

Eawag

Swiss Federal Institute of Aquatic
Science and Technology

Eawag – Science that matters

How can we use water resources while at the same time preventing water pollution and keeping aquatic ecosystems healthy? To address this fundamental challenge, we carry out research and build bridges between academia and practice.

eawag
aquatic research o o o

Will we still be able to drink water without pretreatment in 20 years' time?

The white trailer parked beside the river in Saint-Ursanne (in the canton of Jura) looks as if it has been abandoned by a travelling fair. But on closer inspection, it clearly has a life of its own: a gentle humming sound can be heard, and there is a hose running from the trailer directly into the Doubs. This is Eawag's MS²field – a mobile high-tech laboratory which autonomously analyses surface or groundwater samples for residues of pharmaceuticals or pesticides. Here, around the clock, river water is fed into a mass spectrometer inside the trailer, delivering data in real time – even to a smartphone. Not only is this approach faster and less laborious than conventional sample collection and laboratory analysis, but because short-term peaks can also be detected it provides more precise results. On this basis, more targeted measures can be taken to reduce contamination and thus keep Switzerland's water resources clean – well beyond the next 20 years.

Further information:

www.eawag.ch/en/ms2field



Eawag, Aldo Todaro

Eawag, Andri Bryner

Cover photo left: In Joaquin Jimenez-Martinez's research group Dorothee Kurz is investigating how bacteria form biofilms in soils and groundwater aquifers. (Eawag, Alessandro Della Bella)

We need to see wastewater as a resource



Whenever we flush the toilet, nutrients go to waste: phosphorus, nitrogen, potassium and other valuable components of urine can be used to produce fertilisers for agriculture. Dried faecal sludge can be processed into fuel pellets. In the Blue Diversion Autarky project, Eawag and its partners have developed a toilet which maximises resource recovery: faeces, urine and flush water are separated at source

for further treatment. At the same time, this sanitation system offers a safe and affordable solution for people living in areas without electricity, piped water or sewers. This Swiss sustainable development project has attracted considerable attention at the international level.

Further information: www.eawag.ch/en/autarky



“I’ve always been fascinated by fish and the diversity of fish species. I grew up with more than 25 aquariums in my home. A lot of people would like to protect nature, but very few look underwater. With birds, any changes are widely and rapidly observed. With fish, nobody notices them.

In fact, it’s freshwater fish that are most seriously affected by environmental changes and human interference. Large numbers of species have already gone extinct. We want to understand fish diversity and the dynamics of species development and extinction. We can then determine what needs to be done to preserve biodiversity.

For over 15 years, we’ve been investigating fish diversity in Swiss lakes and rivers – recently also in old sediments. We use genetic methods to analyse the scales, bones and teeth we find. Comparison with historical data shows that what our lakes harbour today is only a fraction of what used to live there.”

Ole Seehausen, Head of Fish Ecology and Evolution

Further information:
www.eawag.ch/en/projetlac

If you want to understand the diversity of nature, you need to get your feet wet!

How can we protect the climate without damaging the environment?

Like a monster's trunk, a pipe lurks at the bottom of Lake Geneva. Water collected at a depth of 40 metres passes through a heat exchanger before being returned to the lake. Energy from the thermal exchange network, rather than oil



or gas, is used by the local authorities to heat buildings occupied by the International Committee of the Red Cross and other international organisations, thus reducing CO₂ emissions by up to 80 percent. During the summer, the system operates in reverse for cooling. Lakes, however, are sensitive ecosystems with complex interdependencies between biological, chemical and physical processes. Eawag's research is showing what types of thermal use are not harmful – or may even be beneficial: cool water extracted from the depths and discharged closer to the surface lowers the summer water temperature, thus mitigating the effects of a warming climate on the lake.

Further information:
www.eawag.ch/en/heatcool



“Empowerment of the Empowerment of the milizsystems system” is how Philipp Stauer, Head of the Water Department at Solothurn’s Cantonal Environment Office, describes a project jointly undertaken with Eawag. In the rural communes of Gänsbrunnen and Buchegg, the ageing wastewater treatment plants need to be replaced. The options available include connection to a larger plant, small decentralised plants, or even innovative urine-diverting toilets. Determining which system is most suitable is particularly difficult for small communes, where many take on duties as local officials alongside their normal professional work. Stauer says: “If it’s hard to assess the consequences of switching to a new system, then you tend to carry on as before. We wanted to empower the authorities to make a real choice.” Eawag broke down the complex issues in such a way as to enable participants to focus on their expectations of the future wastewater system, without having to concern themselves with technical details. This approach is now to be applied in other areas, such as water supplies or road-building.

Further information:
www.eawag.ch/en/DA



Eawag/FHNW, Mariyna Peter-Varbanets

Sustainability also means allowing the next generation to make its own decisions

Access to safe drinking water and sanitation is a human right



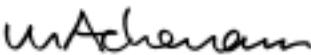
Her children used to get sick when they drank water directly from the lake, Margaret Athieno from Uganda recalls. “But today we’re fine – we don’t need the bilharzia tablets anymore.” The family’s drinking water still comes from Lake Victoria, but now they obtain it – for a small fee – from the water kiosk at the local school. This water is naturally treated using a gravity-driven membrane filtration process developed by Eawag. Together with local partners, Eawag has established five kiosks of this kind in Kenya and Uganda, supplying clean water to tens of thousands of people. At the same time, the water kiosks provide an income for the operators. Experience gathered in Africa is fed back into research conducted in Switzerland on decentralised drinking water supply or grey water recycling.

Further information:
www.eawag.ch/en/graviteau

Eawag is a world-leading aquatic research institute. Covering a wide range of subjects and maintaining close contacts with partners in practice and an international network, it offers an excellent environment for gaining a comprehensive understanding of aquatic ecosystems and water resources, identifying emerging problems, and developing broadly accepted solutions.

Water is a vital resource. For this reason, our ancestors already began to modify the surface-water landscape – draining, damming, diverting and culverting. As the economy boomed, algal blooms and foam appeared on our rivers. But that was then. The problems affecting natural waters today are not immediately visible to the naked eye, but the condition of our lakes, rivers and groundwater reflects current challenges: a warming climate, chemical pollution, loss of biodiversity, and resource-efficient urban development. Nor should it be forgotten that, worldwide, around 800 million people still lack access to safe water and almost 2.4 billion are deprived of sanitation.

At Eawag, through outstanding interdisciplinary efforts involving environmental and social scientists and engineers, we not only improve scientific understanding of water as the basis of life, but ensure that our knowledge can be applied in practice – thus contributing to a more sustainable future for society as a whole.



Martin Ackermann, Eawag Director

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saw the establishment of the ETH Advisory Centre for Wastewater Treatment and Drinking Water Supply, which in 1946 became known as Eawag (German acronym of the Federal Institute of Water Supply, Wastewater Treatment and Water Pollution Control). Now independent, it operates as the Swiss Federal Institute of Aquatic Science and Technology.

A centre of excellence in aquatic science and technology – for Switzerland and worldwide

Eawag is a leader in its field, recognised internationally for its expertise. Some of its scientists are among the most highly cited researchers in their discipline worldwide. Eawag is well-integrated into the national research landscape, maintaining numerous joint professorships with the Federal Institutes of Technology in Zurich and Lausanne, as well as with other higher education institutions.

Teaching also plays an important role at Eawag. Students are involved in projects from the outset, and the institute offers an ideal environment for doctoral research, as shown by the awards regularly received for dissertations. Programmes such as the Eawag Postdoctoral Fellowship foster talented scientists, providing opportunities to build a research career and develop networks.

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Although much has been achieved in the protection of natural waters, our streams, rivers and lakes are still under pressure. Further progress will depend on the findings of cutting-edge research being made available to water professionals – that’s precisely what Eawag does.”

Stefan Müller-Altermatt, National Councillor

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Professors and lecturers

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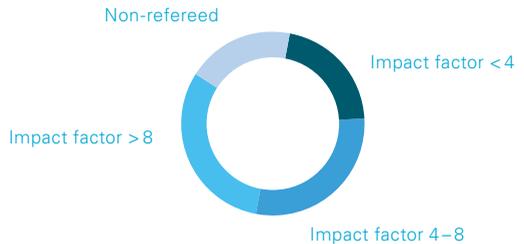
doctoral theses supervised

From curiosity-driven research to application in practice

At Eawag, natural scientists and engineers collaborate closely with social scientists. Developing a technology is often only the first step towards solving a problem – the adoption of a solution will ultimately depend on political and societal processes.

An interdisciplinary approach to water-related questions yields a more subtle analysis and hence often better solutions.

Through training and consulting activities, Eawag disseminates the findings of its research to water professionals. Specialists from industry, administration and engineering/environmental consultancies can bring their knowledge up to speed and benefit from direct contact with Eawag experts.



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Publications (in 2022)

More than half of all Eawag publications appeared in leading journals with an impact factor above 4. The most prestigious (>8) group includes journals such as *Nature* or *Science*.

With an extensive network of partners Eawag develops solutions for practice

Eawag researchers work hand in hand with water professionals. In collaboration with energy companies and the cantonal authorities in the Grisons, Eawag developed guidelines for artificial flooding and the flushing of hydropower reservoirs, which have been recognised as a model internationally and adopted in the USA.

Another example is the use of flow cytometry to quantify microbial cells in water using lasers. This makes it possible to assess the microbiological quality of drinking water more efficiently than with conventional methods. The analytical method developed by Eawag in partnership with universities of applied sciences is now being employed commercially by a spin-off.

As well as higher education institutions, Eawag's regular project partners include federal offices, cantonal laboratories, water suppliers, hydropower operators and engineering/environmental consultancies.

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Our innovations are driven by the need to protect water and use it carefully. Eawag is an important partner in the development of new products for the market – like our urine-diverting toilet, which allows this resource to be utilised.”

*Marc Viardot, Marketing and Design Director,
Roca Group, Keramik Laufen AG*

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joint activities with
universities of applied sciences

Eawag: international to the core

Eawag attaches particular importance to the international composition of its staff. Almost half of its employees come from outside Switzerland. The Eawag Partnership Programme for Developing Countries offers eligible students the opportunity to carry out research at Eawag, establish contacts and – when they return to their home countries – pass on the expertise they have acquired.

Eawag scientists are involved in the work of more than 100 international organisations and committees – as members of scientific associations, the advisory boards of renowned research institutes (such as within the Leibniz Association), or the international commissions for the protection of the Rhine and Lake Constance. Eawag is also a World Health Organization collaborating centre.

National professional committees 81

International scientific committees 70



International professional committees 37

National scientific committees 78

50:50

40 % of the committees on which Eawag experts serve are international.

Ratio of female to male employees.

Among scientific staff, the ratio is 47:53.

Eawag's organisation

Eawag focuses on three areas:

- water for human welfare
- water for ecosystem function
- strategies for resolving resource-use conflicts

Administratively attached to Eawag is the Ecotox centre – the Swiss competence centre for applied, practice-oriented ecotoxicology – which assesses the environmental effects of chemicals and develops strategies for minimising the associated risks.

Altogether, more than 500 people – including 300 scientists – are employed at Eawag's headquarters in Dübendorf (in the canton of Zurich) and at the Centre for Ecology, Evolution and Biogeochemistry in Kastanienbaum (in the canton of Lucerne); support is provided by technical and administrative staff.

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Research departments

- Surface Waters Research and Management
- Aquatic Ecology
- Fish Ecology and Evolution
- Environmental Chemistry
- Environmental Microbiology
- Environmental Toxicology
- Water Resources and Drinking Water
- Process Engineering
- Urban Water Management
- Sanitation, Water and Solid Waste for Development
- Systems Analysis, Integrated Assessment and Modelling
- Environmental Social Sciences



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