Project 1: Exploring Weather Trends

Outline

1. To extract city list data with SQL query statement “SELECT * FROM city_list”
2. **Shenzhen** is the closest big city to where I live
3. To extract Shenzhen’s city level data with SQL statement “SELECT * FROM city_data WHERE city='Shenzhen'” and export the extracted results to CSV
4. To extract global data with SQL statement “SELECT * FROM global_data” and export the extracted results to CSV
5. For average temperature data in both CSV files, create a new column to calculate moving average temperature to make it easier to observe the trends when it be shown in Charts

Shenzhen data screenshot

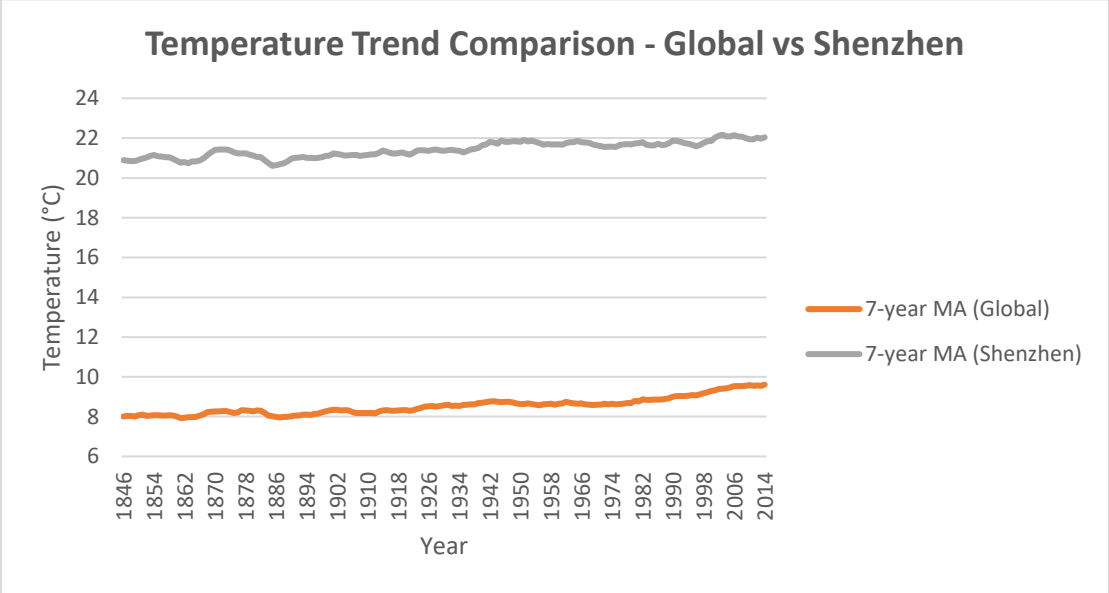
year	city	country	avg_temp	7-year MA	14-year MA
1840	Shenzhen	China	23.71		
1841	Shenzhen	China	20.76		
1842	Shenzhen	China	20.96		
1843	Shenzhen	China	21.05		
1844	Shenzhen	China	20.66		
1845	Shenzhen	China	20.66		
1846	Shenzhen	China	21.28	21.30	
1847	Shenzhen	China	20.91	20.90	
1848	Shenzhen	China	20.55	20.87	
1849	Shenzhen	China	20.85	20.85	
1850	Shenzhen	China	21.03	20.85	
1851	Shenzhen	China	21.12	20.91	
1852	Shenzhen	China	21.1	20.98	
1853	Shenzhen	China	21.61	21.02	21.16
1854	Shenzhen	China	21.47	21.10	21.00
1855	Shenzhen	China	20.9	21.15	21.01
1856	Shenzhen	China	20.4	21.09	20.97
1857	Shenzhen	China	20.97	21.08	20.97
1858	Shenzhen	China	20.84	21.04	20.98
1859	Shenzhen	China	21.07	21.04	21.01
1860	Shenzhen	China	21.08	20.96	20.99
1861	Shenzhen	China	20.83	20.87	20.99
1862	Shenzhen	China	20.17	20.77	20.96
1863	Shenzhen	China	20.67	20.80	20.95
1864	Shenzhen	China	20.53	20.74	20.91
1865	Shenzhen	China	21.49	20.83	20.94
1866	Shenzhen	China	21.06	20.83	20.94
1867	Shenzhen	China	21.39	20.88	20.92

Global data screenshot

year	avg_temp	7-year MA	14-year MA
1846	8.55	7.96	7.82
1847	8.09	8.00	7.83
1848	7.98	8.04	7.82
1849	7.98	8.04	7.86
1850	7.9	8.00	7.87
1851	8.18	8.08	7.93
1852	8.1	8.11	7.97
1853	8.04	8.04	8.00
1854	8.21	8.06	8.03
1855	8.11	8.07	8.06
1856	8	8.08	8.06
1857	7.76	8.06	8.03
1858	8.1	8.05	8.06
1859	8.25	8.07	8.09
1860	7.96	8.06	8.05
1861	7.85	8.00	8.03
1862	7.56	7.93	8.00
1863	8.11	7.94	8.01
1864	7.98	7.97	8.02
1865	8.18	7.98	8.02
1866	8.29	7.99	8.03
1867	8.44	8.06	8.06
1868	8.25	8.12	8.06
1869	8.43	8.24	8.08
1870	8.2	8.25	8.10
1871	8.12	8.27	8.12
1872	8.19	8.27	8.13
1873	8.35	8.28	8.14
1874	8.43	8.28	8.17
1875	7.86	8.23	8.17

6. Visualize the data using Excel

Global vs Shenzhen 7-year moving average temperature line graph



Observations

1. Average global temperature is increasing over time, and so is Shenzhen's temperature. Average global temperature increases from 7.96 in 1846 to 9.57 in 2013, whereas average Shenzhen temperature increases from 21.30 in 1846 to 22.02 in 2013.
2. In terms of level of increment, average global temperature increases at a faster rate over time as compared with Shenzhen. Based on 1), average global temperature is increasing at 20.2% from 1846 to 2013, whereas average Shenzhen temperature is increasing at 3.3% from 1846 to 2013.
3. Average global temperature is increasing steadily from 1846 to 2013, which could be partially explained by the industrial revolution of the western countries back in the 19th century. Average Shenzhen temperature remained stable from 1846 to 1940 and is increasing steadily since then. This could be partially explained by the recovery of China post WWII since the CCP's reign.
4. Below formula is used to measure how strong a relationship between two variables:

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[\, n\sum x^2 - (\sum x)^2 \,][\, n\sum y^2 - (\sum y)^2 \,]}}$$

X Values (Global temperature)
∑ = 1483.3
Mean = 8.525
∑(X - Mx)2 = SSx = 38.183

Y Values (Shenzhen temperature)
∑ = 3728.97
Mean = 21.431
∑(Y - My)2 = SSy = 45.486

X and Y Combined
N = 174
∑(X - Mx)(Y - My) = 28.346

R Calculation
r = ∑((X - My)(Y - Mx)) / √((SSx)(SSy))

r = 28.346 / √((38.183)(45.486)) = **0.6802**

The correlation coefficient between global and Shenzhen temperature trends is 0.6802 which indicates strong positive relationship among them.

Observations

In conclusion, we can depict that the global temperature is increasing steadily from 1846 to 2013 and Shenzhen temperature is also demonstrating similar pattern but at a slower rate during the same period.