European Commission

Science for Environment Policy

The German environmental specimen bank – a blueprint for EU chemicals management?

Environmental specimen banks (ESBs) first emerged in the 1960s and are now essential to environmental management across the globe. ESBs sample and archive environmental specimens and can be used to identify the distributions of chemicals within ecosystems and trace their exposure over time. This study uses the German ESB to illustrate their potential for chemicals monitoring in the EU.

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Environmental specimen banks (ESBs) collect and store samples in a standardised way, not just of wildlife species but also chemical contamination. After processing, samples can be archived and analysed retrospectively to identify trends over time. There are currently 15 ESBs existing or soon to be established in the EU. They stretch from Southern to Central Europe, up to the Polar Regions in Greenland and the Arctic, and down to Antarctica, covering ecosystems on land and in water. However, archived specimens are not currently harmonised between banks.

This study used the German ESB, one of the most established European ESBs, to show the potential of a coordinated system of ESB for EU chemicals regulation.

The German ESB, established in 1985, analyses exposure to chemicals in a range of ecosystems. While the Federal Environment Agency, part of Germany's Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, is responsible for its scientific strategy, the fieldwork, analysis and archiving is allocated to research institutions separate to government. Furthermore, all processes are informed by standard operating procedures, which ensure the reliability of data.

Investigations are carried out in six ecosystem types across a range of sampling areas, designed to represent the diversity of ecosystems in Germany. Four different types of specimen: limnetic (suspended particulate matter and animal samples from rivers and lakes), marine (samples of marine animals, sea birds and seaweeds), terrestrial (samples of animals and plants living on land) and human (body fluids and hair) are collected. Samples are processed, and the quality of the subsamples is verified by chemical analysis for legacy persistent organic pollutants (POPs), metals and other elements. This real-time monitoring data is published online for the scientific community and the public, and archived samples are registered in the storage data bank.

Thus far, the archive has collected approximately 300 000 sub-samples from around 1900 environmental samples. This includes real-time chemical concentration data for up to 14 POPs, 11 polycyclic aromatic hydrocarbons (PAHs) and 20 elements.

Several retrospective monitoring studies have been performed using these archived samples. The authors of this study reviewed a selection of these studies, those investigating persistent contaminants with high potential for bioaccumulation and/or biomagnification (also known as persistent bioaccumulative toxic (PBT) chemicals).

These studies were used to investigate the impact of substance use restrictions. Some of the most important results showed that levels of organotin compounds in marine life from German coastal waters decreased after the EU banned organotin-based antifoulings in 2003, and concentrations of polybrominated diphenyl ethers (PBDEs) in herring gull eggs taken from the North Sea declined following the 2004 EU-wide ban. Results like these highlight the potential of ESBs for monitoring chemical trends over time, and the benefits of cooperation between specimen banks and chemicals management.

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The authors suggest ESBs could enhance chemicals management in the EU by revealing how chemicals are distributed in the environment and how contaminant levels have been affected by specific regulation measures. Furthermore, because ESB monitoring programmes involve highly standardised protocols, they can provide data to support existing monitoring programmes. As well as determining whether substance-specific risk reduction measures have been effective, the authors say ESB data could be used to monitor the impact of general regulatory frameworks, provide quality standards for biota monitoring and to identify PBT chemicals.

The researchers suggest there would be many benefits to an EU-wide ESB programme. Data generated by Member States would be accessible and transparent, helping to build a picture of exposure across the EU. Furthermore, because ESB processes are guided by strict quality management, ESBs could be used to assess the monitoring results generated by less standardised programmes. As one of the oldest and best established in the EU, the German ESB provides a great illustration of their potential.

Overall, this paper demonstrates the utility of data generated by ESBs for chemical risk assessment. This is an unmet need in the EU, which currently lacks a harmonised monitoring scheme for PBT chemicals. However, efforts are being made to develop a more coordinated approach for the collection, storage, access and analysis of data on the occurrence of chemicals, as demonstrated by the Information Platform for Chemical Monitoring (IPChem), a Joint Research Centre initiative.