

1. ABSTRACT

One of the most critical and controversial issues of today is climate change. Climate change is the overall name of a long-term change in the Earth's climate. Also, air pollution is another vital issue in today's world. This project investigates the changes in these main fields by using statistical methods and machine learning techniques. This project consists of several steps starting from the data manipulation to analyze multiple parameters causing climate change and air pollution over the years. Then, investigating whether there is a relationship between these parameters. Additionally, we aim to estimate air pollution in the future using forecasting methods. At the end of the project, we expect to raise awareness on that vital issue with some suggestions on a specific website launched by the team.

2. EXPERIMENTAL PROCEDURE

Valuable studies and interpretations of NOAA's (National Oceanic and Atmospheric Administration) and IPCC (Intergovernmental Panel on Climate Change) are assessed in the literature review. Since most of the studies have used at least 25 years to study climate change, we decided to use the data from 1980 to 2018. Unfortunately, there were not enough amount of the climate data of Turkey accessible online. Thus, we have requested the data of all the stations in Turkey from the Turkish State Meteorological Service. As can be seen from Figure 1, there are 2435 stations in Turkey. Afterward, in the light of our literature review, the most critical 29 factors that may affect the climate have been selected. Secondly, the data needed to be cleaned and manipulated so that it becomes ready to analyze. For example, we matched the stations with their cities and their geographical regions because our primary purpose is to apply all the statistical analysis and machine learning algorithms separately as if using an RCM instead of using all of the regions together. In that sense, we have divided Turkey into its geographical regions. As a statistician, we have investigated the data using descriptive statistics and exploratory analysis before jumping into the study. In other words, how the climate in Turkey has changed from 1980 to 2018 is the question of interest. As the next step, as this project's primary purpose suggests, we still try to work on integrating the concepts in the climate research field with our knowledge by utilizing statistical procedures. Today's popular methods, such as machine learning algorithms and classical time series models, will be utilized.



Figure 1. Locations of the Stations in Turkey

3. MOTIVATION

It is an undeniable fact that global warming is one of the most urgent problems of our world. It will have long-lasting effects on our planet and our lifestyles if nothing is done to stop it. As a team, our motivation was to increase awareness of this urgency. People know it is a threat to us all around the world but think there is still time for action, which is far from the truth. Our planet is currently suffering from the effects of global warming, and soon it will be irreversible. According to a NASA study, 2016 was the warmest year since 1880, continuing a long-term trend of rising global temperatures.

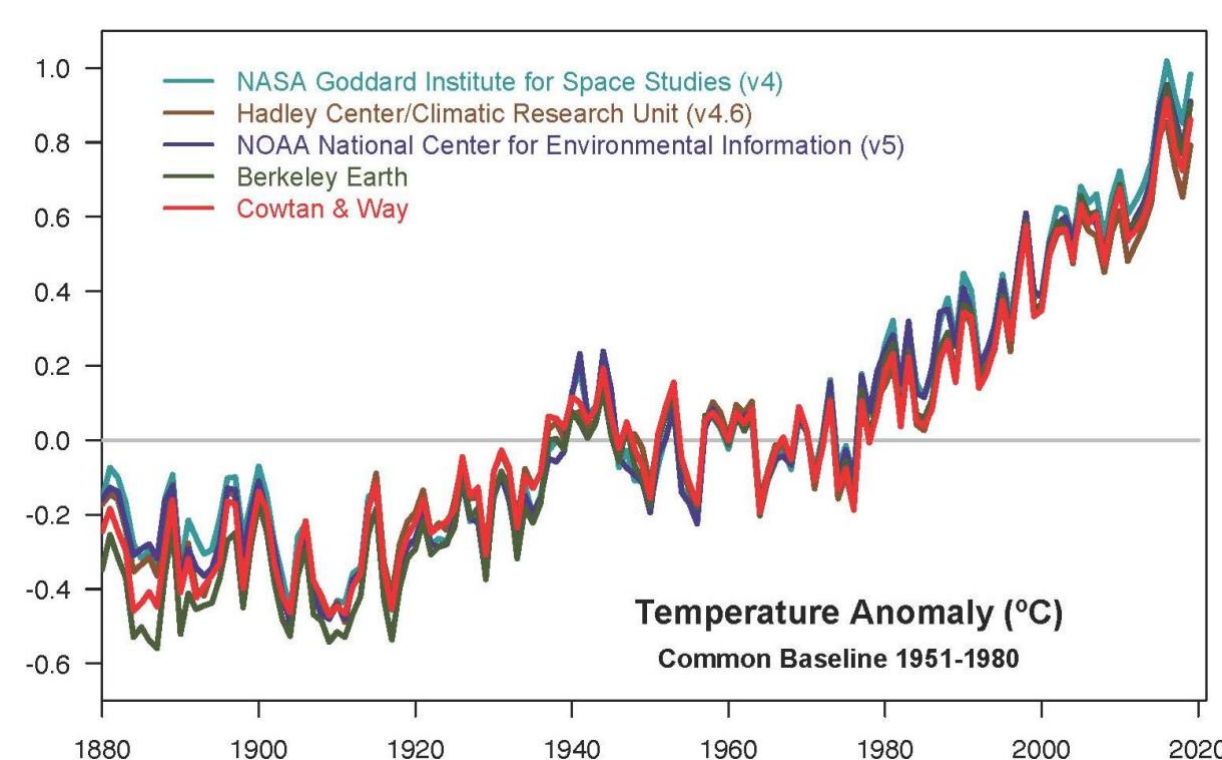


Figure 2. Temperature Anomaly Forecast using NASA data

Therefore, we wanted to play an active role in spreading information on the topic by presenting facts supported by scientific results. We aimed to combine our statistics background with social sciences and show the possible devastating effects of global warming on Turkey.

4. RESULTS AND DISCUSSION

In the initial analysis, specific variables' changes have been assessed through the time series plots. In Figure 3, the Average Humidity in Ankara can be seen over time. It is quite noticeable that there is an increasing trend over the years. Please note that even minimal changes may affect the climate seriously. Also, the fluctuation of humidity in Ankara has increased, resulting in varying humidity levels. More examples will be illustrated in the final report, including all the regions of Turkey.

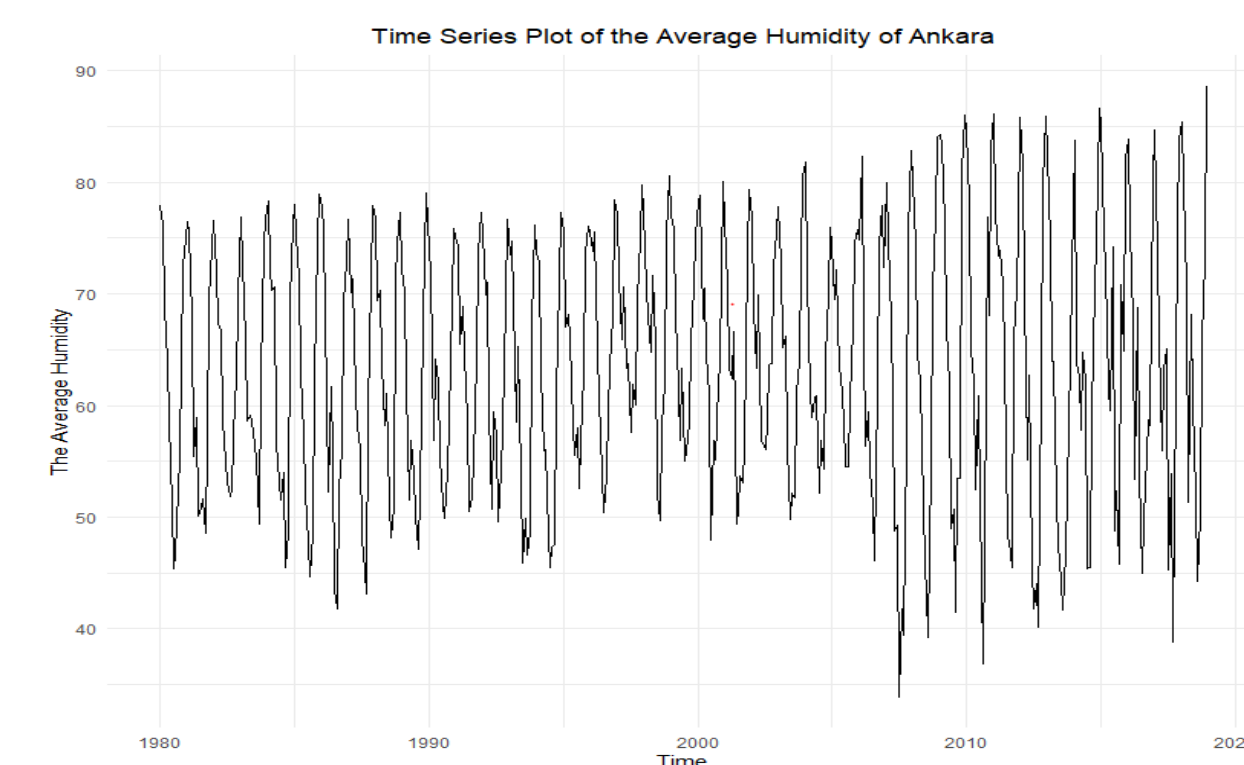


Figure 3. Time Series Plot of the Average Humidity of Ankara

5. CONCLUSION

One of the most popular and useful methods is Regional Climate Models (RCM). These types of models try to simulate only a part of the globe. Takle (2005) indicates that RCMs only consider smaller areas to have a higher spatial resolution as an advantage. Thus, while researching, we also think about how such models can be utilized in Turkey. From this point of view, our primary purpose is first to understand the past behavior of the variables directly related to climate change. Then, using data coming from Turkey Stations, forecast those same variables' future values. Although this project has not been finished yet, we will publish a report about what we will have been examined so far at the end of June. In the end, we believe that contributing to this critical issue with our findings and raise awareness for Turkey would be helpful for those who are interested in this area.

6. REFERENCES

- Tackle E. S. (2005). *Regional climate modeling*, Iowa State University.
- Scientific Consensus: Earth's Climate is Warming (June, 2020). Retrieved from <https://climate.nasa.gov/scientific-consensus/>