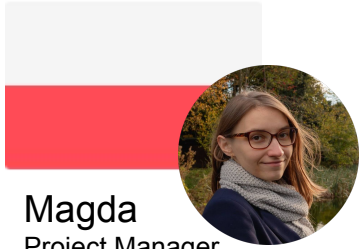
NASA SPACE APPS COVID-19 CHALLENGE

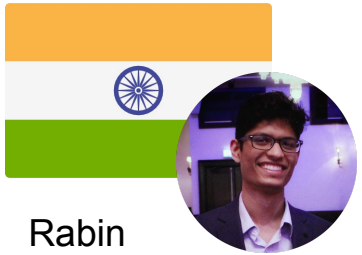
# Quiet Planet

# Data Roamers

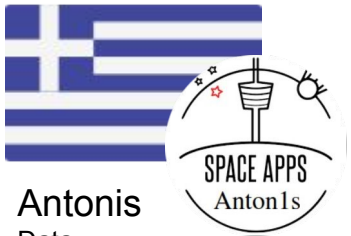
**Olha**
Geographer



**Magda**
Project Manager



**Rabin**
Researcher &
GIS Analyst




**Antonis**
Data
Scientist

**Michele**
DevOps
SW
Engineer

**Elie**
Social
Media &
Marketer

# Challenge

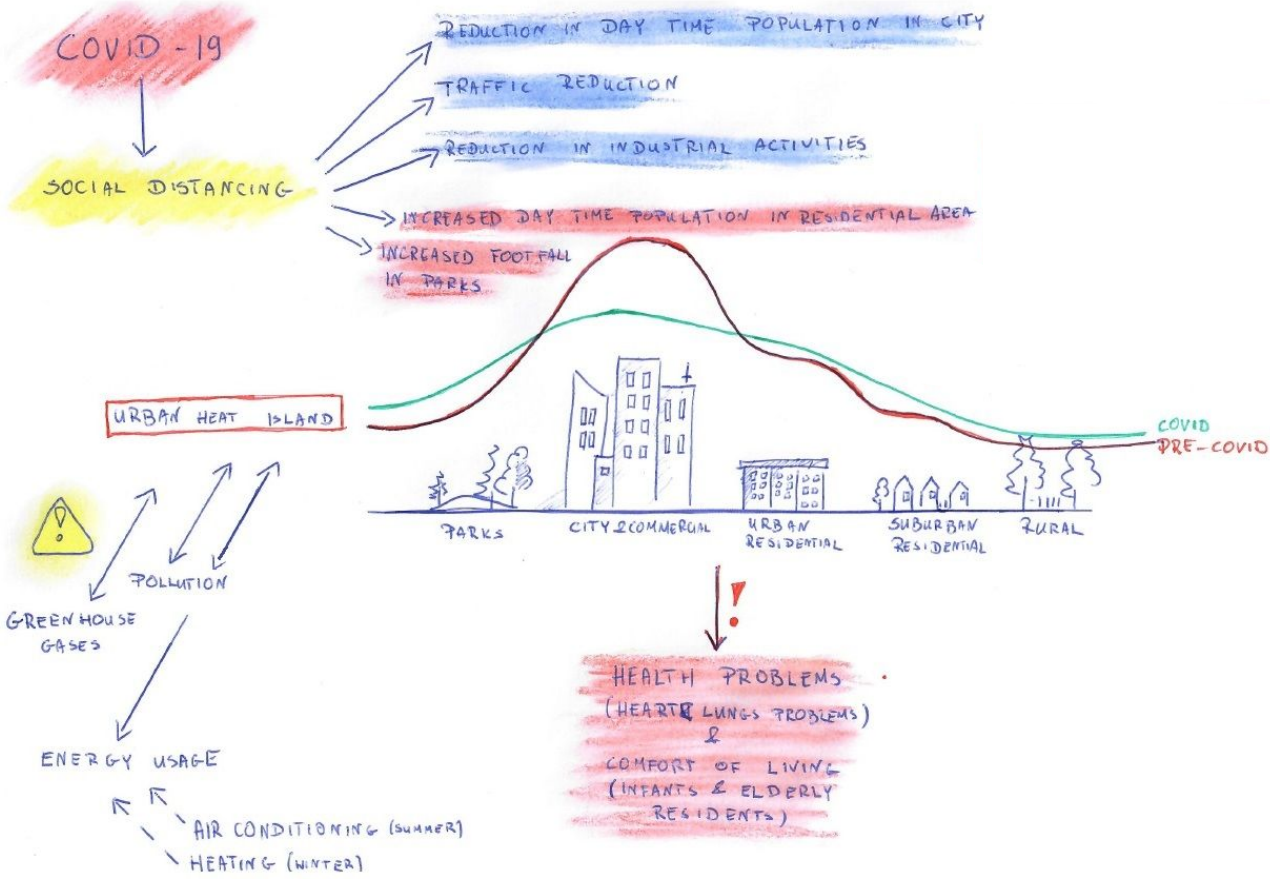
Use space-based data to document local changes in Urban Heat Island caused by COVID-19 related lockdown measures and limited human activity.

*Is there a change?*

*What is the magnitude?*

*What is the delay?*

## Impact of day time human activity change on Urban Heat Island

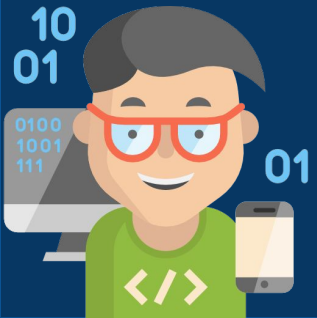


# Solution

LANDSAT 8

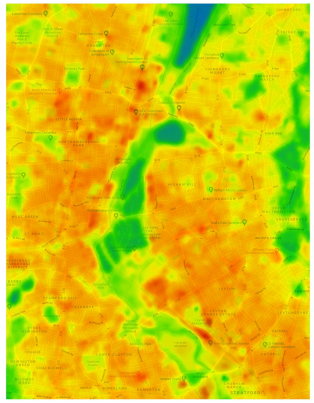
Meteo Data

Relative UHI measure

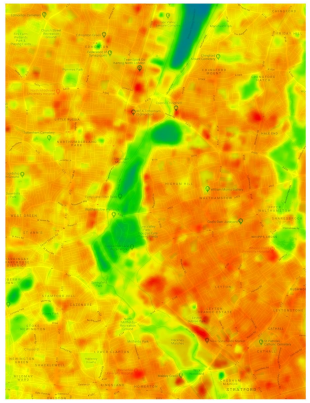



**We used Landsat-8 OLI/TIRS bands 4 and 5** for NDVI calculation and **band 10** to assess Land Surface Temperature and further to derive **Relative Urban Heat Index** using the equation:

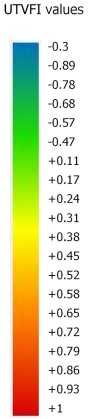
$$UTFVI = \frac{(LST - LST\ mean)}{LST\ mean}$$



LONDON, 15 APRIL 2019



LONDON, 21 MAY 2020




UHI index for Walthamstow, London based on the data from LandSat 8 OLI/TIRS data obtained from Collection-1 Level-1 Dataset. https://earthexplorer.usgs.gov/

We looked at the temperature time series data from Meteomatics. We analyzed the period of March and April 2020 (pre-lockdown and lockdown) for London and surrounding rural areas. Also we accessed historical data for the same period in 2019 to use in further comparisons.

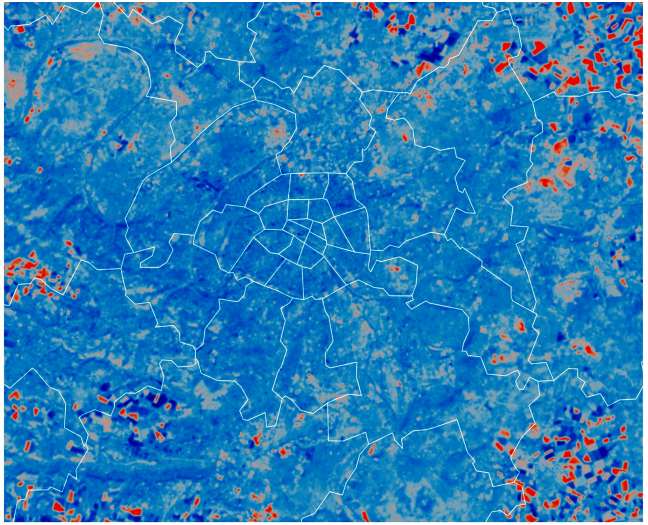
# Results

There results can be used as input/control data in other Covid-related research projects.

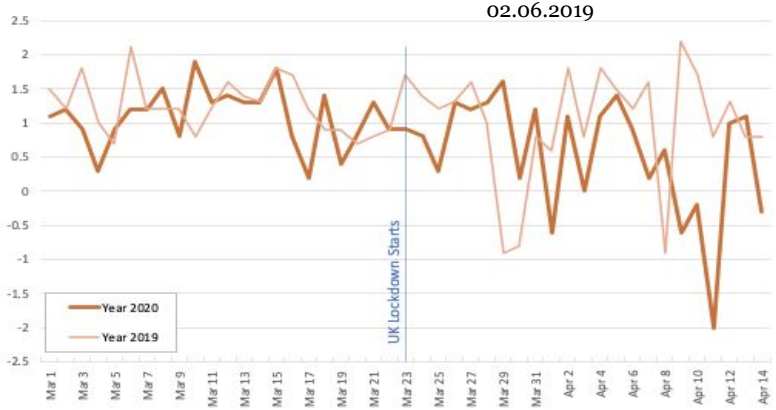
Valuable information for local authorities on arising problem areas due to UHI shift.

*Relative temperature increase in residential areas.*

Calculation of Urban Thermal Field Variance Index for Paris revealed local variation. The relative variance ranged from -1 to 1. The city center showed a drop in UHI index values, while the suburbs suffers from an increase, implying a local pattern shift, as expected.




LandSat 8 OLI/TIRS data obtained from Collection-1 Level-1 Dataset.
**Paris**: Image shows difference in UTFVI values between 01.04.2020 & 02.06.2019




Temperature data from Meteomatics

The average difference in UHI magnitude between 2019 and 2020 for the period of lockdown (23 March - 30 April) was -0.4° C.

# Next Steps

We expect to observe with some delay UHI increase after termination of lockdown measurements due to increased private vehicles traffic and the return to normal life habits.

*Verify*
*Apply to other Cities*
*Measure after lockdown*

Apply same principle analysis to other major cities

Add more satellite datasets to mitigate cloud issues

Implement application to calculate UHI on the fly

Add detailed meteorological data to further enhance UHI calculations

**References:**
Jovanovska Kaplan, Gordana & Avdan, Ugur & Yigit Avdan, Zehra. (2018). Urban Heat Island Analysis Using the Landsat 8 Satellite Data: A Case Study in Skopje, Macedonia.
Subhanil Guha, Himanshu Govil, Anindita Dey & Neetu Gill. (2018). Analytical study of land surface temperature with NDVI and NDBI using Landsat 8 OLI and TIRS data in Florence and Naples city, Italy, European Journal of Remote Sensing, 51:1, 667-678.
Icons made by Freepik from Flaticon.