WATER RESEARCH IN BERLIN

KOMPETENZZENTRUM WasserBerlin

EDITORIAL

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Is water going digital now? Under this rhetorical question, we invited Berlin's media representatives in early autumn to a press conference in the CityLAB Berlin. The actual reason for this press briefing was the launch of the EU project **Digital-Water.City**, which met with a highly positive response.

In fact, we have noted that in times of climate change the interest in efficient and sustainable solutions for water management has increased, particularly if digital tools are supposed to be applied. We intend to develop eligible digital solutions in the Digital-Water.City project together with 24 European partners over the next three years. The online monitoring of pathogens for the purpose of monitoring and quality prediction of bathing water has been started already. In this context, we build on the experience we have gained during several projects focusing on river sanitation, and so we will be able to support the City of Paris to prepare a section of the Seine River for the swimming competitions during the 2024 Olympics. In cooperation with Berlin's water utility Berliner Wasserbetriebe, we have just started the development of mobile applications to support the operation and maintenance of drinking water wells in Berlin.

Further case studies in Berlin, Paris, Copenhagen, Sofia and Paris will follow. We will keep you updated on their progress.

We wish you happy holidays and a prosperous New Year.

Edith Roßbach, Regina Gnirß
Managing Directors

LATEST NEWS
German-Colombian Water Workshop in Bogotá: Modelling Urban Water Systems and Sustainable Rainwater Management
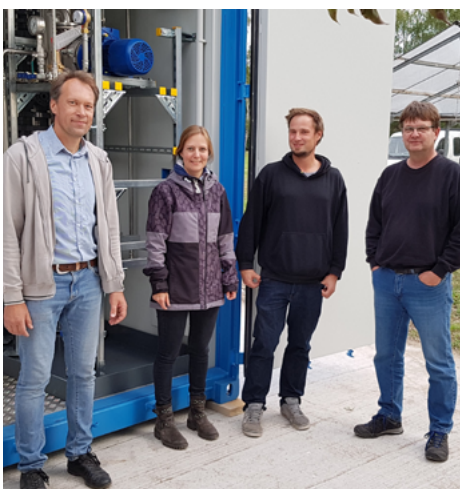
In December, the Institute for Automation and Communication (ifak e.V.) conducted in cooperation with Kompetenzzentrum Wasser Berlin (KWB) a German-Colombian workshop. The event was held at the Universidad JJaveriana Bogotá / Colombia.

The workshop was funded by the German Federal Ministry of Education & Research (BMBF), which entrusted the ifak institute with the organisation of this workshop on the occasion of the BMBF's „Columbia Day" in March 2019. In terms of urban drainage Colombia and Germany can complement each other very well. Colombia in particular has gathered comprehensive experience in managing stormwater events in most diverse climate zones which is a topic that has become the focus of attention in Germany quite recently. The aim of the workshop was to share information on current research issues in the field of urban drainage and to establish a new network for subsequent research collaborations. More than 30 people from various Colombian universities, water professionals and administrative bodies attended the event.
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Tackling nitrate contamination in groundwater
Pilot plant for nitrogen recovery from agricultural waste goes into operation

*The EU-funded project **Circular Agronomics** aims to advance circular economy processes and improve them in terms of their efficiency. The project's focus is on waste from the food industry and agriculture. Valuable substances such as phosphorus, nitrogen and carbon are to be recovered and made available again for need-based use in agriculture.*

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Project-team (f.l.t.r): Dr. Andreas Muskolus (IASP),
Dr. Anne Kleyböcker (KWB), Jan Schütz (KWB),
Dr. Andreas Dünnebeil (PONDUS® Verfahrenstechnik GmbH)

Agricultural waste such as digestate from biogas production usually contains a lot of nitrogen compounds, which can get into the groundwater when being applied on agricultural land. In many agricultural regions of Northern Germany, the threshold of 50 milligrammes nitrate per litre has been exceeded already which has led to restrictions in drinking water production. It is therefore imperative to look for solutions which eliminate this entry path.

In the EU-funded project Circular Agronomics, Kompetenzzentrum Wasser Berlin (KWB) and the company PONDUS Verfahrenstechnik have designed and built a pilot plant for ammonia recovery from agricultural waste, which is scheduled to go

Circular Agronomics

SEWER DETERIORATION AND BATHING WATER QUALITY

DIGITAL SOLUTIONS ALLOW FOR ENTIRELY NEW APPROACHES

Interview with Dr.-Ing. Pascale Rouault, Head of the Urban Systems Unit at the Kompetenzzentrum Wasser Berlin (KWB). Pascale is a civil engineer and holds a PhD in Water Engineering from the Technical University Berlin. Her unit deals with urban water infrastructure systems and their interaction with receiving waters. Key issues are stormwater management, asset management and monitoring of the behaviour of urban water systems.

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Dear colleague, digitalization is a major trend. When did you realise that someday it would also influence water management processes?

In fact, there was no defining moment during my research work in this respect. But with the arrival of digital technologies in our everyday life and the according steps towards Industry 4.0 it has become clear, that the water sector will benefit enormously from this trend as well. At KWB, we have dealt with digitalization issues at an early stage already. So we work for instance with the automated processing of sensor data or by means of machine learning tools. We develop and use the latter in the field of asset management to predict the deterioration of sewers or to forecast bathing water quality. However, we need to consider that the water industry provides services of public interest, and in this area the fast moving mechanisms of the free market do not necessarily apply. The focus here is rather on the maintenance and performance of very long-lasting infrastructures, particularly in terms of health protection and environmental protection. Risks of failure must be clearly ruled out.

You have been significantly involved in the development of the EU project „Digital-Water.City" (DWC). The project which started in June 2019 with 24 international partners, will receive funding by the EU to the amount of five million euros over the next three and a half years. What is the main objective to be achieved with this project?

In close cooperation with the stakeholders of several major European cities - namely Berlin, Paris, Milan, Copenhagen and Sofia - we investigate the potential of digital solutions and assess in which extent they can actually improve water management services. We want to know how digital solutions can be integrated into existing subsystems without compromising the security of the entire system. We are dealing here with critical infrastructures which do not allow any security gaps.

Can you set some examples?

For example, it is being investigated whether innovative sensors can be used for monitoring in real-time the discharges of combined sewers networks. The aim is to better understand the behaviour of the network and avoid undesired overflow during heavy rainfall. In this context, the security and reliability of wireless transmission of sensor data via LoRaWan networks will also be tested. The results will demonstrate whether such data can be used to support strategic decisions. Together with our project partners from R&D, the industry and water utilities, we develop and demonstrate the benefits of 15 innovative digital solutions such as real-time sensors, machine learning, mobile applications, Augmented Reality and data platforms.

Like most projects funded in the EU's Horizon 2020 program, DWC is expected to deliver practical results. The results and products are supposed to achieve a Technology Readiness Level (TRL) of 7 to 9 points, which is indeed very ambitious. Can you tell us something about the key deliverables and the potential users of the final products?

This is indeed very ambitious, but realistic! Most of our solutions already exist and have been tested either on lab scale or in various pilot projects. The DWC project applies, improves and evaluates these solutions on a large scale. To ensure a close cooperation with the water utilities of the mentioned cities, we cannot ignore the practical and real-world issues. Instead, our cooperation partners expect us to ensure the long term use and uptake of the tested solutions.

What is going to happen in Paris and Berlin?

In Paris a combination of online sensors and machine learning tools is being deployed to simulate the bathing water quality of the rivers Seine and Marne. The aim is to ensure the safe water quality of the rivers for the swimming competitions which will take place there during the Olympic Games 2024. In Berlin, we will develop a mobile

application to support the collection of all data related to the management of drinking water wells. This data will be used together with machine learning techniques to develop efficient predictive maintenance plans. For example, it will be possible to identify wells with higher maintenance requirements and prioritize accordingly the maintenance efforts of the utility.

What about the coordination of the rather large project consortium? More than 60 people came to the kick-off meeting which was held in Berlin in September. Are there any specific communication routines which ensure that acquired knowledge reaches the „end user" without any loss?

We have managed some EU projects already and can therefore build on our previous experience. That's why we have decided to have the DWC project coordinated by two persons: Dr Nicolas Caradot is responsible for the scientific coordination whereas Dr Hella Schwarzmüller is in charge of the general management, which includes among others also the budget control. The project is designed in a way that also other partners lead key activities by managing individual work packages. Additionally we established several working groups named Communities of Practice to bring together project partners and external stakeholders. At the local level in each city, they are expected to build the trust of external stakeholders in the future use of the digital solutions and to integrate their expectations in the development of solutions. At the project level, they provide a platform for knowledge exchange between the cities' stakeholders, useful for example to assess the transferability of the digital solutions in other contexts. ●

Dr. Bodo Weigert asked the Questions

WATER RESEARCH IN BERLIN

Implementation of Sponge City Concepts in China

*In the joint project **KEYS**, which is managed by the University of Hannover, German and Chinese partners are working on the spot in various Chinese cities on a demand-based implementation of sponge city concepts („Sponge City").*

Particular attention is paid to the examination of advanced and smart components of stormwater management. The aim is to improve water quality by avoiding pollutant inputs from urban quarters. The KWB coordinates the water resource modeling of catchment areas in the Tongzhou District situated in the southeast of Beijing. Against the background of the many years of experience gained in Germany in this field, this project component will examine the extent to which individual measures of stormwater management can be transferred to China's climate conditions. First analyses based on data from green roofs gathered in Berlin and Beijing have already been validated and presented at two international conferences together with the Chinese partners. Furthermore, a water quality model is being developed that will allow for the identification of hotspots even with scarce data and for the development of adequate measures.

An additional important component of the project is the implementation of innovative process combinations for wastewater treatment. In this context, two MBR pilot plants produced by the Berlin-based company Martin Systems were put into operation in Shenzhen at the end of June 2019. The units are now being intensively examined in cooperation with the Harbin Institute of Technology until the end of 2019.

The picture shows KWB scientist during technical visit together with the „Beijing Enterprises Water Group" on a future test field at the MBR wastewater treatment plants in autumn 2019. ●

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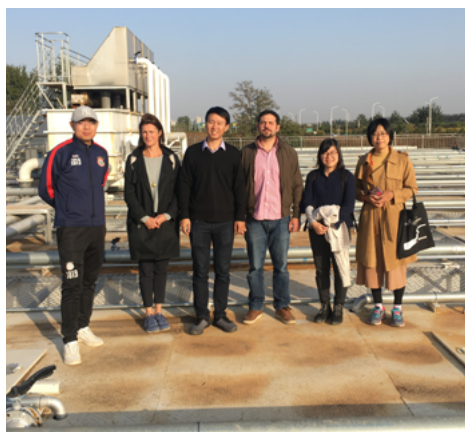
Digital Solutions for the Optimisation of Membrane Bioreactors (MBR)

*Compared to conventional wastewater treatment plants, the cost of operation and maintenance of membrane bioreactors (MBR) is in general relatively high. This is due to the fact that the membranes need to be cleaned frequently to maintain their efficiency. The project **MBR4.0** aims to optimise all process steps of membrane systems by means of digital applications, including process monitoring, control and visualisation of operating data in real time.*

The project MBR4.0 started in early August 2019, including modelling and simulating all biological, chemical and engineering processes of MBR systems by means of the software SIMBA#. The results are the basis for subsequent test runs using membrane modules on site at a water treatment plant operated by Berlin's water utility Berliner Wasserbetriebe. The investigations comprise the smart aeration control as well as the optimisation of the nitrogen removal process.

The groundwork for the improvement of the maintenance operation consists in the continuous detection and documentation of the technical condition of critical MBR life cycle components such as fine screens and membranes.

The project is being funded for a period of two years by the programme "KMU-innovativ" issued by the German Federal Ministry of Education and Research (BMBF). Project partner is the company Martin Systems. ●

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Reducing Trace organic Compounds in urban Rainwater Runoff

During rain events, trace organic compounds such as biocides, plasticizers and flame retardants are washed off from façades and roofs as well as from traffic areas. Depending on weather conditions and urban structure, these pollutants are often discharged directly into surface waters via the rainwater drainage system, usually without prior treatment.

These issues have intensely been investigated and documented in our projects **BaSaR** (ongoing) and **OgRe**. The recently launched project **SpuR** will focus on novel technical solutions to reduce or avoid such emissions into the environment:

• Application of new façade coatings: the paint product to be tested consists of easily degradable active substances for façade protection. Special encapsulation ensures that these are better retained in the façade thus preventing its easy washout;

• Application of new adsorber technology in a decentralised rainwater treatment unit allows for the retention of dissolved organic trace compounds in addition to solids and heavy metals.

Furthermore, the project will develop a planning framework for urban rainwater management. Components include profiles of relevant measures as well as an easily applicable load model for pollution assessment of an urban catchment area with and without the planned measures. The entire procedure will be summarised in a guideline. The investigations are carried out in cooperation with the companies Brillux and Funke and the Swiss University of Applied Sciences in Rapperswil. ●

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SpuR

into operation in December 2019 in Berge northwest of Berlin. Its principal item is a vacuum degasification unit which removes ammonia from the digestate or waste stream. In a gas scrubber, the ammonia reacts with sulfuric acid to ammonium sulfate, a typical fertiliser. The special feature of this process: the plant can be operated with waste streams that still contain a fairly high content of total solids of up to seven percent. A prior separation of the solid matter is not necessary.

This process allows for the separation of nitrogen from the digestate's high-carbon fraction and subsequently for an adequate soil improvement by means of carbon or by the soil's fertilisation with nitrogen. In particular, this approach will have a positive effect on the groundwater, since the nitrogen can be selectively applied in times of the plant's highest nutrient requirement.

During the test operation of the pilot plant, the best practice with regard to pH value, temperature and negative pressure in the degasification unit will be identified. At the same time, the process operation is supposed to be managed as energy-efficient as possible, yielding a high recovery rate of ammonia amounting to a range between 80 and 90%.

The tests will be funded by the EU for four years and are being conducted in cooperation with KWB, the companies PONDUS Verfahrenstechnik and Soepenberg as well as the Institute of Agricultural and Urban Ecological Projects affiliated to Berlin Humboldt University (IASP).

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Horizon 2020
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EVENTS

Meet us at the following events:

26-27 February 2020

ÖWAV-Seminar on Capacity Increase of WWTPs
Venue: TU Vienna, Austria
Information

25-27 March 2020

Groundwater and Catchments – Processes, Data and Models
27th Meeting of the German Association for Hydrogeology in the German Geological Society (DGGV)
Venue: UFZ Helmholtz-Centre for Environmental Research Leipzig, Germany
Information

04-08 May 2020

IFAT World's Leading Trade Fair for Water, Sewage, Waste and Raw Materials Management
Venue: Messe Munic, Germany
Information

26-27 May 2020

IFS International Fertiliser Society Technical Conference
Venue: Hotel Casa 400, Amsterdam, The Netherlands
Information

09-10 September 2020

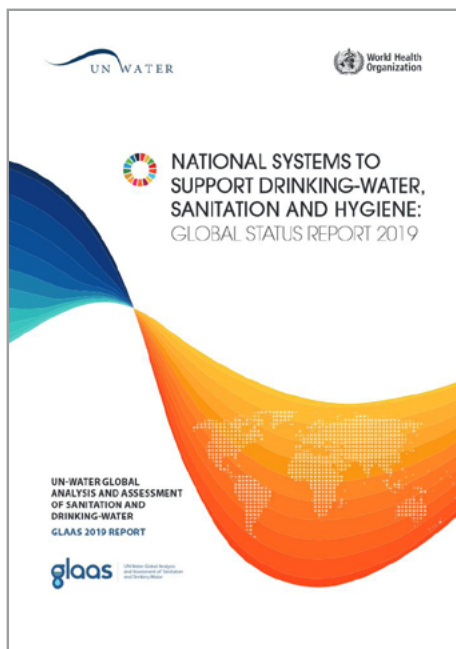**INFRASpree Fachkongress für die Wasserwirtschaft in Berlin und Brandenburg**
Venue: KOSMOS Berlin, Germany
Information

28-29 September 2020

Aqua Urbanica 2020: Schwammstadt – Versickerung 2.0?
Venue: University Innsbruck, Austria

KEY READS

UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS) 2019 report

Global status report 2019 about national systems to support drinking-water, sanitation and hygiene

Editor:
World Health Organization and UN-Water, 2019
144 pages
ISBN: 978-92-4-151629-7

Download

WASH = Water, Sanitation and Hygiene: The recent report published by UN and WHO in summer 2019 provides a detailed analysis and evaluation of the state of water infrastructure worldwide. The report gathers data from 115 countries representing a total of 4.5 billion people or 60% of the world's population.
Result: More than 90 percent of the countries surveyed have developed WASH guidelines and implementation strategies. The degree of implementation (<20 percent) is quite low which is due to a lack of funding and a shortage of trained manpower. However, 50 percent of the countries surveyed want to remedy the shortcomings identified by 2030.
In an exemplary manner, all report data have been made available online in Excel format. ●

about us

Kompetenzzentrum Wasser Berlin gGmbH is a research center for applied water research and knowledge transfer.
With our research projects on smart water management we are dedicated to keep cities like Berlin livable also in the future.
Our associates are the Technologiestiftung Berlin, the Berliner Wasserbetriebe and the Berlinwasser Holding. Our partners are scientific facilities, public institutions, companies as well as multipliers from public and private sectors.

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