Project 1 - Exploring Weather Trends

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Tools: Google Sheets, Google Docs, Power BI

1. Extracting data

The cities I chose to analyze the climate change were Belo Horizonte, Amsterdam and Barcelona. In order to extract data from the database, I've used the SQL queries below:

- Checking city list:
  SELECT * FROM city_list

- Extracting global temperature data:
  SELECT * FROM global_data

- Extracting Belo Horizonte's temperature data:
  SELECT * FROM city_data
  WHERE city = 'Belo Horizonte'

- Extracting favorite cities' temperature data:
  SELECT * FROM city_data
  WHERE city = 'Amsterdam'
  AND year >= '1832 (condition used since Belo Horizonte's data is only from 1832 - 2013)

  SELECT * FROM city_data
  WHERE city = 'Barcelona'
  AND year >= '1832'
  AND country = 'Spain' (condition used since there is also a city named Barcelona in Venezuela)

2. Moving average calculation

Since Belo Horizonte's data set was missing the temperature values from 1844 to 1850, I've decided to fill up these blankets by calculating the average from the last 3 years. In order to calculate the moving average and create my line charts, I've used two different tools: Google Sheets and Power BI. I also chose to use Power BI because I'm familiar with it, I use it in my daily-basis work.

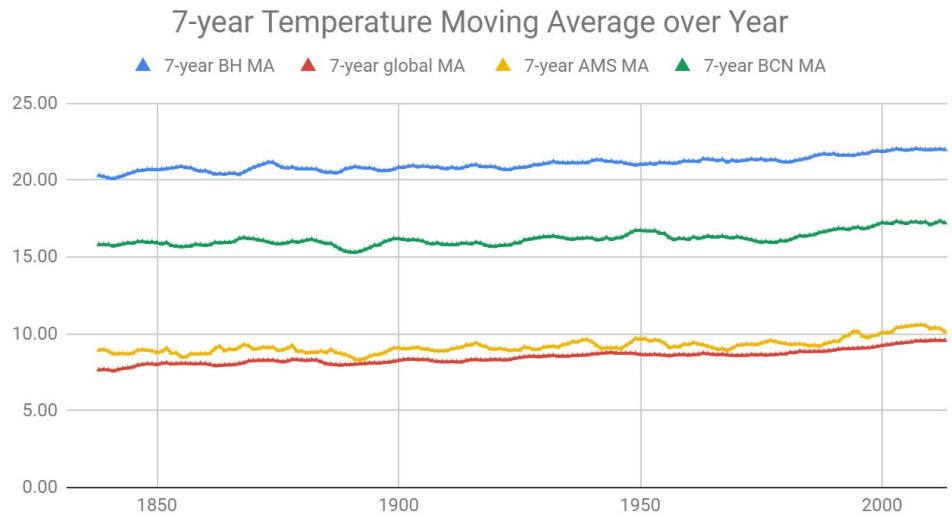
- Using Google Sheets:
  I've calculated a 7-day MA using the formula:
  `= AVERAGE(C2:C8)`

- Using Power BI
  `7_year_MA-BH =`

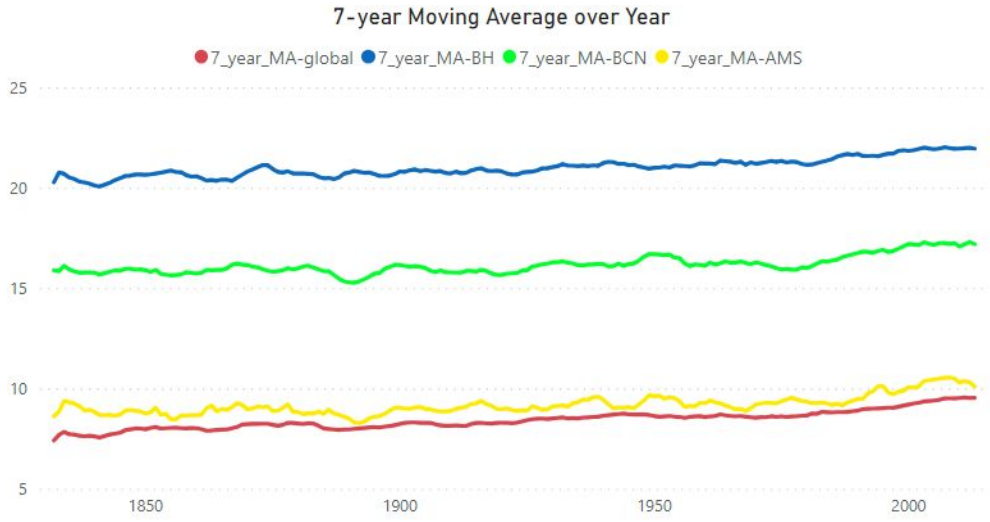
```
        CALCULATE (
                AVERAGEX ( 'dataset'; 'dataset'[avg_temp]);
                DATESINPERIOD  ('dataset'[Date];  LASTDATE  ('dataset'[Date]);  -7;
YEAR
                )
        )
```

3. Line charts

- Using Google Sheets:



- Using Power BI



4. Observations

- As we can see from the line charts, the average temperature in Belo Horizonte is way hotter than the global average temperature and the average temperature from the other chosen cities. The difference between them has been consistent over time, Belo Horizonte is always the hottest one.
- If we check the overall average temperature change from all the chosen places, we realize that the global average temperature change is the biggest, with a difference of 1.92 degrees from 1838 til 2013. It's followed by Belo Horizonte, Barcelona and Amsterdam temperature changes of 1.68, 1.41, 1.20, respectively.
- By analyzing all the average temperature trends, we realize that the world is getting hotter and this trend has been consistent over the last years. Ever since 1990 the global average temperature change has been positive.
- Amsterdam has the most similar average temperature to the global one, followed by Barcelona and Belo Horizonte.

5. Correlation Coefficient

I've used Google Sheets to calculate the correlation coefficient between Belo Horizonte and the global average temperature. The result is 0,96, which means the two variables have a positive linear correlation. If Belo Horizonte's average temperature rises, the global average temperature also goes up.

6. Estimation of Belo Horizonte's average temperature based on global average temperature

If we take a linear trendline over Belo Horizonte and global average temperature, we get two main equations:

- Belo Horizonte: Y = (7.95E-03)*x + 5.75
- Global: Y2 = (8.04E-03)*x - 7

where Y represents the average temperature and x represents the year.

By summing up these two equations, we get:

(Y+Y2) = E-03(15.99x) -1,25

Isolating the Y in the equation, we get an equation that we can estimate the average temperature in Belo horizonte based on the global average temperature and the year:

Y = E-03(15,99x) -1,25 -Y2