Exploring Weather Trends Project

Steps were taken:

• Data Extraction
• Data Cleaning
• Data Exploration
• Data Visualization

Data Extraction

SQL used to extract the data from the database schema :

```
/* Query 1- Query for Cairo city */
SELECT  year, avg_temp
FROM city_data
WHERE city = 'Cairo';

/* Query 2- Query for Alexandria city */
SELECT year, avg_temp
FROM city_data
WHERE country = 'Egypt'
AND city = 'Alexandria';

/* Query 3- Query for Global */
SELECT *
FROM global_data;
```

Extracting the data for two big cities in Egypt (The country where I live), Cairo, and Alexandria using SQL. For Alexandria city, I used country column from city_data table within WHERE statement because of the presence of two cities with the name Alexandria. Then exporting the results of the queries in CSV format.

Data Cleaning

After Opening the CSV file in Microsoft Excel which I will use for data analyzing and Visualizing, there are some missing values of some years for Cairo and Alexandria avg_temp in comparison to Global avg_temp as for the data that was extracted from the database schema the avg_temp for global temperatures data started from 1750 while Cairo temperatures data were from 1808 and Alexandria from 1791, so I removed all years and corresponding avg_temp values that are not in the three sets Cairo,

Alexandria, and Global so I'll be able to compare the temperature moving averages at the same time range.

Data Exploration

- For a better visualization of the data points, I calculated 10 years Moving Average for all of (Alexandria, Cairo, and Global) avg_temps.

|	A	B	C	D	E	F	G
1	Year	Cairo_avg_temp	Alex_avg_temp	Global_avg_temp	Cairo_temp_MA	Alex_temp_MA	Global_temp_MA
2	1808	17.11	19.69	7.63			
3	1809	19.87	19.03	7.08			
4	1810	19.93	19.12	6.92			
5	1811	20	19.19	6.86			
6	1812	19.93	19.02	7.05			
7	1813	20.51	19.55	7.74			
8	1814	20.43	19.5	7.59			
9	1815	20.3	19.39	7.24			
10	1816	20.51	18.91	6.94			
11	1817	21.88	19.08	6.98	=AVERAGE(B2:B11)	19.248	7.203
12	1818	11.6	19.9	7.83	19.496	19.269	7.223
13	1819	20.31	19.44	7.37	19.54	19.31	7.252
14	1820	20.58	19.73	7.62	19.605	19.371	7.322
15	1821	20.63	19.69	8.09	19.668	19.421	7.445
16	1822	20.72	19.8	8.19	19.747	19.499	7.559
17	1823	20.71	19.82	7.72	19.767	19.526	7.557
18	1824	21.44	20.52	8.55	19.868	19.628	7.653
19	1825	21	20.03	8.39	19.938	19.692	7.768
20	1826	20.94	19.96	8.36	19.981	19.797	7.91
21	1827	21.63	20.7	8.81	19.956	19.959	8.093
22	1828	20.99	20.08	8.17	20.895	19.977	8.127

- Calculating Correlation coefficient for Global Vs. Cairo & Global Vs. Alexandria, the correlation coefficient calculated on the 10 years moving averages of the avg_temp values.

Correlation coefficient for Global Vs. Cairo = 0.932543712
Correlation coefficient for Global Vs. Alexandria = 0.95539576

Data Visualization

I plotted a line graph with the temperature moving average values on Y-axis and the year on X-axis for Global, Cairo, and Alexandria to make data points trends more observable.

Comparison of Weather Trend Global, Cairo, Alexandria (10 yr/MA)
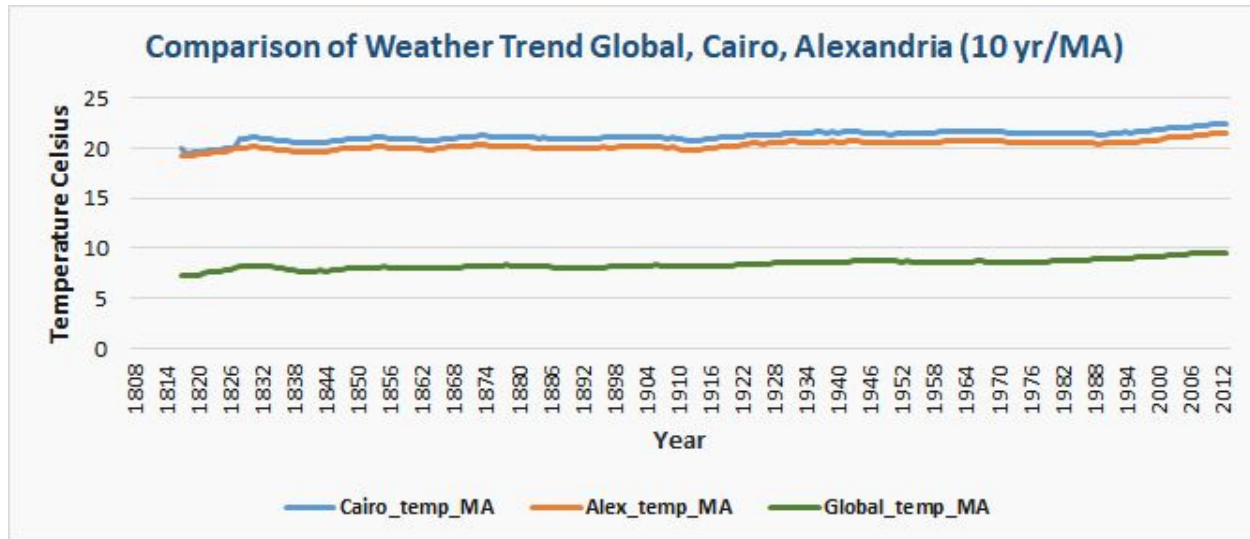
Observations:

- There is an observable upward trend for Global temperatures averages and slightly upward trends for each of Cairo and Alexandria temperature averages.

- Over time each of Cairo and Alexandria average temperatures have been hotter than the overall Global average temperatures, and Cairo city is slightly hotter than Alexandria as the city of Alexandria extending along the coast of the Mediterranean Sea which can be a reason of the slight difference in temperature averages than Cairo.

- The Global temperature ranged from 5 to 10 °C on average from the 19th to 21st century and for each of Alexandria and Cairo scored below and above 20 °C on average, there is an observed increase in all the three lines at the beginning of the 21st century which shows that the climate is changing rapidly now.

- For about a decade from 1817 and 1827, each of Cairo and Alexandria temperature averages was almost the same, It's obvious from the overlapped lines at this period of time, and from the data as the values of the (10yr) temperature moving averages ranged from 19 to 20 °C.

- There is a high correlation between Global and Cairo temperature moving averages with a coefficient value of 0.93, also between Global and Alexandria temperature moving averages with a coefficient value of 0.96. However, we cannot conclude that an increase in temperature of one caused the increase in temperature of the other from this data alone.