Exploring Weather Trends
Data Analyst Nanodegree Program

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1 Objective

In this project, we analyze local and global temperature data and compare the temperature trends in my city to overall global temperature trends.

2 Extract the data

Our goal is to extract both the world averages and my city's averages. To find out what cities the database offering for Canada, we can use the following SQL query:

```
SELECT city FROM city_list WHERE country = 'Canada';
```

After the data is retrieved from the database, as we can see in Figure 1, London is the closest big city from the result.

city	country
Kingston	Canada
London	Canada
Montreal	Canada
Ottawa	Canada
Toronto	Canada
Victoria	Canada

Figure 1: Cities in Canada.

To extract the data for both the world averages and my city's averages. We can use these SQL queries:

SELECT * FROM city_data WHERE country = 'Canada' AND city = 'London';
SELECT * FROM global_data;

Here are the results we get from the two queries:

year	city	country	avg_temp
1743	London	Canada	2.77
1744	London	Canada	10.19
1745	London	Canada	-1.12
1746	London	Canada	
1747	London	Canada	
1748	London	Canada	
1749	London	Canada	
1750	London	Canada	8.34

Figure 2: London Averages.

year	avg_temp
1750	8.72
1751	7.98
1752	5.78
1753	8.39
1754	8.47
1755	8.36
1756	8.85
1757	9.02

Figure 3: Global Averages.

3 Open up the CSV

In Figure 2, some data is missing from 1746 to 1749. Additionally, data from 2014 and 2015 is missing too. To avoid bias, delete missing data is a simple solution. In total, we have 264 rows of data. To smooth out the line, we can use the 12-years moving average. Here is the function for calculating the 12-years MA:

$$=\text{AVERAGE(D2:D13)}$$

Here is part of the yield, after applying the above function cells:

year	London average	London 12-year moveAve	global average	global 12-year moveAve
1750	8.34		8.72	
1751	8.84		7.98	
1752	1.64		5.78	
1753	7.87		8.39	
1754	8.15		8.47	
1755	5.12		8.36	
1756	8.59		8.85	
1757	7.29		9.02	
1758	6.47		6.74	
1759	7.39		7.99	
1760	5.97		7.19	
1761	8.36	7.0025	8.77	8.021666667
1762	7.85	6.961666667	8.61	8.0125
1763	5.54	6.686666667	7.5	7.9725
1764	8.03	7.219166667	8.4	8.190833333
1765	7.37	7.1775	8.25	8.179166667
1766	8.38	7.196666667	8.41	8.174166667
1767	6.97	7.350833333	8.22	8.1625
1768	6.89	7.209166667	6.78	7.99
1769	7.54	7.23	7.69	7.879166667
1770	7.44	7.310833333	7.69	7.958333333
1771	8.41	7.395833333	7.85	7.946666667

Figure 4: Data After Applying 12-Year Moving Average.

4 Create a line chart

Here is the line chart:

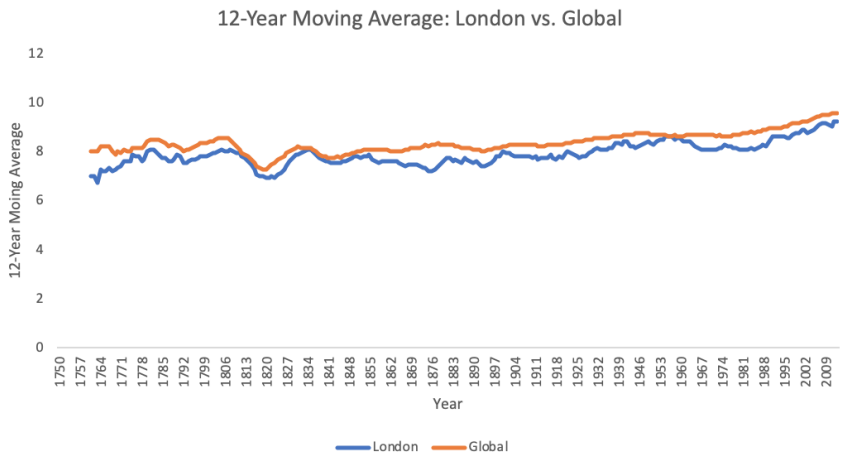

Figure 5: 12-Year Moving Averages

5 Make observations

5.1 Is your city hotter or cooler on average compared to the global average? Has the difference been consistent over time?

Overall, London is colder on average compared to the global average. However, there are three times that the two standards are nearly touching each other. One happened about 1813, one that happened around 1834, and one that happened roughly in 1955.

5.2 "How do the changes in your city's temperatures over time compare to the changes in the global average?"

Both London and global have similar trends. Before 1841, there is fluctuation occurred in both lines. In around 1806, a severe drop of 2 degrees occurred in both London and global. However, the temperature soon climbed back up around 1828. After 1841 both lines are in an upward trend. The global average is steady, whereas the London average contains various small ups and downs.

5.3 What does the overall trend look like? Is the world getting hotter or cooler? Has the trend been consistent over the last few hundred years?

In conclusion, the overall trend is slightly upwards, meaning the world is getting hotter. Over the last few hundred years, the trend is relatively steady.