

Violent rainwater

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Abstract

In the Netherlands we have a lot to do with water. For many centuries we have been threatened by flooding danger. In the last few years we have developed several technologies to protect our country against floods. That's why we have dikes and the so-called Deltawerken. With that system we created a whole new province. Also we have a lot of effluent treatment plants that give us the ability to have a lot of clean drinking water. The purpose of the Dutch water management is to make sure that we maintain dry feet, whilst having sufficient and clean drinking water.

Unfortunately, The Netherlands have less experience in the field of water management, especially when it comes to rainwater. Often, the water runs straight into the sewer, where it is mixed with wastewater, prior to entering into the effluent treatment plant. Of course, this is a waste of water and energy. In addition there tends to be more violently rainwater, as a result of global warming, while at the same time sea level rises, of polar ice melting.

Much area in the country is paved, which ensures fast transport of water into the sewer. As a result of this, the sewer system reaches the limits of the amount of water it can handle, which in turn may cause flooding of local areas.

Also the city of 's Hertogenbosch is confronted with rainwater issues, caused by urbanization. After a sever shower, a lot of water remains on the streets. In addition there is little space for plants, due to a high part of paved areas.

The municipal authorities of the city are in need of advice on how to restructure the city in order to make better use of rain water, having nature in mind. Firstly, we will investigate possibilities for capturing rainwater. We'll also search for unnecessary pavement. After this we will review which methods may be applied in 's Hertogenbosch.

We will conclude with reporting our findings back to the authorities consisting out of a map from the new décor.

Keynotes

's-Hertogenbosch, Rainwater, Pavement

Introduction

When there is a heavy rainfall in an urbanized city there arises a flood in big parts of the city, caused by unnecessary paved areas. The city probably has an sewerage system, but when there is too much water it can't handle all of it by itself. So by taking some pavement away and instead letting water go in the ground you reduce the flooding. But that is not the only benefit that it gives, you can also make a city greener, which is not just better for the environment, according to a Dutch book '*Natuur in de stedelijke omgeving*' nature brings people together and makes them feel safe. For a city it's important that people feel safe because if you don't feel safe, you don't want to live there. We have visited two areas in 's-Hertogenbosch to give our point of view on what could be changed. We will also investigate what kind of plants could be used based not only on how much rainwater tends to fall but also on what type of ground there is in the different areas. We will conclude these findings in our poster-presentation at the water is life conference.

Purpose

The purpose of our project is giving advice to the municipal authorities of the city of 's-Hertogenbosch on how to restructure the city in order to make better use of rainwater, having nature in mind.

Method

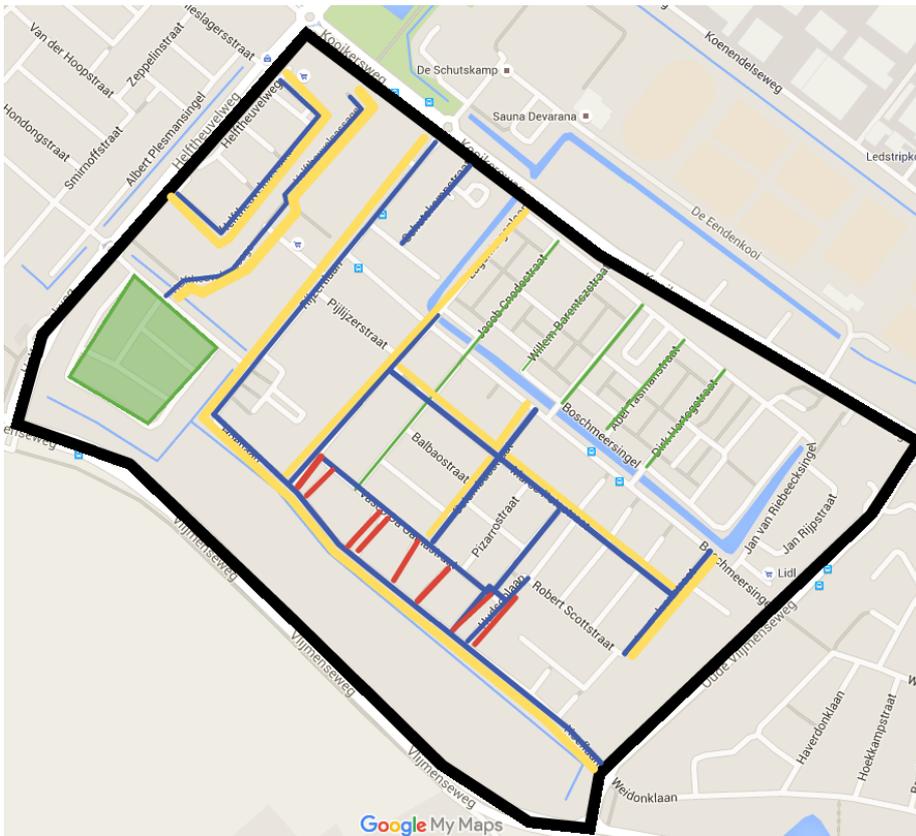
- Firstly we investigated the different possibilities for capturing rainwater
- With this information we were able to choose two parts of 's-Hertogenbosch which one of them really needed some changes and the other one was less in need.
- We visited the two parts to take pictures and to note what we think could be changed on the table we made beforehand, to cross what could be changed in the areas.

Streetname:		Notes:
Parts of the sidewalk aren't being used		
Few pedestrians		
There is a pond or something else with water		
There is a grass area		
There is a paved and / or not used area		

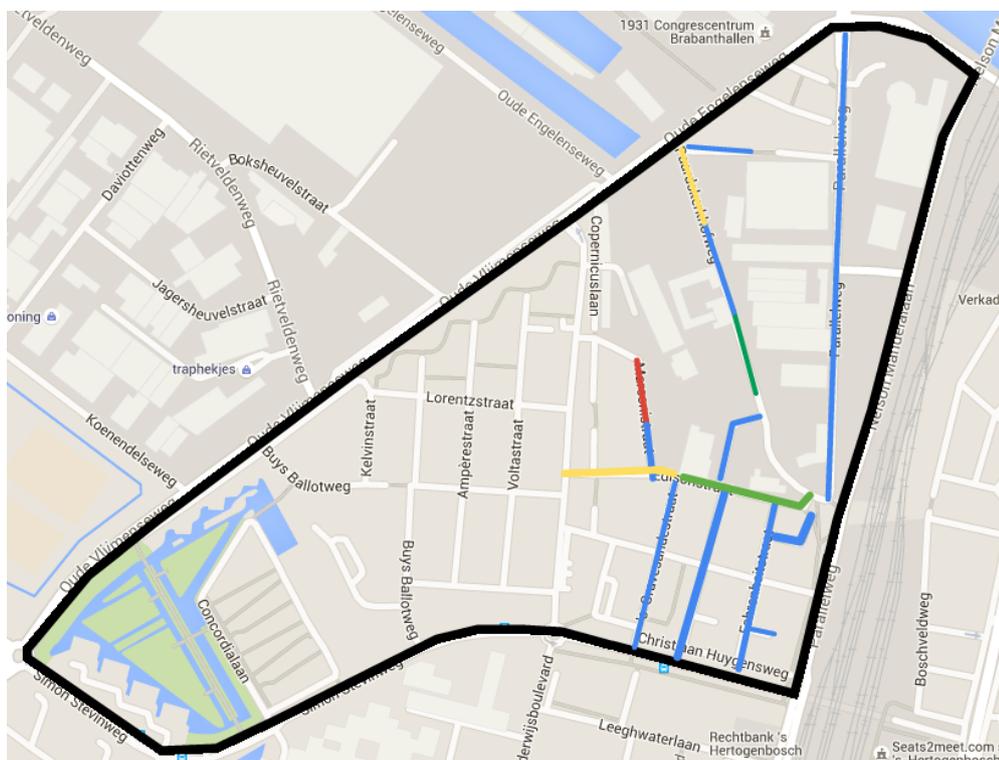
- After each visit we took our notes and pictures and made the two maps in which we included the different possibilities.
- We will do some more research on which plants we could use best, based on how much rainwater tends to fall in a heavy rainfall and based on what type of ground the neighborhoods have..
- We also concluded this information in our maps.

Results

Map 1



Map 2



Explanation lines

	problem	solution
Yellow line	Wide pavements	Terrace tiles, grass strips or trees
Green line	Large road surface	Grass strips
Blue line	Plenty of parking places	Grass tiles
Red line	Tiled squares	Grass surface

Woody plants for wet locations

+ = can be under water for a short period.

++ = can be under water for months.

Species name	Plant type	Water tolerance	Note
Acer negundo	Tree	+	Can be under water for 1-6 months
Abies balsamea	Conifer/tree	+	
Alnus glutinosa	Tree/bush	++	
Andromeda polifolia	Bush	++	Only in acidic soil
Betula nigra	Tree	+	Can be under water for 1 month
Betula pubescens	Tree	+	
Carya aquatic	Tree	++	Can be under water for 1 year
Cephalanthus occidentalis	Bush	++	Can be under water for 1 year
Crataegus mollis	Tree	+	Can be under water for 1-6 months
Myrica gale	Bush	++	Only in acidic soil
Nyssa aquatic	Tree	++	
Salix alba	Tree	++	
Salix aurita	Bush	++	
Salix babylonica	Tree	++	
Salix caprea	Bush	++	
Salix cinerea	Bush	++	
Salix grazilistyla	Bush	++	
Salix nigra	Bush	++	
Taxodium distichum	Conifer/tree	++	

<http://www.vitalegroenestad.nl/wadi>

Conclusion

There are a lot unnecessary paved arias in the neighborhoods we visited in 's-Hertogenbosch.

As a follow-up study we are going to find out which plants we could use best for the paved arias, based not only on how much rain tends to fall in a heavy rainfall, but also based on what type of ground there is in each aria.

That way we will be able to give the authorities better advice. The table for the rainwater we already inserted in this report.

Resources

<http://www.vitalegroenestad.nl/wadi>