

RESOURCE WATER

Technopole expertise
on water and health

Water is an invaluable resource, ecologically, economically and medically. At Technopol Wieselburg and Technopol Krems in Lower Austria, a concentration of companies and research institutions has been established with expertise in water, ranging from the ecosystem to health benefits to the drinking water supply.

Foto: iStockphoto.com/Sasha_Suzi

Water is essential to all life. It is a habitat, food source, economic factor, regional resource, cure and potential danger.

The Research, Technology and Innovation strategy for the State of Lower Austria (RTI strategy) has examined these contexts and identified water as one of ten fields in which research institutions in Lower Austria should focus their attention. The work of the **Lower Austrian technopoles** will thus be centralised.

At the **Lunz Water Cluster** and the **Institute for Land and Water Management Research**, which are members of the Technopol Wieselburg network, water is classified as an ecosystem for the living organisms that inhabit it, interacting with the surrounding environmental compartments.

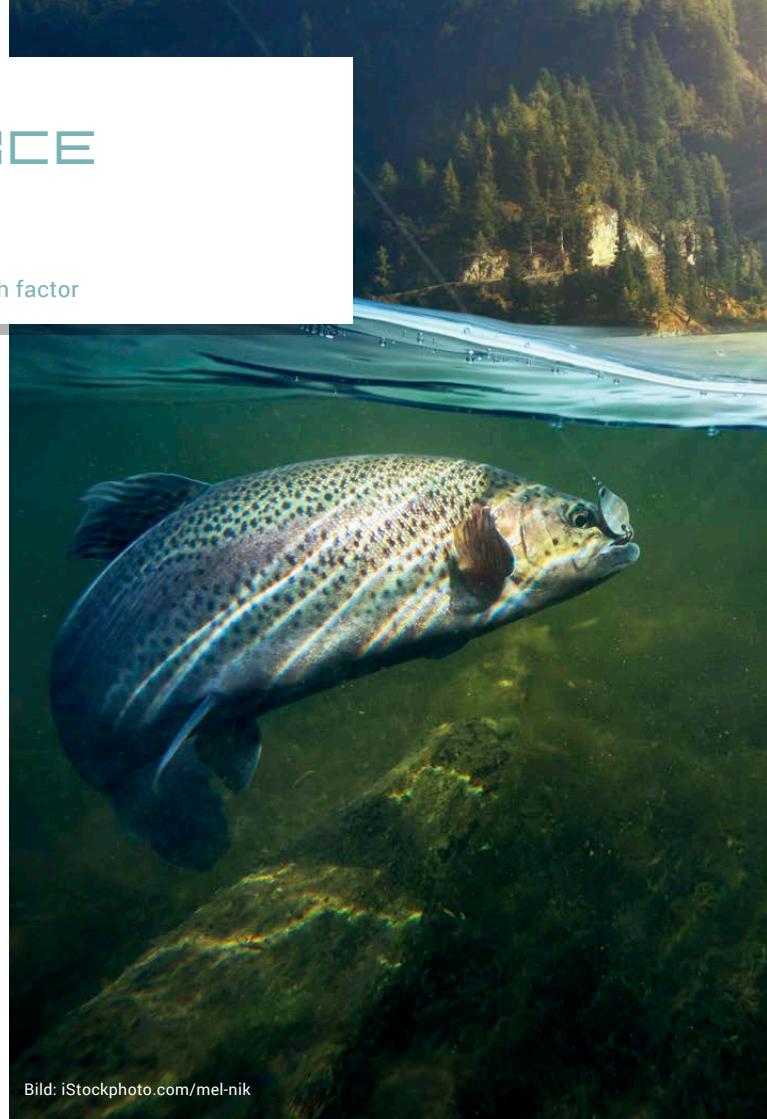
This finely balanced system is threatened by the burden of various pollutants. The **Karl Landsteiner Private University for Health Sciences** recently launched a new research area for water quality and health, which develops concepts and methods for sustainable water safety management (bathing, irrigation and drinking water quality).

The **Department of Integrated Sensor Systems (DISS)** at the **Danube University Krems** has specialised expertise in the development of sensors that can monitor water quality. Both institutions are located at Technopol Krems.

Guidelines for the highest possible water hygiene standards for building installation technology were developed by a cooperation project of the **construction, energy and environment cluster**. The project also resulted in the launch of the network FORUM Wasserhygiene (Water Hygiene Forum), which endeavours to raise awareness and develop know-how on this topic. ■

RESOURCE WATER

From ecosystem to health factor



WATER AS AN ECOSYSTEM

Habitat and food source

The Lunz Water Cluster has in recent years evolved into an internationally renowned research centre for hydrology. The research institution is supported by the University of Vienna, the Danube University Krems and the University of Natural Resources and Life Sciences, Vienna (BOKU), and funded by the states of Vienna and Lower Austria.

The abundance of water and low utilisation impact of the streams and lakes in the alpine foothills around Lunz provide the ideal conditions for water ecology research. In addition, with the reopening of the historic research facility in Lunz, the renovated outdoor research station now allows for experiments to be conducted on a large scale. In recent years, the extensive laboratory facilities have been upgraded to include devices for the analysis of stable isotopes.

The research is divided into four working groups with different specialist areas. The **Aquascale** group is responsible for investigating diversity and functionality of plankton, the **Biger** group examines the influence of external stress factors on the processes on the boundary between water and sediment. The **Ecocatch** group surveys the surface waters of a given catchment area and their input of organic matter. The **Liptox** group studies the development and transmission of lipids in aquatic communities.

Since its founding, the Lunz Water Cluster has launched 48 research projects, approximately two thirds of which relate to basic research and a third to applied research. The EU-funded AquaCosm project, for example, features an international research team studying various aspects of biodiversity at the experimental facilities in Lunz. As part of the Water Science Call programme, the Lower Austrian Research and Education Association (NFB) has approved a project to study the effects of dissolved carbon in the water caused by agriculture. ■



"The Lunz Water Cluster is internationally recognised in the field of water research."

Univ.-Prof. Dr. Thomas Hein,
Head of the Lunz Water Cluster

The Institute for Land and Water Management Research (BAW-IKT) in Petzenkirchen is run by

the Austrian Federal Office for Water Management. Its task is to study the relationships between water and soil in order to preserve soils as filters and reservoirs for water resources according to the motto: soil protection = water protection. "We

describe our work as 'soil hydrology management', since we are intervening in the hydrological cycle for the purpose of sustainability," says Peter Strauss, head of the institute.

The BAW-IKT is divided into three departments: The Department of **Groundwater Protection** studies the filtering effect of the soil cover above the groundwater for percolating precipitation. The Department of **Hydrology of Small Catchment Areas** and Erosion monitors the erosion of soil by water and wind and its transport through surface waters. The Department of **Land Use and Management** examines the intensive use of agricultural and forestry land in Austrian valley and basin landscapes and their impact on the quality of soils and groundwater reserves.

These departments are currently involved in several research projects through the BAW-IKT, such as the reduction of soil and groundwater pollution through waste management processes, automated image analysis for recording land cover, and increasing biodiversity in viticulture and its impact on the soil. The institute has a laboratory for chemical and physical analysis of soil and water samples as well as various lysimeters for the study of the soil water balance. ■

WATER AND SOIL

Infiltration and storage

Energy from water and air

INFO

Algae are considered a promising source of bioenergy because they are not bound to traditional agricultural land. They can, for example, be cultivated on water surfaces or in industrial reactors. At the Wieselburg site of **Bioenergy 2020+** GmbH, the focus is on the production of algae for bioenergetic use and coordinating a network of companies and research institutes engaged in this field, in collaboration with the ÖGUT (Austrian Society for Environment and Technology).

IN SEARCH OF BACTERIA

New methods of microbiological diagnostics

At the Karl Landsteiner Private University for Health Sciences (KL), a research focus has been set up to examine the topic "Water Quality and Health". Work in this area is founded on currently existing structures: On 1 September 2017, microbiologist Andreas Farnleitner was appointed to the professorship for **microbiological diagnostics for water and health**, which was created in collaboration with the Vienna University of Technology. In addition, the KL became a partner of **ICC Water & Health**, which was founded by the Vienna University of Technology and the Medical University of Vienna. The aim of the facility is to develop a leading institution in the Danube region that is the primary point of contact for national expertise in hydrology, and whose know-how above all attracts international cooperation. The project **Aqua-safe** has already been launched, which in cooperation with the BOKU Department of Agrobiotechnology IFA-Tulln, the Medical University of Vienna and EVN Wasser will develop new indicators for microbiological contamination of water. Another focus at KL is on the development of genetic markers, which not only indicate the contamination of water with faecal impurities, but also determine their origin.

This is complemented by biochemical analysis methods developed at the IFA (Department of Agrobiotechnology). Together with other factors such as the hydrological situation of the catchment area, the faecal contamination is included in the safety assessment, from which further management scenarios for use as bathing water or drinking water can be derived. The new research focus at KL will be equipped with the appropriate technical facilities so that it optimally complements the methodological scope of ICC Water & Health. ■



"We develop solutions for sustainable safety management of water, the basis of life."

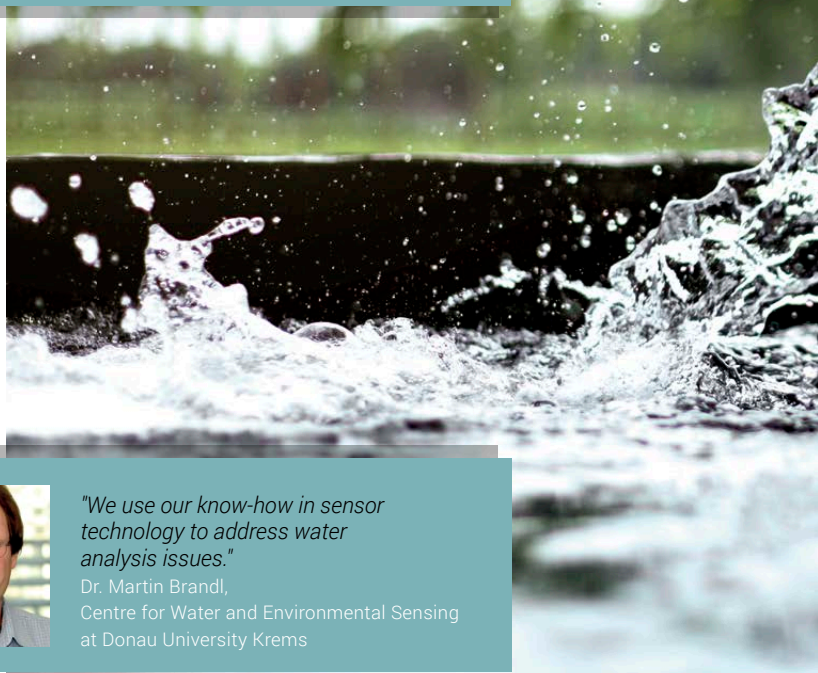
Univ.-Prof. Andreas Farnleitner,
Karl Landsteiner Private University for
Health Sciences

The Department of Integrated Sensor Systems (DISS) at the Danube University Krems develops sensors for a wide range of measurement principles and applications. The **Centre for Water and Environmental Sensors** headed by Martin Brandl specialises in the sensor-based determination of important parameters of water quality. For E. coli bacteria contamination (an indicator of the fouling of drinking water by faecal matter), the team has developed a rapid test that can provide information on whether bacteria contamination is present or not in a matter of hours. The system is intended to enable homeowners in rural areas to quickly assess the quality of water in domestic wells. In another project, sensor systems were developed which enable continuous monitoring of the sum parameters "chemical oxygen demand" (COD) and "biological oxygen demand" (BOD). These quantities provide information about the level of contamination by organic compounds and microorganisms. "Households that are not connected to a sewer system must operate a biological wastewater treatment plant and check it regularly for operational readiness," explains Brandl. The system developed by his group allows this to happen semi-automatically and notifies the homeowner when permissible levels are exceeded. A current research project is also working on rapid, sensitive detection of legionella (human pathogenic microorganisms that can occur in hot water heating systems).

While the detection of microorganisms is usually based on an enzyme reaction that is monitored electrochemically, chemical contaminants such as nitrate or nitrite can be detected photometrically. In this field, the Centre has developed methods for evaluating the measurement results of multi-sensors. ■

SENSORS FOR WATER ANALYSIS

Krems know-how for rapid tests and monitoring



"We use our know-how in sensor technology to address water analysis issues."

Dr. Martin Brandl,
Centre for Water and Environmental Sensing
at Donau University Krems

A close-up photograph of water splashing from a tap, with droplets in mid-air and a blurred green background. The image is used as a background for the top half of the page.

HYGIENIC RIGHT TO THE TAP

Guidelines for drinking water supply in buildings

In 2015, the Lower Austrian Construction/Energy/Environment Cluster project Drinking Water in Buildings, which strives to raise the hygiene standard of drinking water supply in buildings, was awarded the Clusterland Award.

"We are supplied excellent water,

but we are careless about what happens to it inside a building," says Herbert Wimberger, President of FORUM Wasserhygiene (Water Hygiene Forum). Especially as there are numerous sources of hygienic problems: oversized systems, low flow at the taps, lack of decalcification of shower heads and hoses. Hot water heating systems, in particular, are therefore a common breeding ground for the human pathogenic Legionella.

Working in collaboration with research partners such as the Karl Landsteiner Private University, the FH Campus Vienna, the BOKU (University of Natural Resources and Life Sciences, Vienna) and the OFI (Austrian Research Institute), guidelines have been established for piping, insulation, water treatment, storage and valves, as well as hazard analysis.

As a result of the project, the FORUM Wasserhygiene was founded, in which experts from science, local authorities, associations and industry are networked together. The forum under-

takes measures to improve the water hygiene knowledge of planners and tradesmen involved in providing the drinking water supply and is committed to raising awareness of property managers of residential and business premises as well as end customers. ■



*"We are supplied excellent water,
but we are careless about what happens
to it inside a building."*

Herbert Wimberger,
President of FORUM Wasserhygiene

TECHNOPOLES WIESELBURG & KREMS



The institutes based at Technopol Wieselburg are engaged in recognised leading-edge research in the fields of bioenergy systems, agricultural technology, food technology and water management. Key areas include energy efficiency, renewable energies, agricultural technology, feed and food and water balance. k.nagelhofer@ecoplus.at

At Technopol Krems, new paths are being forged in biomedicine, pharmacy and healthcare. The research institutes based here and the companies at Biotechnology Centre Krems (BTZ) and at RIZ Nord have specialised expertise in regenerative medicine, blood purification, oncology as well as numerous aspects of the health sciences. v.ossmann@ecoplus.at

This booklet is also available as an e-paper. Simply scan or download the QR code at:



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In this publication, all statements relating to persons refer equally to women as to men, the male form was chosen in the text only for the sake of simplicity.

