Urban Heat Island Effect

and Climate Change in the Netherlands

Research report, Globe Science Fair 2018

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Index

Introduction

Climate change is one of the main topics in the modern day society. Some people are contributing more than others to this rapid change. Some are trying harder than others to reduce the causes of the climate change. Furthermore it is highly important that a drastic change in our human behaviour occurs fast. The Poles are melting, land ice becomes liquid water which all causes the global sea level to rise. Some countries are literally fighting against the water to extend their existence.
Big cities are contributing the most to this rapid change, with so many people living closely to each other there are more toxic gases polluting the air than anywhere else. All these gases in combination with the sun and the high density of buildings cause the temperature to rise in those cities, this phenomenon is called the urban heat island effect (UHIE). However does this effect only occur in big cities or does in also effect smaller cities and less densely populated areas? In what way does the urban heat effect contribute to the temperature in smaller cities(cities with less than five hundred thousand inhabitants)? This curiosity is why we will investigate the following research question and subquestions.

In what way does the urban heat island effect contribute to the temperature in smaller cities?

- What is the urban heat island effect and what causes this effect?
- What is the expected influence on the climate change due to this effect?
- How can we measure the UHIE and what are the differences in outcome in various populated areas?

To do this investigation, we set up a plan to get our results. We will measure the temperatures in different kind of cities or parts of a city. We will also measure the temperature in a village and compare these results to the results from the cities. We picked Alphen a/d Rijn as our city. We picked Aarlanderveen and the outskirts of woerden as our village. Our idea was to measure the temperature of Alphen. We picked the centre of Alphen. We want to know if there is a difference in temperature between the centre of a city and more of the outer rings of Alphen, far away from the centre. We will measure the temperature in Woerden at the edge of the city, very close to the rural area. Our plan was to measure all these things on different days, but all at the same time. Alexander lives in Woerden, Calvin in Aarlanderveen, Anna in the centre of Alphen and Kylian in Kerk en Zanen. Of course we will do this on different times, one in the morning, one in the afternoon and one somewhere in the evening. To measure the temperature, we will use a thermometer. We do not have most of these materials at home, so we will borrow them from school for a couple of weeks and return them after we have our results.
With doing this field research we hope to get a better look at what the urban heat island effect does for a city like Alphen aan den Rijn.

Hypothesis

We think that the temperature will be lower in the countryside due to a smaller amount of buildings compared to the city. In the city, there are more and higher buildings, which cause the temperature to rise. The warmth is kept in between the buildings which leads to this higher temperature. We assume the air pressure will be lower in the city due to the higher temperature. Warm air will expand, which causes the pressure to be lower. We think that the windforce in the cities will be lower due to the fact that wind goes from a high pressure to a low pressure.

What is the urban heat island effect and what causes this effect?

The urban heat island effect is an effect that occurs in cities. It is an effect in which the city itself is significantly warmer than its surrounding areas and outskirts. It form a kind of bubble with warmer air than outside of it. The effect works both at day and at night but a larger difference is seen in at night because the warmth is then holded in the city. And in the outlands there is nothing to hold the warmth at that moment. There are several causes for this effect. One of them is that black surfaces of roofs and of the roads. These surfaces absorb more sunlight and thus warmth. Another cause is are the high building, these building do two things. The first this is they disrupt the normal reflection and absorption of the sunlight. Therefore there is more heat absorbed throughout the whole city. The second thing they do is keeping the warm air in the city. Due to the buildings and compactness it is difficult to transport the warm air out of the city cause there is less wind and warmth has to rise further to escape the city.

Measurements

Stand alone measurements:

Name: Kylian		
Location: Alphen aan de Rijn		
	Date:9/4/18	Date:10/5/18
Temperatuur (Celsius)	20 degrees	15 degrees

Name: Calvin		
Location: In the countryside near nieuwkoop		
	Date:9/4/18	Date:10/5/18
Temperatuur(Celsius)	22 degrees	16 degrees

Name: Anna			
Location: In the City of Alphen aan de Rijn			
	Date:9/4/18	Date:8/5/18	Date:10/5/18
Temperatuur(Celsius)	20 degrees	27 degrees	15 degrees

Name: Alexander					
Location: On the outskirts of Woerden					
	Date:9/4/18	Date:13/4/18	Date:4/5/18	Date:8/5/18	Date:10/5/18
Temperatuur (Celsius)	15 degrees	13 degrees	17 degrees	28 degrees	15 degrees

Graphs

Measurements over the day

Measured by Alexander

Measured by Anna

Measured by Alexander

Measured by Anna and Alexander

Conclusion

To conclude all this, the project was about the Urban Heat Island. The Urban heat island basically is an effect that happens in cities and urban areas. These cities and urban areas are warmer than the surrounding more rural areas. This project was all about this effect and the differences in temperature between the Urban areas against the Rural areas to look if the Urban heat island actually exists and if it also happens here in the Netherlands in cities like Alphen and Woerden. Looking at the temperatures in Alphen and in Woerden, it is clear that in the afternoon the temperatures are the highest. The only difference is that in Alphen maximum temperature is reached way earlier than in Woerden. In Alphen it is the hottest at the begin of the afternoon and in Woerden at the end. Also looking at the Urban heat island, there is not a big difference in the different places of measurements. The difference is like a maximum of 1 or 2 degrees.

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