

# CLUSTER ANALYSIS AND FITTING ON THE CLIMATIC CHANGES BASED ON WORLD BANK DATA.

**Introduction:** The link between the dependent climatic elements is grouped and explored over 20 years using information from the Climatic Change Parameters from World Bank databases. The influence of population growth and the availability of resources to humanity, as well as the elements influencing climate, are examined. The examination uncovered various links between the Indicators, and the fundamental reasons were looked upon.

The Cluster-based fitting technique separates the input data into N chunks and fits a sequence distribution to each cluster independently; the cluster and fit method is used to test how well this model replicates a correlation matrix. In this poster, I used a data collection from the World Bank to evaluate and work on. Choosing an appropriate method for your data frame might be difficult, despite the fact that there are many options. The properties of the clusters, the attributes of the dataset, the frequency of anomalies, and the number of information points are all key elements in this selection.

**Clustering**, often described as cluster formation, is the challenge of organizing a collection of datapoints so that each point within the same group (designated as cluster) appear to be more similar (in some aspects) to those in different groups (clusters). It is the fundamental purpose of information extraction and a common statistical data analysis method used in a wide range of sectors, including pattern classification, image recognition, retrieval of information, bioinformatics, noise removal, computer animation, and machine learning.

**Curve fitting** is the process of designing an arc, or mathematical function, that best describes a collection of data points, under certain constraints. Interpolation, which needs a precise fit to the data, or smoothness, which entails producing a "soft" expression that approximates the data, are two methods for fitting curves.

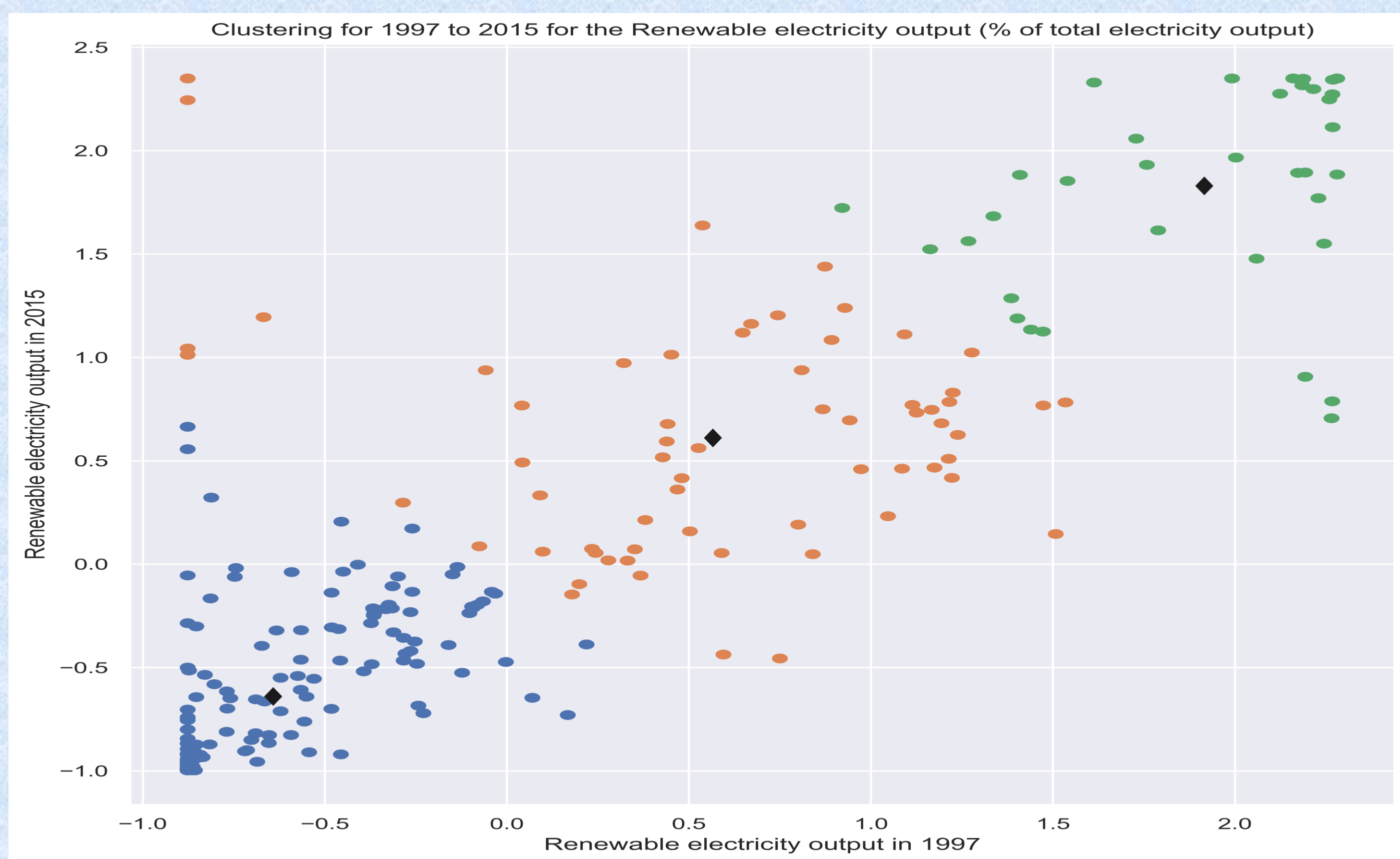


Fig 1: Clustering of Renewable Electricity output.

Figure (1) depicts the increase in renewable power generation between 1997 and 2015. Electricity will play a vital role in the growth and development of the countries as it will boost the economic conditions of the country. As we can see, renewable energy output has progressively grown over the years, and it will play an important part in reducing climate pollution. We have used 3 clusters overall for the better efficiency of the model and also marked the centers for the clusters.

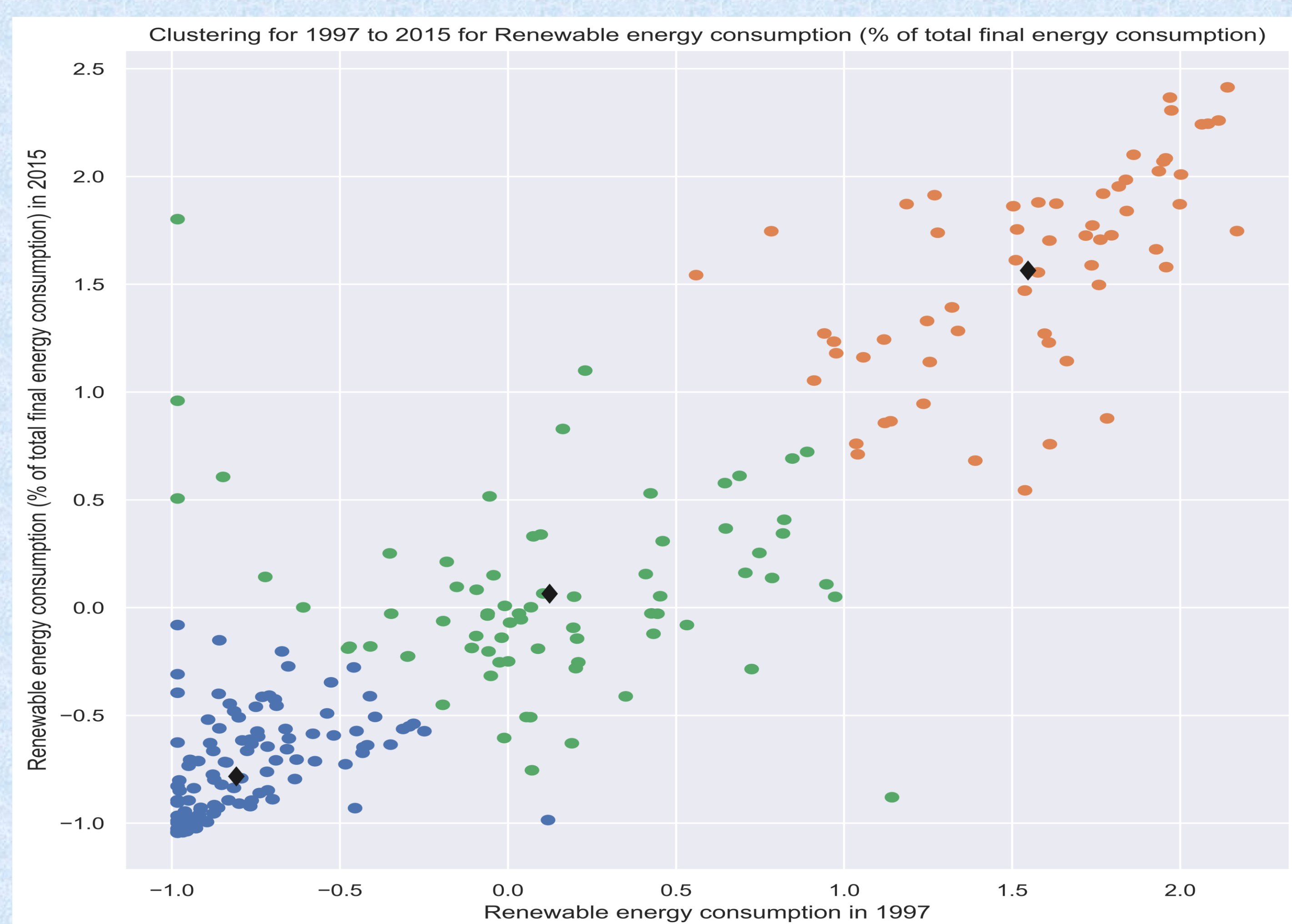


Fig 2: Clustering of Renewable Electricity Consumption.

Above fig.2 shows the three clusters for the comparable data between renewable energy consumption in 1997 and renewable energy consumption in 2015. In cluster 1 which is near to the -1 grid is more denser and the cluster 3 which is in orange colour is more sparse which shows that the usage of the renewable energy is keep on increasing with the development of the country.



Fig 3: Clustering of Electricity production from coal.

Fig.3 illustrates the three clusters for the relatable data between Electricity production from coal sources (% of total) in 1997 and production of electricity from coal in 2015. We can clearly see that the cluster which is in orange has very dense and less data points accumulated in very less area shows that we are more dependent on the energy from coal sources through years and it is increasing rapidly as the population is growing in rocket speed.

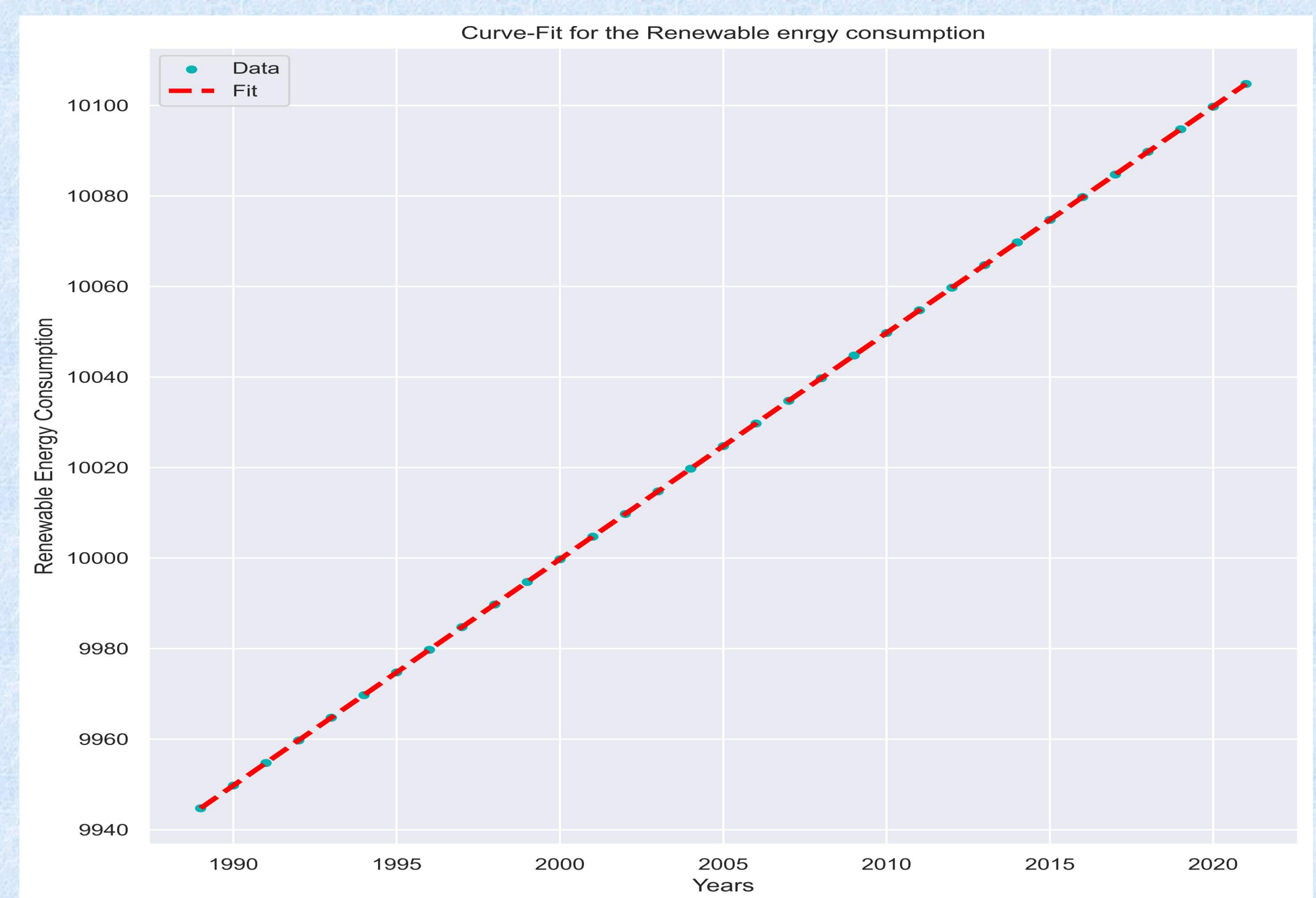


Fig 4: Curve-Fit for the renewable energy consumption.

Above Fig.4 demonstrates the curve-fit between the renewable energy consumption and the linear function  $A \cdot X + B$ . It can illustrate the contrast between the original data as well as the fitted data from 1990 to 2020. The graph shows the linear increase in the original data as well as fitted line which agrees to be great model of fitting.