KWB

Annual Report 2025

Welcome

Water is not only the foundation of life; it is also the foundation of our future. Securing energy supply, strengthening infrastructure resilience, adapting to climate change, and driving Berlin's economic development are inconceivable without water. Together, these are core tasks in ensuring that Berlin remains future-ready and innovative.

Franziska Giffey

This is precisely why the Berlin Senate Department for Economic Affairs, Energy and Public Enterprises is investing in real-world laboratories. Their purpose is to develop technologies in everyday settings, with the active involvement of Berlin-based companies and civil society, in order to create systemic solutions to pressing challenges such as climate change and resource scarcity. Real-world laboratories are an important link between academic research, business spin-offs, and industry. We are unlocking this potential by providing a total of 9 million euros in funding for real-world laboratories over the next three years.

Together with 13 Berlin partners, Kompetenzzentrum Wasser Berlin was successful in the highly competitive funding process. The project IWIQ – Integrated Water and Heat Recovery in Urban Quarters – is one of only three projects selected for implementation from a total of 56 submitted proposals. IWIQ aims to reduce the consumption of drinking water in urban quarters and residential areas by up to 60 percent. Within the IWIQ real-world laboratory, the recycling of household greywater (lightly polluted wastewater from showers, sinks, or washing machines), combined with heat recovery, will be implemented for the first time in existing buildings. By doing so, the project significantly contributes to a future-proof water supply, heat transition, and quality of life in Berlin.

Since its founding in 2001, Kompetenzzentrum Wasser Berlin has become an indispensable partner for our city, combining scientific excellence with practical, real-world solutions. With expertise spanning the entire water cycle, an interdisciplinary and curious team, and a strong international network, it attracts substantial funding and helps drive innovation for Berlin.

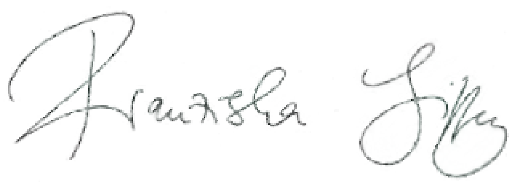
Through its applied research, KWB identifies emerging topics early on and, in collaboration with practitioners, translates them into implementable concepts. As a result, the state of Berlin and its districts, infrastructure companies, businesses, and residents alike benefit directly from the outcomes.

This capability is reflected in projects on the sponge city concept, water reuse, climate adaptation, phosphorus recovery, and advanced wastewater treatment for the protection of water bodies. The establishment of the Berlin Rainwater Agency as well as numerous investment decisions are based on this work and highlight its added value for a climate-neutral and resilient city.

Through its networking with municipalities, water supply and wastewater utilities, research institutions, SMEs, and other stakeholders in Germany and beyond, KWB brings “Made in Berlin” expertise into European and international debates while adapting global experience to Berlin-specific challenges. In doing so, it serves as a leading center of research across the entire urban water cycle. This makes us particularly proud, as Berlin carries responsibility far beyond the city and even state borders.

In this spirit, I wish Kompetenzzentrum Wasser Berlin every success with the IWIQ project and continued innovation for our region, our water, and our future.

I would also like to express my sincere thanks to the staff and to the shareholders – the state-owned enterprises Berliner Wasserbetriebe and Berlinwasser Holding, as well as Technologiestiftung Berlin – whose work makes KWB an institution that enriches and shapes Berlin well beyond the city and state borders.



Franziska Giffey
Senator for Economic Affairs,
Energy and Public Enterprises

Executive Summary

The 2025 Water Atlas published by the Heinrich Böll Foundation shows clearly that water is perceived as a precious resource by 87 percent of citizens. At the same time, only two percent consider the water crisis to be one of the most pressing challenges of our time. Issues such as climate change, energy, war, and economic crises dominate public attention – despite the fact that the way we manage water is closely linked to all of these challenges. Unfortunately, these findings did not come as a surprise to us, as these interconnections are still rarely addressed in public debate.

Managing Director
Dr. Pascale Rouault

For us at Kompetenzzentrum Wasser Berlin (KWB), this is precisely where our work begins. We research and develop practical solutions for the sustainable management of water resources across the entire water cycle. We are guided by the firm conviction that research can only be effective through close collaboration with partners from public administration, business, science, and civil society. For almost 25 years, we have worked closely with the Senate Department for Mobility, Transport, Climate Protection and the Environment, Berliner Wasserbetriebe, districts, NGOs, and citizens to actively shape Berlin's water future. Particularly important and valuable to us is the opportunity to share and further develop our expertise through our research activities and advisory work with partners and municipalities in Germany and around the world.

For KWB, 2025 was characterized by consolidation and strategic development. After several years of growth, we streamlined internal processes and strengthened organizational structures to enable more efficient collaboration. With the new "Water and Risk" team, we have created a platform to support future water management decisions in an even more transparent and data-driven way. Our core values – curiosity, quality, transparency, and scientific excellence – continue to guide everything we do.

Our research activities in 2025 were also marked by strong momentum. In total, we worked on 35 publicly funded projects and 27 commissioned assignments, launched 10 new projects, and successfully completed 12. Key highlights include the IWIQ real-world laboratory funded by the Berlin Senate Department for Economic Affairs, Energy and Public Enterprises, which focuses on implementing greywater recycling in existing buildings, as well as the EU project AI Liner. Coordinated by KWB, AI Liner enables predictive, resource-efficient, and data-driven maitenance of sewer networks through AI-based digital innovations. We were particularly honored by the commission from the German Environment Agency to develop and implement a methodology for evaluating the implementation process of the National Water Strategy.

Special mention should also be made of the completion of the major EU projects PROMISCES and IMPETUS, the federally funded project AMAREX, and the Smart City project Data Governance. Their results are now being transferred into practice: the Berlin Water Model, a new hydrological model for Berlin's water bodies that simulates water quality and quantity on an hourly basis, has been developed and provides a valuable tool for implementing the Water Master Plan. The AMAREX web tool enables the assessment of decentralized stormwater management measures regarding their impact on the urban water balance. This tool is now being applied in Berlin as a profound basis for climate-adapted planning decisions. The satellite-based assessment of the trophic status of small lakes opens up new opportunities to make publicly available data usable for public administration. In addition, data-based evaluation models developed in the previously completed BMFTR project FlexTreat have this year been incorporated into the draft version of DWA-M 1200 to validate new processes for water reuse. These are just a few examples of the strong practical relevance of our research.

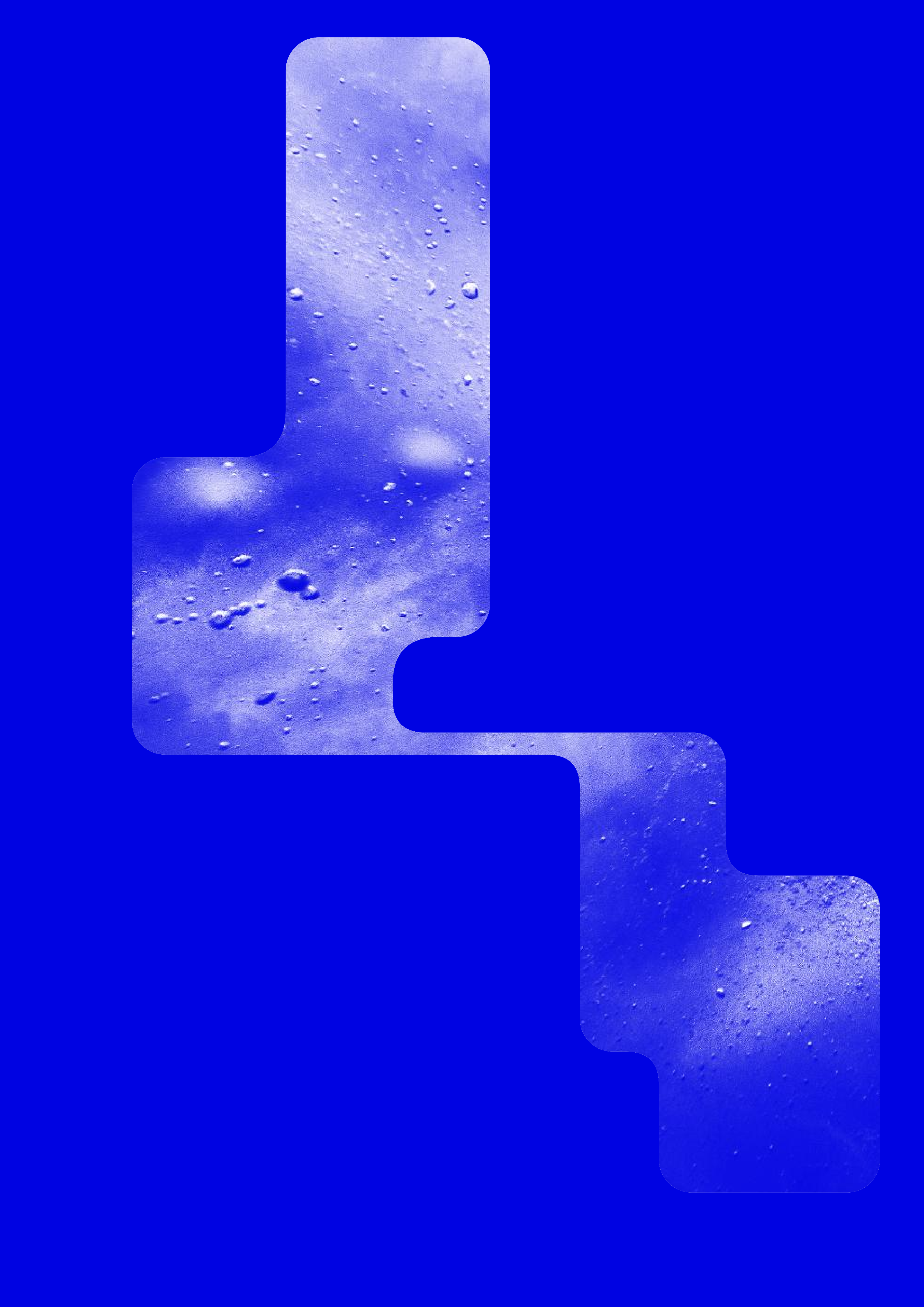
Our special thanks go to our staff, whose commitment, creativity, and expertise form the foundation of our success. We also thank our shareholders, partners, and supporters for their trust and cooperation. We would like to thank our Supervisory Board as well for the successful continuation of our strategic process "KWB 2035." With Nina Heine, Managing Director of Shit2Power, we have also gained an experienced entrepreneur as a new member of the Board, bringing fresh perspectives and valuable entrepreneurial insight.

We invite you to explore the diversity of our projects in this annual report. Much has already been implemented, while other initiatives are still emerging. One thing is certain: we remain curious, committed, and determined to contribute to a sustainable water future – for Berlin, Germany, Europe, and beyond.

Dr. Pascale Rouault
Managing Director | 01. November 2025

Immersion

Dive in and explore the latest advancements in applied research at KWB. Learn about how Berlin is squaring up for a future of dwindling water resources and discover how micropollutant removal facilitates water reuse. Read on for a look into our new software development team.



Berlin prepares for a *w*ater-scarce future

Dr. Nasrin Haacke

Dr. Daniel *W*icke

Dr. Christoph Sprenger

A precious system in transition

Berlin is a city built on water – quite literally. 100 % of its drinking water comes from local groundwater and bank filtration, a system that is unique in Europe. For decades, this supply seemed secure. Today, however, climate change, population growth, pollution from wastewater-borne trace substances, and structural changes such as the planned phase-out of coal mining in Lusatia are confronting the German capital with new challenges. From 2038 onward, one of the most important external sources feeding the River Spree is expected to dry up, threatening to lead to lower water levels and potential supply bottlenecks. The European research project IMPETUS, which concludes in 2025 after four years of intensive research, has established new foundations for strategic responses through a wide range of scientific analyses, scenarios, and methods.

Berlin's annual precipitation averages around 580 liters per square meter and has remained relatively stable over decades. Climate change, however, is altering its temporal and spatial distribution: longer dry periods alternate with intense heavy rainfall events. In summer in particular, natural inflows from the catchment areas of the Spree, Havel, and Dahme rivers decrease – noticeably affecting the availability of surface water and water quality in the region. Declining inflows increase the proportion of treated wastewater in river water, leading to higher concentrations of nutrients and trace substances. This intensifies the demands on drinking water treatment and reduces operational flexibility to respond to pollution peaks or changes in water quality. Current climate projections for Berlin do not point to a clear trend; scenarios range from significantly wetter to significantly drier futures. As a result, water management must develop strategies that function under both extremes – drought and heavy rainfall – while dealing with a particularly high level of uncertainty by European standards.

Around 60–70 % of Berlin's drinking water is produced through induced bank filtration and artificial groundwater recharge. In this process, water from rivers, lakes, and canals infiltrates adjacent aquifers via riverbanks or infiltration basins, triggered by abstraction from around 650 deep wells that locally lower the groundwater table. As the water passes through layers of sand and gravel, it is naturally purified before undergoing further treatment at waterworks. Until now, a crucial buffer during dry periods has been the artificially enhanced flow of the River Spree, fed by groundwater pumped from lignite mining operations in Lusatia. During hot summer months, this contribution can account for up to 75 % of discharge in the lower reaches near Cottbus. Although its share decreases toward Berlin, it remains a significant contribution to regional water supply during dry phases.

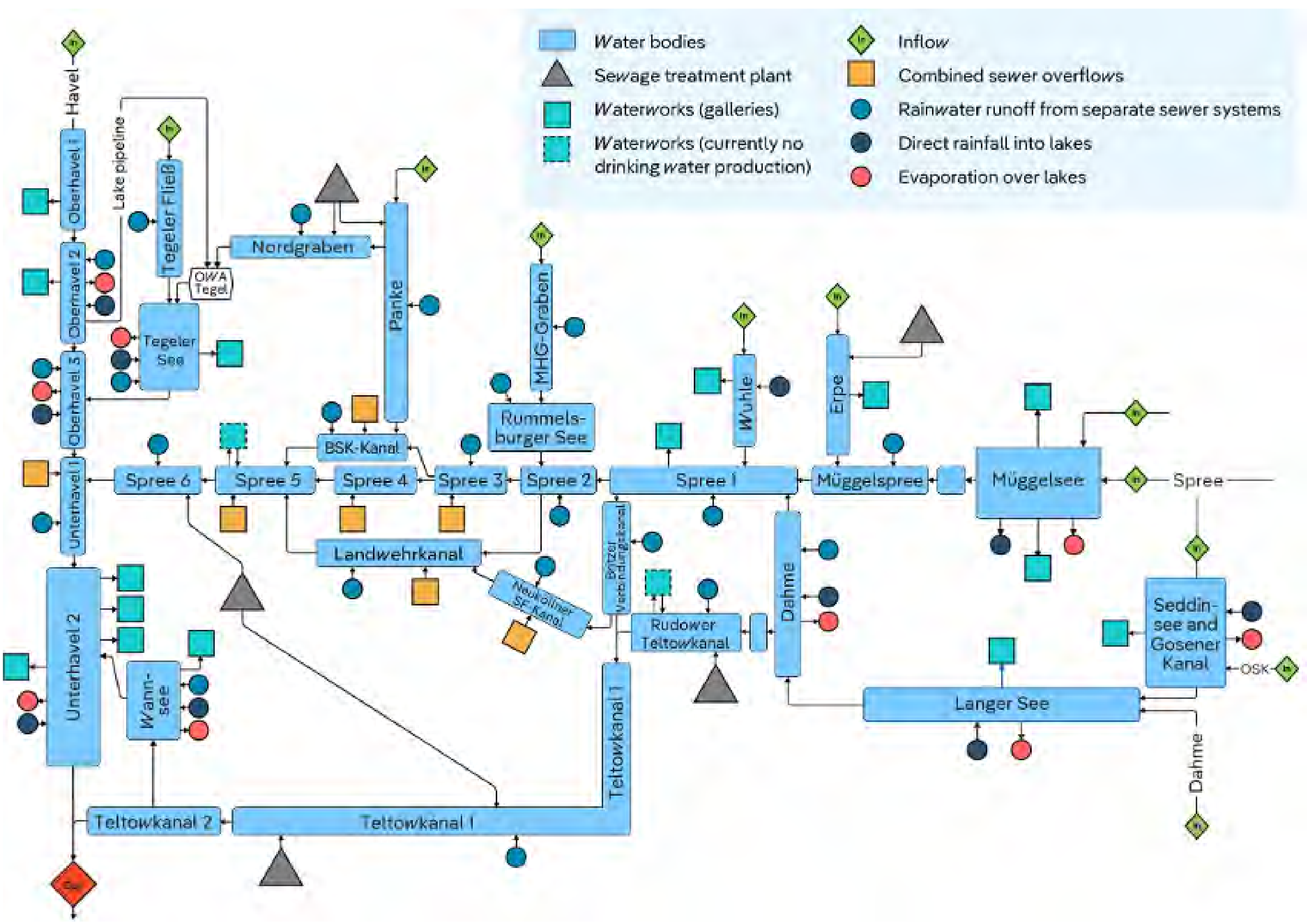
IMPETUS – Research for robust decision-making

The Berlin–Brandenburg demo site is one of seven European regions where IMPETUS has developed and tested innovative approaches to climate adaptation. From the outset, the work was designed to deliberately interlink disciplinary perspectives and institutional responsibilities. Ensuring the water supply of a metropolitan region under changing climatic, demographic, and planning conditions requires not only technical expertise, but also a shared understanding of data, uncertainties, and options for action.

Within IMPETUS, different modeling approaches were combined to assess the impacts of climate change on the regional water balance under various scenarios. These included calculations of bank filtration shares under differing assumptions on groundwater recharge and abstraction, analyses of critical wastewater fractions, projections of water demand, and assessments of measures outlined in the Water Master Plan. For example, the impacts of different discharge pathways from wastewater treatment plants on water levels and locks were modeled using the hydrodynamic 1D model HYDRAX (SenMVKU). In addition, scenario analyses of different adaptation pathways were carried out using the static mixing model of Berliner Wasserbetriebe (see also the interview on p. 13). At KWB, the focus was particularly on developing the Berlin Water Model and on groundwater modeling, both of which are described in more detail below.

▸ ***The Berlin Water Model:***

One of the tools developed at KWB within IMPETUS is the *Berlin Water Model*. It allows the quantity and quality of Berlin's water bodies – both surface water and groundwater – to be represented using a simplified approach. The *Berlin Water Model* is a dynamic mixing model that calculates flows, shares of surface water at waterworks, substance concentrations, as well as proportions of stormwater runoff, combined sewer overflows, and wastewater treatment plant discharges. It builds on the simplified approach of the static mixing model used by Berliner Wasserbetriebe (see also the interview on p. 13) and integrates relevant data from various verified sources over a period of around 20 years (2002–2022). The model also captures negative flows that occur during extremely dry summer months – such as backflows in the Müggelspree or the Rudower Teltow Canal – and the resulting relocation of wastewater treatment plant discharges into Lake Müggelsee or the Dahme River. This makes it possible to assess potential impacts of further reductions in inflows. A comparison with results from the detailed hydrodynamic 1D model HYDRAX, which was used extensively within the Water Master Plan to simulate the dry year 2019, shows very good agreement despite the simplified approach. All input data can be easily adjusted, therefore scenarios involving changes in inflows, wastewater volumes, or rainfall can be modeled with little effort. Results show, for example, that in addition to wastewater treatment plant effluents, temporarily high shares of stormwater and combined sewer overflows occur in many river sections, or that in scenarios with 50 – 75 % reduced inflows, the share of wastewater effluent in Lake Müggelsee can increase to an average of 10 – 20 % during dry summers due to backflows. To facilitate communication of the large volumes of results, model outputs can be visualized as a Berlin map with color-coded rivers showing, for example, concentrations or durations of exceedance of target values. The Berlin Water Model is therefore a promising tool with a wide range of applications.



▸ ***Groundwater modeling:***

To complement the *Berlin Water Model* with realistic information on well galleries, a detailed groundwater model developed by Berliner Wasserbetriebe for the Friedrichshagen waterworks was used. Simulations showed how strongly individual galleries are connected to surrounding rivers and how the share of surface water changes under different groundwater recharge rates and abstraction volumes. On this basis, the typical behavior of Berlin's well galleries could be characterized and transferred to the entire urban area.

The galleries were grouped into three categories: galleries with very high shares of surface water (> 80 %), which are strongly influenced by bank filtration even at low abstraction rates; classic bank filtration galleries with medium to high shares (40 – 90 %), whose behavior responds differently to increasing abstraction depending on location; and galleries with only low shares (< 50 %) because they are less hydraulically connected to surface waters.

This classification was directly incorporated into the Berlin Water Model. It enables realistic city-wide calculations of how much surface water reaches the waterworks and how various measures – for example those included in the Water Master Plan – might affect groundwater conditions. Groundwater modeling thus makes a decisive contribution to strengthening the robustness of the model and supporting planning, operation, and risk assessment in drinking water abstraction.

▸ ***Strategic adaptation pathways for Berlin:***

In addition to quantitative modeling, so-called adaptation pathways were developed—strategic pathways that illustrate how selected measures from the Water Master Plan can be meaningfully combined over time. The aim was to examine, under different future assumptions, when and which measures would be required to secure the region's drinking water supply in the long term. Two approaches were considered: a proactive approach, in which all selected measures start simultaneously, and a staged approach, in which measures are implemented only once the Water Supply Stress Indicator (WSSI) reaches a critical value. The WSSI describes the ratio of water demand to available water resources and indicates when action is required. The static mixing model was used to calculate the additional water volumes made available by the measures.

The adaptation pathways were developed for two scenarios: one based on a dry reference year, and one that more strongly accounts for climate-change-related reductions in inflows. Their development was the result of intensive exchange between the Senate Department for Urban Mobility, Transport, Climate Action and the Environment (SenMVKU), Berliner Wasserbetriebe, and KWB. Different disciplinary perspectives, planning logics, and time horizons came together and were continuously aligned throughout the process. This process itself created particular added value: close coordination fostered a shared understanding of climate adaptation as a societal task—not merely a technical challenge.

The adaptation pathways thus serve as an open discussion tool, offering robust and transparent decision options while strengthening the structures required for long-term resilient water management.

European perspective and synergies

Climate adaptation is not an isolated task. Its effectiveness increases when regions learn from one another and share methods, data, and experience. IMPETUS combines scientific approaches, technical solutions, and local knowledge to advance climate adaptation in a practical way. Across seven European demo sites – addressing challenges ranging from water scarcity and heavy rainfall to biodiversity loss and conflicts over use – tailored strategies were developed, adapted to the respective ecological, social, and institutional contexts.

A shared methodological framework ensures that modeling, digital tools, participatory processes, and concrete measures are closely interlinked. This creates robust decision-making foundations and spaces for collaboration between research, practice, and policy.

Funded by Horizon 2020, more than 30 partner institutions worked within IMPETUS to translate climate risk knowledge into effective action – soundly grounded, locally anchored, and connected across Europe. The Berlin–Brandenburg metropolitan region also benefits from this: through direct access to tested methods, continuous exchange with other regions, and the opportunity to contribute its own experience to a Europe-wide network.

Knowledge transfer and participation

Climate adaptation thrives on dialogue. Technical solutions and scientific analyses only achieve impact when they are discussed and further developed together with those who implement them in practice. At the Berlin–Brandenburg demo site, this took place, among other formats, through workshops that deliberately brought together different perspectives. The *Berlin Water Model*, for example, was presented and discussed in a technical workshop to directly integrate its results into decision-making processes. A workshop planned for 2026 will focus on forest transformation and the role of forests in drinking water supply, aiming to link scientific findings with practical experience from forestry, water management, and public administration. Both formats serve not only to communicate results, but also to identify new research needs and to immediately apply what has been learned to the evaluation of existing measures. A central element of the planned knowledge transfer is the WasserWerkstatt next year – a KWB forum in which the project's results will be presented and discussed with representatives from science, practice, policy, and civil society. The aim is to gather feedback, broaden perspectives, and continue the dialogue on the future direction of regional climate adaptation.

Outlook – acting now

IMPETUS has shown that the joint consideration of data, models, and practical knowledge – brought together at an early stage – lead to robust decision-making. For Berlin–Brandenburg, tools and insights are now available that help plan water supply proactively even under uncertain climatic conditions.

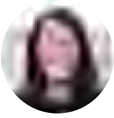
What matters now is to actively build on these foundations: integrating results into ongoing processes, continuously reviewing measures, and strengthening close cooperation between public administration, science, and the water sector. The region faces important decisions in the coming years and needs orientation, transparency, and shared priorities.

Only in this way can the Berlin–Brandenburg metropolitan region ensure a resilient and future-proof water supply in the long term.

Further information on the IMPETUS project is available via:
https://climate-impetus.eu/demo-site/continental/

From left to right:
Dr. Aziz Hassan, Dr. Daniel Wicke, Josefine Filter, Tobias Evel, Sandra Banusch, Dipl.-Ing. Regina Gnirß and Dr. Nasrin Haacke at the last IMPETUS General Assembly in Athens, Greece, in June 2025

Expert interview with Josefine Filter



Josefine Filter
Research assistant at Berliner Wasserbetriebe;
Department of Research and Development

Which scenarios in IMPETUS were of particular interest to Berliner Wasserbetriebe?

We found the scenarios addressing future changes in inflows to the Rivers Spree and Havel particularly compelling. Climate change and the phase-out of lignite mining will have a noticeable impact on Berlin's water balance. The past ten years have already shown that we have to expect longer dry periods, and their effects will be further intensified by the discontinuation of mine dewatering from Lusatia. Another key issue for us is how wastewater treatment plants can contribute to stabilizing the water balance in the future. Planning for the expansion of treatment plant capacities is underway, as is the planning of future discharge pathways. If treated wastewater is deliberately reintegrated into the urban water cycle, we could better maintain water levels during dry summer months. At the same time, we must ensure that our drinking water resources are not jeopardized by excessively high shares of treated wastewater in surface waters. In this context, scenarios on advanced removal of trace substances are of particular interest, as well as the criteria under which future limit values can be reliably met. This measure is currently being implemented in Berlin and is also required under the EU Urban Wastewater Treatment Directive (UWWTD).

What were the specific tasks of Berliner Wasserbetriebe within the project?

As a key player in the urban water cycle, Berliner Wasserbetriebe was a central practical partner in this project. By providing our groundwater models and engaging in intensive dialogue, KWB was able to model scenarios for changing catchment area sizes and proportion of bank filtrate in the galleries – particularly for the Friedrichshagen waterworks. We also carried out our own calculations using a simple static mixing model in order to quickly assess how different scenarios could affect the water balance.

These results formed an important basis for testing the methodology of comparing measures within so-called adaptation pathways and were also incorporated into the development of a knowledge platform – the Resilience Knowledge Booster.

What is the static mixing model?

The static mixing model is based on simple mixing calculations and volume additions at key balancing points within Berlin's water cycle. It was developed by Berliner Wasserbetriebe and further refined within the framework of IMPETUS – for example, to enable the representation of backflows in flowing waters, such as at the Spree Tunnel.

What did you particularly like about the project?

What I found especially enriching was the close cooperation between research, policy, and practice here in Berlin. Working together on key future issues of water supply was both professionally stimulating and personally motivating. The international collaboration at EU level was also very exciting. It deepened my understanding of the challenges faced by other climate regions – and of how much we can learn from one another.

In your opinion, what is the greatest insight gained from the project ?

One central outcome is a heightened awareness of how large the uncertainties in climate models are for our region regarding the water balance. Our existing strategies therefore still rely heavily on historical experience – yet it remains questionable whether this will be sufficient in the future to make and implement preventive decisions. Models are an important tool for better understanding the system. They reveal interdependencies, but they do not provide a clear answer as to which future we should prepare for. This is why dialogue with a wide range of stakeholders – including beyond Berlin's state borders – is essential in order to develop shared assumptions and scenarios.

Creating the perfect drop

How micropollutant removal facilitates water reuse

Michael Stapf

Dr. Ulf Miehe

How can we achieve a safe, cost-effective and practical reuse of treated wastewater?

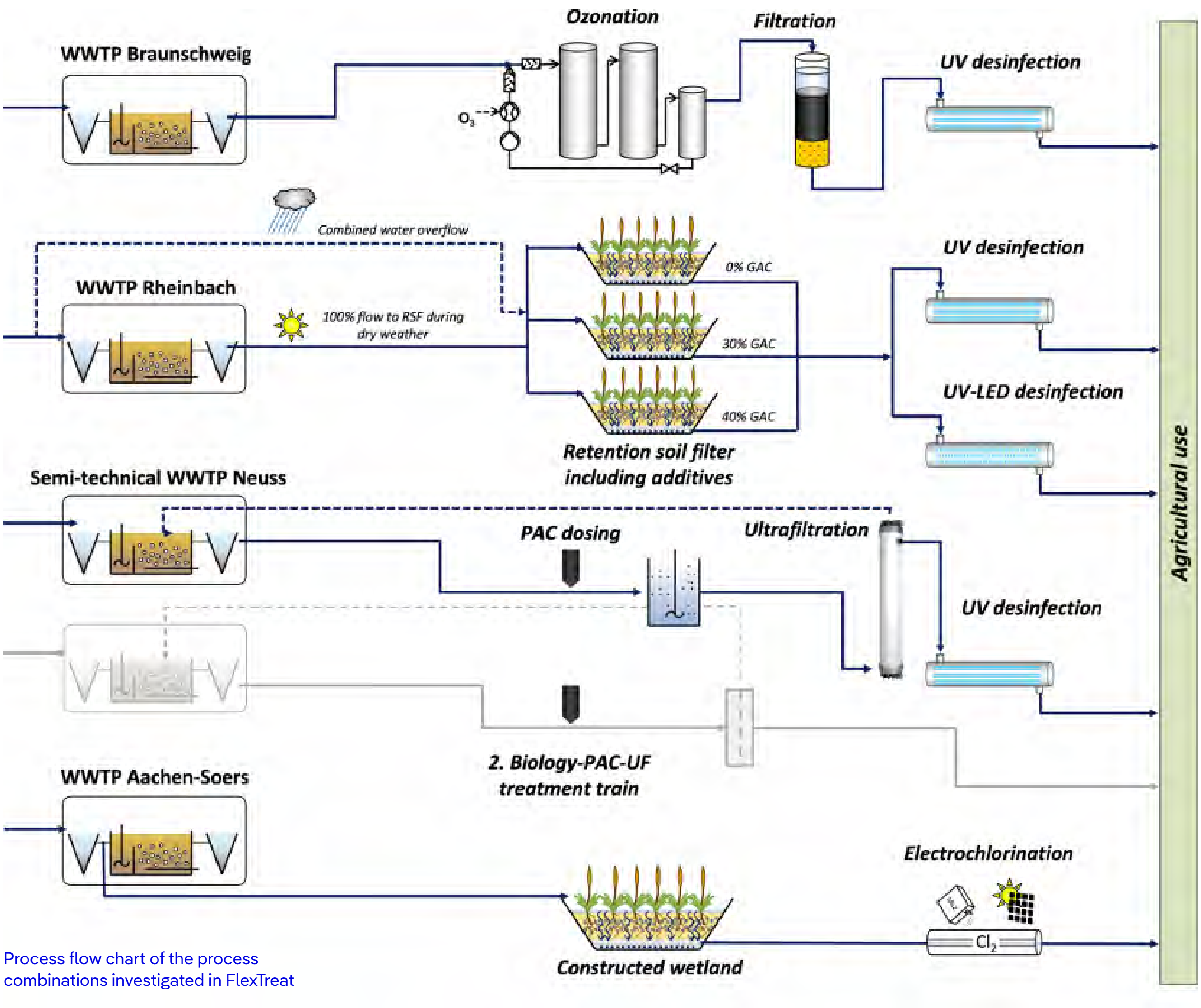
In regions with limited water availability, such as Southern Europe, water reuse has been practiced for quite some time. There, the reuse of treated wastewater is already a key component of integrated water management and makes an important contribution to sustainable water supply and the safeguarding of agricultural production. Climate change, however, is intensifying conflicts over water resources even in regions that were previously considered water-rich. As a result, the topic is becoming increasingly relevant in Germany as well – particularly in light of more frequent dry periods and the opportunities created by new regulatory frameworks.

Together with eleven project partners from research, industry, and municipal practice, we at KWB investigated the development and demonstration of flexible technical and nature-based treatment systems for safe agricultural water reuse within the joint project “FlexTreat”, funded by the German Federal Ministry of Education and Research (now BMFTR). The developed solutions were intended to be adaptable to a wide range of local conditions and requirements.

Many pathways lead to water reuse

Although wastewater treatment plants in Germany already achieve a high level of removal of oxygen-consuming substances and nutrients, a wide range of organic micropollutants – such as industrial chemicals, pharmaceuticals, and household chemicals – can still be detected in the effluent at low but sometimes relevant concentrations. In addition, treated wastewater is not sterile and contains various microorganisms, including potentially pathogenic ones. For safe reuse, therefore, advanced wastewater treatment is required to minimize potential health and environmental risks. At the start of the project, it was assumed that in the future an increasing number of wastewater treatment plants would be equipped with a fourth treatment stage for the removal of micropollutants, and that synergies could be created between such advanced treatment and future water reuse.

For this reason, four case studies investigated different combinations of technologies for micropollutant removal (activated carbon and ozonation) and disinfection methods (ultrafiltration, UV disinfection, and chlorination) at pilot to full scale over periods of more than two years.



Process flow chart of the process combinations investigated in FlexTreat

This allowed a practice-oriented evaluation of the processes under real operating conditions. KWB contributed its mobile ozone system and many years of expertise to the Braunschweig case study, where a combination of ozonation, filtration, and UV disinfection was examined in close cooperation with the Braunschweig Wastewater Association and Xylem Services GmbH.

To assess the different process combinations, a broad spectrum of chemical-physical parameters, micropollutants, and microbiological indicator organisms was analyzed. In addition, various online measurements were used to monitor the individual treatment stages in real time, allowing operating parameters to be adjusted if necessary. A key challenge is that target parameters such as organic micropollutants and microbiological indicator organisms cannot be measured directly in real time. Instead, process-specific surrogate parameters must be used to draw conclusions about current performance.

The results show that targeted micropollutant removal processes can be very effectively combined with advanced treatment for water reuse. These processes already meet the requirements for water reuse with regard to general parameters such as turbidity and filterable solids, while at the same time creating favorable conditions for downstream disinfection. Particularly noteworthy is the improvement in UV transmittance of the water – that is, its permeability to UV radiation – which increases the efficiency of subsequent UV disinfection stages.

Managing risks safely

To minimize risks, operators must demonstrate that the treated wastewater complies with all chemical and hygienic limit values. Both aspects were therefore comprehensively addressed in the project.

For chemical risk assessment, the process-specific removal of micropollutants, the formation of oxidation and transformation products during ozonation, and the potential impacts of agricultural water reuse on groundwater and crops were analyzed. The latter showed that although plants irrigated with treated wastewater can absorb trace substances, concentrations in edible plant parts were very low and thus safe for consumption.

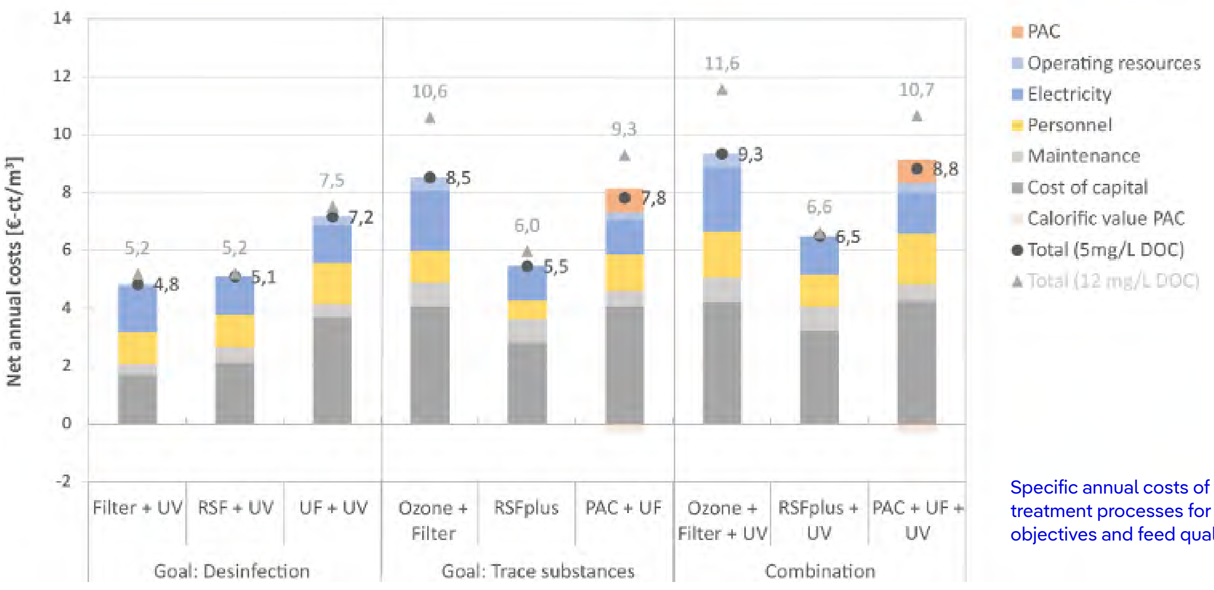
Regarding microbiological risks, it was demonstrated that all process combinations achieved a significant reduction in indicator organisms for pathogenic bacteria, viruses, and protozoa. Antibiotic-resistant bacteria were also largely eliminated. Concerning possible regrowth during controlled storage of the treated water, no cause for concern was identified: during storage for up to two weeks, there was no increase in indicator organisms; instead, a slight decrease or persistence at a low level was observed. The technologies employed exhibited specific strengths and weaknesses in removing indicator organisms. For example, spores of Clostridium perfringens, which are highly resistant to ozone and UV radiation, are best removed by effective filtration, whereas certain viruses can pass through ultrafiltration membranes and therefore require additional UV disinfection. To demonstrate the overall efficiency of the treatment chain, comprehensive process validation is required. Key aspects to be considered are described in our guideline on validation.

The guideline on validation is available via:
https://kompetenz-wasser.de/media/pages/forschung/publikationen/validierungsleitfaden-fuer-die-uneingeschraenkte-bewaesserung/22f76b4f2f-1736173112/flextreat_validierungsleitfaden.pdf

Costs, climate, and circularity

The use of new technologies and more stringent requirements naturally raises questions about economic and environmental aspects. Together with the project partners, annual costs for the investigated process combinations were calculated for various scenarios, and greenhouse gas balances were prepared. The results show that if a fourth treatment stage for micropollutant removal already exists or is planned, only minor additional costs (approx. € 0.01 per m³) are incurred for advanced treatment aimed at water reuse, along with only a slightly higher CO_2-equivalent footprint.

This demonstrates clear synergies between the goals of micropollutant removal and water reuse, which can be strategically considered in future planning. However, it is also important to note that a significant share of the total costs of an agricultural



Specific annual costs of the treatment processes for different objectives and feed qualities water reuse system lies in the infrastructure and operation of the distribution network. The main driver of investment costs for the distribution network is the distance between the fields and the treatment plant, and thus the length of the required transport pipeline.

Policy, practice, and perspectives

The results of FlexTreat show that water reuse is feasible both technically and economically. Before widespread practical implementation can take place, however, a number of regulatory issues still need to be clarified. These include questions of administrative responsibility, as well as the lack of uniform standards and experience with limit values, monitoring, and risk management. Here, too, progress is visible. At the professional level, the German Association for Water, Wastewater and Waste (DWA) has prepared an initial draft of the technical guideline series on water reuse (M1200), incorporating both results from FlexTreat and KWB's expertise. At the legislative level, EU Regulation 2020/741 (minimum requirements for water reuse in agriculture) has been in force since 26 June 2023, and water reuse has been included in the National Water Strategy. In addition, the new EU Urban Wastewater Treatment Directive (UWWTD), which requires a fourth treatment stage for micropollutant removal at many medium-sized and large wastewater treatment plants, will fulfill the core assumption of FlexTreat and thus facilitate entry into water reuse.

What comes next?

Our experience from FlexTreat shows that with the right mix of technology, monitoring, and risk assessment, water reuse can be transferred into municipal practice – initially for agricultural applications and, in the longer term, also for urban uses such as irrigating green spaces or sports facilities.

Water reuse is far more than just another technical solution; it also changes the way we think about water – from one-time use toward responsible and sustainable circular management of this valuable resource. At KWB, we see it as our task to continue supporting the introduction of water reuse into practice in a scientifically sound, interdisciplinary, and application-oriented manner, and to develop solutions together with our partners.

Based on many years of experience from numerous projects on advanced wastewater treatment, KWB can also provide municipalities, operators, and authorities with well-founded, neutral, and independent advice. This may include process validation, the development of monitoring strategies, evaluation of measurement results, or risk management. Further information on our services related to water reuse and fourth-stage treatment can be found on our website.

The new software unit

– Interview with Antoine Daurat, Head of the Software Unit

Hello Antoine,
can you tell us who you are and
what your role is at KWB?

I'm Antoine, I originally studied music composition in Berlin and in 2019 I became a web and software developer. I worked at a couple of private companies of various sizes until 2023. Then, I joined KWB as a software developer. I always particularly enjoyed working closely with R&D teams and joining a research institute with a universally positive impact was a very exciting opportunity.

In 2024, I became lead of the software unit with the goal to strengthen KWB's software development capabilities. The decision to create the unit grew from the simple observation that nearly every project at KWB depends on data and some form of software prototype, even if it is only a basic Excel sheet used to display measurement data. We are a small group of professional developers and our mission is to enable and assist the researchers with our expertise. In most cases, this corresponds to professionalizing the code that is produced and/or used in research projects.

Our contribution to KWB's activities, however, regularly goes beyond this scope. Coming from the private sector, we tend to understand software as a product on its own (as opposed to the researcher's bias who looks at software as a tool, an instrument of research). This approach drives us in developing ideas beyond the prototype stage, scale prototypes into reusable software solutions or even consolidate new commercial solutions from promising research results.

Last but not least, we bring a breath of fresh air to KWB's internal work processes, sharing philosophies and practices like agility and SCRUM that made software development so successful that it serves, nowadays, as the reference for efficient and productive work organization.

Can you give us more detail about
your contributions to this date?

The project I spent the most time working on until now is also the reason why KWB hired a professional software developer in the first place: SEMAplus, a software for predicting and optimizing asset management strategies of urban water networks.

Yaniv Hamou (left),
Hauke Sonnenberg (middle),
Antoine Daurat (right)

User interface of the QMRA tool

At the time I joined KWB, SEMAplus was an ecosystem of tools that had been developed over many years to serve many projects. The growing complexity of this ecosystem was becoming a bit of a problem, as the system had to adjust rapidly to a number of upcoming projects with different end users and requirements. Accordingly, I started by redesigning the architecture of the software to make it more flexible and maintainable. I then refactored the source code into the new architecture and enforced industry standards like automated testing and Domain Driven Design along the way. Today, SEMAplus is driven by a team of two researchers and three developers who use and develop it daily for several parallel ongoing projects and it is ready for its next development phase: in AI:LINER, we will bring SEMAplus to the cloud and mature it to a fully-fledged modern application.

Another project I have been involved in is the development of the QMRA tool (https://qmra.org) as part of the WaterMan project. There, once again, I started refactoring a pre-existing prototype to make it more flexible. Then, with the help of our graphic designer, I did an integral relooking of the user interface, so that users would get the most out of the tool at a minimal cost in terms of clicks and navigation through the pages of the application. Today, QMRA is online and operational. Thanks to the experience we made, we feel more confident with challenging ourselves to develop complex user interfaces and we are already submitting proposals to bring the app to its next development stage.

What does the future hold for the software unit?

All developers in the software unit are highly motivated by the relevance and positive impact of KWB's activities. We all want to contribute to the success and the growth of the organization as best as we can and there are many opportunities to take advantage of our skillsets. In the research field, we want to help the team concentrate on essential scientific work by developing early proofs of concept that demonstrate how their ideas can function in practical situations. Our skillsets of data engineering, software architecture, cloud computing and machine learning can enable researchers to leverage the most advanced technologies such as deep learning or large language models for new applications in the water sector. Furthermore, our ability to wrap a raw result in a presentable format and deploy it should help KWB gain online exposure and accessibility.

But, to me, our greatest potential lies in practical application and the establishment of successful services and consulting activities. There we can lay foundations upon which tools and services upscale seamlessly early on.

Personally, I would like to help KWB become a reference partner in the matter of digitalization. My goal will be achieved the day a constant proportion of our projects outgrow the environment they were born into and become their own successful commercial endeavors.

Selection of projects

- ▶ IWIQ
- ▶ GEWINN
- ▶ AMAREX
- ▶ GEOSALZ
- ▶ AI:LINER
- ▶ WATERMAN
- ▶ AD4GD
- ▶ WATER RESILIENCE

IWIQ

Project volume
€3,547,875 (total amount),
€2,929,438 (total funding),
financed by the Senate Department
for Economic Affairs, Energy,
and Public Enterprises;
€1,029,161.37 (KWB project component);
€170,000 (additional BWB sponsorship)

Partner institutions
Nolde – innovative Wasserkonzepte GmbH; Technische Universität Berlin, Institut für Bauingenieurwesen, Fachgebiet Systemtechnik baulicher Anlagen; Contecht GmbH; inter 3 GmbH – Institut für Ressourcenmanagement; HOWOGE Wohnungsbaugesellschaft mbH; Erste Wohnungsgenossenschaft Berlin-Pankow eG; Helmholtz-Zentrum Berlin für Materialien und Energie GmbH; Magda GmbH

Associated partners
Berlinovo Immobilien Gesellschaft mbH; Baukammer Berlin; fbr – Bundesverband für Betriebs- und Regenwasser e. V.; Berliner Regenwasseragentur; MARIS Berlin Brandenburg

Contact
Yuki Bartels

▶ (1) A real-world laboratory is a research and testing environment in which scientific and societal actors jointly develop and experiment with innovative solutions under real-life conditions. New technologies, processes, or concepts are not tested in a conventional laboratory, but in their actual context of application, allowing technical, social, and legal aspects to be directly linked. The aim is to design innovations in a practice-oriented way and to prepare their transfer into everyday use or the market.

Circular Instead of Consumptive – How the Existing Building Stock Can Save Water and Energy

Greywater recycling (GWR) with heat recovery (HR) is no longer a technological novelty – at least not in new construction. For several years, systems in multiple Berlin neighborhoods have successfully treated wastewater from showers, bathtubs, and washbasins into high-quality service water. For existing buildings, however, practical implementation is still largely lacking. Yet it is precisely here that the greatest potential lies: about 75 % of residential buildings in Germany were built before 1978 – without modern thermal insulation or resource-efficiency concepts.

The Building Energy Act now mandates the energy-efficient renovation of this old building stock in the coming years. The upcoming renovation wave therefore provides a window of opportunity to consider water and heat use together. The IWIQ real-world laboratory ▶ (1) (Integrated Water and Heat Recovery in Urban Quarters) leverages this opportunity to demonstrate how GWR and HR can be integrated into existing buildings from planning, technical, legal, and social perspectives. The focus is on developing practical solutions that can be incorporated into real renovation projects – economically, code-compliant, and transferable.

Representatives of the IWIQ project at the launch of the real-world laboratory in July 2025

During the implementation phase, four Berlin locations are supported with concrete renovation projects, including two sites with standardized GDR-era building types, which are particularly common in the city. The main challenge lies in installing the additional piping network for greywater and service water within the existing building structure in a space- and cost-efficient way. Innovative approaches such as prefabricated façade elements or the use of unused shafts are being tested. In parallel, digital planning processes based on Building Information Modeling (BIM) support more efficient coordination, accelerate renovations – especially for recurring building types – and reduce planning errors.

Greywater recycling system in a Berlinovo student apartment complex

While existing GWR systems in Berlin have so far been limited to using wastewater from showers, bathtubs, and washbasins for toilet flushing, IWIQ takes a decisive step further. The goal is to include additional sources such as wastewater from washing machines or kitchen sinks and to expand the range of uses for treated service water – for example, for washing machines, irrigation of neighborhood green areas, roof and façade greening, or infiltration within the neighborhood.

With these extended applications, the proportion of substituted drinking water can be increased from about 30 % to up to 60 %. Heat exchangers also allow recovery of 30 % to 60 % of the energy needed for hot water production. Feeding heat into local district heating networks is also conceivable. In this way, the IWIQ real-world laboratory contributes to relieving the drinking water supply and to implementing the sponge city concept as well as the urban energy and heat transition.

The extended usage options also place new demands on water quality. While water for toilet flushing has relatively low hygiene requirements, use for irrigation or infiltration requires higher treatment performance – especially regarding micropollutant retention due to groundwater protection. To meet these requirements, the IWIQ real-world laboratory tests various process engineering upgrades, including membrane filtration and granular activated carbon. Data-driven control strategies are also tested to minimize energy demand and maintenance effort. These investigations take place at the existing GWR system in Block 6 ▶ (2) in Berlin-Kreuzberg, which serves as an experimental platform within IWIQ. The data collected there on service water quality, energy efficiency, and system control form the basis for developing standardized procedures and approval criteria.

A central component of the project is the hybrid learning space, which promotes knowledge transfer between research, practice, and administration. The physical anchor is located in Block 6, where project results are presented in a tangible way. Technical, planning, and regulatory questions are discussed jointly with relevant stakeholders to ensure the transferability and acceptance of the developed solutions. In addition, a virtual learning space is being created, making project content digitally available and interactive. The insights gained in the real-world laboratories are intended to have an impact beyond the participating sites. With around 125,000 unrenovated or partially renovated multi-family buildings in Berlin alone, the existing building stock offers considerable transfer potential. The planning tools, standardizations, and learning formats developed in the project provide the foundation for efficiently integrating GWR and HR into future renovation projects – and thus preparing for the transition from demonstration to broad application.

▶ (2) Block 6 in Berlin-Kreuzberg was developed as part of the International Building Exhibition 1984/87 as a model project for ecological and social housing. In 2006, the residential complex was comprehensively modernized and equipped with an innovative greywater recycling system serving 106 apartments and around 250 residents. Since 2013, the site has functioned as a research and demonstration facility within the ROOF WATER-FARM project, where urban water reuse is combined with food production.

GEWINN

Project volume
€531,311 (total amount), financed by the Federal Ministry of Agriculture, Food and Regional Identity;
€200,876 (KWB project component)

Partner institutions
Institut für Agrar- und Stadtökologische Projekte (IASP); PONDUS Verfahrenstechnik GmbH; Soepenberg GmbH

Contact
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Johannes Koslowski

Animal manure – agricultural residues such as slurry, farmyard manure, or digestate from biogas plants that can be applied to fields as fertilizer.

Ammonia stripping – technical process in which dissolved ammonia is transferred from liquids or sludge into the gas phase.

Ammonium – a nitrogen compound (NH_4) dissolved in water and an important plant nutrient, but excessive amounts can pollute water bodies.

Struvite – a crystalline mineral (ammonium magnesium phosphate) with low emissions potential in agricultural use.

Thermal-alkaline hydrolysis – process in which organic matter is broken down by increased temperature and alkaline conditions to make it more accessible for biological degradation.

Digestate – organic residue remaining after biogas production, which can be used as fertilizer.

Methane – an energy-rich greenhouse gas (CH_4) and a major component of biogas; uncontrolled release contributes strongly to climate change.

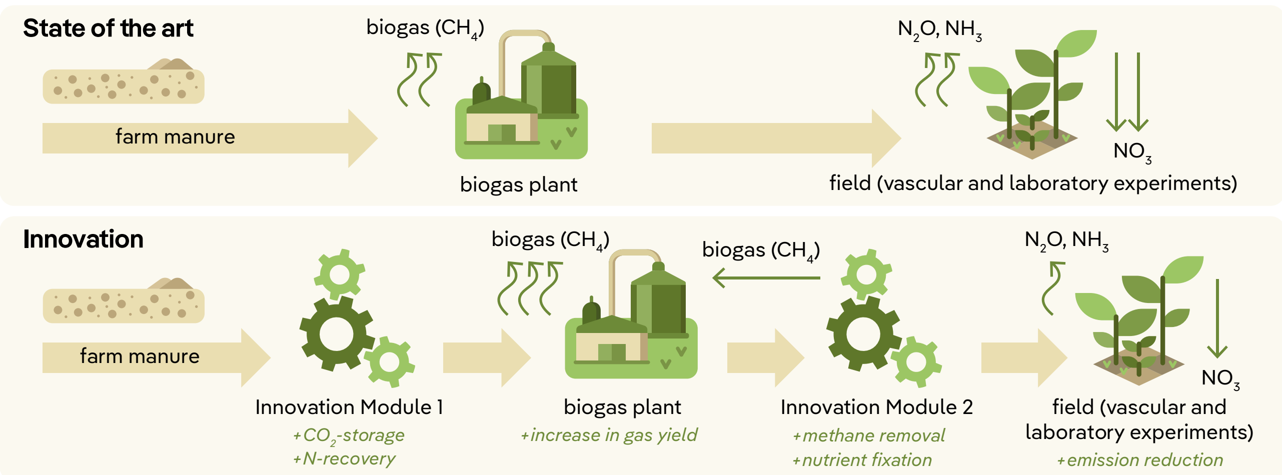
More efficient energy and nutrient use of animal manure through innovative processes

Increasing biogas yields, reducing emissions, and recovering nutrients from animal manure – these goals are combined innovatively in the GEWINN project. In Germany, agriculture produces large quantities of animal manure such as slurry and farmyard manure. These not only serve as feedstock for biogas production but also contain valuable nutrients like nitrogen. The GEWINN project, funded by the Federal Ministry of Agriculture, Food, and Regional Identity, addresses this potential: it develops processes that make biogas production from these agricultural residues more efficient while recovering fertilizers in a usable and low-emission form. Two innovation modules are being tested on a small scale using real animal manure.

In Innovation Module 1, a thermal-alkaline hydrolysis of the slurry ensures that organic substances in the manure become more accessible for subsequent digestion, thereby increasing biogas yield. By raising the temperature and pH during hydrolysis, existing ammonium is converted into volatile ammonia. This dissolved ammonia is then actively removed from the manure via vacuum stripping and subsequently bound with carbon dioxide and gypsum to form ammonium sulfate solution and calcium carbonate solid, both of which can be reused in agriculture.

In Innovation Module 2, remaining methane and carbon dioxide in the digestate after biogas production are removed via vacuum degassing. This prevents emissions that would otherwise escape uncontrolled into the atmosphere and simultaneously allows the captured methane to be used for energy generation. Removing CO_2 raises the pH value in the process, leading to the formation of struvite, a crystalline long-term fertilizer with low emissions potential in agricultural application.

Fig. A: Added value of innovation components in the state-of-the-art process chain.



The impact of these processes extends beyond individual components. More biogas from the same input means a greater contribution to renewable energy supply, while reduced emissions of climate-relevant gases help protect the climate. At the same time, dependence on mineral fertilizers – which require large amounts of energy to produce and rely on finite resources – is reduced. GEWINN thus exemplifies how technical innovations can directly contribute to climate protection, resource conservation, and economic efficiency.

KWB contributes its expertise in developing, testing, and evaluating sustainable technologies. This includes planning, converting, and commissioning the pilot plant for the various process steps in the two innovation modules – from thermal-alkaline hydrolysis and ammonia stripping to nutrient recovery as struvite. Additionally, KWB conducts extensive laboratory analyses to verify the effectiveness of the processes. In a combined ecological and economic assessment, not only the immediate results but also the long-term effects on the environment, agriculture, and energy supply are evaluated.


Re-erection of the assembly scaffolding


The facility following the refurbishment


The refurbishment-team

With GEWINN, KWB continues its strategic focus on energy efficiency, resource conservation, and circular economy.
The project demonstrates how applied research and practical development can go hand in hand to create cross-sectoral solutions. Biogas plant operators benefit from higher substrate yields and the recovery of additional valuable materials, while society benefits from lower emissions and the preservation of natural resources. GEWINN therefore represents not only a technical process but also a forward-looking approach that transforms renewable resources into a source of energy and nutrients.

AMAREX

Project volume
€2,561,995 (total amount), financed by the Federal Ministry of Research, Technology and Space;
€185,500 (KWB project component)

Partner institutions
Technische Universität Kaiserlautern, Berliner Wasserbetriebe (BWB); Ecologic Institut; Stadt Köln; Helix Pflanzensysteme GmbH; Stadtentwässerungsbetriebe Köln; Technologiestiftung Berlin; Universität Stuttgart; Berliner Senatsverwaltung für Stadtentwicklung, Bauen und Wohnen; Senatsverwaltung für Mobilität, Verkehr, Klimaschutz und Umwelt

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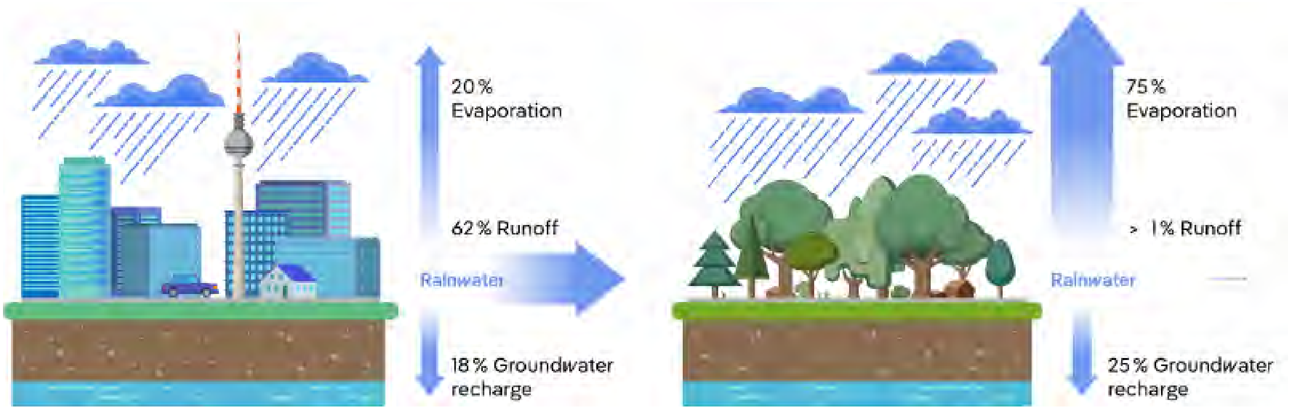
Blue-Green Infrastructure in Urban Planning: A Model for Urban Water Management

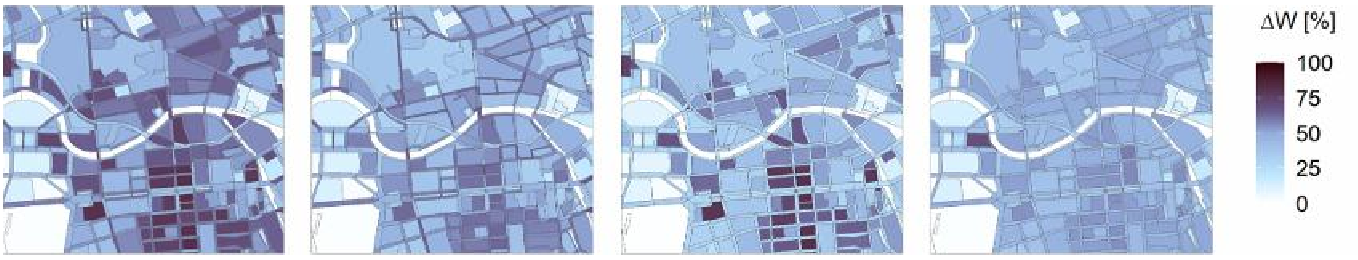
Cities worldwide face major challenges: heavy rainfall events, summer heat waves, and the pollution of water bodies from combined sewer overflows are all consequences of increasing sealing and densification of urban areas. Climate change further exacerbates these risks. To manage rainwater more sustainably and make cities more climate-resilient, new tools are needed that make ecological interrelationships visible and enable their integration into planning processes. An interesting approach is the analysis of the urban water balance. This describes how precipitation is distributed: into evaporation from surfaces and vegetation, infiltration into the groundwater, and runoff into the sewer system. These three components are directly linked to urban climate risks and, conversely, to opportunities for climate adaptation. Evaporation has a cooling effect and improves the microclimate; infiltration contributes to groundwater recharge, and reduced surface runoff relieves pressure on the sewer system. This decreases the frequency of combined sewer overflows and rainwater discharges into water bodies – an important contribution to environmental and ecosystem protection.

To quantify these relationships, the ABIMO model (short for Runoff Formation Model) was used and further developed as part of the AMAREX project. The model calculates the components of the water balance and the deviation from a natural reference state. The indicator ΔW measures how strongly an urban area differs from a natural reference site. This produces a simple, easy-to-understand metric that can be directly integrated into urban planning. The model has been completely revised and expanded in a new open version in the R programming language. This version not only calculates natural water balance processes but also allows concrete measures of blue-green infrastructure (BGI) to be represented.

Figure 1: Comparison of urban and natural water balance. In urban areas, the runoff component of the water balance dominates, while in natural areas, evaporation increases due to vegetation. Infiltration is greatly reduced in urban areas due to the high degree of sealing. In natural areas with abundant vegetation, a large proportion of precipitation is absorbed by plants and released back into the atmosphere through transpiration. As a result, the infiltration rates in heavily vegetated natural and urban areas can sometimes be similar.



For Berlin, more than 58,000 sub-areas were modeled – from individual street sections to entire blocks. The results are high-resolution maps showing where deviations from the natural water balance are particularly high and where measures would have the greatest effect.



a. Status quo b. 50 % green roofs b. semi-permeable surfaces b. 50 % swale infiltration

Figure 2: Simulation of the effects of various hypothetical RWBM scenarios compared with the status quo (a). b) Extensive green roofs on 50% of roof areas, c) Replacement of all paving with semi-permeable surfaces (e.g. grass pavers), d) Connection of 50% of sealed surfaces and roofs to swale infiltration systems.

By integrating green roofs, infiltration swales, and semi-permeable surfaces into the model, concrete blue-green infrastructure measures could be mapped at the neighborhood level for the first time. This enables simulation of different scenarios: How does the water balance change if 50 % of roofs are greened or large areas are de-sealed? The results so far are plausible and consistent with other models: green roofs significantly reduce the ΔW deviation in highly sealed areas, while infiltration swales make a noticeable contribution by redirecting runoff into infiltration.

An important step in the project was applying the model to another city. With the participation of the municipal sewer authorities in Cologne, the model was successfully transferred to the North Rhine-Westphalian city. While a lot of data for Berlin was already available in the correct spatial resolution via the Environmental Atlas, some information had to be supplemented in Cologne – for example, vegetation data derived from satellite images provided by the European Copernicus program.
The results show comparable patterns to Berlin and confirm the consistency of the approach. This marks a key milestone: a tool that can, in principle, be used by municipalities of various sizes to strategically evaluate the impact of BGI measures.

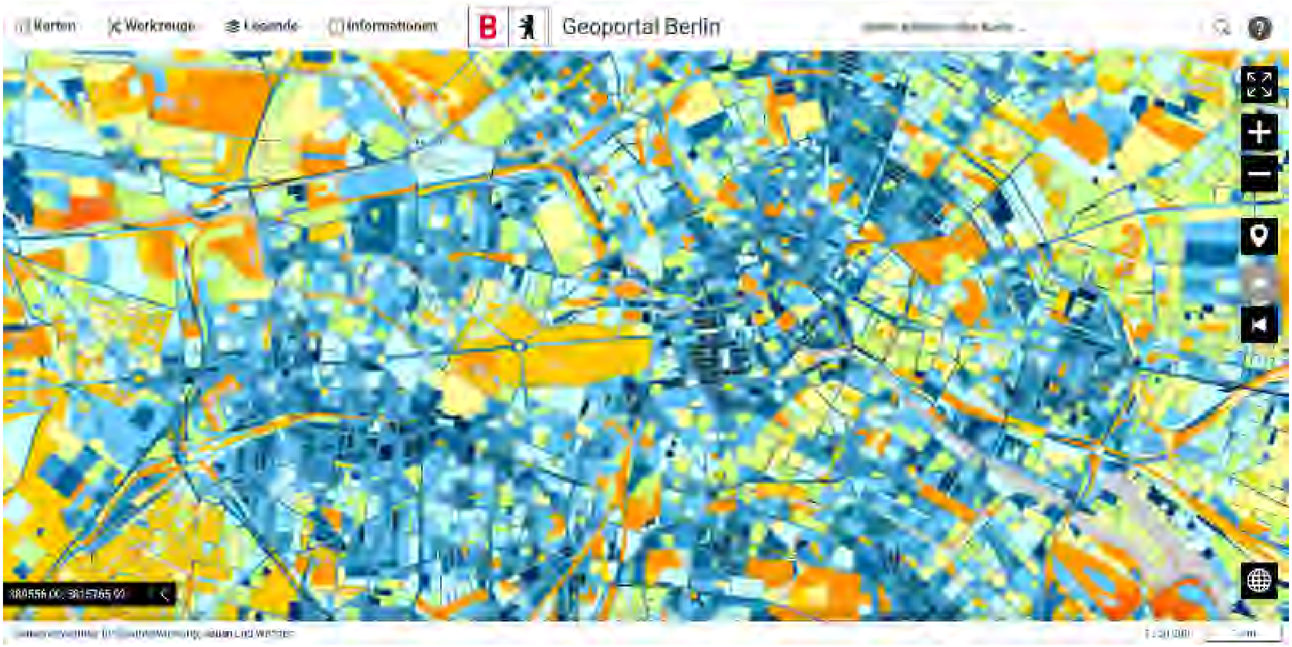
A particularly exciting aspect of the project is the link to other environmental and climate risks. While complex models for flooding or combined sewer overflows require significant computing power, the water balance can be calculated comparatively easily. Analysis has shown that temperature and ΔW are closely related: the greater the deviation from the natural water balance, the higher the summer heat in that area. Clear correlations also exist within catchments for flooding and combined sewer overflows, particularly in relation to deviations in runoff. Thus, ΔW can serve as a proxy indicator: a fast, easily interpretable value to better assess climate-related risks. Essentially, high values indicate a higher burden on the environment and climate, while reductions in ΔW reduce potential climate risks.

The new ABIMO version is freely available as open-source software, including sample data for Berlin, allowing other cities to conduct initial tests. Current results for the present state, the natural reference, and ΔW are also freely accessible via the Berlin Geoportal and are documented comprehensively.

One of the most important outputs of the AMAREX project is a web-based tool to support planning of blue-green infrastructure. The tool is freely available online and allows the simulation of different scenarios for implementing measures throughout Berlin. Users can select specific areas and vary the number of green roofs, infiltration swales, or the degree of sealed surfaces to visualize impacts on the urban water balance.

In the long term, the model is to be expanded to include additional BGI measures – such as intensive green roofs or infiltration trenches – allowing even more detailed scenario analyses. Data preparation remains a significant challenge; automated methods, for example based on satellite imagery, could considerably speed up this process and facilitate application in other cities. The project demonstrates that a relatively simple model can make a complex problem tangible. Cities gain a tool to compare measures not only locally but across the entire urban area. In this way, the urban water balance can become a key indicator and directly support urban planning in adapting to climate change.

Water balance maps published in the Environmental Atlas and Geoportal



Environmental Atlas Berlin/ *Water* Balance 2022↗
www.berlin.de/umweltatlas/en/water/water-balance/2022/summary/

Drinking *w*ater production despite groundwater salinization

Given the increasing demand for drinking water in the Berlin metropolitan region, the impacts of climate change, the presence of wastewater-derived trace substances in bank filtrate, and existing legacy contamination, water resources are coming under growing pressure. Against this backdrop, the GeoSalz research project investigated the formation and dynamics of salinization in the context of more than a century of groundwater management. The goal was to analyze processes using various methods to better understand the interactions between groundwater extraction and saltwater intrusion and to ensure sustainable resource management. Historical data were researched, conductivity measurement chains were installed in drinking water wells, and wells and groundwater monitoring points were analyzed for hydrochemical parameters and environmental isotopes.

The study area included the well galleries of the Friedrichshagen waterworks south of Lake Müggelsee, the Eichwalde waterworks, and the decommissioned Köpenick waterworks. The aquifers are highly heterogeneous due to dynamic deposition and erosion processes during glacial and interglacial periods. Of particular note are the glacial erosion channels from the Elster glaciation, which locally cut through the base of the Oligocene Rupel clay. The Rupel clay acts as a natural barrier between the freshwater layer and the underlying saline groundwater layers, playing a central role. Several discontinuities in the Rupel clay within the study area allow saltwater to migrate from the confined deeper aquifers into the overlying Tertiary and Quaternary layers.

A key component of GeoSalz was the development of numerical flow and transport models. One modeling study created a locally confined model for a well gallery in the Friedrichshagen waterworks. Scenario analyses enabled targeted assessments of how individual input parameters – such as well switching, extraction volume, and river levels – affect saltwater migration. Notably, the model accurately reproduced historical trends in chloride concentrations in extracted water, providing the first model-based explanation for the observed hydrochemical trends.

The second modeling study used a large-scale model to simulate the coupled flow and transport processes in the deeper subsurface of the Friedrichshagen, Köpenick, and Eichwalde waterworks. The aim was to reconstruct both the natural baseline state without anthropogenic extraction and the historical influence of waterworks pumping since the early 20th century. Despite unavoidable uncertainties – such as historical extraction volumes or geological details – the model providing a realistic representation of hydraulic pressures and chloride concentrations. In particular, geogenic salt sources, such as

GeoSalz

Project volume
€345,000, sponsored by Berliner Wasserbetriebe

Partner institutions
Berliner Wasserbetriebe

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Rupel clay discontinuities near Schmöckwitz and Friedrichshagen, were quantified as major factors influencing long-term salinization of the wells.

The findings confirm that the upward movement of saline groundwater in the glacial valley is a natural process, modified by groundwater extraction. A high proportion of bank filtrate in the well galleries proved to be an effective countermeasure to displace rising saltwater from deeper layers. Shallow well construction can therefore be a viable option in managing saltwater intrusion, though it must be assessed site-specifically considering potential risks, such as reduced protection, accelerated well aging, and limited yield.

Additionally, studies of stable isotopes ($\delta^{18}O$, $\delta^{2}H$) provided crucial insights into hydrogeological processes. They allowed differentiation between glacial and recent groundwater formation conditions and, using isotope-based mixing models, enabled quantitative estimates of contributions from different sources, such as saline deep water versus bank filtrate.

The use of conductivity measurement chains in the filter sections of drinking water wells provided valuable information on vertical flow and transport processes in the near-well zone. At the same time, it became clear that practical implementation requires significant technical and personnel resources.

Despite these advances, important questions remain, particularly regarding deeper geological units. Future studies should focus on pressure and concentration conditions in the tertiary freshwater layer and the underlying saline layers below the Rupel clay.

Model-based analyses and hydrochemical observations suggest previously undiscovered weaknesses or “windows” in the Rupel clay. To systematically identify suspicious hotspots for undiscovered Rupel clay discontinuities, especially beneath Berlin’s water bodies, a combined approach using geophysical, drilling, and hydrochemical methods is required.

The “Groundwater Salinization” colloquium

The results of the project were presented to a broad professional audience at the colloquium “Groundwater Salinization”. In addition to the GeoSalz findings, renowned speakers from science, authorities, and practice presented further approaches and insights on this topic. The colloquium took place in the Audimax of Technologiestiftung Berlin, was organized jointly with Berliner Wasserbetriebe, and received strong interest. It offered an afternoon of intensive exchange and lively discussions on the challenges and solutions in managing groundwater salinization.

The audience at Tino Rosin's lecture in the Audimax of the Technologiestiftung Berlin

Dr. Christoph Sprenger presents the GeoSalz project

The presenters Dr. Nasrin Haacke and Dr.-Ing. Alexander Sperlich

AI:Liner

Project volume
€5,960,289 (total amount), financed by the Horizon Europe Programme for Research and Innovation; €1,259,208 (KWB project component)

Partner institutions
Institut National des Sciences Appliquées de Lyon (INSA); Technische Universiteit Eindhoven (TUE); The University of Sheffield (TUoS); Universiteit Leiden (ULEI); Universiteit Twente (UT); Berliner Wasserbetriebe (BWB); Canal de Isabel II Gestion S.A. (CI2); UAV Autosystems Hovering Solutions España SL (HOVERING); Planetek Italia SRL (PLANETEK); Globaz, S.A. (LOBA); The European Water Tech Accelerator (EUWATEC)

Associated partners
Pallon AG; Administration Communale de la Ville de Lausanne; Tokyo Metropolitan Sewerage Service Corporation; Utility Company "Kremenchukvodokanal"; SIMDOURO Saneamento do Grande Porto, S.A.; Metropole de Lyon; Sofiyska Voda AD; Gemeente Rotterdam; CAP Holding SPA

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Digital solutions for sustainable sewer network management

Stormwater and wastewater sewers are usually invisible in the streetscape, yet they are essential for protecting the environment and human health. In many European cities, sewer networks have aged significantly, resulting in leaks, blockages, and rising maintenance costs. Trenchless rehabilitation methods such as cured-in-place pipe lining (CIPP) ▶ (1) are increasingly being used because they enable cost-effective renovation and extend the service life of sewer pipes. However, reliable knowledge about the ageing behavior and technical lifespan of rehabilitated infrastructure is still lacking.

Sewer systems are located underground; therefore continuous monitoring is difficult. Regular inspections are costly, and as a result, robust data on the actual condition of sewer infrastructure are often unavailable. Demographic change and a shortage of skilled workers further challenge the operation of municipal infrastructure systems. Digitalization, automation, and artificial intelligence (AI) open up new perspectives – provided they are implemented responsibly and in a practice-oriented way.

▶ (1) Cured-in-place pipe (CIPP) lining is a trenchless rehabilitation method for wastewater sewers. A resin-impregnated flexible tube (liner) is inserted into the damaged pipe and then cured using heat, steam, or UV light. The liner forms a new, watertight pipe inside the old one – without excavation or surface disruption. This method significantly reduces construction time and costs and is particularly environmentally friendly, as it minimizes impacts on traffic and soil.

A central work package of AI:Liner focuses on the analysis and assessment of CIPP liners. The project investigates their long-term behavior, develops quality standards, and explores options for multiple subsequent rehabilitation cycles. These insights provide an important foundation for the sustainable further development of rehabilitation technologies and for efficient planning of future investments.

The solutions and technologies developed within AI:Liner are being tested at two main sites, Berlin and Madrid. Eight additional urban sewer network operators in Europe and Japan are testing individual approaches, providing data for validation and feedback on the practicality and transferability of the solutions.

This is where AI:Liner comes into play. The project aims to make the inspection, maintenance, and rehabilitation of sewer networks more efficient, safer, and more sustainable using digital technologies. The focus lies on an integrated, data-driven approach to infrastructure management, covering everything from condition assessment to long-term investment planning.

To this end, AI:Liner develops and tests a range of innovative monitoring technologies that complement conventional camera inspections. Remote sensing methods enable large-scale analysis of entire network sections. Autonomous drones can inspect hard-to-access areas while simultaneously improving occupational safety. Acoustic sensors are used specifically to investigate CIPP liners in a material-sensitive manner, allowing structural weaknesses to be detected at an early stage – even when they are not visible in visual inspections.

In addition, AI:Liner uses automation and AI-based methods to optimize the entire sewer rehabilitation process. With the help of AI-based damage detection, automated condition assessment, and forecasts for non-inspected network sections, actionable recommendations can be derived based on risk and priority analyses. In this way, AI:Liner closes the gaps on the path toward fully automated, end-to-end asset management – from short-term operational decision-making to strategic investment planning. The goal is to achieve targeted rehabilitation measures, lower costs, higher operational reliability, and an extended service life of sewer networks.

AI:Liner views digitalization not only as a technological transformation but also as a societal one, and it examines the social and organizational impacts of digitalization in the wastewater sector. Training programs are designed to support professionals in the safe use of new digital tools and to help adapt work processes to changing requirements.

At the same time, AI:Liner places strong emphasis on ethical and transparent AI systems. Data protection, traceability, and cybersecurity are integrated into development from the very beginning. In doing so, the project helps to strengthen trust in the use of digital technologies in the public sector.

AI:Liner brings together the expertise of research institutions, technology companies, and ten European sewer network operators. KWB coordinates the project and actively drives the development of innovative solutions. Close cooperation among all partners ensures that research results are transferred directly into practice. The foundation for this collaboration was laid at a two-day kick-off meeting in October 2025, where 50 participants from research and practice discussed shared challenges and objectives for efficient, sustainable, and future-proof sewer network management in Europe.

WaterMan

Project volume
€4,377,046 (total amount) financed by the Interreg Baltic Sea Region Programme, €430,032 (KWB project component)

Partner institutions
Region Kalmar Län; Kalmar kommun; Kalmar Vatten; Gdańsk University of Technology; Västerviks kommun; Klaipėdos rajono savivaldybė; Saldus novads; Klaipeda University; Kurzemes plānošanas reģions; Bornholms Energi & Forsyning; Urząd Miasta Braniewa; Izba Gospodarcza. Wodociągi Polskie; Asociacija „Klaipėdos regionas"; Stowarzyszenie Gmin RP Euroregion Bałtyk

Contact
Pia Schumann

▶ (1) The Water Recycling Toolbox contains results and documents on local model strategies and pilot projects in WaterMan, as well as a helpdesk listing specific contacts for municipalities or other institutions.

The toolbox can be accessed at: www.eurobalt.org/waterrecyclingtoolbox/

Video: https://kompetenz-wasser.de/en/newsroom/news/waterman-video

New Approaches for Alternative Water Resources in the Baltic Sea Region

Hot summers, dry springs, and sudden heavy rainfall events are creating new challenges for municipal water management even in the water-rich Baltic Sea region. The European WaterMan project demonstrated how rainwater, urban runoff, treated municipal wastewater, and other alternative water sources can be used as part of a climate-resilient water supply – not only in southern countries, but in northern Europe as well.

Funded by the Interreg Baltic Sea Region Programme, WaterMan brought KWB together with partners from Sweden, Denmark, Poland, Latvia, and Lithuania. The aim was to integrate water reuse into municipal strategies. In addition to implementing technical solutions in several countries, the project included training sessions, networking events, and international excursions to share knowledge on the safe use of alternative water resources with authorities and utility companies.

In Gargždai, Lithuania, the countrys first municipal stormwater retention pond designed for water reuse was built. The system, consisting of a pre- and main basin, collects and treats water from a 110-hectare catchment before it is used to irrigate green spaces or trees. This significantly reduces drinking water consumption and gives the city more flexibility during drought periods.

In Braniewo, Poland, a raingarden at the car park of a local sports center was created for stormwater management, improving the local microclimate during long dry periods. At the same location, swimming pool water was treated to fit municipal purposes such as canal flushing. This approach keeps the green areas at the sports and health center alive during long dry periods while improving the local microclimate.

In Kalmar, Sweden, treated municipal wastewater becomes a valuable resource. A mobile treatment unit combines filtration and UV disinfection to allow further use of wastewater from a municipal treatment plant. Tank truck operators control the system via an app, filling the trucks to irrigate young trees in the city of Kalmar. In the future, the plan is to extend the use to irrigation of football fields as well.

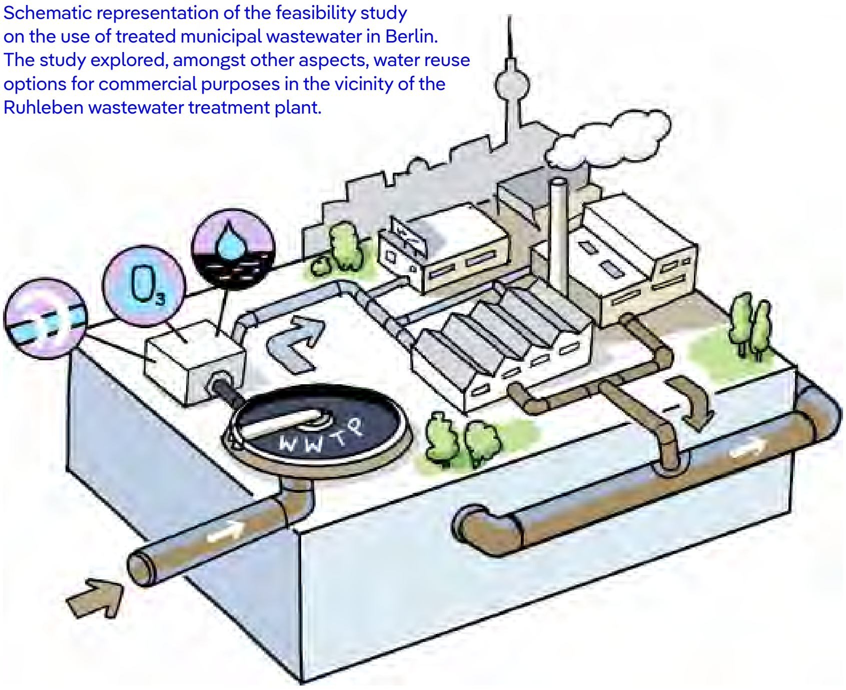
A special feature of WaterMan was the close involvement of municipalities as project partners. KWB actively shaped this process by supporting training, workshops, and peer-to-peer formats and contributing experiences from international projects. In this context, two excursions were organized: one to Murcia, Spain, where water reuse – especially in agriculture – has been practiced for many years, and one to Belgium and the Netherlands, where existing and developing water reuse projects in humid regions were visited.

Of the ten pilot projects, five were implemented as permanent technical installations. They ranged from capturing stormwater runoff to treating and reusing swimming pool wastewater and reusing municipal wastewater for irrigating young trees. All projects were accompanied by an expert panel, with KWB and other research partners ensuring scientific quality assurance and knowledge transfer.

For the Berlin-Brandenburg metropolitan region, the focus was on analyzing opportunities and conditions for water reuse at the Berlin Ruhleben and Berlin Stahnsdorf wastewater treatments plants.
With KWB's involvement, potentials were identified and options discussed – particularly for use in agriculture, industry, and urban irrigation. Against the background of climate-induced water stress and expected changes in the local water system following the end of lignite mining in Lusatia, the main question was how water reuse and alternative water sources can contribute to relieving the pressure on drinking water supply in the long term without compromising existing quality requirements.

The project results are documented in a publicly available Water Recycling toolbox [sidebar], which serves as a guide for municipalities and utilities. An impression is provided by the project video, available on the KWB website ▶ (1). WaterMan has demonstrated that alternative water resources are a valuable addition for the cities of the future.

Schematic representation of the feasibility study on the use of treated municipal wastewater in Berlin. The study explored, amongst other aspects, water reuse options for commercial purposes in the vicinity of the Ruhleben wastewater treatment plant.



AD4GD

Project volume
€4.137 M (total amount), financed by the Horizon Europe Programme for Research and Innovation; €299,800 (KWB project component)

Partner institutions
Atos SE; Aston University; CREAF - Centre de Recerca Ecològica i Aplicacions Forestals; Design Terminal; ECCP - European Cluster Collaboration Platform; ECMWF - European Centre for Medium-Range Weather Forecasts; Fraunhofer FIT; IoT Lab; Mandat International; OGC - Open Geospacial Consortium; PSNC - Poznan Supercomputing and Networking Center

Contact
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Citizen Science for Berlin's Lakes

Would you swim in this Berlin lake? And can you tell us how much deadwood is present in the lake? Simple questions like these have produced surprisingly informative insights into the condition of Berlin's small lakes in the Berlin pilot study of the EU project “All Data 4 Green Deal” (AD4GD).

The aim was to better understand the status of Berlin's many small urban lakes – important oases that mitigate heat, provide habitats for wildlife, and serve as places of recreation and retreat for people. Because data on the condition of these water bodies are often scarce, KWB developed innovative approaches to analyze satellite imagery, sensor measurements, and observations contributed by citizens.

One element of the citizen science approach was the expansion of the CrowdWater app. Originally developed by the University of Zurich for small rivers, the app was adapted for use at small urban lakes. For this purpose, a questionnaire was developed in close coordination with stakeholders in Berlin. The questions were designed so that interested citizens could answer them without any prior technical knowledge. Based on the responses, indicators were calculated that provide insights into water quality, usage pressure, water scarcity, and the lake's function as a biotope. Every observation counts – and together they form an increasingly accurate picture of each water body.

The results are displayed in interactive maps and updated regularly as new observations collected via the app are added. This method is particularly useful for identifying extreme conditions. Figure 1 shows a map of the water scarcity indicator for small water bodies in Berlin. Key inputs for this indicator are questions about whether a lake dries out and the magnitude of water level fluctuations. App users can leave questions unanswered if they are unsure. Any other response shifts the indicator in a positive direction (no water scarcity) or a negative one (water scarcity). Lakes with critical water availability immediately stand out as red circles on the map. In the same way, lakes with likely high nutrient levels, intensive use, or high biotope potential can be identified quickly.

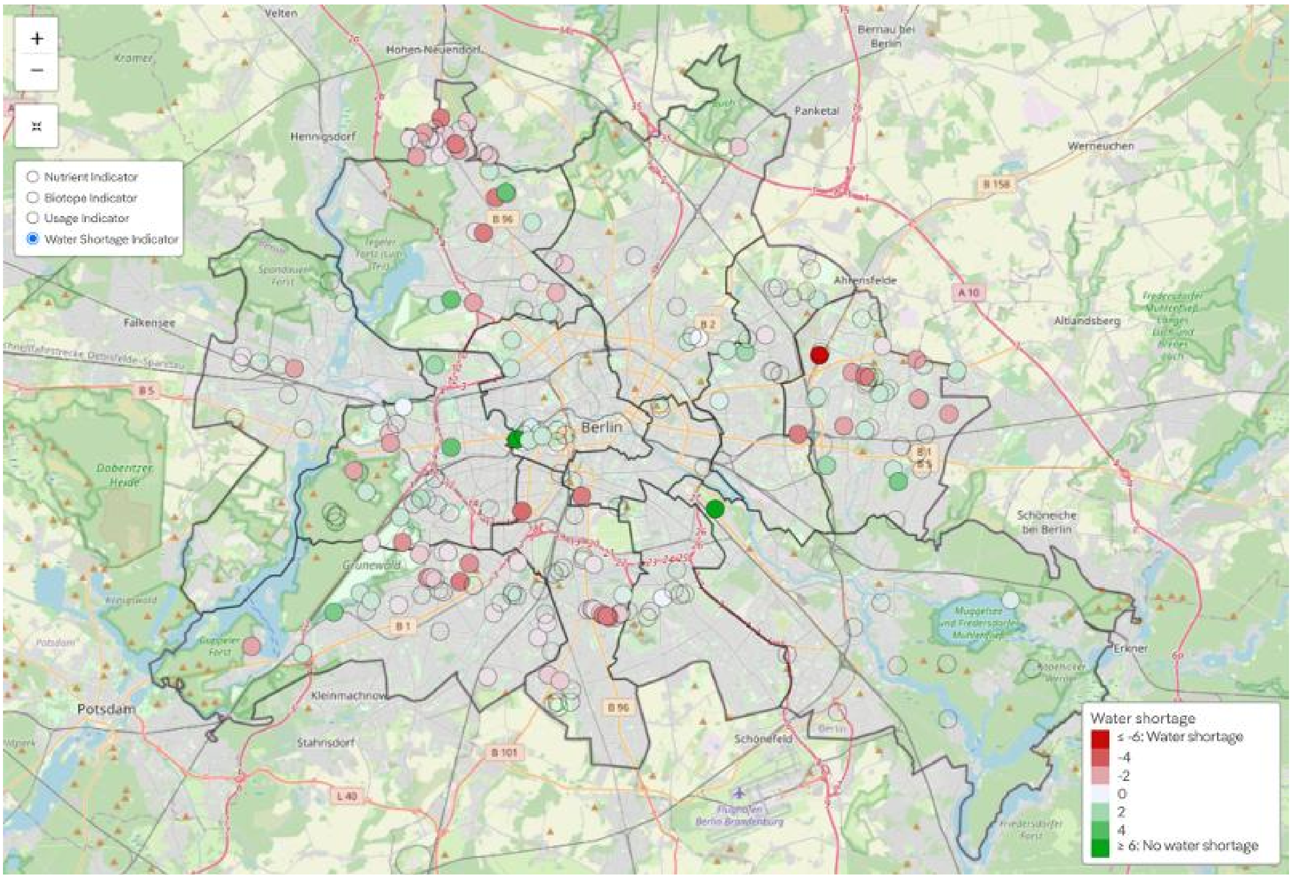

Figure 1: CrowdWater App – Map showing water scarcity in small water bodies in Berlin

The AD4GD project was completed in August 2025. In addition to the CrowdWater approach, citizens participated in simple measurements of nutrient concentrations in lakes, providing valuable data on water quality. The project also used satellite data to assess the trophic status of the water bodies and to detect changes over time. Based on these data, the idea of a central dashboard emerged, in which each lake is presented as an individual entity and all available information on that water body is brought together. This approach has already been implemented exemplarily for several lakes. In the coming years, Berlin's small lakes will continue to be a central topic of research at Kompetenzzentrum Wasser Berlin. Future projects aim to institutionalize and systematically further develop the assessment approaches created so far, in order to provide a robust and reliable foundation for water body management in Berlin.

Water Resilience

Project volume
€2,561,995 (total amount), financed by the Federal Ministry of Research, Technology and Space;
€185,500 (KWB project component)

Partner institutions
Technische Universität München; BGS Umwelt GmbH; Hessenwasser GmbH & Co. KG; Stadtwerke Schweinfurt GmbH; Stadtentwässerung Schweinfurt; Okeanos Smart Data Solutions GmbH; envi-systems GmbH; iat - Ingenieurberatung GmbH

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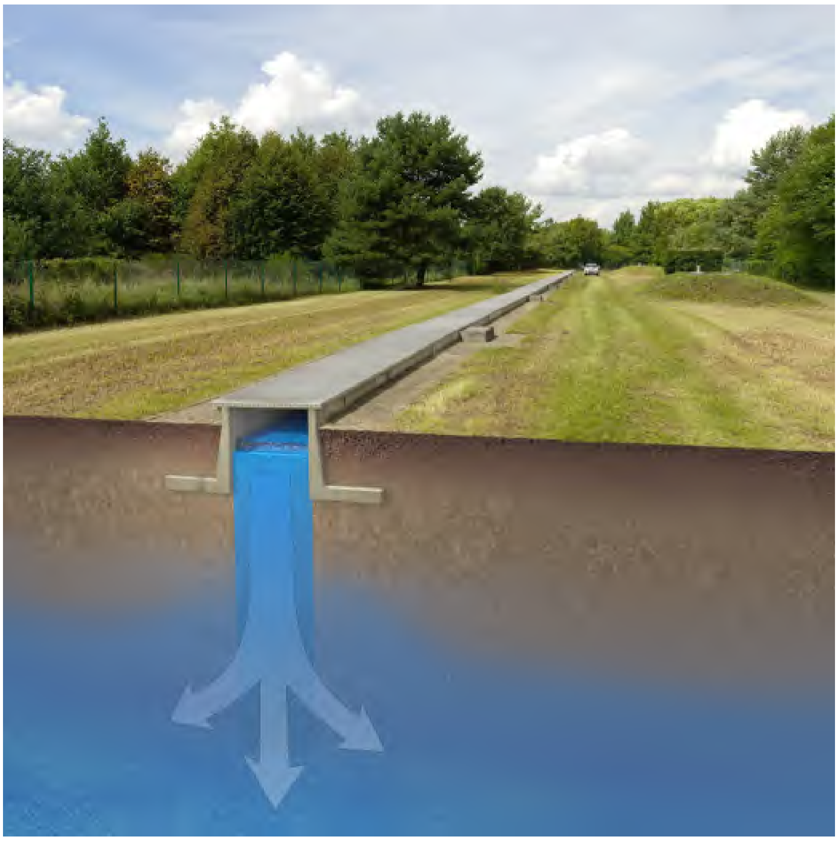
Celina Krüger

Adaptive Water Infrastructure in a Changing World

Our water supply and wastewater infrastructure typically has very long lifespans: the necessary facilities for water treatment and distribution operate for many decades and must be maintained accordingly. Likewise, the construction of new water infrastructure often takes many years due to the complexity and scale of projects. For complex construction projects, it can take more than 10 years from initial planning to commissioning. Until recently, planning for future water infrastructure was therefore based on long-term forecasts of key conditions such as water availability and water demand, allowing investment decisions to be made well in advance.

In recent years, however, it has become clear that the external conditions for future water infrastructure are changing ever more quickly and unpredictably: climate change is altering water availability, and water uses are evolving at an increasing pace. Other factors, such as population growth or the establishment of new industries, have also become more dynamic, making it more difficult to reliably forecast water demand over the long term.

Infiltration trench for artificial groundwater recharge



As a result, there is a growing need for adaptive and thus resilient solutions for the water infrastructure of the future, enabling providers to respond flexibly and quickly to new challenges. This is precisely the goal of the Water Resilience project: KWB, together with strong partners from research and practice, is developing new solutions to enhance the resilience and adaptability of tomorrow's water supply and make it future-proof. The project, funded by the Federal Ministry of Research, Technology and Space (BMFTR), is led by the Technical University of Munich, and the consortium includes various solution providers as well as water supply companies themselves.

Using the regions of Frankfurt am Main and Schweinfurt as examples, the project tests both digital and technical solutions together with practical partners to increase the resilience of local drinking water supplies against future climate change challenges. Examples include an AI-based assistance system for groundwater management or infiltration trench systems for protecting riverbank-filtered wells from fluctuations in surface water quality. All of this is supported by the latest climate models and consumption forecasts and modeled into long-term scenarios for a future-secure water supply. The project also further develops and implements the use of alternative water sources, such as extensively treated wastewater ("reclaimed water").

KWB is developing new indicators for this strategic resilience and evaluating the solutions' environmental impacts through life cycle assessment (LCA). This makes the benefits of the new solutions understandable for decision-makers, while also highlighting potential conflicts between resilience and system efficiency, which are minimized wherever possible. The project is complemented by targeted dissemination of results to water suppliers, including active change management, to successfully implement new ways of thinking and acting in practice. All of this ensures that our water supply remains secure, affordable, and ecologically sustainable in the future.

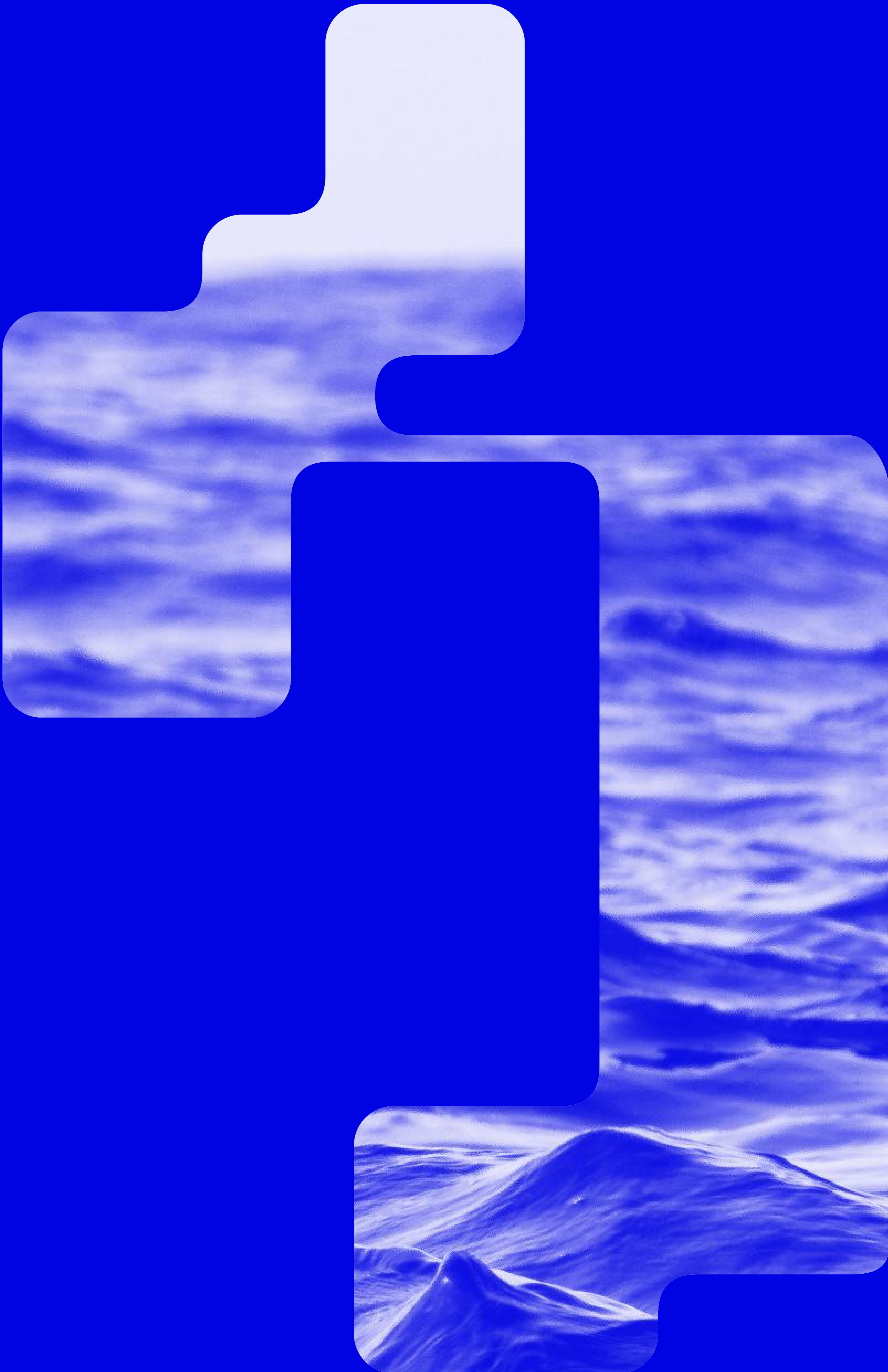
The Water Resilience project thus makes an important contribution to securing water supply for future generations. It ensures that water can be provided reliably, affordably, and sustainably even in times of climate change, protecting one of society's most critical resources and safeguarding the livelihoods of people, the environment, and the economy alike.

Swimming out

For us, "swimming out" means taking a glimpse into the future. Discover how digital tools can help pave the way towards climate-friendly cities and how we can combine statistics and predictive risk assessment to validate safe water reuse. Here you'll also gain an overview of the potential uses of AI in urban water management.

Explore these articles for a glimpse into what the future holds:

- ▶ Digital tools for climate-adapted cities
- ▶ Validating safe water reuse – where statistics meet risk assessment
- ▶ Beyond the hype: the potential of generative AI in urban water management



Digital tools for climate-adapted cities

Lisa Junghans

Dr. Andreas Matzinger

Franziska Knoche

Francesco Del Punta

Paul Schütz

LoRaWAN temperature sensor on an extensive green roof

The Smart*W*ater project and the Blue–Green Infrastructure Planner

Climate change is no longer an abstract future scenario; it has become part of everyday urban life. Extreme weather events are occurring with increasing frequency: summers with temperatures above 35 °C, heavy rainfall that leads to flooded basements, and dry winters that cause soil and vegetation to dry out. Cities are particularly affected, as sealed surfaces, trapped heat, and rapid water runoff reinforce one another. Berlin exemplifies this trend – and at the same time the effort to learn from it.

Turning insight into action requires tools that bring together urban planning, climate impact research, and water management. This is precisely the aim of the SmartWater research project, coordi nated by Kompetenzzentrum Wasser Berlin (KWB). Together with Berliner Wasserbetriebe, Technologiestiftung Berlin, the Senate Department for Urban Development, Building and Housing, the Senate Department for Urban Mobility, Transport, Climate Action and the Environment, Berlin Rainwater Agency, and the two districts of Pankow and Friedrichshain-Kreuzberg, the project is developing a digital infrastructure that enables planners to put climate adaptation into practice.

A tool for the city of tomorro*w*

At the heart of the project is the Blue–Green Infrastructure Planner (BGI Planner) – a web-based tool designed to support urban decision-makers throughout all phases of planning. Its goal is to integrate climate adaptation measures into everyday administrative practice.

The BGI Planner combines spatial data, simulation results, and planning expertise. It identifies locations suitable for de-sealing surfaces, green roofs or façades, and shows how water can be retained and evaporation deliberately enhanced. In this way, complex modeling results are translated into manageable and actionable information. Its modular structure allows flexible use – whether in strategic urban planning, design competitions, or concrete implementation phases. The tool is being piloted in two contrasting urban areas:

- **Alte Schäferei in Pankow** – a new development designed from the outset to be climate-adapted, featuring nature-based stormwater management and reduced soil sealing.
- **Ostkreuzkiez** in Friedrichshain-Kreuzberg – a densely built Wilhelminian-style (Gründerzeit) neighborhood with heat stress, limited green space, and little room for structural change.

By comparing these sites, both preventive and retrofit adaptation strategies can be explored.

Simulation as a basis for planning

The core of the BGI Planner is its model-based impact assessment. Various models calculate how planned measures affect flooding, urban climate, water quality, and the water balance. Results are visualized in maps and diagrams, allowing direct comparison of different scenarios.

These models bridge science and administration: complex environmental processes are condensed into quantifiable indicators that planners can directly integrate into their work. In this way, forecasts are converted into actionable knowledge.

Flooding: how de-sealing reduces risk

Heavy rainfall is no longer a rare event in Berlin. Large volumes of rain fall within short periods, pushing the sewer system to its limits. For the pilot area Ostkreuzkiez, a two-dimensional runoff model was developed using the software InfoWorks ICM, simulating water flow across streets, squares, and courtyards.

A simulation of a 30-year rainfall event shows where water accumulates in depressions and which areas are flooded when manholes overflow. If, for example, parts of roof areas are greened or rainwater is retained locally, runoff patterns change significantly. Figures 1 and 2 illustrate these changes. The modeling demonstrates that even moderate de-sealing has noticeable effects: infiltration increases, water levels decrease, and the number of high-risk areas declines.

These insights support not only risk assessment but also the prioritization of planning and investment. In the future, the BGI Planner can help identify critical hotspots and focus measures where they achieve the greatest impact.

Water quality: models for cleaner urban waterways

Another key objective is protecting Berlin's urban waterways. During heavy rainfall, combined sewer overflows release nutrients and pollutants into water bodies such as the Landwehr Canal, the River Spree, and the River Panke. To assess the positive effects of decentralized measures, a comprehensive modeling chain was developed linking the sewer network with a water quality model.

Using InfoWorks ICM and Gerris / Hydrax / QSim, real precipitation series that caused combined sewer overflows in Berlin's 18 combined sewer catchment areas were simulated and analyzed. One result is shown in Figure 3: reducing the connected, sealed surface area by 27.5 % leads to a significant decrease in water pollution as well as in the frequency and duration of critical oxygen concentrations.

Based on this, a simplified, data-driven model is being developed for the BGI Planner, enabling real-time scenario calculations in the future. This will demonstrate how each project – from greening courtyards to rooftops – contributes to reducing pollution from combined sewer overflows.

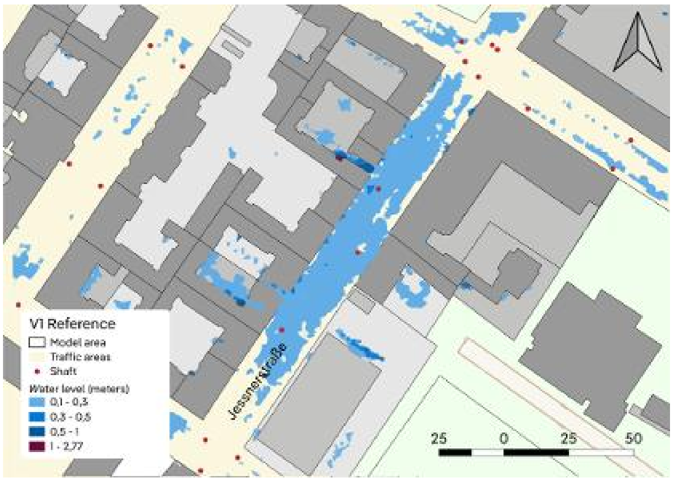


Figure 1: Water levels under current conditions during a 30-year rainfall event (Euler Type II) in part of the Ostkreuzkiez © BWB

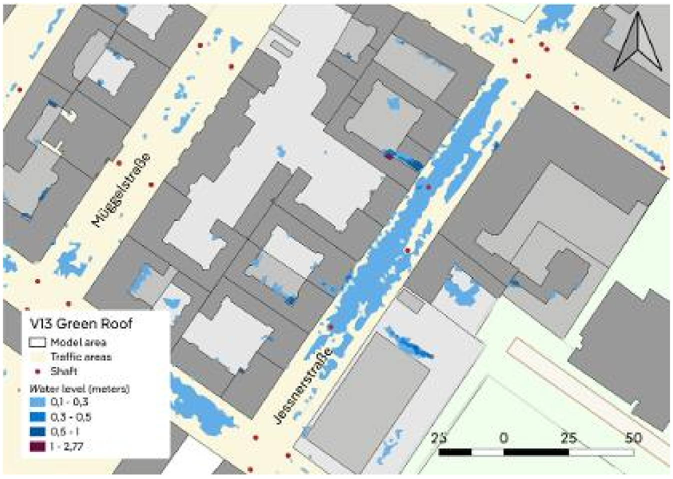
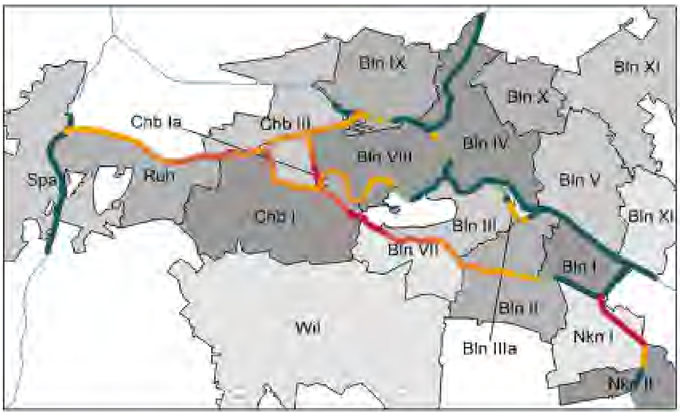
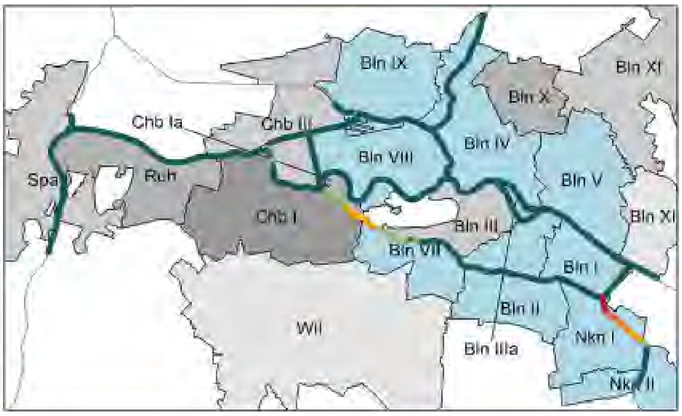


Figure 2: Water levels under a scenario with 25% green roofs during a 30-year rainfall event (Euler Type II) in part of the Ostkreuzkiez



Duration of non-compliance in hours (1.5 mg/L) under current conditions



Duration of non-compliance in hours (1.5 mg/L) with 27.5% disconnection and sewer network rehabilitation in nine combined sewer catchment areas

Figure 3: Left: Current situation; duration (hours) below critical thresholds for 14 real rainfall events with combined sewer overflows into Berlin waterways (grey: combined sewer catchment areas). Right: Same events under a scenario with 27.5 % surface disconnection (light blue: rehabilitated catchment areas)

Urban climate: cooling through greening

Alongside water, heat is the second major stress factor in urban areas. To illustrate how vegetation influences the microclimate, the team uses the software ENVI-met, which enables three-dimensional airflow and energy balance modeling.

In Ostkreuzkiez, typical street sections are analyzed. The model compares current conditions – dense development, few trees – with scenarios including green roofs and façades, de-sealed parking lots, and additional street trees. The simulation of a hot day in August 2024 (Figure 4) shows that air temperatures at pedestrian level can be reduced by up to 1.8 °C, while humidity increases slightly. This significantly improves thermal comfort.

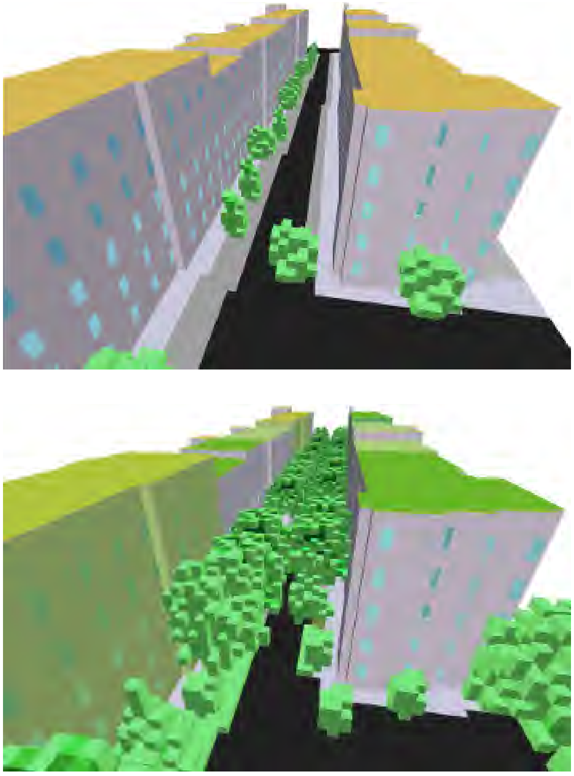
These results are not abstract figures but concrete decision-support tools. They demonstrate that urban greenery provides not only aesthetic value but measurable benefits for health and quality of life.

Water balance: how much rain stays in the city

While heavy rainfall brings excess water, Berlin suffers from water scarcity during dry periods. The project therefore also examines how greening and de-sealing affect the urban water balance over the long term.

Using the enhanced software ABIMO [2], runoff, evaporation, and infiltration are calculated across the entire area. The current situation is compared with a natural reference state, from which the parameter ΔW is derived, indicating how much the hydrological balance has shifted.

Three scenarios were modeled for Ostkreuzkiez – 19 %, 44 %, and 100 % green roofs (Figure 5). The results show that the larger the vegetated area, the smaller the deviation from the natural water balance. In the BGI Planner, these values are displayed in color-coded maps, allowing planners to immediately identify which greening ratio yields the greatest benefit.



Comparison of the current and target states of the Berlin street

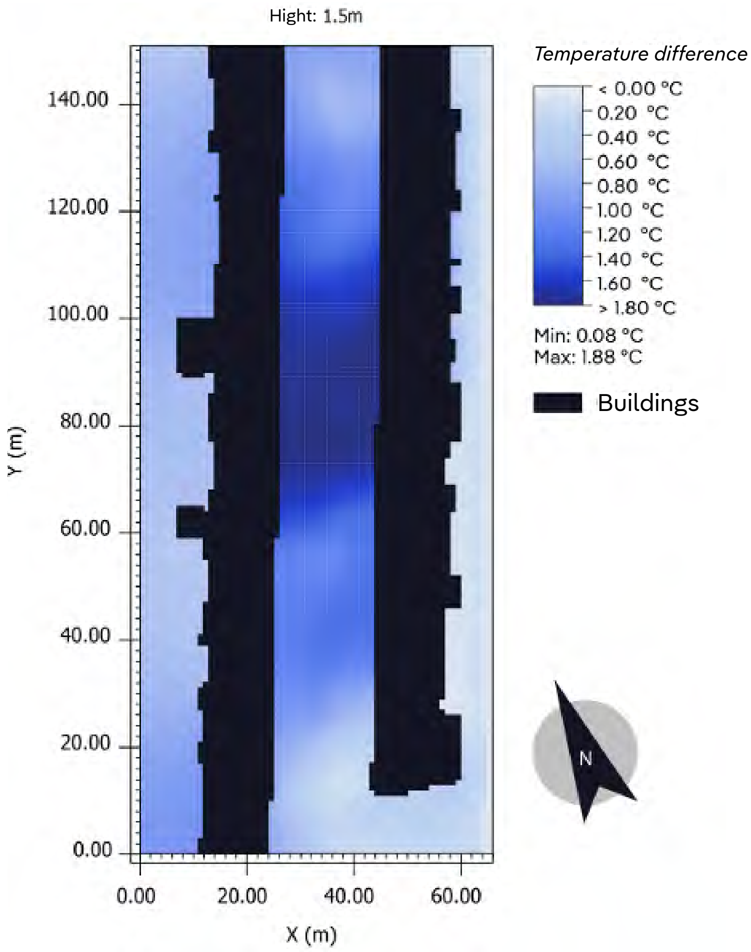


Figure 4:
Left: Model setup (current-state and scenario models); right: temperature difference between current and BGI scenario

A digital tool for administration and planning

The BGI Planner is being developed step by step together with its users. Workshops in districts, feedback from technical departments, and test runs in real planning processes are continuously incorporated into further development.

The tool is not intended as a new expert system, but as a bridge – connecting research, administration, and practice within a shared working space. It creates transparency regarding impacts and trade-offs and facilitates communication between authorities, planning offices, and the public.

In the long term, the BGI Planner could become part of a broader digital platform integrating energy, transport, and land management. Climate adaptation can only succeed if all sectors think and act together.

Outlook: from modeling to implementation

The results so far show that even small design changes can have a significant impact. Partial green roofs or a new row of trees can measurably reduce temperatures while also relieving pressure on the sewer system. At the same time, simulations reveal that effects do not increase linearly. Careful consideration of costs and benefits is therefore essential.

The BGI Planner provides a data-based tool to support such trade-offs. It helps set priorities and evaluate the effectiveness of measures over time, shortening the path from analysis to implementation and making political decisions more transparent.

Beyond Berlin

What is being tested in Berlin can be beneficial for many European cities. Flooding, urban heat islands, and polluted waterways are not local but structural challenges. They require solutions that integrate spatial planning, hydrology, and climate research.

The BGI Planner is deliberately designed as an open-source application. This allows other municipalities to use the tool, adapt it to their own data, and further develop it. In this way, a shared and growing toolbox for climate-adapted urban development emerges, making knowledge and experience accessible across city boundaries.

SmartWater demonstrates that digital applications are more than mere planning aids: they create transparency, facilitate collaboration, and make climate adaptation measurable. Berlin thus becomes a living laboratory from which practical, transferable solutions for a water-sensitive and resilient city can emerge.

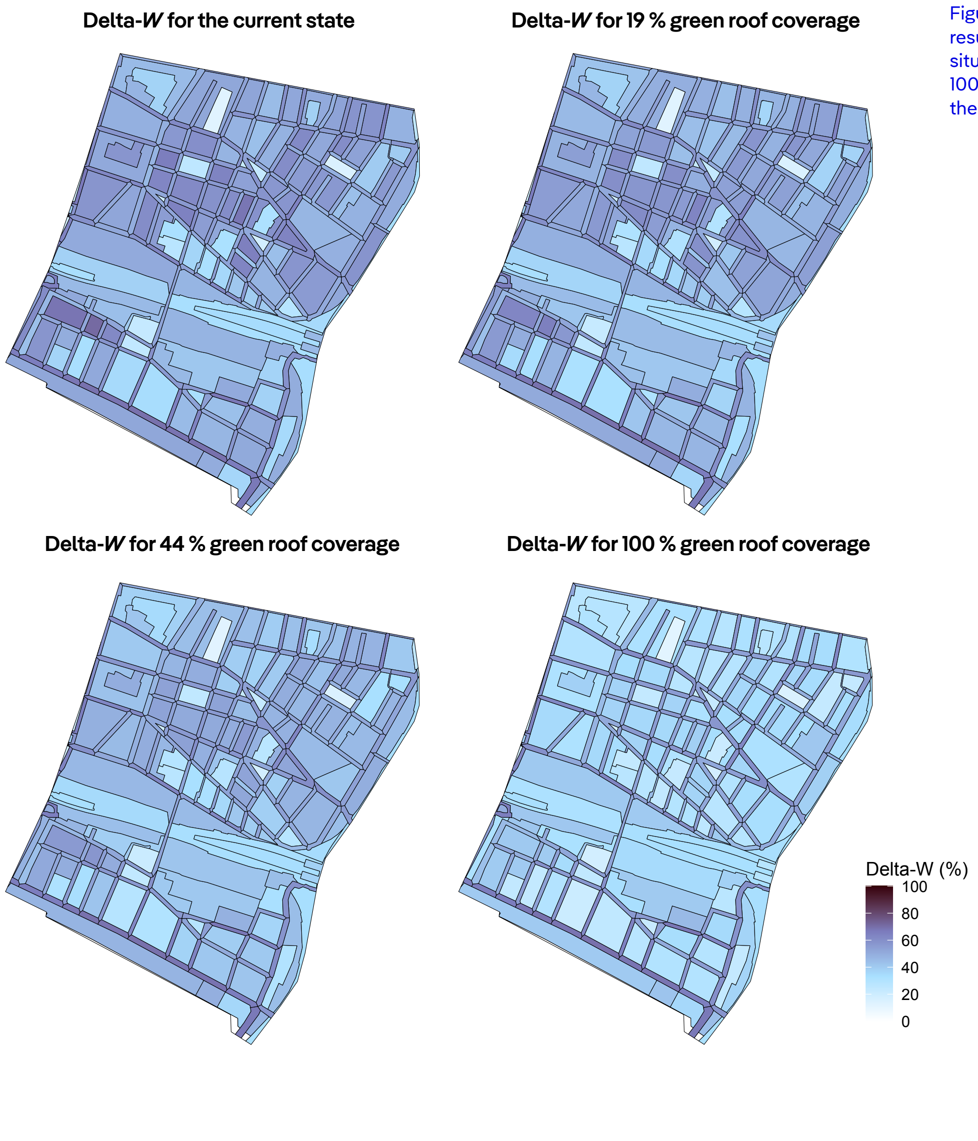


Figure 5: Initial simulation results; ΔW (%) for the current situation and for 19 %, 44 %, and 100 % extensive green roofs in the Ostkreuzkiez pilot area.

Validating safe *w*ater reuse

– *W*here statistics meet risk assessment

*W*olfgang Seis

A new chapter at KWB: Water & Risk

In spring 2025, KWB entered a new chapter. With the launch of the Water & Risk research group, a dedicated space has been created for all questions related to risks in water supply and sanitation. The group is led by Wolfgang Seis, an expert in risk modeling, statistical evaluation, and water quality – and the author of a recently published study on validating safe water reuse.

"Our goal is to take a holistic view of risks rather than focusing solely on individual technical parameters," emphasizes Seis. "We want to understand how technical, hygienic, and environmental factors interact – and to develop solutions that function reliably under real operating conditions."

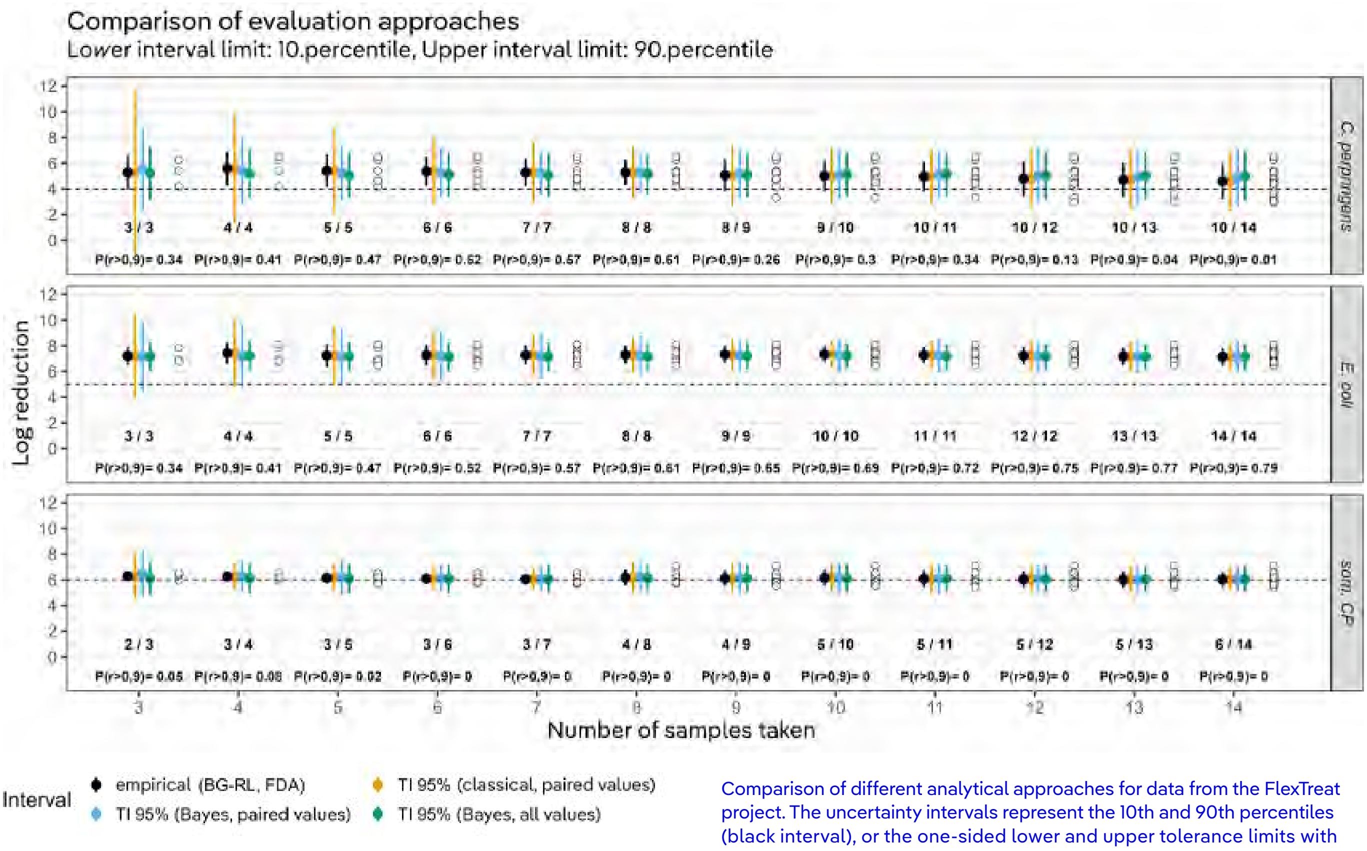
The group consolidates expertise previously spread across various projects and teams. It combines knowledge of hygienic and health-related risks, environmental impacts, and technical-operational challenges. This threefold perspective encompasses the full spectrum of potential hazards – from pathogens in treated water, to pollutant inputs into rivers and aquifers, through to leakages in distribution networks or cyberattacks on digital control systems.

Water & Risk describes itself as an interdisciplinary research group. Engineers collaborate closely with microbiologists, data analysts, and modelers to capture complex interactions and translate them into comprehensible recommendations for action. The group aims to develop tools that are both scientifically robust and directly useful for authorities, utilities, and companies. These include risk and hazard maps, digital early-warning systems, assessment models for treatment plants, and methods for prioritizing protective measures.

Practical relevance is central. "We don't want to develop methods in the lab that nobody uses in practice," says Seis. "That is why we work closely with operators from the outset, to ensure that our tools are truly applicable." Just a few months after its inception, it is already evident that Water & Risk is not merely a new label but a strategic move by KWB to strengthen and showcase its expertise in risk and safety issues.

The challenge: How to ensure safety in water quality?

Safe water reuse is more than just a technical goal; it is a commitment to the public to foster and sustain trust. Whether for agriculture, urban green spaces, or industrial processes, treated water must be free from pathogens or hazardous substances that could threaten human health or the environment. EU Regulation 2020/741 establishes clear hygiene targets – such as reducing E. coli by three or five $\log_{10}$ levels, depending on the context. One log level indicates a tenfold decrease; thus, three log levels signify a 99.9 % reduction. However, while the regulation sets these targets, it does not specify the number of samples to be collected or the statistical methods to be used. This flexibility introduces uncertainty: is a water treatment plant genuinely performing as well as a few measurements indicate, or is the assessment misleading because the statistics have not been properly applied?



Comparison of different analytical approaches for data from the FlexTreat project. The uncertainty intervals represent the 10th and 90th percentiles (black interval), or the one-sided lower and upper tolerance limits with α = 0.05. The numerical values X/Y illustrate the binomial approach, where X = number of successes and Y = total number. Values that fell below the target value due to excessively low input concentrations, marked with '> VALUE', were classified as failures (relevant for somatic coliphages – som. CP)

From theory to practice: examining statistics

This is precisely where the new research group comes into play. In a recent KWB study, co-authored by Wolfgang Seis, various statistical approaches were compared – from simple methods that can be described mathematically, like a coin toss, to complex tolerance intervals. The latter not only provide an average value but also define a range within which, with a given probability, a certain proportion of future samples will fall. Bayesian tolerance intervals, a method that combines probabilistic assumptions with actual measurements, were particularly convincing. This approach produces robust assessments even with small datasets, non-normally distributed values, or a high number of measurements below detection limits.

The study monitored a large-scale treatment plant in Germany for a year. Samples were collected at regular intervals and analyzed for indicators such as E. coli, spores of Clostridium perfringens, and somatic coliphages – representing bacterial, parasitic, and viral pathogens. The results showed that classical percentile calculations, which estimate thresholds based on point estimates, can lead to misclassifications when datasets are small. Conversely, Bayesian tolerance intervals proved to be significantly more reliable. "Our aim was to compare the methods in such a way that a toolbox emerges, enabling practitioners to select the most appropriate approach for each situation," Seis explains.

Why methodology and risk are inherently linked

The choice of statistical method has implications beyond just the numbers in a report. It affects plant operations, regulatory approvals, and investment decisions. A conservative approach can cause unnecessary costs, while an overly optimistic one carries real health risks. For Water & Risk, this interface is vital: statistical methods are not isolated tools but essential elements of an integrated risk concept that considers all relevant hazard pathways and probabilities.

Learning from experience – national and international examples

The expertise pooled within Water & Risk has evolved over many years. With the SWIM:AI forecast tool, which has supported Berlin authorities in assessing bathing water quality since 2018, it has already become evident how data-driven methods can prove effective in practice. International projects in regions such as Spain and Israel have shown that statistical approaches can be successfully adapted to very different climatic and infrastructural conditions. The FlexTreat project, which tested evaluation methods for wastewater treatment, directly contributed to the German DWA guideline M 1200 – illustrating how research findings can influence regulation. Water & Risk plans to pursue this path more systematically in the future.

From laboratory to regulation

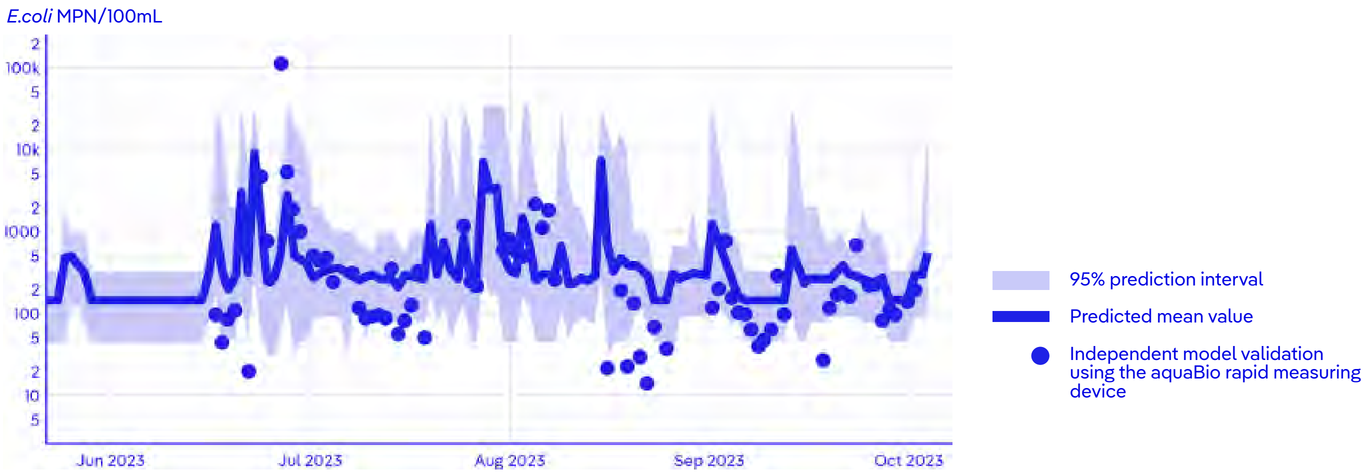
Translating scientific insights into binding requirements remains one of the greatest challenges in water reuse. EU Regulation 2020/741 provides a framework but leaves many practical questions unanswered. Here, Water & Risk considers itself a mediator between research and regulation. "We not only want to develop methods but also to ensure that they are applied in practice – by the authorities that issue permits and by the operators that run their plants," Seis summarizes. The group's goal is to present statistically sound methods in a form that is equally usable for regulators and operators. This includes training courses, practice-oriented guidelines, and digital tools.

Outlook: improved safety via enhanced data

In the coming years, Water & Risk will extend its research to new areas. These include analyzing supply security in urban networks, evaluating the impact of drought periods on aquifers, and integrating AI-supported forecasts into real-time monitoring systems. In water reuse, improved assessment methods are expected to lower barriers and foster trust.

In doing so, the group not only highlights its expertise within KWB but also positions itself as a key interface between research, regulation, and practice – and as a driving force ensuring that water resources are managed more safely, efficiently, and sustainably in the future.

Application of SWIM:AI to predict *E. coli* concentrations and bathing water quality in Berlin's Spree Canal in 2023



Beyond the hype: the potential of generative AI in urban *w*ater management

Dr. Nicolas Caradot

Dr. Rita Ugarelli

Dr. Riccardo Taormina

Generative AI has evolved rapidly from a niche area of research to become a transformative force in society. By enabling machines to produce text, images, music, and video, it is reshaping fields such as communication, education, design, and health-care. Tools such as ChatGPT have become globally popular; they empower users to create content more efficiently and creatively, reducing technical barriers and accelerating digital innovation. Beyond the initial hype, the industry is now focused on using GenAI to generate lasting value. Combining generative models with intelligent agents creates new opportunities for growth, productivity and sustainability. Real-world applications are emerging in areas such as medicine, energy and logistics, where GenAI enhances our ability to solve complex problems. At the same time, GenAI is disrupting organizations and changing the way we work. By automating repetitive tasks, GenAI enables individuals to focus on strategic thinking, creativity, and collaboration. According to a recent McKinsey report, GenAI is set to automate up to 30 % of total work hours (Ellingrud et al, 2023), while the World Economic Forum suggests that LLMs could automate up to 80 % of routine language-based tasks (WEF, 2023).

The rapid rise of generative AI sparks both excitement and concern, prompting debates about its impact on work, knowledge creation, and human interaction. It is transforming decision-making and reshaping worker roles, with AI automating both routine and complex tasks. However, this could lead to job displacement, skills mismatches, and growing inequalities if only highly skilled workers benefit and the economic benefit is not fairly distributed. While productivity may increase, it may also bring greater pressure, reduced autonomy, and risks to worker well-being, especially in sectors facing labor shortages and an aging workforce. These issues are immense and require innovation and appropriate governance to balance AI's potential with societal values and ensure a responsible digital transformation.

But what about urban water management? Beyond the productivity gains and general hype, can generative AI contribute meaningfully to pressing challenges such as sustainability, climate resilience, infrastructure ageing and risk management? This article explores briefly how and where generative AI can add value to urban water management, focusing on three main innovation paths.

Path 1: unlocking insights from unstructured and multimodal data

Unstructured data – such as text, video, audio, PDFs, and sensor logs – makes up an estimated 80 % of all data globally, yet much of it remains under-utilized in the water sector. Traditional modeling approaches struggle to incorporate these diverse formats, often focusing narrowly on structured data-sets. Even within structured environments, up to 80 % of effort is typically spent on data preparation, limiting the time available for insight generation and decision-making. This presents a major opportunity: LLMs can now provide value by processing and interpreting vast amounts of unstructured information, ranging from maintenance reports (Taormina et al., 2024) and incident logs to internal communications and work orders.

When embedded within agentic systems that are connected to the right tools and databases, these models can automate routine workflows, support frontline staff, and help address the growing shortage of skilled operators in the water sector. By tapping into unstructured operational knowledge utilities could begin to build more intelligent, responsive, and resource-efficient systems without requiring major upfront investments in structured data systems (leapfrog approach).

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Path 2: new modeling interactions and experience

Another major theme is the use of generative AI to provide conversational access to simulation models, including digital twins.

Urban digital twins are virtual replicas of urban systems (water and sewer networks, plants, etc.) used for real-time monitoring, control and scenario testing. Interacting with these complex simulations typically requires expert knowledge or complex interfaces. Generative AI offers a more intuitive medium where city planners or operators can ask the digital twin questions in natural language and get explanatory answers or even have the model run simulations on the fly. The trajectory could be moving toward digital twin assistants that make urban simulations conversational, thereby broadening their use by non-experts and enabling more agile scenario planning.

This evolution has the potential to redefine the interaction between decision-makers and complex systems, enabling decision-makers to interact directly with models through accessible, interactive, dialogue-based interfaces. For example, Pradhan et al. (2025) outline how foundational GenAI models can be layered on top of a city's data infrastructure to enable natural language queries against the digital twin. In their survey, they highlight examples where a conversational system lets users explore data analysis and simulation results simply by asking questions, instead of using specialized software. For instance, a traffic operator might query "simulate rush-hour congestion if an accident blocks Street X" and the GenAI interface would leverage the traffic simulation model to provide an answer or visualization. This approach was tested in domains like traffic management and energy grid control, showing how GenAI can bridge complex analytical engines and end-users.

Generative AI offers new opportunities to combine language-based user input with numeric simulation output (Taiwo et al., 2025). By doing so, they make complex tools like drinking water or sewer network flow simulators (EPANET, SWMM), predictive maintenance, flood or water quality modeling more interactive and accessible (Latifi et al., 2025). This would create a significant shift from static dashboards toward conversational decision support. First examples are still prototypes and scaling them to full city operations will require addressing reliability and ensuring the reliability of AI's responses to truly reflect the underlying physics of simulations. In addition, real-world operationalization is limited: it's easier to chat with a digital twin in a controlled demo than in a noisy control room with high-stakes decisions.

Path 3: generative AI for utilities

Generative AI can transform the way utilities operate by seamlessly automating routine tasks, streamlining workflows, and unlocking new operational efficiencies.

Instead of staff spending hours drafting technical summaries, regulatory compliance documents or incident reports, these responsibilities are effortlessly handled by GenAI, which can turn raw logs or structured records into polished documentation, alleviating much of the administrative workload.

Internally, knowledge within the utility becomes far more accessible. AI-powered systems organize expansive archives and internal knowledge bases, enabling employees to quickly locate vital information, review best practices, and draw lessons from past events, ensuring teams are never left reinventing the wheel. Using retrieval-augmented generation (RAG) , LLMs can pull more precise, authoritative snippets from company records to ground every response in verified content . This increased efficiency extends into the real-time operation of utilities as well. Generative models can analyze historical and live data to make intelligent recommendations for crew assignments, maintenance schedules, and supply chain logistics, making sure manpower and resources are allocated where they will yield the highest value.

Staff experience an entirely new way of interacting with their digital environment. For example, Veolia and Mistral AI recently deployed a conversational co-pilot to modernize the monitoring of drinking water and wastewater treatment plants. The solution should provide easier access to a variety of operational data, real-time recommendations and speed up their response to day-to-day challenges.

Finally, the emergence of smaller, open-weight generative AI models presents a unique opportunity for utilities, especially mid-sized and municipal ones, to fine-tune models on their own data. These models can be deployed on-premises or within local cloud environments, allowing utilities to harness GenAI's power without compromising sensitive operational or customer data. This approach enhances adaptability while addressing legal, ethical, and cybersecurity concerns, particularly in regions with strong data governance frameworks.

Address risks and build a roadmap for responsible AI adoption

While these opportunities are compelling, robust validation pipelines, ethical frameworks, and strong cybersecurity are essential, especially as water utilities underpin public health and safety. Accuracy, transparency, and resilience in AI-driven decisions must be built into every layer, from data acquisition to model deployment and user interaction. The deployment of generative AI in critical infrastructure must be accompanied by a clear framework for risk identification, mitigation, and governance. Key concerns include model reliability, hallucinations, bias in training data, regulatory compliance, and transparency.

A shared roadmap is needed bringing together utilities, regulators, researchers, and technology providers to define best practices, validation protocols, and accountability mechanisms that support safe and trustworthy AI deployment at scale.

1 A large-language model (LLM) is a self-contained transformer-based model that generates the next token from its internal weights and the user's prompt, but it lacks memory, long-term goals, and the ability to call external tools. An agentic system takes that same LLM and surrounds it with resources – persistent memory, planning loops, and API/tool access – usually orchestrated through framework layers (custom code, LangChain, Semantic Kernel, etc.) so the model can act autonomously toward a specified objective. A multi-agentic system links several such agents, each with specialized roles, coordinating via shared state and task delegation; protocols like the Message-Passing Coordination Protocol (MCP) provide the structured messaging needed for these agents and tools to interoperate seamlessly.

2 See for example the initiative https://www.parla.berlin/ to search and query proceedings from the regional assembly in Berlin.

3 Retrieval-Augmented Generation (RAG) enhances language models by incorporating external knowledge retrieval. It first converts a user query into an embedding – a numerical vector representation capturing the semantic meaning of the text – and compares it against a vector database that stores embeddings of document chunks. The most relevant chunks are retrieved and provided as context to the language model, enabling more accurate, context-aware, and up-to-date responses, especially in specialized or dynamic domains.

4 www.h2owaternetwerk.nl/h2o-actueel/stowa-gebruikt-kunstmatige-intelligentie-om-al-haar-kennis-te-ontsluiten

5 www.veolia.com/en/our-media/press-releases/veolia-and-mistral-ai-join-forces-revolutionize-resource-efficiency

Docking

After swimming out towards new horizons, we now return to shore. In the following pages you will find impressions of our "Green Social Day" and get to know our new board member Nina Heine in a short interview. Finally, we invite you to meet our team and find out about our current projects – including our most recent publications.

Awaiting you back on land:

Green Social Day

Our company outing this year focused on the environment, water protection, and community. Around Pichelswerder, we worked together with great motivation to collect litter both on land and in the water. In doing so, we once again made a small contribution to protecting water quality and habitats. Along the way, the park rangers from the Berlin Nature Conservation Foundation provided us with fascinating insights into our local ecosystems and their importance. After the work was done, we were able to wind down the day in the sunshine, enjoying good conversations surrounded by nature and with a direct view of the water.

New impulses

– Interview with Nina Heine, the new member of the KWB Supervisory Board

Nina Heine
Co-Founder & CEO of Shit2Power GmbH

Nina Heine has been a member of the KWB Supervisory Board since 13 June 2025. As co-founder and managing director of Shit2Power GmbH, she brings with her many years of expertise from consulting in the public sector and environmental technology companies. She also has extensive experience in working with start-ups. We spoke to her about her role as a supervisory board member and the goals of her work.

Ms Heine,
you were recently appointed to the Supervisory Board of Kompetenzzentrum Wasser Berlin. What motivated you to take on this role, and which topics would you particularly like to contribute?

I find this role very appealing because to me, Water is not an abstract research topic but a highly political issue that concerns our future. I want to create impulses to show how scientific findings can be put into practice faster – from infrastructure to industries. At the same time, KWB is in a unique position: scientifically excellenct and in close contact with practice and politics. It's precisely that combination of personal motivation and institutional strength that makes this task so exciting to me.

How do you view KWB at the intersection of scientific excellence, practical relevance, and strategic positioning? Where do you see its greatest potential, and where its greatest challenges?

KWB has the opportunity to become a real pace-setter between research, politics and industry. I especially see potential for excellent research to lead not just to studies, but products, business models and perhaps even new companies that will have large-scale impact. The challenge will be to clearly define this strategic position without diluting scientific excellence.

You bring experience from the water and wastewater sector as well as entrepreneurial expertise. In which areas do you see the strongest overlap between your previous experience and KWB's strategic objectives?

I have personally experienced how slow systems can be – and how important entrepreneurial speed is. My experience also shows: Those who research technologies are rarely the ones that market them successfully. That intersection is precisely where I see my added value: combining research, regulation, and implementation in such a way that good ideas become effective solutions.

The water sector is undergoing profound change: cities, municipalities, and utilities are facing new and increasing challenges due to climate change, population growth, and new regulations. What impulses would you like to provide to help KWB continue to develop forward-looking solutions in this context?

We can't just discuss climate change adaptation, we need to implement it in concrete terms. My suggestion: remain radically practice-oriented, have the courage to pilot projects, and increase the speed of implementation. Sustainable water management means that we think about technologies, standards, and business models in parallel.

One of KWB's strengths is its ability to bridge research and practical application. What opportunities do you see to further accelerate this transfer of knowledge — also in regard to cooperating with companies and start-ups?

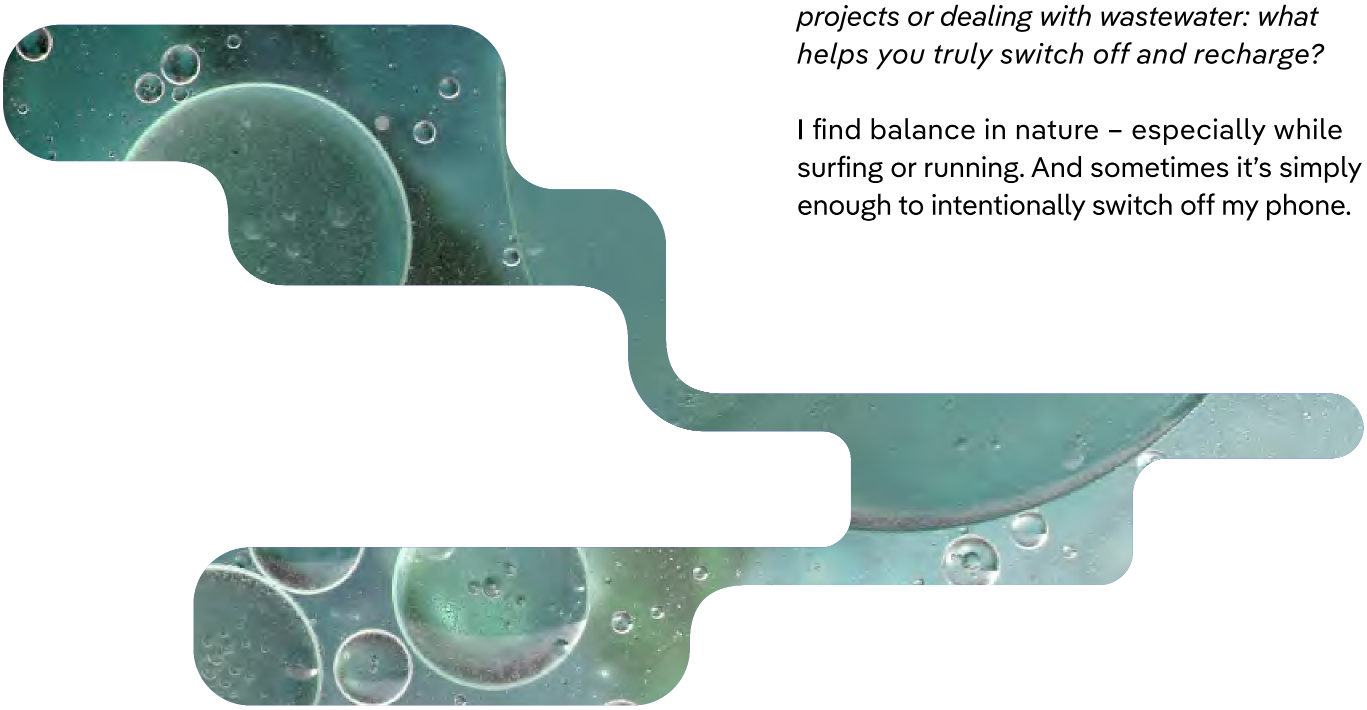
Start-ups are the key here. They bring speed, capital, and entrepreneurial courage to the table. If KWB acts more as a platform – research in, spin-offs out – then we can radically accelerate knowledge transfer. That's how good research turns into real impact.

With Shit2Power, you have built a company that brings technological innovations in water and energy treatment to market. Generally speaking, where do you see points of intersection from which both your company and KWB could benefit, without blurring their respective focuses?

With Shit2Power, we do exactly that: we validate research findings in practice and translate them into scalable solutions. We focus on bringing innovations to market, and KWB on research and networking. This means that our roles are complementary. The potential lies in learning from each other – how to structure the transfer so that both sides win.

And when you are not working on innovative projects or dealing with wastewater: what helps you truly switch off and recharge?

I find balance in nature – especially while surfing or running. And sometimes it's simply enough to intentionally switch off my phone.



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Trainees

KWB is supported by a wealth of up-and-coming talent from a wide range of specialisations. Not only are we proud of being able to provide them with support (such as by assisting them with their numerous final projects), we're also benefiting from their future-oriented ideas.

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Project overview 2025

Title	Subject	Funding sources	Duration	Project management	Department
ABLUFT 3	Evaluation and transfer of the co-treatment of exhaust air in the aeration system	BWB	Dec. 23 - Nov. 25	Ulf Miehe	WT & R, E & R
AD4GD	An Integrated, FAIR Approach for the Common European Data Space	EU Horizon Europe	Sep. 22 - Aug. 25	Malte Zamzow	S & SW
AI:LINER	Data-driven sewer asset management: a path toward the resilient transformation of Europe's sewer infrastructure	EU Horizon Europe	Sep. 25 - Aug. 28	Annika Kramer	SC & I, E & R
AMAREX	Adaptation of stormwater management to extreme events	BMFTR	Feb. 22 - Jan. 25	Andreas Matzinger	S & SW
AQUAMON	Advanced quality monotoring system of water in urban areas	EU Horizon Europe	Jun. 25 - Dec. 28	Hannah Schubach	W & R
BOOST-IN	Boosting the uptake of innovative Solutions in the context of Water and Circular Economy	EU Horizon Europe	Jan. 24 - Dec. 26	Anne Kleyböcker	E & R
City Blues	Bluegreen nature-based solutions for climate change adaptation and citizen wellbeing	EU INTERREG	Nov. 23 - Oct. 26	Paul Schütz	S & SW, SC & I
DASAM	Data-driven sewer asset management in Germany and Israel	BMFTR	Oct. 23 - Sep. 26	Nicolas Caradot	SC & I
Data Governance	Data & Smart City governance using the example of air quality management	Land Berlin	Nov. 22 - Sep. 25	Nicolas Caradot	SC & I
DigiWaVe	Digital solutions for resource-efficient and safe water reuse in urban areas	BMFTR	Sep. 23 - Aug. 26	Jonas Hunsicker	WT & R, E & R, W & R
GeoSalz	Dynamics of saline intrusion for early identification of endangered drinking water wells and quantification of the hydraulic potential	BWB	Aug. 21 - Jan. 25	Christoph Sprenger	GW
GEWINN	Increasing gas yield and reducing emissions in manure digestion	BMLEH	Jan. 25 - Dec. 27	Fabian Kraus	E & R
IMPETUS	Dynamic information management approach for the implementation of climate resilient adaptation packages in European regions	EU H2020	Oct. 21 - Dec. 25	Nasrin Haacke	GW
iOLE	Intelligent online leakage detection	BMFTR	Sep. 23 - Jan. 26	David Steffelbauer, Johannes Koslowski	W & R
IWIQ	Implementation phase real laboratory: Integrated water and heat recovery in the neighborhood	City of Berlin/BWB	Jul. 25 - Jun. 28	Yuki Bartels	E & R, S & SW WA & WV
LASSO 2	Further investigation of nitrous oxide emissions from biological wastewater treatment	BWB	Oct. 23 - Sep. 25	Christian Remy	E & R, WT & R
LASSO 3	Continuous investigation of nitrous oxide emissions from biological wastewater treatment	BWB	Nov. 25 - Apr. 27	Jonas Hunsicker	E & R, WT & R
LIWE	Large-scale implementation of tertiary treatment and phosphate recovery in Lidköping, Sweden	EU LIFE	Jul. 18 - Jun. 27	Fabian Kraus	WT & R, E & R
MaWaSta	Feasibility study on water reuse in Stahnsdorf	BWB	Aug. 24 - Apr. 25	Jan Schütz	WT & R
Power-to-P	Phosphorus recovery and sewage sludge ash utilization through the innovative use of electrodialysis	BMFTR	Jan. 25 - Jun. 27	Fabian Kraus	E & R

Title	Subject	Funding sources	Duration	Project management	Department
ProClean-Lakes	Integrated emerging approaches for joint protection and restoration of natural lakes in the spirit of European life heritage support	EU Horizon Europe	Jun. 24 - May 28	Malte Zamzow	S & SW
PROMISCES	Prevention Recalcitrant Organic Mobile Industrial chemicals for Circular Economy in the Soil-sediment-water systems	EU H2020	Oct. 21 - Mar. 25	Veronika Zhiteneva	WT & R, GW, S & SW
Raindrop	Optimization of rainwater drainage	BML Österreich; Federal states of Steiermark, Salzburg, Kärnten, Niederösterreich; City of Villach; Linz Service GmbH	Mar. 24 - Feb. 26	David Steffelbauer, Daniel Wicke	S & SW
ReCreate	Reliability and effectiveness of integrated alternative water resources management for regional climate change adaption	EU Horizon Europe	Jan. 24 - Dec. 27	Anne Kleyböcker	WT & R, E & R
R-Rhenania	Production of modified phosphate from sewage sludge ash for Bavaria	BMFTR	Jul. 20 - Jun. 26	Fabian Kraus	E & R
SafeCREW	Climate-resilient management for safe disinfected and non-disinfected water supply systems	EU Horizon Europe	Nov. 22 - Apr. 26	Christoph Sprenger	GW
Smart Water	Agile planning of stormwater management with a focus on urban green and blue	City of Berlin	Nov. 22 - Sep. 26	Lisa Junghans	SC & I, S & SW
SWEET HEAT	Modeling solutions in water management – opportunities and possibilities for utility companies	BWB	Feb. 25 - Dec. 25	Johannes Koslowski	E & R, SC & I
Local water balance planning 2.0	Model-based decisions for Berlin	City of Berlin	Sep. 25 - Dec. 25	Lisa Junghans	SC & I, S & SW
Wasser-resilienz	Innovative management and operational concepts for sustainable and resilient water infrastructure systems	BMFTR	Mar. 25 - Feb 28	Christian Remy	E & R
WaterMan	Promoting water reuse in the Baltic Sea Region through capacity building at local level	EU INTERREG	Jan. 23 - Dec. 25	Elisa Rose, Pia Schumann	E & R, WT & R
WELL-KI	AI well aging	BWB	Oct. 25 - Oct. 27	Michael Rustler	GW
Zukunft	The future of water in Berlin-Brandenburg	BWB	Apr. 24 - Aug. 24	Ulf Miehe	WT & R

Abbreviations of funding sources:

BMFTR	Federal Ministry of Research, Technology and Space
BMLEH	Federal Ministry of Agriculture, Food and Regional Identity
BWB	Sponsoring Berliner Wasserbetriebe
BML Österreich	Federal Ministry Republic of Austria Agriculture, Forestry, Regions and Water Management
EU H2020	EU Horizon 2020

Abbreviations of departments:

E & R – Energy & Resources
GW – Groundwater
S & SW – Stormwater & Surface Water
SC & I – Smart City & Infrastructure
WT & R – Water Treatment & Reuse
W & R – Water & Risk

Publications

Project reports:

Gernjak, W. …, Kleyböcker, A., et al. (2025). D1.1 Future water supply availability and demand based on different RCP scenarios: 84.

Groot, H., …, Zhiteneva, V., et al. (2025). Deliverable D2.3 - Toolbox fate & transport modelling of PMTs in the environment: 46.

Hartmann, J., …, Zhiteneva, V., et al. (2025). Deliverable D5.8 - Modular recommendations for evaluation and implementation of relevant EU directives, strategies and action plans: 54.

Jurewicz, A., Schubach, H., et al. (2025). PROMISCES Layman's report: 15.

Mahmoud, A. …, Sprenger, C., et al. (2025). Safe drinking water production in view of global threats including climate change. Technological solutions and gaps: 35.

Naus, F., …, Zhiteneva, V., et al. (2025). Deliverable D5.6 - Guidance on transdisciplinary co-creation of solution strategies to reach a non-toxic environment and safe reuse of resources: 130.

Remy, C. (2025). D3.4: Experiences and lessons learned from End-of-Waste criteria of circular products: 25.

Seis, W., et al. (2024). Validierungsleitfaden für die uneingeschränkte Bewässerung: 61.

Sprenger, C., et al. (2025). D2.1 Monitoring zur Charakterisierung der räumlichen und zeitlichen Dynamik der Grundwasserversalzung im Umfeld der K-Galerie des WW Friedrichshagen - Hydrochemie, Isotopen, Geophysik.

Sprenger, C., et al. (2025). D4.1 Bewertung betrieblicher Einflussgrößen und Handlungsempfehlungen für den Brunnenbetrieb - Zusammenfassung der Ergebnisse aus den GeoSalz Projekt.

Thisgaard, P., Kleyböcker, A. (2025). D5.2: First updated roadmap for the implementation and monitoring of actions at the case studies, Chapter 2.2 CS#2 Kalundborg, Denmark: 18–23.

Wintgens, T. …, Miehe, U., Stapf, M., Rustler, M., Sprenger, C., Seis, W., Remy, C., et al. (2025). Flexible und zuverlässige Konzepte für eine nachhaltige Wasserwieder-verwendung in der Landwirtschaft. Abschlussbericht zum BMBF Vorhaben 02WV1561A-L, Projektlaufzeit 06/2021 – 10/2024: 345.

Zessner, M., …, Knoche, F., et al. (2025). Deliverable D2.4 - Guidance document on fate, transport and exposure for PMT's in the environment: 220.

Zhiteneva, V., Zamzow, M., Daurat, A., et al. (2025). Deliverable D2.5 – Open source model for probabilistic human health risk assessment: 118.

Conference papers:

Campbell, E., et al. (2025). The Dual Model: A Robust Tool for Leakage Detection in Water Supply Networks. CCWI 2025. Sheffield, University of Sheffield.

Del Punta, F., et al. (2025). Application of a predictive machine-learning model to forecast sewer's pipes condition. A case study in Lausanne, Switzerland. Urban Drainage Modelling Conference - UDM. Innsbruck.

Del Punta, F., et al. (2025). Simulation der Effekte von blau-grünen Infrastrukturen auf den urbanen Wasserhaushalt: Ein einfaches Berechnungsmodell zur Bewertung von Regenwasserbewirtschaftungs-strategien auf gesamtstädtischer Ebene. Aqua Urbanica. Rapperswil.

Guericke, L., et al. (2025). Modelling Pipe Deterioration or Defect Evolution? 6th International Conference on Water Economics, Statistics and Finance and 10th Leading Edge Conference for Strategic Asset Management (LESAM). Pafos, Cyprus.

Guericke, L., et al. (2025). Defect Evolution in Sewer Pipes: Enhancing Deterioration Models. Urban Drainage Modelling Conference - UDM. Innsbruck.

Guericke, L., et al. (2025). Advancing Sewer Asset Management with Data-Driven Solutions. 6th International Conference on Water Economics, Statistics and Finance and 10th Leading Edge Conference for Strategic Asset Management (LESAM). Pafos, Cyprus.

Guericke, L., Del Punta, F., Daurat, A., Sonnenberg, H., …, Caradot, N. (2025). Advancing Sewer Asset Management with Data-Driven Solutions. Informatik Festival. Potsdam.

Jährig, J., et al. (2025). Collecting water data from small Berlin lakes with the help of citizen science. CS4Water Conference. Delft, Netherlands.

Kleyböcker, A., et al. (2025). Full-scale nutrient recovery in Germany: challenges and barriers to replication and how to overcome them. IWA Resource Recovery Conference. Leeuwarden, The Netherlands.

Knoche, F., et al. (2025). Agile Planung blaugrüner Infrastruktur für eine klimaresiliente Stadt. Aqua Urbanica 2025. Rapperswil.

Koslowski, J., et al. (2025). SWEET HEAT Modelling Wastewater Temperatures for Efficient Wastewater Heat Recovery. CCWI 2025. Sheffield, University of Sheffield.

Kraus, F. (2025). Nachhaltige Phosphorrückgewinnung? – Treibhausgasbilanz und Kostenschätzung. 58. Essener Tagung, Aachen.

Remy, C., et al. (2025). Ist Messen gleich Messen? Vergleich von Langzeitmessungen für Lachgas in Flüssig- und Gasphase. 58. Essener Tagung. Aachen, Institut für Siedlungswasserwirtschaft der RWTH Aachen. 259.

Seis, W., et al. (2025). Entwicklung eines datengetriebenen Modells zur Überwachung und Optimierung der Aufbereitungskette zur Wasserwiederverwendung. 16. Aachener Tagung Wassertechnologie. Aachen.

Sprenger, C., et al. (2025). Isotopic and Hydrochemical Analysis of Groundwater Salinization in Berlin: Implications for the management of salinity prone well fields. European Geosciences Union 2025, Vienna.

Wicke, D., Knoche, F., Matzinger, A., Miehe, U., et al. (2025). PFAS in urbanem Regenwasserabfluss eines industriellen Einzugsgebietes und einem urbanen See. Aqua Urbanica. Rapperswil.

Zamzow, M., et al. (2024). Satellite data for monitoring and management support of small lake water quality. ICUD - International Conference on Urban Drainage, Delft.

Zamzow, M., et al. (2024). Risk-based human exposure assessment of chemicals in the circular economy. The 19th IWA Leading Edge Conference on Water and Wastewater Technologies, Essen, Germany.

Articles in scientific journals:

Auer, A., et al. (2023). Öffentlichkeitsbeteiligung in der datengetriebenen Verwaltung. Ein prozessbezogener Ansatz zur Lösung datenbezogener Interessenkonflikte durch die Ergänzung formeller Beteiligung. HIIG Discussion Paper Series 2023(5): 35. (Nachtrag – bisher noch nicht in KWB-Jahresberichten gelistet)

DWA (2025). Treibhausgasbilanzierung in der Wasserwirtschaft auf Unternehmensebene. Arbeitsbericht des DWA-Fachausschusses KA-2 Klimaschutz und Treibhausgas, Korrespondenz Abwasser, Abfall 72(6): 427–432.

Freier, L. ..., Stapf, M., et al. (2025). Bacterial community dynamics during reclaimed water storage. Water Reuse 15(3): 528–545.

Hasselder, P. ..., Stapf, M., Miehe, U., et al. (2025). Complexity and challenges in agricultural water reuse monitoring from a German perspective. Water Reuse 15(3): 439–457.

Jährig, J., et al. (2025). Wasserwiedergewinnung für die Industrie. F&S Filtrieren und Separieren 05: 40-48.

Jährig, J., et al. (2025). Wasserwiederverwendung für die Industrie. gwf Wasser Abwasser 05: 74–83.

Jährig, J., et al. (2025). Innovative pre-treatments for reverse osmosis to reclaim water from biotech and municipal wastewater for the industrial symbiosis in Kalundborg. Water Science and Technology 06: 698-713.

Kleyböcker, A., et al. (2024). How collaboration between industry and water sectors is driving effective water management solutions. AWE International 86: 30–37.

Knoche, F., et al. (2025). Digitale Planung blau-grüner Infrastruktur - Der BGI-Planer: Ein agiles Tool für eine klimaresiliente Stadtentwicklung. Aqua & Gas 10 / 2025: 32–37.

Rose, E., Schumann, P. (2024). Wasserwiederverwendung in der Hauptstadtregion als Strategie. wwt Modernisierungsreport 2024/2025: 48–51.

Schumann, P., Rose, E. (2024). Regenwasser als alternative Wasserressource im Ostseeraum. wwt 11-12/2024: 12–15.

Seis, W., Stapf, M., Miehe, U., et al. (2025). Comparison of statistical evaluation approaches for log-removal validation according to European water reuse regulations. Science of the Total Environment 964

van der Werf, J. A. ..., Guericke, L., et al. (2025). Flooded with potential: urban drainage science as seen by early-career researchers. Water Science and Technology 91(7): 861–875.

Theses:

Jacob, J. (2024). Erstellung einer unternehmensbezogenen Treibhausgasbilanz zur Ermittlung relevanter Emissionen. Pharma- und Chemietechnik. Berlin, Berlin University of Applied Sciences and Technology. Bachelor.

Krüger, C. (2025). Entwicklung einer ökobilanzbasierten Methodik zur Bewertung des Treibhauspotenzials von Sanierungsverfahren im Kanalnetz. Fachgebiet Sustainable Engineering, Technische Universität Berlin. Master.

Datasets:

Knoche, F., Matzinger, A., Wicke, D. (2025). KWB-R/kwb.promisces-emission-model: kwb.promisces-emission-model (v0.1.0): Emission model to calculate the monthly load of pollutants entering various water bodies and watercourses via stormwater and wastewater.

Sonnenberg, H., et al. (2024). kwb.1dbear (0.1.0): R package for generic calculation of attenuation of PMT & other substances during riverbank filtration. P. project.

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References

p. 4-5: Executive Summary
Wasseratlas: www.bund.net/wasseratlas

p. 42-47: Digital tools for climate-adapted cities
Reinhart, L. (2024). Blau-grüne Infrastruktur: Eine Analyse dezentraler Rückhaltepotenziale für Regenwasser anhand von Überflutungssimulationen. Bachelorarbeit, Hochschule für Forstwirtschaft Rottenburg, 2024.

Rachimow, C. und Rachimow, M. (2009). ABIMO3.2 – Abflussbildungsmodell. Algorithmus zum BAGROV-GLUGLA-Verfahren für die Berechnung langjähriger Mittelwerte des Wasserhaushalts (Version 3.2), Beschreibung des Verfahrens zur Behandlung grundstücksbezogener Daten.

p. 52-55. Beyond the hype: the potential of generative AI in urban water management
Ellingrud, K., Sanghvi, S., Dandona, G. S., Madgavkar, A., Chui, M., White, O., & Hasebe, P. (2023, July 26). *Generative AI and the future of work in America. McKinsey & Company.* https://www.mckinsey.com/mgi/our-research/generative-ai-and-the-future-of-work-in-america

Latifi M, Beig Zali R, Savić D., 2025, GenAI Models for Urban Water Systems: Opportunities, Challenges, and Future Directions. *Cambridge Prisms: Water.* Published online 2025:1-20. doi:10.1017/wat.2025.10008

Pradhan, D., Arora, L., Girija, S. S., Shetgaonkar, A., Kapoor, S., & Raj, A. (2025). *Opportunities and Applications of GenAI in Smart Cities: A User-Centric Survey*. arXiv preprint arXiv:2505.08034.

Taiwo, R., Yussif, A.-M., & Zayed, T. (2025). Making waves: Generative artificial intelligence in water distribution networks – opportunities and challenges. *Water Research X*, 28, 100316.

Taormina, R., & van der Werf, J. A. (2024). Interpretable Sewer Defect Detection with Large Multimodal Models. Engineering Proceedings, 69(1), 158.

WEF, 2025, Jobs of Tomorrow: Large Language Models and Jobs, White paper

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p. 50. Seis, W., Zacharias, N., Aumeier, B., Freier, L., Stapf, M., Miehe, U., & Wintgens, T. (2024). Validierungsleitfaden für die uneingeschränkte Bewässerung. Zenodo. https://doi.org/10.5281/zenodo.13756832
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