

# **EXPLORE WEATHER TRENDS**

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## **OVERVIEW:**

In this project, I have explored San Francisco city temperature and compared with global temperature. This manuscript details about goals, data analysis process, observations and key findings from this analysis.

## **DATA ANALYSIS:**

### **Extraction of Data:**

- I used the following SQL commands to view which cities are available for United States.

```
SELECT *  
FROM city_list  
WHERE country LIKE 'San Francisco'
```

- I found in the SCHEMA that both city\_data and global\_data contains same attributes named "avg\_temp". I decided to use JOIN option in SQL to combine both tables. In order to differentiate column name "avg\_temp", in both tables, I changed column name "avg\_temp" using following SQL commands

```
ALTER TABLE city_data RENAME COLUMN avg_temp to CAT  
ALTER TABLE global_data RENAME COLUMN avg_temp to GAT
```

- In order to join two tables, I used following SQL commands  
SELECT global\_data.year, global\_data.GAT,city\_Data.CAT  
FROM global\_data JOIN city\_data  
ON global\_data.year = city\_data.year  
WHERE city LIKE 'San Francisco'

- Finally, I downloaded combined table in CSV format. The resulting table contains data from global\_data and city\_data corresponds to San Francisco.

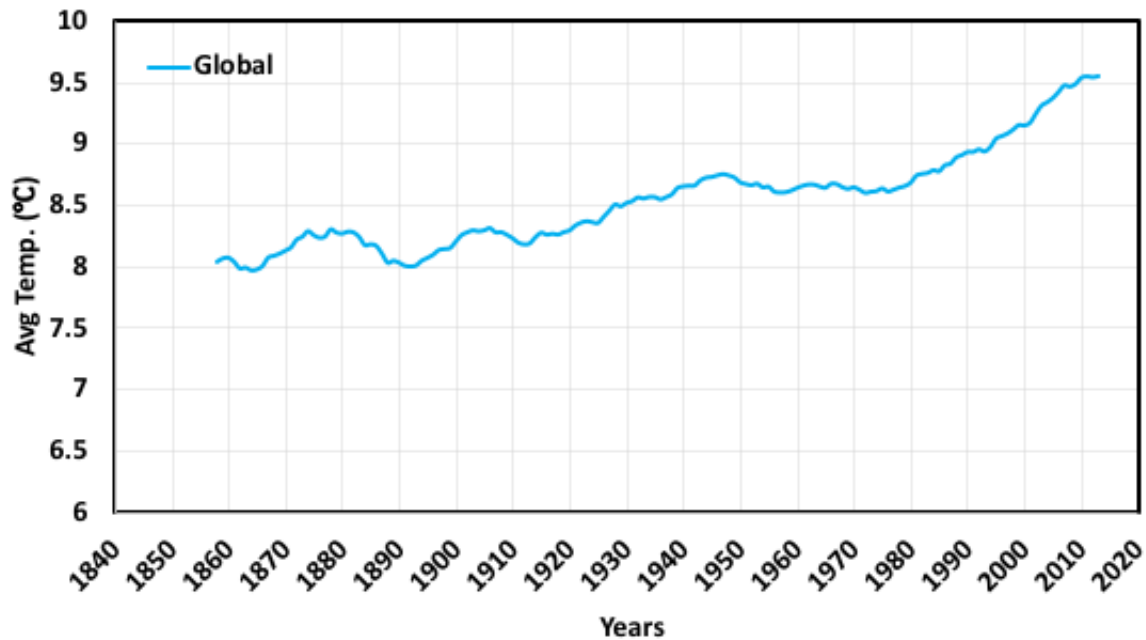
### **Calculation of Moving Averages:**

- In order to observe long term trends and not get lost in daily fluctuations, data was filtered (i.e smoothened) by moving averages method. Moving averages were calculated for city & global average temperature with 10-Year interval in Excel.
- First 10 years of temperatures were used in AVERAGE() function cell. After that, clicking and dragging the formula down until the end of the dataset will do the moving averages calculation.
- Alternatively, I used moving averages in Data analysis tool pack in Excel. Using this option, the input data (average temperature for global and SFO city), interval (10 years) and output range were defined. The chart was generated with actual and forecast temperature trend over the period of time.

### **DATA VISUALIZATION:**

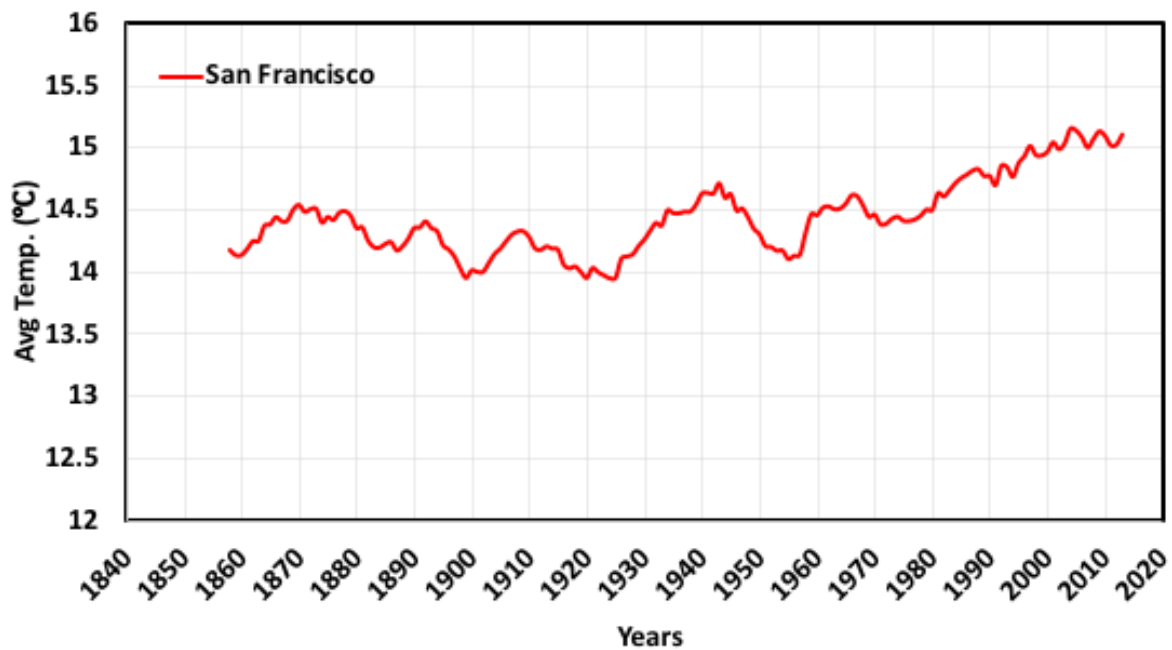
#### **Global Temperature Trend:**

I started with global temperature data from 1849-2013 as there was no missing data from that period for both San Francisco and global temperatures. Below chart shows 10 year moving average temperature trend for global. During 1859-1945, the global temperature increased gradually except during little ice age period (~1880-1890), the reduction in temperature was observed globally and it is also seen as dip this chart. After that it remained constant until 1975. Later from 1975 onwards, the global temperature took steep trend indicates World is getting hotter now. This may be an effect of worldwide industrialization.



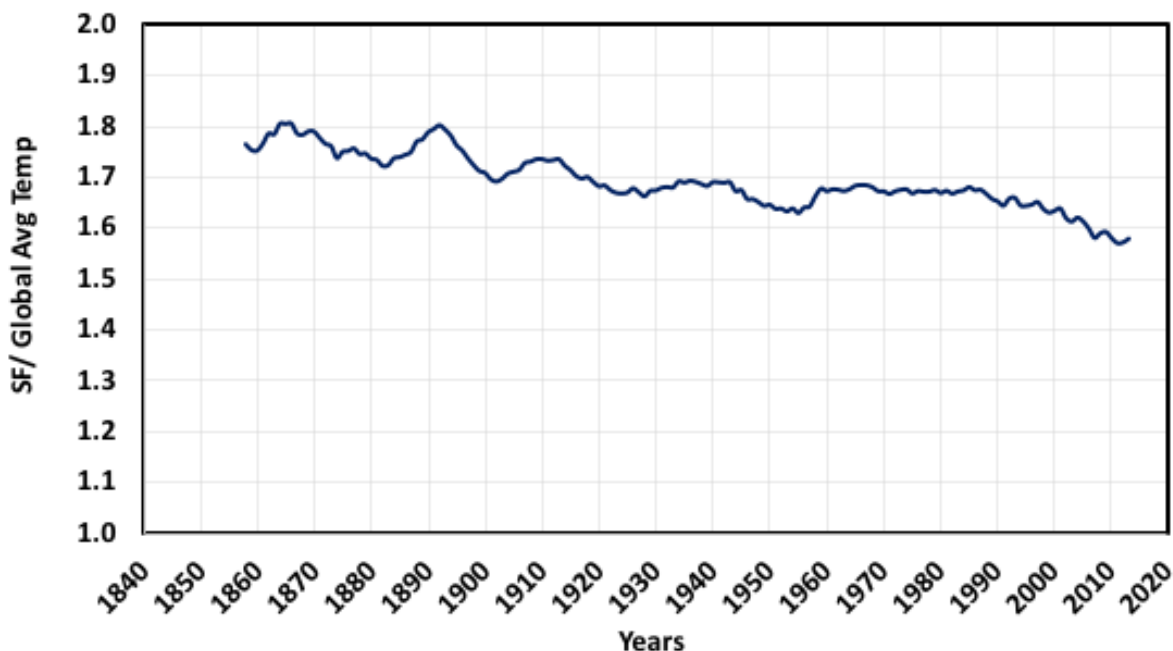
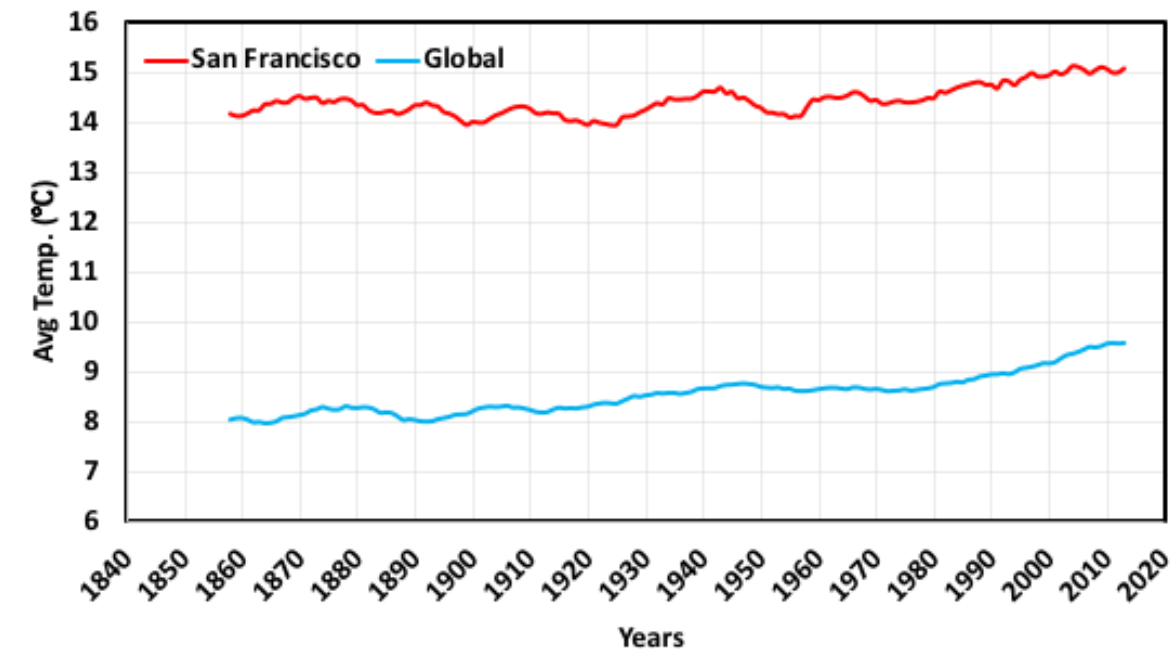
### San Francisco City Temperature Trend:

Below chart shows 10 year moving average temperature trend for San Francisco city. During 1859-1925, the city temperature dropped slightly after that started increasing gradually until 1975. Later from 1975 onwards, the San Francisco city temperature also started rising like rest of the World.



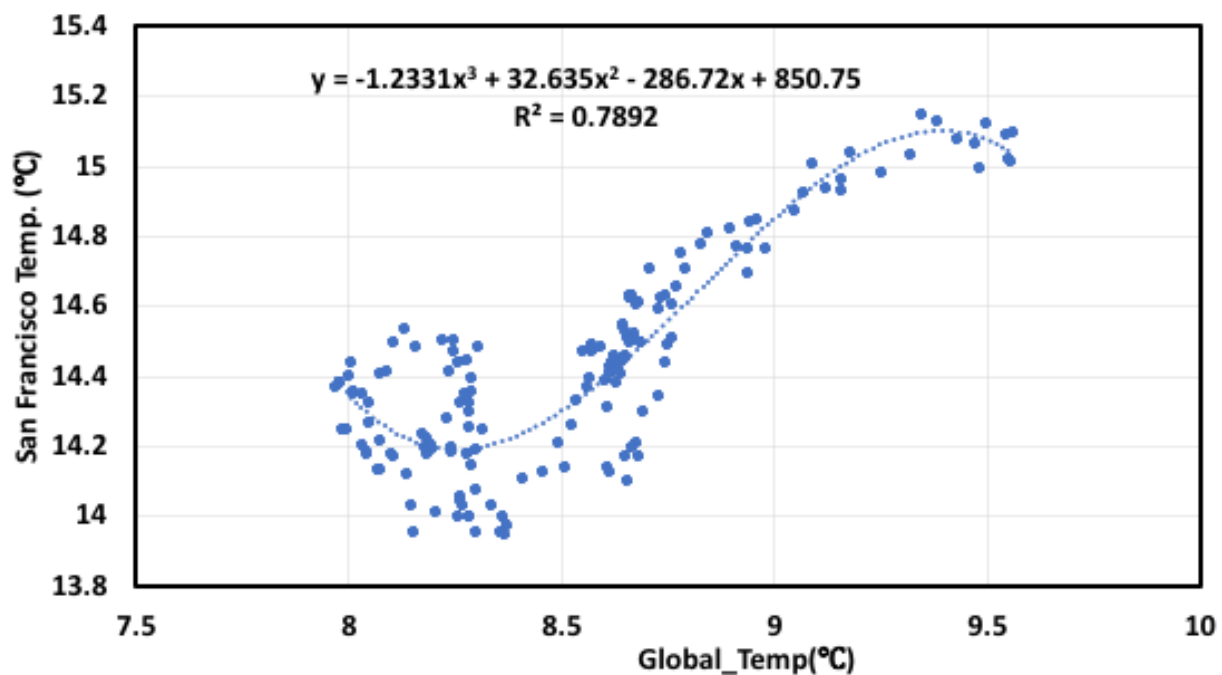
## Comparison of San Francisco City Temperature Trend with Global:

Below chart shows 10 year moving average temperature trend for San Francisco city and global. Overall, the trend shows the San Francisco city is hotter than global. Also, San Francisco city temperature is 1.7 to 1.8 times global temperature. But the ratio was observed decreasing over the period of time.



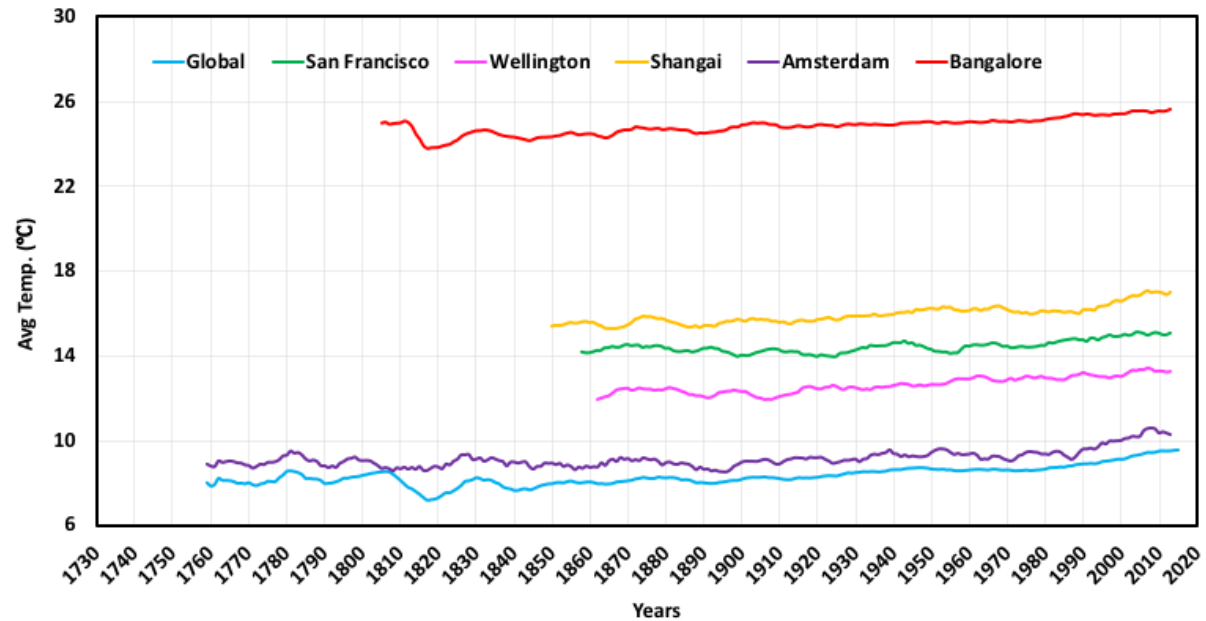
## Correlation between San Francisco City Temperature and Global Temperature:

I tried to find correlation between San Francisco city temperature and global temperature. Below chart shows correlation between global and San Francisco city temperature. The reduction in global temperature during “little ice period” and increasing trend in temperature afterwards is captured with power trendline option in EXCEL. The equation for predicting San Francisco temperature with correlation coefficient is also shown. Overall, the correlation coefficient of 0.79 is not bad for this kind of trendline curve.



## Comparison of Global Temperature Trend with other Cities:

Below chart shows comparison of 10 year moving average temperature trend for global and some major cities (San Francisco, Wellington, Shanghai, Amsterdam, Bangalore). By comparing all these city temperatures with global temperature, Bangalore city tops with hot temperature. Reason behind this is India lies closer to the Equator contributing high temperature. Amsterdam city temperature closely follows with global temperature. All Other cities, San Francisco, Wellington and Shanghai have little higher temperature than global.



## CONCLUSION:

Generally global temperature is colder. The reason for colder global temperature is most part of the world lies above tropic of cancer and below tropic of Capricorn. Regions away from equator will have lower temperature. Only small part of world lies in between Tropic of Capricorn and tropic of cancer. In those region, temperature will be high compared to other parts of world due to equator. Due to global industrialization, even the global temperature is also started increasing drastically over the last four decades.