

1	Our society has to move toward a circular economy. For waste water that means that we should re-use it. We should re-use the plant nutrients in agriculture, as fertiliser. Nitrate and phosphate are especially important nutrients, and also very unsustainable in the current system
2	Take nitrate for example. It is produced in fertilizer factories. This one is the largest fertilizer factory in the Netherlands, and also one of the largest CO2 emitters in the Netherlands. To produce nitrate, it uses 4 gigawatts of energy. That's the same as the combined capacity of all the land-based Dutch windmills.
3	Phosphorus comes from phosphate mines, mainly from Morocco. According to some researchers, the commercial phosphorus reserves will run out within a 100 years. Others think that supplies will last longer. In any case, it is a scarce resource that we should not waste.
4	Phosphate and nitrate become part of our food, and ultimately they end up in the waste water. We have developed very efficient systems to treat waste water, that destroy the nitrate and the phosphate. And to do so the waste water treatment plant consumes a very large amount of energy.
5	So we need a circular system that doesn't consume energy but produces it, and that doesn't destroy the nutrients but recovers them. One way to do that is by separating the waste water in the house into black water from the toilets, and grey water from the rest of the house.

6	If you treat the waste water separately you will get many positive results. Recovery of fertilisers. Biogas from black water. Heat from grey water. Saving and re-using water. More efficient treatment. And you can also use the system for food waste collection.
7	To do this you need a different sewerage system inside the house. Vacuum sewers for the black water, to keep it as concentrated as possible. Maybe also for the food waste. Normal sewers for the grey water. This is only possible in new houses, or in houses that are completely renovated.
8	Waternet has started a pilot project for in an old industrial area of Amsterdam that is being redeveloped. We have started with two partners: a social housing corporation that is developing around 800 apartments in different blocks, and a cooperative of citizens who have built 46 floating houses.
9	To treat the waste water we have built a small treatment plant. We call it a biorefinery. It will be a net producer of energy, and it will recover plant nutrients. It has a treatment capacity for around 2000 inhabitants. It had to be a floating facility because of the lack of space on land.
10	This is just a small project, but it is meant as a pilot for a much larger one. Amsterdam is creating new islands to build more houses. This one is called Strandeiland ("Beach Island"). In 5 to 10 years it will have 8.000 apartments for around 20.000 inhabitants. And it will have a separated sewerage system.
11	Amsterdam is not the only European city that is trying to make its waste water more circular. There already is a pilot in another town in Holland. In Hamburg, Germany there is a small neighbourhood with waste water separation, and on the right a similar project in the city of Gent, here in Belgium.

12	Unfortunately, we had several setbacks in our project. For example, the construction of the apartments was delayed by almost two years because some business owners in the area were contesting the building permits. That meant that we also had to delay our project of course.
13	We also found that the vacuum toilets cause more noise than allowed. In neighbouring apartments you should not hear more than 30 decibels, but the vacuum system sometimes produces 37 decibels. We are now trying to find a solution to this problem.
14	Last October we had a major setback. The bio refinery was at a shipyard. Due to a stupid mistake by one of the employees, it has sunk, and it was severely damage. It has been salvaged, the insurance will pay the damage, we are going to repair it, but there will of course be much more delay.
15	We have learned a lot of lessons here. First one: for an innovative project you need good cooperation with all the stakeholders, and shared ambitions. But you should also recognise that different parties have different interests, and that you need formal agreements with a clear division of the responsibilities
16	Innovative projects are vulnerable. To start things up you will need a lot of improvisation, but in the long run the project will only survive if there is a clear vision. And in a practical sense: if a project is very innovative, you can expect builders and installers not to understand it, so they can easily screw it up.

17	<p>The financial crisis was a great environment for innovations. The normal developments came to a standstill, and suddenly there were opportunities for out of the box thinking. When the economy is going well, there is not so much room to fool around. So never waste a good crisis.</p>
18	<p>This project was subject to many uncertainties and delays. This is a bit of a problem for European projects such as Cityzen, because these have to be completed within five years, including one year of monitoring. As a result, this project did not fit well within the time frame of Cityzen.</p>
19	<p>Another lesson: the importance of multiple pilot projects to discover the small issues that can become big problems. For example, there had already been a small pilot in another city, but in that project the noise of the vacuum toilets was not detected as a breach of the building regulations.</p>
20	<p>So, it remains to be seen whether this system is the best solution to make wastewater circular, and if it should be scaled up. Right now it is more expensive than traditional sewerage, but we think that it is still the best way to make waste water circular.</p>