EXPLORING WEATHER TRENDS

Udacity Project

Submitted By

Kailainathan.M.K

Introduction:

Weather trends keep on changing day by day. It also varies from place to place with a region in Canada being extremely cooler compared to a region in India with extremely hot conditions. These changes should be duly analyzed in order to have a better understanding of the climatic changes happening around the world. Most of the world's problems are related to global warming which is due to change in the climatic conditions which is happening at an alarming rate. So in order to keep a track of even the minute detail, a detailed report is going to be created by analyzing the average temperature rise over a year across the globe. This report will be ably supported by a chart which will help in noticing the differences between the rise in temperature globally as well as a particular city locally.

Methods Used:

In order to generate this report, Structured Query Language(SQL) and MS-Excel have been used. These two are primarily the most used to generate this report along with MS-Word. The data used for analysing was fetched from the database provided using queries written with Structured Query Language(SQL). The data was exported as CSV using the workspace provided. The Moving Averages of temperatures for 10 years were calculated using MS-Excel and the visualizations were also done using the same. The moving averages were used as they can give us a clear representation on the chart instead of the yearly averages of temperature.

Structured Query Language:

The data for analysing the trends has been provided in the form of three tables namely city_list, city_data and global_data. The city_list table consists of the records of cities in each country, city_data consists of the average temperature of the cities over the years and the global_data table contains a list of global average temperatures over the years. The details from the tables are pulled using the SQL queries. The SQL queries used here are:

- Extracting global data from global_data: SELECT * FROM global_data;
- Extracting the cities from city_list: SELECT * FROM city_list WHERE country LIKE '%India%';
- Extracting data for temperatures of the local city: SELECT * FROM city_data WHERE city IN ('Bangalore');

Thus these queries were used in the workspace provided to extract the data from the database. The results obtained from using these queries were "Exported" as a Comma Separated Values(CSV) using the export option provided in the workspace.

Microsoft Excel:

MS-Excel was used for calculating the Moving Averages and also for the visualization of the obtained data for providing a better picture. Moving averages are calculated for a period of ten years for the average temperatures of both global and the local data. For calculating the moving average, we make use of the average formula in excel.

B11= Average (B2:B11)

After the moving averages are calculated, the chart is plotted using the three columns namely – Global moving average temperature, Local moving average temperature and finally the years. So the chart is plotted using the Insert->Chart->Line Chart option where these three columns are selected.

Observations:

The line chart provides the details of the changes in temperatures globally and locally.
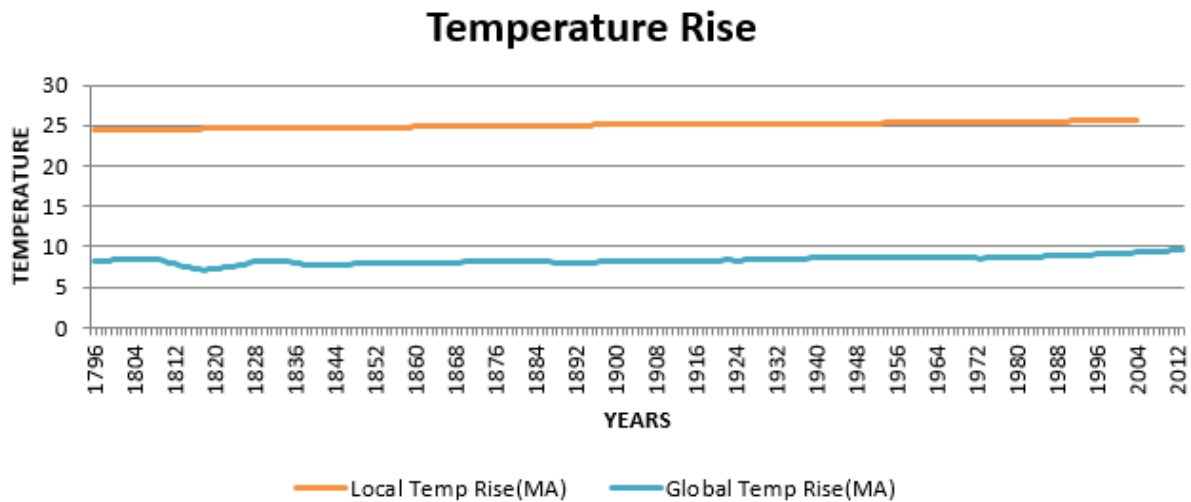
The city considered for the local temperature rise is Bangalore from India. The temperature rise in that area is compared with that of the global temperature rise and the following observations are made:

- **Start of the 18th Century:**

    Although there is not enough evidence to support the case of temperature changes in the 18th century, It will be used as the point from which the analysis will be kick started. As per the observation, the 18th century is the lowest contributor to the climatic changes happening around the globe and also in Bangalore. The temperatures recorded and the average temperatures obtained for the world as well as Bangalore were found to be at a constant level compared to the other centuries. Both the sets of data proved that this century didn't lead to any changes in the temperatures as the rise effect was nullified and the temperatures were found to be constant.

- **The 19th century Low:**

    The Lowest temperatures around the globe came in the 19th century as there was a significant drop in the average temperatures recorded over that period. This was in contrast to the temperatures recorded in Bangalore as there was a constant progression in the rise of the average temperatures being recorded. This drop and rise can be found in the graph during the 19th century. The drop can be due to the

presence of cooler areas in the world as there are parts of world which are cooler for the entire year as opposed to Bangalore which is cooler only for a particular season. This can be a reason which contributes for the drop in temperatures recorded in the 19th century. Anything can be the reason but the most important point to be noted is that 19th century was the coolest century with much lesser temperatures as compared to the others. The later part of the 19th century showed increases as this was the foundation which laid the path for the 19th century and for global Warming.

- **The 20th century and the start of Global Warming Alarm:**

  The early part of the 20th century was found to be similar to the 19th century as the temperatures recorded were more or less similar. The most important point to note in this century is how the temperatures started to increase rapidly than their previous counterparts. Credits to this rapid rise in the temperatures goes to the machines which started evolving and to the industries which started increasing at a faster rate around the world. With these developments, the emission of Non-Environmental friendly gases started which resulted in a bigger problem called Global Warming. From the graph, one can infer that the global temperatures started rising at a faster rate compared to the temperatures being recorded in Bangalore. One main reason for Bangalore having a constant rise in the temperatures was due to the non-availability of industries on a large scale and also because of the lesser availability of computers and other machines in the industry and in household. This period was the start of Bangalore getting ready to be converted into one of world's best Tech hub.

- **The Weather Demons of the 21st century**:

  The 21st century is the hottest century ever with temperatures around the globe at an all-time high. This century has contributed to the worst environmental impacts with the ice cover decreasing at an alarming rate. The temperatures around the world and also that of Bangalore are found to be at their peak and they are increasing. Bangalore's temperature has increased due to the inflow of many industries, machines and the number of tech parks which provide an exodus of carbon di oxide if not correctly monitored. This century is facing a higher risk of global warming and other environmental problems due to the temperature rises recorded which doesn't seem to subside.

- **Overall Observation:**

  From the above graph, we can arrive at a conclusion that there has been a constant rise in the temperatures globally. This has been the case for Bangalore too which has faced a steady rise in the temperatures from the 18th century without even a slight decline in the temperatures being recorded. Bangalore has recorded a higher average temperature year after year which is not the case with the temperatures around the globe. This provides a quick conclusion which can be easily seen from the chart that Bangalore is outscoring the globe on temperature variations.

Rising Temperatures in the Indian Cities:

As the temperature changes around the globe has been monitored to some extent , It's time to take a much closer look into India - One of the fastest growing nations of the world. This observation has been made keeping in mind the 21st century. So three cities – Delhi , Varanasi, Bangalore are considered for the analysis. These three cities have one thing in common – Pollution. With the advent of more global players in the Indian Market, the number of industries in the nation has increased exponentially. Here we are seeing three cities which have faced a higher rate of pollution in the 21st century. The line chart depicting temperatures in the 21st century of these three cities is shown below:
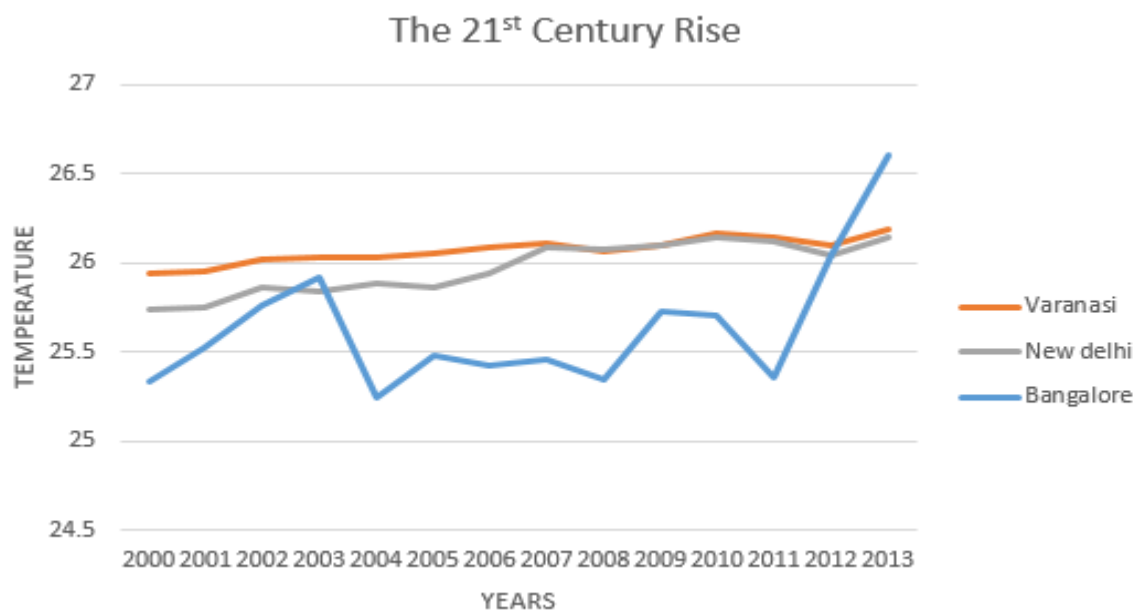
The three cities have had a high increase in temperature during the 2012-2013 time period with Bangalore having a very sharp increase among the three. Varanasi is not a metropolitan city. It is a temple town with no signs of industries and with a large amount of sanyasi's. Then how come this has a higher temperature rise? This question can be answered. The river Ganges which flows through Varanasi is one of the highly polluted rivers across the globe. It contains most of the pollutants in the form of industry effluents, Plastic and other substances which makes it a major contributor to global warming. Even though there has been an influx of programs to clean the river, there are no results which can be witnessed with the naked eye. This has been the case of Varanasi which has had a steady and constant rise in temperature with the temperatures taking a higher range in the 2012-2013 time periods.

Coming on to the case of New Delhi, Capital of India and one of the four Metropolitan cities. New Delhi has been on the radar of all environmental and pollution control boards of India. The environmentalist has been very critical of Delhi's Pollution over the last few years. The amount of vehicles and Industries have contributed to the cause significantly as New Delhi is having one of the highest pollution rates for cities in India. As we can see from the chart, New Delhi was having lesser temperatures when compared with Varanasi in the early 2000's. However the temperatures started matching that of Varanasi from 2007 and there has been no looking back for New Delhi which has progressed with Varanasi in maintaining the temperatures. The Capital cuts a sorry figure when it comes to controlling pollution which is making things falling out of hand at a faster rate.

Looking into the case of Bangalore again, One of the Major Technological Hubs of the World with countless industries and IT Parks and with a inflow of vast number of people from different parts of India which eventually has its plus and minus. The introduction to Bangalore is enough to tell the story of Bangalore and what are the causes for the temperature rises in this area. From the chart we can see that Bangalore was having a lower temperature in the early part of 2000's. The city was having a to and fro motion in respect to temperatures as there is a constant drop and spike in the temperatures. The city recorded one of its lowest temperatures in 2008. The temperatures started to soar after 2008 eventually reaching temperatures higher than Delhi and Varanasi. There is enough evidence to prove that Bangalore has been contributing more to the nation's temperature rise. Once a tourist destination, Bangalore has changed drastically into a Tech Hub and has contributed much to the temperature rise. There is no stopping the skyrocketing temperatures unless pollution control strategies are employed.

Conclusion:

Thus with the data provided we are able to arrive at a conclusion that the temperature around the world has been facing a constant rise which is worsening with each passing century. Even though the solution to these problems are out of scope of this project, it is high time that People of Mother Earth start to take serious note of this issue as this may have significant impact in the upcoming centuries.