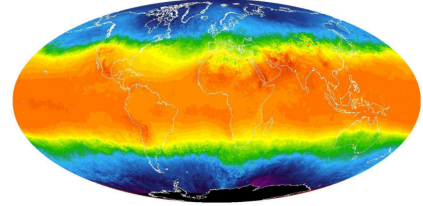


Project 1 - Explore weather trends

Summary

This project is a comparison of the global temperature over the years with the data of the capital of New Zealand, Wellington.



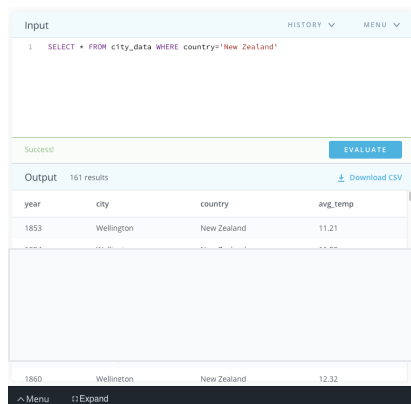
Key considerations:

Show clear data, the data has to be accurate as much as possible, has to be easy to read and show relevant information that can help to shape action plans.

1-Extracting

I downloaded all Udacity's database available by executing the followings commands in the SQL workspace.

```
SELECT * FROM global_data
SELECT * FROM city_list
SELECT * FROM city_data
```

A screenshot of the Udacity SQL Workspace interface. The 'Input' section shows a SQL query: 'SELECT * FROM city_data WHERE country='New Zealand''. Below the input, a 'Success' message is displayed. The 'Output' section shows 161 results. A table with 4 columns (year, city, country, avg_temp) is visible, showing data for Wellington, New Zealand. The table has a header row and several data rows. The bottom of the interface shows a 'Menu' button and an 'Expand' button.

year	city	country	avg_temp
1853	Wellington	New Zealand	11.21
1854	Wellington	New Zealand	11.21
1855	Wellington	New Zealand	11.21
1856	Wellington	New Zealand	11.21
1857	Wellington	New Zealand	11.21
1858	Wellington	New Zealand	11.21
1859	Wellington	New Zealand	11.21
1860	Wellington	New Zealand	12.32

Udacity's SQL Workspace

In addition, in the SQL workspace, I ran the following code to visualise all available data in the New Zealand and I saved this into a new spreadsheet called "city_data_where_nz":

```
SELECT * FROM city_data WHERE country = 'New Zealand'
```

The only city found in their database in New Zealand was Wellington.

2-Merging information

Then I opened the spreadsheet **global_data** and then created **city_data_where_nz** with Excel.

In the spreadsheet **global_data**, I created a new column called "Wellington, NZ" and I used the VLOOKUP in order to get all values from the another spreadsheet:

```
=IFERROR(VLOOKUP(A105,city_data_where_nz.csv!$A:$D,4,FALSE),"Not Available")
```

Year	Average Global Temperature	Wellington, NZ
1853	8.04	11.21
1854	8.21	11.99
1855	8.11	12.09
1856	8	11.64
1857	7.76	11.49
1858	8.1	11.51
1859	8.25	12.21
1860	7.96	12.32
1861	7.85	12.91
1862	7.56	12.45
1863	8.11	11.83
1864	7.98	12.58
1865	8.18	12.58
1866	8.29	12.91
1867	8.44	12.83
1868	8.25	12
1869	8.43	12.42
1870	8.2	12.42
1871	8.12	12.04
1872	8.19	12.82
1873	8.35	12.5
1874	8.43	12.16
1875	7.86	12.45
1876	8.08	12.88

The ifError formula was needed because for some years the database had no data for Wellington, therefore, I decided to leave the cells as "not available", which means that the data could not be found in the **city_data_where_nz** spreadsheet. Then I applied a filter in order to keep only the years where I could find data in both compared spreadsheets.

Filtering only available data

3- Calculations

I used this way to find out what was the percentage difference between every year.

Year	Average Global Temperature	10 Years - MA - Global Temperature	% Diff from previous year
1863	8.11	7.991	0.09%
1864	7.98	7.968	-0.29%
1865	8.18	7.975	
1866	8.29	8.004	=C118/C117-1
1867	8.44	8.072	0.85%
1868	8.25	8.087	0.19%
1869	8.43	8.105	0.22%

Yearly increase rate global

Wellington, NZ	10 Years - MA - Wellington, NZ	% Diff from previous year
11.83	12.044	0.52%
12.58	12.103	0.49%
12.58	12.152	
12.91	12.279	=F118/F117-1
12.82	12.412	1.00%

Yearly increase rate local

And the following formulas to create this table:

Local	Globally	Wellington	Diff
Mean temperature increase rate	=AVERAGE(D:D)	=AVERAGE(G:G)	=[@Wellington]-Table5[@Globally]
Standard Error	=STDEV(D:D)/SQRT(COUNT(D:D))	=STDEV(G:G)/SQRT(COUNT(G:G))	=[@Wellington]-Table5[@Globally]
1883 Temperature	=MIN(B:B)	=MIN(F:F)	=[@Wellington]-Table5[@Globally]
2013 Temperature	=MAX(B:B)	=MAX(F:F)	=[@Wellington]-Table5[@Globally]
Difference in 130 years (C°)	=K118-K117	=L118-L117	=[@Wellington]-Table5[@Globally]
Difference in 130 years %	=K118/K117-1	=L118/L117-1	=[@Wellington]-Table5[@Globally]

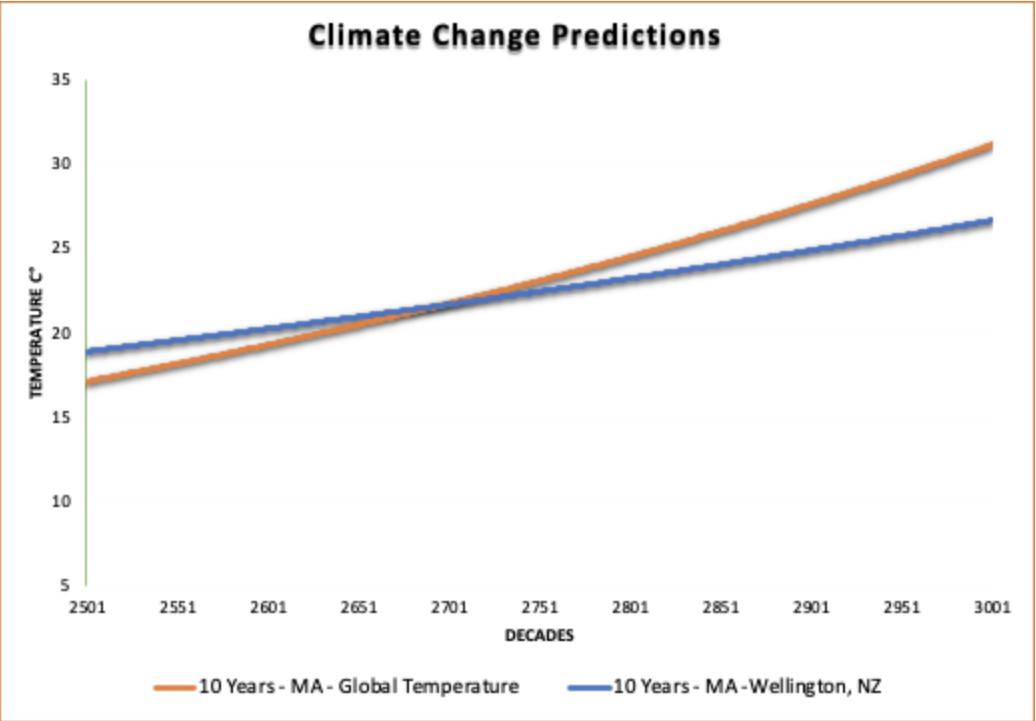
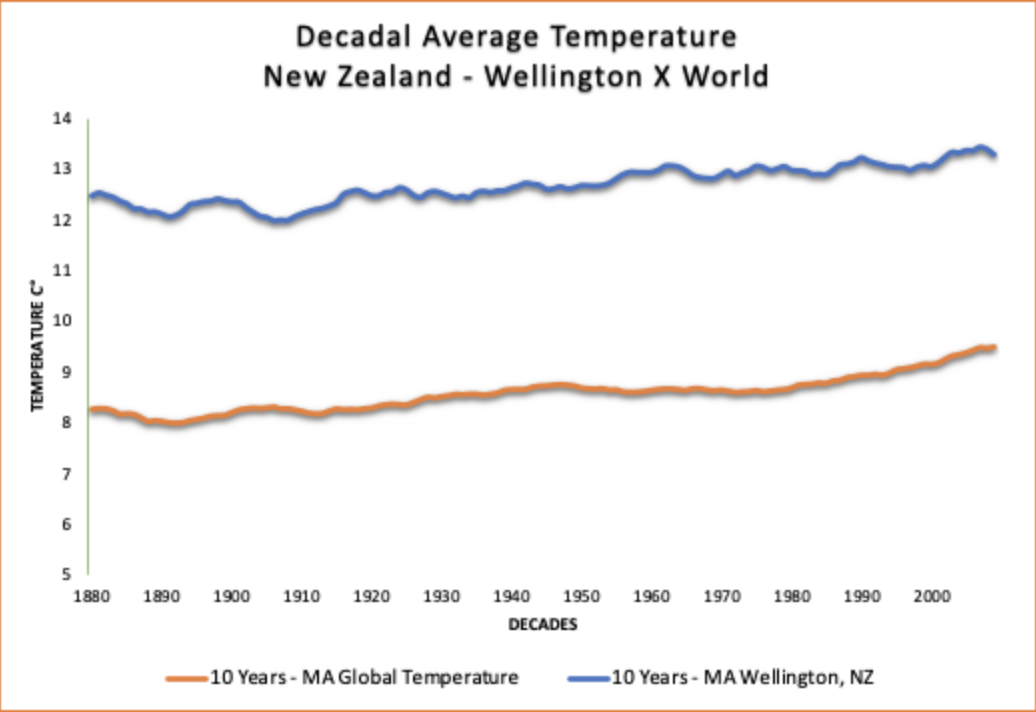
Data summary, formulas taken.

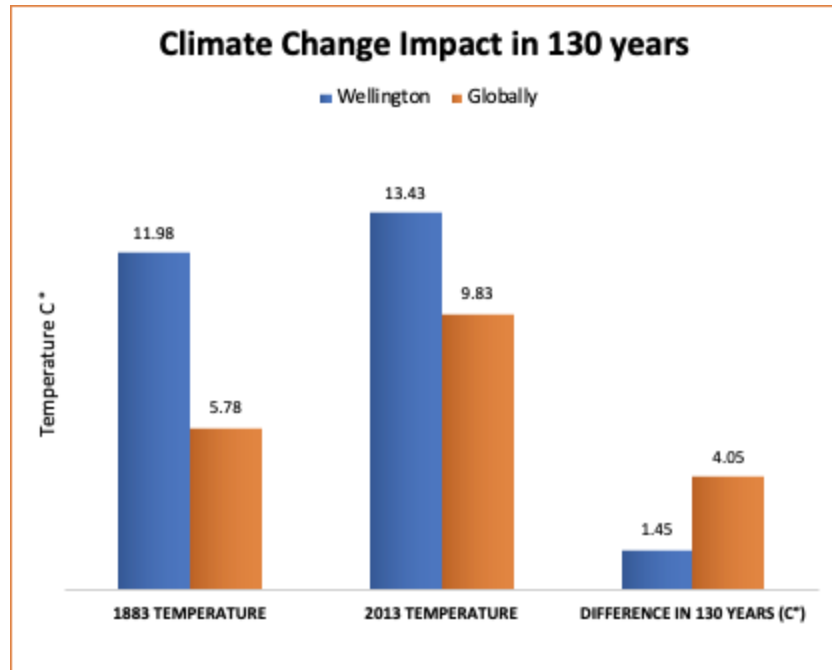
The moving average used to smooth the data was taken by 10 years time.

A	B	C
Year	Average Global Temperature	10 Years - MA Global Temperature
1863	8.11	7.991
1864	7.98	7.968
1865	8.18	7.975
1866	8.29	8.004
1867	8.44	8.072
1868	8.25	8.087
1869	8.43	8.105
1870	8.2	8.129
1871	8.12	8.156
1872	8.19	8.219
1873	8.35	
1874	43	=AVERAGE(B117:B126)

10 years - moving average

4- Charts





5- Predictions

This is a rough predictions of what would be the next years temperature globally and locally.

I have got the global and local average temperature and I used its rate as a constant to find what would be the next year temperature.

Logic: (Previous year temperature X Average temperature increase rate)+ Previous year temperature

Formula: $(B12 * \text{global_data!} \$K\$115) + B12$

fx =(B16*global_data!\$K\$115)+B16				
B	C	D	E	
Average Global	10 Years - MA -		10 Years - MA -	
Temperature	Global	Wellington, NZ	Wellington, NZ	
9.61		13.57		
9.621	9.586	13.58	13.354	
9.633	9.579	13.59	13.350	
9.645	9.591	13.60	13.406	
9.656	9.584	13.61	13.422	
=(B16*global_data!\$K\$115)+B16		13.62	13.429	
9.679	9.624	13.63	13.508	
9.691	9.623	13.64	13.517	
9.702	9.641	13.64	13.536	
9.714	9.662	13.65	13.612	

formulas taken

Final considerations:

- Both average temperatures have been increasing over time.
- Both have a higher average temperature now comparing with the past.
- Over 130 years, the Wellington temperature has increased 1.45 C° and the global temperature 4.05 C°
- The Wellington temperature has not been increasing as the global is.
- The global temperature increase rate is higher than in Wellington, which means the world itself has a more climate impact than Wellington.
- The global data has a lower standard error, which means fewer fluctuations, more data reliability.
- The global average temperature has been approaching the Wellington temperature over the years.
- The global temperature would match with the Wellington around the year 2696.
- The Wellington city in New Zealand apparently do more effective environmental protective actions than other countries.

References:

Accessed at 03/05/2020:

<https://www.usatoday.com/story/money/2019/07/14/climate-change-countries-doing-most-least-to-protect-environment/39534413/>