

Standardising Environmental Monitoring Data Analysis: Dashboard-Driven Approaches for Water Quality Assessment

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Introduction

- Open-data policies have expanded access to environmental monitoring data.
- Data are generated by many organisations for different purposes, using different methods and reporting formats.
- While data availability has increased, variability in structure, scope, and accessibility continues to limit effective integration and use.
- A key challenge lies in the lack of consistent guidance for environmental monitoring data analysis and interpretation.
- Regulatory frameworks and authorities apply differing methodologies, assumptions, and thresholds, reducing comparability and reproducibility of outcomes.

Methodology

- Guidance from multiple regulatory sources across a range of jurisdictions was synthesized to define a unified framework for monitoring data analysis and interpretation.
- The framework was implemented within an interactive R-Shiny environmental monitoring dashboard underpinned by the EnviroDataMonitor data collection and curation service β 2.0.1 database.

Results

- The dashboard enables consistent analysis across heterogeneous datasets by standardising analytical workflows and outputs.
- Provides a range of calculation options aligned with regulatory practices, guidance and reporting in the EU [including the WFD (2000/60/EC), QA/QC Directive (EC 2009/90/EC)], UK (UKTAG, 2013), Switzerland (Schorr et al., 2025), Netherlands (IPLO, 2026), as well as the US (EPA, 2009) and internationally (ISO, 2008).
- Options implemented address, amongst others:
 - The calculation of standard WFD and national statistical endpoints;
 - Utilising non-detect data with options ranging from substitution to non-parametric, semi- and parametric approaches;
 - The calculation of confidence thresholds for statistical endpoints;
 - The use of time- and flow-weighted data;
 - A range of default EU and national environmental quality standards.

Conclusions and Next Steps

- The implemented analytical approaches facilitate transparent comparison of results and supports more reproducible and robust chemical risk assessments.
- By improving consistency and transparency in data analysis, the approach helps reduce variability in interpretation across stakeholders, supporting more robust and defensible decision-making.
- Highlights importance of best practices for environmental monitoring data analysis and the role of open-source, well-documented methods and tools in improving consistency, transparency, and regulatory applicability.
- Public dashboards will be launched later this year.
- Assessment approach will be published later this year.

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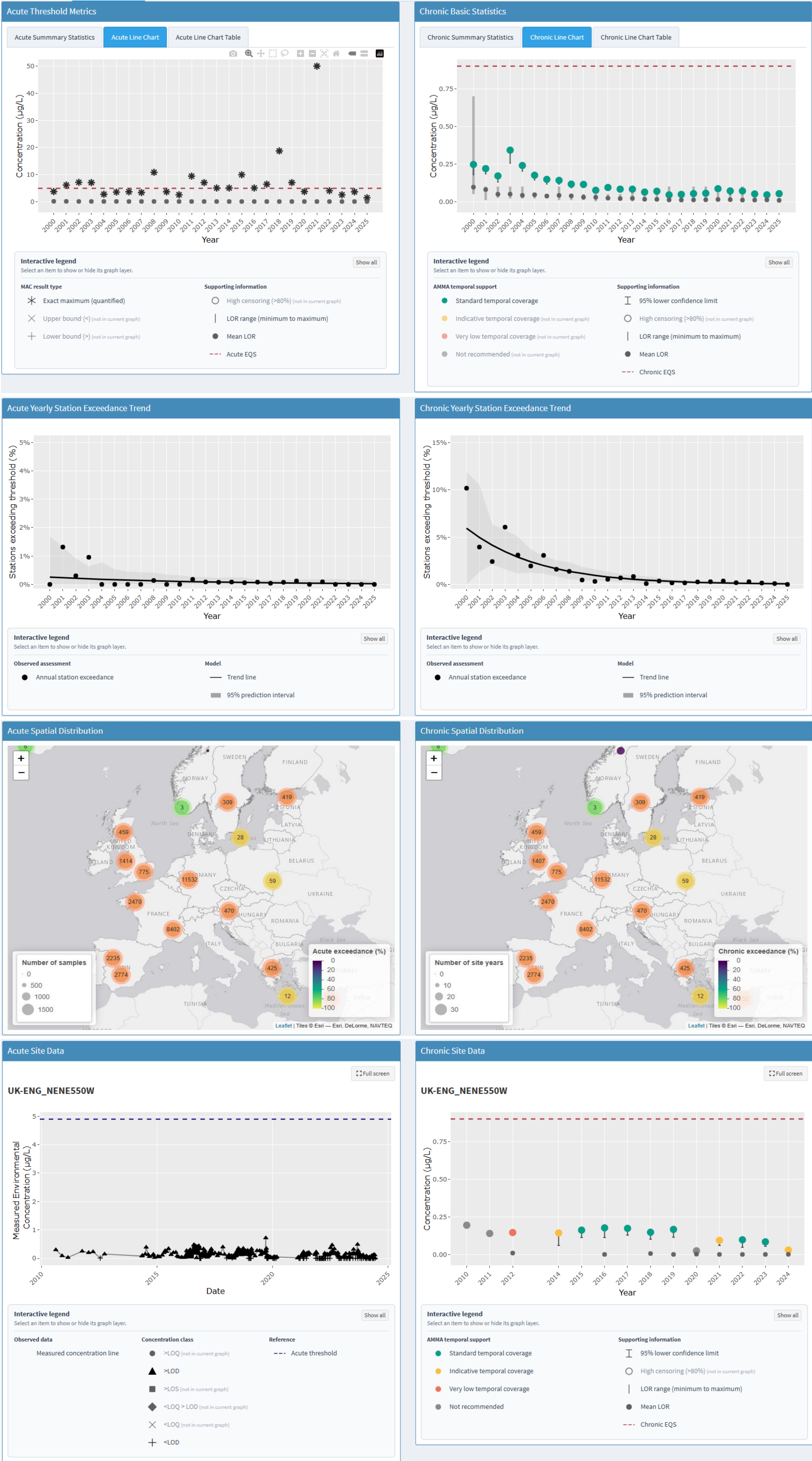


Figure 1: (a) Acute and (b) Chronic water quality assessment using EU WFD approach