Aquatic Quality in the city

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Inhoud

[Abstract 2](#_Toc1673853720)

[Research question 3](#_Toc277284631)

[Hypothesis 3](#_Toc322920833)

[Theory 3](#_Toc1298781893)

[Materials 3](#_Toc1730343682)

[Method 3](#_Toc524266800)

[Results 4](#_Toc1747032980)

[Conclusion 4](#_Toc1231948322)

[Discussion 5](#_Toc1402117938)

[Possible improvements that can be made for future developments. 5](#_Toc1867238484)

[Suggestions for further research 5](#_Toc516487449)

[References 5](#_Toc666336733)

# Abstract

The first thing we did was argue on what subject we were going to choose. We decided to go for the aquatic quality. Then we went to 3 locations to collect some water. These locations were: the Oudegracht, the water purification plant and the pond behind Leidsche Rijn College. When we were there, we collected water in small tubes and dipped test strips in the water for a first test. When we were back at school, we took 2 other samples from destilled water and tap water and also used the test strips on these 2 samples. Then we divided every sample into 5 test tubes. And we started testing these samples with 5 different tests: the pH; and the concentrations of dissolved: PO4, NH4, NO2, NO3. We used the test kit from Visocolour ECO Analyse kit to test the samples. After all these tests we came to the conclusion that the water in Utrecht was cleaner than we thought it would be and, in the discussion, we talked about the things that could've gone better.

# Research question

What is quality of water in Utrecht, based on the abiotic factors of dissolved substances?

# Hypothesis

We expect the water quality in the city Utrecht to be worse, while in the suburbs it will be better.

# Theory

Research from Dunea has shown us that the standard values for drinking water for the substances we’ve measured are as follows:

pH: 7

PO4: 2.2 mg/L

NH4: 0.2 mg/L

NO2: 0.1 mg/L

NO3: 50 mg/L[[1]](#footnote-2)

# Materials

25ml water from 5 different locations (Oudegracht Utrecht, Waterzuiveringsplant Terwijde, Pond behind school, distilled water, tapwater)

25 Test tubes

25 stoppers

1 test tube holder

5 beakers

Test kit for water quality (Visocolour ECO Analyse kit)

Timer

# Method

We started by collecting water at five different locations in Utrecht. Here we collect 25 ml samples. Each sample was split into 5 5ml samples, each in their own test tube.

The indicators from the Visocolour ECO Analyse kit were used as per the guidelines in the manual.

# Results

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Destilled water | Tap water | Oudegracht | Waterzuiveringsplant Terwijde | Pond behind Leidsche Rijn College |
| pH | 6.5 | 8 | 8 | 7.5 | 8 |
| PO4 (mg/L) | 1 | 0.85 | 2 | 0.3 | 0.6 |
| NH4 (mg/L) | 0 | 0 | 0.7 | 0.2 | 0.3 |
| NO2 (mg/L) | 0 | 0 | 0.07 | 0.02 | 0.06 |
| NO3 (mg/L) | 3 | 3 | 3 | 3 | 10 |

Phosphorous does not have much effect on drinking water, instead it is used to measure the effectiveness of the purification process because phosphorous can usually be found in fertilisers and drinking water found in the Netherlands is usually originates from groundwater. [[2]](#footnote-3)

Concentrations greater than 1.5 mg/L of NH4 can result in a strange smell and taste. Furthermore, long-term ingestion of water containing more than 1 mg/l can cause damage to internal organ systems. [[3]](#footnote-4)

NO2 is poisonous, and if it gets into the bloodstream, it can cause cyanosis as it binds to the Hemoglobin in your blood, which in the worst case can cause brain damage and/or death

Approximately 5% of NO3 that has been absorbed by your body is converted into NO2 in the salivary glands, which as described above can cause death. [[4]](#footnote-5)

pH the measure of the acidity of the water, with a pH of 7 being neutral. If the pH is off, it can cause extreme sickness, damage tissues, or even death. [[5]](#footnote-6)

# Conclusion

Even ignoring biotic factors, this water is most certainly not potable. The levels of phosphorous are lower than the required standard, which would indicate that the purification processes are effective. The levels of ammonium aren’t all under, some are above. But again, doesn’t have disastrous consequences. All samples have a low amount of NO2, which is good as NO2 is the most concerning. The pH value of the water is off by a verry small amount. This will not have any disastrous consequences.

As we can see in our results the water treatment plant, cleans the water by lowering the pH-value. Next to that it filters out the NO2, the ammonium and the phosphorous as well. After the cleaning of the water, it is almost as safe as the tap water, if it were not for the fact that there is still some NO2 in the water there, wich is highly dangerous and, even though it is a safe amount, you would never want to have in your drinking water.

In conclusion, the water that streams through the locks and canals in Utrecht is relatively clean, and, though we wouldn’t recommend due to the biotic factors in the water, is relatively safe to drink.

# Discussion

In line with the hypothesis, the water quality of Utrecht city was worse compared to the water quality of the water nearby our school and the water purification system, when looking at the values of drinking water by Dunea. The water samples from Utrecht had the highest amount of PO4 compared to all other water samples, as well as NO2 and NH4. Our collected data tells us that the water from Utrecht stad have a concentration of 0,7 mg/L of NH4, which is way above the standard values of Dunea (0,2 mg/L). The same can be said of the concentration of NO2 which is 0,07 mg/L, while is should be 0,1 mg/L at most.

## Possible improvements that can be made for future developments.

- Instead of one, we could’ve used two or perhaps three quicktest strips to reduce the measurement uncertainty.

- We could've used more water samples that were taken on multiple days instead of one to reduce the measurement uncertainty.

- Because of time pressure, we didn’t bother to wait for the small test-tubes to completely dry before putting another water sample in it when working with the Visocolour ECO Analyse kit. This left the possibility open of small leftovers from the previous water sample mixing with the new water put into the test-tube. Though this probably is insignificant, it could be prevented by either using enough test-tubes and not reusing any, or by letting the test tubes dry completely.

- Since we took water samples by multiple locations, there is some time inbetween the taken samples. To make sure that time won’t be a factor in the research, we could’ve all spread and taken the samples at the exact same time, each at a different location.

- We left some air in the containers where we kept the water. This should be avoided next time, since we follow protocol.

- To reduce measurement uncertainty, we could’ve determined the data twice with the Visocolour ECO Analyse kit instead of one by using multiple samples as mentioned before.

## Suggestions for further research

A possible topic for further research could be researching the health issues related to water quality. Further research could focus on how the water quality changes depending on the location.

# References

Department of Human Services . (2000). *Technical bulletin Health care ammonia.* Portland: Office of Environmental Public Health.

unknown. (2023, may 26). *bedrijfstechnische parameters*. Opgehaald van Dunea duin & water: https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/bedrijfstechnische-parameters#:~:text=Een%20concentratie%20van%201%2C5

unknown. (2023, may 26). *gezondheidskundige normen*. Opgehaald van Dunea duin & water: https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/gezondheidkundige-normen#Nitraat%20en%20Nitriet

Bedrijfstechnische parameters | Dunea Duin & Water. (n.d.). Www.dunea.nl. Retrieved May 26, 2023, from https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/bedrijfstechnische-parameters#:~:text=Een%20concentratie%20van%201%2C5

Gezondheidkundige normen | Dunea Duin & Water. (n.d.). Www.dunea.nl. Retrieved May 26, 2023, from https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/gezondheidkundige-normen#Nitraat%20en%20Nitriet

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1. <https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/bedrijfstechnische-parameters#Fosfaat%20(totaal)> & <https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/bedrijfstechnische-parameters#Zuurgraad%20(pH)> [↑](#footnote-ref-2)
2. <https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/bedrijfstechnische-parameters#Fosfaat%20(totaal)> [↑](#footnote-ref-3)
3. <https://www.oregon.gov/oha/PH/HEALTHYENVIRONMENTS/DRINKINGWATER/MONITORING/Documents/health/ammonia.pdf> [↑](#footnote-ref-4)
4. <https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/gezondheidkundige-normen#Nitraat%20en%20Nitriet> [↑](#footnote-ref-5)
5. <https://www.dunea.nl/drinkwater/waterkwaliteit-en-samenstelling/verschillende-normen/bedrijfstechnische-parameters#Zuurgraad%20(pH)> [↑](#footnote-ref-6)