energy usage.
- The upward trend shows a global shift to more sustainable and environment friendly energy solutions.

This report suggests the importance and necessity to invest and continue support in area of renewable energy to maintain the growth and sustainability of energy.