

Science for Environment Policy

Chemicals risk assessment: Baltic study recommends more monitoring of emerging pollutants

Chemicals are everywhere and new substances are regularly being introduced to the market. However, only some pose a risk to the environment. How do we decide which of them to monitor? A new study using a database of chemicals found in fish in the Baltic Sea has assessed which chemicals are commonly monitored. The researchers suggest that monitoring is biased towards known, already regulated hazardous chemicals, and recommend changes to address other chemicals.

Although chemicals have improved people's quality of life in many ways, they have, in some cases, put the health of ecosystems and of people at risk. To protect the environment, the EU's [REACH](#) regulation requires all substances for which over 1 tonne is produced in (or imported to) the EU every year to be registered. Under REACH, the hazards posed by registered substances to human health and the environment are evaluated, and restrictions on placing them on the market and on their use are imposed if appropriate.

In order to enable sound management of chemicals, with the aim of reducing the risks associated with their use, their effects in the environment should be known and their occurrence should be monitored. However, it is not feasible to do this for the millions of chemicals in use. It is, therefore, important to prioritise the chemicals of highest concern — a major challenge currently facing regulatory bodies.

This study investigates how chemicals are prioritised for environmental analysis, using the Baltic Sea as a case study. The Baltic Sea is heavily polluted both by chemicals currently emitted, such as certain pharmaceuticals, and also by 'legacy' pollutants — i.e. pollutants released extensively years ago, but still of concern due to their persistence and hazardous properties.

To investigate which of these chemicals have been analysed (not specifically for regulatory purposes), the researchers looked at which chemicals were detected in Baltic Sea fish between 2000 and 2012. The focus on fish was for several reasons, including that contamination of fish in the Baltic Sea is a well-known and serious problem, which has led to restrictions on the European market in the trading of herring caught in the Baltic Sea, and that herring, a prominent fish species in the Baltic Sea, is very lipid rich, which facilitates the detection of organic pollutants in its tissue. The researchers collected data from screening programmes in Sweden, which borders the Baltic Sea, and from scientific journals.

In total, 105 different substances/groups of substances were analysed in Baltic Sea fish. The most studied substances were polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) (more commonly known as dioxins), and polychlorinated biphenyls (PCBs), another type of persistent organic pollutant (POP). POPs were by far the most studied substances; almost three quarters (72%) of all analyses were related to a POP-type substance. The majority (87%) of the analyses focused on the same 20% of substances, and almost half of substances were analysed only once.

Next, the researchers determined how many of these chemicals are regulated under the following:

- [Regulation EC 1272/2008 on classification, labelling and packaging \(CLP\) of substances and mixtures](#), which provides hazard information on chemicals.
- [The Stockholm Convention](#) (Annexes A, B and C) — an international agreement to protect human health and the environment from POPs.



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- [Regulation EC 1907/2006](#) concerning the registration, evaluation, authorisation and restriction of chemicals (REACH), which provides two important risk-management measures: authorisation and restriction:
 - [REACH – Restriction list \(Annex XVII\)](#), which restricts placing on the market and use for specific chemicals.
 - [REACH – Candidate list](#), which proposes identified 'substances of very high concern' (SVHC) for the [Authorisation list \(Annex XIV\)](#).
- [Directive 2008/105/EC](#) (as amended by [Directive 2013/39/EU](#)) on environmental quality standards (EQS). This Directive sets EQS in EU waters for a list of priority substances identified as posing a significant risk to the environment, or to human health via the environment, with the aim of achieving good chemical status.

More than two thirds of substances (70%) were covered by at least one regulation, or self-classified by industry according to CLP environmental hazard criteria. Some of the non-regulated chemicals included certain metals, perfluorinated compounds (present in water-resistant materials and flame retardants), phenolic substances (widely used in industry) and phthalates (used to make plastics more flexible), although many chemicals in these groups are regulated.

Overall, the results show that the majority of analyses of fish in the Baltic Sea are focused on a small number of already regulated chemicals. Although regulated and some other known hazardous chemicals pose a high risk, the bias towards them could be diverting policymakers from identifying risks posed by other toxic chemicals.

The researchers suggest several ways of improving this situation, including using [non-target screening techniques](#), such as chromatography combined with high-resolution mass spectrometry, which uses a more open-ended approach to screening for pollutants and can detect not only known hazardous chemicals (traditionally detected by using reference substances) but also potentially overlooked harmful chemicals. The researchers also recommend using biological tools, such as biomarkers, which measure the toxicity of chemicals via the physiological effects they have on organisms, such as effects on growth, reproduction or gene expression¹.

They also say that more open communication between regulatory activities, such as between risk assessment under REACH and monitoring under the [Water Framework Directive](#), could be beneficial. Finally, they recommend that environmental agencies consider the chemicals contained in consumer products as emerging pollutants. They say these products are a major source of toxic substances, but are covered to a limited extent by current regulation.

As this study was limited to analyses on fish, only chemicals with the potential to bioaccumulate are represented in the results. It is possible that other chemicals have been monitored in other types of study, such as in studies that sample water directly.



1. For more information on effect-based biological tools, see the European Commission's 2014 Technical Report on Aquatic Effect-Based Monitoring Tools: <https://circabc.europa.eu/sd/a/0d78bbf7-76f0-43c1-8af2-6230436d759d/Effect-based%20tools%20CMEP%20report%20main%2028%20April%202014.pdf>