

Explore Weather Trends

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SQL query

```
1  WITH t1
2  AS (SELECT
3      city_data.year year_data,
4      city_data.avg_temp dublin_temp,
5      global_data.avg_temp global_temp
6  FROM city_data
7  JOIN global_data
8      ON city_data.year = global_data.year
9  WHERE city = 'Dublin'),
10 t2
11 AS (SELECT
12     city_data.year year_moscow,
13     city_data.avg_temp moscow_temp
14 FROM city_data
15 WHERE city = 'Moscow')
16 SELECT
17     t1.*,
18     t2.moscow_temp
19 FROM t1
20 JOIN t2
21     ON t1.year_data = t2.year_moscow
22 ORDER BY 1
```



Moving Average Calculation in Excel

Moving averages calculation is based on 10-years period

	A	B	C	D	E	F	G	H	
1	year_data	dublin_temp	global_temp	moscow_temp	Year	Dublin, Ireland (MA)	Moscow, Russia (MA)	Global (MA)	C
2	1750	9,32	8,72	4,84	1750				
3	1751	9,12	7,98	5,07	1751				
4	1752	6,28	5,78	-2,08	1752				C
5	1753	8,63	8,39	3,87	1753				
6	1754	8,59	8,47	4,07	1754				
7	1755	8,29	8,36	3,99	1755				
8	1756	8,75	8,85	4,51	1756				
9	1757	8,72	9,02	4,66	1757				
10	1758	7,83	6,74	2,22	1758				
11	1759	8,82	7,99	3,45	1759	8,44	3,46	8,03	
12	1760	8,14	7,19	2,41	1760	8,32	3,22	7,88	
13	1761	8,95	8,77	4,14	1761	8,30	3,12	7,96	
14	1762	8,32	8,61	4,1	1762	8,50	3,74	8,24	
15	1763	7,95	7,5	2,91	1763	8,44	3,65	8,15	
16	1764	8,26	8,4	4,35	1764	8,40	3,67	8,14	
17	1765	8,08	8,25	4,3	1765	8,38	3,71	8,13	
18	1766	8,24	8,41	4,23	1766	8,33	3,68	8,09	
19	1767	8,38	8,22	4,05	1767	8,30	3,62	8,01	
20	1768	8,25	6,78	2,72	1768	8,34	3,67	8,01	
21	1769	8,33	7,69	3,85	1769	8,29	3,71	7,98	
22	1770	8,08	7,69	3,97	1770	8,28	3,86	8,03	
23	1771	8,14	7,85	3,23	1771	8,20	3,77	7,94	
24	1772	8,22	8,19	3,93	1772	8,19	3,75	7,90	
25	1773	8,26	8,22	4,79	1773	8,22	3,94	7,97	



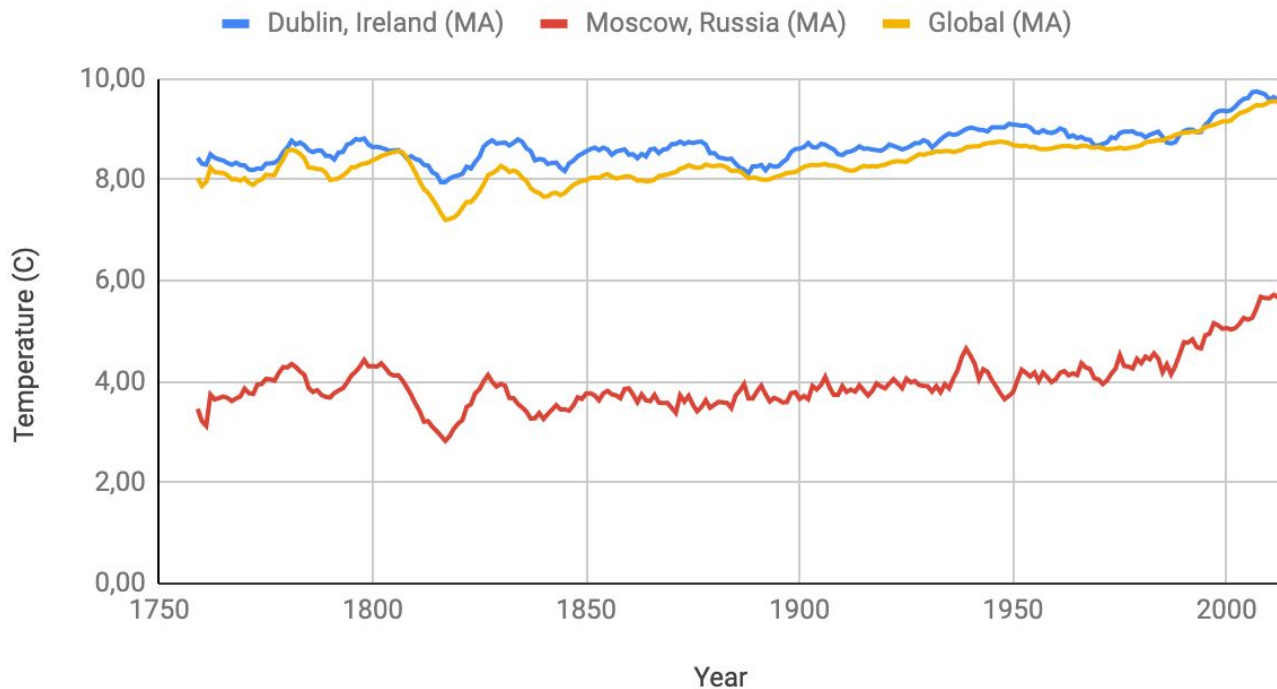
Key consideration in visualization

- Line chart - clear presentation and visibility
- Head 'Weather Trends' - good explanation of project's goal and presentation of tendencies of climate changes
- Horizontal axe 'Year' - visibility of temperature changes over time
- Vertical axe 'Temperature, C' - visibility of temperature fluctuations
- Legend - using contrast colors for lines which presents temperature in two different cities and global
- I compared temperatures in two cities where I lived - Moscow, Russia and Dublin, Ireland - with global dates, The dates, which I used for creating chart, are based on moving averages.



Line Chart 'Weather Trends'

Weather Trends





Observations

- Both cities follow global trend of warming. Dublin almost repeats global trend with a slight temperature rise by tenths of a degree Celsius. However, in the 1990s, temperature in Dublin readings were slightly below global, then temperature bounced back, and currently it is decreasing again. In 1750s, the average temperature in Moscow is four degree Celsius less than global. A significant decrease in temperature by two degrees in Moscow and the world occurs at the end of 1820. Then there is a steady rise in temperature, and the difference in average rates has decreased from five to four degrees Celsius.
- The warming in Moscow happens faster than in Dublin, because the average temperature in Moscow increased from 3,4 C to 5,9 C, and in Dublin it picked up from 8,4 C to 9,5 C, while global figures have changed from 8 C to 9,6 C, which is absolutely equivalent to the data in Dublin.



Observations

- The overall trend looks like the world is getting hotter. Generally, the trend has been consistent over the last few hundred years. The most significant drop in temperature was in 1820, since then there have been small declines in temperature, but overall the temperature is steadily increasing.
- As we can see on the chart, a couple of centuries ago, we could still observe significant temperature drops, as evidenced by the readings of 1790 and 1820, but over the past 30 years the temperature has been increasing at an extremely fast rate. Megalopolises with a population of more than 10 million people (for example, such as Moscow) have a particular impact on the planet's climate.



Correlation coefficient

Using moving average data I have calculated Correlation coefficient for both cities and got the following rates:

Dublin_Global_CC = 0,91

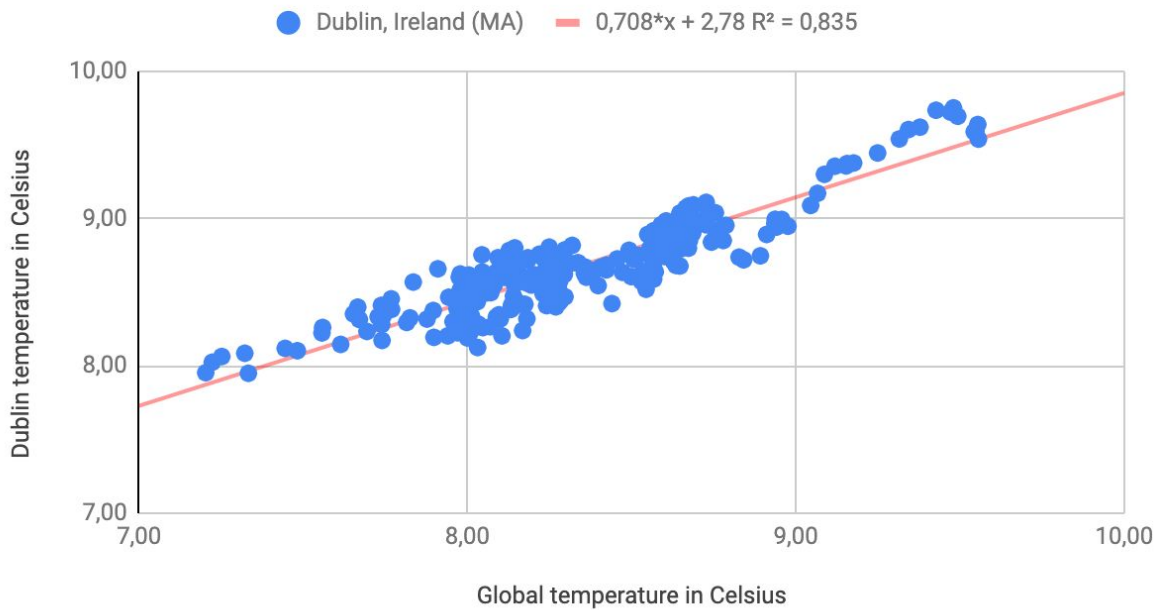
Moscow_Global_CC= 0,90

Observation: the global temperature is highly correlated with local temperature in Dublin and Moscow. That means I can build a regression model to predict local temperature using global temperature with a high success.



Local temperature estimation (Dublin)

Linear regression Dublin - Global

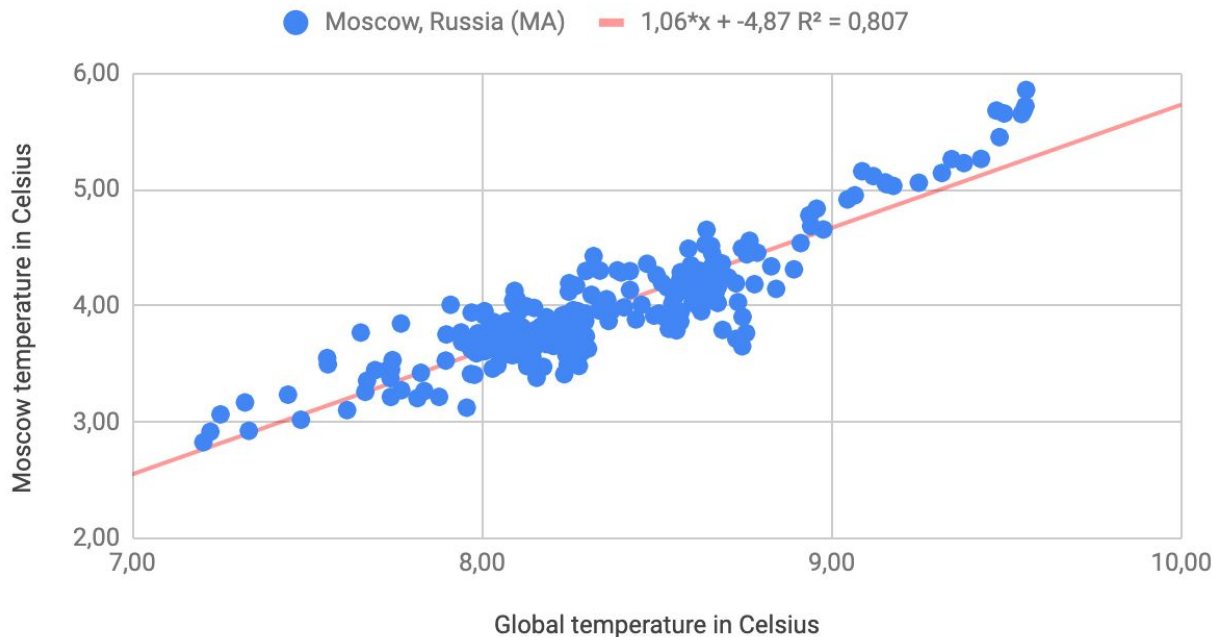


$$\text{Dublin temperature} = \text{Global temperature} * 0,708 + 2,78$$



Local temperature estimation (Moscow)

Linear regression Moscow - Global



$$\text{Moscow temperature} = \text{Global temperature} * 1,06 - 4,87$$