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 year, avg_temp
        FROM global_data;

    b. Memphis (US) temperature data
        i. SELECT year, avg_temp
        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 year, avg_temp
        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 10, 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. Informative Graph: Moving Average of 10 years data was selected for visualization as it gave more details in trend.

4. Observations:

    a. The 10 year moving average observations for the data between (1706 – 2013) include:
        i. Lowest temperature was recorded in the decade of 1810 (1810-1820)
        ii. Trend indicates the world is about 2 degree warmer now than its lowest recorded temperature (1810 – 1820)
        iii. The Global temperature is much cooler than Memphis (US)
        iv. 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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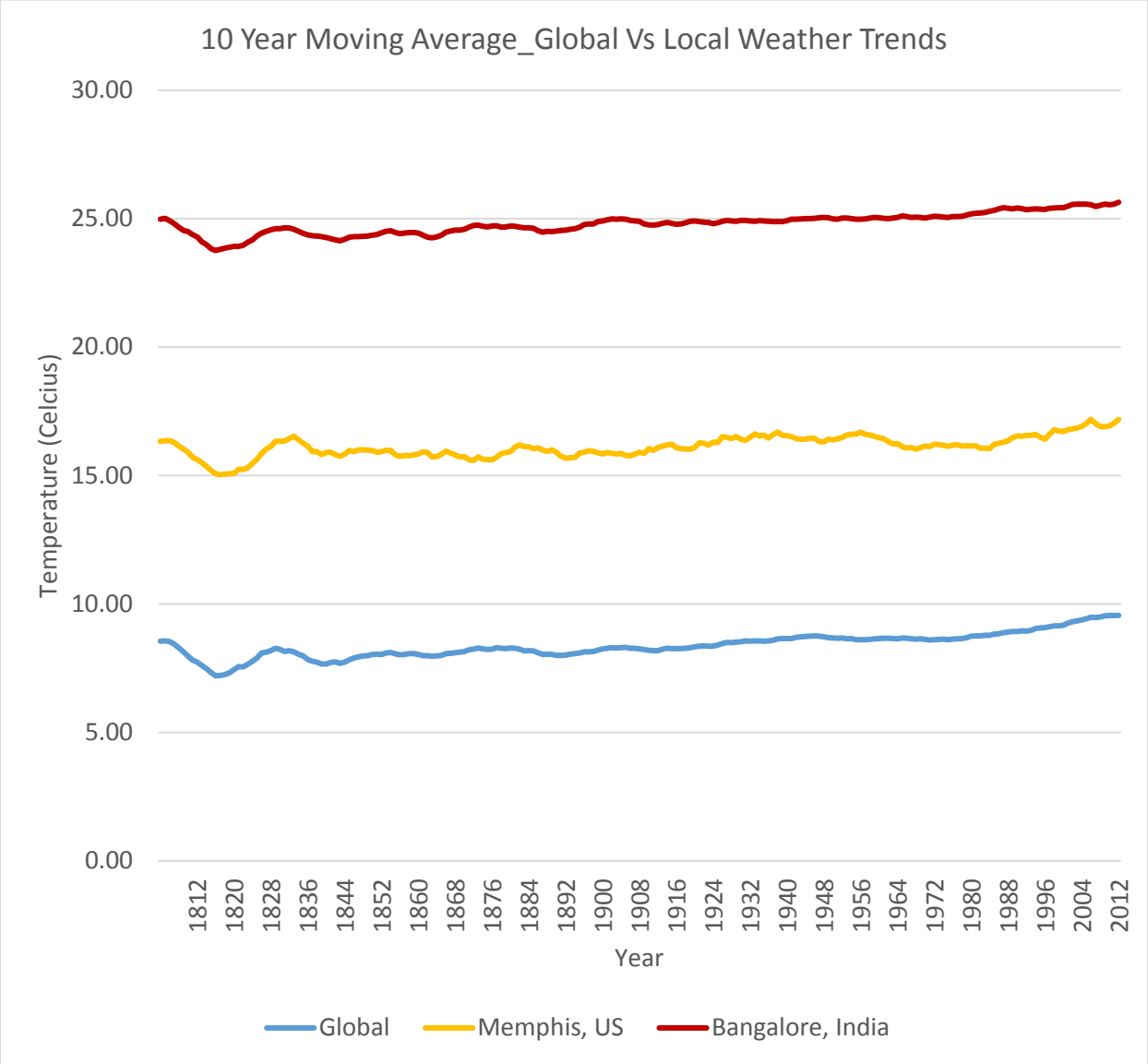

Graph 1: the chart represents the moving average of Bangalore, Memphis and the Global temperature over a decade.