innovation

Research & Innovation

Annual Report 2016

waternet
waterschap amstel gooi en vecht
gemeente amsterdam

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R&I Annual Report 2016 Foreword

With its strong Research & Innovation programme, Waternet is preparing for the future: introducing new technologies, improving operations and responding to challenges in society. Equally, Research & Innovation offers great opportunities to build and strengthen contacts with water cycle companies in other countries that face the same challenges.

In 2016, we strengthened our links with PUB in Singapore, HOFOR in Copenhagen and Berliner Wasserbetriebe in Berlin. This annual report highlights the most important results achieved by the research & innovation programme carried out on behalf of the Regional Public Water Authority Amstel, Gooi en Vecht and the City of Amsterdam.

Jan Peter van der Hoek, Head of Strategic Centre, Waternet

Relaxing on the Sunny Rain Solutions water bench, Waternet's 10th Anniversary Festival

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“10 years of #Waternet. Dragons' Den.
Great ideas.”
28 May 2016 @GerBaron

'Better every day' book of ideas

The 2016 motto “Better every day” was the inspiration for a competition that invited colleagues to suggest knowledge and innovation ideas. Three ideas – the canal edge, the groundwater map and LoraWan - made it through to the Dragons' Den.

Book of ideas and funding

The members of the judging panel Roelof Kruize, Ariane Hoog (Regional Public Water Authority Amstel, Gooi en Vecht), Ger Baron (CTO, City of Amsterdam) and Evelien van der Heijden (Young Waternet) provided funding for the three ideas. In total over sixty ideas were collected in the book of ideas. The ideas were matched with clients and valued.

The canal edge

Waste ends up in the canals of Amsterdam when it is windy or the streets are swept or pressure-cleaned. An edge on the water side of the canal can prevent this from happening.

The canal edge works at a test location

Dragons' Den

A first test was conducted in 2016, in partnership with the Amsterdam Project Engineering department. A 10-cm canal edge keeps out 80 to 90% of the waste. There will be a follow-up to the test in 2017, in alliance with the City of Amsterdam.

Testing LoRaWAN coverage in the dunes, Photo: Pieter Nijdam

LoRaWAN to boost communication in the dunes

LoRaWAN (Long Range Wide Area Network) is a new communication technology for wireless communication. Its applications include the Internet of Things. LoraWan uses much less energy than existing communication technology. This means its battery life can be up to four times that of the solutions currently in use. In the Amsterdamse Waterleidingduinen (Water Supply Dunes) the reach of the GPRS transmitter masts is not good. People drive through the dunes area every day to inspect water levels. Thanks to the application of LoraWan, water levels can be displayed on a smartphone, reducing the number of inspections required. Leiderdorp Instruments was selected to develop sensors that can read the water levels using LoraWan. The test will be conducted in 2017.

Groundwater map

During roadworks, etc. in the city, in order to deal with the groundwater in the right way (when it comes to discharging or drawing up water), you need to know where areas of pollution are located. A database of readings is available from an external party. In 2016, a start was made in exploring the options for mapping these readings, making them accessible to everyone. Unfortunately, it proved impossible to convert the information into safety categories directly. Work is therefore now underway to interpret the textual data in order to use it to populate the map.

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New Sanitation: sustainable processing of waste water

We have a highly effective waste water processing system in the Netherlands. It is among the best in Europe. Almost all waste water is treated in some way or other. But this does not necessarily mean we are ready for the future. Domestic waste water contains valuable raw materials (including phosphate) and energy (biogas and heat). Waste water is a valuable resource!

Separation of waste water streams

In order to extract energy and raw materials from domestic waste water, it is necessary to separate the different streams at the source. This makes separate processing possible.

This new form of waste water disposal is referred to as New Sanitation. New Sanitation minimises the use of energy. Raw materials and heat are reused as far as possible. The circular city is in sight!

Overview of the key features of New Sanitation in the circular city

These different streams are:

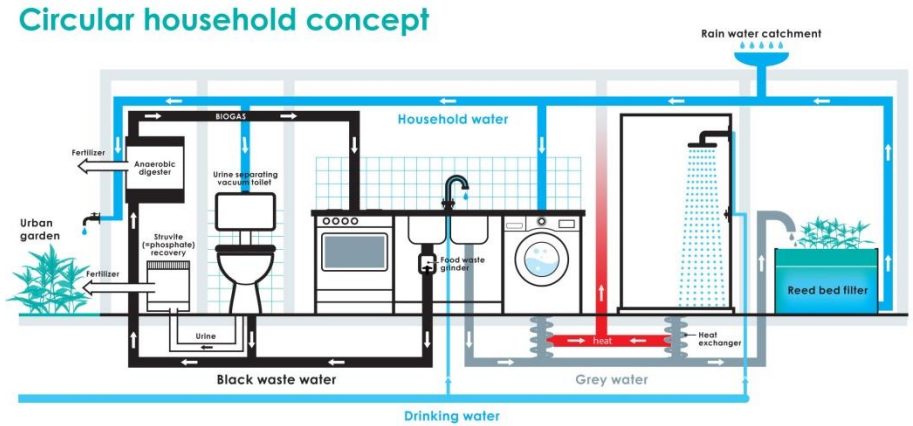
- concentrated “black water” from the toilet, possibly supplemented by organic kitchen waste via a kitchen waste disposal unit
- slightly polluted “grey water” from the kitchen, dishwasher, washing machine and shower
- urine can sometimes be collected separately: “yellow” water
- rainwater

Multiple pipe system

New Sanitation is based on always separating black and grey water streams. The traditional gravity sewer is replaced by a multiple pipe system:
a vacuum pipe for black water with a vacuum toilet
a gravity sewer for grey water.

This concept was displayed in the New Sanitation show stand at a range of events in 2016 (see image).

The interior of the New Sanitation show stand



The circular house, New Sanitation in an infographic

Recapturing heat and raw materials

The separate collection of black and grey water makes it possible to recapture low-temperature heat from the grey water and biogas and raw materials from the black water (including phosphate). At local level, this can then help meet the house occupants' energy needs while also reducing CO_2 emissions. A great example of the circular economy in practice!
In the years ahead, Waternet intends to gain experience with a range of applications of New Sanitation. The first of these will be the establishment of a sanitation raw materials station in Buiksloterham!

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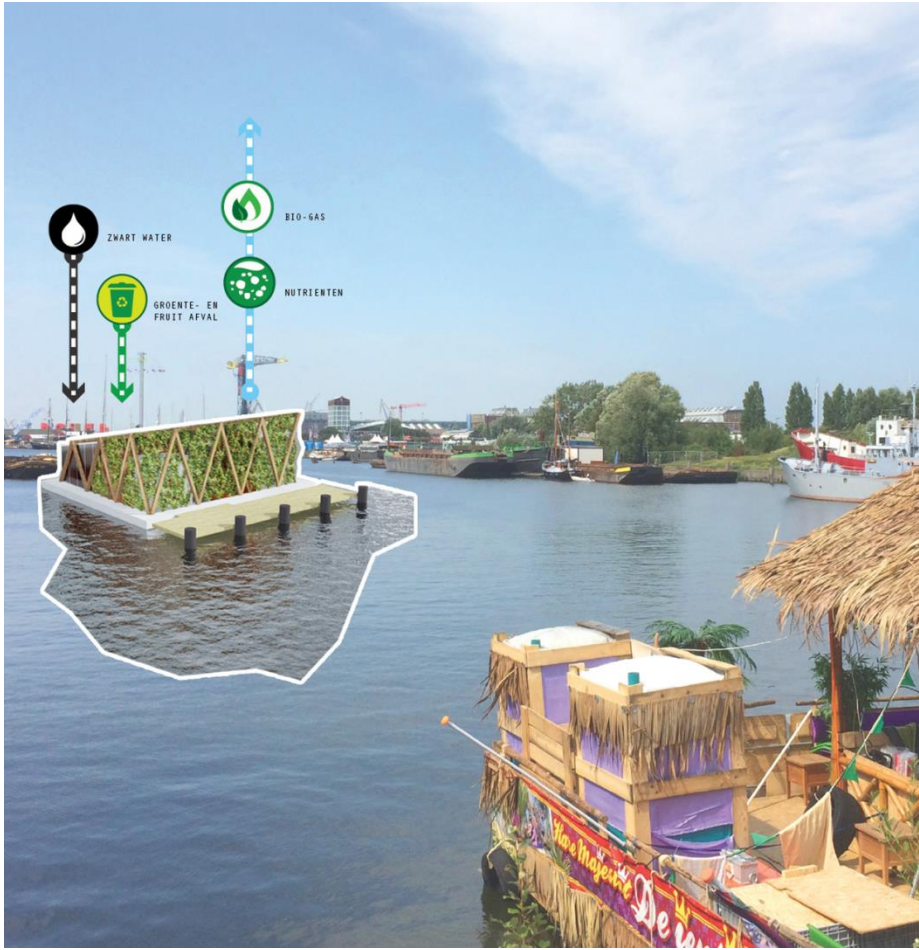
Circular Buiksloterham

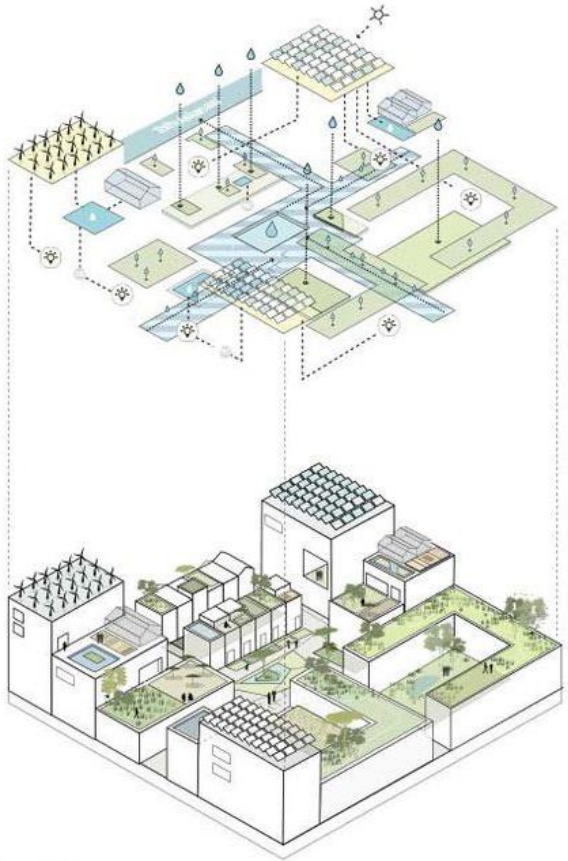
In 2016, we continued in our efforts to achieve the ambitions of the Circular Buiksloterham manifesto: building a sustainable future for the city. We made agreements on harvesting raw materials and applying New Sanitation.

New Sanitation and raw materials station

As part of the Schoonschip and Buiksloterham & Co projects, we made agreements about the application of New Sanitation with the parties involved. We were able to reach these agreements thanks to a financial contribution in the form of a European City-zen grant and a decision by the management board (accepting the risk of a fallback option). The preferred location for the integration of the (floating) raw materials station was based on a spatial plan and coordination with Amsterdam City Development. In December 2016, the water authority made available a preparatory loan for the application of New Sanitation in Buiksloterham.



BSH Raw Materials Station structural integration, One architecture



Circular options for new buildings, with a focus on ground-level rainproof systems (DELVA Landscape Architects / Studioninedots)

Water awareness

Our role in the Circular Buiksloterham network is raising water awareness among many developers. Rainproofing measures are being applied in a range of different developments. They vary from a rainwater harvesting system at ground level to the collection of rainwater in a bag in the crawl space. In addition, the rainwater harvested is being reused in a range of different ways.

Realisation phase

The experimental approach being applied at Buiksloterham is slightly at odds with the City's housebuilding commitments. The realisation phase is a time for genuine action, with little room for experimentation. Each collaborative partner in the network faces the challenge of building on the lessons learned from the first phases of Buiksloterham's development and applying these in subsequent phases.

Future

The challenge for the years ahead is to work with all collaborative partners in a concerted effort to achieve the collective objectives laid down in the manifesto while also achieving the objectives of the individual parties.

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The Calcite Factory under construction

Calcite pellets from softened drinking water are being treated in The Calcite Factory pilot plant. We intend to use them as high-quality raw materials for customers in food, feed, industry and chemicals. The end product is intended to be a sustainable alternative to quarry chalk.

Softening drinking water

Waternet softens drinking water in order to prevent scale formation on heating elements in washing machines, etc. For softening drinking water, we use seeding material. Lime particles become attached to the seeding material, forming a crystal. When the pellets have been removed, the water has been softened. They can then be reprocessed to create new seeding material. Using recycled seeding material in the softening process rather than quarry chalk is a major advance towards a circular process.

Calcite pellets

The Calcite Factory under construction

The Calcite Factory

Waternet is working on The Calcite Factory in partnership with Advanced Minerals. This pilot plant is being built in the Western Harbour area of Amsterdam. The plant reprocesses some of the calcite into new seeding material. The remaining calcite pellets are processed to make high-quality niche products for ceramics, paint, soil improvers and the carpet tile industry. Aqua Minerals (formally de Reststoffenunie) will be responsible for sales.

This project is initially being run in the form of a pilot in order to demonstrate within three years whether the concept is feasible. By opting for Advanced Minerals, specialists in calcite pellets, as a partner, Waternet has found an effective compromise between an in-house approach and leaving it to the market.

Impact on the drinking water sector

It is the explicit intention for other drinking water companies to become involved. Once the factory has become operational, demand-led supply will become possible. This will have a positive impact on finances, image and the environment. The sector will be able to make its own seeding material, effectively closing the chain, since there will no longer be a need to purchase seeding material elsewhere. When the pilot plant is complete, each individual drinking water company will be able to supply (sand-free) calcite pellets and collect seeding material.

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Collaboration with Pakhuis de Zwijger

The Cities in Transition (*Steden in Transitie*) platform coordinated by cultural organisation Pakhuis de Zwijger is a network for numerous organisations to meet, connect and contribute to the city of the future. We are active partners in this community and also a member of the Pakhuis de Zwijger partners' council. By positioning ourselves in an active community of 'city makers' and innovators, we are helping to raise water awareness.

Solutions for complex urban challenges

With the Cities in Transition platform's creative and innovative strategy, we are working together with City Makers (Stadmakers), public and private organisations in the search for solutions to complex urban challenges. We are participating in new initiatives, research and projects. Our aim: a sustainable environment and society.

Contribution to series of programmes

We are making an active contribution to a range of programmes, including The Circular City, Area Development and Water Republic.

The Pakhuis de Zwijger "Water Republic" programme series

We share our knowledge and innovations through publications in the magazine and on the Cities in Transition online platform. The platform regularly features almost all of the Waternet innovation programme. Would you like to know about all the events we have attended? If so, take a look at working together on the city of the future or for details of new programmes, see the Water Republic calendar or the Pakhuis de Zwijger calendar.

Water Republic 2025 is an imaginary water state, developed to achieve a greater focus on water in Amsterdam and the region. Water Republic lecture, Rainproof on 18 April 2016.

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Improving Sloterplas water quality

In clean water, the ecology is good and people can swim and enjoy boating safely. During 2016 and 2017 we have been investigating how to make Amsterdam's Sloterplas lake healthy and clear, with no chance of blue algae blooms. To do this, we are taking advantage of the presence of quagga mussels and underwater plants. Quagga mussels filter the water, making it clearer and underwater plants help balance the ecosystem.

Quagga mussels

Waternet has joined forces with the City of Amsterdam and the University of Amsterdam (UvA) to conduct research into quagga mussels. We are investigating even more effective ways of using mussels to improve water quality. A research island has been specially created in the middle of the Sloterplas. The research into the health of mussels under different conditions and into the best materials on which to grow mussels is continuing in 2017.

Quagga mussels

Experimental equipment in the Sloterplas

Aquatic plants

Aquatic plants are essential for a healthy lake. The Sloterplas has relatively few aquatic plants. They are only able to grow in a small section of the lake, because it becomes too deep very quickly. This is why we have joined forces with Bureau Waardenburg to conduct research into the best places for aquatic plants and to find out whether fish or mussels or the places they live can inhibit the growth of aquatic plants. As part of the research, test containers of aquatic plants have been placed under water. The initial results are expected in February 2017.

Quagga filter

We aim to bring about sustainable improvement to the Varkensbaai swimming beach by keeping it extra clean with the help of nets on which mussels grow: the quagga filter. All the water that flows to the beach passes through the filter. This provides the beach with additional protection against blue algae. In 2016, insufficient numbers of mussels attached themselves to the quagga filter. In 2017, we expect the impact to have improved and will be monitoring it.

Future

We will have the results of the research by the end of 2017. We will then know what we need to do to keep the lake clean, clear and healthy and whether we can use mussels and aquatic plants to achieve that.

Fine-sieve system at Blaricum STP

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Cellulose from waste water

Of all the raw materials in our sewage water, cellulose accounts for the greatest quantity. This makes sense – every Dutch person flushes away large quantities of toilet paper every day, 90% of which is made of cellulose. It amounts to some 10 kg of toilet paper per person per year. Although the most significant, toilet paper is not the only source of fibre in waste water. Clothes, leaves and vegetables, bread and other food products also contain fibre. All of this provides plenty of reasons for investigating the harvesting of paper fibre and its application.

Fine-sieve system

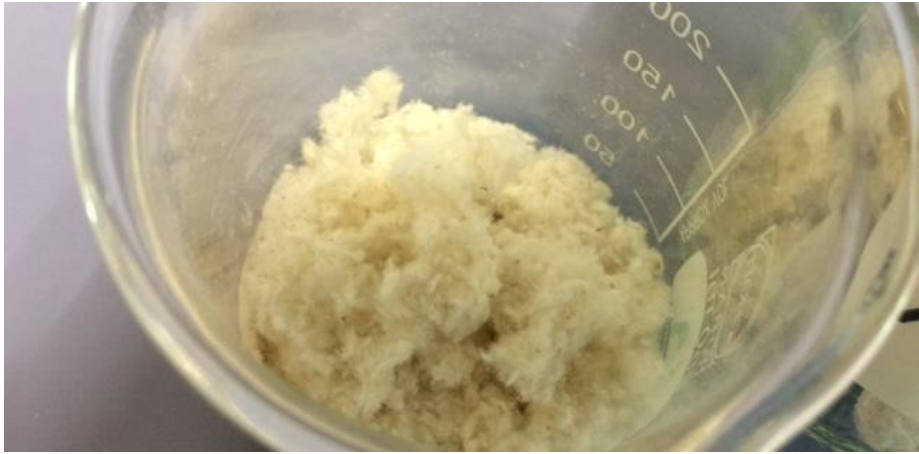
At the Blaricum sewage treatment plant (STP), the Netherlands' first fine-sieve system began operation in 2010. There are now a total of 18 at five locations in the Netherlands. More are expected to be commissioned in the years ahead.

Measurement programme

Waternet is conducting its own research into cellulose, but is also collaborating with other water authorities (as part of the Cellulose Steering Committee). In partnership with Waterproef, a method was developed in 2016 to measure the quantity of cellulose. This method is now being used by other water authorities. At the end of 2016, a programme was started at several of our sewage treatment plants to measure the amount of cellulose discharged from the sewer. In addition, research is being conducted into the most effective and cheapest way of harvesting cellulose. The impact of cellulose harvesting on the sewage treatment plant is also being investigated.

Cellulose products

The use of cellulose in products is an area that is still developing. In 2016, cellulose was used as a drip inhibitor in asphalt for the first time. Across the country, various research programmes are underway. For example, Waternet is participating in the Waste2Aromatics consortium, coordinated by TNO (Netherlands Organization for Applied Scientific Research). An attempt is being made to convert cellulose fibres from (a combination of) organic waste, nappies, manure and sieved waste into raw materials to produce aromatics. These can be used to make plastic. Despite the large quantities of cellulose that can potentially be harvested, each individual water authority is too small to be a serious partner for cellulose buyers. This means that collaboration between water authorities will be essential.



Sieved cellulose

Circular Challenge

There is also collaboration between Waternet and Saxion, in which cellulose is being used as a raw material for the production of textiles (e.g. viscose). In 2016, this was the entry for the Circular Challenge, in which we won second prize.

Future

In 2017, the chance of success in using cellulose as a raw material from waste water is expected to become much clearer.

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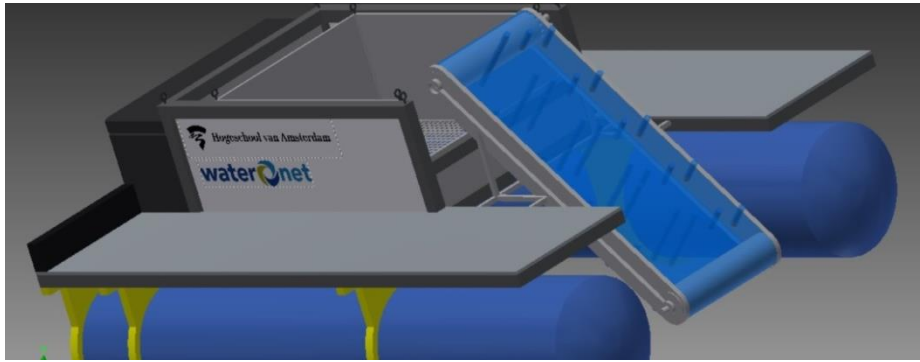
"The Nautonomous makes us an attractive employer"
AlexvanderHelm@waternet

The Nautonomous: unmanned floating-waste fishing

The Nautonomous is the prototype for an unmanned, self-driven collector of floating waste. It can support the manned boats that fish for floating waste by focusing on shallow and difficult to reach waters. The first fully autonomous test voyage of the Nautonomous was successfully completed at the end of 2016. It involved the Nautonomous independently negotiating a route that had been set out using GPS points.

Handy remote control

To guarantee the safety of the boat, an actuation platform has recently been developed as an interface between the on-board computer and the engines. It monitors whether steering signals are accurate and enables control to be taken over remotely.
Linking the radiographic remote control to the actuation platform means that we can always take over control of the boat, even if the on-board computer fails.



3D drawing of the Nautonomous

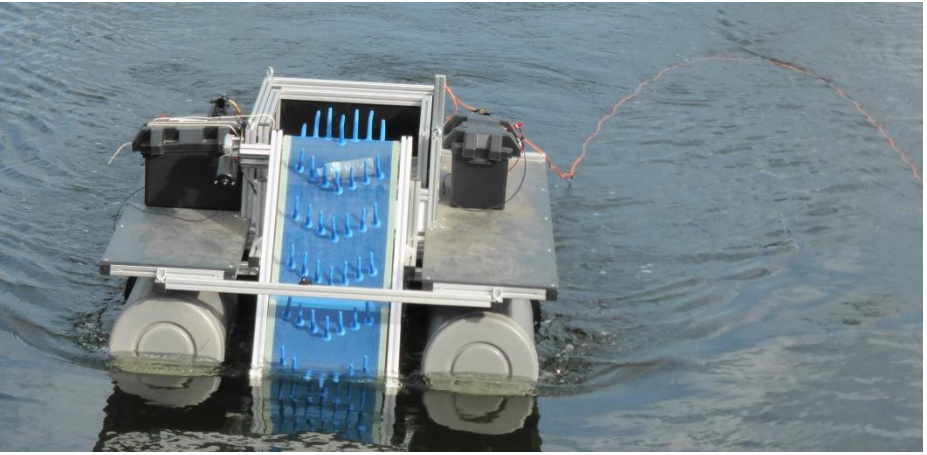
By using the Nautonomous as a wifi hotspot, we can easily communicate with the boat from the shore and also operate it using an android app on a mobile phone.

Route planner

A route planner was made for Amsterdam city centre. In calculating the route, it uses the online indicator that highlights areas of the canal that are particularly busy as well as any blockages (to be found at grachten.waternet.nl).

Collaboration

We are collaborating with the Amsterdam Institute for Advanced Metropolitan Solutions (AMS) and the Massachusetts Institute of Technology (MIT), which together launched the Roboat research project at the end of 2016.



Front view of the Nautonomous

The Nautonomous during a test voyage on the River Amstel

We also receive support from students at Amsterdam University of Applied Sciences and Delft University of Technology.

New design

A new design for the boat was developed over the last year in order to expand its areas of application. This will make it possible to place different modules on the boat, including sonar, water quality sensors or a waste conveyor belt with a collection container for floating waste. In 2017, we are conducting research into the various applications. We are also exploring ways of avoiding collisions with other vessels.

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"It will now be impossible to build sandcastles without thinking of the Battle of the Beach!"
Peterjanssen@waternet

Battle of the Beach wins Water Innovation Award

The Battle of the Beach was the winner of the Water Innovation Award in the water awareness category! The Battle of the Beach is the education event for all water authorities and primary schools in the Netherlands. In the classroom and in the media, there is a focus on education about water all year round, but when you actually experience it for yourself, on the beach, with your own class, it is truly unforgettable! Who will build the sturdiest sandcastle and which will stay intact for longest as the tide rises?

Third Battle of the Beach

In 2016, the third annual Battle of the Beach took place. Some 1,300 children enthusiastically built their sandcastles. The Battle was organised at five locations along the North Sea coast. The schools taking part were not the only ones interested – there was plenty of media coverage. This ranged from local and national newspapers and children's TV programmes to the New York Times.

The presentation of the Water Innovation Award on 17 November 2016

Water Innovation Award

The Water Innovation Award 2016 was presented at the Water Authorities' Market and Innovation Day at the Rijtuigenloods warehouse in Amersfoort on 17 November. The Battle of the Beach won the award in the Water Awareness category. The other categories were Water Safety, Clean Water and Enough Water. All winners were offered an acceleration programme.

One of the Battle of the Beach locations

The Netherlands underwater

Without the dykes, much of the Netherlands would be underwater. Two-thirds of the country is at risk from flooding. This is why we need to continue to invest in our dykes, especially in view of climate change and rising sea levels. The Netherlands is and remains vulnerable to flooding. The Battle of the Beach helps draw attention to this fact and raise water awareness.

Collaboration

Battle of the Beach is a collaboration between the Rijnland Water Authority, the Regional Public Water Authority Amstel, Gooi en Vecht, Waternet, Hollands Noorderkwartier Water Authority, Scheldestromen Regional Water Authority, Delfland Water Authority, Wetterskip Fryslân, Hunze and Aa's Regional Water Authority, Rijkswaterstaat, the Province of Zuid-Holland, the Ministry of Infrastructure and Environment, the National Water Traineeship, Deltares, Madurodam and the Dutch North Sea Foundation.

Future

There are many plans for the event to be upscaled further in 2017 and 2018. This could include involvement by citizens, businesses and institutions. The option of including a world record attempt is also being considered. The opportunities for upscaling are unlimited!

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Combating brackish seepage in the Horstermeer

In the Horstermeerpolder, brackish seepage is a major issue. This project (*Temmen van brakke kwel* / Solving brackish seepage) aims to pump up salt water and drain it away. This will prevent it from entering the polder ditches. It will no longer be spread in the surrounding area and water quality will improve as a result.

Making use of brackish seepage

Brackish seepage is water that rises up from underground. The Horstermeer is a deep polder (land reclaimed from the sea) in which there is a lot of brackish water deep underground. Currently, the problem of brackish seepage is countered by means of a lot of freshwater from the Markermeer lake. Thanks to the *Project Temmen van brakke kwel*, we can make use of the brackish seepage to make drinking water. This will mean that water will no longer be required from the Markermeer. To enable this to happen, surveys were conducted in 2016, to identify where the brackish water is located.

The boundary between salt water and fresh water at various depths in the Horstermeerpolder. At the centre of the polder, the boundary is closer to ground level than in the outer sections

Probe vehicle for serving groundwater flows in the Horstermeer

Preliminary survey work

At the start of 2016, we explained our plans at a residents' meeting. The initiative was met with great enthusiasm. We intend to keep residents posted on the project's progress. In 2016, the main focus was on conducting a soil survey in order to identify the boundary between fresh water on the outside of the polder and the area of salt water in the middle. This will enable us to identify where to locate the wells for pumping out the brackish water. The work proved successful. The results can be seen in the figure on the previous page.

Pilot

In 2017, a pilot will start with the installation of a single well for extracting water and a mobile system for converting the brackish water into drinking water. These will be used over a two-year period to pump up and treat the brackish groundwater. The aim is to investigate the impact and results. Armed with what we have learned, we will pump out all of the brackish water from the polder and treat it to create drinking water.

We will of course keep residents and interested parties informed of progress in the project.

innovation

“I've noticed that I am making a point of rinsing out the drinking bottle in my car more often than I used to”
Maarten Claassen, Parool, 26 October 2016

Citizen science – The Freshness of Water

“The Freshness of Water” is the Netherlands' drinking water sector's first citizen science project. The project works with citizens to conduct research. Amsterdam residents have started testing their own drinking water quality at home. Using citizen scientists makes it possible to achieve the research objective more effectively, faster and more easily.

The research

The KWR Watercycle Research Institute instigated the research and invited Waternet to join it as a partner. The research has three main aims:

- gaining experience of the new next generation sequencing test method
- acquiring knowledge of the changes in the bacterial population of drinking water during transport and after standing
- gaining knowledge of the value of citizen science for citizens, researchers and drinking water companies.

Testing drinking water

Following a round of open applications via Facebook, 50 Amsterdam citizens were selected. As part of the project, participants took three drinking water samples: one with water straight from the tap first thing in the morning, one after allowing the tap to run and one from a source of their choice (drinking bottle, glass of water or coffee machine).

KWR analysed the samples in the lab using the new next generation sequencing test method in order to determine the bacteriological biodiversity. In addition, the citizen scientists also tested the water for microbes at home. They were able to monitor the growth of microbes over a period of several days.
The launch event with the citizen scientists was held at Micropia on 4 June 2016.

The value of citizen science

The citizen science project gives the drinking water sector an opportunity to learn proactively by involving customers in research into the quality and composition of water. In addition, citizens are able to supply samples that are difficult or impossible to obtain by other means, such as tap water samples before running the tap and water from drinking water bottles.

Launch event

Handing out the testing kit

The fact that more than enough applications were received in a short space of time, the launch event was very well attended, 100% of samples arrived at the lab and were of exceptional quality all go to show that this kind of research can be a resounding success.

The participants in Amsterdam appreciated the ability to conduct tests themselves and enjoyed being able to learn about drinking water quality and contribute to scientific research. This helped raise water awareness and with it people's confidence in the drinking water.

How fresh is the water in Amsterdam?

The research revealed that the freshness of water can diminish if it is not used immediately after emerging from the tap. The transport of drinking water by the distribution system and the building's drinking water installation have relatively little influence on the bacterial composition. Check out the following links for more information on the results:

The interactive map with research results

The video of the closing event at Pakhuis de Zwijger.

The project also revealed new socially scientific insights; a great deal of understanding, awareness raising and new water ambassadors.

Two laboratory samples

Two home samples

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> “Reef baskets, the equivalent of car parks for fish, were placed in the Noordzeekanaal”
> 11 August 2016 @AT5

Reef baskets in the Noorder IJplas

In August 2016, the water authority placed reef baskets in the Noorder IJplas. A reef basket provides a place to hide for small or young fish.

A hiding place for fish

Small and young fish have a greater chance of survival if they have a hiding place that larger fish and predatory birds cannot reach. Reef baskets provide the hiding place they need. They are concrete objects shaped like beehives in which fish can hide. They are hollow and contain holes, enabling the fish to swim in and out. Each one is around 1m high and weighs 800 kg.

Noorder IJplas

In partnership with Rijkswaterstaat, the baskets were placed in the Noorder IJplas. The Noorder IJplas used to be a sand quarry. This large area of water now plays an important role in maintaining fish stocks in the Noordzeekanaal.

Placing reef baskets in the Noorder IJplas

The Noorder IJplas has been made more attractive for various species of fish by making it shallower and installing a fish connection between the salt water Noordzeekanaal and the freshwater Noorder IJplas. Initial tests show it was successful. The fish spawn and rest in the IJplas. Young fish gather at the fish connection before going through it. But because of the lack of vegetation, they are vulnerable to predators.

innovation

Using drones in our working processes

Waternet is investigating whether the use of drones can make work more efficient, accurate and safe. The possibilities within our working processes are diverse. Every year, we explore new applications, and 2017 will be no different.

From photography drone to water drone

Waternet currently owns various drones. Each drone has its own specialism. The drone featured on the photograph on the right can be fitted with RGB, infrared, near infrared or a UV camera. Other drones are used for visual inspections or to take water samples.

Drone that can be fitted with various cameras

Inspecting the River Vecht using a drone

Example cases from 2016

In 2016, we worked on the following applications using drones:

- 3D Mapping
- using drones to inspect pumping stations
- using a heat-sensitive camera to count deer
- monitoring the development of a bed of mussels
- assisting at a defence exercise at Weesperkarspel
- taking accurate aerial photographs of sewage treatment plants
- linking 2D data to 3D visualisations.

By using such precision instruments as drones, we aim to make our work smarter and more efficient.

Future

The possibilities for using drones (and robotics in general) are very wide-ranging. The number of sensors that can be used is increasing all the time and the quality of drones continues to improve. At Waternet, we are fully committed to the responsible use of these new technologies. The roll-out of innovative solutions has been fully set in motion, offering us some great new opportunities. In that respect, Waternet is leading the way in the world of water authorities.

innovation

Innovations at events

In 2016, many event visitors had an opportunity to become acquainted with Waternet's innovations. We featured at the Waternet 10th anniversary festival, at FabCity and at the Innovation Expo.

FabCity

FabCity was a temporary city featuring innovative pavilions and installations for the city of the future. FabCity was part of “Europe by People”, the cultural programme during the Netherlands' EU Presidency. Waternet had a prominent presence at FabCity. Many visitors from the Netherlands and abroad attended the innovative New Sanitation and Rainproof pavilions between the start of April and the end of June 2016.

New Sanitation pavilion

How will we deal with waste water and sewage in the future? In the New Sanitation pavilion, visitors were able to find out about a new way of collecting and processing waste water. This included a vacuum sewer, a shower heat exchanger and a food waste disposal unit

The New Sanitation show stand at FabCity

Rainproof pavilion

The exterior of the Rainproof Pavilion showed the existing paved city compared to the future rainproof city. Inside the pavilion, the Rainproof network was ready and waiting to hear people's own ideas for action and inspiration on rainproofing the city.

Rainproof Pavilion

Launch of rain(a)way ebb tiles (photo:Merlijn Michon)

A green roof that stores water, a green facade, rain(a)way tiles and a permeoblock capture rainwater, sending it somewhere where it will not cause damage.

Some of the rainwater was even used to grow herbs (RoofFood). Visitors could see for themselves the impact of heavy rain showers of the existing and future city by switching on the shower sprinklers.

Innovation Expo

On 14 April 2016, the Netherlands' biggest innovation event took place in Amsterdam. The theme was: “Sustainable Urban Delta”. Waternet was represented with its New Sanitation show stand. Rainproof joined VP-Delta in a pavilion packed full of smart rainproof innovations developed by partners in our network.

Waternet 10th anniversary festival

Waternet celebrated its 10th anniversary in 2016. At a family festival in May, it showcased various innovations. The Nautonomous was on hand to fish floating waste out of the water, the drone made test flights and there was an opportunity to explore the New Sanitation show stand. At the mini-symposium celebrating Waternet's 10th anniversary, there were even more smart innovations on display, including the 3D printer, the waste boards made from plastic waste and the smart water butt. We also presented our top 20 innovations from 10 years of Waternet.

Demonstration of the Nautonomous at the Waternet 10th anniversary Festival

Waternet's 10th anniversary symposium, Photo: Eric Martin

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100,000 solar panels by 2020

What factors should be taken into account when installing solar panels? This is an area we have been researching since 2012. We investigate the best places for installing panels and how much energy this generates. We also run pilots to test various solar energy systems in order to gain experience. By 2020, we aim to have 100,000 solar panels as part of our contribution to an energy-neutral future. The first field-based solar arrays are already a reality.

Huizen sewage treatment plant

On 7 September 2016, Regional Public Water Authority Amstel, Gooi en Vecht began using 384 solar panels at the sewage treatment plant in Huizen. In previous pilots, experience was acquired in placing solar panels at ground level or on the roof of commercial and other buildings. In Huizen, solar panels were placed above one of the aeration tanks for the first time. They supply energy for sewage treatment.

Solar panels on the aeration tank at Huizen sewage treatment plant

The project aims to gain experience of this unusual situation. It involves a double use of space, for both water treatment and energy production.

Loenderveen drinking water plant

In 2016, 380 solar panels were installed in a roof at Loenderveen drinking water plant. This pilot is investigating the effect of a solar energy system integrated within a roof (Building Integrated Photo Voltaics (BIPV)). If the result is positive, there will be more solar energy projects of this kind.

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"Unveiling of biocomposite bench made of natural residual materials by @ArianeHoog at #Fabcity"
@waterschapagv 25 May 2016

Biomass is a valuable resource!

Every year, we harvest 6,000 tonnes of dried aquatic plants, reed and grass. Initially, we disposed of this green waste or left it to rot away. We are now investigating the possibilities of reusing it. We would like to make biocomposite or other high-quality products with it. The aim of the programme is to have the biocuttings reused and applied in products. By 2020, we aim to achieve CO_2 reductions of 7 kilotonnes with no additional costs.

Biomass cuttings

Paint made from flax

Biorefinery

With the help of biorefinery biomass can be converted into components such as proteins and fibres. These can be used as raw materials for chemicals, biopolymers and animal feed (see the blog Harvesting cellulose from waste water). Waternet sometimes leaves some of its land uncultivated. We aim to make better use of these sites. In 2016, we grew flax on the uncultivated land at the West sewage treatment plant. We use the flax as a raw material to produce paint. This is then used to paint the buildings in the Amsterdamse Waterleidingduinen area.

Biocomposite

Dried aquatic plants, reeds and grasses can be used to make biocomposite. The glass fibre normally used to make composite is replaced by a fibre from plants. Biocomposites can be used to make great products, such as sheeting for furniture, sheet piling and dashboards for cars (see the blogs Sustainable biocomposite from residual materials, the video on making furniture from grass cuttings and the video on using frying fat to make a fat snowman).

Collection and processing

We are conducting research into how grass cuttings can best be collected and pretreated. If the material is to be used to make biocomposite, it needs to be free of sand, dry and well shredded. An experiment has been conducted to test pretreatment. In 2016, a start was made in taking cuttings from aquatic plants in the Horstermeerpolder.

Shredding aquatic plants

Shredded aquatic plants

These plants from the Horstermeerpolder have been dried, shredded and sieved. As shown in the photographs above, tests were conducted to find out which machine is most effective at processing the dried biomass. The tests revealed that cutting mills are effective at fine shredding and produce little dust. In 2017 we will be testing whether these fibres from aquatic plants can be used for biocomposites.

Biocomposite products

We are also investigating the quality of the biocomposite and the products made from it. We are compiling a business case to analyse the issues of sustainability and costs. It has already proved possible to make furniture from reeds. In 2016, reeds were harvested in the Vecht, and the cuttings transported to a drying plant rather than a composting company. In the near future, we intend to use it to make products. If you have any ideas for products, please let us know!

Our intern from TU Delft is investigating which products can be made from biocomposite, such as sheet piling, furniture, street signs and tide gauges. Research reveals that biocuttings could be an effective and sustainable replacement for current products made from aluminium and glass fibre.

Bench made from biocomposite

Table made from biocomposite

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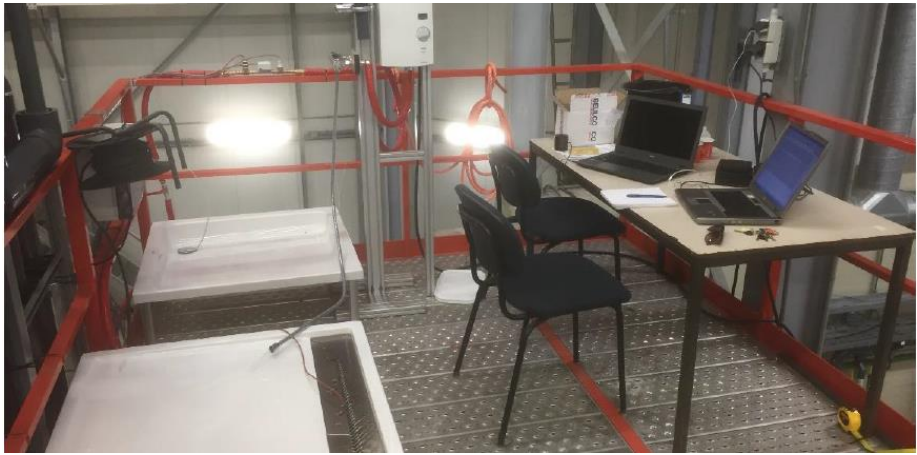
Heat from shower water

Is it possible to reuse the heat from shower water to heat up cold drinking water for the shower? At the Uilenstede student accommodation in Amstelveen we installed 100 shower heat exchangers. We took measurements from ten of them. What did these reveal? They are working perfectly!

Energy saving

The shower water heat generally goes down the drain along with the water. This means that the heat is not being used even though there are numerous opportunities for reusing it. The heat can be collected in the shower drain using a shower heat exchanger. This is a device that transfers the heat from the shower water to the cold drinking water. This means that the drinking water requires less heat from the boiler, thereby saving energy!



Test equipment

The experiment at Uilenstede

In student accommodation on the Uilenstede campus, we installed 100 shower heat exchangers in one-person student flats. In ten of the flats, continuous measurements were taken. The performance of the shower heat exchangers in the flats were compared to the test equipment in the Waternet test lab. This made it possible to compare what was happening in practice with the ideal situation. The measurements will be taken until 2020 in order to observe the long-term effects, including the build-up of soap residue in the shower heat exchanger.

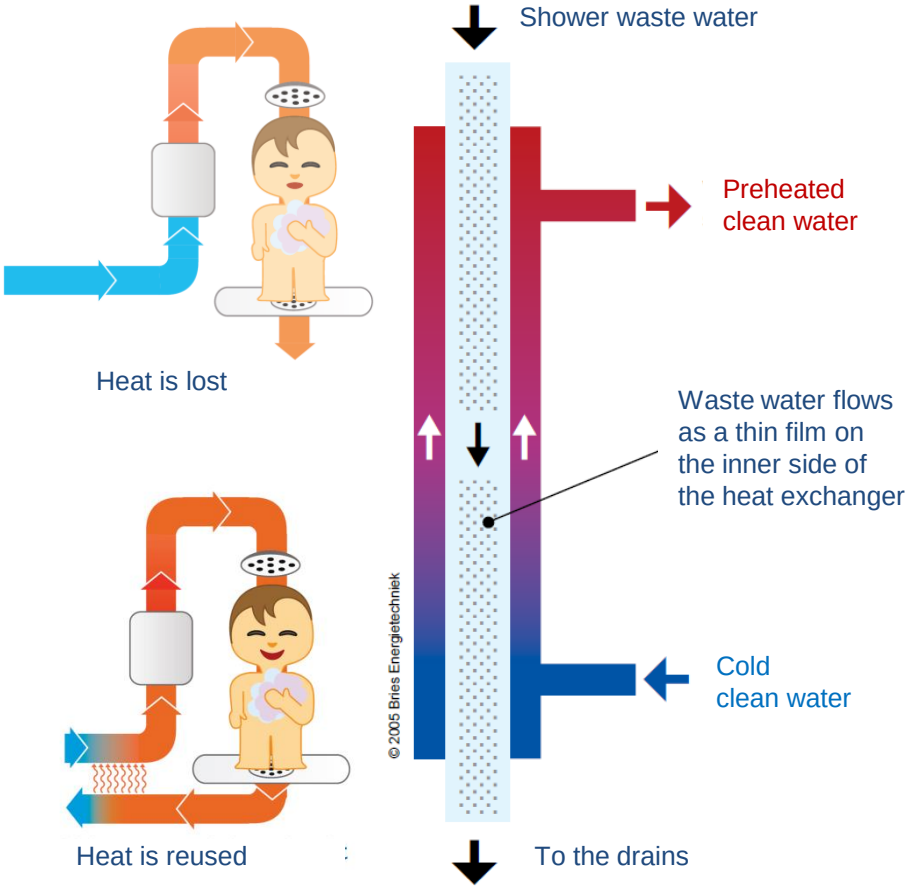


Illustration of showers with (lower left) and without (upper left) shower heat exchangers and a diagram of the vertical shower heat exchanger

The results

The results apply to the vertical shower heat exchanger in the form of a double-walled pipe

- The heat exchanger saves €50 worth of energy per person per year. Including installation, the equipment costs approximately € 600. This means that, in a single-person household, it would pay for itself in 12 years and in less than five years for households with three people or more.
- During the test period, the heat exchangers did not require maintenance. In other words they remain intact for a reasonable period without maintenance.
- No faults occurred in the shower heat exchangers during the test period.
- Around half of the heat from the shower water is fed back to the house. The average annual efficiency rate is more than 50%. When incoming drinking water is lower in temperature, as in the winter, efficiency is even higher. The opposite applies in the summer.

Collaboration

The project was realised in alliance with the Municipality of Amstelveen, housing association DUWO, Ursem (contractor), Schouten Techniek (installation) and Dutch Solar Systems (shower heat exchanger supplier). Read the blog for more information.

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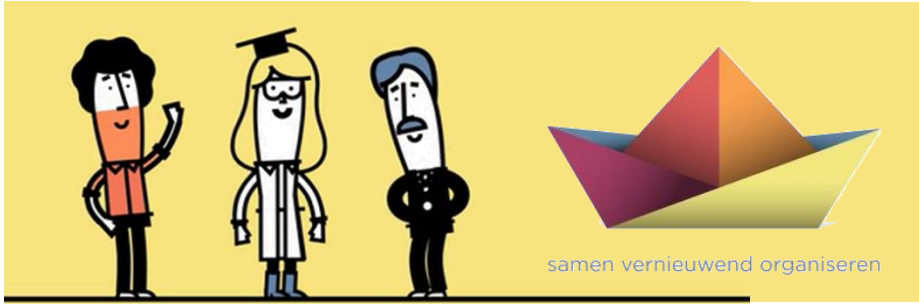
Welcome to the water knowledge action programme! In 2016, we laid the foundations for an innovative approach.
Wiegert Dulfer @ AGV

Water governance knowledge action programme

In 2016, we set up a knowledge programme on innovation in water management. It aims to strengthen contacts between scientists, entrepreneurs, people in government, public administrators and citizens. The idea is to improve understanding of the water-related challenges involved in and organisation of the circular city in order to bring about real improvements!

Challenges in cities

Cities are very complex places. They are made up of various systems for infrastructure, knowledge and governance. They have an influence on and are also influenced by the climate, ecology and economics. This continually creates new challenges. A series of trial projects are being conducted to demonstrate technical innovations, including local and circular solutions. But can this knowledge also be used in different places and on different scales? How will the risks and responsibilities be shared out? What implications do these developments have for governance models? Residents, scientists and local administrators need to work together to change the city in a coordinated way.



Programme structure

The programme aims to assist with governance challenges in practice by applying science and involving public administrators. It has three priorities:

strategies for responding to changes;

governance of new technologies in the water system;

new ways of sharing out responsibilities and risks.

In 2017, the details of the working packages will be finalised and the network brought together at a series of events. We look forward to a future of more resilient and innovative water management!

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Amsterdam Rainproof

elke druppel telt

Working together to rainproof the city

The Amsterdam Rainproof network aims to enable the city to withstand heavy rain. We are working on this with residents, businesses, knowledge institutions and government. But it involves more than just that: Rainproof does not intend to dispose of free rainwater, but actually make use of it. Heavy rain is becoming increasingly common. It causes damage, because much of the surface of the city is covered in asphalt and buildings and gardens are tiled. Hardly a drop can penetrate the soil.

Rainproofing measures

We are working with the Rainproof network of around 80 organisations to develop smart rainproof solutions. Last year saw the realisation of numerous rainproof projects. They included the innovative water-retardant green strips at the Zuidas, the lowered gravel garden and rainproof parking spaces at the De Mirandabad pool, underground water storage at Mahlerplein and the climate-proof street. Visit rainproof.nl to see what you can do.

Stichting PlantageLab: working together to rainproof the city, Photo: Merlijn Michon

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Afterword

The Waternet research and innovation programme is continuing in 2017. By 2020, we aim to be climate-neutral and emit no more CO_2. More than ever before, we are now focusing on projects that will be implemented by 2020.

Of course, this does not mean we are not looking further ahead. We still face some major challenges. It is likely to rain more often and more heavily, become drier and our assets are ageing. This is why, in 2017, we will be focusing more on these assets. How can we find smarter ways of determining whether assets are still fit for purpose or need replacement, how can we determine their status more effectively and make use of human sensors?

Water will remain one of the driving forces behind Global Goals, which is why we are working with our partners to find great future-proof solutions that boost confidence in government.

Alice Fermont, Research & Innovation Coordinator

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Presentation of Water Innovation Award 2017, Battle of the Beach winner, Water Awareness category

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