Trend Analysis of BPA in Surface Waters and Sediments: Lessons from Europe and Implications for a North American Study

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This work is funded by the American Chemistry Council's BPA Global Alliance

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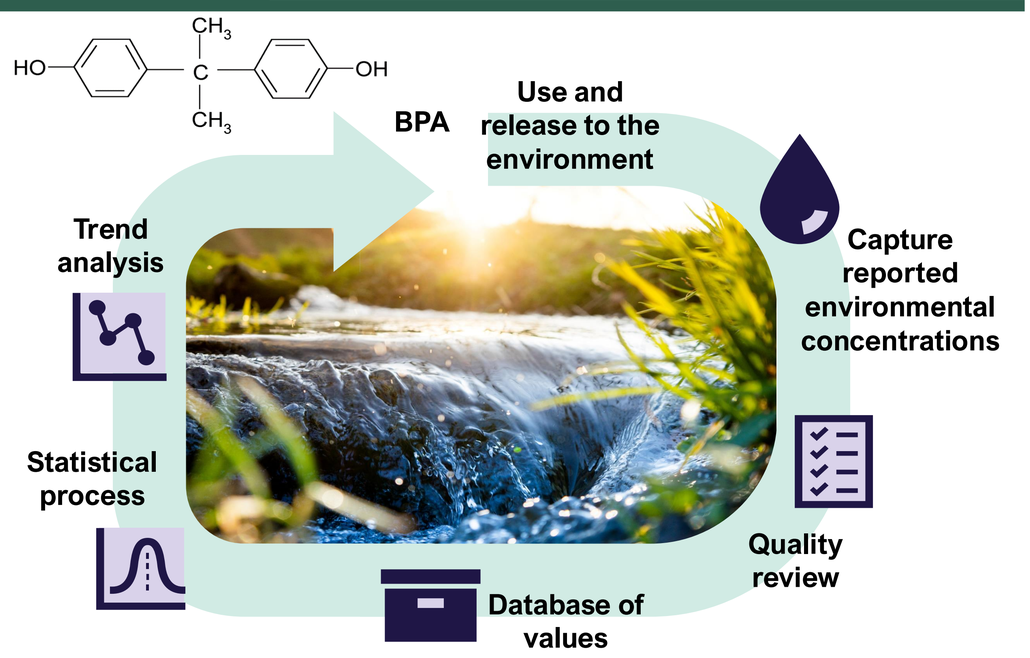
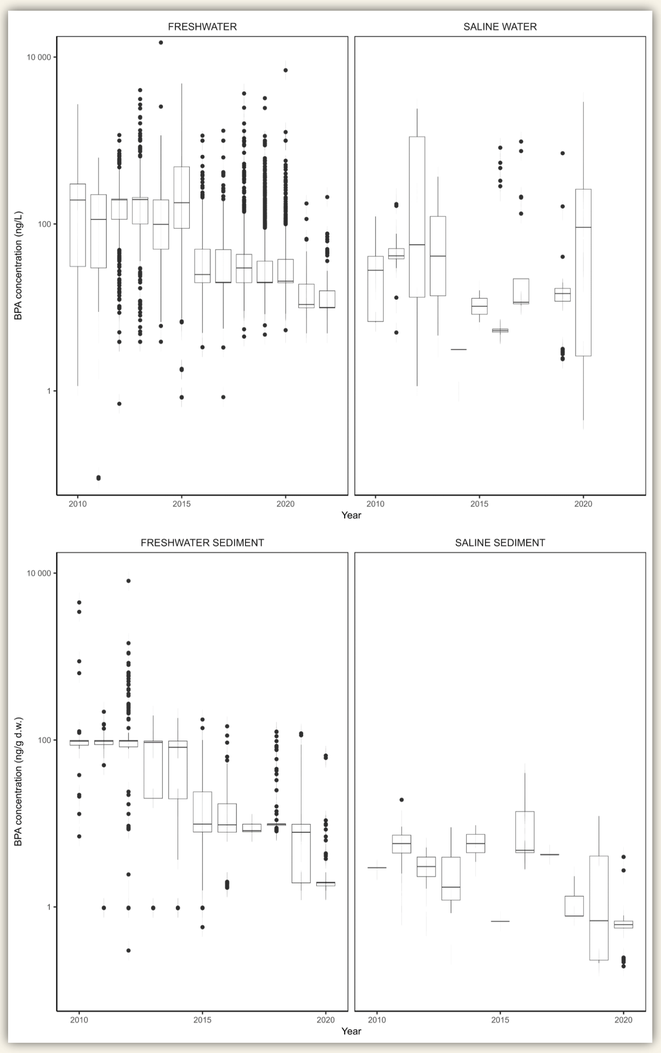
Introduction

- Bisphenol A (BPA) is a high-production-volume chemical used in numerous consumer products and materials for over 50 years.
- BPA has been detected in surface waters and sediments since the mid-1990s. Concerns over the endocrine active properties of BPA and other bisphenols have prompted increased regulatory scrutiny.
- This study examines recent data on BPA concentrations in surface waters and sediments across Europe and North America, with a focus on analysing trends over the past 14 years, updating the evidence base established by Klečka et al. (2009) and Staples et al. (2018).
- The study is the first large-scale application of the CREED (Criteria for Reporting and Evaluating Exposure Datasets) (Merrington et al., 2024).

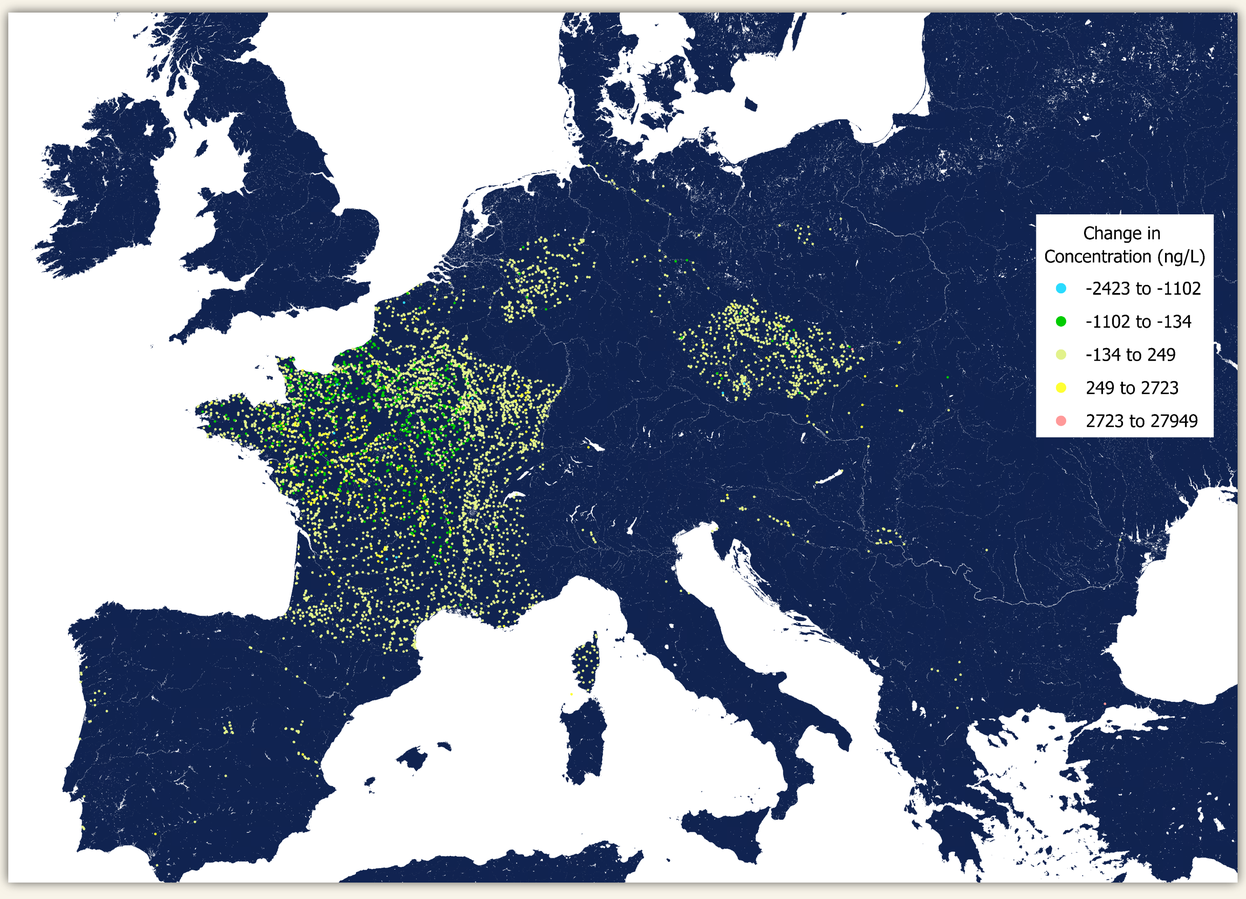


Trends in Europe: What we've learned

- 85,295 observations of BPA were identified from scientific literature and publicly available monitoring data.
- Only 46% of assessed studies met the CREED quality criteria, highlighting significant reliability issues in publicly available data.
- The dataset exhibits strong temporal and spatial variability.
- Data in France comprised the largest proportion of the dataset (89%, n=75,824).
- 85% of the dataset consisted of censored values (reported below the study-specific LOD).
- Time-trend analysis revealed an overall decrease in BPA levels in European freshwater and freshwater sediment, while no trends were observed in saline water and saline sediment over the period of 2010 to 2022.



Change in concentrations of BPA for individual sites in freshwater samples



Country	Environmental compartment	Years	OLS coefficient	P-value	Kendall Tau	P-value	Trend
France	Freshwater	2010 - 2020	-0.00126	0	-0.071	6×10^{-6}	Decreasing
	Freshwater sediment	2010 - 2020	-0.0385	0	-0.524	0	Decreasing
Germany	Freshwater	2010 - 2022	-0.0142	0	-0.151	0	Decreasing
Belgium	Freshwater	2013 - 2020	0.0767	0	0.232	0	Increasing

- Statistically significant declines were found in French and German freshwaters and French freshwater sediments.
- Contradictory results were noted in data from Belgian freshwater sites.

Next Steps: North America

- The U.S. Environmental Protection Agency has listed BPA as a chemical subject to prioritisation under its risk evaluation framework.
- To better understand current levels and historical trends of BPA from 2010 to 2024, analysis of surface waters and sediments across North America is essential.
- The geographical scope of this assessment includes the United States, Canada, and Mexico.
- The evaluation will follow the same methodology used in Europe.
- Review of scientific literature and publicly available databases is currently underway for BPA data collected from 2010 to 2024, evaluated using the CREED criteria.

What might we observe?

Regulatory actions, increased public awareness, and voluntary industry activities toward BPA-free products are expected to contribute to a decline in environmental BPA levels over time.

BUT preliminary results suggest there is a lack of extensive monitoring data available for North American surface waters and sediments.

BUT many literature studies and monitoring databases may not meet the CREED quality criteria due to poor reporting.

The Road Ahead: What comes next?

- ✓ Expand the collation and evaluation of reported BPA observations in North American surface waters and sediments.
- ✓ Conduct analysis of trends in BPA concentrations in North American waters. Advanced or refined statistical methods may need to be applied to the North American dataset.
- ✓ Preparation of a standardized guidance for the acquisition of high-quality environmental monitoring data based on the CREED

PARTICIPATING INSTITUTIONS

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