RIWA-RIJN - ASSOCIATION OF RIVER WATER COMPANIES

RIWA

Our Rhine water

WFD ARTICLE 7.3
IS THE LEVEL OF PURIFICATION TREATMENT DECREASING?

PHARMACEUTICAL RESIDUES
INSPIRATION FROM THE CHAIN APPROACH

"The Rhine needs to be cleaner"

Dear reader,

"We invite our politicians to provide more support to drinking water issues in international consultations, particularly to raise awareness and emphasise the importance of clean rivers. Because the Rhine needs to be cleaner. Let's accept the challenge and make concrete agreements to improve the water quality of the Rhine." That's the message of RIWA-Rijn to politicians.
This is the RIWA-Rijn magazine 'Our Rhine water', a special edition on the occasion of the Rhine Ministers conference on 13 February 2020 in Amsterdam.
In this magazine, we want to inform you about recent developments which are important for drinking water companies which use the Rhine as a source for the production of drinking water.
Due to the recent drought problems, more attention has been focused on the quality of the Rhine. That increased attention is positive, but it is not enough. Our evaluation of the Water Framework Directive has shown that, despite all the efforts to improve the water quality over the past 20 years, drinking water companies are having to work increasingly hard to produce drinking water. The question is therefore: how do we achieve concrete improvement?
To do that, a wide range of measures is necessary, for both the industrial and household sources. In concrete terms: RIWA-Rijn wants to improve policy and the issuing of waste water permits. Including more transparency about substances which are discharged. Special attention must also be devoted to preventive policy against the spreading of pharmaceutical residues in water. In addition, we want special attention paid to contrast agents, which we can already eliminate with easy interventions.
This Rhine Ministers conference is a special moment: it offers many opportunities for improvement. If they are successful in adopting effective quantitative reduction goals in the Rhine Action Plan 2040, that would be a huge step forward.

Joke Cuperus, *president RIWA-Rijn*
Gerard Stroomberg, *director RIWA-Rijn*

CONTENT

COLOPHON

This is a special publication by RIWA-Rijn, Association of River Water Companies
Publication date: January 2020 **Text and editing:** Ingrid Zeegers and RIWA-Rijn
Pictures: RIWA-Rijn, Waternet, PWN, Oasen, Vitens, Rijkswaterstaat, Ministerie van IenW, Alexander Gerst, Dirk Jansen Photography, Fier Media, Depositphotos, Disentis Sedrun
Design: Fier media **Printing:** PrintRun BV, Nieuwegein - PrintRun supports work experience opportunities for people with a distance to the labour market - This magazine has been printed on FSC mix credit paper
Cover: *John Frost bridge across the Rhine in Arnhem (Alarmy)*

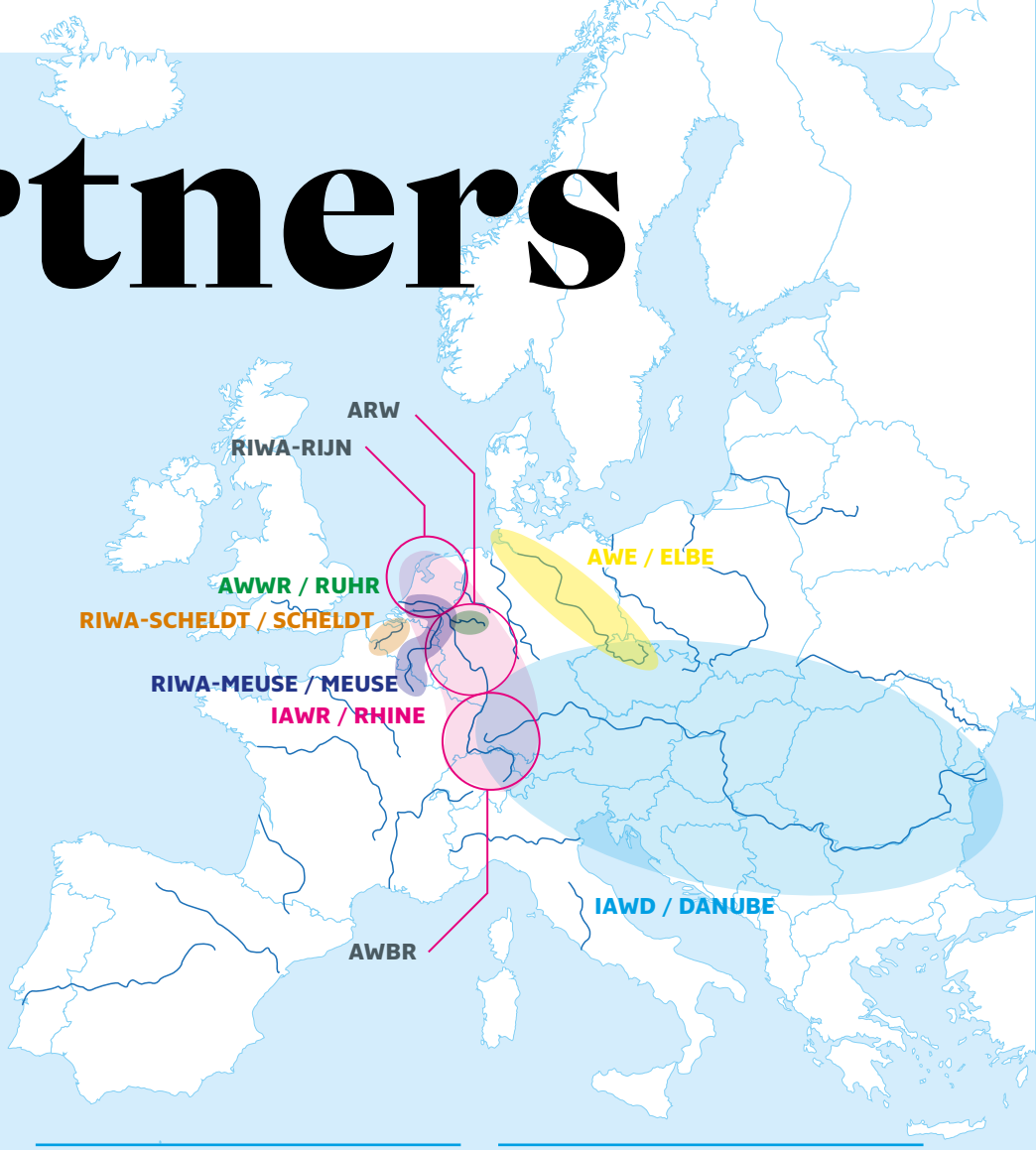
On 6 August 2018 the International Space Station ISS flew over the Netherlands. The German ESA astronaut Alexander Gerst took this photo of the Dutch Rhine delta. The setting sun colours the water golden and thus portrays the Dutch water system in high detail. Even the infiltration areas in the dunes, where the river water of the Rhine is purified to produce drinking water, can be seen in the photo. And unmistakably, the proximity of the North Sea. It is as if our water system hangs from a single thread: the Rhine. The astronaut himself said after an earlier flight: "One sees how vulnerable and isolated the earth is". The words vulnerable and isolated also apply to our water system. The Rhine therefore deserves our constant attention and protection.

> One sees how vulnerable and isolated the earth is
>
> Alexander Gerst, ESA-astronaut

Our partners

RIWA-Rijn

RIWA-Rijn represents the interests of drinking water companies which depend completely or partially on the Rhine as a source of drinking water: PWN, Waternet, Oasen and Vitens. We aim for 'impeccable drinking water by natural, simple purification'. We carry out that mission by accumulating knowledge, sharing information and by lobbying. Because our Rhine water does not stick to boundaries, neither do we. We work on different levels with fellow NGOs at home and abroad. In the Netherlands, these are our colleagues from RIWA-Maas and RIWA-Scheldt, with whom we form the RIWA umbrella organisation. At international level, RIWA-Rijn is part of the IAWR, in which we participate together with the ARW and the ABWR. At European level, RIWA is a member of the ERM coalition, which has drawn up joint target values for the water quality in the river.



IAWR

The mission of the IAWR, the International Association of Waterworks in the Rhine Basin, is to promote sustainable water management. The aim is to protect the Rhine so that drinking water can be produced in a natural, sustainable way. The umbrella organisation works on behalf of the ARW (Arbeitsgemeinschaft der Rheinwasserwerke e. V.), the AWBR (Arbeitsgemeinschaft Wasserwerke Bodensee-Rhein) and RIWA-Rijn (Association of River Water Companies). The IAWR is thus the international umbrella organisation for 120 water companies from the six Rhine countries of Austria, Switzerland, Liechtenstein, France, Germany and the Netherlands. In this area, around 30 million people rely on water from the Rhine, its tributaries and the lakes in the river basin for their drinking water supply. The IAWR is a recognised NGO in the ICPR.

ERM coalition

Drinking water associations from the Meuse, Rhine, Danube, Elbe and Ruhr basins have drawn up a European River Memorandum (ERM). Around 170 drinking water companies are members of the associations. Together they represent more than 115 million consumers of drinking water in 17 countries (Germany, Austria, Belgium, Bosnia-Herzegovina, France, Croatia, Liechtenstein, Luxembourg, the Netherlands, Montenegro, Romania, Servia, Slovakia, Slovenia, Switzerland, Czech Republic and Hungary). They have a joint strategy and vision for the production of drinking water which is based on the principles of sustainability and precaution/prevention. The ERM target values are an elaboration of that joint vision. River water of which the composition remains below the target values can be used for the preparation of drinking water with natural sustainable treatment methods.

ICPR

In the International Commission for the Protection of the Rhine (ICPR), the countries bordering the Rhine - Switzerland, France, Germany and the Netherlands as well as Luxembourg and the European Commission - work together on the basis of an agreement under international law for the protection of the Rhine. An international secretariat based in Koblenz (Germany) assists the president and consultation groups of the ICPR and supports the implementation of the European Water Framework Directive (2000/60/EG) and the European Floods Directive (2007/60/EG). In the framework of implementing this European directive, the international cooperation was extended with Austria, Liechtenstein and the Waals Gewest. During the Rhine Ministers conference, decisions will be taken about important political issues and the basis will be laid for coherent coordinated programmes of measures.

WE DRINK RHINE WATER

RESIDENTS (X 1000) • CONNECTIONS (X 1000) • PRODUCTION (MILLION M³/YEAR)

[1]) A member of RIWA-Maas
[2]) Population Zwolle
[3]) Population Goeree-Overflakkee and Schouwen-Duiveland
[4]) Calculation based on population number

PWN Velserbroek
Residents: 1724
Connections: 810
Production: 92

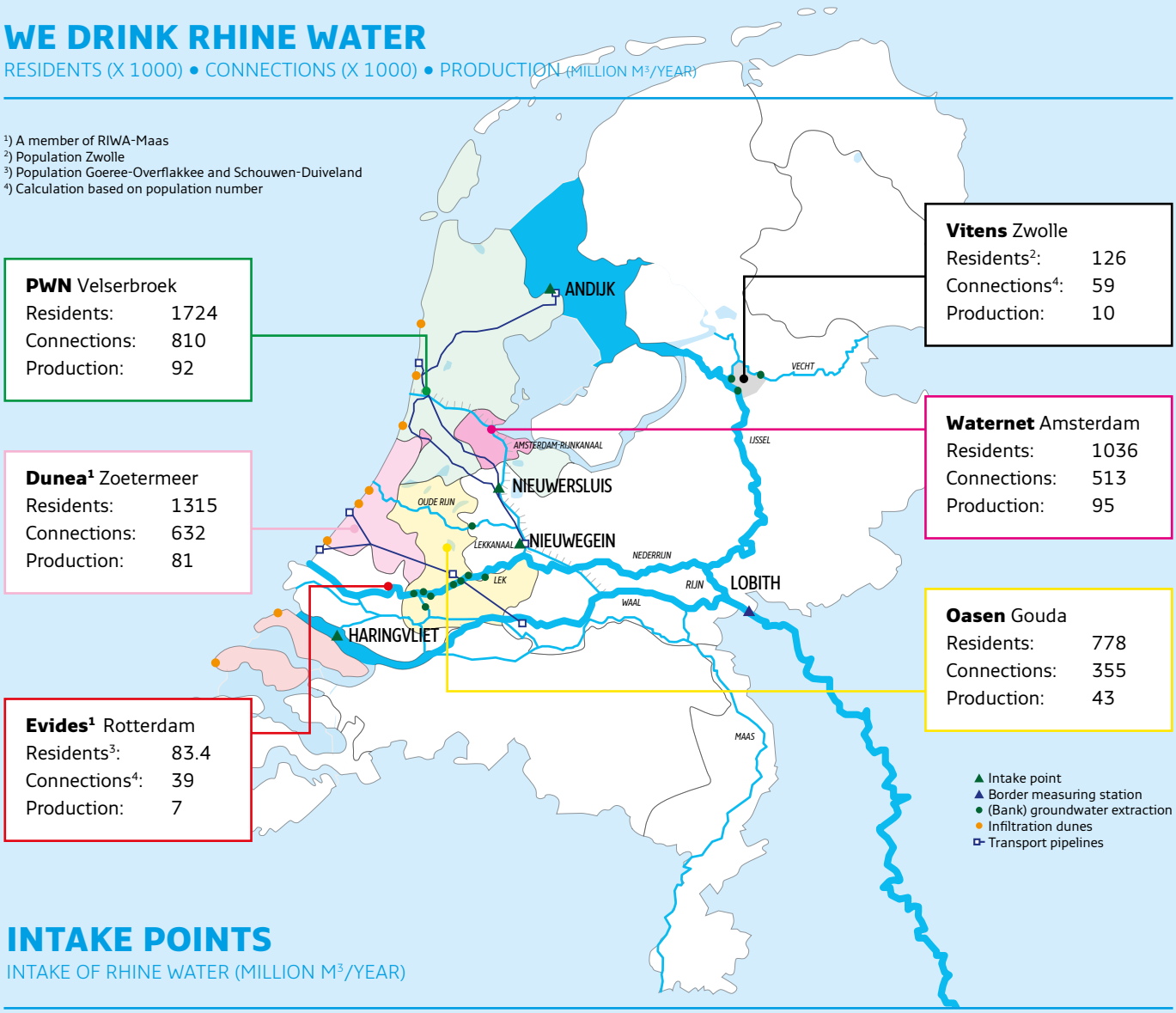
Dunea[1] Zoetermeer
Residents: 1315
Connections: 632
Production: 81

Evides[1] Rotterdam
Residents[3]: 83.4
Connections[4]: 39
Production: 7

Vitens Zwolle
Residents[2]: 126
Connections[4]: 59
Production: 10

Waternet Amsterdam
Residents: 1036
Connections: 513
Production: 95

Oasen Gouda
Residents: 778
Connections: 355
Production: 43



INTAKE POINTS

INTAKE OF RHINE WATER (MILLION M³/YEAR)

84
Andijk
Since 1968, PWN has been taking water from the IJsselmeer for the production of drinking water because the groundwater reserves from the dunes were being depleted.

PM
Nieuwersluis
Nieuwersluis only collects water from the Amsterdam-Rhine canal when no water can be collected from the Bethunepolder.

105
Nieuwegein
Collection from the Lekkanaal was started in 1957. Pre-treated water is pumped through pipelines to the dunes.

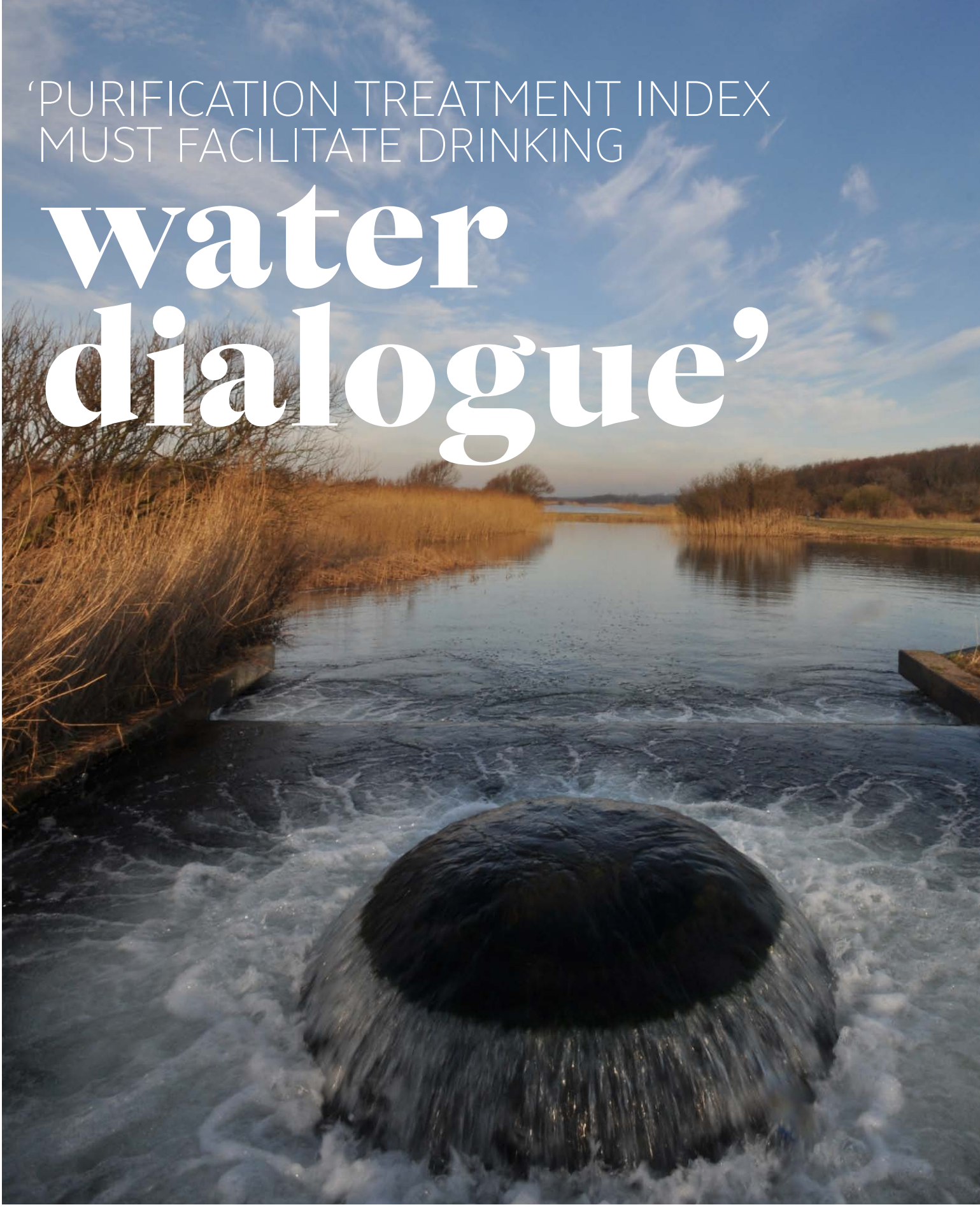
55
Bergambacht
Bergambacht is used to a limited extent when the quality of the water from the River Meuse is below standard. 55 million m³/year is the maximum that can be collected.

7
Haringvliet
The water collected from the Haringvliet consists on average of 80% water from the Rhine and 20% water from the River Meuse.

10
Zwolle
Bank collection location Het Engelse Werk takes 10 million m³/year, 50% is groundwater, 50% is river water after ground passage.

39
Oasen
The total of all bank collection locations along the Lek is 39 million m³/year, 50% is groundwater, 50% is river water after ground passage.

2200 m³/s
Lobith
The average discharge from the Rhine is around 2200 m³/s. However, the discharge can vary from 600 to 16000 m³/s.



‘PURIFICATION TREATMENT INDEX MUST FACILITATE DRINKING water dialogue’

The Water Framework Directive will soon be celebrating its twentieth anniversary. "Despite all efforts to improve the water quality, drinking water companies are finding it increasingly difficult to make drinking water," says Gerard Stroomberg, director of RIWA-Rijn. He commissioned KWR Water Research Institute to develop a new index to support the policy dialogue about drinking water interests.

Gerard Stroomberg
Director RIWA-Rijn

Tessa Pronk
Data Scientist KWR Water Research Institute

First of all: what does RIWA-Rijn do?
Gerard Stroomberg: "A healthy river forms the basis for healthy drinking water. RIWA-Rijn collects and analyses the measurement data provided by the drinking water companies about the quality of the water in the Rhine. We then use the data to inform the parties involved about the state of the river and promote better water quality upstream. In the Netherlands, the Rhine is used as a source for drinking water. As such, the river water first needs to be treated. Drinking water companies are very good at that. Water from the tap is always clean and healthy. But we want more attention for the effort that is required to purify the river water, and more attention for the trend: has that level of purification treatment been increasing or declining in recent years?"

In 2019, RIWA-Rijn had a special index developed to gain control of that purification treatment. Why?
"Since 2000, the Water Framework Directive article 7.3 has promised us that the level of purification treatment would be reduced for the drinking water companies. An important promise, but this is not further quantified, neither is it reflected in the policy objectives. We therefore felt it would be a good idea to describe the level of purification treatment in concrete terms and then see whether it has actually reduced over the years as a result of the measures in the Water Framework Directive. Tessa Pronk (KWR) will explain more about the calculation method in the index."

Water Framework Directive, Article 7.3: "Member States shall ensure the necessary protection for the bodies of water identified with the aim of avoiding deterioration in their quality *in order to reduce the level of purification treatment required in the production of drinking water."*

THE METHOD EXPLAINED

How does the purification treatment index work?

Tessa Pronk, data scientist at KWR: "The difference between the water quality in the river and the requirements for drinking water can be considered as the level of purification. The purification treatment index assumes that the water at an intake point needs to be treated so that all the substances fulfil their standard in the Dutch Drinking Water Decree. The more substances that exceed that norm, the greater the level of treatment required and the higher the index."

Is working with an index new, or is it something that's been done for some time?

"The idea has existed for a while. The first water quality index dates from 1965. Every index has a different approach, depending on the goal. Often it concerns a set of parameters. Our task was to develop a simple method which is directly related to the purification. The simple starting point is that all substances that exceed the norm must be treated. The index is also just expressed in percentages. However, the simplicity of that approach and the fact that all the substances to be treated are included is something new."

Is it true that the index is not sensitive to a break in the trend in the analysis of substances?

"That's right. We assume that the measurement programme is always focused on problematic substances. If there is a need to treat new substances, the measurement programmes are given an update. The purification treatment index is not therefore a fixed set of parameters. Whatever the chosen substance, the index offers an independent test. Each time a new substance needs to be treated, we include it in the index. If you didn't include these new substances, you would miss part of the drinking water problem."

> "The more substances that exceed that norm, the greater the level of treatment required and the higher the index."

Who can use the method?

"Drinking water companies, but also water managers. For example, to be able to assess the water quality in terms of drinking water. Water managers can then focus on specific solutions. To gain an understanding of which sources increase the level of purification requirement, we assessed the measurement location Lobith in more depth. Here there are four different groups of substances: general parameters and nutrients; pharmaceuticals and endocrine disrupters; industrial substances and consumer products; pesticides, biocides and their metabolites. Figure 1 shows the result, the index, displayed as coloured bands. Each band is a substance. The wider the band, the greater the purification requirement."

Can the index also be used for other rivers?

"The index is universal, but the result depends on the quality of the measurement programme. If the measurement programme is incomplete, it doesn't work.

"The index is universal, but the result depends on the quality of the measurement programme. If the measurement programme is incomplete it doesn't work."

In that case, you are looking at substances which were measured by chance, which means that the index is not complete. But if different substances are measured in another river and those substances exceed the norm for which they need to be purified, then they belong in the index. In other words: which substances are relevant can vary from river to river."

NEW PERSPECTIVE

The purification requirement index thus provides a new perspective on the water quality of the Rhine. So what did it show?

Gerard Stroomberg: "For us, it wasn't about the size of the numbers themselves. We wanted to see whether there was a trend: have the measures from the Water Framework Directive actually reduced the level of purification requirements for drinking water companies? That was not the case. To our own surprise, we see that the index has not reduced over the years but has increased. There is also good news from the calculations. Some substances

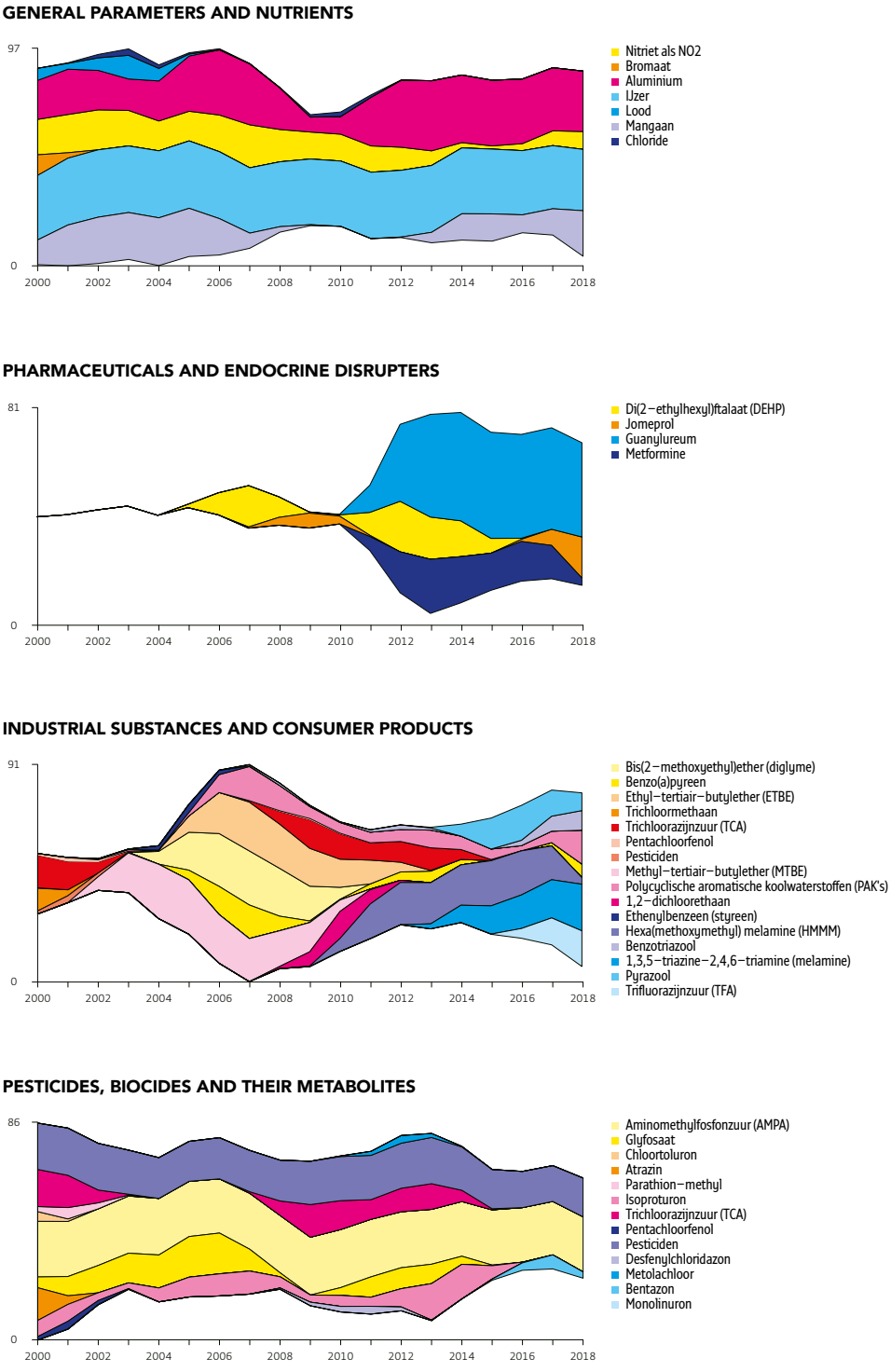


Figure 1 The treatment index in individual parameters (shown as coloured 'ribbons') per parameter group (in the individual plots) for location Lobith. By using a 'smoothing factor' when drawing these figures, the observations per parameter are visually extended over the adjacent years.

which were still a problem in 2000 are no longer a problem today. Those substances are still in the Rhine but below the level of the Drinking Water Norm. We also see that substances which appeared in the meantime (for example the anti-knocking agents MTBE and ETBE) have also disappeared again after a while. The agreements reached with the transport sector appear to have worked.

In short: the index shows that with the right attention, we can control the pollution problem. However, we haven't yet been able to prevent problems with new substances. Consider, for example, the emerging substances."

Isn't it logical that if you measure more, more substances will exceed the drinking water norm, meaning that the level of purification requirement increases?
"No, it works the other way round: because more substances exceed the drinking water norm, more measurements are taken. KWR performed an analysis for us to study the relationship between the number of measured substances and the purification requirement index. This shows that more measurements do not lead to more substances exceeding the norm."

NEXT

What will happen now with the purification treatment index?
Gerard Stroomberg: "The current purification treatment index is based on the number of norm-exceeding substances that need to be purified to a certain level. We asked KWR to extend the index with the purification *effort.* How much effort does it take to remove substances? Obviously one substance is easier to purify than another. It is also interesting for us to link the index to locations along the whole Rhine. We can then take fingerprints: from Basel to the Dutch intake points for drinking water. That can help us gain insight into the places where substances that are relevant to drinking water get into the water. We can then incorporate drinking water interests in a more balanced way in water quality policy."

> **The index shows that with the right attention, we can control the pollution problem.**

If it also appears that the purification effort increases for drinking water companies, what might be the cause?
"In the substances policy, there has always been a lot of attention for toxicity and bioaccumulation. Regulations have been drawn up for that. The result is that the industry now prefers to produce substances that are less bio accumulative. However, such substances dissolve well in water. That in turn makes it more difficult for drinking water companies to remove them from the water. The purification effort then increases. Whether that is truly the case will be apparent from new analyses in the coming period."

The report "Removal requirement and purification treatment effort for Dutch Rhine water from 2000-2018" was published at the beginning of 2020 and can be downloaded from our website.

More measurements do not lead to more substances exceeding the norm

WATERNET

‘CONTINUED FOCUS ON SOURCES OF POLLUTION NEEDED’

Arno Sierkstra, head of the Drinking Water Production department at Waternet, is delighted with the great societal confidence in the treatment technology of the drinking water companies, but not if that distracts political attention from the dischargers and polluters.

Arno Sierkstra
Head of Drinking Water Production

waternet
waterschap amstel gooi en vecht
gemeente amsterdam

Waternet supplies drinking water to over 1 million people in Amsterdam and the surroundings. Around two thirds of this comes from water from the Lekkanaal near Nieuwegein that is first pre-treated before being infiltrated into the Amsterdamse Waterleidingduinen.

Production process in context
Sierkstra: “Until 1957, the Rhine was not important for Waternet. We then took water from two other sources: the dune area on the coast and the Bethunepolder near Maarssen. In the 1940s, it became clear that the dunes were becoming desiccated and brackish. At the same time, there was increased demand for water from the Amsterdam area. We needed to get water from elsewhere. Our search led to the Lekkanaal, a tributary of the Rhine near Nieuwegein. To be allowed to infiltrate that water into the dune area, all kinds of permits apply. Which is logical, because it’s a Natura2000 area. No polluting chemical substances must get into nature.”

Why is the Rhine so important for Waternet?
“The Rhine is now a lifeline for us. That became evident during the drought of 2018. When less water flows through the Rhine, the concentration of pollutants increases. That makes life very difficult for us, because it means that we have to perform extra treatments and incur extra costs. In extreme cases, poor water quality can mean that we are unable to collect water from the Rhine. That happens on average once a year, for example after a discharge of a hazardous substance or after an accident with a ship.
Our dependence on the Rhine sometimes demands pragmatism. We know that some harmful substances are present as a kind of background value in the Rhine, like the substance melamine. For that reason, the original ministerial norm was extended.
In terms of public health, nothing went wrong. However, drinking water companies need to take extra measures to remove such substances from the water.”

Why is the Rhine Ministers conference so important?
“Because, by definition, the problem is a trans-national problem. The International Rhine Commission must help us prevent more new chemical substances getting into the river. How? By ensuring that the discharge permits are in order and that no hazardous substances may be discharged into the water. In addition, it’s crucial to have good enforcement. In short: the governments at home and abroad must be totally aware of the problem. It is important that the drinking water sources remain excellent.”

VITENS

‘WE MUST NURTURE OUR **EXTRACTION POINTS’**

Rian Kloosterman, senior strategy advisor at Vitens, emphasises the importance of sufficient surface water for use in the east of the Netherlands. Because the IJssel, a tributary of the Rhine, is the only big river in the area.

Rian Kloosterman
Senior Strategy advisor

In the Dutch part of the Rhine catchment area – in addition to surface water – groundwater is also used to make drinking water. Groundwater company Vitens supplies drinking water to 5.6 million people in the provinces of Flevoland, Friesland, Gelderland, Utrecht, Overijssel and Drenthe. For Vitens too, the Rhine is vitally important.

The production process in context
Kloosterman: “Vitens has many independent sources of groundwater and that’s unique. These concern 110 water extraction areas where groundwater is pumped up. The areas are in or near nature areas, agricultural areas or close to a town. Because the total supply area is now more extensive, we have more possibilities to extract water where that is sustainably possible, where there is enough water and where the impact on the surroundings is limited. For us, that diversity in the sources is very important to enable us to manage the consequences of climate change.”

Why is the Rhine so important for Vitens?
“The IJssel, a tributary of the Rhine, is the only big river with a reasonable flow in our area. Smaller rivers, like the Dinkel and the Vecht, are more susceptible to climate change. The groundwater that we use is supplemented with surface water in many places. Pollutants which are now in the Rhine and the IJssel eventually get into the groundwater too. How long it takes for these substances to get into the groundwater varies in each situation.
In one of the 96 production locations (Zwolle), a bank filtrate of the IJssel is also used. There, the water from the IJssel flows through the bed several years before we use it. At the extraction location, we largely see the same substances as in the Rhine. We therefore need different treatment techniques. We installed a membrane filtration there, which was not a good thing. We must ensure that the Rhine becomes clean again. If there’s nothing there, you don’t need to remove it.”

Why is the Rhine Ministers conference important for Vitens?
“What should the participants at the conference do? Ensure that the existing and potentially new bank filtrate extractions for drinking water preparation are not subject to discussion. Competition with other functions – like nature – is increasing through climate change and more intensive land use. We not only need to ensure sufficient, good quality Rhine water which flows - via the IJssel – to the IJsselmeer, but also focus on the spatial aspects of drinking water preparation.”

OASEN

‘IMPROVEMENT PLAN FOR THE RHINE NEEDS CONCRETE OBJECTIVES’

Peter Wessels, head of the Research department at drinking water company Oasen, is hoping that the new action plan for the Rhine will include concrete reduction goals. This is important to be able to better steer the essential quality improvement of the Rhine going forward.

Peter Wessels
Head Research department

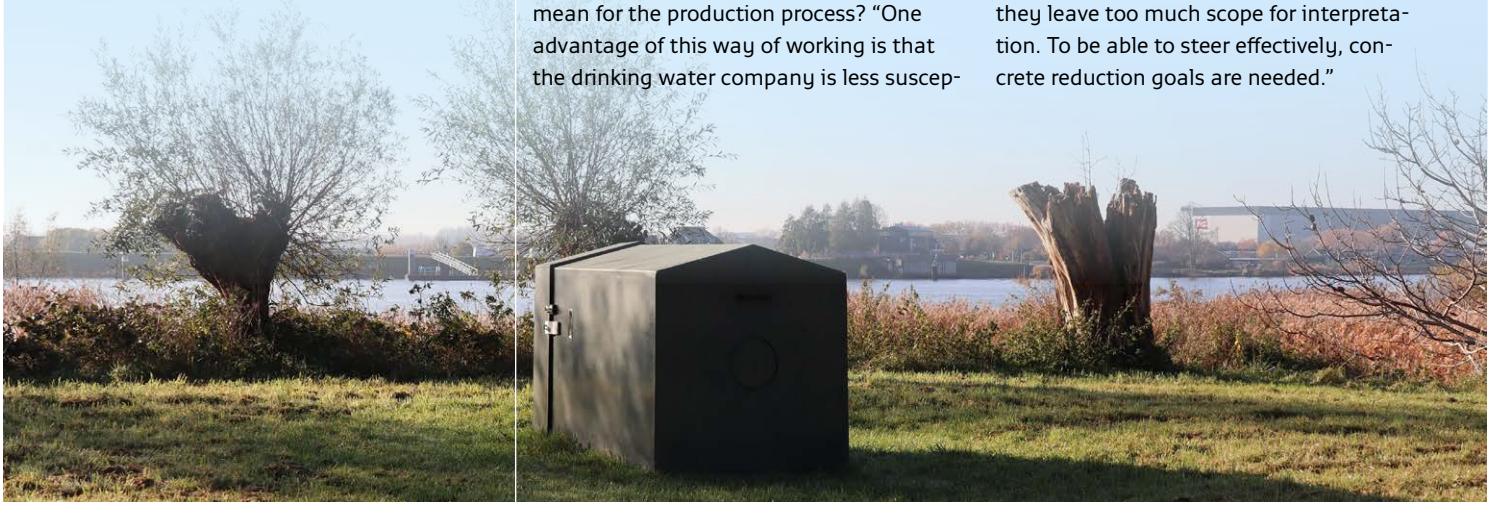
oasen drinkwater

Drinking water company Oasen produces drinking water for 750,000 people in the eastern part of the province of Zuid-Holland, including towns like Gouda, Alphen a/d Rijn and Gorinchem. In order to do so, water is obtained from the river banks of the river Lek. This means that much of the drinking water is produced from water that originally comes from the river Lek or the Rhine. Every year, Oasen supplies around 46 million m^3 of drinking water.

Why is the Rhine so important for Oasen?
Wessels: “The Rhine directly affects the quality of our source of drinking water. Options for other drinking water sources are very limited. One possibility would be to treat surface water directly from the Lek, but the quality of that water is not as good as bank groundwater. Another alternative is to use groundwater further from the Lek. However, in the west of the Netherlands, we would soon get brackish groundwater which we would then need to desalinate. Very brackish groundwater produces salty waste flows.”

Production process in context
The bank groundwater that goes to the treatment plant is always a mix of young and old bank groundwater. What does that mean for the production process? “One advantage of this way of working is that the drinking water company is less susceptible to calamities and peak discharges on the river. The disadvantage of using bank groundwater is that all the substances that were once present in the Rhine are still lingering. These are mainly polar substances from industrial discharges on the Rhine, like 1,4-Dioxane, Trifluoroacetic acid and polar aromatic sulfonates. The drinking water company currently removes these pollutants with activated carbon and partly also with membrane filtration.”

Why is the Rhine Ministers conference important for Oasen?
“The Rhine Commission has been in existence for a long time. Looking back at the efforts that have been taken over the past 20 years to protect the Rhine from pollution, they do not seem to have produced a significant improvement of the Rhine. New and worrying substances continue to appear and the number of incidents with pollutants is increasing. Drinking water companies need to work harder to make drinking water.
In the Rhine Commission, they are now thinking about new goals for the Rhine for the period after 2020. It is crucial to achieve quality improvement in the coming period. In the new plan for 2020-2040, it is therefore not desirable merely to choose abstract formulations, because they leave too much scope for interpretation. To be able to steer effectively, concrete reduction goals are needed.”



PWN

‘IF THERE’S NOTHING THERE, YOU DON’T NEED TO REMOVE IT’

Paul Wesselius, Drinking Water team manager at PWN, wants to get rid of the continuous flow of new substances that continue to surprise the drinking water companies. In his view, the treatment efforts are at risk of getting out of hand.

Paul Wesselius
Team manager Drinking Water

Drinking water company PWN supplies drinking water to over 780,000 households, businesses and institutions in the province of Noord-Holland. 90 percent of the required water comes from the IJsselmeer and thus, from the Rhine. Every year, 24 million m^3 of water from the IJsselmeer is treated to produce drinking water. Another 45 million m^3 of IJsselmeer water is pre-treated in Andijk, before being transported to the industry as process water or to the dunes for infiltration for the production of drinking water.

Why is the Rhine so important for PWN?

Wesselius: “The Rhine flows - via the IJssel – into the IJsselmeer. That’s our lifeline and we more or less assumed that this fresh water stock was inexhaustible. During the drought of 2018, however, PWN was unable to collect water for a long time from the intake point in Andijk, because the chloride level was too high. The concentrations rose to 300 milligrams per litre, which is above the formal collection boundary of 150 milligrams per litre. In that case, drinking water companies must stop their intake. Such an event highlights once again the importance of a clean supply of water from the Rhine for us.”

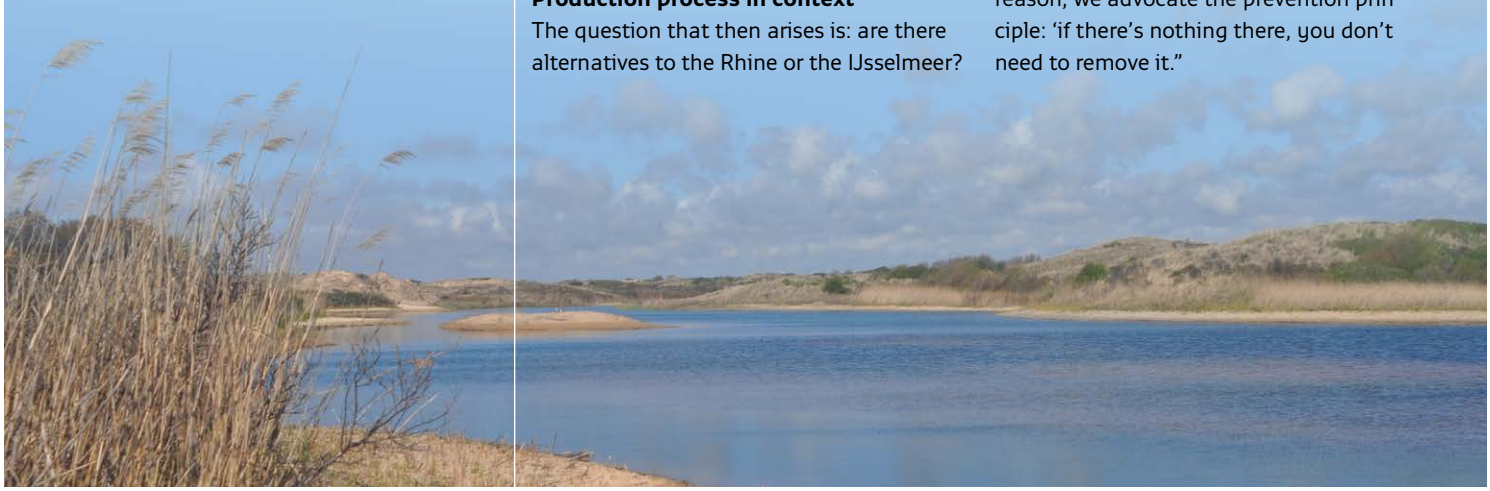
Production process in context

The question that then arises is: are there alternatives to the Rhine or the IJsselmeer?

“Until 1955, PWN collected the drinking water for Noord-Holland from the dunes. To replenish the groundwater, it was decided to infiltrate water from the Rhine or the IJsselmeer into the dunes after pre-treatment. Other sources for drinking water production were also sought. In 1968, PWN therefore opened a factory on the IJsselmeer, where IJsselmeer water is directly purified to become drinking water. Initially, this was simple purification. A few years ago, PWN built a very advanced treatment plant in Andijk. That treatment plant operates on the basis of ion exchange, with ceramic membranes behind for microfiltration.”

Why is the Rhine Ministers conference important for PWN?

“For a long time, there was boundless faith in technological solutions for quality problems in the Rhine. But drinking water companies are increasingly faced with new substances which are found in the river. First, it has to be decided whether these substances can cause a threat to public health. And then it has to become clear whether and which treatment processes are suitable to remove these substances or render them harmless. In short: drinking water preparation is at risk of becoming an increasingly expensive process. For that reason, we advocate the prevention principle: ‘if there’s nothing there, you don’t need to remove it.”



‘Hidden Rhine water’

Water from the Rhine is – indirectly – also used for drinking water in the provinces of Zuid-Holland and Zeeland. Dunea uses water from the Lek, Evides from the Haringvliet. Both rivers are fed by the Rhine.

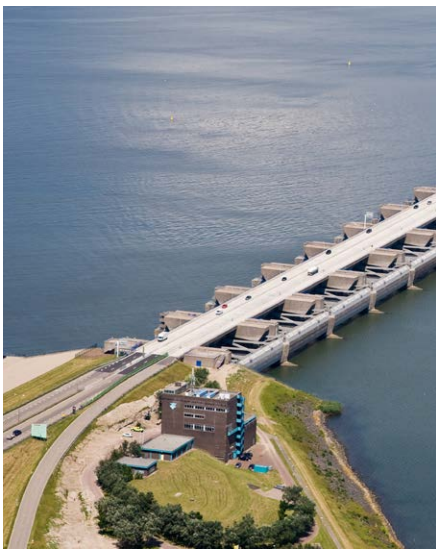
DUNEA

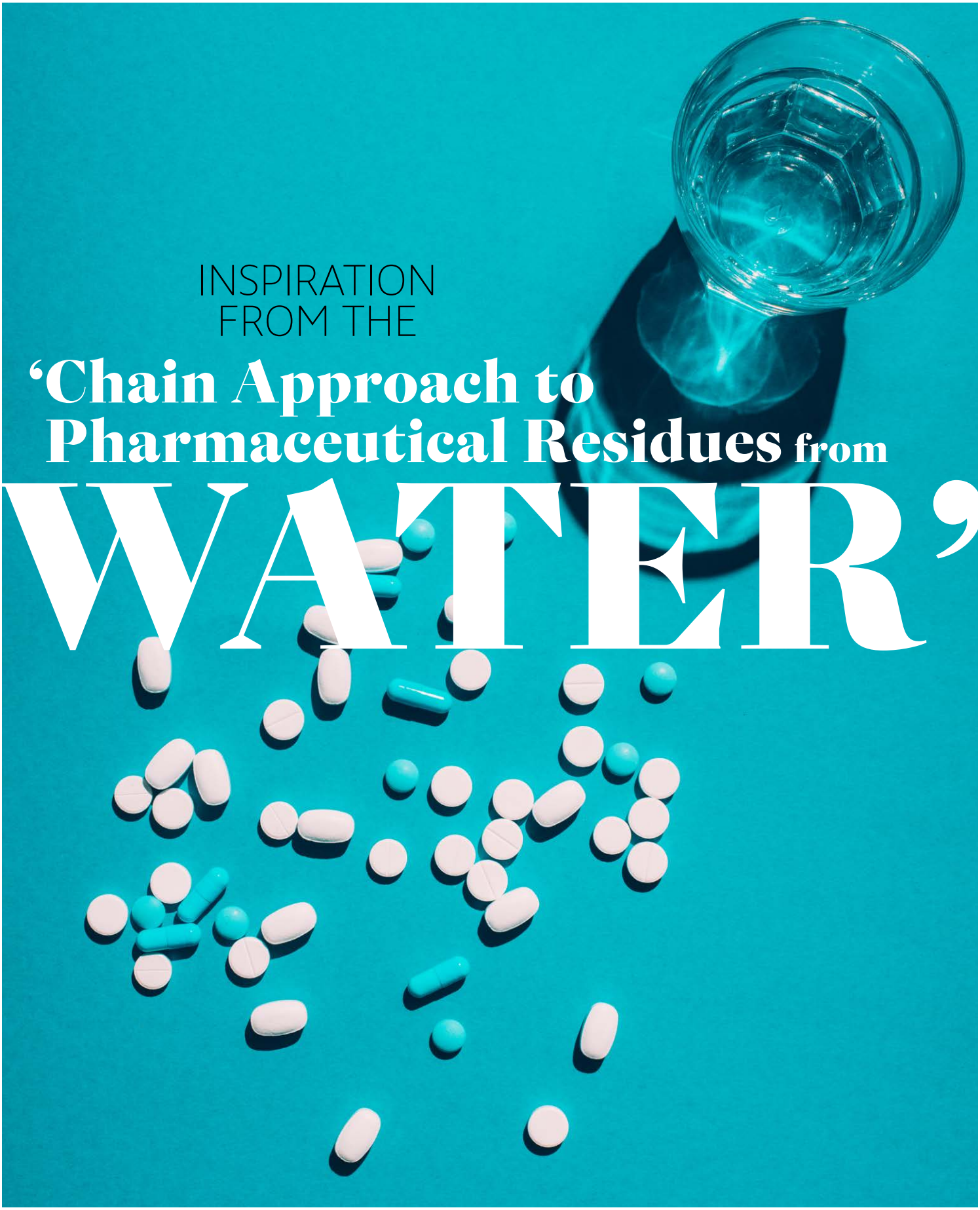
Dunea supplies drinking water to 1.3 million people in 18 municipalities in Zuid-Holland, including The Hague, Leiden and Zoetermeer. To do so, it uses water from the Afgedamde Maas, an old branch of the River Meuse on the boundary of Gelderland and Noord-Brabant.
The drinking water producer has not always used water from the Meuse. In the past, water from the Lek or the Rhine were used. However, due to the poor quality of the Rhine water, in 1976 it was decided to switch to water from the Meuse. The intake point near the Lek has since only been used as a reserve. In 2014, that intake point for Lek water was brought back into operation. This followed an incident in 2012, involving a discharge of pesticides. For a long time afterwards, the Meuse water was unusable and it became clear that a plan B was urgently required. Since that time, the ‘second anchor’ on the Lek (or the Rhine) has been back in use for the production of drinking water in Zuid-Holland. Since 2018, water from the Meuse is mixed with water from the Lek in order to meet the growing demand.

EVIDES

Evides supplies drinking water to 2.5 million people and businesses in Zuid-Holland, Zeeland and the Brabantse Wal area. To do this, it uses three different sources: surface water, infiltrated dune water and groundwater. 80 percent of the water required for the drinking water production comes from the River Meuse.
For Goeree-Overflakkee and Schouwen-Duiveland, however, water is taken from the Haringvliet. The Haringvliet is administratively part of the Meuse river basin, but 80 to 90 percent of the water comes from the Rhine.

Immediately after the Haringvliet locks were built in 1970, it was proposed that the Haringvliet would become the new store of fresh water. Later people changed their mind. The Haringvliet locks not only created a hard barrier between fresh and salt water but also an impenetrable obstacle for migrating fish. For that reason, the locks were opened slightly. This caused the water in the western part of the Haringvliet to become brackish. As a result a sufficient supply of fresh water from the Rhine became increasingly important.





INSPIRATION FROM THE

‘Chain Approach to Pharmaceutical Residues from WATER’

Everyone agrees that pharmaceutical residues do not belong in surface water. But how do we manage this complex, diffuse problem? Innovation strategist Judith Hoogenboom -bureau VanWaarde- explains a formula that appears to work: the Chain Approach to Pharmaceutical Residues, developed by the Ministry of Infrastructure and Water Management.

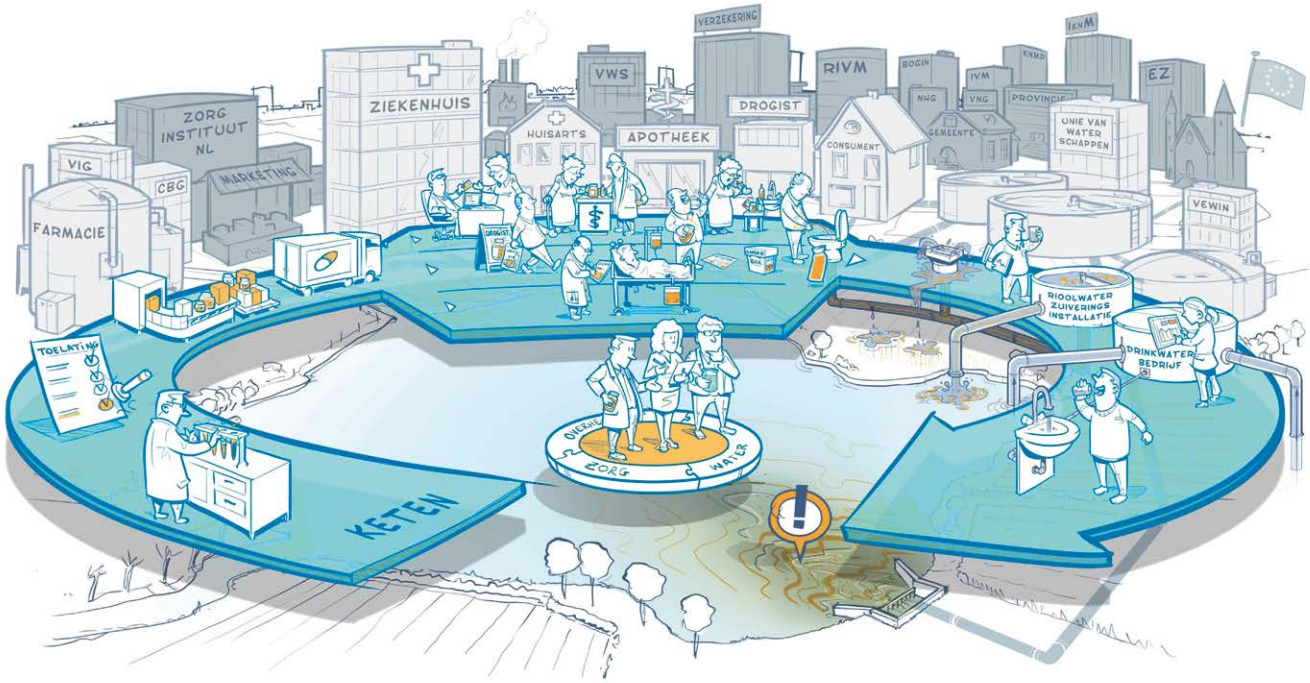
Firstly: why was a Chain Approach to Pharmaceutical Residues developed?
"In the Netherlands, we discharge 140,000 kilos of pharmaceutical residues into the water every year. These substances can cause tissue damage, hormonal disruption and behavioural change in organisms in the water. Some products, like radiographic contrast agents, pass straight through all the treatment plants and end up in our drinking water in small quantities.
And we obviously don't want that.
In 2016, the Ministry of Infrastructure and Water Management embarked on a structured approach to solve the problem. A lot of information had already been collected about the pharmaceutical residues problem. Through the structural chain approach, however, this dossier was given a new impulse and extra attention from the Dutch Delta Approach to Water Quality."

Who are involved in the chain approach?
"The entire chain: health care professionals who prescribe and issue medicines (doctors, pharmacists), organisations which treat water and produce drinking water (water boards, drinking water companies) as well as parties who develop and manufacture those medicines (pharmaceutical industry)."

How did you begin?
"At the beginning, we wanted to understand the problem better. Obtain more insight and a wider view. What exactly is the problem and how extensive is it? What kind of measures could really make a difference? To this end, RIVM wrote a 'clarification report' addressing, for example, the distribution route of pharmaceutical residues. How and where do they get into the water? It appears that 95 percent of the substances get into the water via the patient's body. A small percentage of medicines are washed down the sink.
Other studies into the operation of wastewater treatment plants reveal that around 90 percent of pharmaceutical residues in wastewater comes from households and 10 percent from hospitals. Water boards also carried out a 'hotspot analysis' to find out at which Dutch sewage treatment plants the water quality was impacted the most by pharmaceutical residues. Because these places will benefit most from supplementary purification measures."


In the Netherlands, we annually discharge 140,000 kilos of pharmaceutical residues

The health care industry and the water sector don't know each other: how do you get them to cooperate with each other?
"After the report was published, we started identifying clear common starting points which apply to everyone. In this case, these starting points are: medicines remain



available to everyone who needs them; we will take a pragmatic approach and actually solve problems; and finally: every party in the chain does what it can, we won't wait for each other. Another thing that worked well is that all the parties involved visualised the pharmaceuticals chain. This gave us an idea about who could do what. We then incorporated those actions in an implementation programme. That programme runs from 2018-2022."

Examples of important measures?
"The water boards are responsible for one important action. In the identified 'hotspot' sewage treatment plants, they will introduce supplementary treatment measures. Another action concerns radiograph contrast agents. We will address these at the source. That means that we will work to reduce the use of these agents. In addition, we want to promote the use of urine bags by patients. If they can use them to collect their urine for 24 hours after the scan, no radiograph contrast agents will get into the water. Finally, there is an action focused on general awareness."

Awareness still sounds rather vague. What are you doing in concrete terms?
"We are currently focusing on information in the FTOs, i.e. pharmaceutical consultation groups involving GPs and pharmacists. There are 850 FTOs in the Netherlands. We have trained people from the water sector and drinking water companies to organise interactive sessions for these groups, showing them which pharmaceutical residues get into the wastewater treatment plant at that specific location. GPs and pharmacists then discuss ideas for possible actions. One GP goes and talks with the local councillor, another installs collection containers in the practice or gives information to the patient. This interactive approach has proved a great success, because we continue to receive lots of requests for information sessions. Our message is therefore: promote the dialogue between the health care sector and the water sector and look for possible actions together."

> "Every party in the chain does what it can, we won't wait for each other."

Are such actions also the most important results of the chain approach?
"By implementing such actions, we will ultimately ensure that fewer pharmaceutical residues end up in the water, which is our goal. With these actions, we show that the chain approach works. A crucial element here is that we manage to get the whole chain around the table and keep it there. That is only successful if there is one party that continues to create the connection within the chain and between the chain partners. In our case, Marc de Rooy from the Ministry of Infrastructure and Water Management fulfils that role."

Finally: what can the drinking water industry do?
"Our drinking water is of good quality, so let's keep it that way. The drinking water industry plays an important role in identifying the problem. In the case of pharmaceutical residues, this is a complicated subject involving many difficult substances. The drinking water industry helps by telling the story without making consumers afraid to drink the water. We also see that good forms of cooperation exist between drinking water companies and water boards, particularly now that drinking water technology is going to be applied more and more to wastewater treatment."

THE SOURCE OF THE RHINE

Where does our beloved Rhine come from? Connoisseurs consider Lake Toma (Lai da Tuma) as the source of the river. The lake lies at an altitude of 2,344 meter, in the middle of a nature reserve. Cuckoo flowers, gentian, alpine roses, marguerites and white cotton grass grow there. Lake Toma is on the list of Swiss landscapes and natural monuments of national importance. The water there has the quality of drinking water. After a journey of 1233 km this Rhine water eventually reaches the North Sea.

Water dossiers

In this section you will find a brief outline of a few river-relevant topics and activities from the past year.

1 MRI CONTRAST AGENTS

Christina Lavini, UMC Amsterdam

"On 2 October 2019, Rotterdam was the venue for an expert meeting about MRI contrast agents with gadolinium, organised by GREC (Gadolinium Research & Education Committee). Radiologists, chemists, physicists and pathologists discussed their research projects. Gerard Stroomberg from RIWA-Rijn was also invited to give a presentation.

Attention for the safe use of MRI contrast agents is growing worldwide. Although 'free' gadolinium is a toxic substance, packed as a chelate (in a 'molecular cage') it can be safely administered as an MRI contrast agent. Since the 1980s, more than 300 million doses have been administered globally. Recently, however, it has been revealed that in some patients, gadolinium stays in the body. It has not yet been established whether this makes patients ill. However, there is growing attention for the fact that after being administered to patients, gadolinium gets into sewage water. Once in the water, it cannot be filtered out. This means that it is also introduced into drinking water and even soft drinks, according to recent German studies. The amount varies according to the region.

The appeal by RIWA-Rijn to give patients urine bags after an MRI scan was well received by the radiologists."

2 EMERGING CONTAMINANTS FROM CONSUMER PRODUCTS

Gerlinde Roskam, Deltares

"On behalf of the national working group 'emerging contaminants', in 2019, Deltares embarked on research into emerging contaminants from consumer products. We collected data about the presence of substances in personal beauty products and cleaning products, the use of these products, the presence in surface water and the toxicity. Based on the results, we want to be able to prioritise substances or products for further research.

Interim results? The number of substances that were identified ran into the thousands. However, the collected qualitative and quantitative information is not sufficient to be able to prioritise the substances. The research will therefore be followed up in 2020, and we will focus more on the function of the substances. This will result in recommendations for policy and legislation.

My message to the participants of the Rhine Ministers conference? There are always too many emerging contaminants to measure and too many to set standards. For that reason, it is important to formulate an overarching strategy, rather than focus on individual substances. In addition, a strategy aimed at sources of pollution is always better than a strategy aimed at substances that are already present in the water."

3 GERMAN NATIONAL WATER DIALOGUE

Gerard Stroomberg, RIWA-Rijn

“We want living rivers and lakes, water of good quality and quantity and sufficient protection from extreme weather. To achieve this, we will continue to need a well-functioning water management system and a sustainable and careful approach to our water resources. Ensuring this is the task of the National Water Dialogue”. With these words the German Federal Minister of the Environment, Svenja Schulze, launched the National Water Dialogue in 2018.

"At its heart is the exploration of measures for the German water industry to be able to tackle new challenges: climate change, demographic developments, changes in land use, technological innovations and changes in consumer behaviour. These developments lead to radical changes which cannot be addressed by local measures alone.

Aquatic ecosystems always need time to respond to improved limiting conditions. Because the water infrastructure focuses on the long term, the measures which are necessary up to 2030 must be discussed with the parties involved today. The industry, the agricultural sector, the environmental movement and the drinking water industry are represented in this process and are working together on the building blocks for a national water strategy ‘Zukunft Wasser’. The goal being a sustainable German water industry.
Our international association of drinking water companies in the Rhine catchment area, the IAWR, is participating in this dialogue. And that is important. When considering all the interests, the importance of healthy and clean drinking water with simple purification technology must not be forgotten.”

4 INNOVATION ACCELERATOR PROGRAMME ON WATER QUALITY

Lieke Coonen, Vewin

”Our Minister has expressed the ambition to become ‘world champion in water quality’. An important aspect of this is to achieve the goals of the Water Framework Directive and to deal with emerging contaminants. Based on the Dutch Delta approach to Water Quality, an innovation accelerator programme has been launched with three tables: one about agriculture (pesticides and fertiliser), one about emerging contaminants and pharmaceutical residues and a broad overarching table (including monitoring and enforcement, plans for the WFD). This innovation accelerator programme must achieve breakthroughs in improving water quality.

Current situation in this process? The innovation accelerator programme has been running for a year. Agreements have already been made about a training programme for permit issuers. At the end of 2020, more fundamental agreements will follow about measures that must really make a difference.
My message to the Rhine Ministers conference? In the Netherlands, the sources for drinking water are under increasing pressure. Through the innovation accelerator programme, we are trying to achieve breakthroughs to improve water quality, but we are also dependent on what is happening in the countries around us. Joint agreements on the water quality of the Rhine are therefore crucial: preferably in the form of quantitative reduction goals.”

5 APPROACH TO PERSISTENT, MOBILE TOXIC SUBSTANCES (PMT)

Harrie Timmer, Oasen

“RIWA, the Ministry of Infrastructure and Water Management, RIVM, the Directorate-General for Public Works and Water Management, the water boards and drinking water companies are involved in the national approach to emerging contaminants. In this approach, we focus on a category of new problematic substances: PMT Substances. These are persistent, mobile and toxic. PMT substances pass through the treatment process and could harm our health. Well-known examples are PFOA, GenX and 1,4-dioxane.

The action plan is based on the following thoughts: how can we prevent PMT substances getting into the sources for drinking water? Can we identify clear criteria so that we can recognise and classify PMT substances? Finally: can we introduce more restrictions to the discharge of PMT substances? In other words: can the required purification efforts be tightened – through the discharge permit – so that these substances don’t cause any more problems?

Current situation? This will all be elaborated over the coming year. This is a Dutch programme, but in a European context, we appeal for a similar classification of PMT substances, for example via REACH. Our Minister has said that she supports this idea. There is also a great deal of support internationally. In January 2020, for example, an international scientific symposium was organised in Leipzig about the approach to such substances.”

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Here you can find our latest annual report (in Dutch):

RIWA-Rijn