KOMPETENZZENTRUM
WasserBerlin

Annual Report 2016

Greetings

Energy, climate and resources are the future key issues and also the major challenges for the management of cities. Urban infrastructure systems relating to water and wastewater, energy supply, waste management and transport need to synergise. Against this background, Berlin has decided to prioritise smart city initiatives and is therefore well on its way.

Kompetenzzentrum Wasser Berlin (KWB) realised the necessity of networking towards urban management years ago and initiated numerous research projects focusing on solution-oriented approaches and practical application. The POWERSTEP project which is managed by KWB is a good example in this line: Large-scale industrial tests performed throughout Europe demonstrate that sewage treatment plants are a significant component for the generation of renewable energy in the future.

Within the joint project KURAS terminated last year, KWB was responsible for the scientific management and thus contributed to the advancement of Berlin's rainwater management. The methods and proposals developed illustrate how the smart combination and integration of suitable measures facilitate rainwater harvesting on-site in urban quarters. In addition, the formation of summer urban heat islands can be avoided and the water quality can be improved. In its coalition agreement, Berlin's government has approved the implementation of the KURAS project results

The successful cross-sector collaboration between science and industry is an important factor for Berlin's innovation-friendly atmosphere. Networking generates new projects, and projects lead to new partnerships. Berlin's dynamism is indispensable for working on innovative solutions for the challenges of a smart city in the 21st century.

Since its foundation in 2001, KWB has established an international network of research and cooperation partners from academia and industry. These include Berlin's university and non-university research institutions, top-performing companies of the medium-sized water industry, the Berliner Wasserbetriebe as Germany's largest communal water service provider, and the urban administration.

KWB and its strong network of regional water expertise will continue to promote science and technology projects and will remain true to its mission: contribute to improving the quality of life and to creating sophisticated solutions towards a sustainable, ecological and economical water infrastructure in our city.

I wish Kompetenzzentrum Wasser Berlin
every success!

Ramona Pop, Senator for Economics,
Energy and Public Enterprises
(Berlin State Government)

Contents

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Phone: +49–30–536 53 800
www.kompetenz-wasser.berlin
Managing Director: Edith Roßbach
Editing: Dr. Bodo Weigert, *bodo.weigert@kompetenz-wasser.de*
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Foreword

Our recent Annual Report provides an overview on the broad range of our research projects and events we performed in 2016 which was in fact a year full of work, but marks also the beginning of a new chapter in our history.

After the remunicipalisation of Berlin's water utility Berliner Wasserbetriebe, Veolia - our long-standing principal shareholder - left KWB. Over the past 15 years, Veolia had supported and accompanied KWB on its way to a research institution with internationally recognised expertise. I would like to express my sincere thanks and appreciation for this significant contribution to KWB's success.

Since autumn 2016, we have been working within a new shareholder structure. Berliner Wasserbetriebe/Berlinwasser Holding and Technologiestiftung Berlin have demonstrated their strong commitment to KWB's future by taking over the shares of Veolia. In 2017, the State of Berlin will support KWB with an institutional partial financing.

So our work has been worthwhile, and we are proud to be recognised for our expertise which we have been building up for many years in numerous national and international research projects relating to the different issues of an ecologically responsible water management. It is our major concern to enhance our skills and to contribute to the development of integrated solutions to the urban infrastructure challenges of a smart city, focusing on digitisation, energy, resources and climate. Our Annual Report covers a number of projects, which underline that KWB has set to work on the according issues already – just to mention POWERSTEP, KURAS and T-MON.

I am most grateful to all our partners from academy, industry and the municipalities, to our shareholders, and in particular, to our employees, for their great commitment, which has made 2016 a successful year for KWB.

Edith Roßbach
CEO Kompetenzzentrum Wasser Berlin

The Kompetenzzentrum Wasser Berlin

Kompetenzzentrum Wasser Berlin (KWB) is a non-profit water research centre based in Berlin, founded in 2001. Our shareholders are Berliner Wasserbetriebe and Technologiestiftung Berlin.

According to our mission statement, our major concern is to advance scientific knowledge and to push research & development activities in the water sector. To this end, we design research projects relating to all issues of the water cycle and carry them out together with our partners from academia, business enterprises and public authorities. The results contribute to keeping cities liveable also in the future. Our network activities link water professionals on the national and international level. Our PR communicates up-to-date information and research trends regarding all kinds of water topics to the interested public.

Our management system is certified according to DIN EN ISO 9001:2008.

Shareholders

berlinwasser

Berliner Wasserbetriebe

TECHNOLOGIE STIFTUNG BERLIN

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The Year in Numbers

28 28 Employees

83.000 Turnover and funds per staff member in euro

30 30 Interns and student assistants

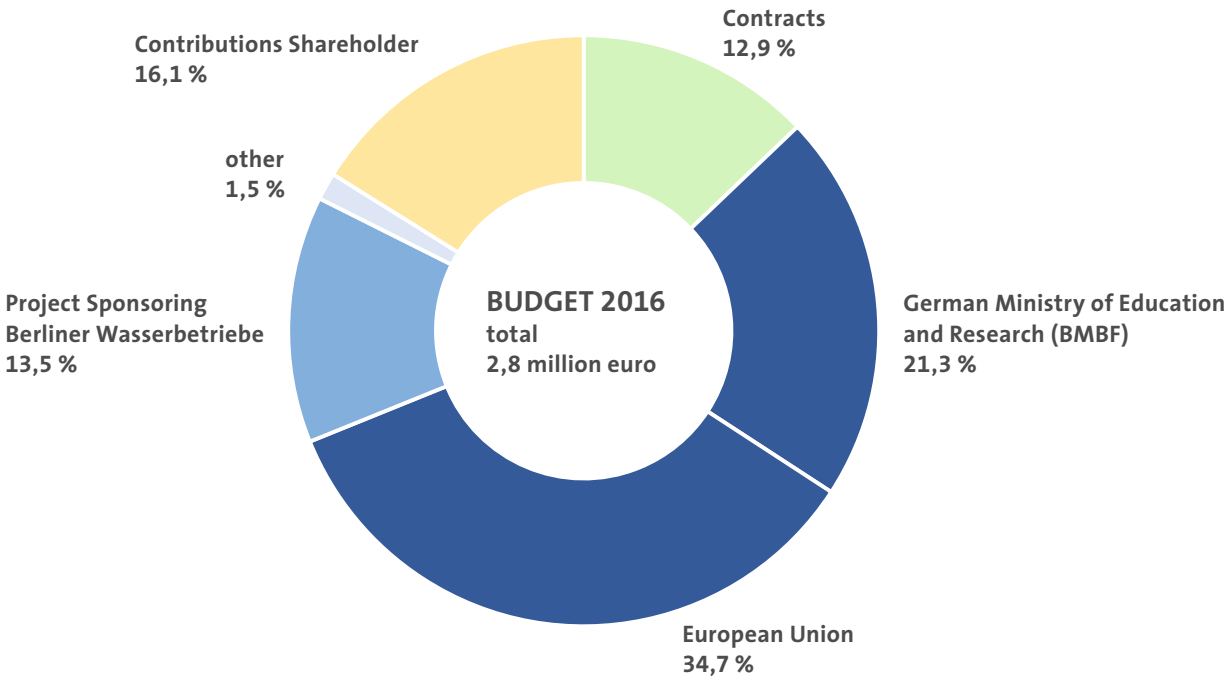
22 Projects with an overall volume of 6,4 million euro

17 Participation in 17 scientific committees and professional associations

7 Technical conferences with 1,000 attendants

600 Berlin Long Night of the Sciences with 600 visitors

32 32 Contributions to technical journals and conferences



Department
Water and Wastewater Technology

- Improving the purification performance of waste water treatment plants and the reuse of treated wastewater
- Energy and nutrient recovery during water treatment processes
- Optimisation of sewage sludge treatment
- Life Cycle Assessments

Head of department: Dr. Ulf Miehe
ulf.miehe@kompetenz-wasser.de




Wastewater treatment Wastewater reuse Nutrient recovery
Activated carbon filtration Energy production Sewage sludge
Wastewater treatment plant Life Cycle Assessment
Ozonation Trace organic contaminants
Tertiary treatment Process engineering

Combination of natural and engineered processes for water and wastewater treatment systems

AquaNES –
Demonstrating synergies in combined natural and engineered processes for water treatment systems

http://www.aquanes-h2020.eu

Contact
Dr. Daniel Wicke (KWB),
daniel.wicke@kompetenz.wasser.de;
Dr. Ulf Miehe (KWB),
ulf.miehe@kompetenz-wasser.de

Duration	06/2016 – 05/2019
Project Volume	10.7 million euro; KWB: 551,000 euro
Financing	EU Horizon2020

Partners
Kompetenzzentrum Wasser Berlin in a consortium of 30 partners from Europe, Israel and India, coordinated by the University of Applied Sciences and Arts Northwestern Switzerland

Project Goals
Technical demonstration of combined natural and engineered processes for water and wastewater treatment; development of a robust risk assessment framework and a design and implementation guidance for cNES; Identification of new market opportunities in Europe and overseas for cNES

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 689450

Processes for water and wastewater treatment systems can be substantially improved through the systematic combination of engineered and natural components.

The AquaNES project operates 13 pilot plants in Europe, Israel and India to demonstrate the benefits of these combinations on a technical scale. Two demonstration sites are located in Berlin.

The two demonstration sites in Berlin include the combination of ozonation processes and a natural post-treatment for the elimination of trace organic compounds in wastewater effluent as well as the combination of bank filtration and nanofiltration for the removal of sulphate and trace organic compounds during drinking water extraction.

The international project consortium involves 30 partners. In Berlin, Berliner Wasserbetriebe, AKUT Umweltschutz Ingenieure and KWB participate in the project. Besides these activities, KWB coordinates a work package related to constructed wetlands and soil filters with test sites in Germany, the UK and Greece. In 2016, the according demonstration plants were installed and will be commissioned by March 2017.

"...through the combined use of natural treatment systems trace organic contaminants and antimicrobial resistance could be reduced..."

Dr. Daniel Wicke, Project Manager

Discharge of treated wastewater to support the landscape water balance

Water reuse in Europe

The ability of Europe's water suppliers to respond to increasing water stress by taking advantage of water reuse opportunities is restricted by low public confidence in solutions, inconsistent approaches to evaluating costs and benefits of reuse schemes, and poor coordination of the professionals in this field.

In DEMOWARE, altogether nine case study sites all over Europe and Israel were investigated with regard to innovative water reuse schemes to tackle legislative and technological barriers at the EU level.

Together with Stadtentwässerung Braunschweig KWB demonstrated low-cost fit-for-purpose disinfection alternatives and performed risk assessment and life cycle analyses. In cooperation with Veolia Water Solutions Iberica (VWSI) KWB designed and fully implemented a soil aquifer treatment scheme for indirect potable reuse in El Port de la Selva (Northern Spain). To this end, regular field campaigns were realised with local partners to analyse the site-specific requirements for the implementation of water reuse schemes. Data concerning the local hydrochemistry and the fate of hygienically relevant microorganisms and anthropogenic trace compounds were recorded. Quantification methods in the scope of a microbial risk assessment were carried out.

The focus of the 2016 activities was on quantitative microbial and chemical risk assessment as well as on the upgrade of the WWTP effluent quality by activated carbon filtration. All results were published in several reports and presented on the DEMOWARE Final Meeting in Southern France last November.

"...our tools providing a new statistical approach in terms of quantitative microbial and chemical risk analysis have received great interest..." Dr. Ulf Miehe, Project Manager

DEMOWARE – Innovation Demonstration for a Competitive and Innovative European Water Reuse Sector – Demonstration of promising technologies to address emerging pollutants in water and wastewater

www.demoware.eu

Contact
Dr. Ulf Miehe (KWB),
ulf.miehe@kompetenz-wasser.de

Duration	01/2014 – 06/2017
Project Volume	10.5 million euro, KWB: 840,000 euro
Financing	7th European Research Framework, Veolia, Abwasserverband Braunschweig, Stadtentwässerung Braunschweig GmbH

Partners
Kompetenzzentrum Wasser Berlin in a consortium of 28 partners from Europe and Israel, coordinated by Fundació CTM Centre Tecnològic, Spain

Project Goals
Risk and life cycle assessment of water reuse schemes, Implementation of indirect potable reuse (El Port de la Selva, Catalonia), Options for partial wastewater disinfection without chlorination.

WWTP in Port de la Selva (Catalonia)

Comparative Life Cycle Assessment of fertiliser production based on P-Recovery from wastewater path and phosphate rock

PHORWÄRTS –
LCA study to compare fertiliser production from rock phosphate with P-recovery from the wastewater stream

Contact
Fabian Kraus (KWB)
fabian.kraus@kompetenz-wasser.de

Duration	9/2016 – 02/2018
Project Volume	138,000 euro
Financing	German Federal Environment Agency (UBA) UFOPLAN FKZ 3716 31 330 0
Partners	Proman Management GmbH (subcontract)

Project Goals
Creation of a new data basis for different options of fertiliser production, comparison of fossil and renewable raw materials by LCA; practical assessment of fertiliser production in ecological and economic terms.

Umwelt Bundesamt

Phosphorus is essential for life and an indispensable component of many fertilisers. The European and national legislation calls for the recovery of phosphorus form the wastewater stream in the medium term. Due to the lack of reliable data it has remained unanswered so far to what extent P-recovery can be considered appropriate in ecological and economic terms.

By means of the LCA methodology, the PHORWÄRTS project compares conventional fertiliser production from rock phosphate with selected methods of phosphorus recovery from the wastewater path. Since the informative value of the parameter toxicity is rather limited in conventional LCAs, the project PHORWÄRTS additionally provides a comparative contaminant risk assessment for the fertiliser application for different fertilisers. In this context, the contamination with heavy metals and organic pollutants is spotlighted. This comparison will be completed by a cost estimate of the various production methods.

The project was started in September 2016 and is financed by the Federal Environment Agency (UBA) in the scope of the Environmental Research Plan issued by the German Federal Ministry for the Environment. Up to now, data from LCA-datasets have been investigated regarding internal consistence and plausibility. A relevant number of errors and inaccuracies had been identified so far.

"Phosphorus recovery from wastewater – The HOW is important."

Fabian Kraus, Project Manager

Assortment of phosphorus recyclates

Fertilisers from biobased waste

Fertilisers play an important role as nutrient suppliers. Their production strongly depends on phosphorus from fossil sources, a fact which makes fertiliser production vulnerable to agricultural supply and pricing policies and in addition, influences food security.

The main objective of the NewFert project which was started in 2015, is to build up a breakthrough in fertiliser production and to decrease raw material dependency in Europe and to prevent resource depletion.

The project focuses on the development of viable and cost-effective nutrient recycling schemes to be used for the production of a new generation of fertilisers. Further benefits include substantial energy savings in fertiliser production processes. The work organisation has been designed to link and pursue a successful industrial integration supported by a solid life-cycle cost analysis.

The NewFert consortium is led by the Spanish fertiliser company FERTIBERIA and brings together six business and research partners from Spain, France, Germany and Austria. KWB is responsible for evaluating the whole process chain ranging from recovery to the recycling as commercial fertiliser product.

In 2016 a shortlist was compiled featuring the most suitable and best available nutrient recyclates. Further tests with regard to process adaptation and development are being carried out.

"The direct cooperation with one of the biggest Spanish fertiliser company ensures the project's practical relevance."

Dr. Christian Kabbe, Project Manager

NewFert –
Nutrient recovery from biobased waste for fertiliser production

http://Newfert.org

Contact
Dr. Christian Kabbe (KWB),
christian.kabbe@kompetenz-wasser.de

Duration	07/2015 – 12/2018
Project Volume	Total volume: 2.41 million euro, funding EU: 1.2 million euro; Volume KWB: 250,000 euro
Financing	EU Horizon2020-BBI

Partners
Fertiberia SA (coordination), Kompetenzzentrum Wasser Berlin, Universidad de Leon, Drage & Mate International SL, Institut national de recherche en sciences et technologies pour l'environnement et l'agriculture (IRSTEA), Proman Management GmbH

Project Goals
Development of new value chains based on nutrient recovery bio-processes from waste streams and residues for manufacturing a new generation of bio-based fertilisers.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 668128

Microplastic particle removal from the water cycle

OEMP –
Optimised materials and methods for microplastic particle removal from the water cycle

Contact
Dr. Ulf Miehe,
Kompetenzzentrum Wasser Berlin
ulf.miehe@kompetenz-wasser.de
Daniel Venghaus, TU Berlin
daniel.venghaus@tu-berlin.de

Duration	4/2016 – 3/2018
Project Volume	1.442,110 euro, KWB: 70,000 euro
Financing	German Federal Ministry of Education and Research (BMBF), KWB with co-financing by Berliner Wasserbetriebe

Partners
GKD – Gebr. Kufferath AG, Technische Universität Berlin (coordination), Bundesanstalt für Materialprüfung (BAM), German Federal Environment Agency (UBA), INVENT Umwelt- und Verfahrenstechnik AG, Kompetenzzentrum Wasser Berlin

Project Goals
Evaluation of micro plastic content from different urban water streams and the validation of technical options to reduce the micro plastic content.

Bundesministerium für Bildung und Forschung

Berliner Wasserbetriebe

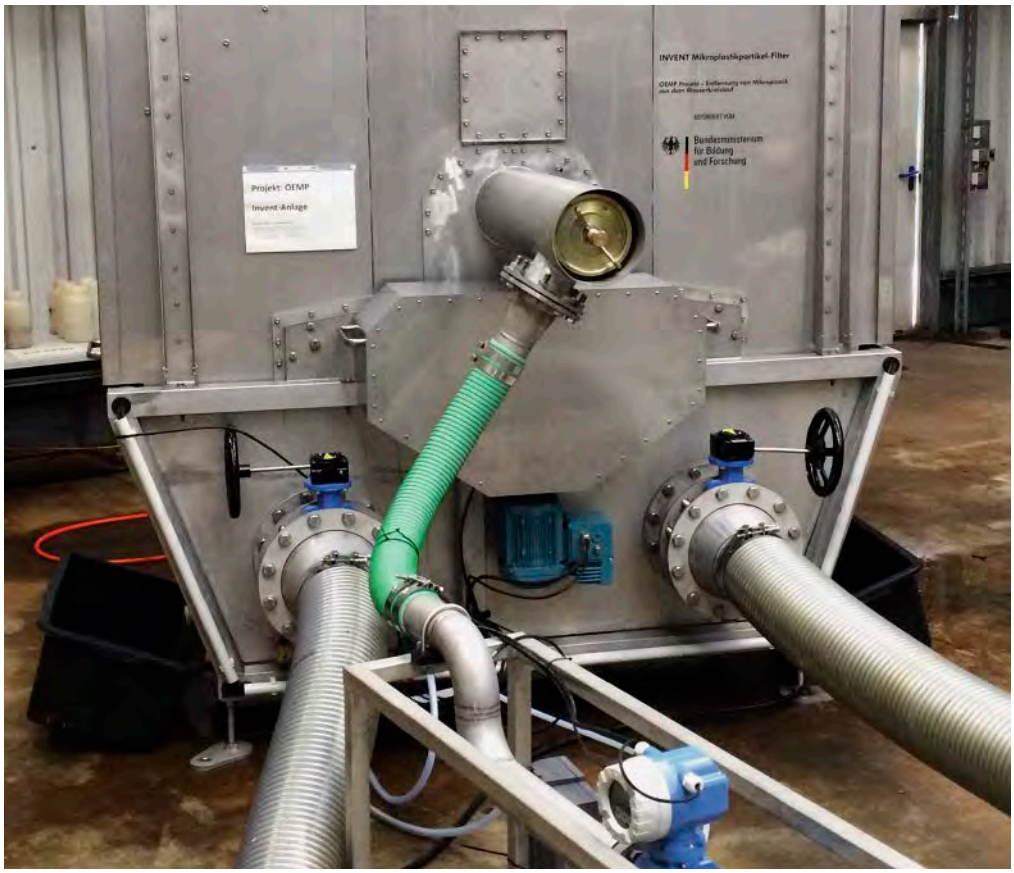
The increasing use of plastic components in all areas of life entails the undesired immission of these substances into the aquatic environment. Small plastic particles (microplastic) discharged from domestic wastewater and urban areas can get into the water cycle.

The OEMP project is dedicated to developing materials and methods which will help to retain the entry of microplastic particles (MP) emerging from diverse pathways of the urban water cycle. In addition, simple and natural systems such as soil filters are to be analysed with regard to their retention efficiency.

In late 2016, two pilot plants for the reduction of microplastic from secondary effluent were installed at the WWTP Berlin-Ruhleben. First sampling campaigns took place for the pile cloth media filtration unit. KWB focusses on the operation and samplings at the pilot plant with particular interest on particles with a size below 100 µm by using a particle counter. In addition, KWB is responsible for analysing the microplastic concentrations in different Berlin wastewater pathways.

"Plastics must be kept away from the water cycle."
Dr. Ulf Miehe, Project Manager

Pile cloth media filtration pilot unit at WWTP Ruhleben, Berlin



The power of wastewater

The organic components of municipal wastewater contain a high potential of chemical energy which remains to a large extent untapped in conventional wastewater treatment processes. In the European context, this corresponds to 87,500 GWh per year which is equivalent to the output of 12 large-scale power stations. At the same time, the energy consumption of contemporary WWTPs corresponds to the output of more than 2 large-scale power stations.

In fact, recent studies have revealed that with novel process schemes using existing technologies, sewage treatment plants could actually become a new source of renewable energy, without compromising the treatment performance. The project POWERSTEP aims at demonstrating such innovative concepts with currently available technologies. In 6 full-scale case studies located at 5 European WWTP sites various processes are being investigated. The work packages performed at WWTP Westewitz (D) and Sjölunda (SE) focus on the extraction of carbon and nitrogen from waste water. The research partner Avedore (DK) is investigating the implementation of "power-to-gas technology" through smart connection to the power grid. The case study carried out in Brunswick (D) deals with energy production from waste heat in CHP units and heat storage. The investigations of the sewage treatment plants of Kirchbichl (A) and Altenrhein (CHE) concentrate on advanced process water treatment in sewage works using membrane technology.

The results of the individual case studies will merge into integrative activities such as treatment scheme modelling and design of new treatment systems, energy and heat management and carbon footprinting.

The project is managed by KWB and involves several partners from different European countries. In 2016, the pilot plants were designed, realised and commissioned. First reliable results are expected in 2017.

POWERSTEP –
Full scale demonstration of energy positive sewage treatment plant concepts towards market penetration

http://www.powerstep.eu/

Contact
Dr. Christian Loderer (KWB)
christian.loderer@kompetenz-wasser.de
Dr. Ulf Miehe (KWB)
ulf.miehe@kompetenz-wasser.de

Duration	07/2015 – 06/2018
Project Volume	5.2 million euro, part KWB: 850,000 euro
Financing	EU Horizon 2020

Partners
Kompetenzzentrum Wasser Berlin (coordination) in a consortium with 15 partners from Germany, Netherlands, Belgium, Switzerland, Austria, Denmark and Sweden

Project Goals
Enhanced carbon extraction from waste water, innovative nitrogen removal processes, power-to-gas with smart grid approach, heat-to-power concepts and innovative process water treatment

"POWERSTEP is a lighthouse project in the field of wastewater. Newest processes and concepts will be shown under real technical large scale conditions." Dr. Christian Loderer, Project Manager

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 641661

POWERSTEP pilot plant at WWTP Westewitz
Abwasserzweckverband Döbeln-Jahnatal

Material recovery from wastewater

SMART-Plant –
Scale-up of low-carbon footprint material recovery techniques in existing wastewater treatment plants

http://smart-plant.eu

Contact
Dr. Christian Remy (KWB)
christian.remy@kompetenz-wasser.de

Duration	6/2016 – 05/2020
Project Volume	9.7 million euro; KWB: 291,000 euro
Financing	EU Horizon2020

Partners
Kompetenzzentrum Wasser Berlin in a consortium of 25 partners from Europe and Israel, coordinated by the University of Verona (IT)

Project Goals
Demonstration of material recovery in municipal wastewater treatment plants at industrial scale

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement no. 690323

Domestic wastewater contains many valuable raw materials which have not been tapped so far. Their systematic recovery would be of advantage in ecological and economic terms.

The SMART-Plant project aims to make increased use of domestic wastewater as a material source and to test the corresponding processes on a technical scale. The project focuses on the recovery of biopolymers, cellulose, plant nutrients, fertilisers and semi-finished products which can be recycled into commercially usable end products.

The project will demonstrate the feasibility of recycling of different materials originating from domestic wastewater and assess the environmental and economic benefits with LCA. To this end, existing technologies for material recovery are optimised on an industrial scale at five existing municipal WWTPs over a period of more than 2 years and tested under real conditions including two post-treatment schemes for materials. A market study and the development of novel business models will consolidate the partnership between the wastewater sector and the chemical industry and consequently stimulate the implementation of the relevant technologies. KWB's work package comprises the Life Cycle Assessment of all processes in order to demonstrate the sustainability of the concept.

The project was launched in June 2016. To date, the pilot plants have been designed and first LCAs have been prepared.

"...to understand wastewater as a resource and to make use of it."

Dr. Christian Remy, Project Manager

Plant for cellulose recovery from wastewater, The Netherlands

Rapid test schemes for the assessment of trace organic contaminants removal from wastewater

The design of technical facilities for the removal of unwanted organic trace contaminants from wastewater is complex and expensive. Due to regionally varying boundary conditions, a standardised process design is not always possible to achieve so that comprehensive pilot tests have to be performed first.

In the scope of the TestTools project a set of tools is developed providing for the rapid and inexpensive prediction of the efficiency of technical and natural TrOC removal schemes. The results are to be used for the technical planning. The so-called "TestTools" consist of suitable lab tests and parametric modelling. They facilitate the prediction of TrOC elimination degrees depending on different water qualities and the related expenditures. They are calibrated in pilot trials in Berlin and validated in comparison with pilot results obtained in other regions of Germany.

KWB is responsible for the lab tests on ozonation which were continued in 2016 and investigated the influence of different ozone dosages at lab scale, temperature and suspended solid content. First results demonstrate that in fact the lab tests are able to produce transferable results on trace organic contaminant elimination.

"The project will provide important preliminary information for the design of technical facilities for trace organic compound removal and makes expensive piloting obsolete." Dr. Ulf Miehe, Project Manager

TestTools –
Development and validation of rapid test schemes for the assessment of trace organic contaminants (TrOC) behaviour in technical and natural barriers in the urban water cycle

Contact
Dr. Ulf Miehe (KWB),
ulf.miehe@kompetenz-wasser.de
Regina Gnirß (BWB),
regina.gnirss@bwb.de

Duration	08/2015 – 07/2017
Project Volume	775,000 euro; KWB: 238,000 euro
Financing	German Federal Ministry of Education and Research (BMBF), part KWB co-financed by Berliner Wasserbetriebe

Partners
Technische Universität Berlin (coordinator), Berliner Wasserbetriebe

Project Goals
Development and provision of rapid lab tests to assess the efficiency of natural and engineered processes for the removal of trace organic compounds from wastewater, the tools are lab tests and model calculations; KWB work package focuses on test systems for trace organic compound removal by ozonation processes.

Bundesministerium für Bildung und Forschung

Berliner Wasserbetriebe

Department
Sewers and Surface Water Protection

- Sewerage system operation and effects on the quality of surface waters
- Rehabilitation strategies for sewerage systems
- Risk Assessment
- Urban rainwater management

Head of department: Dr. Pascale Rouault
pascale.rouault@kompetenz-wasser.de




Sewer management
Bathing waters
Data analysis
Surface water protection
Modelling
Monitoring
Storm water
Rehabilitation strategies
Emerging pollutants
Combined sewer systems

Research for clean bathing waters

FLUSSHYGIENE – Hygienically relevant microorganisms and pathogens in multifunctional water bodies and hydrologic circles – Sustainable management of different types of water bodies in Germany

Contact
Wolfgang Seis (KWB),
wolfgang.seis@kompetenz-wasser.de
Dr. Pascale Rouault (KWB),
pascale.rouault@kompetenz-wasser.de
Regina Gnirß (BWB),
regina.gnirss@bwb.de

Duration	06/2015 – 05/2018
Project Volume	2,7 million euro; KWB: 713,000 euro
Financing	German Federal Ministry of Education and Research (BMBF) with additional co-financing by Berliner Wasserbetriebe

Partners
Kompetenzzentrum Wasser Berlin (Coordination), Berliner Wasserbetriebe, The German Federal Institute of Hydrology (BfG), German Federal Environment Agency (UBA), IWW Water Centre, Ruhrverband, Dr. Schumacher – Ingenieurbüro für Wasser und Umwelt, Bavarian Environment Agency (BLU), inter 3 Institute for Resource Management, University of Cologne, Berlin Senate Department for the Environment, Transport and Climate Protection, Bavarian Health and Food Safety Authority (LGL), Stiftung Zukunft Berlin (SZB), Münchner Stadtentwässerung (MSE)

Project Goals
Model based development of long term strategies and early warning systems for the management of rivers concerning short term pollution events. Socio-economic analysis for opening new river bathing sites in the four German reference regions.

Bundesministerium für Bildung und Forschung

Berliner Wasserbetriebe

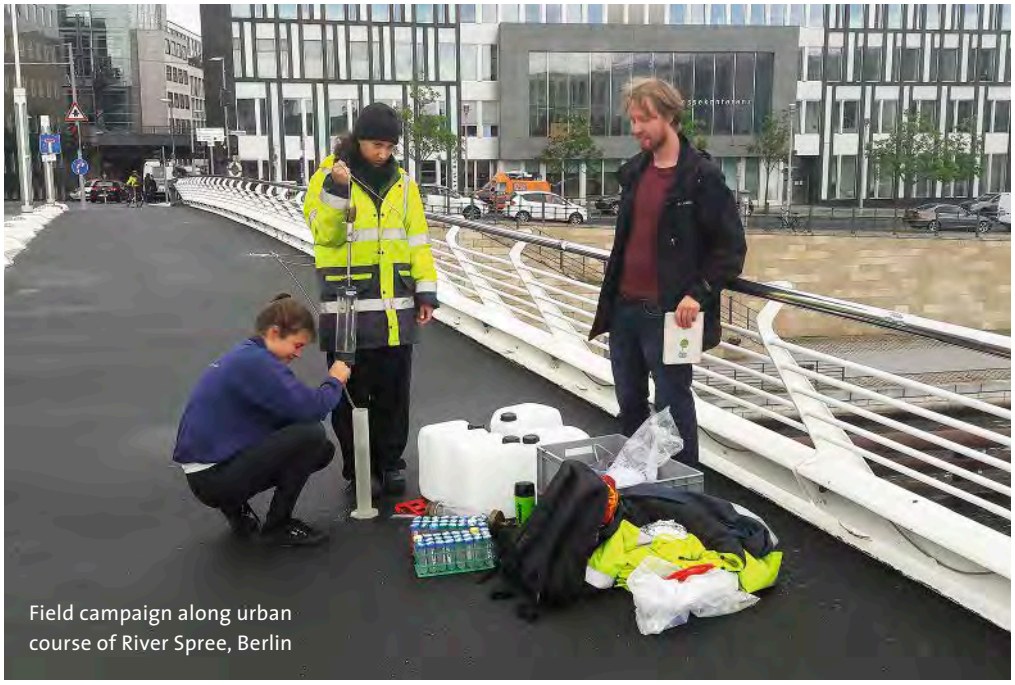
The pollution of Germany's rivers has been visibly reduced in the past decades. Nevertheless, out of the 2.000 sites which comply with the EU Bathing Water Directive there are only 30 bathing areas situated along rivers. This is due to the fact that rivers in particular are subject to short-term pollution loads resulting from unpredictable stormwater entries and combined sewer overflows which can turn recreational bathing into a health risk.

The objective of the FLUSSHYGIENE project is to gain a clearer understanding of the entry paths and dynamics of sanitary loads in rivers in order to develop the necessary basis for decisions. Moreover, the tools for managing multifunctional waters in a way that the highest possible protection of public health can be guaranteed without compromising their economic functions are created.

FLUSSHYGIENE develops project forecasting tools for the prediction of sanitary loads. In addition, a cost-benefit analysis of possible scenarios is conducted covering long-term strategies aiming at the maintenance or improvement of the sanitary status of waters. In addition, the potential for the development of new bathing sites is analysed.

The investigations are coordinated by KWB and performed by ten project partners at different types of water bodies situated in Berlin, Bavaria, Rhineland-Palatinate and North Rhine-Westphalia. In 2016, comprehensive measurements of the sanitary loads and related processes were carried out in the four reference areas. KWB was responsible for the investigations in Berlin.

"It is particularly exciting for me to contribute to the improvement of Berlin's quality of life." Wolfgang Seis, Project Manager



Field campaign along urban course of River Spree, Berlin

Smart management of wastewater and stormwater

Due to climate change and population growth, urban water infrastructure is facing increasing challenges. Integrated concepts covering a city's entire water management are urgently needed in order to be prepared for the upcoming challenges such as intense rains, heat waves and dry periods.

The project designed a method to plan decentralised stormwater management measures for complete urban districts. The combination of measures which were developed revealed the great potential of stormwater management for the protection of surface waters and for the improvement of the urban climate, in particular the prevention of local heat stress. Many small decentralised measures to manage stormwater events such as green roofs, infiltration swales, ponds or even conventional rainwater storage tanks can prevent that the intake capacity of the sewage system is exceeded. The results of these measures are so-called "cold islands", which contribute to a better quality of life for the residents and, in addition, provide valuable habitat for urban flora and fauna.

Additional tests and simulations have demonstrated that there are still many options for the advancement of adaptation measures relating to operation and construction of the urban sewer network: the better utilisation of existing storage spaces, new sewer flushing schemes, operational and structural optimisation of sewage treatment plants as well as smart control of pumping stations and improved pump technology.

Besides the coordination of the project's priority "Stormwater", KWB was responsible for the work packages Sewer Modelling, Groundwater, Surface Water and Life Cycle Assessment. In the autumn of 2016, the KURAS project was finalised with a well-attended full day workshop.

"The great public interest in the project and its inclusion in the coalition agreement of the new Berlin government is a terrific success!" Andreas Matzinger, Project Manager

Overall concept based on ecological processes including rainwater management, at former malt factory Berlin

KURAS – Concepts for urban stormwater management and sewage systems

www.kuras-projekt.de
www.bmbf.nawam-inis.de

Contact
Dr. Pascale Rouault (KWB),
pascale.rouault@kompetenz-wasser.de
Dr. Andreas Matzinger (KWB),
andreas.matzinger@kompetenz-wasser.de
Prof. Dr.-Ing. Paul Uwe Thamsen (TUB),
paul-uwe.thamsen@tu-berlin.de

Duration	06/2013 – 10/2016
Project Volume	4.5 million euro, KWB 1.1 million euro
Financing	German Federal Ministry of Education and Research (BMBF) (INIS Programme), co-financed by Berliner Wasserbetriebe and Veolia

Partners
Technische Universität Berlin (administrative coordination), Kompetenzzentrum Wasser Berlin (scientific coordination), Berliner Wasserbetriebe, Ingenieurgesellschaft Prof. Dr. Sieker, Ramboll Studio Dreiseitl, GEO-NET Umweltconsulting, IWW Water Centre, German Institute of Urban Affairs (Difu), Freie Universität Berlin, Hochschule Neubrandenburg, Leibniz Universität Hanover, German Federal Environment Agency (UBA), Technische Universität Kaiserslautern, ifak – Institut für Automation und Kommunikation e. V., Berlin Senate Department for Urban Development and the Environment

Project Goals
Model-based demonstration of integrated concepts for sustainable management of wastewater and stormwater for urban areas; Comparability of central and decentralised measures with regard to their effects on the environment, urban climate, building physics and costs; Combination of measures for urban districts, small towns as well as metropolises relating to existing buildings and new buildings; Proposals for future financing models and regulatory measures.

Bundesministerium für Bildung und Forschung

Berliner Wasserbetriebe

VEOLIA

Development of planning criteria for climate-just cities

netWORKS4 – Resilient networks: Contributions of urban supply systems to climate justice

Contact
Dr. Pascale Rouault (KWB),
pascale.rouault@kompetenz-wasser.de
Regina Gnirß (BWB),
regina.gnirss@bwb.de

Duration	10/2016 – 09/2019
Project Volume	1,0 million euro; KWB: 121,000 euro
Financing	German Federal Minstry of Education and Research (BMBF), with cofinancing by Berliner Wasserbetriebe

Partners
Kompetenzzentrum Wasser Berlin, ISOE – Institute for Social-Ecological Research (project management), German Institute for Urban Affairs (Difu), Berliner Wasserbetriebe, Berlin Senate Administration for Urban Development and Housing, Berlin Senate Administration for the Environment, Transport and Climate Protection, City of Norderstedt

Project Goals
A useful coupling of gray, green and blue infrastructures for the sustainable transformation of urban spaces. Dialogue process to develop common guidelines for integrated urban and infrastructure development. Set-up or extension and consolidation of governance structures in the partner municipalities.

Bundesministerium für Bildung und Forschung

Berliner Wasserbetriebe

The design of a climate just city requires an integrated urban development and infrastructure planning. The Resilient netWORKS project aims at initiating a comprehensive discussion on the future design of urban water infrastructures in cities.

In the scope of a geared transformation management for specific urban transformation areas, definite implementation measures will be designed and advanced in cooperation with municipal policy makers. To this end, grey, green and blue infrastructures (technical infrastructure, green urban areas and water bodies) will be taken into consideration. Their clever interconnection will generate a potential of synergies leading to improved climate resilience of the according schemes. Together with the cities of Berlin and Norderstedt suitable approaches to the future water infrastructure design will be developed and verified. Parallel modelling and the accompanying reflection and synthesis will illustrate the impacts and consequences for the urban land-use planning.

The project was launched in October 2016. Kompetenzzentrum Wasser Berlin is responsible for the work package "Scientific-Technical Assessment". One objective is to simplify the assessment methods of stormwater management strategies developed in the BMBF-funded project KURAS and to verify their advancement by a quantitative resilience analysis. In addition, KWB will contribute to concrete planning activities to be performed at Berlin sites.

"With our work, we help towards climate-just cities and in particular towards climate-just Berlin." Dr. Pascale Rouault, Project Manager

Stormwater management and water design at Potsdamer Platz, Berlin

Limitation of nitrogen emissions to surface waters

Most inland waters in Germany do not meet the good ecological status requirements stipulated in the EU Water Framework Directive. Amongst other things, this is due to high nitrogen loads. Previously, it was assumed that phosphorus is the primary determinant of water quality.

The NITROLIMIT project systematically investigated the role of nitrogen as an impact factor for the growth of phytoplankton in water bodies. It was demonstrated that in fact this nutrient is also a relevant parameter for water quality. It can be expected that a reduction in the nitrogen concentrations leads to an improvement of the ecological status of many lake lakes and river lakes. Case studies have shown that nitrogen reduction is reasonable also in economic terms.

The KWB supported the project team which was coordinated by the BTU Cottbus-Senftenberg in particular with regard to ecosystem modelling. To this end, a simplified process-based model approach illustrating the nitrogen turnover and the sediment structure was developed. Furthermore, it was analysed to which extent nutrient reduction measures already implemented at sewage treatment plants and combined sewers have had an effect on the trophic state of selected water bodies.

In addition, a Life Cycle Assessment covering specific measures and work packages was carried out comparing enhanced treatment of WWTP effluents and the reduction of the entries from the urban sewer network. The results indicated that measures implemented at WWTPs are the most efficient way to prevent nitrogen entries. The NITROLIMIT project was finalised in 2016 with a full day workshop.

"The project has delivered clear information on the role of nitrogen for water quality." Dr. Pascale Rouault, Project Manager

Eutrophicated waterbody in Brandenburg

NITROLIMIT II –
Nitrogen limitation in fresh waters

http://www.nitrolimit.de

Contact
Dr. Pascale Rouault,
pascale.rouault@kompetenz-wasser.de
Dr. Claudia Wiedner,
wiedner@tu-cottbus.de

Duration	03/2014 – 10/2016
Project Volume	2,5 million euro; KWB: 144,000 euro
Financing	German Federal Ministry of Education and Research (BMBF), with co-financing by Berliner Wasserbetriebe

Partners
Brandenburgische Technische Universität Cottbus-Senftenberg (coordination), Kompetenzzentrum Wasser Berlin; German Federal Institute of Hydrology (BfG), Technische Universität Berlin, Technische Universität Dresden, Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB)

Project Goals
Assessment of the influence of nitrogen and phosphorus on surface water quality; Concepts for nutrient reduction; Costs, benefits and acceptance of nutrient reduction measures

Bundesministerium für Bildung und Forschung

Optimisation of sewer inspection and rehabilitation strategies

RELIABLE SEWER –
Optimisation of sewer inspection and rehabilitation strategies

Contact
Nicolas Caradot (KWB)
nicolas.caradot@kompetenz-wasser.de

Duration	4/2016 – 1/2019
Project Volume	k.a.
Financing	Veolia / VERI (Veolia Recherche & Innovation)

Partners
Veolia / VERI
(Veolia Recherche & Innovation)

Project Goals
Development of a series of prototypes to support municipalities in the definition of sewer inspection and rehabilitation strategies in view of financial optimisation; support utilities to choose where and when to inspect sewers and to estimate investment need to cope with sewer system deterioration.

VEOLIA

The maintenance of wastewater infrastructure systems is expensive. The costs for replacement and maintenance amount to several millions of euros which have to be procured by cities and communities. To date, population growth in urban areas has led in the first place to the upgrade and expansion of wastewater treatment plants and sewer systems. The rehabilitation of existing schemes however, has been neglected to some extent. As a consequence, most cities face an ageing infrastructure in extensive and emerging need of repair, rehabilitation or renewal.

RELIABLE SEWER aims to develop a panel of tools to support municipalities in the definition of cost-efficient sewer inspection and rehabilitation strategies. The project will improve the reliability of current sewer deterioration modelling approaches and, in addition, simulate the expenditures for repair and renovation measures. This will facilitate the estimation of uncertainties in budget forecasts, the optimisation of asset management scenarios and the identification of the most appropriate balance between replacement, renovation and repair measures.

Three case studies carried out in Germany, Bulgaria and USA demonstrate the benefits and potential costs savings obtained from the use of deterioration modelling. RELIABLE SEWER was started in April 2016 and is sponsored by Veolia.

"With RELIABLE SEWER we address a major challenge of municipalities and utilities: the future management of public infrastructure." Nicolas Caradot, Project Manager

Asset management of sewer systems

In the last 30 years, most cities and communities have rather invested in sewer system expansion and upgrade than in the maintenance of the existing wastewater infrastructures. In Germany, a national study has revealed that about 17 percent of the sewers have severe defects and should be immediately rehabilitated.

In order to develop suitable strategies towards sustainable rehabilitation and inspection of sewer systems, it is necessary to gather detailed information on their condition first. Models already available on the market can be used by sewer operators to simulate the condition of sewers and forecast the evolution of the system. SEMA aimed to examine whether available sewer deterioration models are actually suitable to reliably predict the development of sewer condition. To this end, KWB in close cooperation with 3S Consult GmbH used the comprehensive sewer inspection data of the City of Brunswick, Germany and Montbéliard, France and compared them with model data. The evaluation has revealed that the accuracy of the prognosis model examined is very promising in terms of simulating the general system condition. The results underline the potential benefits of using deterioration models to support asset management strategies. The project was closed in April 2016; follow-up projects were started. Furthermore, we initiated a research cooperation with the Javeriana University in Bogotá (Columbia).

SEMA –
Sewer deterioration model for asset management strategy

Contact
Nicolas Caradot (KWB)
nicolas.caradot@kompetenz-wasser.de

Duration	10/2013 – 04/2016
Project Volume	488,000 euro
Financing	Veolia

Partners
Kompetenzzentrum Wasser Berlin, Veolia, OEWA Wasser und Abwasser, VERI Veolia Recherche & Innovation, SE|BS Stadtentwässerung Braunschweig, Berliner Wasserbetriebe, 3SConsult

Project Goals
Assess the suitability of sewer deterioration modeling to simulate sewer condition

"We provide the tools to control the condition of our underground infrastructure." Nicolas Caradot, Project Manager

CCTV inspection of an obstructed sewer pipe, Sofia 2013

Department Groundwater Management

- Natural methods for water treatment
- Hybrid methods for groundwater recharge
- Wells – Energy efficiency and safe operations and maintenance

Head of department: Dr. Hella Schwarzmüller
hella.schwarzmueller@kompetenz-wasser.de




Bank filtration Drinking water
Groundwater Microbiology Risk Assessment
Emerging substances Clogging Wells
Subsurface solutions Well field operation

Optimisation of the installation and operation of dewatering wells

RWE-BO –
Planning, implementation and evaluation of investigations on the optimisation of dewatering wells in the Rhenish lignite open-cast mining area

Contact
Dr. Christian Menz (KWB)
christian.menz@kompetenz-wasser.de

Duration	10/2014 – 12/2017
Project Volume	n. a.
Financing	RWE Power AG
Partners	RWE Power AG
Project Goals	Development of schemes for the prevention of ageing of dewatering wells in opencast mining

RWE

The mining of lignite in the Rhenish lignite mining area requires the area's groundwater table to be lowered. Dewatering wells reaching down to a depth of about 750m are used. In the entire Rhenish lignite mining area, approx. 1,500 dewatering wells are operated by RWE Power AG to drain the opencast mines. Declining groundwater levels and well ageing processes lead to substantial reductions in productivity of individual wells which have to be compensated by considerable investments for the construction of new wells. With the aim of reducing ageing processes in the dewatering wells and generating long-term savings, KWB was asked by the RWE Power AG to develop suitable measures towards adjusted well design and operating regimes.

As a result, a new well design was developed and implemented successfully to reduce ochre formation, which is a main well ageing process. Smart adjustments of well operation regimes contributed to maintaining or even boosting the productivity of existing and newly constructed wells in the long term. Last year, KWB's main tasks focused on the analysis and assessment of the schemes which had been implemented by RWE.

"The close cooperation between research and industry has generated new ideas how to use the designed technologies in other sectors." Dr. Christian Menz, Project Manager

Rhenish lignite mining area

Temperature signals for continuous monitoring of groundwater travel times

About 80 percent of Berlin's drinking water originate from river bank filtration or managed aquifer recharge. The routine operation involves iron and manganese removal via aeration and filtration but no chemical disinfection. To ensure the hygienic safety of drinking water supply, the drinking water protection zones, in particular those in the proximity of drinking water wells (zone II) are of particular importance. Zone II is defined as the start line, from which groundwater has a travel time of 50 days in the underground before it is pumped from the wells to the waterworks.

The subsurface travel time of groundwater can be determined by means of tracer tests. However, as these tests are technically complex and time-consuming, it was proven within the T-MON project that seasonal temperature variations of the surface water bodies and the delayed and damped temperature signals in the drinking water wells can be used to quickly and easily evaluate the subsurface travel times.

Since 2015, one riverbank filtration site and one MAR site have been equipped with loggers and continuous accompanying samplings have been carried out. In 2016, all temperature data were diagrammed as time series. The data were assessed in terms of their extreme values and amplitudes and compared to conservative tracer measurements. In the future, the logger data will be continuously visualised during routine operation. The instantaneous residence time will be determined through the curve shape. The minimum residence time of 50 days can be ensured via the control of the infiltration and withdrawal quantities.

T-MON –
Development of a strategy for the continuous monitoring of the travel times from groundwater recharge basins and bank filtration sites to drinking water wells at the demonstration sites Berlin-Tiefwerder and Berlin-Spandau

Contact
Dr. Hella Schwarzmüller (KWB)
hella.schwarzmueller@kompetenz-wasser.de
Dr. Alexander Sperlich (BWB)
alexander.sperlich@bwb.de

Duration	04/2015 – 08/2017
Project Volume	174,000 euro
Financing	Berliner Wasserbetriebe

Project Goals
Development of a simple and inexpensive determination scheme illustrating the residence time of water in the underground; analysing the possibilities to influence the operation to ensure compliance with 50 days line

"One of the project's highlights was the frequent fieldwork and the regular sampling on the island of Baumwerder in Lake Tegel." Dr. Hella Schwarzmüller, Project Manager

Field campaign at MAR site


KOMPETENZZENTRUM
Wasser Berlin

Department
Network | Communication

- Platform for applied water research
- Network activities
- Organisation and execution of technical conferences
- Dissemination of research issues and results
- Press relations

Head of department: Dr. Bodo Weigert
bodo.weigert@kompetenz-wasser.de




Events Conferences
Exhibitions Networking Press Relations
Trade fairs Workshops Science Communication
Wasserwerkstatt Berlin City talks series

The European Water Platform

WssTP –
European Technology Platform for Water
www.wsstp.eu

Contact
Dr. Ulf Miehe,
Kompetenzzentrum Wasser Berlin
ulf.miehe@kompetenz-wasser.de

Duration since 2004

The European Water Platform (WssTP) was initiated in 2004 by the European Commission to stimulate integrated research and technology development in the European water sector. KWB is one of the founding members. In the meantime, more than 160 institutions from academia, industry and policy have joined the platform, which provides recommendations on future research programmes to the European Commission. The recent trends and challenges in the European water management are gathered and recorded by 17 expert groups. KWB is participating in the working groups "Ecosystem Services", "Green Infrastructure", "Emerging Pollutants" and "Bathing Waters", the latter being headed by KWB.

KWB employees explain Berlin's groundwater management

Long Night of the Sciences

KWB once again contributed to Berlin's "Long Night of Sciences". In close cooperation with the Department of Fluid Dynamics of the Technische Universität Berlin KWB presented, amongst other things, a functional model explaining urban rainwater management as well as an experiment demonstrating the challenges of groundwater management through a play. The event was held at the "House of Water" of the Technische Universität Berlin.

Membership in the research platform Watershare®

Watershare® is an international knowledge platform towards the share of expertise within the water sector. The platform is organised by the Dutch KWR Watercycle Research Institute. Its current 18 members are leading non-profit water research institutes from all over the world. Watershare´s objective is to share knowledge and expertise, as for instance software tools, among the partners and make it internationally available to water practice.
In 2016 the members started to work together in five Communities of Practice (CoPs), each covering a global priority theme in the water sector: Natural Water Treatment, Future-Proof Water Infrastructures, Resource Recovery, Emerging Substances and Resilient Urban Water Management.

Watershare

https://www.watershare.eu/watershare-tools/

Contact
Dr. Bodo Weigert,
Kompetenzzentrum Wasser Berlin,
bodo.weigert@kompetenz-wasser.de

Duration since 2013

Stadtgespräch at Berlin House of Representatives

Discussion Series “Wasser bewegt Berlin”

The series of these Berlin-specific discussions started in 2010 was continued with three sessions in 2016. The event format, which is deliberately designed for the interaction with the attendants, contributed to a lively participation and led to results that were adopted by Berlin’s national policy. The following topics were addressed: “Bathing in rivers – but where?”, “Wasser bewegt Berlin – 5 years Water as Talk of the Town” and “Berliner Wasserbetriebe back with the public authorities – well then?”

Berlin Water Workshop

The Berlin Water Workshop sessions were again well received by the city's water professionals. The 2016 series was hosted by different institutions and therefore took place at various venues. Besides Berliner Wasserbetriebe and Technische Universität Berlin, the Embassy of the Kingdom of the Netherlands needs to be explicitly mentioned here having made available the embassy's lecture hall situated directly on Berlin's river Spree. Last year, the following topics were presented and discussed: "Stormwater – all clean? Latest findings on trace organic substances in stormwater run-offs", "Extreme weather patterns and wastewater infrastructure: How about the resilience of our sewer systems?", "Phosphorus recycling - Nexus between water management and agriculture". As usual, all presentations can be downloaded from our homepage.

Final Workshop of KURAS project at EUREF Campus, Berlin

Final Workshop of BMBF-funded Collaborative Project KURAS

Three years ago a research consortium of 15 partners started to work on the development of tools that enable the simulation and scoring of urban storm- and wastewater management measures from tip to toe. KURAS was finalised end of October 2016 by a well-attended full-day workshop. A variety of presentations, panel discussions, poster sessions and one-on-one interviews with project partners enabled a lively communication.

Kompetenzzentrum Wasser Berlin – Team

Status: 1 December 2016

Network Office

Edith Roßbach, Managing Director
Dr. Bodo Weigert, Deputy Director
Dr. Ulf Miehe, Deputy Director
Dr. Pascale Rouault, Deputy Director
Andrea Lüty, Executive Assistant
Monika Jäckh, Assistant
Sylvia Deter, Assistant
Theresa Lorenz, Communications Assistant
Kristine Oppermann, Project Controlling

Department Water and Wastewater Technology

Dr. Ulf Miehe, Environmental Engineer (Department Leader)
Jeannette Jährig, Environmental Engineer
Dr. Christian Kabbe, Chemist
Fabian Kraus, Environmental Engineer
Dr. Christian Loderer, Agricultural Engineer
Dr. Christian Remy, Environmental Engineer
Michael Stapf, Environmental Engineer
Rabea-Luisa Schubert, Environmental Engineer
Vahid Toutian, Chemical Engineer
Kuangxin Zhou, Environmental Engineer

Department Sewers and Surface Water Protection

Dr. Pascale Rouault, Water Engineer (Department Leader)
Nicolas Caradot, Civil Engineer
Dr. Andreas Matzinger, Limnologist and Environmental Scientist
Mathias Riechel, Environmental Engineer
Wolfgang Seis, Environmental Engineer
Hauke Sonnenberg, Environmental and Computer Science Engineer
Roberto Tatis Muvdi, Biologist
Dr. Daniel Wicke, Environmental Engineer

Department Groundwater Magement

Dr. Hella Schwarzmüller, Geologist (Department Leader)
Dr. Christian Menz, Hydrogeologist
Michael Rustler, Geoecologist
Dr. Christoph Sprenger, Hydrogeologist

Trainees (2016)

Lars Burhop, TU Berlin, Computer Engineering
Vincent de Boisdeffre, University UPEC , Water Science
Kristin Diercks, Universität Weimar, Environmental Engineering
Gleb Dietrich, Beuth-Hochschule für Technik, Process and Environmental Engineering
Joshua Gallegos, Ghent University, Environmental Technology
Nathalie Hernandez Rodriguez, Pontificia Universidad Javeriana, Kolumbien, Civil Engineering
Inga Hilbrandt, TU Berlin, Environmental Technology
Christina Hofmann, FU Berlin, Geographical Sciences
Nils-Kristof Kabisch, TU Braunschweig, Environmental Engineering
David Kahlert, RWTH Aachen, Civil Engineering
Saebom Kim, UdK Berlin, Art and Media
Franziska Knoche, TU Berlin, Environmental Technology
Katharina Lutscher, TU Berlin, Power and Process Engineering
Charlotte Merkel, FU Berlin, Geological Science
Finn-Niclas Meyer, Internship
Micaela Pacheco-Fernández, TU Berlin, Environmental Technology
Alejandro Palomo-Gonzales, Technical University of Denmark, Microbiology
Mario Pfeifer, Hochschule für Forst-wirtschaft Rottenburg, Water Resources Management
Christian Pyerin, Universität für Bodenkultur Wien, Kulturtechnik und Wasserwirtschaft | Civil Engineering and Water Management
Michael Rau, TU Berlin, Environmental Technology
Cristina Saravia Arzabe, TU Berlin, Environmental Technology
Lukas Schatten, FH Münster, Civil Engineering
Julia Schmidt, TU Berlin, Environmental Technology
Pia Mara Charlotte Schumann, TU Berlin, Environmental Technology
Sneha Suresh, Universität Duisburg-Essen, Water Science
Vlatko Vilovic, TU und FU Berlin, Environmental Policy and Planning
Lijia Wang, TU Berlin, Electrical Engineering
Julian Weihs, Internship
Marcus Weinkauf, TU Berlin, Environmental Technology
Malte Zamzow, TU Berlin, Environmental Technology

Publications 2016

All relevant information on our projects, including the project reports, is available on our website: *www.kompetenz-wasser.de*

Reports Water and Wastewater Technology

Project DEMOWARE: van Houtte, E., Sukupova, M., Kraus, F., Remy, C. and Miehe, U. (2016). Deliverable D1.2: Report on opportunities for nutrient reduction and recycling in water reuse schemes.

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Project DEMOWARE: Kraus, F., Remy, C., Seis, W and Miehe, U. (2016). Deliverable D3.3: Generic assessment of treatment trains concerning their environmental impact and risk reduction potential.

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Reports Sewers and Surface Water Protection

Projekt NITROLIMIT: Horbat, A. Remy, C., Mutz, D., Meyerhoff, J., Kruse, N., Matranga, M., Venohr, M., Rouault, P. (2016): Positionspapier - Band 4 - Kosten und Nutzen einer Verbesserten Gewässergüte am Beispiel der Berliner Unterhavel. www.nitrolimit.de

Projekt NITROLIMIT: Wiedner, C. und Schlief, J. (Hrsg.) (2016). Positionspapier. Ergebnisse, Schlussfolgerungen, Empfehlungen.

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Projekt KURAS: Mitchell (ed) (2016): Zukunftsorientierte Anpassung der urbanen Abwasserinfrastruktur – Maßnahmenkombinationen, Projekt KURAS, Schwerpunkt "Abwassersysteme", 2016.

Reports Groundwater Magement

Projekt OPTIWELLS: Rustler, M., Philippon, V., Sonnenberg, H. (2016). Optiwells-2 Synthesis Report.

Journal Articles

Baudron, P., Sprenger, C., Lorenzen, G. and Ronghang, M. (2016). Hydrogeochemical and isotopic insights into mineralization processes and groundwater recharge from an intermittent monsoon channel to an overexploited aquifer in eastern Haryana (India). Environmental Earth Sciences, vol. 75:5, 434.

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Kompetenzzentrum Wasser gGmbH · Cicerostraße 24 · 10709 Berlin · Germany
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