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TZW news

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DVGW

INNOVATIVE · OPERATIONAL · TRANSPARENT
THE DVGW WATER RESEARCH ROADMAP

The Water Research Roadmap 2025 of the German Gas and Waterworks Association was designed to boost research for innovation in the drinking water sector in line with requirements of waterworks.

Since the foundation of the German Gas and Waterworks Association (DVGW) in the year 1859, attention has always been paid to research and development. One of DVGW's first structured research program in the water sector was developed in cooperation with experts of the water utilities already in 1982. For the years to come, a new roadmap for the German water research community was developed under the coordination of TZW and in cooperation with IWW and DVGW head office.

A four-step-approach was employed to develop the roadmap: scoping, forecasting, backcasting and transfer. A unique feature was scoping supported by a comprehensive, operational related knowledge base, which was created by an intensive dialogue with key players in the water sector including senior experts from water utilities, industry, politics and science. Moreover, 11 DVGW-expert working groups with specialists from the waterworks were interviewed. On top of the data base forecasting and backcasting were applied. Various scenarios of the German water supply in the year 2025 were drafted within workshops with senior managers of the German waterworks. Each scenario is based on predefined key factors that significantly influence the business activities of the water supply such as the political and legal framework, the state of the infrastructure or customer expectations. Out of the possible scenarios, the most likely scenario was chosen. Disruptive developments were also identified for various key factors. Challenges and opportunities of the developed vision of the future water supply were transferred into 40 research topics. These topics represent the research priorities of the Roadmap 2025. By active contribution of the water utilities the future water research was designed to support the German waterworks to manage the challenges and chances in the future for safe drinking water.

Scenario analysis

Research priorities

Josef Klinger, Uwe Müller

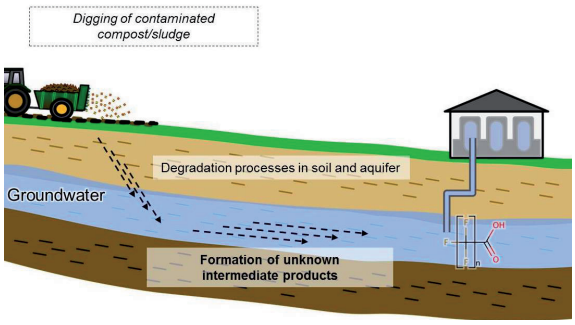
Roadmapping process

EOF solves the precursor dilemma of PFAS contaminated soils

The amount of unknown precursors of analyzable perfluoroalkyl and polyfluoroalkyl substances (PFAS) in contaminated soils can be estimated by comparison of extractable organic fluorine (EOF) compared to organofluorine from single compound target analysis.

Two cases of agricultural soils contaminated with perfluoroalkyl and polyfluoroalkyl substances (PFAS) had become known in Germany in Northrhine-Westfalia in 2006 and in Baden-Württemberg in 2013. Since then this issue was recognized by water suppliers, authorities, and the general public. With about 500 ha of contaminated land this environmental pollution in the state of Baden-Württemberg is by far the largest known in Germany by area.

Besides this there are numerous contaminated lands worldwide, polluted by fire-fighting foams (airports, fire-fighting brigades, refineries, etc.). In all such cases the dilemma exists that the fluorochemicals for paper finishing or fluorinated surfactants present in fire-fighting foam concentrates are widely unknown and no analytical standards are available. These so-called precursors can degrade to analyzable, persistent and mobile perfluoroalkyl carboxylates and sulfonates, which might affect drinking water sources.



Contamination pathway

Degradation products

To assess unknown precursors, the parameter EOF was implemented within two projects funded by the Ministry of the Environment, Climate Protection and the Energy Sector Baden-Württemberg (program BWPLUS). The EOF analysis consists of the extraction of a soil sample with methanol, followed by the removal of inorganic fluoride and analysis of the final extract by combustion-ion chromatography (C-IC).

Organofluorine concentrations up to the mg/kg range were measured in soils around Baden-Baden/Rastatt both by PFAS analysis including some paper chemicals and by EOF. The unknown EOF in soil samples amounted 43 % on average. The sum of organofluorine from known PFAS correlated well with the EOF.

Frank Thomas Lange, Jens Müller
Analysis and Water Quality

German Australian Joint Lab on Health Related Water Microbiology

In August 2017 a German-Australian cooperation was launched between the largest organisation for applied research in Australia (CSIRO) and TZW.

Prompt water monitoring and quality control are essential for public health protection and risk regulation. Consequently, the rapid, specific and sensitive detection of microbial indicators and waterborne pathogens represent a key challenge in modern water quality monitoring. In the last years the application of monitoring concepts and technologies was expedited at TZW as well as at CSIRO. Both the Australian and German collaborators have developed new methods in these specific areas, which enables deep collaboration and exchange possibilities with great benefits and synergistic effects. 2017 a joint project with the overarching objective to optimise and extent methods for water quality monitoring started (Gabi, www.gabi-cooperation.org). The project is initially funded for two years by the German Ministry of Education and Research (BMBF) in the framework of a Funding Programme to establish joint research centres with partners in the Asia-Pacific Research Area (APRA).

PCR reference lab

The specific and sensitive detection of pathogens and indicator organisms using molecular biological techniques opens up new possibilities for rapid monitoring and further assessment of the hygienic water quality. The collaboration covers topics such as PCR detection of viruses and bacteria, the use of microbial source tracking tools to identify faecal sources of contamination, the detection of antibiotic resistances, and the application of microarray technology.

Overall, the methods for molecular biologi-

cal monitoring should be further developed to such an extent that (i) selected methods find their way to routine diagnostics and (ii) the jointly acquired excellence could function as a good basis for pursuing research activities. In the framework of the project the existing contacts are deepened and structures such as a joint PCR reference lab, joint pilot test sites, and exchange programmes for scientists will be implemented.

Claudia Stange, Andreas Tiehm
Microbiology and Molecular Biology

gabi
GERMAN
AUSTRALIAN
JOINT COOPERATION
FOR WATER MICRO-BIOLOGY

Chlorate concentrations in disinfected drinking waters

Connected with a new drinking water regulation in Germany, maximum values for chlorate were decreed. This causes attention for drinking water disinfection.

Chlorate is formed during transport and storage of sodium hypochlorite, calcium hypochlorite and chlorine dioxide solutions as result of decomposition which is influenced by temperature and light. However, it is also formed by the electrochemical in situ production of chlorine and the in situ production of chlorine dioxide.

For an overview on chlorate concentration in potable waters in Germany measurements were carried out by TZW. They encompass 50 water treatment plants and pumping stations using sodium hypochlorite, electrochemical made chlorine solutions or chlorine dioxide. The chlorate concentration was measured in drinking water after disinfection and in the disinfectant feed solution. As a result, it turned out that using dosages of 0.2 to 0.5 mg/L chlorine resp. 0.1 to 0.3 mg/L chlorine dioxide which are normally used for disinfection in Germany, the chlorate concentration in drinking water was below 70 µg/L, which is the usual limit value for chlorate. However, in app. 30 % of the disinfectant feed solutions (sodium hypochlorite as well as in electrochemical made chlorine and chlorine dioxide) higher concentrations of chlorate were found. In these cases, a dosage of 1.2 mg/L chlorine resp. 0.4 mg/L chlorine dioxide would lead to chlorate concentrations of more than 70 µg/L in the drinking water.

Limit value

In consequence of the measurement program recommendations for a proper handling of disinfectant solutions were prepared. In addition, further investigations are necessary to minimize the chlorate formation during electrochemical chlorine and chlorine dioxide production.

Disinfectant handling

Burkhard Wricke, Katrin Bornmann
Distribution Networks

International Research Project TRUST started in Peru

TZW develops new planning tools and integrated water supply and wastewater disposal concepts together with experts from various disciplines.

The Lima region is representative of many water scarcity areas worldwide. An additional challenge for sustainable water resource management is the inadequate database on the quantity and quality of water bodies. The work in TRUST aims to contribute to achieving the UN-Sustainable Development Goals (SDG).

TZW-researchers will create the necessary data basis in cooperation with Karlsruhe Institute of Technology (KIT-IWG and KIT-IPF), the company OTT and local stakeholders. The data will be used in a decision support and risk management system for water suppliers developed within the project by TZW-scientists and Disy, a software company. The catchment area of a drinking water reservoir in Saxony serves as a test area to develop the methods and to investigate the transferability of the results in close collaboration with the State Reservoir Administration of Saxony (LTV).

Reservoir near Santiago de Tuna
(Photo: C. León)

In order to facilitate the most efficient use of

available water resources in rural as well as in urban areas TZW-scientists, the Institute for Sanitary Engineering of the University of Stuttgart (ISWA) and the consultant ipp are developing concepts for water supply, sanitation and water reuse.

To gain a better understanding of the Peruvian water sector ZIRIUS (University of Stuttgart) identifies the relevant actors and possible conflicts together with the consulting firm decon international. ZIRIUS also coordinates the project.

TRUST is funded by the German Federal Ministry of Education and Research (BMBF) as part of the "GROW - Global Resource Water" funding measure in the "Research for Sustainable Development (FONA)" programme.

Water reuse

Friederike Brauer, Sebastian Sturm
Groundwater and Soil

Towards a Future-Proof European Water-Smart Society

TZW holds the cluster leadership "value in water" in WSSTP's revised working structure in order to promote both WssTP's activities and the needs of the German drinking water sector.

After an intensive drafting process WssTP, the European Water Platform, has published its strategic innovation and research agenda (SIRA) already in 2016 as living document, which will be updated on a regular base. In consequence of the SIRA vision "multiple waters for multiple purposes and users" WssTP has revised its working structure at the beginning of 2018 because achieving the Water-Smart Society requires leadership, strategic action, and persistence. Therefore, WssTP will drive the transition to a Water-Smart Society by means of a customized cluster matrix. The cluster matrix consists of 6 horizontal research and knowledge driven clusters and 3 market- and living-lab driven clusters representing the main societal uses of water. TZW was nominated as leader of the cluster "value in water". Thus, DVGW and the German drinking water sector are directly linked to WssTP's board. This means visibility, leadership and enlargement of the international water network and it will help promoting living labs with multi stakeholders on a national and international level.

Living lab

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