

Chemicals of concern: a prioritisation and early warning system for England

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Addressing Chemicals of Emerging Concern is a global challenge. There are more than 350,000 chemicals and mixtures of chemicals registered for production or use (1), and that number is predicted to double by 2030. The UK Government's 25-Year Environment Plan (2) highlights the need for early identification of chemicals of concern, so that effective intervention can be undertaken prior to damage being caused to the environment, wildlife, or human health. To address this chemical challenge, the Environment Agency (EA) have developed a Prioritisation and Early Warning System (PEWS) for England.

The EA's aim has been to establish a system which ensures appropriate regulatory focus on individual and groups of substances of emerging concern. This is based on a suitable risk assessment, considering each substance in terms of readily available usage data, fate and ecotoxicological parameters and monitoring data.

The PEWS process, as shown in **Figure 1**, includes nomination and sifting of substances, then screening of substances for potential risks to surface waters (freshwater and marine), groundwaters, soils, biota, and sediments and to human health *via* the environment. Chemicals are then prioritised for environmental regulation if there is considered sufficient risk. For some substances, the process demonstrates a need for further environmental monitoring to understand current concentrations and increase certainty in prioritisation outputs.

This brief describes the development and use of PEWS, illustrating some of the substances which have been screened for potential risks to date, and the link from PEWS to potential regulatory intervention where this process has shown to be appropriate.

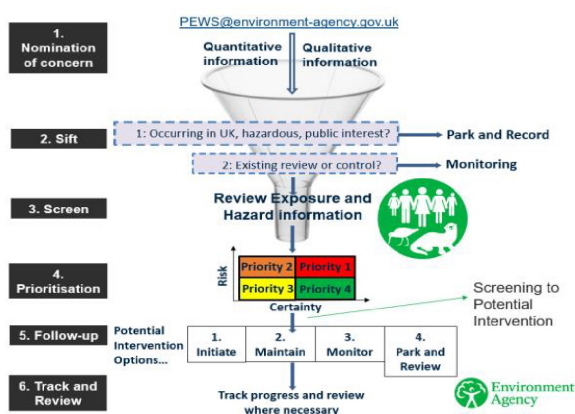


Figure 1: Prioritisation and Early Warning System process.

Nominating chemicals of concern

We invite readers of this ECG Environmental Brief to be part of the solution to emerging contaminants with the opportunity to nominate substances considered to be of concern. To nominate a chemical of emerging concern into PEWS, email PEWS@environment-agency.gov.uk, with the name of the substance and any explanation as to why it should be considered.

Nominations from interested parties and monitoring evidence are routinely included within PEWS. Following advice from the Hazardous Substances Advisory Committee, the EA is now systematically screening a sub-set of scientific literature for chemicals of emerging concern through an RSS feed. In 2021, we have also been part of the first ever horizon scan specifically focusing on chemical issues, mirroring the horizon scan approaches taken previously for biodiversity (3). Several of the issues flagged within the horizon scan will form areas of focus for identifying relevant substances to be nominated into PEWS in the coming years.

Sifting chemicals of concern

For each nominated substance, sifting gives a ranking of 'High', 'Medium' or 'Low', based on whether it is anticipated to occur in the UK and whether it has the potential to become dispersed in the environment. We also consider whether the chemical poses a hazard, and the substance's toxicity (based on the Predicted No Effect Concentration (PNEC) from the NORMAN network factsheets (4)) and

incorporate an understanding as to whether the substance is of public interest.

A second level of sifting is undertaken to consider the current reviews and controls in place through existing regulations. Substances which score as 'High' are put forward for more detailed consideration in a screen.

Screening chemicals of concern

Screening considers both exposure data and chemical hazard data. Exposure data is based on EA monitoring data. The EA currently monitors surface and groundwaters with GC-MS and LC-MS target scans (5) for 1527 substances. Screening is undertaken on blocks of substances referred to as tranches. As of February 2022, 169 substances have been screened in six tranches. The limitations of taking a single substance approach to screening are recognised, so a group approach has also been adopted where possible, such as for quaternary ammonium compounds, glycol ethers, linear alkyl sulfonates, neonicotinoids, pet flea and tick treatments, phenolic benzotriazoles, synthetic pyrethroids and flame retardants. A fast-track approach has also been taken on groups of substances which have already been subject to detailed consideration at the EA, with these substances bypassing the screening step entirely to move straight to the potential intervention step.

Prioritising chemicals of concern

The result of screening is a set of prioritisation scores for each chemical of emerging concern, which are collated into heat maps. Water matrices (surface water and groundwater) have a result of 1 to 4, where 1 is 'High risk, high certainty', as shown in step four of Figure 1. Soil, biota, and sediment are either flagged for further consideration or not. This approach gives a systematic approach for determining whether each substance (or group of substances), based on current evidence, is considered to be of concern to the environment in England.

Potential Interventions

Prioritised substances are considered for potential interventions and, if appropriate, regulatory planning work is conducted. To establish where there may be outcome gaps, we consider a substance's source-pathway-receptor model, the existing legislative framework that applies and any known ongoing interventions by the EA (or other regulators).

We consider all three environmental compartments (air,

land, and water), and also consider the waste streams, given that waste disposal is often a significant pathway through which a chemical can enter the environment. Where we identify an outcome gap, we consider a range of possible interventions to close that gap, and where resources allow, we look to introduce these. Our regulatory planning work highlights common gaps or themes across a range of substances, and we are currently developing a number of work packages to address these. Delivery often involves working with partner organisations. For most emerging contaminants, new monitoring can be required. Recent additions to our target scans, linked to PEWS are 6PPD-quinone – a product of tyre breakdown which may pose a risk of mortality to Coho salmon in the US, and UV-328, a candidate Persistent Organic Pollutant. The lessons learned from regulatory planning work are used to provide feedback to Defra to help inform the proposed chemical strategy.

The next steps

Initial discussions have taken place to begin to explore the potential for PEWS to be a UK-wide system in the future, rather than England-only. The EA recognises the challenge in monitoring the growing number of chemicals of emerging concern. To address this gap, the EA is now beginning to invest in non-target screening approaches, which should give the presence or absence of up to 65,000 different substances. The insights from non-target screening will be fed into PEWS. If you would like to receive updates on the PEWS project, please get in touch to be added to the mailing list.

References

1. Z. Wang, G. W. Walker, D. C. G. Muir, K. Nagatani-Yoshida, *Environ. Sci. Technol.* **54** (5), 2575-2584 (2020).
2. 25-Year Environment Plan, <https://www.gov.uk/government/publications/25-year-environment-plan> (accessed February 2022).
3. W. J. Sutherland, et al., *Trends Ecol. Evol.* **37** (1), 95-104 (2022).
4. NORMAN network factsheets database, <https://www.norman-network.com/nds/factsheets/> (accessed February 2022).
5. Open Data Link to Environment Agency Target Scan Data, <https://data.gov.uk/dataset/0c63b33e-0e34-45bb-a779-16a8c3a4b3f7/water-quality-monitoring-data-gc-ms-and-lc-ms-semi-quantitative-screen>, (accessed July 2022).