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The hazardous priority substances in Italy: National rules and environmental quality standard in marine environment

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Abstract

Article number 16 of the Water Framework Directive (Directive 2000/60/EC) lays down the community strategy for establishment of harmonised quality standards for the priority substances and other substances posing a significant risk to the aquatic environment.

In order to achieve the protection objectives of the Directive 2000/60/EC, the Italian Ministry of the Environment proposed the quality standards for surface water, sediments and biota related to the priority substances listed in the decision No. 2455/2001/EC of the European Parliament and of the Council of November 20 (2001) [Decision N. 2455/2001/EC of the European Parliament and of the Council of 20 November 2001. The list of priority substances in the field of water policy and amending Directive 2000/60/EC. Official Journal of the European Communities, 15.12.2001, p. 5].

Particularly, for the protection of the marine environment, the proposed Italian rules state that, from 1 January 2021, the concentrations of the hazardous priority substances in Italian marine and lagoon waters must be near the natural background for natural substances, like metals, and near zero for the anthropogenic one.

According to Directive 2000/60/EC, the Italian Ministry of Environment issued in 2003 Decree 367 in which has derived 160 Environmental Quality Standard (EQS) for water and 27 Environmental Quality Objective (EQO) for sediment of marine coastal area, lagoons and coastal ponds. Biota quality standards have still to be fixed. The paper illustrates the criteria applied for the definition of the quality standards and some comments are presented.

Keywords: Environmental quality standard/objective; Priority substances; Directive 2000/60/EC; Marine environment; Ministerial Decree 367/2003

1. Introduction

Ideally, the Environmental Quality Objectives (EQO) should be the concentration of a chemical, or the level of a physical factor, that would not produce any adverse effect on the environment.

The setting of Environmental Quality Objectives (EQO) is an essential step for the environmental risk assessment of potentially dangerous chemicals.

Article 16 of the Water Framework Directive (Directive 2000/60/EC, 2000) lays down the community strategy for establishment of harmonised quality standards for the priority substances and other substances posing a significant risk to the aquatic environment.

The European Parliament and Council decision No. 2455/2001/EC identifies the hazardous priority substances that, according to Directive 2000/60 EC and in

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coherence with the previous "daughter directives" of the EC Directive 76/464 (Directive 76/464/EEC, 1976), have to be progressively reduced or phased out from the discharges. Proposal for environmental quality standards and emission controls for point sources had to be submitted within two years of the inclusion of the concerned substances in the list of the priority substances.

From March to June 2003, the Italian Ministry of Environment organized some working groups inviting the main Italian Research Institutes in order to define the national quality objectives for several priority and hazardous substances. Consequently, on 6 November 2003, Decree 367 on environmental quality standards in aquatic environment for the priority substances was promulgated by the Italian Ministry of the Environment.

This work describes the approach used to derive the environmental quality standards values reported in the national Decree 367/03.

2. Methodological approach

As required by the above mentioned Water Framework Directive, in order to obtain a "good chemical status" of the national surface waters, it is necessary to define appropriate quality standards that include water, sediment and biota elements.

In general, the quality standards are intended to protect the structure and the functioning of the marine ecosystems from any significant alterations due to the potential impact of the hazardous chemicals. In addition, the protection of human health from the occurrence of adverse effects due to the ingestion of food originating from aquatic environments or due to the intake of water, is a further objective to be reached by definition of quality standard**.** To obtain a "good surface water chemical status" the concentrations of pollutants don't have to exceed the EQS.

The methods adopted to derive the EQS are therefore intended to protect both freshwater and marine ecosystems from adverse effects, and human health by intake of drinking water and food.

2.1. Human health

To protect human health from the indirect toxic effects due to intake of drinking water and bioaccumulation in the food chain the procedure is usually based on the Tolerable Daily Intake values, TDI, or Acceptable Daily Intake values, ADI, adopted by international bodies such as the World Health Organization (Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment, 2000; WHO/IARC, 1997; WHO, 1991).

2.2. Marine ecosystem

To protect the marine ecosystem, article 10 of Council Regulation (EEC) No. 793/93, the revised chapter 3 of Technical Guidance Document on Risk Assessment of European communities (Technical Guidance (EC) n. 1488/94, 1996; part II, chapter 3) describes the procedure to derive the Predicted No Effect Concentration (PNEC) for (salt)water and marine sediment. Two approaches may be used to calculate the PNEC, depending on the quantity and quality of available effects data: using statistical extrapolation methods or the assessment factor (AF) method. For most substances, the data available to predict ecosystem effects are very limited and it is, therefore, required to use empirically derived assessment factors. The intention of the application of such factors is to predict a concentration below which an acceptable effect will most likely not occur. The assessment factors reflect the degree of uncertainty in extrapolation from laboratory test data for a limited number of species to the "real" environment. The size of assessment factor depends on the confidence with which a PNEC can be derived from the available data. Thus, lower assessment factors can be used with a larger and more relevant data-set.

The assessment factors to derive a PNEC for aquatic environment:

- AF 1000 — at least on short-term L(E)C50 from each of three trophic levels of the base set (fish, *Daphnia*, algae);
- AF 100 — one long-term NOEC (either fish or *Daphnia*);
- AF 50 — two long-term NOECs from species representing two trophic levels (fish and/or *Daphnia* and algae);
- AF 10 — long-term NOECs from at least three species (normally fish, *Daphnia* and algae) representing three trophic levels.

According to the suggestions of the Directive 2000/60/EC, as well as of the Legislative Decree 152/99, two different values should be fixed to define EQS for marine water, sediment and biota to be reached respectively in the years 2008 and 2015. The Directive 2000/60 EC imposes the priority substances' presence has to be phased out from the discharges by 2008.

Criteria adopted by Italy to define the environmental quality standards for the first deadline (2008)