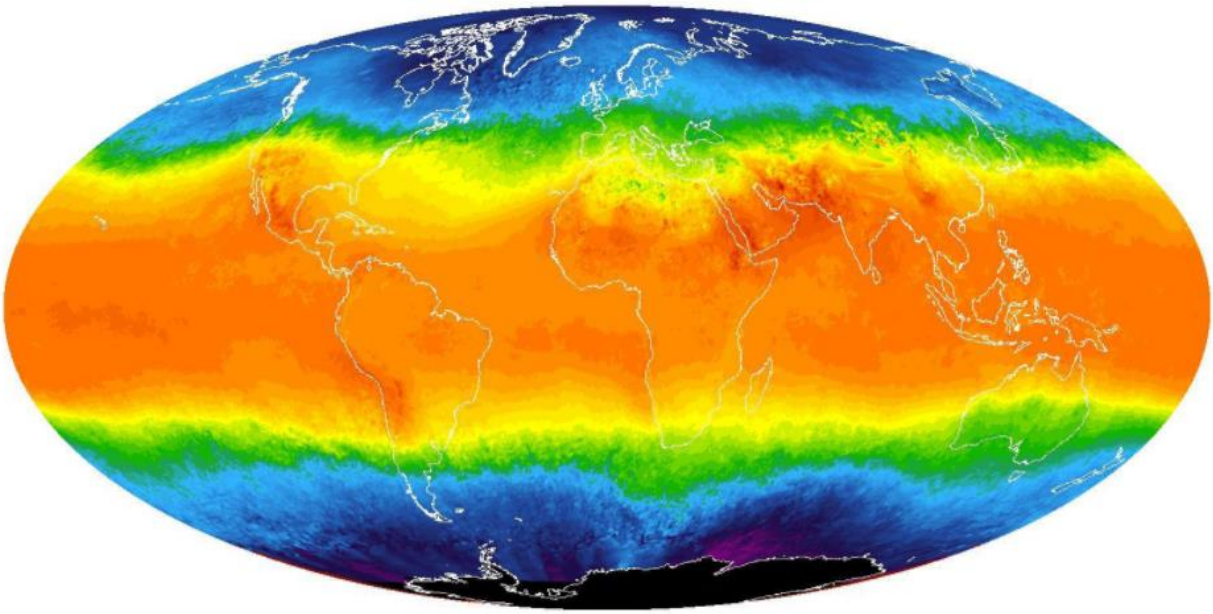
UDACITY Data Analyst Nanodegree Program

Project 01: Explore Weather Trends



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The following are the steps and tools used to prepare the data for visualization:

1. **Step 1**: Retrieved data using Postgres SQL
2. **Step 2**: Calculated moving average in MS Excel
3. **Step 3**: Plotted line charts for data visualization in MS Excel

1. SQL Queries

Below are SQL queries employed to retrieve the data:

a. SQL query to check the nearest city in my country from "city_list.csv"

```
SELECT *
FROM city_list
WHERE country = 'Qatar'
```

city_list.csv:

city	country
Doha	Qatar

b. SQL query to extract the global data from "global_data.csv"

```
SELECT *
FROM global_data
```

global_data.csv: (limited to 9 rows)

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
1758	6.74

c. SQL query to extract the city level data "city_data.csv"

```
SELECT *
FROM city_list
WHERE country = 'Qatar' AND city = 'Doha'
```

city_data.csv: (limited to 9 rows)

year	city	country	avg_temp
1843	Doha	Qatar	26.32
1844	Doha	Qatar	18.74
1845	Doha	Qatar	22.36
1846	Doha	Qatar	
1847	Doha	Qatar	
1848	Doha	Qatar	26.14
1849	Doha	Qatar	26.34
1850	Doha	Qatar	25.96
1851	Doha	Qatar	26.6

d. SQL query to join city data and global data to calculate moving averages "global_local.csv":

```
SELECT global_data.year,
        global_data.avg_temp AS global_avg_temp,
        city_data.avg_temp AS doha_avg_temp
FROM global_data
JOIN city_data
ON global_data.year = city_data.year
WHERE city LIKE 'Doha';
```

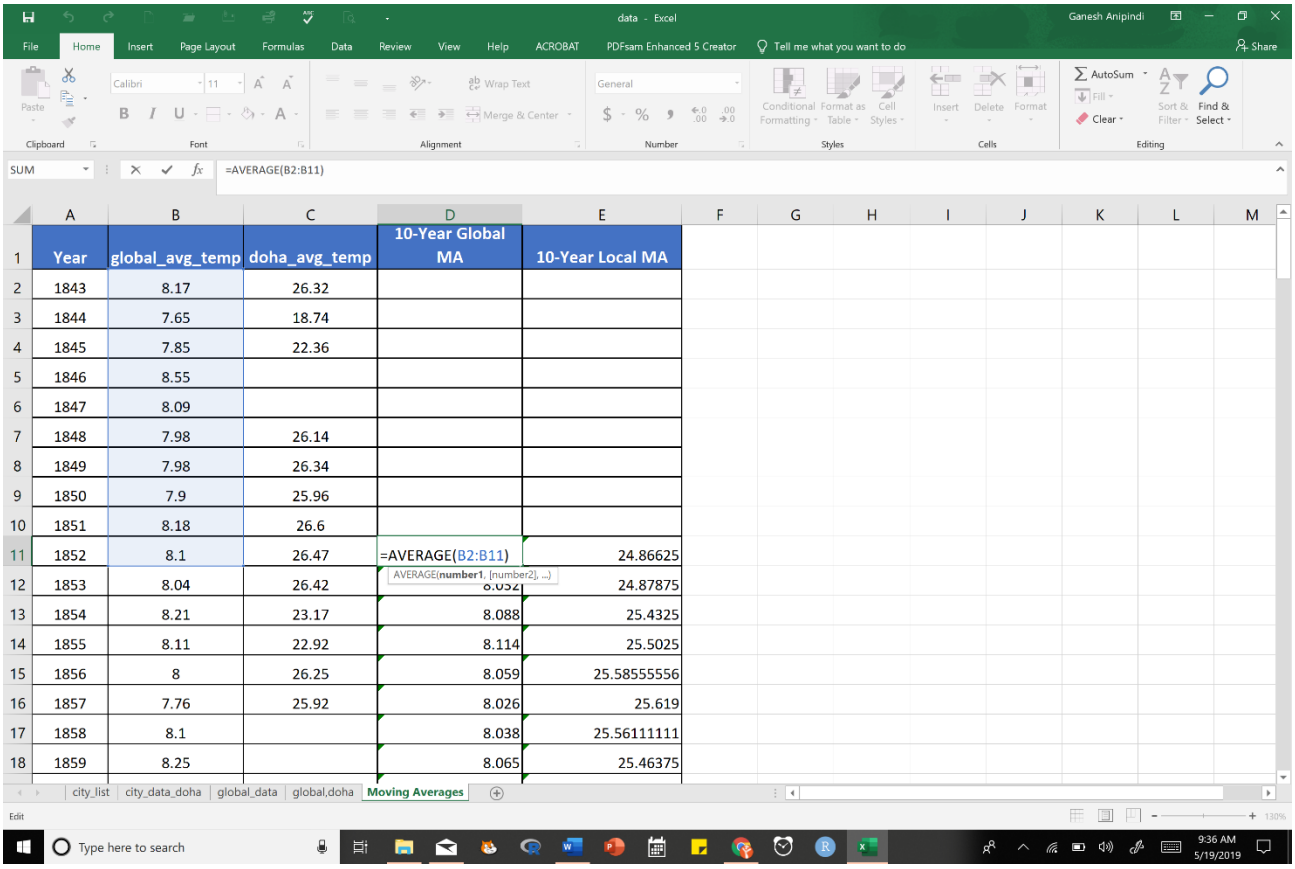
global_local.csv: (limited to 9 rows)

year	global_avg_temp	doha_avg_temp
1843	8.17	26.32
1844	7.65	18.74
1845	7.85	22.36
1846	8.55	
1847	8.09	
1848	7.98	26.14
1849	7.98	26.34
1850	7.9	25.96
1851	8.18	26.6

2. Moving Averages

A 10-year moving average was calculated using **MS Excel** for global and local (Doha, Qatar) annual average temperatures. Moving averages was used to: (1) smooth out the annual average temperature data, (2) to remove any outliers, (3) filter out the "noise" from random annual movements and (4) identify overall trends in the data.

The formula used is "= AVERAGE(number1, [number2], ...)". Below is a screenshot of the MS Excel workbook:



	A	B	C	D	E
1	Year	global_avg_temp	doha_avg_temp	10-Year Global MA	10-Year Local MA
2	1843	8.17	26.32		
3	1844	7.65	18.74		
4	1845	7.85	22.36		
5	1846	8.55			
6	1847	8.09			
7	1848	7.98	26.14		
8	1849	7.98	26.34		
9	1850	7.9	25.96		
10	1851	8.18	26.6		
11	1852	8.1	26.47	=AVERAGE(B2:B11)	24.86625
12	1853	8.04	26.42		24.87875
13	1854	8.21	23.17	8.088	25.4325
14	1855	8.11	22.92	8.114	25.5025
15	1856	8	26.25	8.059	25.58555556
16	1857	7.76	25.92	8.026	25.619
17	1858	8.1		8.038	25.56111111
18	1859	8.25		8.065	25.46375

3. Data Visualization:

The **key considerations** when deciding the data visualization for this project are, to:

- Demonstrate the trend
- Observe and record acceleration or deceleration of data over a period of time
- Observe volatility of global and local annual average temperatures over 171 years.

A line chart of the annual average temperatures (Fig. 1) and a 10-year moving averages (Fig. 2) are plotted using **MS Excel**. These charts compare average annual temperature in Doha (Qatar) with global records.

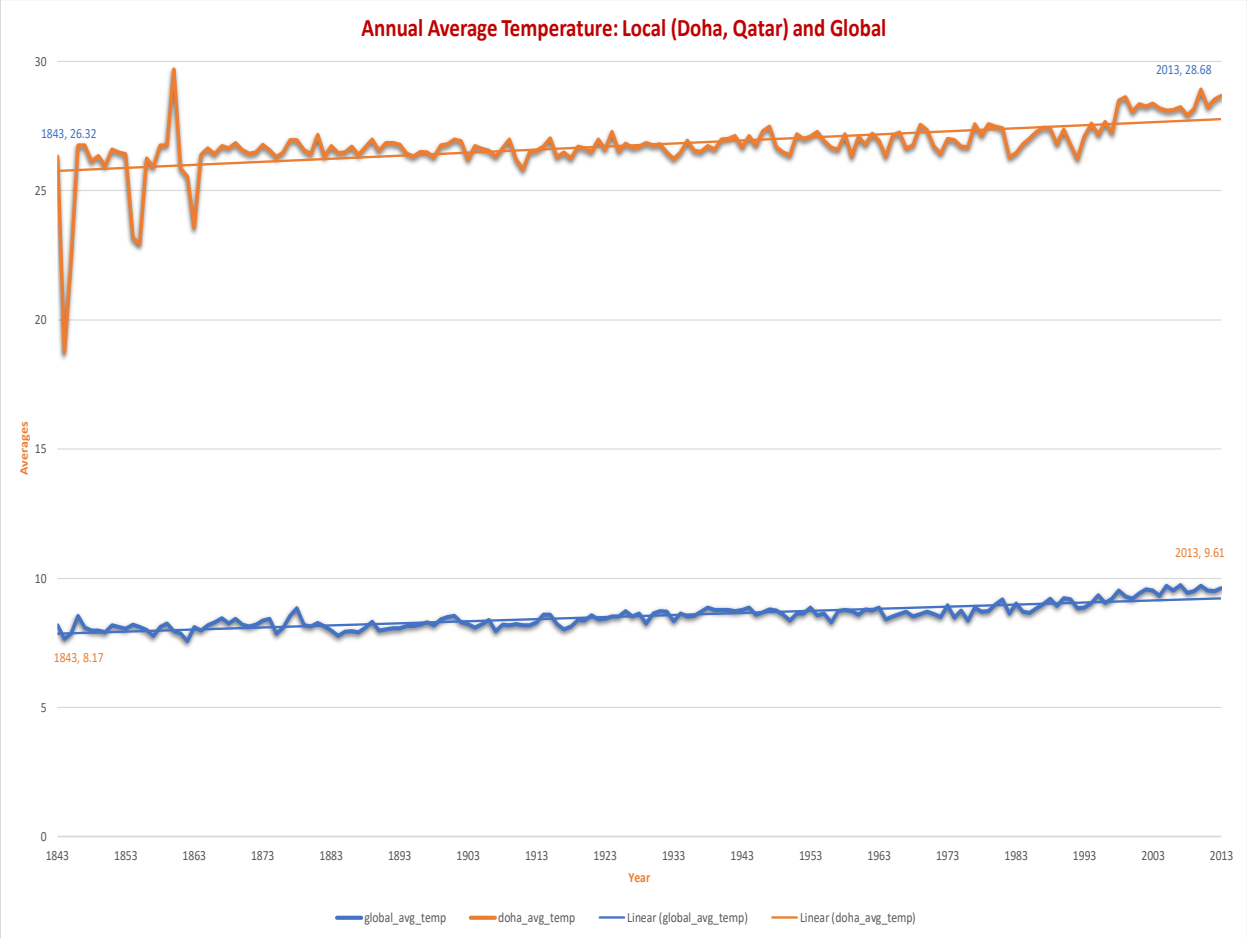


Fig 1. Annual average line chart

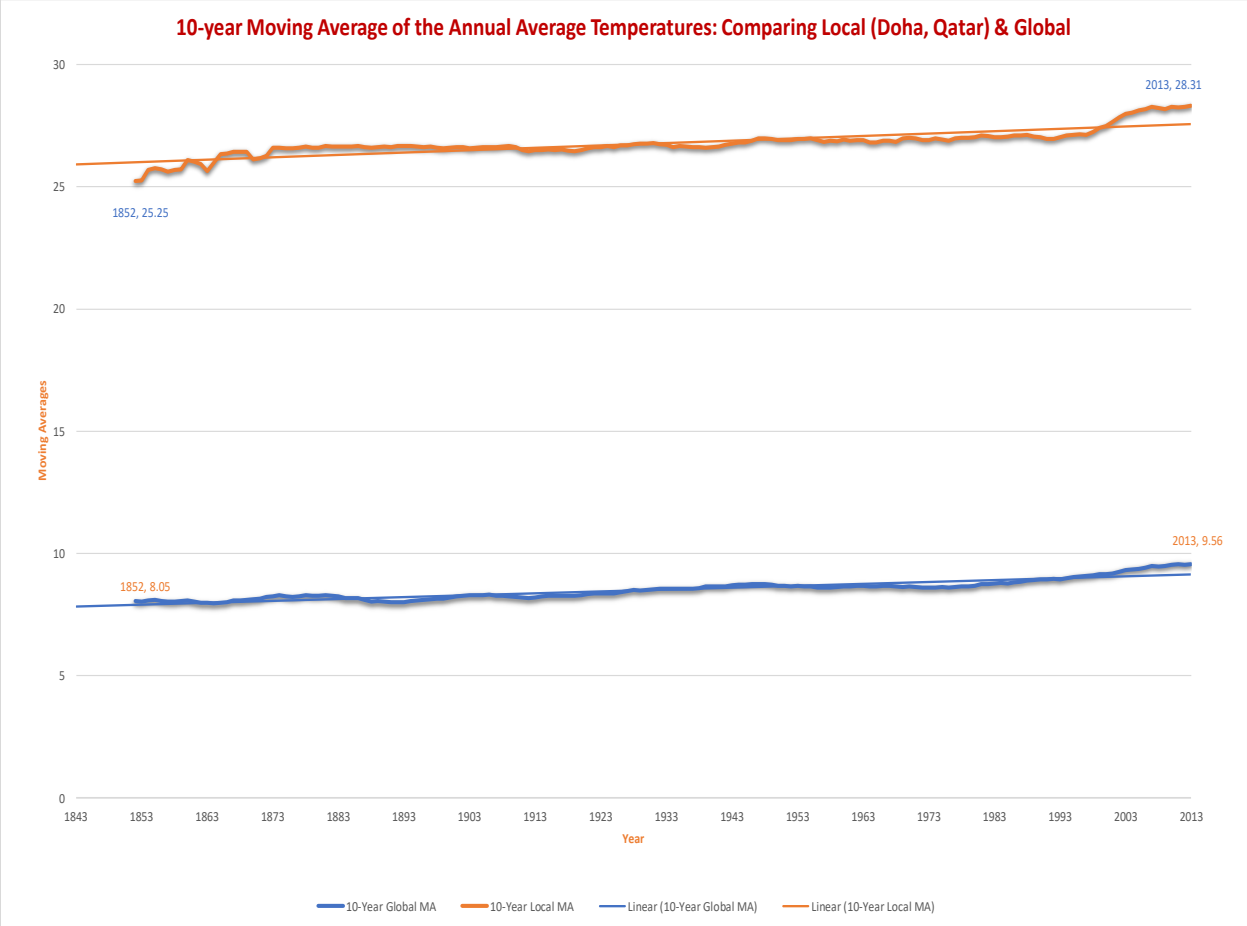


Fig 2. 10-Year Moving average line chart

4. Data Interpretation:

Below are some observations derived from the dataset:

- Overall annual average temperatures in Doha (Qatar) are higher than the overall global average temperatures. This is probably because of the geographical location. This difference has been consistent over time.
- In the short term, both global and local temperatures are volatile, but in the long term, both display a slow increasing trend.
- The annual average global temperatures recorded a minimum of 7.56˚C in 1862 and a maximum of 9.73˚C in 2007. The percentage increase in annual average growth of temperature from 1862 to 2007 is 28.7%.
- The annual average temperature in Doha recorded a minimum of 18.74˚C in 1844 and a maximum of 29.7˚C in 1860. However, both these values seem to be outliers. The next lowest value is 23.56 in 1863 and the highest annual average temperature recorded was 28.93˚C in 2010. The percentage increase between 1863 and 2010 is 22.7%
- Both global and local temperatures show increase in average temperature with time, which means earth is getting hotter. However, the above percentage increases indicate that the global average temperatures are becoming increasingly warmer than the desert climates of Doha. This indicates significant global warming happening at an alarming rate.
- However, caution should be exercised in reading too much into this data as these are annual averages and more data points would be required to provide specific accurate and appropriate conclusions.