

“Capacity Building and Strengthening Institutional Arrangement”

Workshop: “Hazardous Substances and Wastes”

The Derivation of Environmental Quality Standards Under the Water Framework Directive (Wfd)

Mr. Nicola Pacini

APAT

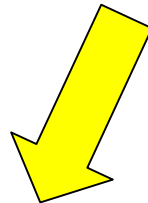
Agency for Environmental Protection and Technical Services

Index

1. Environmental Quality Standard (EQS)
2. Legislative tools
3. Setting the values
4. EQS Implementation: the Italian case
5. EQS and IPPC

1. Environmental Quality Standard (EQS)

COMBINED APPROACH



Definition of
Environmental Quality Standards
(water, sediment, biota)

Emission control:

- BAT
- Emission limits
- Good environmental practices

1. Environmental Quality Standard (EQS)

Definition of Environmental Quality Standard:

“the concentration of a particular pollutant or group of pollutants in water, sediments or biota which should not be exceeded in order to protect human health and the environment” (WFD, Article 2)

EQS define the environmental objective of “good surface water chemical status”

EQS represent criteria for assessing whether Member States are in compliance

Despite the Commission’s harmonisation strategy, current EQS differ among Member States, resulting in different levels of protection

EQS explicit targets of environmental quality to be met by 2015

1. Environmental Quality Standard (EQS)

Evaluation of the EQS European Strategy

Setting harmonised EQS was reputed more cost-effective than other options, such as: setting no EQS, or setting EQS+other control measures

- For organic substances compliance is >75%
- For metals it is comprised between 50 and 80%
- Gaps exist for Ni, Pb and some organics
- Monitoring data are incomplete

EQS setting will be continuously tested by risk assessment exercises and by peer review by the *Scientific Committee for Toxicity, Ecotoxicity and the Environment (SCTEE)*

1. Environmental Quality Standard (EQS)

Cost: 700 million euro

Benefits:

- 100-400 million euro savings in water treatment
- fisheries, shellfish
- opportunities for new clean technologies
- Biodiversity
- Reduced exposure for bathers/swimmers
- Cleaner sediments, lesser accumulation in food chains
- Reduced administrative burden: savings on preparatory work to arrive at sound scientific standards

2. Legislative Tools

Current targeted actions

Amending directives:

1. 96/61/EC “IPPC” explicit mention of dangerous substances
2. 91/414/ED “Pesticides” risks for the marine environment

Collection & Know How Exchange of success stories and best practices for the enhancement of implementation and enforcement of EQS and chemical control policies implemented in different MS

Clear transparent procedures for streamlined relevant info on priority substances to be gained from MS

WISE: Enhance information on priority substances trends, releases, pathways in the aquatic environment

2. Legislative Tools

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

on environmental quality standards in the field of water policy and
amending Directive 2000/60/EC

[COM(2006) 397 final]

1. EQS as required by Art. 16.7 WFD including the introduction of a transitional area of exceedance
2. inventory of discharges, emissions and losses to check whether the objectives of reduction or cessation are met
3. repeal of "daughter Directives" listed in annex IX WFD
4. identification of priority hazardous substances (PHS) out of the 14 substances under review as required by Dec 2455/2001/EC

2. Legislative Tools

Subsidiarity principle:

EQS need to be set at Community level to ensure harmonisation and reduce administrative burden

Additional pollution control measures are left to the MS

Proportionality principle:

To ensure proportionality, much scope is left to MS in identifying appropriate pollution reduction measures

The proposed Directive covers all requirements set by Article 16

2. Legislative Tools

Elements taken into account in the setting of the standards

- Monitoring data
- Environmental fate (persistency, degradation rate, lipofily)
- Ecotoxicological properties (bioaccumulation, biomagnification and bioconcentration)
- Toxicity towards humans (mutagenicity, cancerogenicity, endocrine disruption).
- Chemical-physical properties (volatility, Henry's Law...)
- Structure/activity – QSAR- use as pesticide

2 types of EQS are set:

1. Inland surface waters
2. Transitional, coastal and territorial waters (Other WB)

3. Setting the values

Environmental Quality Standards

- expressed as the **maximum mean annual concentration** of a given pollutant or group of pollutants in surface waters, in sediments and within the biota which should not be exceeded to protect human health and the environment
- Such level should ensure the protection of the ecosystem from **long-term exposure** to a given pollutant

3. Setting the values

MAC: Maximum Acceptable Concentration

- expressed as the **concentration** of a given pollutant or group of pollutants in surface waters that should **never be exceeded** in any single analytical measurement
- Such level should ensure ecosystem protection from **short-term exposure** to a given pollutant

3. Setting the values

Article 3: transitional area of exceedence

Is defined for the vicinity of point source discharges for those parts of WB (near point sources) where EQS cannot be met due to the elevated levels of pollutants in the effluents

Article 4: inventory from 2007

inventory of emissions, discharges and losses to allow compliance checking on reduction and cessation or phase out of discharges, emissions and losses for priority substances by 2025

Article 5, Annex II: PHS

out of the 14 substances proposed for review, only 2 are now proposed as priority hazardous substances (PHS)

Article 6, 7 and 8

Amendment and repeal "Daughter" Directives
QS incorporated in this proposal

3. Setting the values

EQS:

Concentrations in prey tissue (fish, molluscs, crustaceans and other biota)

10 µg/kg hexachlorobenzene

55 µg/kg hexachlorobutadiene

20 µg/kg methyl-mercury

MS should monitor those EQS and check compliance with them in biota, or convert them into EQS for surface water.

MS set up EQS for sediment or biota where necessary and appropriate to complement EQS set up on Community level.

In order to assess long term impacts of anthropogenic activity and trends, MS ensure that existing levels of contamination will not increase.

3. Setting the values

EQS values for 33 hazardous substances +8 other substances

Name of substance

CAS number

AA-EQS (Inland surface waters)

AA-EQS (Other surface waters)

MAC- EQS (Inland surface waters)

MAC-EQS (Other surface waters)

3. Setting the values

Procedure for the establishment of EQS specific for the protection of human health

- Definition of Acceptable Daily Input (ADI) based upon NOAEL (No Observed Adverse Effects Level) in chronic toxicity studies, carcinogenicity and animal reproduction
- Contribution of fish products to the total ADI
- Establishment of the mean daily consumption of fish products
- Establishment of biota quality standards (mollusc, fish, crustacean) based upon the relation between ADI and mean daily consumption
- Establishment of water quality standards based upon the relationship between biota QS and BCF (bioconcentration factor) or BMF (biomagnification factor)

3. Setting the values

Environmental quality standard - metals

$$\text{Environmental quality standard} = C_{\text{background}} + \text{MPA}$$

Such approach is based upon two assumptions:

- Positive of adverse effects onto a given ecosystem by a background concentration are considered part of natural biodiversity
- Species in a given ecosystem are adapted to background; the same amount of a given substance has a similar effect, under the same environmental conditions, even in different areas

MS are allowed to take local bioavailability and background levels into account while setting EQS for metals

3. Setting the values

Definition of emission limits

Emission limit: mass expressed in relation to specific parameters, or concentration and/or emission level not to be overtaken within a given time

- ELV based upon the implementation of best available technologies (technological limits)
- ELV based upon EQS:
 1. Implementation of a standard dilution factor
 2. Implementation of a specific dilution factor
 3. Implementation of a site-specific hydrogeological model

3. Setting the values

Implementation of a specific dilution factor

$$DF = Q(\text{river})_{\min} / Q(\text{s.d.})_{\max}$$

$$ELV = EQS \times DF \text{ (if } DF < 50\text{)}$$

$$ELV = EQS \times 50 \text{ (if } DF > 50\text{)}$$

DF= dilution factor

Q(river) = minimum mean river discharge

Q(s.d.) = maximum mean river discharge

EQS = environmental quality standard

4. EQS Implementation: the Italian case

Decree n. 367

by the Ministry of Environment, 6 November 2003

(Regulation concerning the definition of aquatic environmental quality standards for dangerous substances, following article 3, paragraph 4, of Legislative Decree n. 152, 11 May 1999)

Chemical quality standards for 160 dangerous substances in inland, transitional and coastal waterbodies

Chemical quality standards for 27 substances in the sediments of coastal waterbodies, lagunes and coastal ponds

- by 2008 a quality standard will be reached, such that drinking water and the consumption of aquatic organisms will be safe for human health
- by 2015 a quality standard will be reached, coherent with the good chemical status requested by Directive 2000/60/CE, equivalent to the protection of the entire ecosystem constituted by a surface waterbody

4. EQS Implementation: the Italian case

Government authorities involved in its implementation

- Ministry of the environment
- Ministry of health
- National Health Research Institute (ISS)
- National Institute of Water Research – CNR
- National Institute of Marine Sciences ICRAM
- National Environmental Protection Agency APAT

4. EQS Implementation: the Italian case

Water quality standards are set for 160 dangerous substances

substances	Families/Classes
6	Metals
6	Organometals
9	Polycyclic Aromatic Hydrocarbons
8	Semivolatile Organic Compounds
37	Volatile Organic Compounds
7	Nitroaromatics
9	Alophenols
5	Aniline
54	Organochlorated + Organophosphorated Pesticides
19	Other compounds

4. EQS Implementation: the Italian case

Art. 2, paragraph 1, DM 367 of 2003

The Regions identify the dangerous substances according to their potential presence within their territory

- Within industrial cycles
- In sewage discharges and in receiving waterbodies
- In agricultural produce
- In any other activity centre that may lead to exposure to diffuse sources within the aquatic environment

Clear

- [FULL RECORD](#)
- [BEST SECTIONS](#)
- [Human Health Effects](#)
- [Emergency Medical Treatment](#)
- [Animal Toxicity Studies](#)
- [Metabolism/Pharmacokinetics](#)
- [Pharmacology](#)
- [Environmental Fate & Exposure](#)
- [Environmental Standards & Reg](#)
- [Chemical/Physical Properties](#)
- [Chemical Safety & Handling](#)
- [Occupational Exposure Standard](#)
- [Manufacturing/Use Information](#)
- [Laboratory Methods](#)
- [Special References](#)
- [Synonyms and Identifiers](#)
- [Administrative Information](#)

ETHYLBENZENE

CASRN: 100-41-4

For other data, click on the Table of Contents

Environmental Fate & Exposure:

Environmental Fate/Exposure Summary:

Ethylbenzene's production and use as an intermediate for the production of styrene, its presence in automotive and aviation fuels, and its presence in crude oil may result in its release to the environment through various waste streams. If released to air, a vapor pressure of 9.6 mm Hg at 25 deg C indicates ethylbenzene will exist solely as a vapor in the ambient atmosphere. Vapor-phase ethylbenzene will be degraded in the atmosphere by reaction with photochemically produced hydroxyl radicals; the half life for this reaction in air is estimated to be 55 hr. If released to soil, ethylbenzene is expected to have moderate mobility based upon an estimated K_{oc} of 520. Volatilization from moist soil surfaces is expected to be an important fate process based upon a Henry's Law constant of 7.88×10^{-3} atm-cu m/mole. Ethylbenzene may volatilize from dry soil surfaces based upon its vapor pressure. Biodegradation in soil takes place via nitrate-reducing processes. If released into water, ethylbenzene may adsorb to suspended solids and sediment in water based upon the estimated K_{oc} .

4. EQS Implementation: the Italian case

Comparison: Monitoring Data – EQS

if $MD > EQS$, than: implement measures

if $MD < EQS$, than: good chemical status

Substance	Bioaccumulation (BCF)	Cancero-genicity	Pathologies	Standard 2008	Standard 2015
Cadmium	100/4000 molluscs	Group 1 IARC	Bone Degeneration Liver & Kidney dysfunction	1d 0,2 m/l	0,1 d 0,03 m/l
Benzopyrene	9000 algae	Cat. 2 UE	Cancer lungs and kidneys	0,004 d 0,003 m/l	0,001
Tributyltin	1500/6000 bivalves and fish	==	Endocrine and reproductive system dysfunction Sterility	0,001	0,0001
Benzene	153 crustaceans	Cat. 1 UE	Leukaemia	0,5 d 0,25 m/l	0,2 d 0,1 m/l
Lindane	240 algae	Group 2b IARC	Breast cancer Liver damage	0,01 d 0,005 m/l	0,001 d 0,0005 m/l

4. EQS Implementation: the Italian case

Criteria for the development of sediment quality standards (Decreto Ministeriale n. 367 of 2003)

	Methodology	Protection
Ecotoxicological criteria	Threshold -concentration below which toxicity is improbable	Aquatic organisms Benthic Community
Human health criteria	Maximal residue limit–	Human health (consumption of fisheries products)
Coastal waters monitoring data	Critical areas –Marine Protected Areas	

5. EQS and IPPC

COMMUNICATION FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT

Integrated prevention and control of chemical pollution of surface waters in the European Union

{SEC(2006) 947}

{COM(2006) 397 final}

5. EQS and IPPC

Requirement for industrial and agricultural activities with a high pollution potential to have a permit which can only be issued if certain environmental conditions are met

IPPC concerns highly polluting new or existing industrial and agricultural activities, as defined in Annex I to the Directive (energy industries, production and processing of metals, mineral industry, chemical industry, waste management, livestock farming, etc.).

5. EQS and IPPC

MS obligations

- use all appropriate pollution-prevention measures, namely the best available techniques (which produce the least waste, use less hazardous substances, enable the recovery and recycling of substances generated, etc.);
- prevent all large-scale pollution;
- prevent, recycle or dispose of waste in the least polluting way possible;
- use energy efficiently;
- ensure accident prevention and damage limitation;
- return sites to their original state when the activity is over.

5. EQS and IPPC

In addition, the decision to issue a permit must contain a number of specific requirements, in particular including:

- emission limit values for polluting substances (with the exception of greenhouse gases if the emissions trading scheme applies - see below);
- any soil, water and air protection measures required;
- waste management measures;
- measures to be taken in exceptional circumstances (leaks, malfunctions, temporary or permanent stoppages, etc.);
- minimisation of long-distance or transboundary pollution;
- release monitoring;
- all other appropriate measures.

5. EQS and IPPC

A transitional period (30 October 1999 - 30 October 2007) is provided for, during which existing installations can be brought into conformity with the requirements of the Directive.

The Member States are responsible for inspecting industrial installations and ensuring they comply with the Directive. An exchange of information on best available techniques (serving as a basis for emission limit values) is held regularly between the Commission, the Member States and the industries concerned. Reports on the implementation of the Directive are drawn up every three years.