

Exploring Weather Trends

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Introduction

In this report, we are going to analyze the similarities and differences between global temperature trends and temperature trends in the city where I live, which happens to be Abuja; the capital city of Nigeria.

In order to carry out this analysis properly, there were several criteria we adhered to. These criteria outline the steps taken in the successive stages of our analysis and the tools we used in each of those stages. These steps are;

- *Extract data from a database using SQL*
- *Choose a tool(python, Excel, etc) and use that tool to calculate the Moving Averages*
- *Visualize the temperature trends using a line chart*
- *State observations about the data visualization*

Extract The Data:

As I mentioned in the introductory section of this report, I happen to live in Abuja which is a big city and the state capital of Nigeria. Hence, the data of interest to me were the temperature data of the world and the temperature data of Abuja.

I wrote SQL queries to extract and export both of these data from a database.

Firstly, I queried the **city_list** table to find the list of Nigerian cities.

```
SELECT * FROM city_list WHERE country LIKE '%Nigeria%';
```

After ensuring that the city of Abuja wasn't in the list of Nigerian cities and it wasn't misspelt, I wrote a query to extract its city-level data from the **city_data** table.

```
SELECT * FROM city_data WHERE city = 'Abuja' AND country = 'Nigeria';
```

Finally, we wrote a query to extract global data from the **global_data** table.

```
SELECT *  
FROM global_data;
```

Note: The names of the cities and countries may have been misspelt or duplicated. Using the **LIKE** operator may not be adequate, but because SQL does not [support regular expression](#)[1] without managed code, we were limited to the use of the **LIKE** operator for this report.

Data Preparation:

The tool I chose to use for this analysis was Google sheets. I opened both CSV in Google sheets and then combined the data from both files into a single sheet.

To do this, I observed that in booth sheets, they had a column with the same name; **avg_temp**. I changed that column name to **Abj_avg_temp** for the **City data sheet**, and **glb_avg_temp** for the **Global data sheet**. Having done this, I merged booth sheets into one, discarding the irrelevant columns.

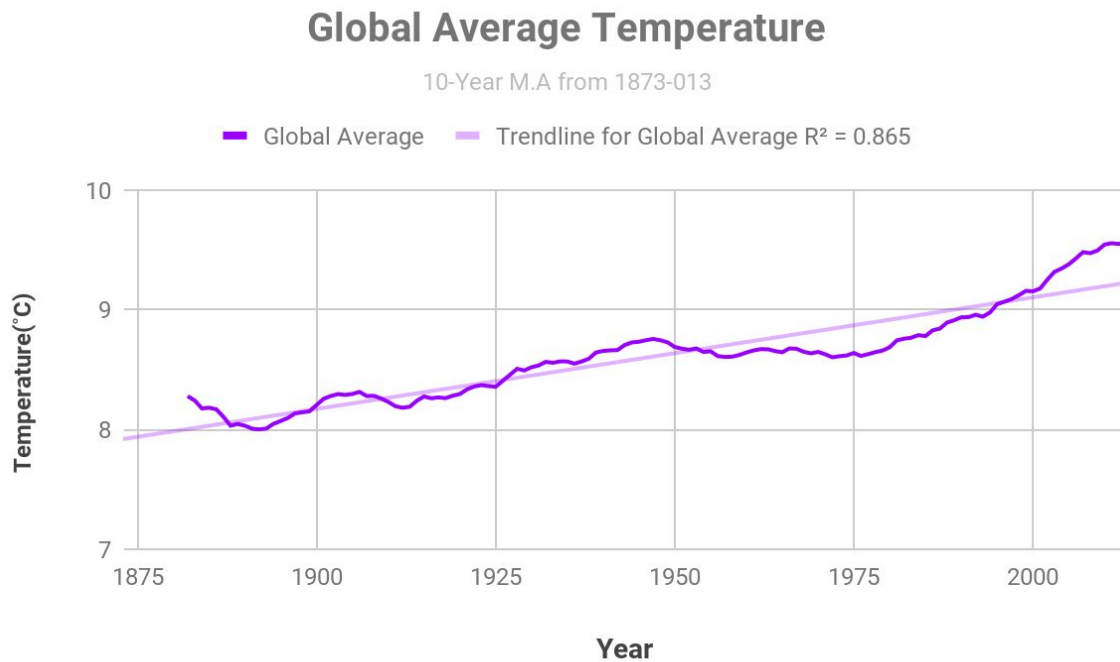
Moving Average:

A moving average is usually carried out on time-series data in order to smooth out the short term fluctuations so that we can observe long term trends more keenly[2]. For this analysis, we calculated a 10-year moving average. I used a range from 1873 to 2013 because that was the subset of the data that had no missing values after joining both the Abuja City data and the global data.

Data Visualization:

I used a line graph because it is the best way to show visually how two variables are related or how they vary. using tools available in google sheets I obtained the Trend line for both graphs. I also calculated the range and the slope of the trend line.

Below are the line graphs for the Global average temperatures and for Abuja average temperatures. The last graph is a log scale line graph of the combination of both.



Trend line Linear Equation(Global) $9.31E - 03 * x + - 9.53$

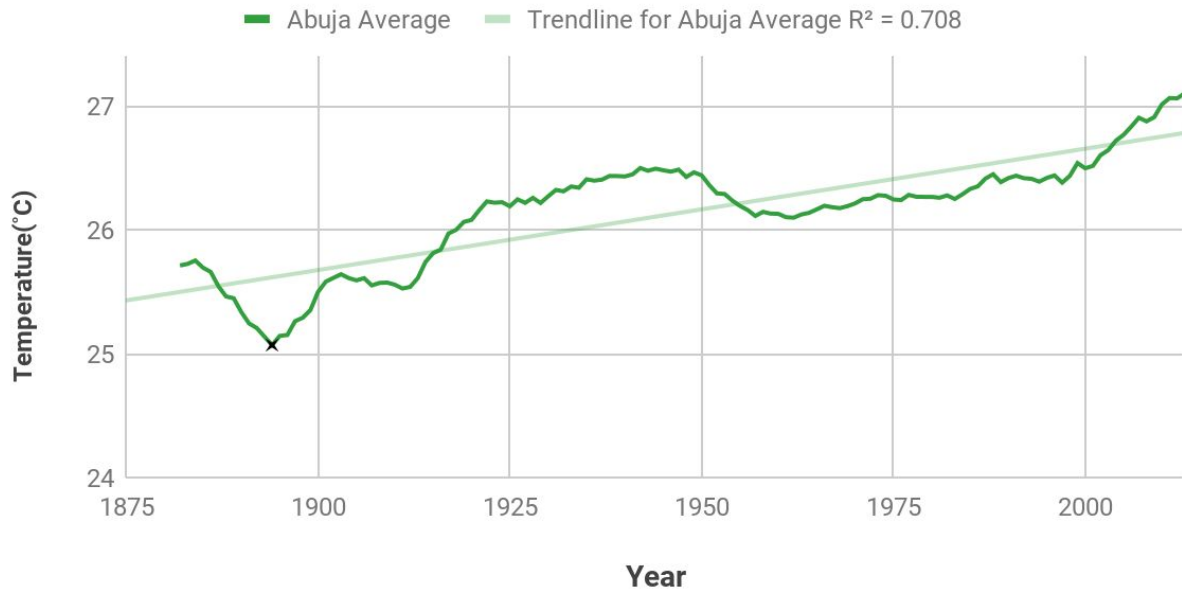
slope : $9.31E-03=0.00931$

$R^2 = 0.865$

Min Global Average	8
Max Global Average	9.556
Range	1.556
% Increase since 1873	15.439
variance	0.146

Abuja Average Temperature

10-year M.A form 1873-2013



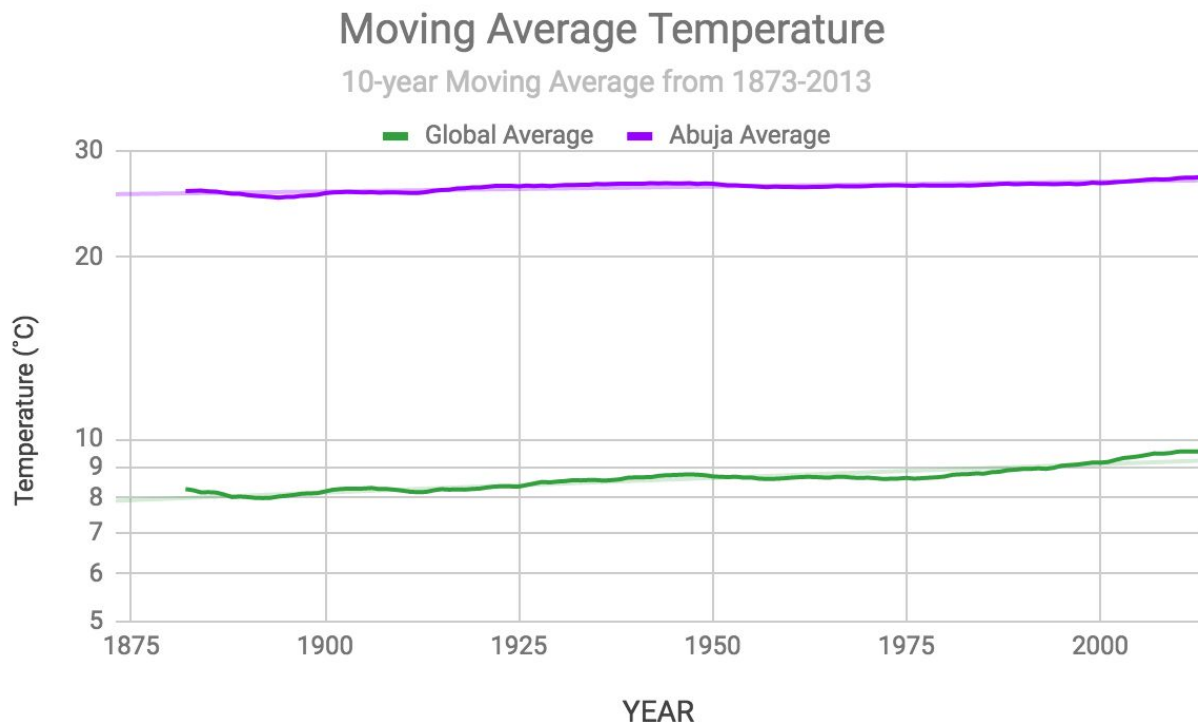
Trend line Linear Equation(Abuja) $9.8E-03 * x + -7.05$

slope : $9.8E-03 = 0.0098$

$R^2 = 0.708$

Min Abuja Average	25.07
Max Abuja Average	27.104
Range	2.034
% Increase Since 1873	5.41
Variance	0.197

Log Line chart for both the Global Average and Abuja Average

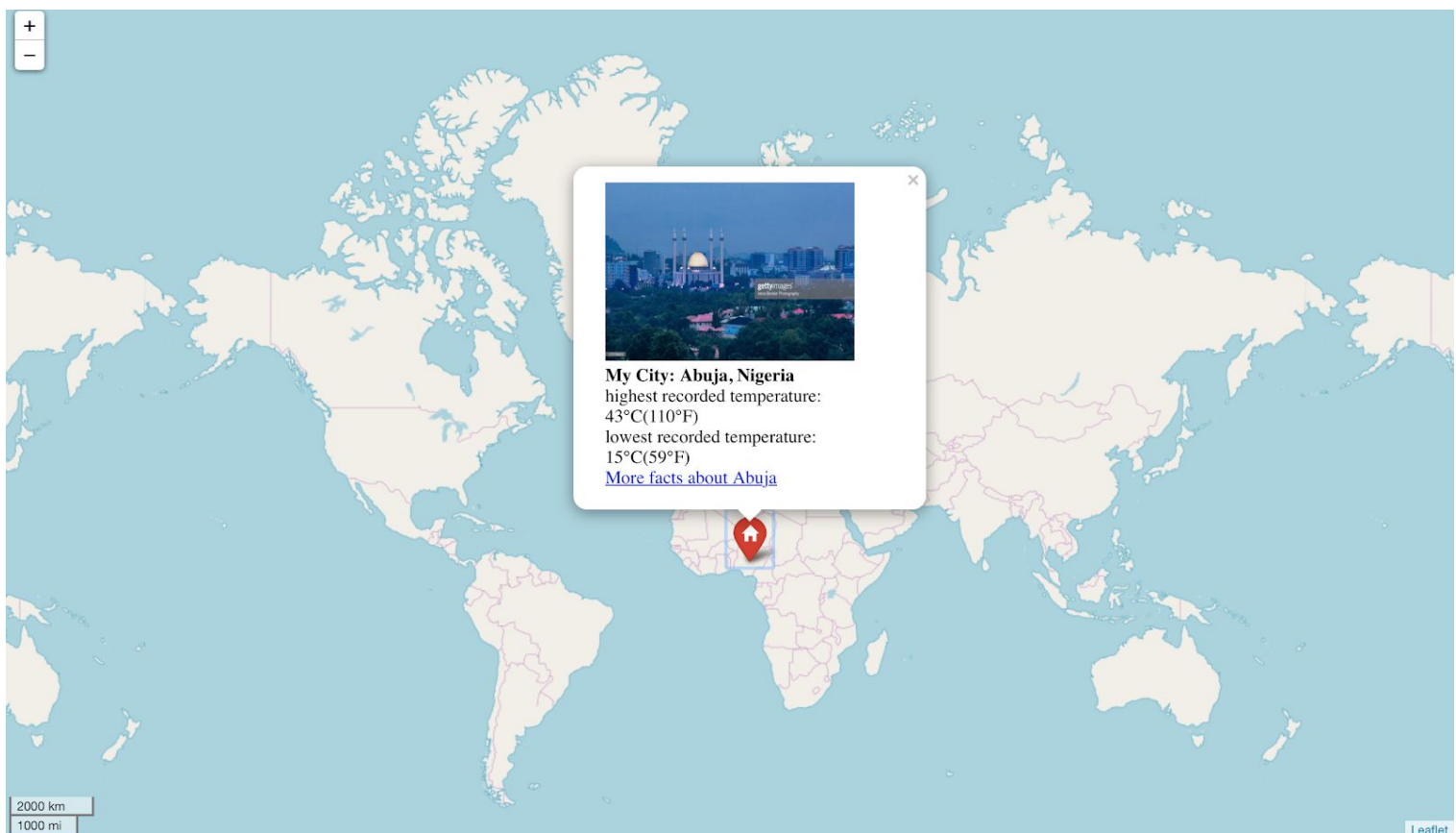


Observations:

- From the line graphs above we can clearly see that on average, Abuja is consistently a lot hotter than the global Average.
- I calculated the range(the difference between the maximum and minimum values) for both Abuja Average temperatures and the Global temperatures. The Global temperature range is 1.5°C while for Abuja it is 2.034°C. This indicates that the Abuja temperatures are more dispersed than the global average temperature.

- From the line graph, it seems that the temperature values of Abuja were more spread out than the global average temperatures, calculating the variance proved that and buttresses the indication we got from calculating the range. Abuja had a variance of 0.197 while the global data was 0.146.
- Also comparing both global and city temperatures I can see that the temperatures changed at about the same rate, with Abuja temperature changing at a slightly higher rate as indicated by the difference in the trend line slopes; Abuja 0.00981, Global 0.00931

Map of the World Highlighting My City



Created Using python and Folium

Conclusion:

In conclusion, the line graph clearly shows that the world is getting hotter. This trend has been fairly consistent for most of the time period analysed except from 1883-1900 and 1950-1975 where it shows a downward trend.

References:

[1] CLR Regular Expressions Assembly for SQL servers.

<https://www.red-gate.com/simple-talk/sql/t-sql-programming/clr-assembly-regex-functions-for-sql-server-by-example>

[2] Moving Average. https://en.wikipedia.org/wiki/Moving_average