

Exploring Weather Trends

1. Data Extraction: The following cities were considered for the exploring weather trends (vis-a-vis global temperature). The SQLs used to extract data are also mentioned below:
 - a. Global temperature data
 - i. `SELECT * FROM global_data;`
 - b. Memphis (US) temperature data
 - i. `SELECT *
FROM city_list
WHERE upper(country) = upper('United States') AND
UPPER(city) = UPPER('Memphis');`
 - c. Bangalore (India) temperature data was extracted as CSV using the following SQL Query:
 - i. `SELECT *
FROM city_data
WHERE UPPER(country) = UPPER('India') AND
UPPER(city) = UPPER('Bangalore');`
2. Data Analysis: The SQL output was exported to a spreadsheet. Excel and LibreOffice Writer were used for Data Analysis. Data exploration and analysis included:
 - a. Identifying the data format and data types
 - b. Validated that the counts of the records in the spreadsheet matched the count of rows returned by the queries, and random checks to ensure that data was not lost during the export / import process
 - c. Missing data was noticed, and therefore a cleansing process was identified and implemented. Considered various statistical methods like moving average, and related techniques to identify the best methodology. Final determination was to use Interpolation. Linear and higher forms of interpolation was implemented to ensure that the missing data could be estimated. Eliminating those missing records was not an acceptable option since this would result in gaps in generating the moving average charts
 - d. Moving Average for 30, 50, 75, 100 years was generated
 - e. Correlation Coefficient was calculated using the formula `[=correl(array1,array2)]`

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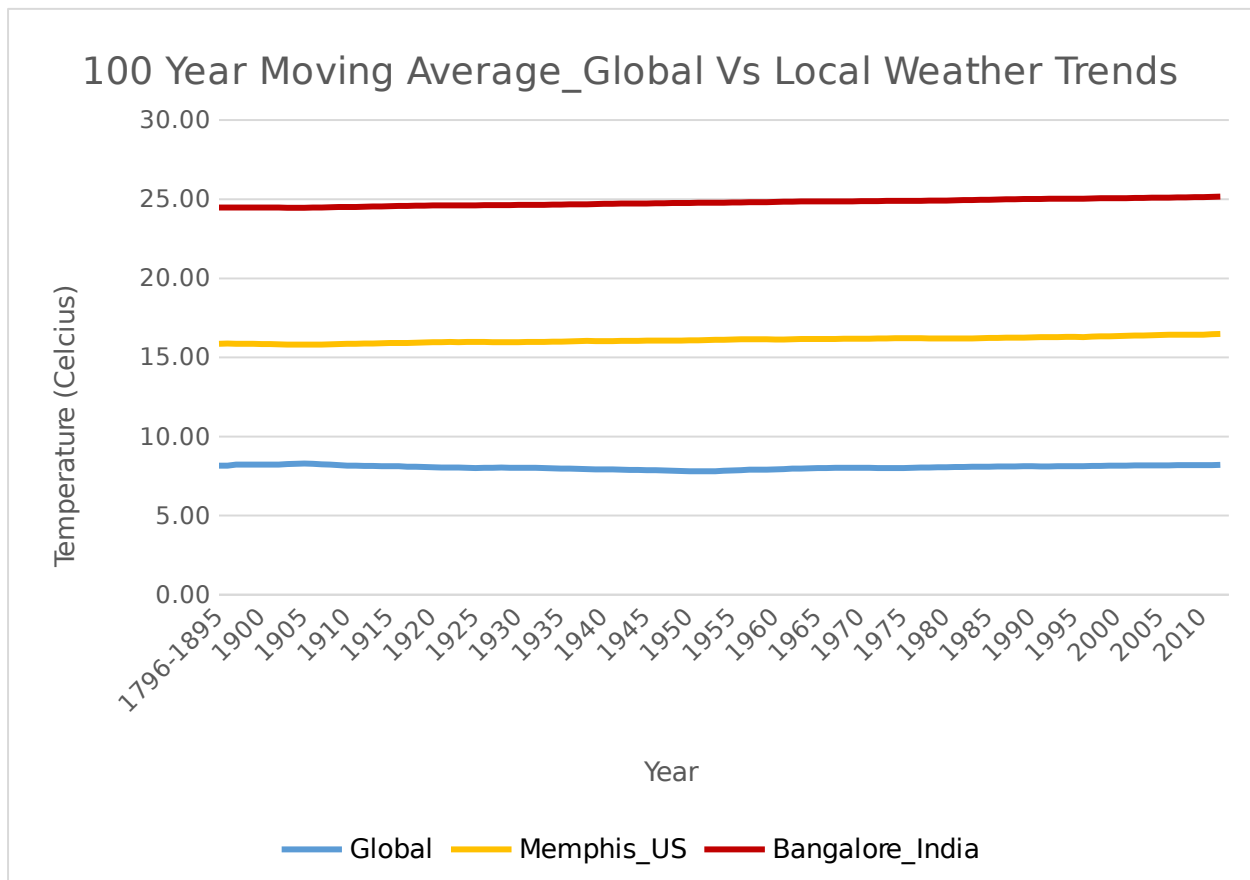
3. Key Considerations for Plotting:

- a. Identify the message
- b. Avoid chart junk
- c. Not to mislead the reader
- d. Use color effectively
- e. Smooth Graph: Moving Average of 100 years data was selected for visualization as it gave the smoother graph.

4. Observations:

- a. The 100 year moving average observations include:
 - i. World is consistently getting hotter over the last hundred years
 - ii. The Global temperature is much cooler than Memphis (US)
 - iii. Memphis is cooler than Bangalore (India)
- b. Over the last couple of decades the following moving average observations include:
 - i. Memphis is about 7 degrees warmer than the global average
 - ii. Bangalore is about 17 degrees warmer than the global average
- c. Yearly average observations are:
 - i. Correlation coefficient between global temperature and Memphis is 0.6262
 - ii. Correlation coefficient between global temperature and Bangalore is 0.8659
 - iii. There is a strong positive correlation between global average and local average temperature.

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Graph 1: The chart represents the moving average of Memphis, Bangalore and the Global temperatures over a centu