

# GLOBE

*Water quality in Delft and surroundings*



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## **Abstract**

We have conducted this study with the goal to investigate the water quality in our locality and see if the water is in a good condition and if there are any differences between the city centre and its outskirts. We thought that there would be substantial differences between the water quality of the city and the countryside. Considering the fact that eutrophication takes place in the countryside, the levels of nitrate and phosphate were expected to be higher and the oxygen level lower in comparison to the city. However, we also foresaw that the water quality would still be acceptable. We did measurement on the nitrate, phosphate and oxygen level, the pH-value and the temperature of four waters located in or around the city of Delft. In addition to more accurate results, we measured twice at each location. The results showed that our hypothesis was partly correct. There were no big differences between the waters in the city centre and the countryside but the quality of them are good. Therefore, we can conclude that our hypothesis is almost fully correct.

**Research question and hypothesis:**

Water is a big part of our life, but is the quality good? In 2000 the EU set up a organisation called the EU Water Framework Directive (WFD) which would work for better water qualities within the EU. The WFD came up with certain standards the water quality had to meet. With our research we want to find out whether the water in our region is from good quality. We will specifically look at the differences in water qualities between the city (Delft) and the countryside (Schipluiden, Delft-zuid). Is there a difference between these water qualities or not? In what circumstances is the water cleaner and what influences it?

**Materials and Methods:**

For this experiment we used a JBL O<sub>2</sub> (Oxygen) test, a JBL NO<sub>3</sub> (Nitrate) test, a easy-life PO<sub>4</sub> (Phosphate) test, a thermometer and a pH-value test. We first took a sample of one of the waters and followed the manuals which came with the tests. Before all checks, we measured the outside temperature and the temperature of the water.






With the pH value test we dipped the pH paper in the water and waited for it to change colour. Then we compared that with the colours given. The matching colour would be the corresponding pH-value.

The O<sub>2</sub> test came with a test tube to put the water in and two bottles with liquid called O2 1 and O2 2. We first cleaned the test tube with the water we were going to test, to make sure that the tube was only filled with the water we wanted to test. We then filled the test tube fully and made sure no more could be added. Then we took the tube and added six drops of O2 1 and six of O2 2. The other bottle was our control group in which we didn't add anything. Then we shook the tube in which we added O2 1 and 2 for 30 seconds. We then compared the colour of the liquid with the colours on the table which was included with the box .

The NO<sub>3</sub> test came with two test tubes to put water in, a small spoon and two bottles, one filled with liquid and one filled with powder. With this test we also cleaned the two test tubes first with the water we were testing. After that we filled both tubes with 2,5 mL water, one of them was the control group. We added two small spoons of the powder to the test tube which wasn't the control group and after that also added six drops of the liquid. Then we shook the tube for 1 minute and left it for 10 minutes. We then compared the colour to the test paper.

The PO<sub>4</sub> test came with a test tube and two bottles called PO4 1 and PO4 2. We cleaned the test tube with the water we were testing with. After that we filled it with 2 mL water. We added 4 drops of PO4 1 under a 45 degree angle and 9 drop of PO4 2 under a 45 degree angle. We shook it lightly for a few times and waited for fifteen minutes. After the fifteen minutes we compared the colour of the liquid to the ones of the test paper and noted the numbers.

We repeated this with different samples of water from different places and repeated this process again another day to check whether it had changed.

	<b>Phosphate test:</b>
	<b>Oxygen test:</b>
	<b>Nitrate test:</b>
	<b>PH indicator strips:</b>
	<b>Thermometer:</b>

**Research journal:**

	City- centre (canal)		Schie (water way)		Tanthof (ditch)		Schiplui den (pond)	
	24-4	3-5	24-4	3-5	24-4	10-5	24-4	29-4
Nitrate mg/L (ppm)	1	1	1	< 0,5	< 0,5	< 0,5	1	1
Oxygen mg/L	8	10	7	10	9	10	10	10
Phosphate mg/L	0,2	0,3	0,2	0,3	0,1	0,3	0,5	0,2
pH- value	7	10	8	7	8	8	7	7
Temperat ure °C	15	8	16	13	17	14	18,5	11
Outside temperatu re	22	18	22	18	22	16	22	14

**Data summary:**

	Nitrogen mg/L (9 ppm)	Oxygen mg/L (9 ppm)	Phosphate mg/L	PH- value
Good quality	<0.5 till 1	8 till 10	0.005 till 1.0	>7

**Analysis and results:**

Based on the tests we did, you can tell that there isn't much of a difference between the city centre and the outskirts of the city. Of course the water- and outside temperatures were different, this is because a few waters were tested on different days with different types of weathers. But besides that, there is a noticeable difference between the oxygen values from the Schie. On test day one, the value is only seven, and on test day two, the oxygen increased to ten.

The phosphate values were fine, they were beneath the 0.5 mg/L. Only the values from the pond in Schipluiden on the first testing day came close to the maximum so were rather high.

The Ph-value from day one in the city centre was just neutral. All the other Ph-measures were a little bit higher, but not too much that the water quality would be bad.

The nitrogen levels were totally fine so there is no problem there.



**Conclusion:**

We can conclude there isn't much of a difference between the water quality in the city and the countryside. We have used different materials to measure the water quality. The factors, which influence the water quality, that we have discussed are:

- Oxygen → By using an oxygen test we can conclude that the oxygen is sufficient in the city and countryside for aquatic organisms to live. The oxygen level is higher when the water temperature is lower. This is because warm water is less capable of holding dissolved oxygen. This causes aquatic organisms in a weakened physical state. In the measurements you can see that the oxygen rate is higher by a cooler temperature.
- pH → By using a pH indicator we measured the pH value. The pH value of the water is mostly 7, neutral, or 8. Something noticeable in the measurements on the 3rd of May of the Schie is that the pH value had increased to pH value 10. The pH value was in all probability affected by a detergent solution that had been thrown in the canal.
- Temperature → We measured the water quality on different dates. The first measurements were on a sunny day, so the water was warmer too. The water in Schipluiden was warmer than the water of the canals. This is caused by two factors. The first factor is that the houses next to the canal shadow the canal. The water in Schipluiden wasn't shadowed by houses. Also the flowing water made the temperature lower. The water in the pond did not flow. The temperature influences the oxygen rates.
- Nitrate → Nitrate comes from earth and an oxidized form of nitrogen. Nitrate is a source of food for algae and other plants so it's important that the level of nitrate is high enough in the water. However, algae shouldn't have an unlimited source of nitrate because algae can cause extreme fluctuations in dissolved oxygen. The nitrate rate is sufficient and good for plants to grow. The nitrate level was good in all the tests.
- Phosphate → Phosphate is needed too for plants to grow, however, too much of phosphate causes algae which has negative effects. Algae will reduce the amount of sunlight available to other plants, which will kill them. Phosphore comes from fertilizers, human and pet sewage, chemical manufacturing, vegetable and fruit processing and the pulp and paper industry.  
Also the phosphate level was well in all the tests.

## **Discussion**

If we would redo this research, we would repeat the measurements more often. By doing this we would have more data to base our conclusion on. Also the data would be more reliable. An example for this is the difference in Ph-value between the measurements from the water in the city centre.

On the twenty fourth of april the Ph-value was 7, while it was 10 just two weeks later. This is probably due to water containing cleaning agents, that have been thrown in the water.

Another point of improvements is that we have to measure the temperature of the water either all in a sunny place, or in a shadow place. But this was very difficult to do due to the high quay in the city centre. The only place where we could come close to the water was next to a bridge, resulting in a place that is shadowed for a big part of the day. This could be the reason for the lower temperature.

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