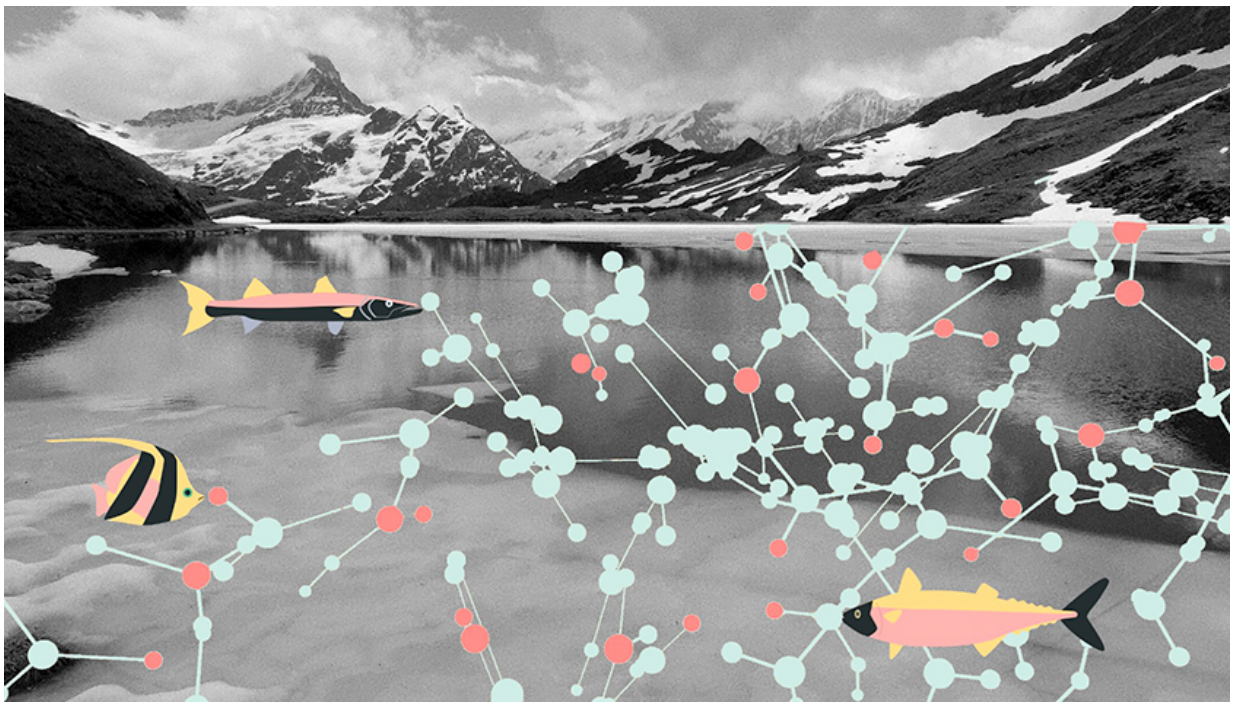

Industrial wastewater: even state-of-the-art treatment plants do not eliminate all contaminants

July 19, 2022 | Andri Bryner
Topics: Wastewater | Pollutants

Even though industrial wastewater is treated at state-of-the art plants, the sheer variety of synthetic organic compounds from the chemical and pharmaceutical industry which end up in surface waters are seriously underestimated. This is shown by a new study carried out by Eawag and ETH Zurich.

Certain sources of chemical pollution of the aquatic environment, such as agriculture or municipal wastewater, are now reasonably well known. But knowledge of the quantities and diversity of synthetic organic compounds released in industrial wastewater from chemical and pharmaceutical production remains fragmentary. This is not unproblematic, as the substances in question include compounds which are highly persistent, bioaccumulative or may promote the development of antibiotic resistance. In addition, many substances slip through the net of conventional monitoring since they are simply not targeted.

Non-registered chemicals also found

In this nationwide study, effluents from 11 wastewater treatment plants (WWTPs) were investigated in detail over a period of several months. At the WWTPs selected, discharges from industry made up a widely varying proportion of the wastewater treated – from 0 to 100%. Effluent samples were analysed using (partly automated) high-resolution mass spectrometry. It was thus possible to determine the total number of compounds present and also to monitor substances for which only short-term peaks were detected. The findings of this extensive sampling campaign were essentially threefold:

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- **Larger variety of substances and higher concentrations** than in treated domestic wastewater: Compared to domestic effluents, treated industrial wastewater contains at times up to 15 times more substances, with 1–2 orders of magnitude higher maximum concentrations of synthetic organic compounds and greater fluctuations.
- **Composition reflecting production processes:** The chemical diversity of effluents is highly site-specific, reflecting the production processes of the companies concerned. However, it is also strongly influenced by other factors, such as the extent of on-site pretreatment, companies' wastewater storage and discharge practices, and the type of WWTP facilities available.
- **Complex mixtures:** Among the enormous variety of substances detected, there may also be toxic compounds, which pose risks to aquatic communities – not least because the highly fluctuating emissions can lead to unexpected peak concentrations and this in constantly changing chemical compositions. Also identified in the effluent samples were non-registered chemicals.

The scientists involved in the study conclude that current water quality assessment practices are inadequate. Today, monitoring generally involves analysis of a standard list of target compounds and certain sum parameters, rather than consideration of the individual situation. But, as the scientists argue, this would be essential if suitable monitoring programmes are to be developed and – where necessary – mitigation measures adopted. Mitigation strategies require a multifaceted approach, ranging from changes in companies' wastewater handling and innovations at WWTPs, to modifications of production processes and legal regulations, or even prohibition of certain substances. Industrial companies are already successfully implementing some of the measures.

Original publication

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Simplified version for water professionals on the Water Science Policy platform: Singer, H. et al. (2022) 'Mapping unknown chemical contaminants in Swiss waters' Water Science Policy, doi: https://dx.doi.org/10.53014/USJG7720

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