CLIMATE DETECTIVES 2021 – 2022

Eco besties

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RESEARCH QUESTION

What is the influence of urbanization of the city Prague on the climate and can we reverse it?

SUMMARY OF PROJECT

As we know, big cities have an impact on microclimatic conditions. In Prague, according to the document Climate change Adaptation, we can observe climate change, such as an increase in air temperature, an increase in the influence of urban heat islands, an increased number of heat waves and precipitation problems. The City of Prague is trying to implement an adaptation strategy to climate change in order to reverse or slow down negative impacts.

We would like to focus on the heat island effect. Heat Island is an area of the city that is significantly warmer than the surrounding area. It is created by replacing a natural surface (meadow, forest, field) with an artificial one (asphalt, concrete, glass), which retains much more heat from the sun's rays. As a result, the air in the city heats up more. It also has the effect that rainwater drains quickly from the surface into the sewer without it being able to cool it. Human activities such as heating, air conditioning, transportation and so on also have an impact.

We decided to use Sentinel-2 L2A and Landsat 8-9 to collect data from 3 different parts of the city. The Old Town Square, which is a typical city center, the Klánovice Forest with a reference to the natural habitat and the district around Kolbenova, which has undergone a number of changes and developers are trying to involve nature and water elements in the fight against the negative impact on the environment.

Figure 1: We decided to use Sentinel-2 L2A and Landsat 8-9 to collect data from 3 different parts of the city.

MAIN RESULTS

If we compare the 3 target areas we can see a difference. Line graphs show surface temperatures in our 3 target areas over 2 years. Let's look at the chart of the Old Town Square. In summer, the surface temperature climbs up to 40 ° C. But in winter we see that the temperature drops rapidly to -20 ° C. There is a huge difference between summer and winter. We can see there strong heat island effect. The NDVI index around 0 corresponds to areas without vegetation. On the other hand, the temperature chart of the Klánovice Forest shows more stable temperatures thanks to a healthy vegetation cover. The NDVI here is about 0.8, as it should be for a normal forest. We see that in summer there is not even 30 ° C. The coldest forest surface temperature is -10 ° C. Temperatures around Kolbenova are better than on the Old Town Square and changes are slower, but there is still room for improvement. The NDVI index here represents grasslands and shrubs (it usually fluctuates between 0.2 - 0.4).

We also conducted field research around Kolbenova to monitor what countermeasures they used here. The main reason why the effect of the heat island is not so obvious is the less dense development with parks and water features. There are terrain elements that help slow down the outflow of water in the Rokytka river. New buildings have retention ponds that are used to retain a certain amount of rainwater for a certain period of time before being discharged into a sewer or watercourse. We also went to the old factory where is now cafe and gallery. It's a wonderful use of the old space that was supposed to be demolished. Near the old factory we found an dead wood habitat for insects.

It is not possible to have the same cooling effect as in the Klánovice forest but there is still room for more trees and better rainwater management. We see that better results can be achieved, but there is still much room for improvement, for example, there is only a green roof on the entrance to the underground parking lot, but no building has a green roof. They can plant more trees and there is too much space with short-cut grass that dries easily. Rainwater from most buildings is also not captured.

Figure 2: Surface temperature charts from Landsat.

ACTIONS TO HELP LESSEN TO THE PROBLEM

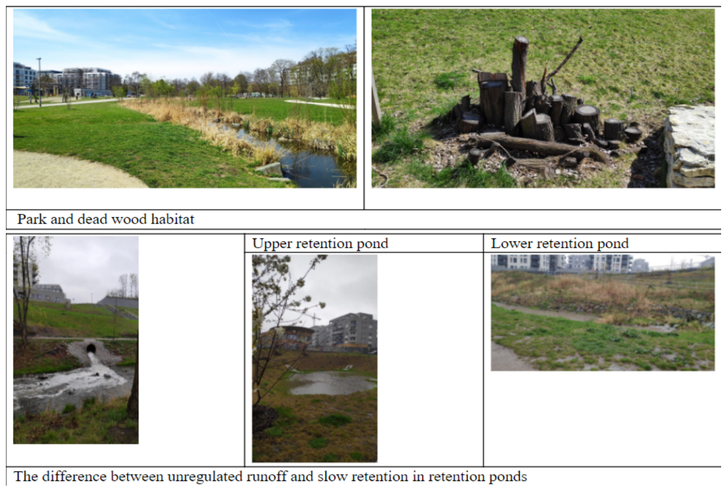

Figure 3: The district around Kolbenova countermeasures

For a start we shared information about this problem with our classmates and friends because we are future house owners and maybe also mayors of a city. We are preparing an escape game for our younger classmates, which will introduce them to the problems of the heat island. Due to the severity of the covid situation, we did not have enough opportunities to measure air temperature to compare different types of surfaces. So we used this opportunity only to get to know how Pasco Wireless Weather Sensor works. But we would like to conduct proper field research in the summer and use it for our new study.

Next step is to obtain contact with local authorities, developers and communities because is impossible to achieve anything without them. In the old parts of the city we need more trees and flowers. Forest areas like Klanovice forest is necessary to protect. In the new modern part of the city we can really achieve some cooling effect with the implementation of the green and blue infrastructure, but there is still much room for improvement.
Our next steps and more information we will be sharing on our instagram e.c.o.besties.