

# **GLOBE Phenological Observations and Global Warming**

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## The project was based on personal phenological research, meteorological data from the World Meteorological Organization (WMO), according to the GLOBE program

**Subject and object of study:** Leaf chlorosis and abscission of sour cherry (*Prunus cerasus*) in different countries at approximately the same latitude, along with changes in average daily air temperatures in middle latitudes.

**The purpose and tasks of the ecological project:** to determine the differences in phenological changes, assess the rates of climate change, and develop measures to address warming at the household level.

**Research methods:** data recording, monitoring phenological signs, mathematical and statistical analysis techniques, methods for graphic representation.

**The practical significance of the obtained results:** confirmed the onset of rapid warming and underscores the necessity to inform the population about this phenomenon.



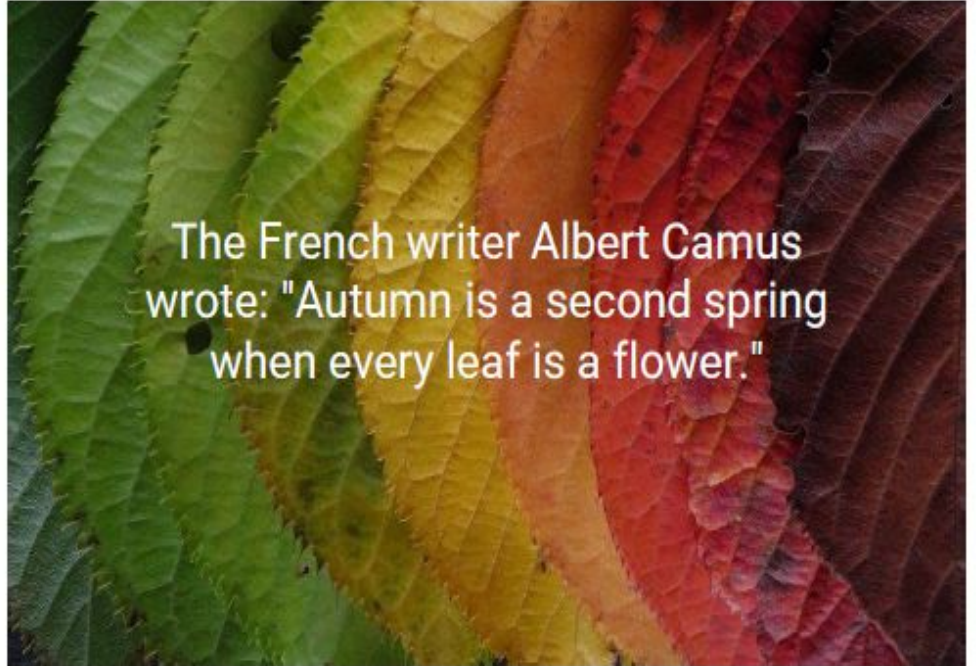
# What causes the vibrant colors of fall foliage?

The green color of spring and summer leaves is caused by chlorophyll. As daylight hours decrease, trees reduce and eventually cease chlorophyll production. As the green pigment in the leaf cell disappears, other colors that were masked by chlorophyll begin to appear.

The first colors that appear on autumn leaves are yellow, caused by carotenoid pigments (carotenes and xanthophylls). Carotenoids cause yellow and orange color.

The red or purple color of the leaves consists of anthocyanin pigments. These pigments give the color red and purple.

The time and intensity of leaf coloration depends on the species of tree, altitude, temperature and humidity.



The French writer Albert Camus wrote: "Autumn is a second spring when every leaf is a flower."



Collecting information,  
entering data on the GLOBE  
website, and analyzing the  
results.

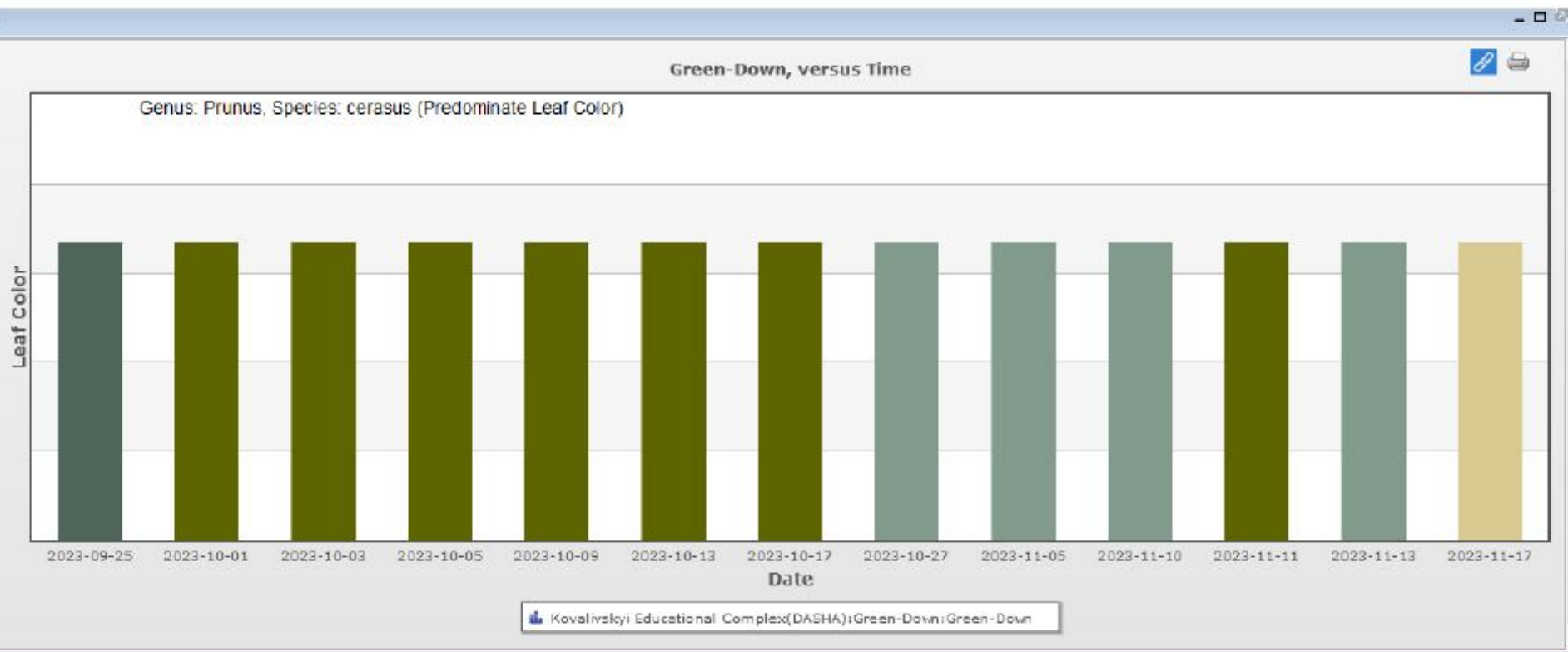
# GLOBE is a platform for research

Kovalivka Lyceum has been working in the program since 2015, and since 2017 we have had access to data visualization of all educational institutions in the world. The sequence of our research was affected by the pandemic, the irregularity of the electricity supply, the low speed of the Internet, and air alarms. But we are working!





This is how the color change of cherry leaves looks like until 17.11.23



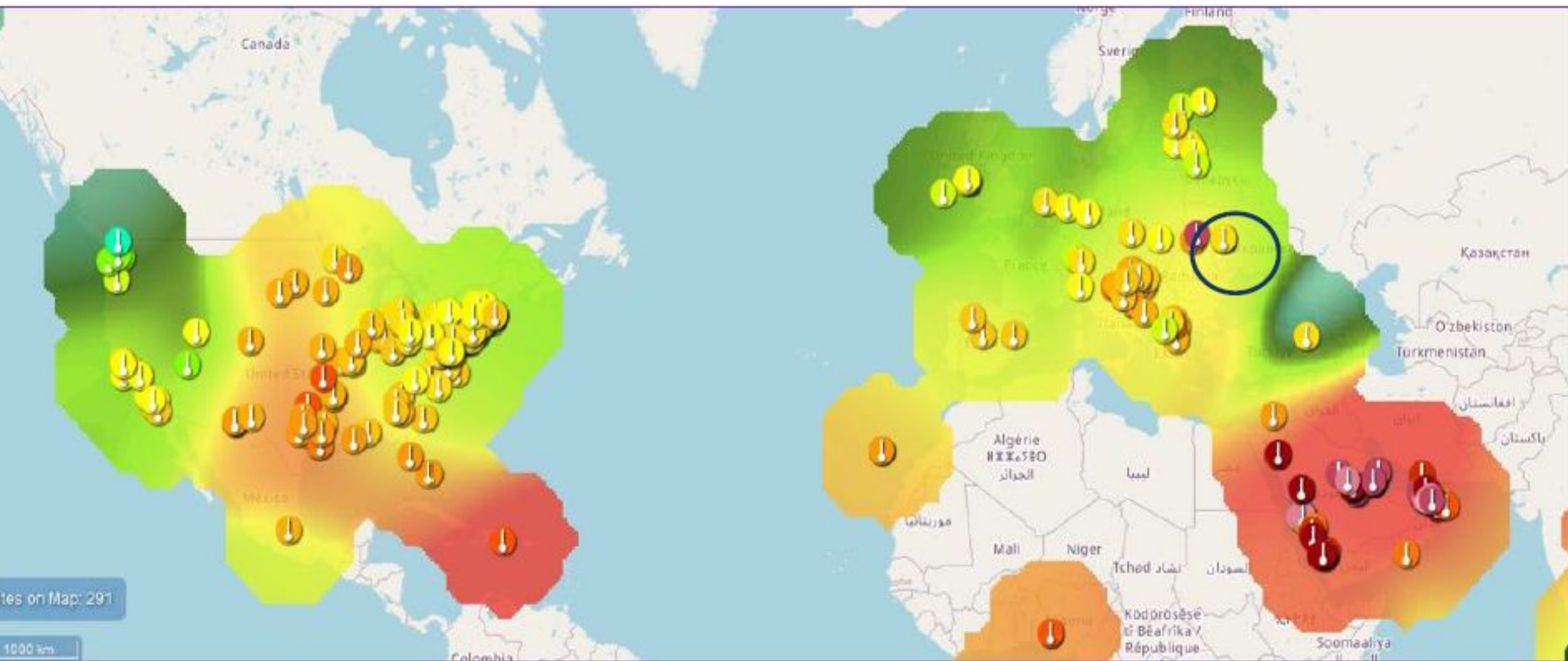




# Analysis of temperature indicators



# Map of daily temperatures for 01.10.2023



# Map of daily temperatures for 22.10.23

n System



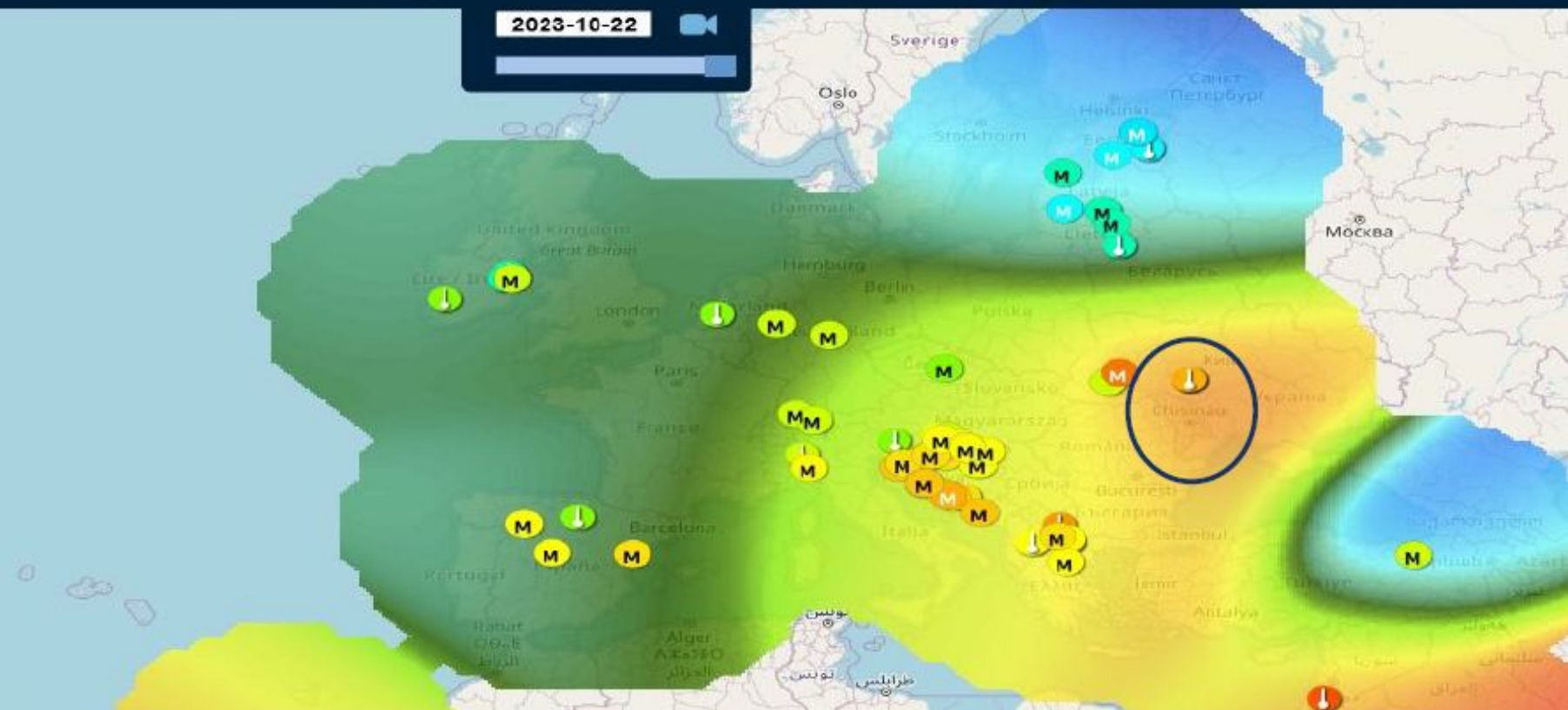
Measurements | Data Counts



Вибрати мову |



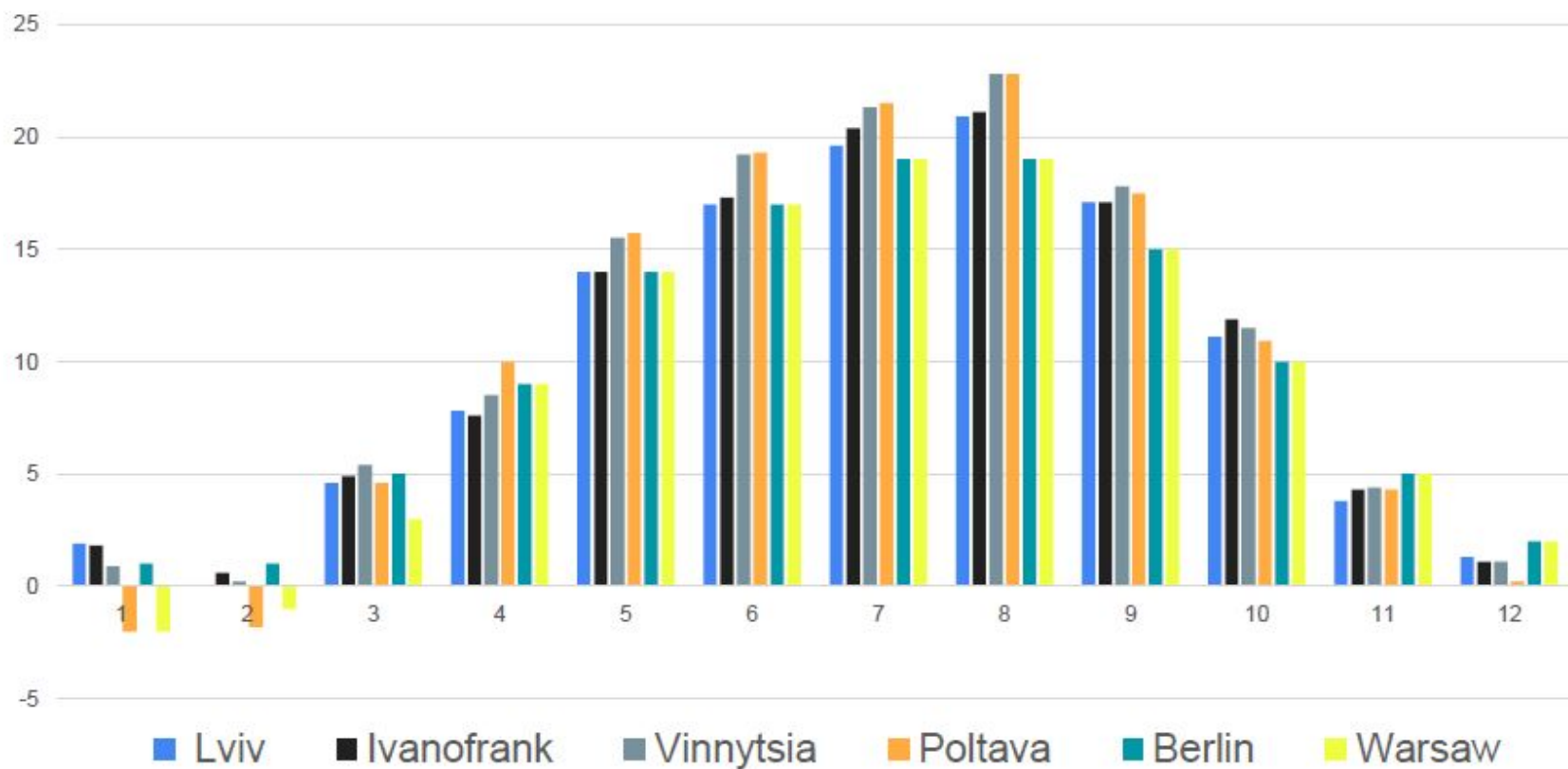
2023-10-22



I decided to compare the average monthly temperatures in the cities of our latitude. Data from the World Meteorological Organization (WMO)

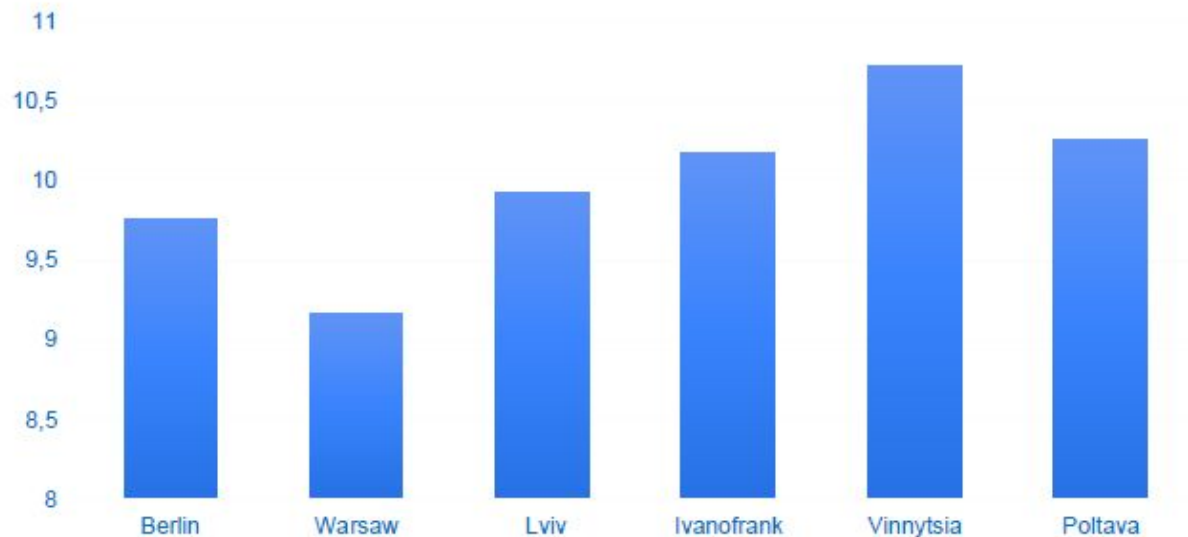
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Berlin	1	1	5	9	14	17	19	19	15	10	5	2
Lviv	1,9	0	4,6	7,8	14	17	19,6	20,9	17,1	11,1	3,8	1,3
Ivanofrankivsk	1,8	0,6	4,9	7,6	14	17,3	20,4	21,1	17,1	11,9	4,3	1,1
Vinnytsia	0,9	0,2	5,4	8,5	15,5	19,2	21,3	22,8	17,8	11,5	4,4	1,1
Poltava	-2	-1,8	4,6	10	15,7	19,3	21,5	22,8	17,5	10,9	4,3	0,2
Warsaw	-2	-1	3	9	14	17	19	19	15	10	5	2





A diagram of average monthly temperatures in European cities illustrated that temperature depends on continentality (distance from the ocean). Therefore, Vinnytsia and Poltava are the warmest cities from April to October, but colder in winter. After calculating the average annual temperatures in these cities, such a picture appeared that suggested that Vinnytsia is most threatened by global warming.

### Average annual temperatures for 2023



# Data from the World Meteorological Organization WMO with reference to the Hydrometeorological Center of Ukraine

2023 - 2013p.

**10,72°-8,63° =2,09°**

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
January	-5,1	-4,5	-1,1	-5,1	-5,8	-2,6	-4,8	0,2	-2,5	-1,5	0,9
February	-0,9	-1,6	-1,3	2,3	-3,5	-4,4	0,7	1,8	-3,8	1,3	0,2
March	-2,1	5,5	4	4	5,8	-1,9	4,6	5,2	1,6	2,8	5,4
April	10,4	9,2	8,5	11,9	9,2	13,3	9,2	9,2	7	7,9	8,5
May	17,4	15,5	15,2	14,2	14,1	17,5	15,5	11,6	13,4	14,7	15,5
June	19,3	16,7	19,3	19,4	19,1	19,3	21,6	20,2	19,3	21,7	19,2
July	18,8	20,3	21,2	20,7	20	19,8	19,1	20,4	22,4	20,8	21,3
August	18,8	20	21,2	19,9	21,2	21,1	20,3	20,4	19,2	22,4	22,8
September	11,8	14,4	16,9	15,9	15,3	15,5	15,2	17,3	12,8	12,8	17,8
October	9,3	7	7,1	5,8	8,3	10	10,2	12,3	7,2	11	11,5
November	6,5	1,4	4,3	1,1	3,4	0,3	5,2	3,5	4,7	0,5	4,4
December	-0,6	-2,2	1,7	-2,1	1,3	-2,4	2,1	-0,1	-1,6	-0,1	1,1
average annual temperature	<b>8,63</b>	<b>8,475</b>	<b>9,75</b>	<b>9</b>	<b>9,03</b>	<b>8,79</b>	<b>9,908</b>	<b>10,17</b>	<b>8,308</b>	<b>9,525</b>	<b>10,72</b>





What is happening to the  
climate?

## If the level of greenhouse gases will increase

Consequences of global warming: melting of glaciers and permafrost, rise in the level of the ocean and flooding of large areas, the occurrence of extreme waves of deadly heat (near +50°), droughts, dust storms and fires, more frequent showers, typhoons and hurricanes, a threat to the biodiversity of the planet and the emergence of climatic refugees

# What can I do?

I will continue working on the GLOBE platform. My personal studies of phenological changes and temperatures aim to contribute to creating an accurate representation of the state of the planet and Ukraine. I will disseminate information to the public through my project, social networks, and the developed booklet.

Additionally, I am committed to conserving energy and fuel, refraining from burning garbage, and reducing waste.

I will actively engage in planting trees and sowing flowers. Furthermore, I am ready to collaborate with others to achieve climate goals.

