

PROJECT REPORT: EXPLORE WEATHER TRENDS

SUMMARY: In this project, we analyse the global and local temperature data to understand and compare the trends of both, over a period of 266 years.

DATA: The data is present in SQL tables provided by UDACITY. The Global Data is present in global_data and City specific data is present in city_data.

AIM: The analysis of the data aims to answer the following questions:

1. What does the Overall trend look like, globally and for my local city(Toronto)?
2. Is my city cooler or hotter compared to the global average? Has the difference been consistent over time?
3. How do the changes in my city's temperatures over time compare to the changes in global average?

TOOLS USED:

1. Microsoft Excel
2. SQL

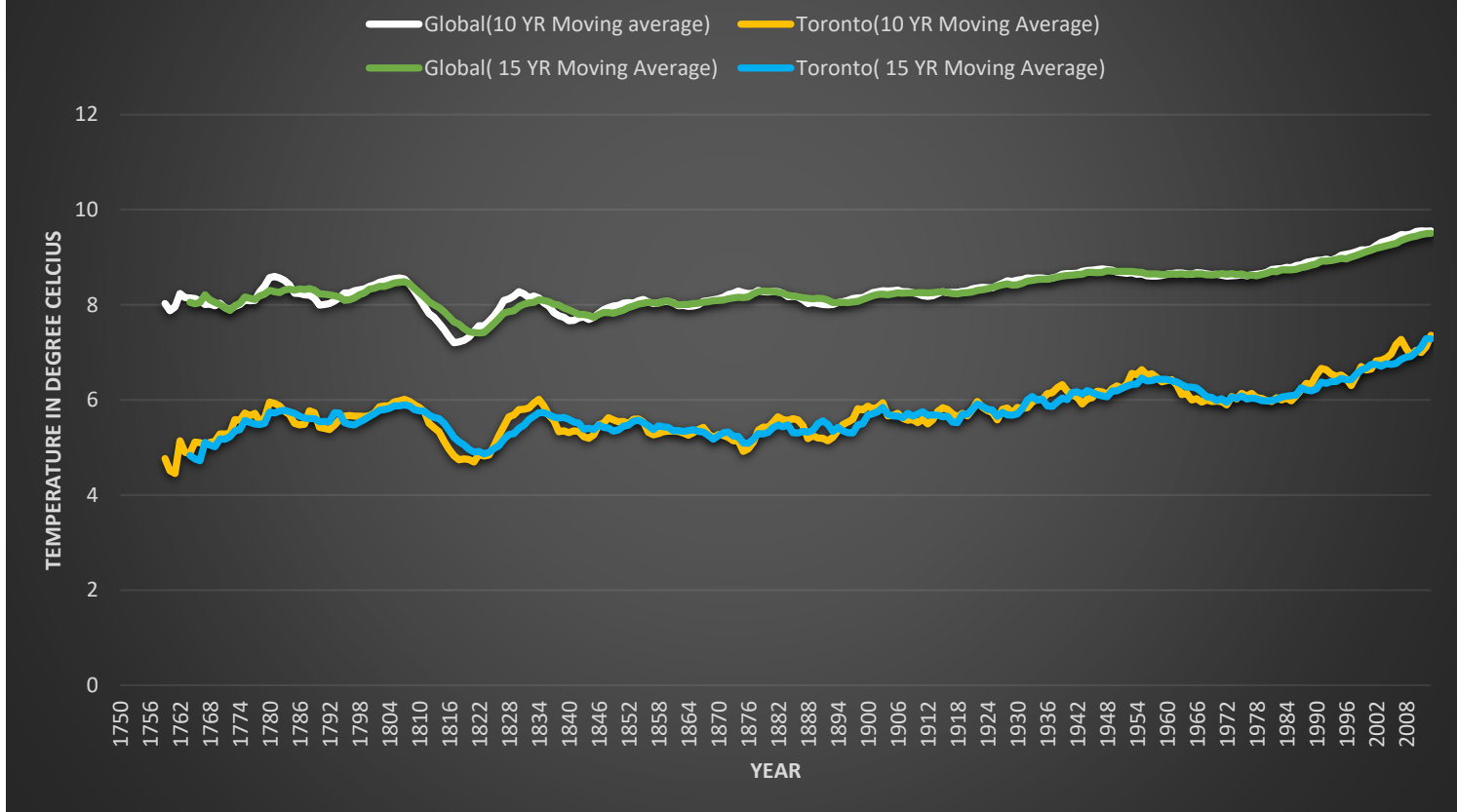
METHODOLOGY:

1. The temperature data was extracted from the tables using SQL query. It is listed below:

```
select global_data.year,global_data.avg_temp global_temp,city_data.avg_temp
city_temp from global_data
inner join city_data
on global_data.year = city_data.year
where city_data.city = 'Toronto';
```

2. After running each of the queries, the results were exported to a CSV file.
3. I calculated 10 year and 15 year moving averages for the temperatures. I decided to go with both the 10 year and 15 year moving average calculation to see if there were any major spikes that were incorrectly smoothened out with the 15 year moving average. Also, because the time frame spans over 260 years, anything less than 10 years would be too granular and could be sudden spikes, not necessarily representative of a trend.
4. The moving average was calculated using the method shown in class. So, the first 10 year moving average entry is the average of values in cells 1-10(excluding header), second entry is average of values in cells 2-11(excluding header) and so on. Similar for 15 year.
5. On this new sheet, we clicked Insert→ Charts and created the following line chart.

10 year and 15 year moving averages of Global and Toronto Temperatures over time- A comparison



The above is a line chart where we have plotted the 10 year and 15 year moving averages of global and local(Toronto) temperatures (Y axis) across the years 1750 to 2013 (x axis).

INTERPRETATION OF VISUALISATION AND ANSWERS TO QUESTIONS:

1. What does the Overall trend look like, globally and for my local city(Toronto)?

From the chart above, we can see that both globally, as well as for Toronto, there is a consistent upward moving trend for temperatures, except for a marked drop around 1819-1820 for both.

2. Is my city cooler or hotter compared to the global average? Has the difference been consistent over time?

My city is cooler compared to the global average. The difference seems to get lesser very slowly. From the earliest data points, it appears that the difference between the two was slightly more than 5 degree Celsius, whereas in the latest data point the difference is around 2.5 degree Celsius.

3. How do the changes in my city's temperatures over time compare to the changes in global average?

The gradient for both the temperature lines is quite close, so we can say that the rate of increase over time is fairly similar. However, for the Toronto line, there are much more little fluctuations than the

Global line. My understanding is, the fluctuations are smoothened out for the latter because it takes an enormous number of places into account while calculating the global average.

4. Similarities and dissimilarities between Toronto trends and Global Trends.

- a. Toronto seems to have grown warmer much faster than the global average till about 1805. From then on, the trends in both the charts are largely similar. From 1750 to 1808, Toronto's temperature rise has been 3.2 degrees and globally it has only been 0.7 degrees.
- b. Toronto remains cooler than the global average consistently. The difference between the latest data points is 2.2 degree Celsius. The difference between the earlier data points was about 5 degrees, so Toronto has warmed up faster than the global average. The rate of rise in temperature remains steady though.
- c. For both the sets, there was a spike of temperature rise around the period of 1832-1835, followed by a sharp drop. However, after that for about the next 30 years, there was a gradual drop in temperatures in Toronto, whereas, there was steady increase in global temperatures.
- d. The difference in the highest and lowest temperatures in Toronto is higher than the global temperature difference. The earliest data point for Toronto shows a temperature of -0.11 degree Celsius and the latest datapoint shows a temperature of 8.46 degree Celsius, a difference of 8.35 degrees. For the Global data, this difference is 1.11 degree Celsius. Toronto is getting warmer, faster.

Here are some additional statistics to corroborate the assumptions:

Metrics for	Minimum Temperature	Maximum Temperature	Mean Temperature	Earliest Recorded Temperature	Latest Recorded Temperature	Difference between Highest and Average Temperatures	Difference between earliest and latest temperatures	Difference between latest and average temperatures
Toronto	-1.1	8.7	5.77	6.29	8.46	2.93(+50.76%)	2.17(+34.5%)	2.69(+46.60%)
Global	5.78	9.73	8.36	8.72	9.61	1.37(+35.77%)	0.89(+10.21%)	1.25(+14.96%)

CONCLUSION:

After analysing the data and plotting it against time, it is clear that the temperature trends in Toronto align with Global in that both are increasing. Toronto was and remains cooler than the global average but is getting warmer faster than the global average.