

WEATHER TREND FORECAST

UDACITY DATA ANALYST NANODEGREE- ASSIGNMENT 1

This report analyzes the temperature trend of 100 years (1914-2013), and reports the observations for the global temperature, and the city of Amsterdam and Abu Dhabi. Also, a prediction has been made for the temperature of the year 2025 from the trend.

Report By Jahid Razan

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1.0 Objective

The objective of this report is to create a visualization and point out the similarities and differences between global temperature trends and temperature trends in the closest big city next to me- Amsterdam in my case.

2.0 Data Acquisition

- Three SQL queries have been made to obtain the data from SQL database. (For the SQL codes please see the Attachment section).
- The Data have been exported to CSV format.
- The data have been analyzed and line charts have been plotted using MS-Excel for convenience.

3.0 Key Considerations

Following considerations are crucial for the purpose of this study:

- For analysis, the data of 100 years (1914-2013) have been chosen for the following reasons- 1) Amsterdam city data, as well as the global temperature data is available for these years. 2) From this data set, it is possible to get an impression of how temperature pattern has changed in the recent past.
- The city of Abu Dhabi has been chosen to observe the temperature pattern of a desert. Also, the data during 1913-2014 is chosen for consistency and availability.
- The moving average of a decade (the average of 10 consecutive years) has been used to draw the line curve (please see Attachment 1). It gives a smooth out curve which makes it is easier to observe the long-term trends and helps us not get lost in daily fluctuations of temperature change.
- For temperature, the unit of degree Celsius is used throughout this report.

4.0 Line Charts

Figures below depict the temperature trend for the cities of Amsterdam, and Abu Dhabi as well as the global temperature trend.

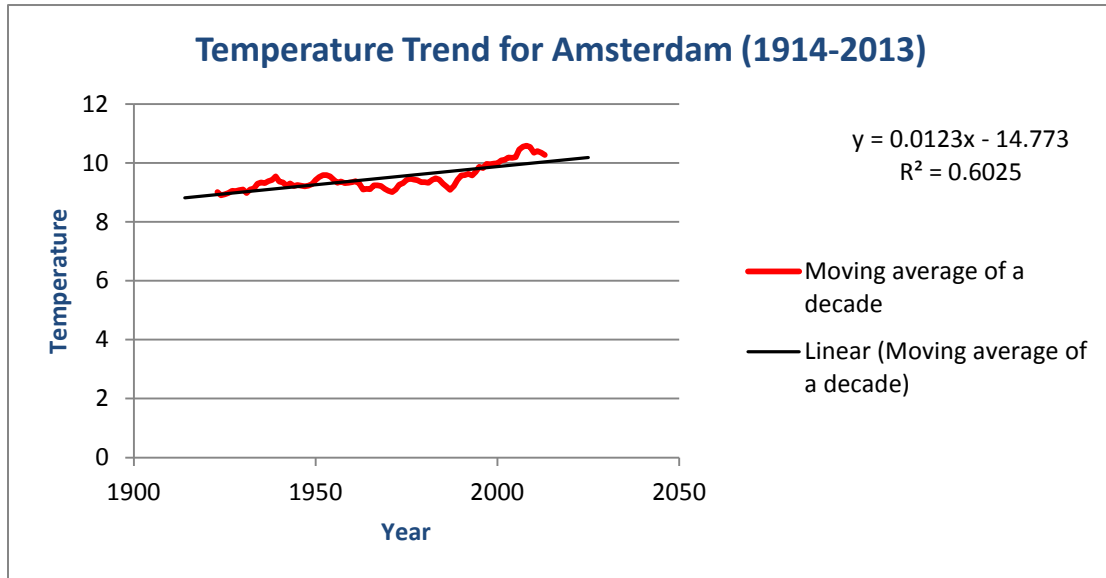


Figure 1: Temperature Trend for Amsterdam

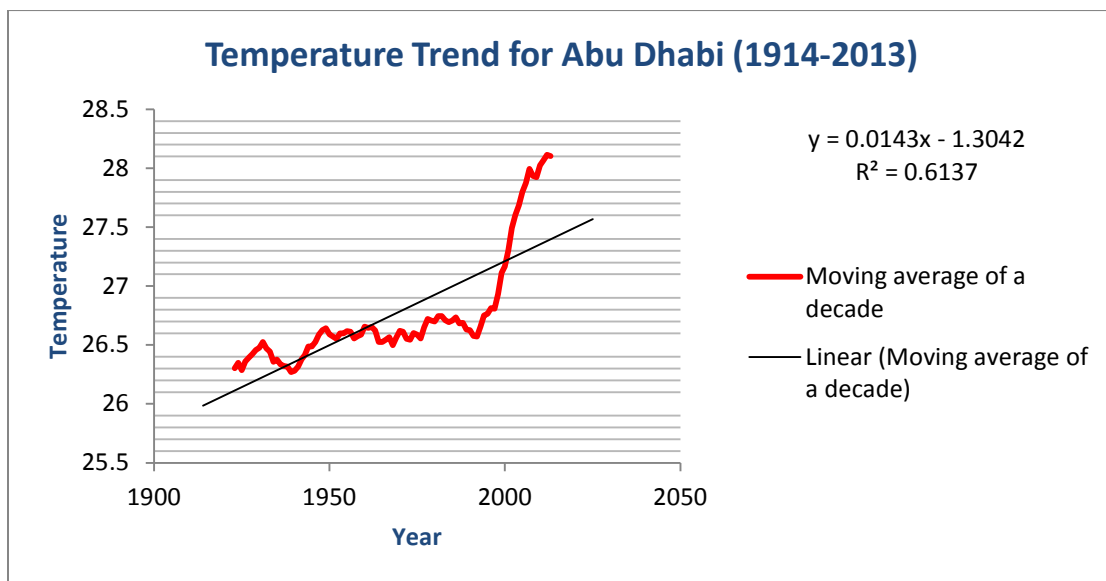


Figure 2: Temperature Trend for Abu Dhabi

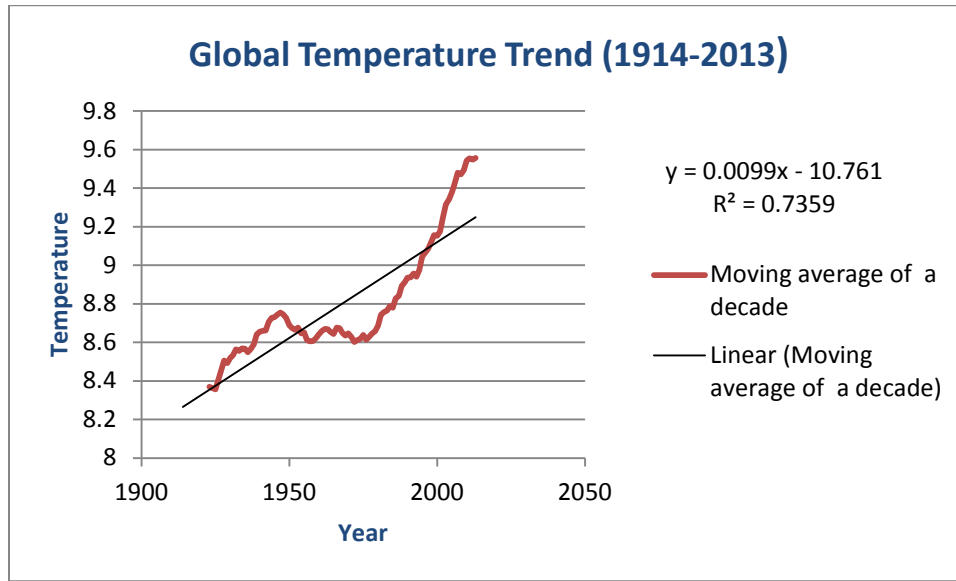


Figure 3: Global Temperature Trend

5.0 Observations

The following table summarizes the observations for temperature between 1914 to 2013:

Table-1: Summary of the Data

No	Topic	Amsterdam	Abu Dhabi	Global Data
1	Trend	Positive	Positive	Positive
2	Maximum avg temperature	11.04	28.69	9.73
3	Minimum avg temperature	7.81	25.89	8.02
4	Average temperature over the total period	9.49	26.8	8.81
5	Difference Between maximum and minimum avg temperature	3.23	2.8	1.71
6	Estimated moving average of 2025	10.13	27.6533	9.2865
7	Standard Deviation of moving average	0.41	0.48	0.31
8	Correlation of the moving average	0.60	0.61	0.74

From Table-1 following observations can be made:

1. **The temperature trend** around the globe is positive (see Figure 3) - that indicates that the world is getting warmer. This is also the case with the two other cities (see Figure 1 & 2) - Amsterdam and Abu Dhabi as studied in this report. The rising pattern of temperature in the positive direction is almost consistent over the period of 1914-2013.
2. **On average** the city of Amsterdam and Abu Dhabi is hotter compared to the global average as can be seen from the observation 4 in Table-1.
3. **The change of temperature** can be observed from the slope of the trend curve. The positive slope indicates a positive rate of temperature rise with time which is the case for all the three observations as plotted in Figure 1, 2 & 3. Abu Dhabi has the highest positive value of the slope, Amsterdam ranks second and the world temperature ranks third. So, it can be concluded that the rate of temperature increase is the largest in Abu Dhabi. And the rate of temperature increase in Amsterdam is larger than the global increase.
4. **The standard deviation** (of the moving average) of the Abu Dhabi city is highest and the global data is the lowest. So the (average) temperature variation in the Abu Dhabi city is the highest. And the variation in Amsterdam is lower than in Abu Dhabi. The variation is the lowest for the global temperature.
The maximum average temperature is highest in Abu Dhabi and lowest for the global data. However, for the minimum average temperature the temperature, in Amsterdam is lower than the global average minimum.
5. **From the trend curve, an approximate temperature** for a future year can be **predicted**- which is done for the year 2025. As expected from the trend curve slope, the city of Abu Dhabi will have the highest temperature if the temperature trend continues to follow an upward trend at this rate and Amsterdam will rank second. The values for all the three cases can be seen in Table 1.
6. **The highest correlation** value with the previous year's temperature is observed for the global temperature, and the weakest is observed for Amsterdam as Abu Dhabi ranks second. The correlation value of Amsterdam and Abu Dhabi are somewhat close but these are weak positive correlation while the global temperature shows a moderate positive correlation.

6.0 Limitations

Moving averages draw trends from past information and it doesn't take into account the other factors that may have an impact on actual future temperature. Hence, the temperature predicted is a rough estimation, which has a higher margin of error, and the accurate prediction requires the inclusion of other complex factors which is beyond the scope of this project.

7.0 Attachment

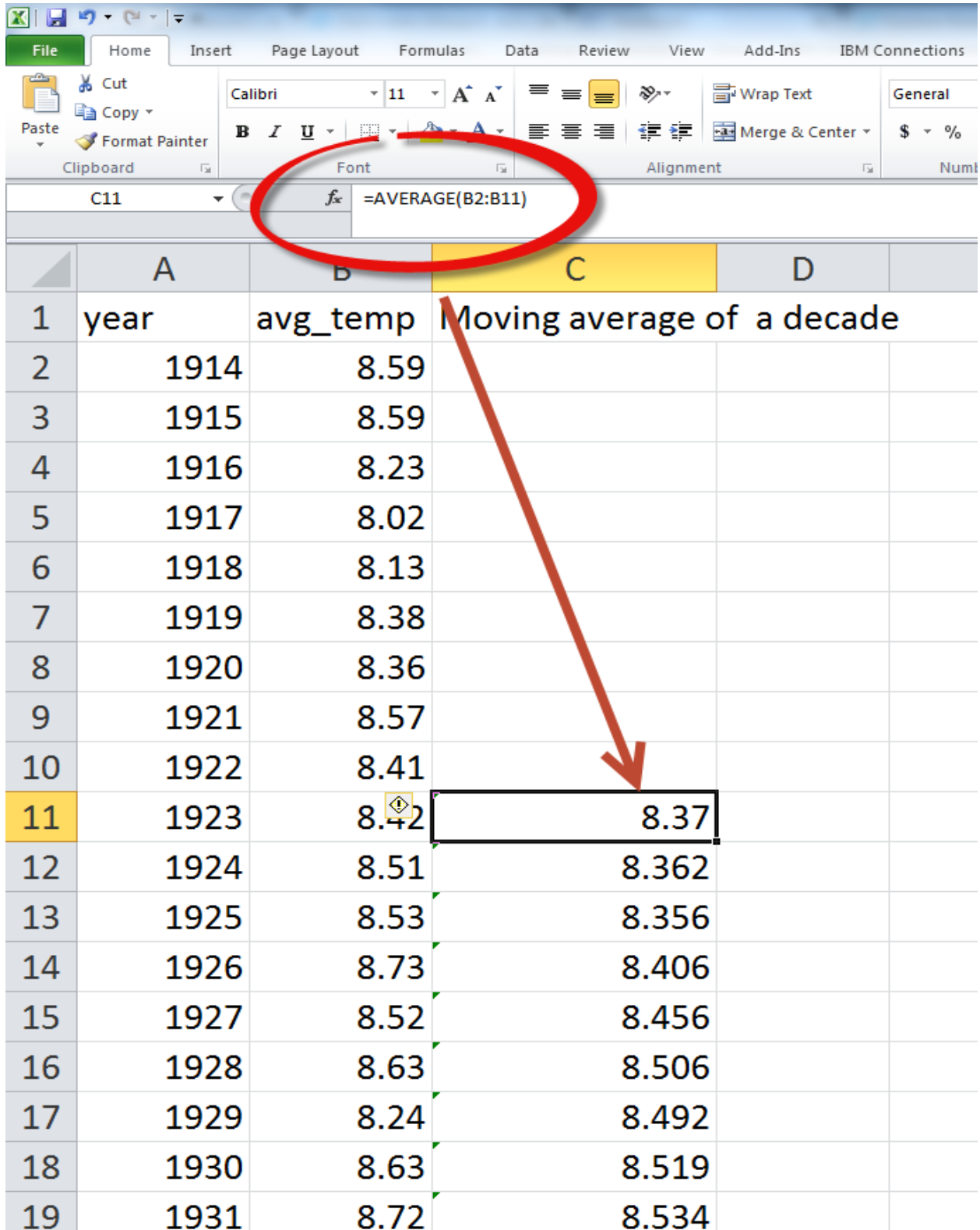
SQL Code: Following SQL queries have been made to obtain and exploring the data

Data	Description	SQL Code
city_list	This contains a list of cities and countries in the database	SELECT * FROM city_list ;
city_data	Contains the average temperatures for each city year in degree Celsius	SELECT * FROM city_data
global_data	This contains the average global temperatures by year in degree Celsius	SELECT * FROM global_data ;
Global Data (1913-2014)	Global average temperature Data from 1913 to 2014 in degree Celsius	SELECT * FROM global_data Where year >1913 and year<2014;
Global Data (1913-2014) max	Global maximum average temperature for the period of 1913-2014 in degree Celsius	SELECT * FROM global_data Where year >1913 and year<2014 ORDER BY avg_temp DESC LIMIT 1;
Amsterdam City Data	Data for the city of Amsterdam in degree Celsius	SELECT * FROM city_data Where city = 'Amsterdam';
Amsterdam Data (1913-2014)	Average temperature Data from 1913 to 2014 in degree Celsius of Amsterdam City	SELECT * FROM city_data Where (city= 'Amsterdam') and (year >1913 and year<2014);
Amsterdam Data (1913-2014) max	Maximum average temperature for the period of 1913-2014 of Amsterdam City	SELECT * FROM city_data Where (city= 'Amsterdam') and (year >1913 and year<2014) ORDER BY avg_temp DESC

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		LIMIT 1;
Abu Dhabi City Data	Data for the city of Abu Dhabi in degree Celsius	SELECT * FROM city_data Where city = 'Abu Dhabi';
Abu Dhabi City Data (1913-2014)	Average temperature Data from 1913 to 2014 in degree Celsius of Abu Dhabi	SELECT * FROM city_data Where (city= 'Abu Dhabi') and (year >1913 and year<2014);
Abu Dhabi City Data (1913-2014) max	Maximum average temperature for the period of 1913-2014 of Abu Dhabi	SELECT * FROM city_data Where (city= 'Abu Dhabi') and (year >1913 and year<2014) ORDER BY avg_temp DESC LIMIT 1;

2. Calculation of moving average for the global temperature



	A	B	C	D
1	year	avg_temp	Moving average of a decade	
2	1914	8.59		
3	1915	8.59		
4	1916	8.23		
5	1917	8.02		
6	1918	8.13		
7	1919	8.38		
8	1920	8.36		
9	1921	8.57		
10	1922	8.41		
11	1923	8.42	8.37	
12	1924	8.51	8.362	
13	1925	8.53	8.356	
14	1926	8.73	8.406	
15	1927	8.52	8.456	
16	1928	8.63	8.506	
17	1929	8.24	8.492	
18	1930	8.63	8.519	
19	1931	8.72	8.534	