

Applicability of sediment quality standard derived using standardized equilibrium partitioning method for the assessment of water bodies' status

Sandrine Andres, Arnaud Papin, Marc Chevreuil, Hélène Budzinski, Cécile Cren, David Amouroux, Fabrizio Botta

▶ **To cite this version:**

Sandrine Andres, Arnaud Papin, Marc Chevreuil, Hélène Budzinski, Cécile Cren, et al.. Applicability of sediment quality standard derived using standardized equilibrium partitioning method for the assessment of water bodies' status. 24. SETAC Europe annual meeting "Science across bridges, borders and boundaries", May 2014, Bâle, Switzerland. pp.151. ineris-01862424

HAL Id: ineris-01862424
https://ineris.hal.science/ineris-01862424

Submitted on 27 Aug 2018

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Applicability of sediment quality standard derived using standardized equilibrium partitioning method for the assessment of water bodies' quality

Andres S.[1], Papin A. [1], Chevreuil M.[2], Budzinski H.[3], Cren C.[4], Amouroux D.[5], Botta F.[1]

[1]INERIS, BP 2 Parc ALATA – Verneuil en Halatte, 60550 France
[2]LHE-EPHE, Université Pierre et Marie Curie, 4 Place Jussieu – Paris, 75005 France
[3]LPTC-EPOC, Talence, France
[4]ISA, Solaize, France
[5]IPREM-LCABIE, Pau, France

E-mail contact: sandrine.andres@ineris.fr

1. Introduction

In the implementation of the Water Framework Directive (WFD) [1], quality standards (QS) may be derived in the most appropriate matrix, including sediment for e.g. hydrophobic substances which are barely detected in water. The EU Technical Guidance Document on EQS (TGD-EQS) [2] recommends in certain circumstances to apply the equilibrium partitioning (EqP) method to derive a standard in sediment based on the standard derived in water. The TGD provides default values for the equations used in the application of the EqP, in particular for organic carbon content. When applied for the protection of benthic organisms, this method is generally believed to be rather protective, except for highly hydrophobic compounds for which an additional factor has to be applied, in order to take into account contamination occurring through food consumption.

This method was applied at national level for the derivation of QSsed of a large number of chemicals to be investigated in an exceptional survey in which 85 chemicals were analyzed at about 115 sampling points together with total organic carbon (TOC).

2. Materials and methods

Selection of chemicals

The selection of chemicals to be investigated in sediment took place within a larger prioritisation exercise among 2400 compounds considered as potential candidate substances; of which more than 400 are pharmaceuticals and associated metabolites, and about 70 are chemicals used in personal care and household products. The remaining compounds are mainly pesticides, biocides and industrial chemicals (Dulio and Andres, 2013 [3], adapted from NORMAN [4]).

Sampling site selection

These pesticides/biocides and other chemicals were analysed over 115 sampling points in rivers and 18 lakes in water and/or sediment, depending of the physico-chemical properties of the substances.

Physico-chemical analysis

Sediments were characterized by determining the percentage of the fraction of size smaller than 63 µm on the fraction of size of sediment smaller than 2 mm, the rate of dry material and the measure of the TOC. These freeze-dried samples were distributed to 5 laboratories for chemical analysis of organic substances (IPREM, EPHE, LPTC, CNRS-ISA and INERIS). The limits of quantification (LOQ) to be achieved for each chemical were determined as 1/3 of the quality standard in sediment (QS_{sed}). For this purpose, QS_{sed} was calculated using the EqP method from QS_{water} and default values for sediment parameters. According to the EU TGD on EQS, the default fraction for TOC is set at 0.05.

Organic-carbon partition coefficient (Koc) selection

For the application of the EqP method, Koc values are required. These values were retrieved from the existing INERIS database (www.ineris.fr/substances/). When several values were available, the lowest Koc value was used, since it represents a worst case in the application of the EqP method.

3. Results and discussion

The aim of this monitoring campaign is to contribute to the selection of substances to be integrated in water agencies' monitoring programmes in the various French river basins. Substances for which a risk of degradation of the water body quality was identified will be prioritised. For substances for which sediment was deemed a relevant compartment for monitoring, this risk was calculated comparing the environmental concentrations and the QS_{sed} derived with the EqP method with both default and site specific values for organic carbon.

The results show that for a significant number of stations, the estimation of the risk may be different depending of the use of default or site specific TOC (Figure 1*)*. This result is substance-dependant. In addition, for those sampling sites with a TOC profile which differs significantly from the default EU sediment, the overall estimated risk is evidently more impacted. It is also to be noted that default values proposed in the TGD for the application of the EqP method at EU level are not protective in a majority of the stations investigated in this campaign. In order to increase the understanding of *in situ* toxicity, this indication of bioavailability is used to interpret the differences observed between the so-called chemical status and biological status.

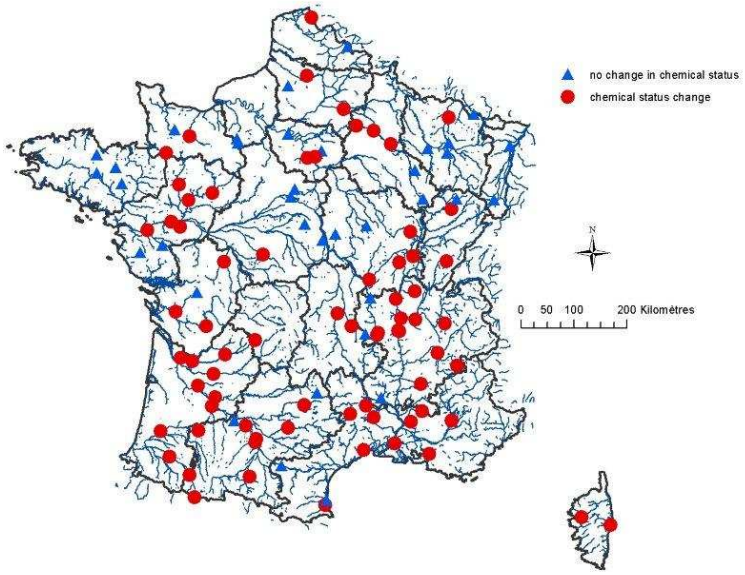


Figure 1: Impact of the use of site-specific TOC values on the quality assessment of 123 sampling sites selected in the national monitoring campaign in surface waters.

4. Conclusions

In this study, the EqP method was applied using EU-TGD default values or site specific TOC values for the derivation of QS_{sed}. The results show the use of site specific information may change the conclusions of the evaluation. These results indicate that bioavailability which is currently only considered for the assessment of trace metals under WFD should also be taken into account for organic substances.

5. References

[1] Directive 2013/39/EU of the European Parliament and of the Council of 12 August 2013 amending Directives 2000/60/EC and 2008/105/EC as regards priority substances in the field of water policy

[2] European Union, 2011. Technical guidance for deriving environmental quality standards. Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Guidance Document No. 27. Brussels, Belgium: European Communities.

[3] Dulio V., Andres S. 2013. Référentiel Méthodologique pour la priorisation des polluants des milieux aquatiques, pp. 45.

[4] NORMAN: Network of reference laboratories monitoring of emerging environmental pollutant (www.norman-network.net)