

VARIABILITY IN ENVIRONMENTAL QUALITY STANDARDS: WHAT ARE THE CAUSES?

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INTRODUCTION

The Water Framework Directive (WFD) aims to achieve good surface and groundwater status by 2015. One of the tools used to deliver this aim are Environmental Quality Standards (EQS). In addition to EQS for Priority Substances (PS) that are harmonised across the EU, the WFD requires that Member States (MS) identify substances that are being discharged in "significant quantities" as Specific Pollutants and establish national EQS according to Annex V of the Directive. Many of the Specific Pollutants that have been identified are common across MS. Since MS have access to similar sources of data (and in some cases exactly the same data) and approaches to EQS setting are set out in EU Technical Guidance, most people would expect assessors to arrive at the same EQS when faced with the same data and methodology. This research examines whether this is the case.

Here, we show the results from an analysis based on eleven substances that recent research^{[1][2]} has identified as Specific Pollutants common to at least six MS, and we discuss the likely causes of the EQS differences between European MS under the WFD.

MATERIALS AND METHODS

In order to understand the causes of variability this project reviewed each step of the EQS derivation, focussing on long-term EQS for freshwater, expressed as an annual average. EQS dossiers were obtained, where available, from twelve MS. For each chemical the following information was collated:

- Number of ecotoxicity data points obtained (the inputs to EQS derivation)
- Number of data points remaining after reliability and relevance evaluation
- Choice of critical datum (typically the most sensitive species/endpoint)
- Extrapolation method adopted (deterministic or probabilistic)
- Choice of assessment factor

These have been compared in order to understand their contributions to any differences in the final long-term EQS values. Statistical methods have been used to determine whether there are any general causes for the variability in EQS values.

RESULTS AND DISCUSSION

Analysis of the EQS values derived by different MS for the same substance showed a high degree of variability for some substances (Figure 1).

Some of the variability in the EQS between MS is due to values being based on previous regulatory drivers and not updated to reflect current guidance. Variability between EQS was lower when comparing EQS that had been derived using the 2011 Technical Guidance.

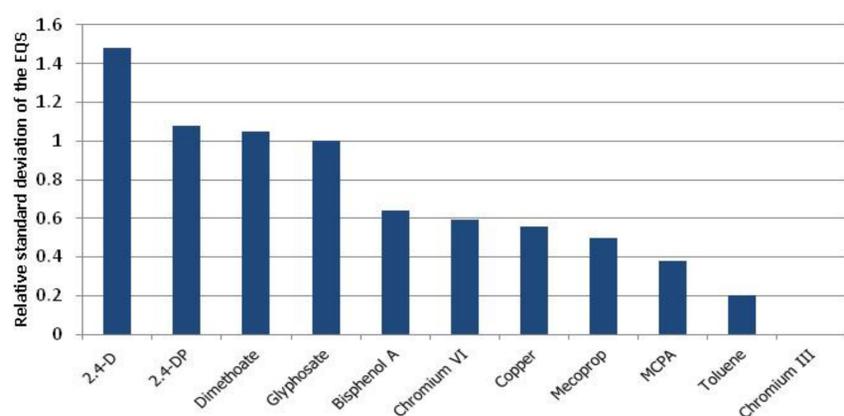


Figure 1. Relative standard deviation of the EQSs derived by different MS for all substances

STATISTICAL ANALYSIS

Although some causes of variability are relevant to more than one substance, Principal Component Analysis and regression analysis showed no general patterns between different substances and no clustering between substances in the same substance class (pesticides, organic chemicals and metals). If a larger dataset were available it may be possible to identify systemic causes of variability.

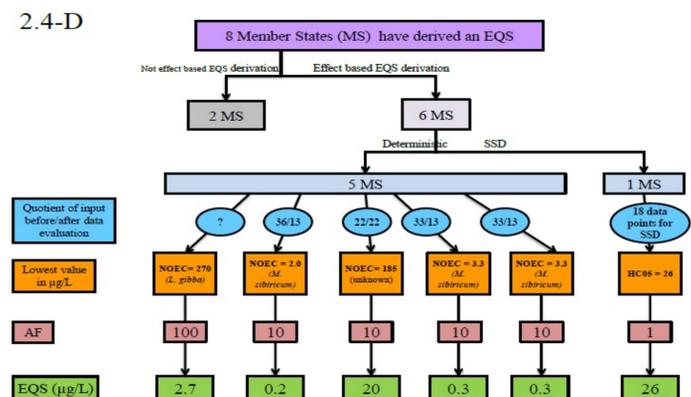
Although general causes of variability are not evident, it is possible to identify causes of variability that are common to a number of substances and separate these from substance-specific causes of variability. Substances with high, medium and low variability in EQS values are used as examples to illustrate causes of variability.

References:

- [1] Claussen U, Müller P, Merkelbag A, Garling T, Arle J. 2012. Germany: Umweltbundesamt (UBA). Comparison of Limits of River Basin District Specific Pollutants set for the Demands of the European Water Framework Directive in Streams and Rivers. WFD CIS ECOSTAT WG. Vers. 1.0.
[2] European Commission (EC). 2012. Comparative Study of Pressures and Measures in the Major River Basin Management Plans in the EU. Contract study 070331/2011/603663/ETU/D1.

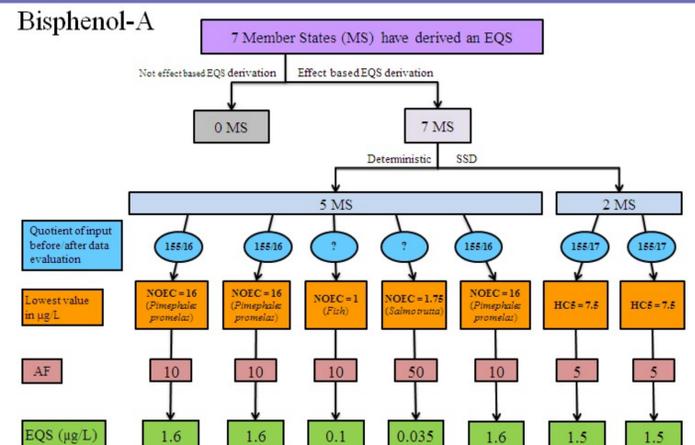
2,4-D (high variability)

Variation mainly due to the choice of the critical NOEC value. This depends on whether the MS have accepted results from non-standard species. Dicotyledonous plants are more sensitive to 2,4-D due to its mode of action, but standard test organisms are monocotyledonous (*Lemna* sp.), leading to higher NOEC values.



BISPHENOL A (medium variability)

- Reduced variability in the EQSs as a common data source (EU RAR) is used as the basis for the EQS
- Main cause of variability due to differences in reliability assessment of data and choice of the critical datum



TOLUENE AND CHROMIUM III (low variability)

- Low variability in EQS values as a common data source (EU RAR) used by nearly all MS
- Some variation in EQS derived for toluene as an older, more stringent EQS value, derived without using chronic data, was retained by one MS under the 'no deterioration principle'

CONCLUSIONS

- EQSs developed under previous regimes differ from those developed following the WFD Annex V principles. In time, these should be superseded by new EQS.
- The quantity of ecotoxicity data retained after quality assessment for a substance can differ greatly between MS. This may reflect differences in investment in data searching or in the rigour with which reliability assessment of the data is undertaken.
- Lower variability results when an EU risk assessment report (EU RAR) is the basis for the EQS derivation.
- Choice of extrapolation method (deterministic vs probabilistic) has a major impact on EQS variability.
- The identification of the critical datum can differ between MS, especially for endpoints where a standard test guidelines has not been used, and expert judgement is required.

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