Project 1 – Changing Weather Trends

This is my project on Weather Trends. This project shows my observations regarding the changes in temperatures in the world as well as in a city which I picked; Bangalore. The detailed description of the steps which I took to complete this project is as given below.

1. The first step I had to do was to know whether my city (I am from Cochin, India) is included in the database. So in order to search for my city I used the following query in the CITY_LIST table;

```
SELECT *

FROM city_list

WHERE country = 'India'
```

Which gave me the following 22.

city	country
Agra	India
Ahmadabad	India
Allahabad	India
Amritsar	India
Bangalore	India
Bhopal	India
Delhi	India
Haora	India
Hyderabad	India
Indore	India
Jaipur	India
Kanpur	India
Ludhiana	India
Nagpur	India
New Delhi	India
Patna	India
Pune	India
Rajkot	India
Ranchi	India
Surat	India
Vadodara	India
Varanasi	India

Since my city was not listed I decided to take the nearest big city and that was Bangalore.

2. My next step was to get the temperature data corresponding to Bangalore city. For that I queried the CITY_DATA table using the below query.

```
SELECT *

FROM city_data

WHERE city = ‘Bangalore’
```

Which yielded 218 results which I exported to a csv file.

3. Then the missing component that I required in order to start the analysis was the world temperature data which was obtained from the table GLOBAL_DATA using the below query.

SELECT *

FROM gobal_data

Which yielded 266 results and which too was exported to a csv file.

4. The csv files were opened using Microsoft Excel 2013 and the values were copied into a single tab. The 5 year moving average was calculated for the World wide data as well as for the Bangalore data. The 5 year moving average was calculated using Excel in separate columns named 5 yr MA World and 5 yr MA Bangalore. It was calculated as the average/mean of first 5 values. For egs. Given below is a table with a few data and the calculated 5 yr MA corresponding to the same.

Year	World (Yi)	5 yr MA World (MAi)
1750	8.72	
1751	7.98	
1752	5.78	
1753	8.39	
1754	8.47	7.868
1755	8.36	7.796
1756	8.85	7.97
1757	9.02	8.618
1758	6.74	8.288
1759	7.99	8.192
1760	7.19	7.958
1761	8.77	7.942
1762	8.61	7.86
1763	7.5	8.012
1764	8.4	8.094
1765	8.25	8.306
1766	8.41	8.234
1767	8.22	8.156
1768	6.78	8.012
1769	7.69	7.87
1770	7.69	7.758

MA stands for Moving Average. Here we consider the average world temperatures as Yi and the 5 yr moving average values are represented as MAi. The first MA value is calculated as:

MA1 = Y1+Y2+Y3+Y4+Y5/5.

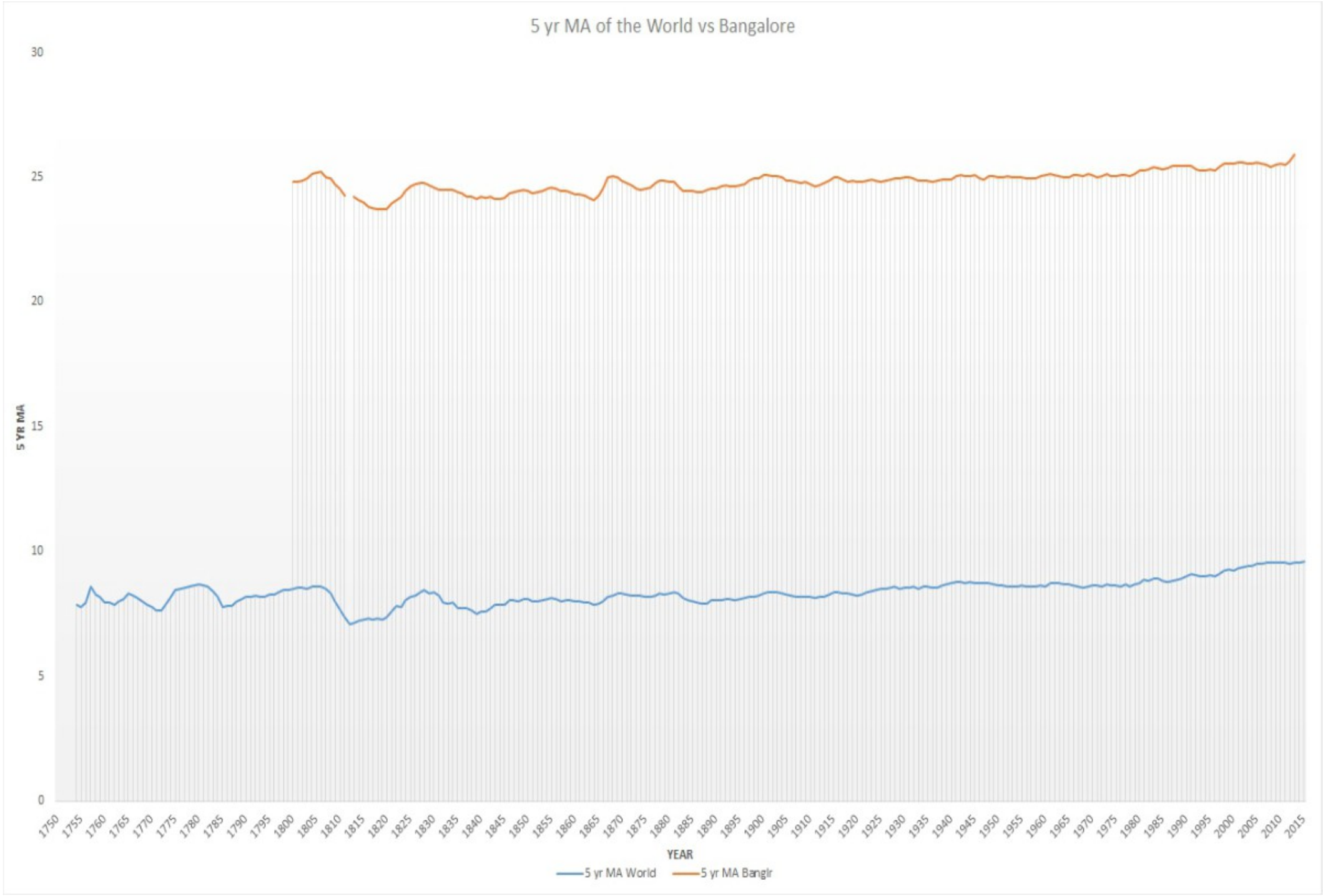
Substituting the values.

MA1 = 8.72 + 7.98 + 5.78 + 8.39 + 8.47 / 5 = **7.868**

In excel we use the average function and select the first 5 columns.

Likewise we calculate the 5 year MA for both the world as well as for Bangalore.

5. Then using these 5 year MA values we plot a line graph using excel. The graph is shown below.


5 yr MA of the World vs Bangalore
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5 YR MA
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YEAR
5 yr MA World
5 yr MA Bangl

6. Analysing this graph I reached the following observations.

1. The temperatures in Bangalore was started to get recorded in the year 1796. From a period just before 1805 the temperature began gradually increasing till it reached a peak point somewhere in the mid of 1805 – 1810 and then it starts to reduce. Considering the world temperature the graph shows a stable line which reached a peak nearer to 1810.

2. At or around 1810 the global temperature started to decrease reaching the lowest point around 1815. For Bangalore the temperature started to reduce nearer to 1810 and continued to do so till I reached nearer to 1820 which shows the lowest point in the curve.

3. After 1820 there was a gradual increase in temperature reaching a maximum point around 1830 for both Bangalore and the world.

4. After 1830 we can see a small rise in temperatures and stays almost constant with very minor changes until the period of late 1860.

5. We can see that from the late 1860 there has been a dent in the line reaching the low point around 1865 for Bangalore. But this change in temperature is more pronounced in Bangalore compared to the world average. There is not much difference in the global temperatures during this period.

6. After the 1865 period we can see that there is a sudden increase in temperature in Bangalore reaching a peak at around 1870 whereas no notable differences can be seen globally during this period.

7. For the rest of the period, from the graph we can see that there are no drastic changes happening both globally and for Bangalore. We can see from the graph that the temperatures through the years are almost constant or have only very small changes.

8. But from the 2000s we can see that the graph is increasing though slightly nonetheless increasing. This shows that both globally as well as for Bangalore the temperature has been increasing and is continuing to do so till the last recorded data.

9. This graph helps us to identify a relationship between the global temperature changes to the local temperature changes. We can come to a conclusion that the global temperature differences have affected and are affecting the local temperature differences. The vice versa can also be said. The local temperature changes gives us the proof that the temperature globally has been affected due to various reasons contributing to the temperature changes contributing to the global changes as well.

10. This gives rise to our main observation that the temperature has been increasing gradually over the course of time and from the observations, it will continue to do so since even with the last recorded data the temperature was increasing.

7. We could also calculate the correlation coefficient of the average temperatures obtained from the database.

The correlation coefficient is denoted by r. The formula for calculating **r** is :

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2}\sqrt{\sum_{i=1}^{n}(y_i - \bar{y})^2}}$$

where:

- n is the sample size
- x_i, y_i are the single samples indexed with i
- $\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$ (the sample mean); and analogously for $\bar{y}$

Here for the temperature data collected for the world the correlation coefficient, r = 0.622774506

For the temperature data for Bangalore the correlation coefficient, r = 0.707408534

This means that both sets of data have a positive correlation coefficient which symbolizes that as the year increases so does the temperature. This situation is stronger or clearer in the case of Bangalore as it has a relatively higher correlation coefficient.

8. In order to observe the relations of other cities' under the same criteria I incorporated the temperatures of other cities around the world into another line chart which is displayed in the page below. We can see from the graph that the temperature rises as the year progresses for every city which agrees with my initial observations between the world and Bangalore.

Note: In order to get the data for London city I used the following query:

SELECT *

FROM city_data

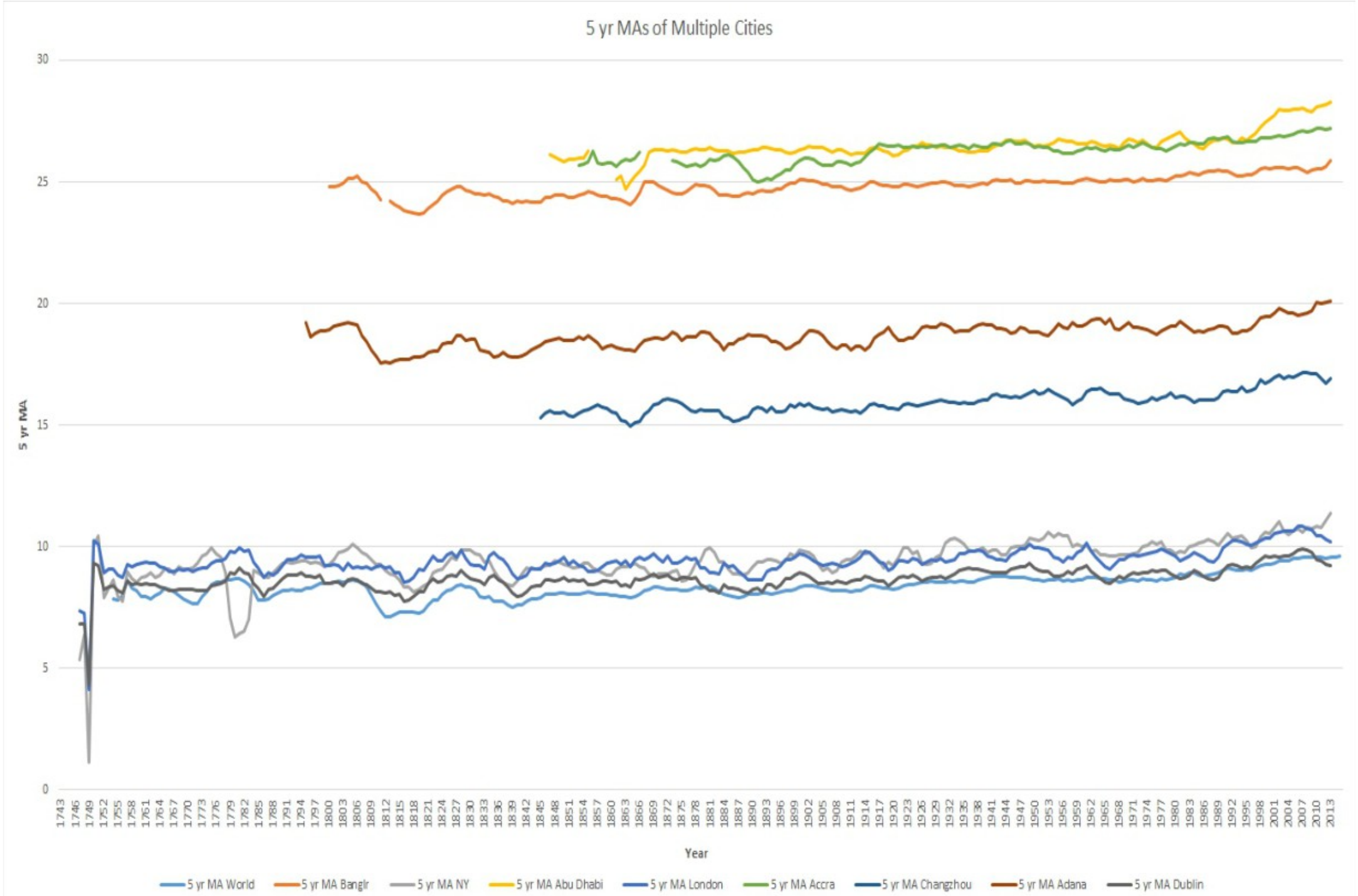
WHERE city = 'London'

AND country = 'United Kingdom'

Because there is also another London in Canada.

The excel field containing all the details is attached in this document.

Weather Trends_Udacity Proj


5 yr MAs of Multiple Cities
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2013
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5 yr MA NY
5 yr MA Abu Dhabi
5 yr MA London
5 yr MA Accra
5 yr MA Changzhou
5 yr MA Adana
5 yr MA Dublin