EXPLORING WEATHER TRENDS

April 30, 2020	Riyadh vs The Global Temperature

An executive report that shows yearly average temperatures' comparison between Riyadh and the world.

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Exploring Weather Trends

RIYADH VS THE GLOBAL TEMPERATURE

Briefing

Seeking to explore the weather trend for the world and compare it to Riyadh temperature over the time, this report shows steps of data preparation and results of the analyzing the data extracted from the Udacity portal. The extracted data includes:

- Yearly average temperatures for 342 cities in 135 countries,
- Global Yearly average temperatures

Extracting the data

In order to extract the data from Udacity portal, the following SQL codes have been used:

```
select * from global_data
```

```
select * from city_data
```

```
select * from city_list
```

Data cleansing and analysis steps

Excel has been the tool for preparing the data, formulating, and making the charts.

Preparing the data includes:

- Extracting Riyadh data from the city_data table,
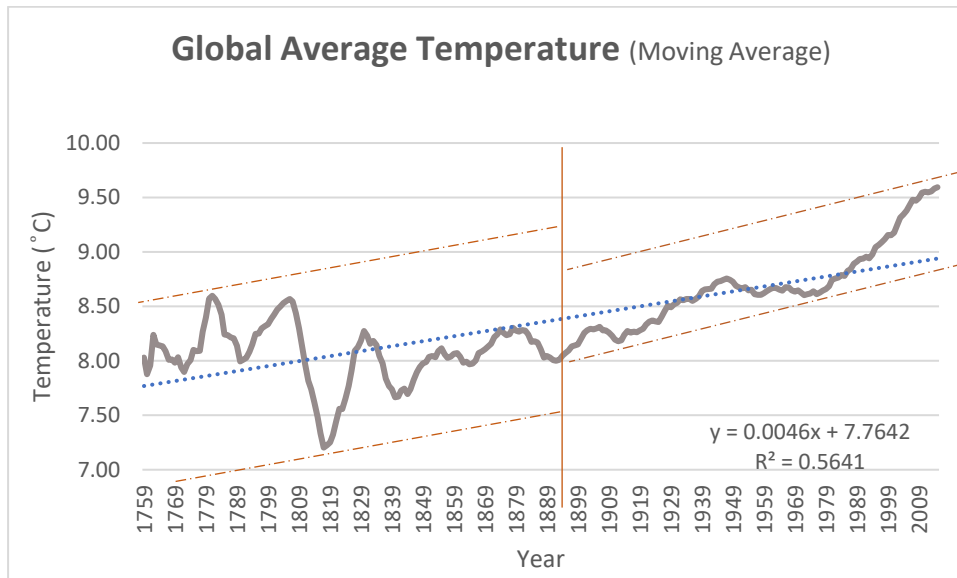- Removing outliers based on the observations

Data analysis:

In the beginning, general data statistics have been prepared such as the rage of years, number of available temperature readings, averages, and so on. Then moving average for the recoded average temperature readings has been calculated with a period of 10 years. Moreover, a base year for each category has been determined to observe the yearly change in temperature in comparison to the base year. Also, a calculation of the number of years it took to in get an increase of about 0.25 ^{o}C. In addition, more than one line-charts have been plotted to grasp some insights. Finally, online searches have been conducted to trying to link observations to the events.   All statistics and charts will be presented later in the report.
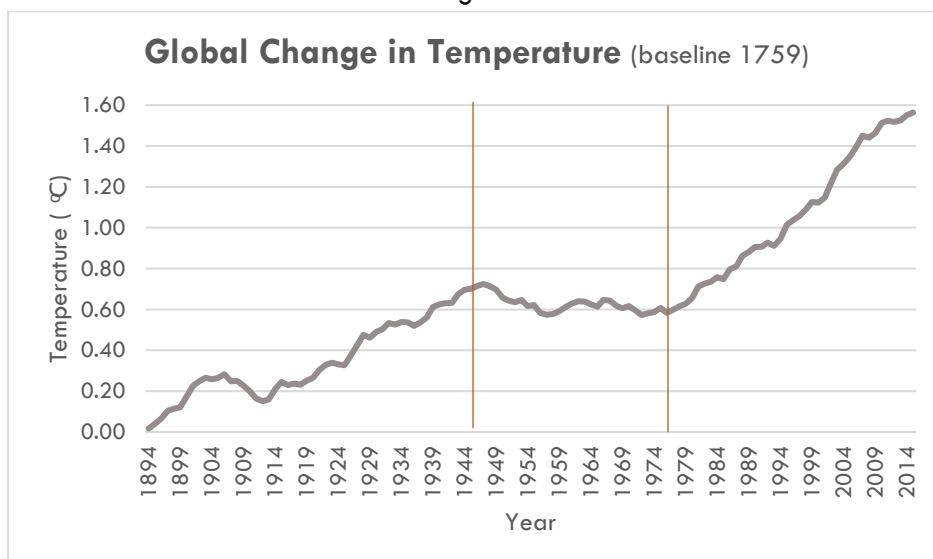
Observations

Global data observations:

1. Since 1869 the data shows only positive change in temperature compared to the baseline year.
2. 1759 has been considered as the baseline of yearly average temperatures comparison. The data has been divided into two sets before and after 1984. The first set of data shows a considerable big fluctuation, whereas the second set shows a relatively less fluctuation as shown in the chart below.

Global Average Temperature (Moving Average)

$y = 0.0046x + 7.7642$
$R^2 = 0.5641$

3. The line-chart below shows the change in moving average temperatures compared to the baseline. The chart shows around 50 years of steady growth in temperature, then about 30 years of relatively stable temperature followed by another steady growth in temperature. The first half of century has witnessed number of events that could have an effect to the temperature trends such as:
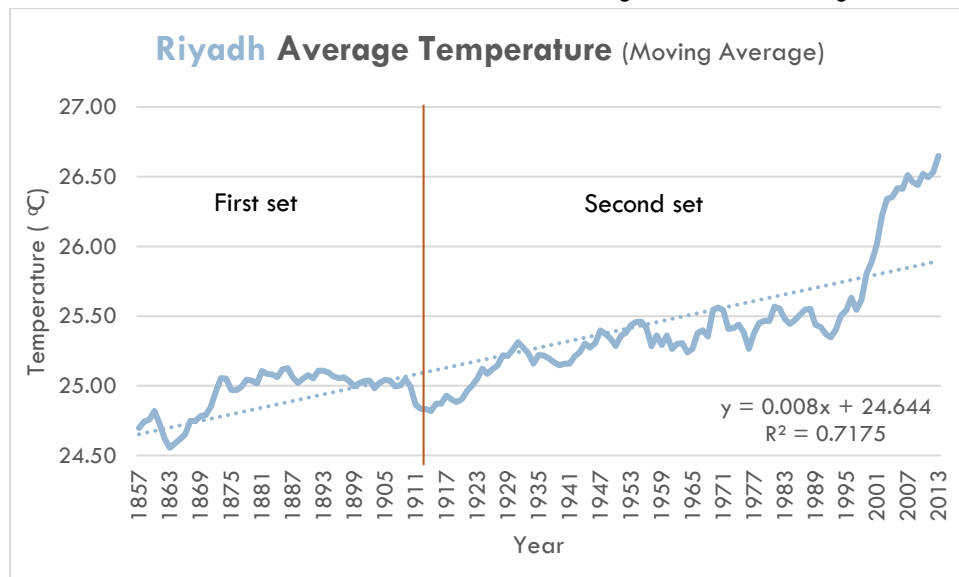   a. Mass production of automobiles
   b. World War I
   c. World War II

   While the second steady growth could have been affected by manufacturing relocating to countries with weak environmental regulations.

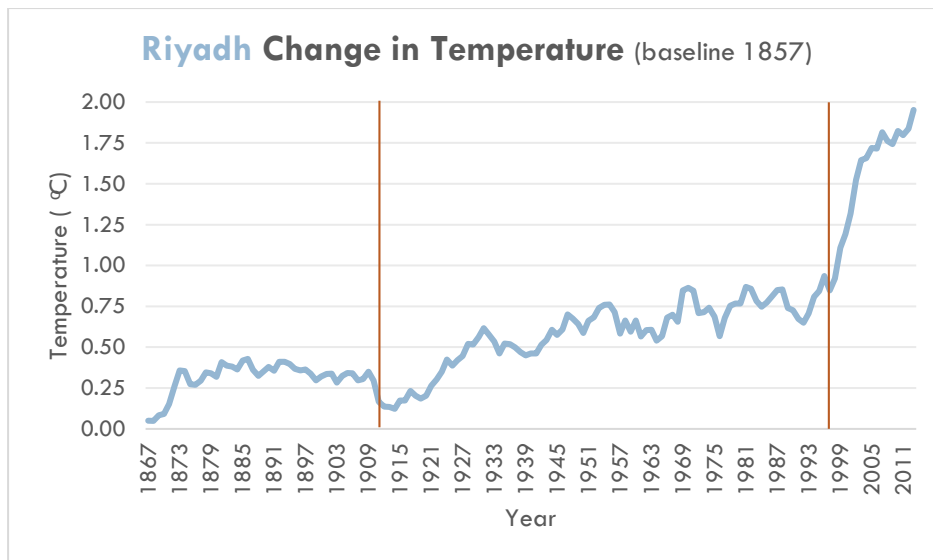**Global Change in Temperature** (baseline 1759)

4. The 0.25 °C test for the second set of data shows that – compared to the baseline- it took around 9 years since 1894 to get the first increase of temperature by 0.25 °C. Then another 29 years to reach the second increase in 1932, and 52 year for the third increase in 1984. Then, the data shows that only 23% of time was needed (12 years) for the fourth increase, and only 7 years for the fifth increase. Finally, last increase has taken 10 years to occur in 2013.

Riyadh data observations:

1. The second and third year of data have been considered as outliers for there are big gabs between them and the other data in previous and next years,
2. There are two years of missing data,
3. As shown in the chart below, the moving average temperatures from first calculated year shows that there are two sets of data. The first set was between 1857 and 1910, while the second set started at 1911 onwards following the global trend. This gives an indication that the accuracy of data might have been increased, and the second set of data could be more reliable than the first one due to new methods of measuring or new technologies.

Riyadh **Average Temperature** (Moving Average)
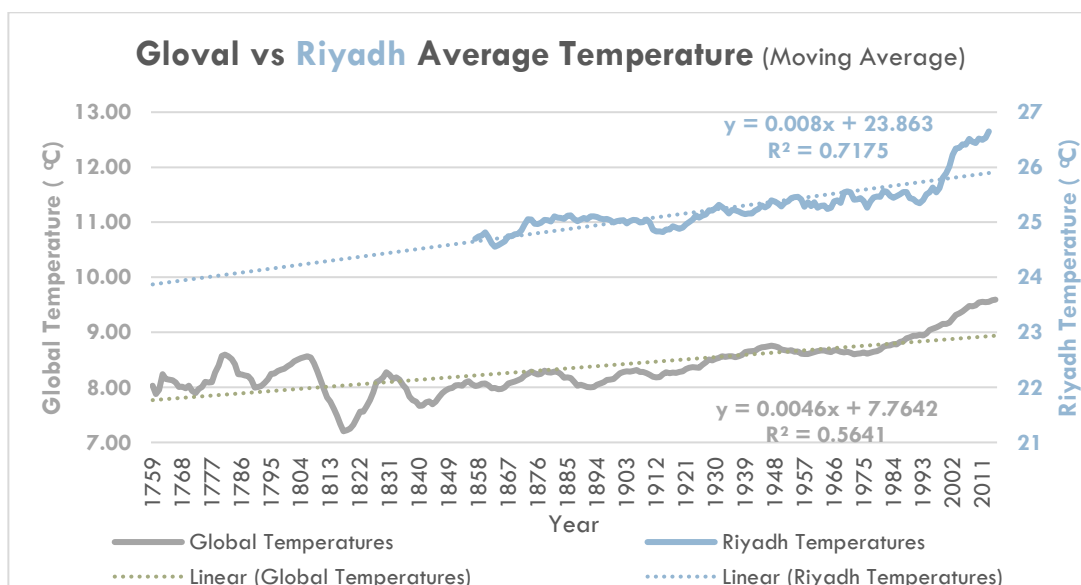
$$y = 0.008x + 24.644$$
$$R^2 = 0.7175$$

4. Since 1867 the data shows only positive change in temperature compared to the baseline year as shown in the chart below. The chart also shows that the temperature has been relatively stable for 44 years, then started following the global trend slowly with steady growth for 90 years. After that, the change in temperature has shifted to a new level within 5 years and has continued growing. The second gulf war consequences could be one of the reason for this huge shift.

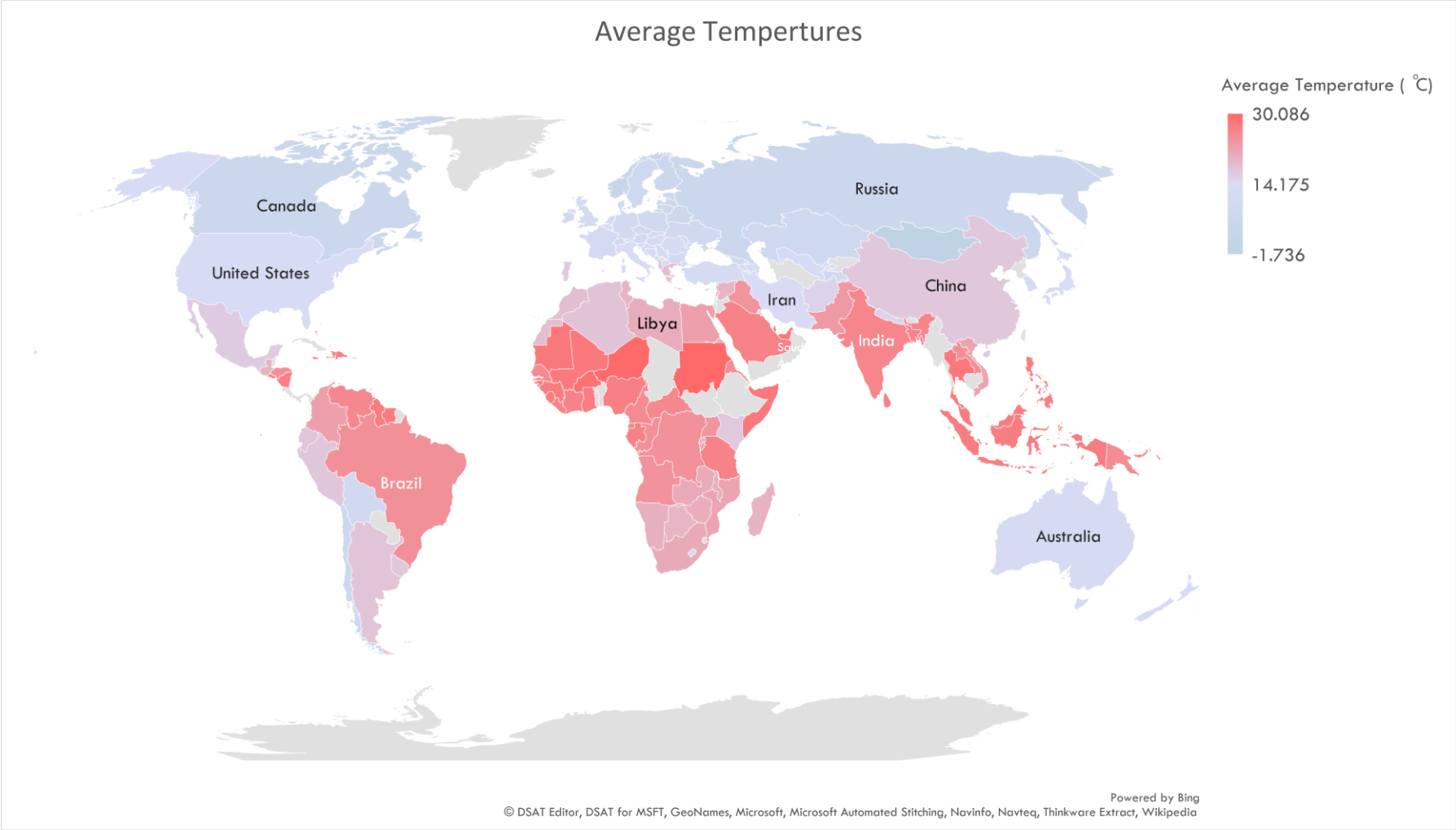**Riyadh Change in Temperature** (baseline 1857)

5. The 0.25 °C test for the second set of data shows that – compared to the baseline- it took around 13 years since 1911 to get the first increase of temperature by about 0.25 °C. Then another 23 years to reach the second increase in 1947, and 49 year for the third increase in 1996. Then, the data shows tremendous jumps in temperature in short periods of time. It has taken only 4 years for the fourth increase, and 2 years only for the fifth one. Finally, last increase has taken 5 years to occur in 2007.

General Statistics and Chart Comparison:

Item	Global	Riyadh
First year of recording	1750	1843
Last year of recording	2015	2013
Number of years	266	171
Number of recorded temperatures	266	169
Average temperature (°C)	8.37	16.14
Lowest Average temperature (°C)	5.78	15.45
Highest Average temperature (°C)	9.83	27.78

Gloval vs Riyadh Average Temperature (Moving Average)

$y = 0.008x + 23.863$
$R^2 = 0.7175$

$y = 0.0046x + 7.7642$
$R^2 = 0.5641$

Heat Map per country:

Average Tempertures

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