

# Exploring Weather Trends

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# Exploring Weather Trends

## Executive Summary:

This document is intended to give a description of similarities and differences between global temperature trends and temperature trends in the closest big city to where I live.

## Project Goal:

The goal of this project is to analyse the local and global temperature data, create a visualisation and compare the temperature trends of the nearest city (Bangalore) to where I live to overall global temperature trends.

## Instructions:

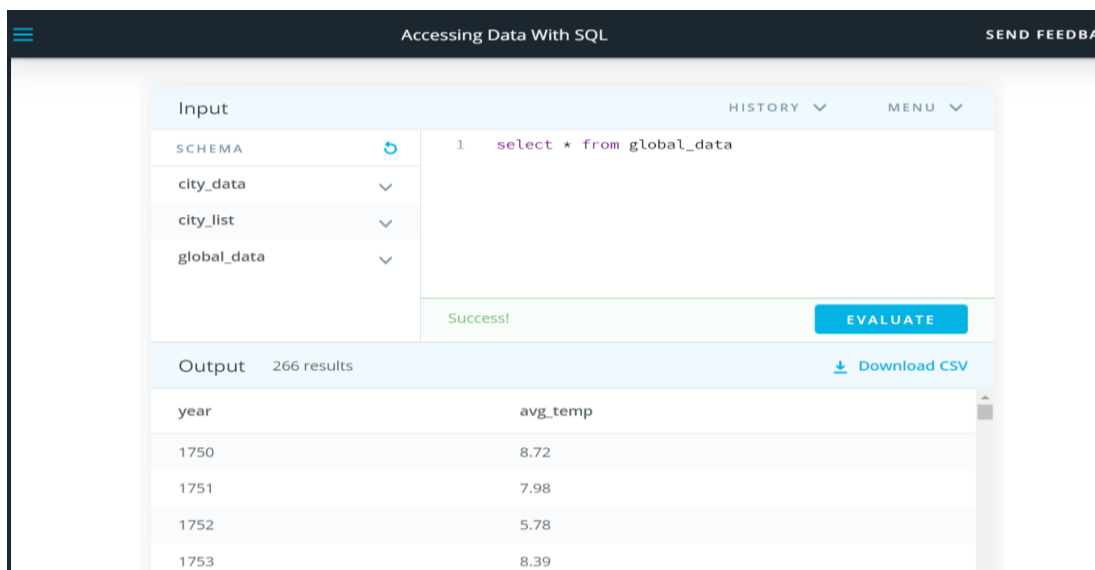
- **Extract the data** from the provided workspace which is connected to a database and export it to CSV.
- **Open up the CSV** in desired tool.
- **Create a line chart** that compares the city's temperatures with the global temperatures by plotting the *moving average* in order to smooth out the lines, making trends more observable.
- **Make observations** about the similarities and differences between the world averages and city's averages, as well as overall trends.

## Tools Used:

- **SQL** – to extract data from database.
- **Excel** – to analyse and visualize data.

## Steps followed to extract data using **SQL**:

Step 1: Viewing and extracting Global Data from the table “global\_data”



The screenshot shows a web-based SQL interface titled "Accessing Data With SQL". On the left, under the "Input" section, a schema is listed with tables: "city\_data", "city\_list", and "global\_data". The "global\_data" table is selected. The SQL query editor contains the query: `1 select * from global_data`. Below the query, a green "Success!" message is displayed. To the right of the message is a blue "EVALUATE" button. Below the input section, the "Output" section shows "266 results" and a "Download CSV" link. The output is a table with two columns: "year" and "avg\_temp". The first four rows of data are visible:

year	avg_temp
1750	8.72
1751	7.98
1752	5.78
1753	8.39

Step 2: Listing all the cities in “India” to select nearest city from the table “city\_list”

The screenshot shows a SQL interface titled "Accessing Data With SQL" with a "SEND FEEDBACK" link. The "Input" section displays a schema with tables: city\_data, city\_list, city, and country. The "city\_list" table is selected, showing columns: city, country, and global\_data. The SQL query entered is: `1 select * from city_list where country='India'`. A green "Success!" message and an "EVALUATE" button are visible. The "Output" section shows 22 results, with a "Download CSV" link. The output table has columns "city" and "country", listing cities like Agra, Ahmadabad, Allahabad, and Amritsar, all with "India" as the country.

city	country
Agra	India
Ahmadabad	India
Allahabad	India
Amritsar	India

Step 3: Extracting nearest city data (Bangalore) by,

- Joining the tables – global\_data & city\_data on year
- Filtering the result where country="India" and city="Bangalore"

The screenshot shows the same SQL interface. The "city\_data" table is selected, showing columns: year, city, country, and avg\_temp. The SQL query entered is: `1 select gd.year, gd.avg_temp as g_avg_temp, cd.avg_temp as c_avg_temp from global_data gd join city_data cd on cd.year=gd.year where cd.country='India' and cd.city='Bangalore'`. A green "Success!" message and an "EVALUATE" button are visible. The "Output" section shows 218 results, with a "Download CSV" link. The output table has columns "year", "g\_avg\_temp", and "c\_avg\_temp", showing data for the years 1796, 1797, 1798, and 1799.

year	g_avg_temp	c_avg_temp
1796	8.27	24.49
1797	8.51	25.18
1798	8.67	24.65
1799	8.51	24.81

Step 4: **Download CSV** of the evaluated result.

## Steps followed to fill missing data using **EXCEL**:

Step 1: Analyse the downloaded **CSV** in Excel and fill the missing city data by,

- An absolute difference of city average temperature and global average temperature (non-missing data in both) is calculated
- Mean of difference is calculated (i.e., 16.4155)
- Mean of difference is then added to global average temperature to obtain missing data for city average temperature

	A	B	C	D	E	F
1	year	g_avg_tem	c_avg_tem	Diff		Mean of diff
2	1796	8.27	24.49	16.22		16.4155
3	1797	8.51	25.18	16.67		
4	1798	8.67	24.65	15.98		
5	1799	8.51	24.81	16.3		
6	1800	8.48	24.85	16.37		
7	1801	8.59	24.49	15.9		
8	1802	8.58	25.44	16.86		
9	1803	8.5	25.22	16.72		
10	1804	8.84	25.67	16.83		
11	1805	8.56	25.01	16.45		
12	1806	8.43	24.87	16.44		
13	1807	8.28	24.25	15.97		
14	1808	7.63				
15	1809	7.08				
16	1810	6.92				
17	1811	6.86				
18	1812	7.05				
19	1813	7.74	24.23	16.49		
20	1814	7.59	23.91	16.32		

## Steps followed to visualise data using **EXCEL**:

Step 1: To make the plot more observable, "10 years" *moving average* is calculated using the formula,

- {City Data} =AVERAGE(C2:C11)
- {Global Data} =AVERAGE(B2:B11)

CORREL						
=AVERAGE(C2:C11)						
	A	B	C	D	E	F
1	year	g_avg_tem	c_avg_tem	Global_M	City_MA	Diff
2	1796	8.27	24.49			16.22
3	1797	8.51	25.18			16.67
4	1798	8.67	24.65			15.98
5	1799	8.51	24.81			16.3
6	1800	8.48	24.85			16.37
7	1801	8.59	24.49			15.9
8	1802	8.58	25.44			16.86
9	1803	8.5	25.22			16.72
10	1804	8.84	25.67			16.83
11	1805	8.56	25.01	8.551	E(C2:C11)	16.45
12	1806	8.43	24.87	8.567	25.019	16.44
13	1807	8.28	24.25	8.544	24.926	15.97
14	1808	7.63	24.0455	8.44	24.8655	16.4155
15	1809	7.08	23.4955	8.297	24.7341	16.4155
16	1810	6.92	23.3355	8.141	24.5826	16.4155
17	1811	6.86	23.2755	7.968	24.4612	16.4155
18	1812	7.05	23.4655	7.815	24.2637	16.4155
19	1813	7.74	24.23	7.739	24.1647	16.49
20	1814	7.59	23.91	7.614	23.9887	16.32

Step 2: Plot a line chart of Global moving average and Bangalore moving average.

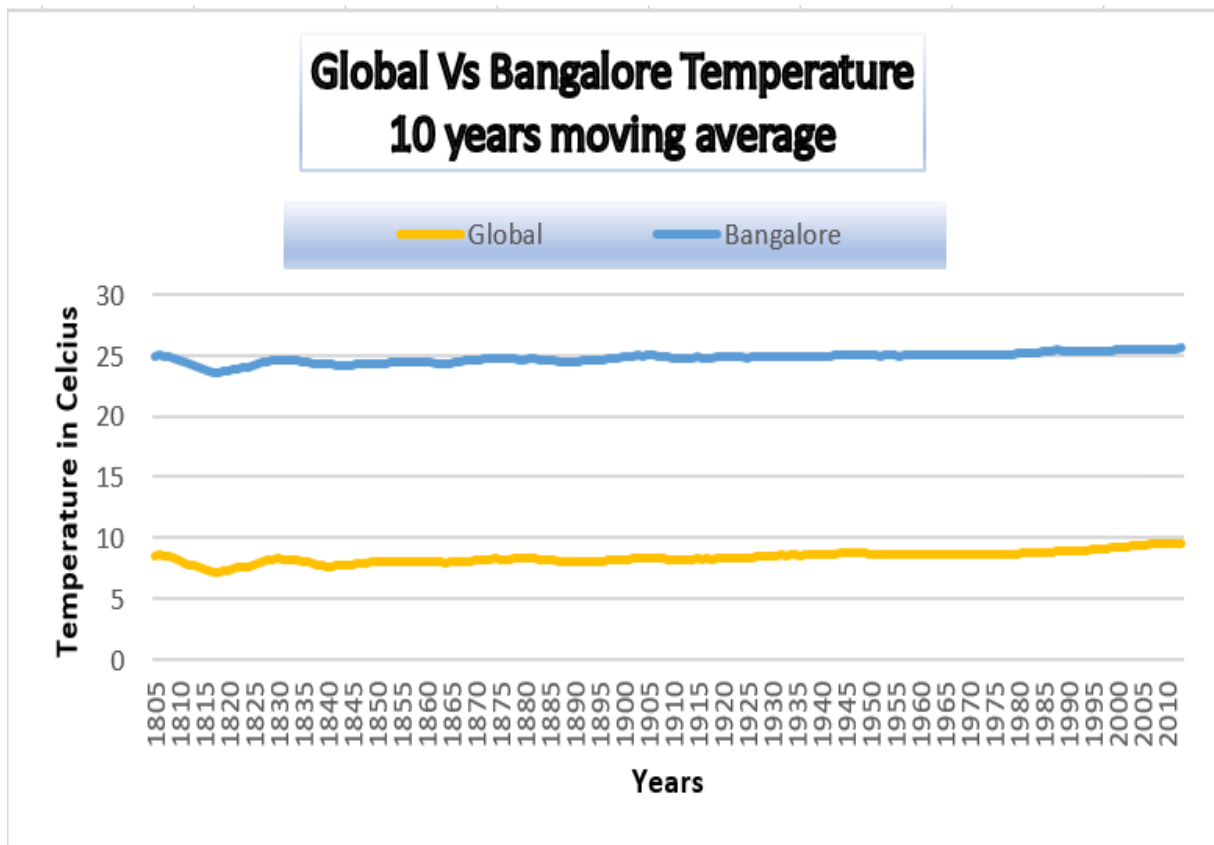


Figure 1 : 10 years Moving Average (Global Vs Bangalore)

Step 3: For further observation, the following values are calculated and plotted in a line chart.

Calculation	Global	Bangalore
Minimum	=MIN(B2:B219)	=MIN(C2:C219)
Maximum	=MAX(B2:B219)	=MAX(C2:C219)
Standard Deviation	=STDEV(B2:B219)	=STDEV(C2:C219)
Correlation	=CORREL(B2:B219,C2:C219)	

Calculation	Global	Bangalore
Minimum	6.86	23.2755
Maximum	9.73	26.61
Standard Deviation	0.54866	0.52015
Correlation	0.88435	

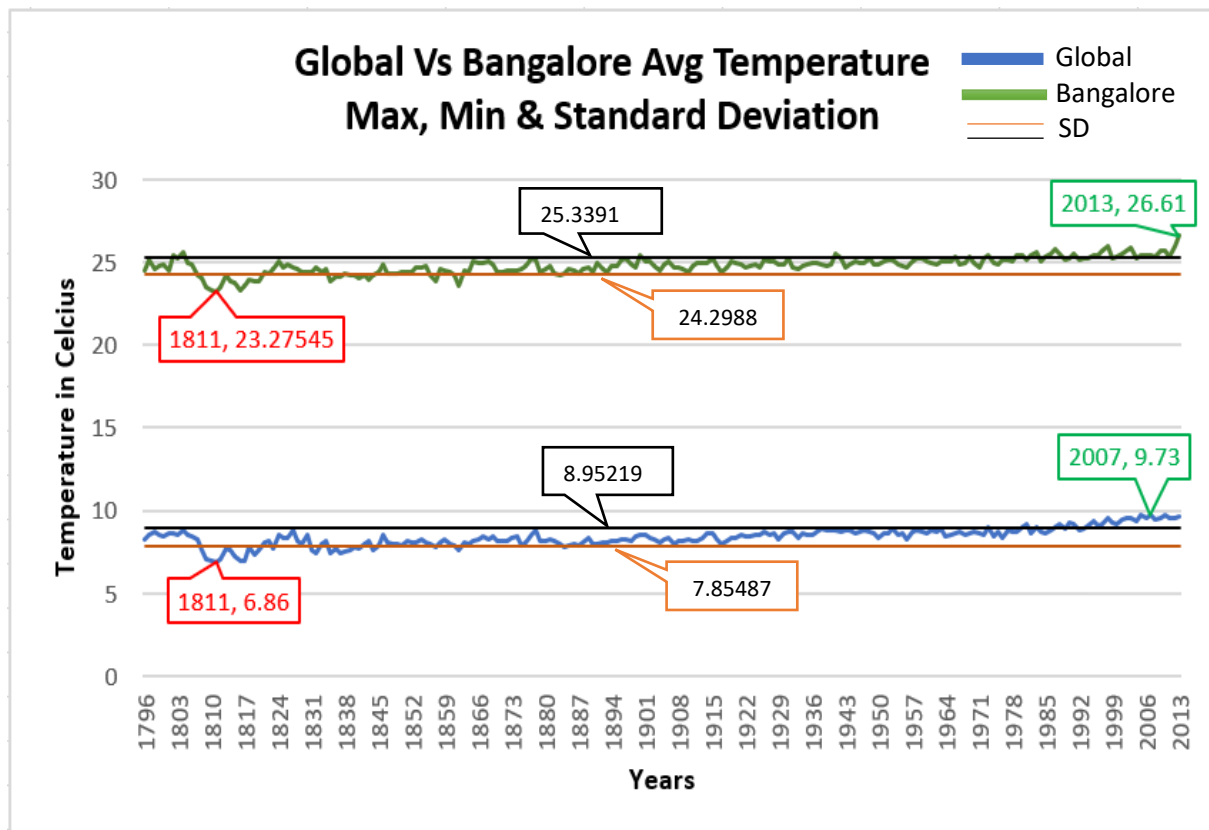


Figure 2: Average & Standard Deviation (Global Vs Bangalore)

#### Observations:

1. From Figure 1 & Figure 2, it is observed that Bangalore is hotter compared to the Global average temperature by average of 16.41
2. From Figure 1, it is clear that moving averages of both Bangalore and Global has been consistent and almost parallel to each other for more than 100 years
3. Bangalore average temperature is highly correlated to Global average temperature by 0.88435
4. Both Bangalore & Global average temperature dropped down to its lowest of 23.27c & 6.8c correspondingly at the year **1811**
5. Bangalore & Global average temperature is rising steadily and had its peak in last **20 years**
6. Between 1866 and 1975, the temperature was pretty flat for both Bangalore & Global deviating within the Standard Deviation
7. From 1803 to 1830, both Bangalore & Global had experienced a great fluctuation