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The 3rd ClimEd Online Training on "Digital Tool and Datasets for Climate Education"

(26 October - 12 November 2021)

## Group HWA: C12

**URBAN ECONOMY - ENERGY CONSUMPTION** 

Khandogina Olga, BNUUEK Stavetska Ruslana, BTNAU Kryshtop Lidiia, NGO Kateryna Slobodianyk, OSEU



Geographical region: Ukraine, Cherkasy (49° 26′ 40″ N, 32° 3′ 35″ E)

### ➤ Problem to discuss:

The increase of temperature in the city leads to an increase in the usage level of cooling systems. This leads to a load on the national power system.

#### ➤ Main aim:

To explore temperature changes affecting overspending of electricity for air conditioning

> Types of data (observations / modelling ): modelling

- > Datasets / repositories / archives: ERA5, Landsat
- Variables / parametres: temperature statistics, heat waves; extremely high and low temperatures, precipitation
- > Approach (s) for visualisation and data analysis: vector/imagery analysis, remote sensing
- > Tools for visualisation and data analysis: CDS Toolbox, ArcGIS















Electricity consumption (Ukraine)





Monitoring based on China's freight index

We can also see that the number of free containers in China is falling sharply, which means that the number of air conditioners sold in 2020-2021 has greatly increased. Based on that we can say that people is trying to regulate the increasing number of hot days





![](_page_5_Picture_2.jpeg)

For the 1981-2010 reference period, the annual average temperature in **Cherkasy** was 8.6°C.

Monthly average temperature ranged from -3.7°C (January) to 20.8°C (July).

![](_page_5_Figure_5.jpeg)

2019

# Average daily temperature above 22 degrees Celsius Group HWA: C12 ColimEd

![](_page_6_Figure_1.jpeg)

![](_page_6_Figure_2.jpeg)

![](_page_6_Figure_3.jpeg)

![](_page_7_Figure_0.jpeg)

Max and Min Temperature Analysis

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This graph shows that the highest anomaly temperature was at August 2010(33°C) and the lowest was at February 2012(-13°C). By this visualization we can see that Cherkasy has a warm-summer continental climate.

WorldWeatherOnline.com

![](_page_8_Picture_0.jpeg)

Monthly 2m average temperature in 2000

![](_page_8_Figure_3.jpeg)

Heatmap of Ukrainian cities

2000 vs 2021

![](_page_9_Figure_0.jpeg)

#### 2019

Percentage of households with air conditioning in the top 15 metro areas and Portland

![](_page_9_Figure_3.jpeg)

https://www.usnews.com/news/cities/articles/2021-07-09/air-conditioning-trends-in-americas-biggest-cities

![](_page_10_Figure_0.jpeg)

![](_page_10_Figure_1.jpeg)

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Catalog Search

#### Growing Degree Days 1980 (above 22°C)

0 12.5 25 37.5 50 62.5 75 87.5 100 112.5 125 137.5 150 162.5 175 177.625

![](_page_11_Figure_2.jpeg)

![](_page_11_Picture_3.jpeg)

#### Growing Degree Days 2010 (above 22°C)

125 150 175 200 225 250 275 300 325 350 375 400 408.111

64.3895 75 100

![](_page_11_Picture_5.jpeg)

#### Growing Degree Days 1990 (above 22°C)

![](_page_11_Picture_7.jpeg)

![](_page_11_Picture_8.jpeg)

#### Growing Degree Days 2019 (above 22°C)

![](_page_11_Picture_10.jpeg)

![](_page_11_Picture_11.jpeg)

![](_page_11_Picture_12.jpeg)

15 30 45 60 75 90 105 120 135 150 165 180 195 210 225 229.561

![](_page_11_Picture_14.jpeg)

## Calculate Growing Degree Days Index

Year

1980, 1990, 2000, 2010, 2019

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#### Temperature Threshold

22

@ct.application(title='Calculate Growing Degree Days Index', layout=layout)

@ct.input.dropdown('year', label='Year', values=range(1980, 2021)
@ct.input.text('tas\_min\_celsius', label='Temperature Threshold',
help='Celsius degrees', type=float, default=22.)

![](_page_12_Picture_0.jpeg)

## ➤ Results:

- 1. the results of the analysis confirm the tendency of temperature increase in the studied region, temperatures are expected to be above comfortable for warm period of the year, abnormal temperatures can be observed
- 2. gradual movement to higher latitudes of areas with high temperatures by years is observed for the region
- 3. an increase in air temperature in the summer months leads to an increase in the use of energy for cooling systems
- 4. in the summer the area of the raised temperatures (heat island) is formed, mitigation of the influence can be achieved by the development of green infrastructure
- 5. the obtained results could be used for decision-making during development of the mitigation measures for climate changes

![](_page_12_Picture_7.jpeg)