Project 1

Explore Weather Trends

Steps taken to prepare the data to be visualized are as follows:-

- **Extract the data :**
  In order to extract the city and global level data, I used the following SQL query-
  - ✓ SELECT * FROM city_list; (This gives the list of cities and countries)
  - ✓ SELECT * FROM global_data; (This gives the list of average global temperature by year)
  - ✓ SELECT year,city,country,avg_temp
    FROM city_data
    WHERE city='Delhi'; (This gives the list of average temperature of Delhi by year)

  After exporting data to CSV, I opened all the 3 files using Excel.

- **Creating a Line chart:**

  I live in Delhi, India. In order to create a line chart for comparison between my city's temperatures and global temperatures, I followed the following steps:-

  - ✓ Opened the city_data CSV file.

	A	B	C	D
1	year	city	country	city_avg_temp
2	1796	Delhi	India	25.03
3	1797	Delhi	India	26.71
4	1798	Delhi	India	24.29
5	1799	Delhi	India	25.28

  - ✓ Found the global average temperature for the corresponding years from global_data file.

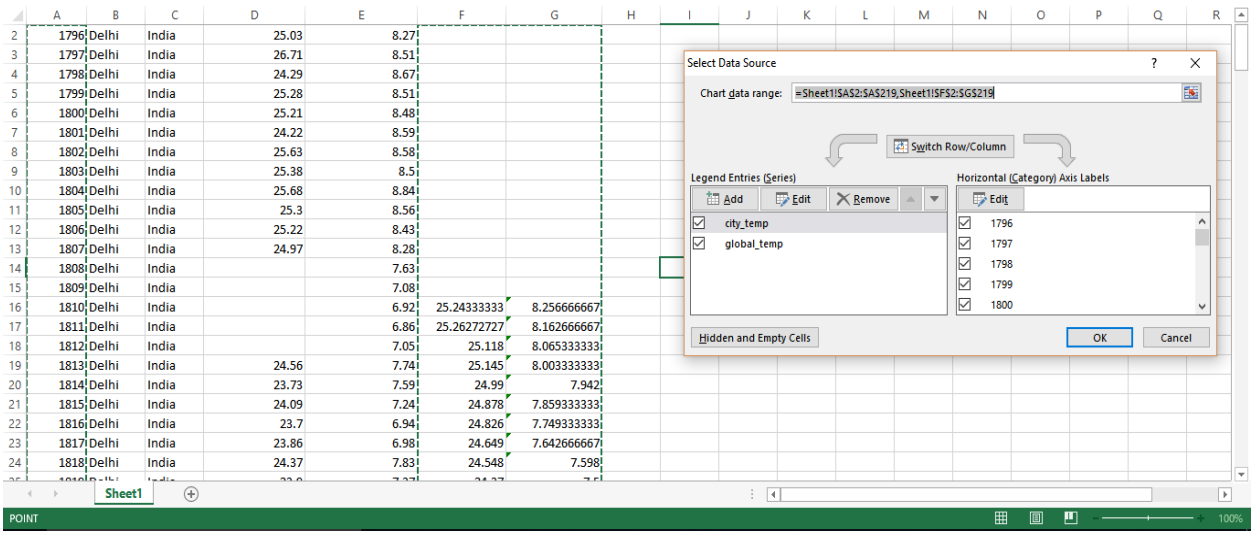
	A	B	C	D	E
1	year	city	country	city_avg_temp	global_avg_temp
2	1796	Delhi	India	25.03	8.27
3	1797	Delhi	India	26.71	8.51
4	1798	Delhi	India	24.29	8.67
5	1799	Delhi	India	25.28	8.51

- ✓ Calculated the Moving Average for both city_avg_temp and global_avg_temp columns in order to make trends more observable.
  Moving Average = 15 years

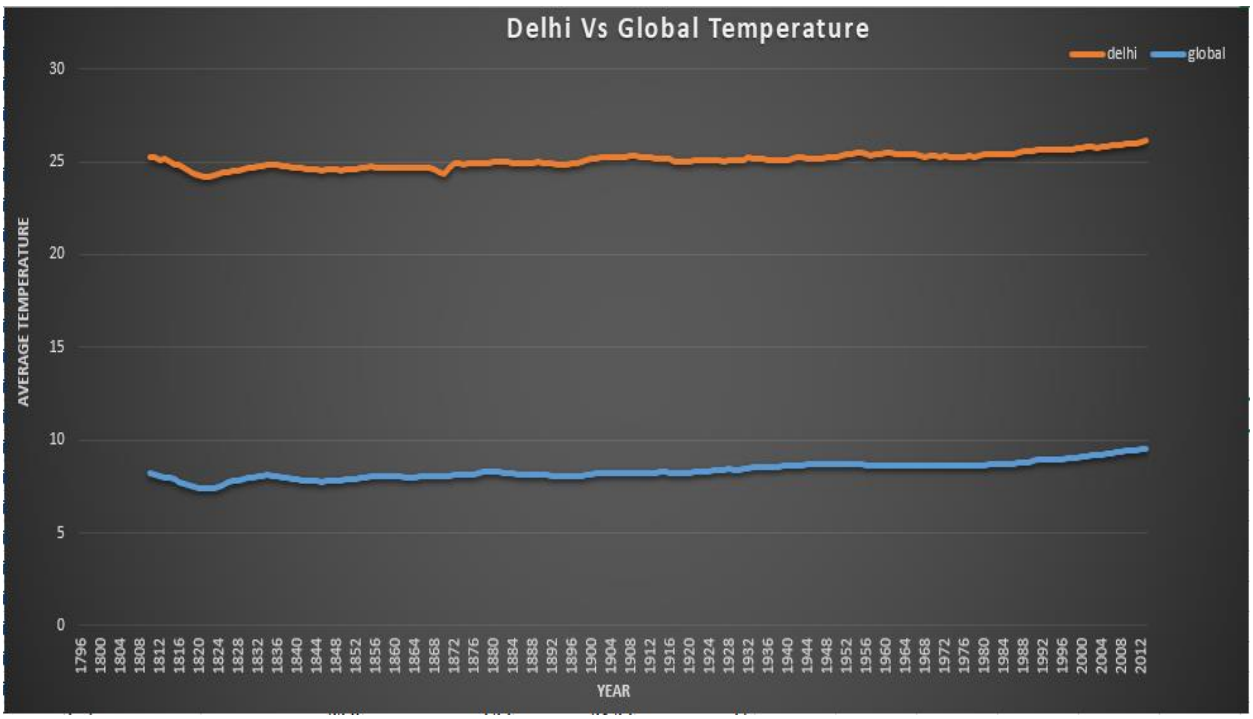
SUM | =AVERAGE(E2:E16)

	A	B	C	D	E	F	G
1	year	city	country	city_avg_temp	global_avg_temp	15Yr_city-MA	15Yr_global-MA
2	1796	Delhi	India	25.03	8.27		
3	1797	Delhi	India	26.71	8.51		
4	1798	Delhi	India	24.29	8.67		
5	1799	Delhi	India	25.28	8.51		
6	1800	Delhi	India	25.21	8.48		
7	1801	Delhi	India	24.22	8.59		
8	1802	Delhi	India	25.63	8.58		
9	1803	Delhi	India	25.38	8.5		
10	1804	Delhi	India	25.68	8.84		
11	1805	Delhi	India	25.3	8.56		
12	1806	Delhi	India	25.22	8.43		
13	1807	Delhi	India	24.97	8.28		
14	1808	Delhi	India		7.63		
15	1809	Delhi	India		7.08		
16	1810	Delhi	India		6.92	25.24333333	=AVERAGE(E2:E16)
17	1811	Delhi	India		6.86	25.26272727	
18	1812	Delhi	India		7.05	25.118	
19	1813	Delhi	India	24.56	7.74	25.145	
20	1814	Delhi	India	23.73	7.59	24.99	
21	1815	Delhi	India	24.09	7.24	24.878	
22	1816	Delhi	India	23.7	6.94	24.826	
23	1817	Delhi	India	23.86	6.98	24.649	

- ✓ Selected the required columns i.e 15yr_city-MA and 15yr_global MA to create a line chart showing comparison between city's temperature and global temperatures



- ✓ Finally, the line chart created is shown below:



Some of the key considerations when deciding ways to visualize trends include:

- ✓ Selecting the appropriate columns for the line chart.
- ✓ Calculating the 15yr moving average for city_temp and global_temp columns in order to smooth out the lines.
- ✓ The correlation can be identified by using correlation coefficient and by observing the trends.

- **<u>Calculating the Temperature Coefficient (K_t)</u>**

  There is an observable proportional relation between my city's temperature and the global average temperature.
  This relation coefficient (K_t) can be estimated as below:-

✓ Select few years randomly and find out the difference between Delhi's average temperature and Global average temperature for each year.

	A	B	C	D	E	F
1	year	city	country	city_avg_temp	global_avg_temp	difference
2	1999	Delhi	India	26.36	9.29	=(D2-E2)
3	2000	Delhi	India	26.05	9.2	
4	2001	Delhi	India	25.86	9.41	
5	2002	Delhi	India	26.63	9.57	
6	2003	Delhi	India	25.72	9.53	
7	2004	Delhi	India	26.24	9.32	
8	2005	Delhi	India	25.72	9.7	
9	2006	Delhi	India	26.37	9.53	
10	2007	Delhi	India	26.15	9.73	
11	2008	Delhi	India	25.68	9.43	
12	2009	Delhi	India	26.55	9.51	
13	2010	Delhi	India	26.52	9.7	
14	2011	Delhi	India	25.63	9.52	
15	2012	Delhi	India	25.89	9.51	
16	2013	Delhi	India	26.71	9.61	

✓ Then calculate the mean from the differences calculated.

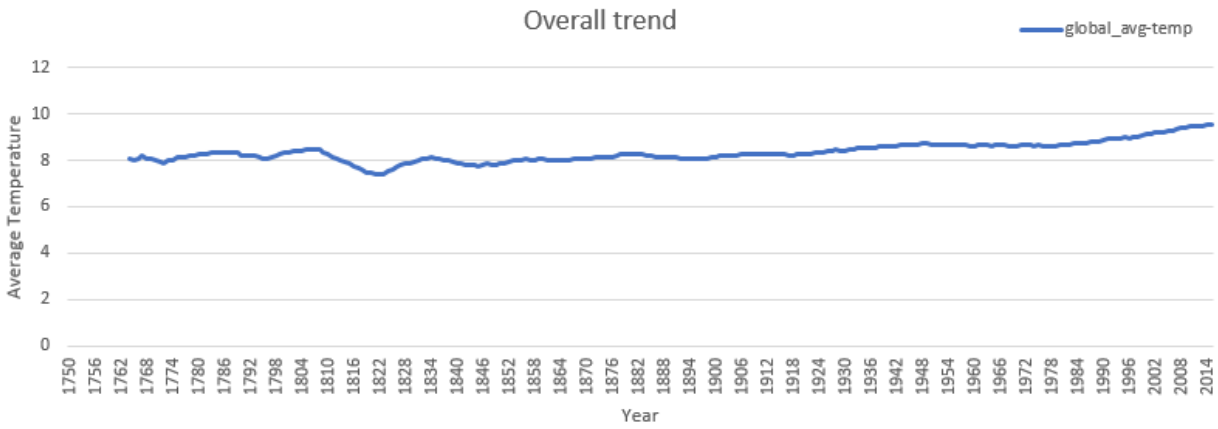
	A	B	C	D	E	F	G	H
1	year	city	country	city_avg_temp	global_avg_temp	difference	mean	
2	1999	Delhi	India	26.36	9.29	17.07	=AVERAGE(F2:F16)	
3	2000	Delhi	India	26.05	9.2	16.85		
4	2001	Delhi	India	25.86	9.41	16.45		
5	2002	Delhi	India	26.63	9.57	17.06		
6	2003	Delhi	India	25.72	9.53	16.19		
7	2004	Delhi	India	26.24	9.32	16.92		
8	2005	Delhi	India	25.72	9.7	16.02		
9	2006	Delhi	India	26.37	9.53	16.84		
10	2007	Delhi	India	26.15	9.73	16.42		
11	2008	Delhi	India	25.68	9.43	16.25		
12	2009	Delhi	India	26.55	9.51	17.04		
13	2010	Delhi	India	26.52	9.7	16.82		
14	2011	Delhi	India	25.63	9.52	16.11		
15	2012	Delhi	India	25.89	9.51	16.38		
16	2013	Delhi	India	26.71	9.61	17.1		

Mean = 16.634

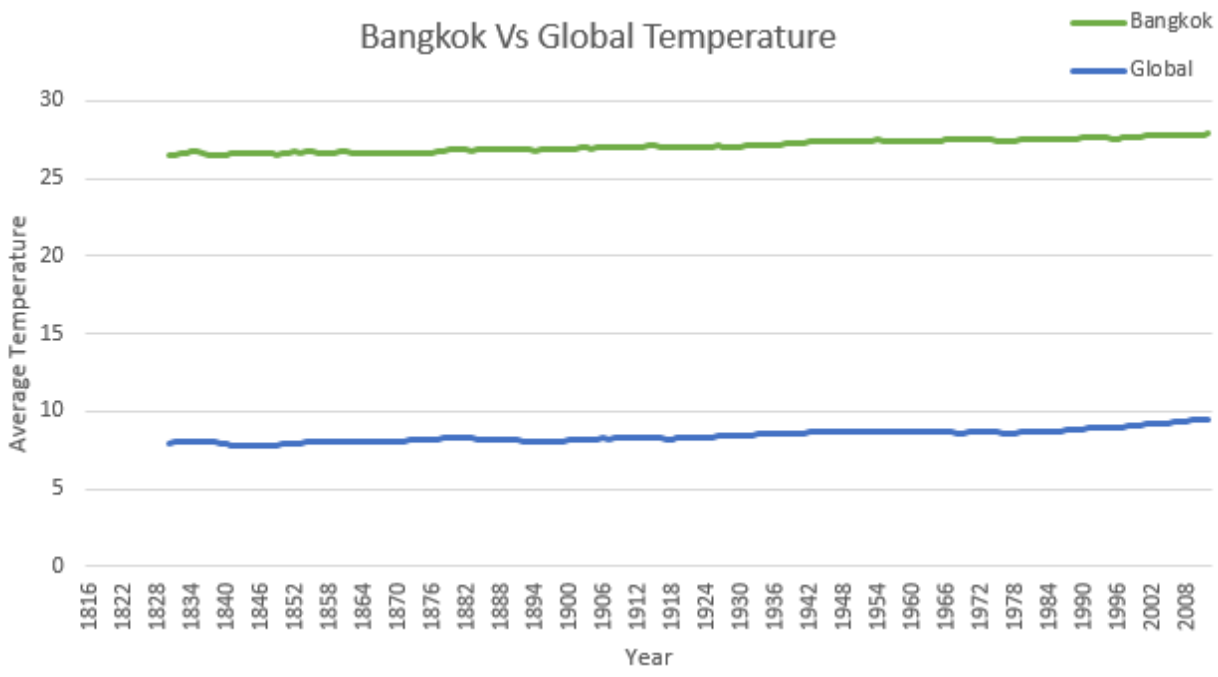
✓ This mean is the temperature coefficient K_t

Other trends

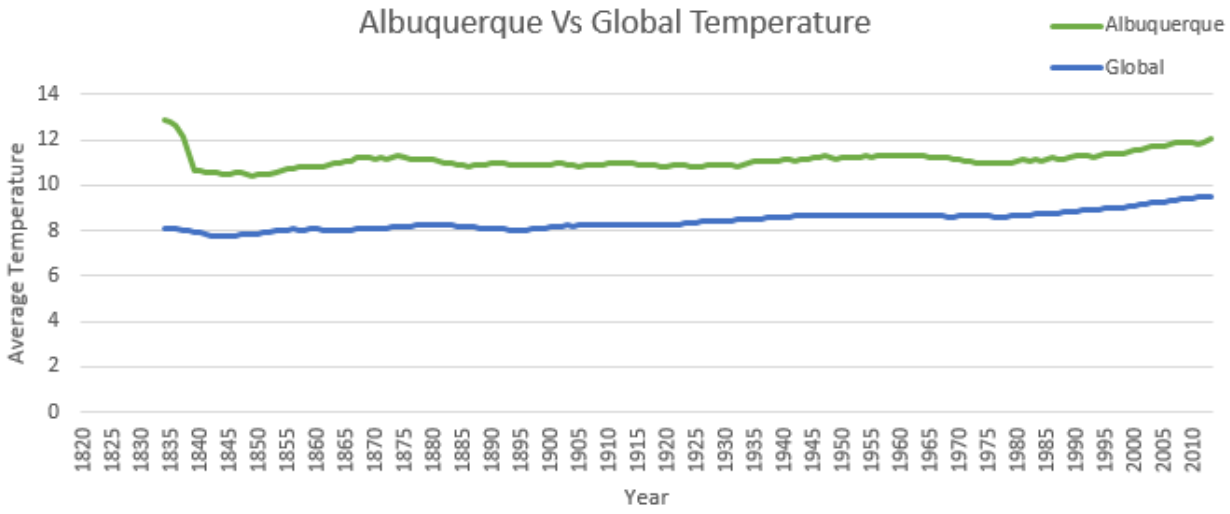
- *Overall trend*



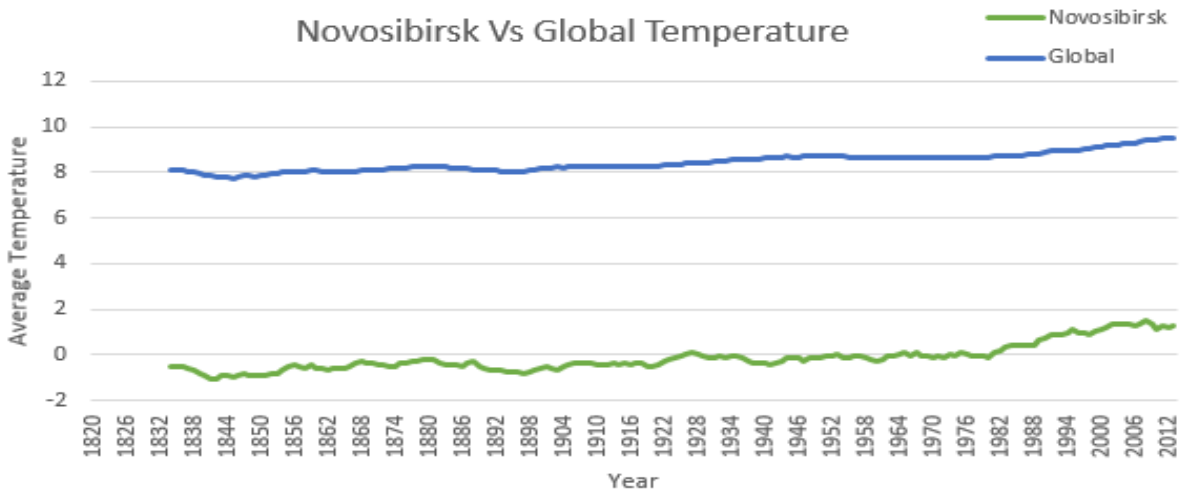
- *Bangkok Vs Global*



- *Albuquerque Vs Global*



- *Novosibirsk Vs Global*



Observations

From the line chart, the following observations can be made:-

- My city i.e., Delhi is *hotter* on average as compared to the global average, and the difference has been constant over time..

- There is a *positive correlation* between changes in Delhi's temperature over time and changes in the global average.
  Correlation coefficient is *near to +1 (0.8 approx*). It is calculated using the following formula in excel :- **=CORREL(array1,array2)**

- The *difference* between Delhi's average temperature and the global average temperature over the years has been *large* .Delhi's Average temperature has been nearly 25 and that of world is nearly 8, i.e there is a difference of approx. 17 which is quite huge.

- Apart from delhi, if we compare the average temperature of other cities from different countries with the global average , it can be concluded that they have positive correlation among them.

- If we look at the overall trend, the *world is getting hotter* since the global average has been increasing since past hundred years.

- The average temperature of some cities like Novosibirsk is fluctuating over the years.

- By the help of temperature coefficient K_t , we can derive an estimation (prediction) relation between my city(Delhi) and Global average as follows:-

  My city's avg temperature in year X ≈ Global average temperature in year X + K_t

  For eg:- Global avg temperature in 1996 ≈ 9.04
  Coefficient K_t ≈ 16.634
  My City's avg temperature ≈ 9.04 + 16.634
  ≈ *25.67* which is nearly equal to *25.55*

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