



Strengthening capacities in the Western Balkans countries  
to address environmental problems through remediation of high priority hot spots

## Environmental Monitoring and Field Surveillance Reference Guide



Publisher:  
**UNDP Montenegro**

For Publisher:  
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Printed on recycled paper in **Publikum**, Belgrade  
700 copies

October 2009

*Western Balkans Environmental Programme  
is funded by Government of Netherlands*

ISBN 978-9940924539

UNDP Country Offices from the region of South-Eastern Europe provided essential support to the whole process of developing the Report, in particular through the involvement of:

**Klodiana Marika, UNDP Albania**  
**Siniša Rodić, UNDP Bosnia and Herzegovina**  
**Vladimir Stavrić, UNDP Macedonia**  
**Borko Vulikić, UNDP Montenegro**  
**Agron Bektashi, UNDP Kosovo**  
**Dobriła Simić, UNDP Serbia**

In addition to UNDP Country offices listed above, a number of International organizations/institutions/projects, such as UNEP (United Nations Environmental Programme), NEWEN (Netherlands and Western Balkans Environmental Network) and NSW DECW (New South Wales Department of Environment, Climate Change and Water) contributed to the Report. Their suggestions and involvement in the process of developing the Report were very valuable and are hereby gratefully acknowledged.

## Editorials

Environmental Monitoring and Field Surveillance Reference Guide is comprehensive and easy to use information source on environmental issues and environmental monitoring. Well structured, concise and clear, the booklet point to documents (guidelines, tools, standards....) and regulations related to environmental monitoring and field surveillance from Europe, as much as from various International institutions.

Definitely, the booklet is must have for every practitioner of environmental engineering/control, and essential for WB Countries professionals, trying to cope with lack of regulations and proper technical support across the region.

*Professor Dr.Sc. Boris Krstev  
University "Goce Delcev" - Stip, Macedonia*

The Environmental Monitoring and Field Surveillance Reference Guide produced by UNDP for the Western Balkans Environmental Programme is an important contribution to the work of regional monitoring and field surveillance professionals. It meets an oft-expressed need for a broad, flexible and easily navigated guide to information on the topic. This compilation of official sources - both from European and from International Institutions from further abroad - places information on environmental monitoring guidance, media standards and thresholds, tools, laws and regulations, etc., in one easily accessed document. The booklet should be widely used by practitioners in coming years.

*Associate Professor Philip Peck  
Lund University, Sweden*

## Preface

The purpose of this Reference Guide is to provide a practical and user-oriented overview of the major EU and International information sources available for environmental monitoring and field surveillance. The “information sources” include a broad spectrum of websites, databases, electronic HTML and PDF documents. These sources provide useful information on environmental monitoring and field surveillance, both within the EU and internationally.

The compilation of this Reference Guide was conducted in response to the identified needs of practitioners/experts in the area of environmental monitoring in the Western Balkan countries/territories, as relevant institutions, practitioners/experts in this region. It was intended to provide a single source document, able to provide better information and to provide awareness of, and access to the EU and international standards.

The main focus of this guide is to identify and provide official sources from European and other International Institutions, such as: WHO, UNECE, OECD, UNEP, USEPA, the Canadian Ministry of the Environment and the Australian Environmental Protection Agency (EPA). Whilst the focus is predominantly on air, water, sediment and soil, there is also a section dedicated to waste.

The Guide is divided into two main parts:

The first part contains relevant European information sources: website/homepage addresses of EU institutions, containing information on the environment, on environmental monitoring and on field surveillance guidance, on tools, documents, laws and regulations, etc.

The second part of this guide provides links to information sources that relate to the environmental monitoring of air, water, sediment, soil, and waste from different international institutions outside of the EU.



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## Introduction

The Western Balkan Environmental Programme for strengthening capacity in the region to address environmental problems, through the remediation of high priority hot spots, is a 3 year, \$ 15 million programme, funded by the Government of the Netherlands. This Programme has united the efforts of 6 countries/territories in the Western Balkans (Albania, Bosnia and Herzegovina, FYR Macedonia, Montenegro, Serbia and UNATSCR 1244 Kosovo) surrounding issues concerning the environment and development in the region.

Whilst the main focus is on the physical works required to mitigate these ecological problems, institutional strengthening and capacity building are an integral and important part of this programme. Eight hotspots in six countries/territories have been selected for cleanup and remediation works. The physical works are at different stages of implementation in each, some ongoing, others completed, though all are planned to be finished by April 2010.

Environmental monitoring is a critical component in evaluating such work. The establishment of a water and/or air pollution monitoring regime and system – a fundamental responsibility of the hotspot owner - is a common requirement for all pilot or demonstration projects within the program for each site. In the absence of an environmental monitoring regime and system, it would not be possible to assess the effectiveness of the relevant specific clean-up activity.

Providing opportunities to improve environmental monitoring skills, spread over the involved countries/territories and program sites is important. It allows physical works to be undertaken to mitigate problem to be assessed. It is also an important component that can be used for strengthening institutions, for capacity building and for improving the capability of environmental management within the region.

Due to this identified requirement and need, UNDP Montenegro, under the umbrella of the Western Balkan Environmental Programme, organised a two day workshop on Environmental Monitoring and Field Surveillance.

The Western Balkan Environmental Monitoring and Field Surveillance Workshop was held on May 6th–7th 2009, in Becici, Montenegro. It hosted practitioners who were involved in conducting, planning or assessment of environmental monitoring and field surveillance, along with stakeholders from six countries/ territories involved in the Western Balkan Environmental Programme (Albania, Bosnia and Herzegovina, Montenegro, Serbia, the FYR of Macedonia, and UNATSCR 1244, Kosovo).

The purpose of the workshop was to produce a regional snapshot of what the participating countries/territories were doing in relation to environmental monitoring and in conducting field surveillance. It also highlighted what they needed, and provided participants with further skills by giving them training in environmental monitoring and in identifying those tools and resources needed.

One of the outcomes of the workshop is the production of this Reference Guide which should, as a single source document, help provide practitioners/ experts with references materials required in terms of facilitating access, for them, to information relating to hot spot monitoring.

## Environmental Monitoring

Environmental monitoring is used to describe the processes and activities that need to take place in order to characterize and monitor the quality of the environment. Environmental monitoring is used in the preparation of environmental impact assessments, as well as in many circumstances in which human activities pose a risk of harmful effects to the natural environment. It is commonly included as a requirement by laws and is cited in regulations, firstly, regarding compliance assessment, and secondly, for reporting industrial emissions and effluents released into the environment. However, monitoring can be made more cost effective when data obtained for one purpose can also be used for other purposes. This data can be reviewed, analyzed statistically and ultimately results in providing adequate conclusions about the status of the monitored environment/ media. Parameters to be monitored depend on the media which is the subject of that particular environmental study, from the processes that are influence to material/ substance inputs that change the chemistry of that media. To determine the risk, measurement is usually aimed at the elements which are most likely to exceed accepted limit values and which therefore are believed to represent the main risks to human and environmental health. In relation to this, the data produced after the lab analysis has to be compared against the relevant limit values. These are different for each type of media and are presented in the relevant legal formats (for Europe, the EU Directives), or in other relevant standards (WHO or any other). In addition to limit values, there are also warning thresholds and margins of tolerance which should trigger further investigations.

An integral part of environmental monitoring is the development of a formal monitoring programme. The main aim of the programme is to provide objective information on the situation, to assist in decision making. Quality control and quality assurance are an important part of this in order to ensure reliability of collected data and to ensure quality throughout the process. There are many procedural guides and standards which assist with this. Main elements of the programme can include information related to the monitoring process: the objectives of the monitoring (i.e. why we are conducting it), what is being monitored, how the monitoring is to take place, and the time-scale during which it should all take place.

There are different types of sampling methods which vary widely depending on the type of environment or media that is being sampled (water, air, soil, etc.) and the subsequent analysis of the sample. The sampling may be simple, for example, like sampling water from the river with a clean bottle and taking it for lab analysis. However, it may be complex using specialised sampling equipment to sample degradable substances requiring special storage and handling followed by chain of custody procedures prescribed by regulation.

## What Information Can be Found in this Reference Guide?

This reference guide is built around information obtained from various relevant European sources: websites/homepages, documents (guidelines, tools, standards, etc) and laws and regulations related to environmental monitoring and field surveillance. Due to a large amount of information that is closely related to this topic, and in order to give a clear overview of these sources, the structure of this guide has been divided into two parts. The first part contains relevant European information sources: websites/homepage addresses of EU institutions containing information on the environment, on environmental monitoring and on field surveillance guidance, on tools, documents, etc. Each website address is followed by a short description of the content of the website. The next chapter provides an overview of guidance materials, useful tools, and other documents available free of charge on the internet. One chapter has been especially dedicated to EU legislation and regulation, regarding the environmental monitoring of air, water and sediment, soil, and waste. The second part of the Reference Guide provides links to information sources that relate to the environmental monitoring of air, water, sediment, soil, and waste provided by different international institutions.

The structure of this guide is as follows:

### Part I

1. An overview of relevant European websites, including a comprehensive list of information on environmental issues, environmental monitoring and field surveillance;
2. An overview of relevant EU documents (guidelines, standards, laws and regulations) on environmental monitoring and field surveillance, with links to relevant websites;

### Part II

3. WHO standards and documents on environmental monitoring;
4. other international guidelines, tools and standards related to environmental monitoring and field surveillance.



## Relevant European Websites

### 1. The European Commission Environment Website

► [http://ec.europa.eu/environment/index\\_en.htm](http://ec.europa.eu/environment/index_en.htm)

The European Commission Environment website is the responsibility of DG Environment . The European Commission publishes its official documents on this site and offers further information regarding the work of the Commission, including its environmental policy, and other material such as:

- » Air – information about air quality standards (legislation, the implementation of ambient air quality legislation), the emission of air pollutants (national emission ceilings, industrial emissions, models, evaluation of ecosystem damage, etc).
- » Chemicals – information about REACH (Registration, Evaluation, Authorization and Restriction of Chemical substances), Classification and labelling (Classification, labelling and packaging of chemicals and mixtures), previous legislation on dangerous substances, previous legislation on existing substances, mercury, pesticides, POPs, the trade of dangerous chemicals, etc.
- » Industry and Technology – information about EMAS (Eco-Management and Audit Scheme tool), pollution from industrial installations (the European Pollutant Register, IPPC, large combustion plants, waste incineration, and others), standardization, etc.
- » Land use – information about environmental impact assessment (EIS), Geographical information System (GIS), etc
- » Soil – information about the soil thematic strategy, the preparation of the strategy, decision making process, etc.
- » Waste – information about different types of waste such as batteries, waste incineration, waste landfills, mining, packaging, PCBs/PCTs, waste management plans, etc.
- » Water – information about water and health (drinking water and water for bathing), water pollution (urban waste water, industry, agriculture), EU water initiatives, etc.

## 2. The European Environment Agency – Star Database (Guidelines for Soil, Water, Nature and Air)

➤ <http://star.eea.eu.int/available.asp>

The European Environment Agency (EEA) is an agency of the European Union. Our task is to provide sound, independent information on the environment. We are a major information source for those involved in developing, adopting, implementing and evaluating environmental policy, and also the general public. Currently, the EEA has 32 member countries

## 3. UK Environment Agency's Monitoring Certification Scheme

➤ <http://www.environment-agency.gov.uk/business/regulation/31829.aspx>

MCERTS is the United Kingdom's Environment Agency's Monitoring Certification Scheme. MCERTS is operated on behalf of the Environment Agency by Sira. The United Kingdom Accreditation Service (UKAS) accredits Sira to undertake the product and personnel certification activities which underpin the MCERTS scheme. The scheme provides a framework within which environmental measurements can be made in accordance with the UK Agency's quality requirements. The scheme covers a range of monitoring, sampling and inspection activities including:

- » MCERTS product certification;
- » MCERTS personnel certification for manual stack emission monitoring;
- » MCERTS effluent flow monitoring inspection.

For more information on these schemes, please click the links above, or to the left.

#### 4. The European Industrial Emissions Home Page

➤ <http://ec.europa.eu/environment/air/pollutants/stationary/index.htm>

The European Industrial Emissions home page website is part of the European Environmental Agency website and contains information, guidelines and legislation on air emissions from large combustion plants (LCPs) to waste incinerators. It provides information about the European Pollutant Register, IPPC, the VOC Solvents Emissions Directive and the Paints Directive.

#### 5. The UK Department for the Environment, Food and Rural Affairs

➤ <http://www.defra.gov.uk/environment>

The Department for Environment, Food and Rural Affairs (Defra) is a Government Department in the UK with the responsibility for setting legislation, policy, regulations and guidance for a number of environmental issues. There are also several European and international laws and policies that apply. Use the link above to access further information

#### 6. The European Pollutant Emission Register (EPER)

➤ <http://eper.eea.europa.eu/eper/introduction.asp?i=>

EPER is the European Pollutant Emission Register - the first European-wide register of industrial emissions into air and water. It was established as a result of a decision made by the Commission on 17th July 2000. The EPER decision was based on Article 15(3) of Council Directive 96/61/EC, concerning integrated pollution prevention and control. It gives access to information on the annual emissions of approx. 9,200 industrial facilities in the 15 Member States of the EU as well as Norway and Hungary. According to the EPER decision, Member States have to produce a report on emissions made by industrial facilities into air and water every three years. The report covers 50 pollutants, which must be included, if the threshold values indicated in Annex A1 of the EPER decision are exceeded. It helps to group information easily, by pollutant, by activity (sector), by air and water (direct or via a sewerage system)

or by country. It also makes it possible to see detailed data on individual facilities. This was replaced by E-PRTR in February 2006.

### **7. The European Pollutant Release and Transfer Register (E-PRTR)**

➤ [http://eper.eea.europa.eu/eper/documents/GuidanceDocs/EN\\_E-PRTR\\_fin.pdf](http://eper.eea.europa.eu/eper/documents/GuidanceDocs/EN_E-PRTR_fin.pdf)

E-PRTR is the European Pollutant Release and Transfer Register, which replaced EPER in February 2006. The obligations, under E-PRTR regulations, extend beyond the scope of the EPER mainly in terms of including more facilities. There are also more substances which have to be reported, there is additional coverage on releases onto land, on off-site transfers of waste and on releases from a greater diversity of sources, on public participation and there is annual, rather than three yearly reporting.

### **8. The European Monitoring and Evaluation Programme (EMEP)**

➤ <http://www.emep.int/>

This website is structured in such a way as to facilitate the understanding and accessibility of information compiled under the Co-operative Programme for Monitoring and Evaluation of Long-range Transmission of Air Pollutants in Europe (EMEP). “The operational objectives and needs of the programme are presented together with updated EMEP data on European regional air quality, concerning acidification, eutrophication, ground level ozone, heavy metals, persistent organic compounds and atmospheric particles”.

### **9. The European Chemical Agency (ECHA)**

➤ [http://echa.europa.eu/home\\_en.asp](http://echa.europa.eu/home_en.asp)

On this website, comprehensive information related to registration, evaluation, authorisation of and restrictions for chemical substances (REACH) can be found. These REACH processes are designed to provide additional information on chemicals and to ensure their safe use. The European Chemical Agency provides information on chemicals and on scientific and technical

advice. On this website, you can visit the Substance Information Exchange Forum (SIEF), find REACH guidance, access guidance fact sheets, read about socio-economic analyses and legislation, learn more about new classifications, labeling and packaging regulations, as well as additional information.

## 10. OECD Guidelines for Testing Chemicals

> [http://www.oecd.org/document/40/0,3343,  
en\\_2649\\_34377\\_37051368\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/40/0,3343,en_2649_34377_37051368_1_1_1_1,00.html)

This website provides guidelines regarding the testing of chemicals. These guidelines represent a collection of the most relevant internationally agreed test methods used by governments, industry and independent laboratories, to determine the safety of chemicals and chemical preparations, including pesticides and industrial chemicals. They cover tests for the physical-chemical properties of chemicals, human health effects, environmental effects, and degradation and accumulation effects on the environment.

## 11. UNECE Dangerous Goods and Special Cargoes Section Homepage

> <http://www.unece.org/trans/danger/danger.htm>

The United Nations Economic Commission for Europe (UNECE) was set up in 1947 by ECOSOC. It is one of five regional commissions of the United Nations. It provides analysis, policy advice and assistance to governments. It gives focus to the United Nations global mandates in the economic field, in cooperation with other global players and key stakeholders, notably the business community. The UNECE also sets out norms, standards and conventions to facilitate international cooperation within and outside the region which can be accessed from the above link.

## 12. The Basel Convention on the Control of the Trans-Boundary Movement of Hazardous Waste and its Disposal

➤ <http://www.basel.int/>

The Basel Convention on the Control of the Trans-Boundary Movement of Hazardous Waste and its Disposal is the most comprehensive global environmental agreement regarding hazardous and other wastes. The main aim of the convention is to protect human health and the environment from the adverse effects resulting from the generation of, the management of, and trans-boundary movement and disposal of hazardous and other wastes. This website contains documents and information used by the parties of the Basel Convention and other stakeholders.

## 13. The NIOSH Pocket Guide to Chemical Hazards

➤ <http://www.cdc.gov/niosh/npg/>

The NIOSH Pocket Guide to Chemical Hazards (NPG) is intended to be a source of general industrial hygiene information regarding several hundred individual chemicals and chemical classes for workers, employers, and occupational health professionals. The NPG does not contain an analysis of all pertinent data. Rather it presents key information and data in abbreviated or tabular form for chemicals or substance groupings (e.g. cyanides, fluorides, manganese compounds) which are found in the work environment. The information found in the NPG should help users to recognize and control occupational chemical hazards.

## 14. The Stockholm Convention on Persistent Organic Pollutants

➤ <http://chm.pops.int/>

The Stockholm Convention on Persistent Organic Pollutants is a global treaty to protect human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife

causing certain cancers, birth defects, dysfunctional immune etc. Given their long range transport, no one governing acting alone can protect its citizens or its environment from POPs. In response, the Stockholm Convention, which was adopted in 2001 and entered into force 2004, requires Parties to take measures to eliminate or reduce the release of POPs into the environment.

## 15. The European Chemical Substances Information System

► <http://ecb.jrc.ec.europa.eu/esis/>

The European Chemical Substances Information System (ESIS) is created and maintained by the European Commission Joint Research Centre Institute for Health and Consumer Protection. ESIS is an IT System which provides information on chemicals, related to:

- » EINECS (The European Inventory of Existing Commercial Chemical Substances)
- » ELINCS (The European List of Notified Chemical Substances) in support of Directive 92/32/EEC, the 7th amendment to Directive 67/548/EEC,
- » NLP (No-Longer Polymers),
- » BPD (Bio-cidal Products Directive) active substances listed in Annex I or IA of Directive 98/8/EC or listed in the so-called list of non-inclusions,
- » PBT (Persistent, Bio-accumulative, and Toxic) or vPvB (very Persistent and very Bio-accumulative),
- » C&L (Classification and Labelling), substances or preparations in accordance with Directive 67/548/EEC (substances) and 1999/45/EC (preparations),
- » Export and Import of Dangerous Chemicals listed in Annex I of Regulation (EC) No 689/2008,
- » HPVCs (High Production Volume Chemicals) and LPVCs (Low Production Volume Chemicals), including lists of EU Producers/Importers,

- » IUCLID Chemical Data Sheets, IUCLID Export Files, OECD-IUCLID Export Files, EUSES Export Files,
- » Priority Lists, Risk Assessment processes and tracking systems in relation to Council Regulations (EEC) 793/93 also known as the Existing Substances Regulation (ESR).

## EU Documents in Relation to Environmental Monitoring and Field Surveillance

This section includes relevant EU documents addressing environmental monitoring and field surveillance are organised based on the media which is being monitored: air, water, soil, sediment and waste. For each section this commences with documents from the United Kingdom.

### Air Monitoring

#### Technical guidance note regarding monitoring

▶ <http://www.environment-agency.gov.uk/cy/busnes/rheoleiddio/31831.aspx>

#### 1. Environmental Monitoring Strategy – Ambient Air - Technical Guidance Note M8

▶ <http://publications.environment-agency.gov.uk/pdf/GEHO1105BJYA-e-e.pdf?lang= e>

Throughout the document explanatory text is taken essentially verbatim from the relevant web pages.

The Technical Guidance Note M8, generated by the United Kingdom Environment Agency, provides guidance on developing monitoring strategies for assessing levels of pollutants in the ambient atmosphere. Initial consideration is given to identifying the aims and objectives of an ambient air quality monitoring study and the importance of developing a monitoring strategy to ensure that these objectives are met. The note concludes with guidance on the handling, analysis, interpretation and method of reporting on air quality monitoring data.

Relevant chapters of the document are listed below with page number references:

- P.4 - Survey objectives and monitoring strategy
- P.5 - Review of existing information
- P.8 - Which species to measure
- P.9 - When to sample, how long to sample for, and how many samples to take
- P.12 - How to measure
- P.17 - Accompanying measurements and supplementary data
- P.18 - Where to sample
- P.24 - Data handling
- P.25 - Analysis of results and reporting
- P.32 - Quality control and quality assurance
- P.35 - Appendix B: Computer dispersion modelling.

## 2. Monitoring methods for ambient air - Technical Guidance Note M9

► <http://publications.environment-agency.gov.uk/pdf/GEHO1105BJYB-e-e.pdf?lang=e>

This Note, generated by the United Kingdom Environment Agency, provides guidance on the monitoring methods available for assessing levels of pollutants in the ambient atmosphere. The different generic sampling and analysis techniques used in ambient air quality monitoring are reviewed, before focusing on the different methods available for each pollutant. A distinction has been made between particulate pollutants and gaseous pollutants. Where there is a generally accepted, preferred method for a particular application, this has been indicated. The note concludes with guidance on quality assurance and quality control. It is important to recognise that some of the monitoring methods reviewed involve the use of hazardous reagents. Users of these methods must ensure that such reagents are handled safely and in accordance with current health and safety legislation.

Relevant chapters of the document are listed below with page number reference:

- P.3 - Sampling and measurement techniques for particulate matter
- P.16 - Specific methods of measurement for particulates
- P.33 - Sampling and measurement techniques for gaseous pollutants
- P.39 - Optical methods for gaseous pollutant analysis
- P.50 - Specific methods for measuring gaseous pollutants
- P.82 - Wet deposition monitoring
- P.84 - Quality control and quality assurance

### 3. Monitoring hydrogen sulphide and total reduced sulphur in atmospheric releases and ambient air - Technical Guidance Note M13

► [http://publications.environment-agency.gov.uk/pdf/GEHO1105BJXV-e-e.pdf?lang=\\_e](http://publications.environment-agency.gov.uk/pdf/GEHO1105BJXV-e-e.pdf?lang=_e)

The Note generated by the United Kingdom Environment Agency, provides guidance on the monitoring methods available for measuring hydrogen sulphide and other compounds containing sulphur. The different generic sampling techniques used for measuring industrial stationary-source emissions and ambient air-quality monitoring are reviewed, before focusing on specific methods for each application. Where there is a generally accepted, preferred method for a particular application, this has been indicated. The note concludes with guidance on quality assurance and quality control. Appendices give additional information on the principles of analytical techniques sampling, and equipment

Relevant chapters of the document are listed below with page number references:

- P.6 - Monitoring strategy
- P.9 - Monitoring techniques
- P.11 - Specific published methods for the measurement of H<sub>2</sub>S and TRS
- P.11 - Source releases and stack monitoring
- P.16 - Other methods
- P.20 - Olfactometric methods

- P.21 - Method selection
- P.26 - Quality control and quality assurance
- P.29 - Appendix 1: Analytical principles relevant to H2S and TRS
- P.39 - Appendix 2: Grab sampling

#### 4. Monitoring PM10 and PM2.5- Technical Guidance Note M15

- [http://publications.environment-agency.gov.uk/pdf/PMHO1006BLOZ-e-e.pdf?lang=\\_e](http://publications.environment-agency.gov.uk/pdf/PMHO1006BLOZ-e-e.pdf?lang=_e)

This Technical Guidance Note, generated by the United Kingdom Environment Agency, provides guidance on stack emission monitoring and the ambient monitoring of particulate matter with a diameter less than 10µm. It focuses on the following: • sources of PM10 and PM2.5; the health effects of PM10 and PM2.5; general guidance on PM10 and PM2.5 stack emission monitoring techniques; and general guidance on monitoring PM10, PM2.5 and PM1 in ambient air.

Relevant chapters of the document are listed below with page number references:

- P.2 - Sources of PM10 and PM2.5 in stack emissions
- P.3 - Health effects
- P.4 - Guidance on PM10 and PM2.5 stack emission monitoring methods
- P.7 - Limitations to size fractionation measurement
- P.8 - Measuring PM10, PM2.5 and PM1 in ambient air

#### 5. The measurement and monitoring of volatile organic compounds to air from industrial installations- Technical Guidance Note M16

- [http://publications.environment-agency.gov.uk/pdf/GEHO1105BJXW-e-e.pdf?lang=\\_e](http://publications.environment-agency.gov.uk/pdf/GEHO1105BJXW-e-e.pdf?lang=_e)

This particular note, generated by the United Kingdom Environment Agency, provides information on the sampling, monitoring and measuring of volatile organic compounds (VOCs) in the air resulting from industrial processes. This Technical Guidance Note assumes the reader has at least a basic knowledge of

the industries to which it applies and a sufficient level of technical knowledge to understand the methods described within it. It covers three main areas: (1) a description of the main sources of VOCs, their environmental impact, and the regulatory framework for controlling these emissions; (2) An examination of the main techniques for monitoring and measuring VOCs, the generic methods for sampling, monitoring and measuring these gases and vapours; (3) a summary of the principal methods, standards and guidance for monitoring and measuring VOCs.

Relevant chapters of the document are listed below with page number references:

P.3 - Major stationary sources of VOC emissions

P.4 - Types of VOCs

P.6 - Regulatory requirements for different processes

P.9 - Techniques for monitoring VOCs

P.17 - Sampling and extraction systems

P.20 - Frameworks, standards and methods for monitoring

P.43 - Appendix 2: Toxic VOCs

P.44 - Appendix 3 - Example of calculating total organic carbon

P.47 - Appendix 4 – Response factors, and expressing TOC results as toluene equivalents

## **6. Stationary source emissions — A procedure to use an alternative method for measuring emissions of sulphur dioxide, using instrumental techniques- Technical Guidance Note M21**

► [http://publications.environment-agency.gov.uk/pdf/GEHO0708BOIU-e-e.pdf?lang=\\_e](http://publications.environment-agency.gov.uk/pdf/GEHO0708BOIU-e-e.pdf?lang=_e)

This TGN describes a procedure which uses an alternative method (AM) for measuring emissions of sulphur dioxide (SO<sub>2</sub>) from industrial stacks and flues. The standard reference method (SRM) for measuring emissions of SO<sub>2</sub> is BS EN 14791. This SRM is a manual method which employs wet chemistry. However, test laboratories may use other methods instead of SRMs, which are known as alternative methods (AM), as long as the test laboratory can demonstrate that the AM produces results of an equivalent quality to the

SRM. This standard recognises that many test laboratories and operators wish to use an AM which uses instrumental methods for measuring SO<sub>2</sub>, instead of using a manual SRM based on wet chemistry and subsequent laboratory analysis.

Relevant chapters of the document are listed below with page number references:

- P.2 - Description of measuring equipment - sampling and sample gas conditioning systems
- P.3 - Monitoring systems
- P.5 - Determination of the characteristics of the method: analyser, sampling and conditioning line
- P.8 - Field operation
- P.11 - Ongoing quality assurance
- P.11 - Expression of results
- P.12 - Test report
- P.17 - Annex A: Example of a determination of uncertainty

## Water and Sediment Monitoring

### 1. Monitoring of discharges to water and sewer - Technical Guidance Note M18

➤ <http://publications.environment-agency.gov.uk/pdf/GEHO1105BJXY-e-e.pdf>

This technical guidance note, generated by the United Kingdom Environment Agency, describes the agency's overall approach to self-monitoring for discharges to the water environment and provides guidance on the selection of analytical methods used for regulatory purposes. The approach is also applicable to discharges of sewer, although caveats are given in the text where discharges of difficult matrices may cause additional problems. It covers: (1) the legislative framework; (2) quality assurance and quality control requirements; (3) different approaches to sampling; (4) guidance on the selection and validation of analytical methods; (5) accuracy requirements; and (6) an index of common monitoring methods.

Relevant chapters of the document are listed below with page number references:

- P.3 - Monitoring strategy
- P.9 – Sampling
- P.9 - Choice of sampling point
- P.10 - Composite or spot samples
- P.11 - Automatic sampling equipment and MCERTS
- P.11 - Access, facilities and services
- P.11 - Sample storage and transportation
- P.11 - Sampling procedure manual
- P.12 - Sampling quality control
- P.13 - Analytical systems
- P.18 - Flow measurement
- P.23 - Appendix 2: Detailed sampling requirements
- P.27 - Appendix 3: Index of monitoring methods

## 2. General sampling of the aquatic environment

➤ [http://www.environment-agency.gov.uk/static/documents/Business/19\\_09\(1\).pdf](http://www.environment-agency.gov.uk/static/documents/Business/19_09(1).pdf)

This general guidance document, produced by the United Kingdom Environment Agency, defines and describes general sampling techniques for controlled water, discharges and associated materials for chemical analysis in the aquatic environment.

Relevant chapters of the document are listed below with page number references:

- P.4 - Procedures
- P.5 - Pre-sampling quality check
- P.6 - Sampling sites
- P.7 - Arrival on site
- P.7 - Avoiding contamination
- P.8 - Water sampling
- P.10 – Sampling effluents and discharge
- P.11 – Sample taking
- P.19 - Field measurements
- P.19 - Sample traceability
- P.20 - Storage, transport and sample delivery
- P.21 - Storage at depots
- P.22 - Maintaining equipment
- P.22 - Providing laboratory storage

### 3. Surface water quality monitoring - Topic Report No 2/1996

➤ <http://www.eea.europa.eu/publications/92-9167-001-4>

This report provides an overview of the existing surface water quality monitoring activities in the countries within the European Environment Agency area (the 15 European Union Member States plus Iceland and Norway). The study includes all surface water, ie. rivers, lakes and reservoirs, coastal and open marine waters. The study is limited to the description of monitoring activities which contain information that may be of interest at European, Euro-regional, national or large regional levels.” Relevant chapters of the document are listed below with page number references:

- P.5 - Introduction, data and information sources
- P.11 - Surface water quality monitoring
- P.15 - Summary descriptions of surface water monitoring activities in each country
- P.65 - Monitoring programmes

#### 4. Monitoring under the Water Framework Directive - Guidance Document No. 7

► [http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework\\_directive/guidance\\_documents/guidancesnos7smonitoring/EN\\_1.0\\_&a=d](http://circa.europa.eu/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents/guidancesnos7smonitoring/EN_1.0_&a=d)

This guidance document is to help those who are undertaking monitoring programmes, leading and managing experts undertaking monitoring, using the results from monitoring to take part in the policy making process or reporting on the results of monitoring to the EU as required by the Directive. The guidance will help to: (1) Verify the common understanding of key concepts to assess ecological quality, risk, precision and confidence, surveillance, operational and investigative monitoring of surface waters, surveillance, operational and quantitative monitoring of groundwater, surface water monitoring for protected areas and other linked considerations; (2) Select mandatory and recommended Quality Elements (QEs) for monitoring and parameters most representative of catchment pressures for surface and groundwater; (3) Design, establish and implement monitoring programmes based on the identified objectives and required outcomes of the Directive, with an emphasis on achieving acceptable levels of risk, precision and confidence; and (4) Select water bodies, monitoring sites within water bodies and sampling frequencies required for surveillance, operational, investigative and quantitative status monitoring programmes and for the monitoring of protected areas. The guidance document proposes an overall methodological approach to monitoring for the implementation of the WFD.

Relevant chapters of the document are listed below with page number references:

- P.1 - A guidance document: what for?
- P.3 - Implementing the Directive: setting the scene
- P.8 – A common understanding of the monitoring requirements of the water framework directive
- P.35 - What quality elements should be monitored for surface water?
- P.74 – The design of groundwater monitoring programmes
- P.91 - Best practices and tool box
- P.125 - Best practices examples for using the guidance

## Soil Monitoring

At this point, in the EU, there are no overarching topic specific guidelines or manuals in relation to which provide environmental or human health thresholds for soil monitoring, due to different environmental policies on water, waste, chemicals, etc. which all collectively contribute to soil protection. The European Commission has adopted a Soil Thematic Strategy and a proposal for a Soil Framework Directive, from which more specific recommendations in relation to soil monitoring should be able to be defined. Though this is still to be adopted by the EC parliament

### 1. UK MCERTS Performance Standards for Laboratories Undertaking the Chemical Testing of Soil

- ▶ [http://publications.environment-agency.gov.uk/pdf/GEHO0203BKAY-e-e.pdf?lang=\\_e](http://publications.environment-agency.gov.uk/pdf/GEHO0203BKAY-e-e.pdf?lang=_e)

MCERTS is the United Kingdom's Environment Agency's Monitoring Certification Scheme. The scheme provides a framework within which environmental measurements can be made in accordance with the UK Agency's quality requirements. The above performance standards detail the requirements for a laboratory undertaking the chemical testing of soil and for the procurer of analytical services to meet MCERTS performance standards.

## Waste Monitoring

### 1. DUTCH Circular on target values and intervention values for soil remediation

- ▶ [http://international.vrom.nl/Docs/internationaal/annexS\\_I2000.pdf](http://international.vrom.nl/Docs/internationaal/annexS_I2000.pdf)

Four annexes belong to this circular:

- » annex A deals with the target values, the soil remediation intervention values and the indicative levels for serious contamination;

- » annex B contains the measurement and analysis regulations for soil/sediment and groundwater for the substances listed in annex A;
- » annex C gives the data required for determining the remediation urgency and the remediation deadline for the substances in part A;
- » annex D provides a guideline for dealing with substances for which there are no standards.

\* Further detail on environmental monitoring and guidelines on soils is provided 20, 23 and 25

## **2. Preparing a Waste Management Plan - a methodological guidance note**

➤ [http://ec.europa.eu/environment/waste/plans/pdf/wasteguide\\_final.pdf](http://ec.europa.eu/environment/waste/plans/pdf/wasteguide_final.pdf)

These guidelines, produced by the EC Environment DG, aims to provide a tool for waste management planning and also to promote the development of more coherent and appropriate planning practices across the EU Member States, in compliance with the requirements of relevant EU legislation.

## **3. OSPAR Commission - Protecting and conserving the North-East Atlantic and its resources**

➤ <http://www.ospar.org/welcome.asp?menu=0>

OSPAR has first developed, and is implementing, a suite of five thematic strategies to address the main threats that it has identified within its competence (the Biodiversity and Ecosystem Strategy, the Eutrophication Strategy, the Hazardous Substances Strategy, the Offshore Industry Strategy and the Radioactive Substances Strategy), together with a Strategy for the Joint Assessment and Monitoring Programme, which assesses the status of the marine environment and follows up implementation of the strategies and the resulting benefits to the marine environment. These six strategies fit together to underpin the ecosystem approach.

**4. Assessment and Monitoring series: 2007/2008 CEMP Assessment: Trends and concentration of selected hazardous substances in sediments and trends in TBT-specific biological effects**

➤ [http://www.ospar.org/documents/dbase/publications/p00378\\_2007-2008\\_CEMP\\_assessment.pdf](http://www.ospar.org/documents/dbase/publications/p00378_2007-2008_CEMP_assessment.pdf)

This report presents scientific assessments of OSPAR marine monitoring data on hazardous substances in marine sediments and the biological effects arising from presence of the anti-fouling agent tributyl tin in the marine environment. The overall conclusion is that continued monitoring is needed before clear conclusions can be drawn on whether the widespread downward trends of hazardous substances in biota, that have been reported by OSPAR in 2005, 2006 and 2007 are also occurring in sediments and whether the effects of TBT are also reducing. The majority of measurements, however, show that both naturally occurring and man-made contaminants remain above long-term targets.

**5. Coordinated Environmental Monitoring Programme (CEMP) Monitoring Manual**

➤ [http://www.ospar.org/content/content.asp?menu=00170301000135\\_000000\\_000000](http://www.ospar.org/content/content.asp?menu=00170301000135_000000_000000)

The Coordinated Environmental Monitoring Programme Monitoring Manual (CEMP Monitoring Manual) webpage provides links to the most up to date versions of the OSPAR monitoring guidelines that apply under the CEMP. OSPAR monitoring guidance is regularly reviewed in collaboration with ICES and where necessary updated to take account of new developments including the inclusion of new monitoring parameters in the CEMP. Guidelines for monitoring of hazardous substances are: JAMP Guidelines for Monitoring Contaminants in the Sediment, and JAMP Guidelines for Monitoring Contaminants in Biota

**6. Arctic Monitoring and Assessment Programme: Persistent Toxic Substances, Food Security and Indigenous Peoples of the Russian North, Activity 6 – Monitoring of PTS levels in human tissue (Final Report)**

➤ <http://www.amap.no/>

Sub-Project “Analytical determination of PTS levels in blood samples” (Activity 6) is the component of the RAIPON/AMAP/GEF Project “Persistent Toxic Substances (PTS), Food Security and Indigenous People of the Russian North”. The objective of the sub-project was to fulfil analyses of human blood samples for determination of PTS levels



## EU Legislation on Environmental Monitoring

The legal frameworks at a national level across Western Balkan countries/territories are similar in subject matter, if not almost identical, but in content they are different regarding environmental protection from one country to another. Despite this, all of Western Balkan countries/territories are in the process of transposing EU legislation into their own legal frameworks as part of their obligation to achieve country candidate status and subsequent EU community entry, and to abide by environmental laws and regulations regarding environmental monitoring and field surveillance. At this moment (in their current state) Western Balkans Countries/Territories are in different stages of transposing the required environmental legislation and have just begun building the environmental and regulatory frameworks to accompany this. To support this a compilation of EU laws and regulations which tackle, either directly or indirectly, environmental monitoring and field surveillance, are presented in this section.

### Air Pollution

- » DIRECTIVE 2008/50/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on ambient air quality and cleaner air for Europe (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:152:0001:0044:EN:PDF> )
- » COUNCIL DIRECTIVE 96/62/EC on ambient air quality assessment and management – Air Quality Framework ( website: <http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1996/L/01996L0062-20031120-en.pdf> )
- » COUNCIL DIRECTIVE 1999/30/EC relating to limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and lead in the ambient Air–First ‘daughter’ directive (website: <http://faolex.fao.org/docs/pdf/eur38299.pdf> )
- » DIRECTIVE 2000/69/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL relating to limit values for benzene and carbon monoxide in ambient air – second ‘daughter’ directive (website: <http://>

[eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:313:0012:0021:EN:PDF](http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2000:313:0012:0021:EN:PDF) )

- » DIRECTIVE 2002/3/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL relating to ozone in ambient air – third ‘daughter’ directive (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2002:067:0014:0030:EN:PDF> )
- » DIRECTIVE 2004/107/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:023:0003:0016:EN:PDF> )
- » DIRECTIVE 2004/42/CE OF THE EUROPEAN PARLIAMENT AND COUNCIL on the limitation of emissions of volatile organic compounds, due to the use of organic solvents in certain paints and varnishes, and in vehicle refinishing products and amending Directive 1999/13/EC (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:143:0087:0096:EN:PDF> )
- » DIRECTIVE 2001/81/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL on national emission ceilings for certain atmospheric pollutants (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0081:EN:HTML> )

## Water and Sediment Pollution

- » DIRECTIVE 2000/60/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL which establishes a framework for community action in the field of water policy – Water Framework Directive (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32000L0060:EN:HTML> )
- » COUNCIL DIRECTIVE 98/83/EC on the quality of water intended for human consumption – (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:330:0032:0054:EN:PDF> )
- » COUNCIL DIRECTIVE 91/271/EEC of 21 May 1991 concerning

urban waste-water treatment (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0271:EN:HTML>)

- » COMMISSION DIRECTIVE 98/15/EC which amends the Council Directive 91/271/EEC with regard to certain requirements established in Annex I (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1998:067:0029:0030:EN:PDF> )
- » DIRECTIVE 2006/118/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL on the protection of groundwater from pollution and deterioration (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:372:0019:0031:EN:PDF> )

## Soil Pollution

Within the EU legal framework for environment and environmental protection, different environmental policies (for instance on water, waste, chemicals, industrial pollution prevention, nature protection, pesticides and agriculture) contribute to soil protection. However, these policies have other aims and other scopes of action, and are not sufficient to ensure an adequate level of protection for all soil in Europe. Due to this, the European Commission has adopted a Soil Thematic Strategy and a proposal for a Soil Framework Directive with the objective of protecting soil across the EU. The Soil Thematic strategy and the proposal for a Soil Framework Directive can be found by following these links:

- » The Soil Thematic Strategy (Website: [http://ec.europa.eu/environment/soil/three\\_en.htm](http://ec.europa.eu/environment/soil/three_en.htm))
- » Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND COUNCIL to establish a framework for the protection of soil and which will amend Directive 2004/35/EC (website: [http://ec.europa.eu/environment/soil/pdf/com\\_2006\\_0232\\_en.pdf](http://ec.europa.eu/environment/soil/pdf/com_2006_0232_en.pdf) )

## Waste

- » DIRECTIVE 2006/12/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL on waste (website: [http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l\\_114/l\\_11420060427en00090021.pdf](http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_114/l_11420060427en00090021.pdf))
- » Council Directive 91/689/EEC, 12 December 1991, on hazardous waste (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31991L0689:EN:HTML>)
- » European Parliament and Council Directive 94/62/EC, 20 December 1994 on packaging and the packaging of waste (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31994L0062:EN:HTML>)
- » Waste Management and Clean Technology (website: <http://eur-lex.europa.eu/en/legis/latest/chap15103030.htm>)
- » COMMISSION DECISION, 2001/68/EC, which establishes two reference methods of measurement for PCBs, pursuant to Article 10(a) of Council Directive 96/59/EC on the disposal of polychlorinated biphenyls and polychlorinated terphenyls (PCBs/PCTs) (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:023:0031:0031:EN:PDF>)
- » COMMISSION DECISION, 2001/171/EC, which establishes conditions for the derogation of glass packaging in relation to heavy metal concentration levels, established in Directive 94/62/EC on packaging and the packaging of waste (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2001:062:0020:0021:EN:PDF>)
- » COUNCIL DECISION, 2003/33/EC, which establishes criteria and procedures for the acceptance of waste at landfill sites pursuant to Article 16 of, and Annex II, of Directive 1999/31/EC (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2003:011:0027:0049:EN:PDF>)

## Other

- » DIRECTIVE 2008/1/EC OF THE EUROPEAN PARLIAMENT AND COUNCIL concerning the prevention and control of integrated pollution (website: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:024:0008:0029:EN:PDF> )
- » COMMISSION DECISION on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/61/EC concerning the prevention and control of integrated pollution (IPPC) (website: [http://eper.ec.europa.eu/eper/documents/comission\\_17072000.pdf](http://eper.ec.europa.eu/eper/documents/comission_17072000.pdf))
- » REGULATION (EC) No 166/2006 OF THE EUROPEAN PARLIAMENT AND COUNCIL concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC (website: [http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l\\_033/l\\_03320060204en00010017.pdf](http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_033/l_03320060204en00010017.pdf))
- » The Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and their Disposal (website: <http://www.basel.int/>)
- » The Stockholm Convention on Persistent Organic Pollutants (POPs) (website: <http://chm.pops.int/> )
- » Reference Document on the General Principles of Monitoring (MON) (website: [http://eippcb.jrc.es/pub/english.cgi/d946763/11%20Reference%20Document%20on%20General%20Principles%20of%20Monitoring%20\(adopted%20Jul%202003\)%20-%201%20Mb](http://eippcb.jrc.es/pub/english.cgi/d946763/11%20Reference%20Document%20on%20General%20Principles%20of%20Monitoring%20(adopted%20Jul%202003)%20-%201%20Mb))



## WHO Guidelines and Standards on Water and Air Pollution

### WHO Guidelines for Safe Recreational Waters



[http://www.who.int/water\\_sanitation\\_health/bathing/srwe1/en/](http://www.who.int/water_sanitation_health/bathing/srwe1/en/)

“The primary aim of the guidelines is the protection of public health. The guidelines are intended to be used as the basis for the development of international and national approaches (including standards and regulations) to control health risks which may arise from hazards that might be encountered in recreational water environments, as well as providing a framework for local decision-making. The guidelines can also be used as reference material for industries and operators when preparing development projects in recreational water areas. They can be used as a checklist for understanding and assessing the potential health impact of recreational projects, and in particular for conducting assessments on the impact on the environment and also on health.”

### WHO Guidelines for Drinking-water Quality – 3rd Edition. DRAFT



[http://www.who.int/water\\_sanitation\\_health/dwq/gdwq3rev/en/index.html](http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/index.html)

“The guidelines are intended to support the development and implementation of risk management strategies that will ensure the safety of drinking-water supplies through the control of hazardous constituents of water. These strategies may include national or regional standards, developed from the scientific basis provided in the guidelines. The guidelines outline the reasonable minimum requirements of safe practice to protect the health of consumers and/or to derive numerical “guideline values” for the constituents of water or for indicators of water quality. In order to define mandatory limits, it is preferable to consider the guidelines in the context of local or national environmental, social, economic and cultural conditions.”

The guidelines include:

- » A drinking-water safety framework
- » A quality management approach for drinking-water systems from the catchment area to the tap
- » Assessment of health risks presented by: microorganisms, chemicals, radiological constituents
- » An explanation of the criteria used to select the various constituents which are addressed
- » The approaches used in deriving the guidelines, including guideline values
- » An explanation of how the guidelines are intended to be used

### **WHO Air Quality Guidelines for Europe**

<http://www.euro.who.int/document/e71922.pdf>



“This publication includes an introduction on the nature of the guidelines and the methodology used to establish guideline values for a number of air pollutants. In addition, it describes the various aspects that need to be considered by national or local authorities when guidelines are transformed into legally binding standards. For the pollutants addressed, the sections on “Health Risk Evaluation” and “Guidelines” describe the most relevant considerations which have led to the recommended guideline values. For detailed information on exposure and on potential health effects of the reviewed pollutants, the reader is referred to the World Health Organisations regional office’s web site above, where background documents on individual air pollutants can be accessed.”

P. 1 – Introduction

P.11 – Criteria used in establishing guideline values

P. 58 – Organic pollutants

P. 123 – Inorganic pollutants

P. 173 – Classical pollutants

P. 199 – Indoor air pollution

P. 218 – Evaluation of eco-toxic effects

## Other Large Scale Compilations of Environmental Guidelines, Tools and Standards

This second part of this guide provides links to information sources that relate to the environmental monitoring of air, water, sediment, soil, and waste from different international institutions outside of the EU.

### USEPA Guidelines and Standards

The United States Environmental Protection Agency (USEPA) is an agency of the federal government of the United States charged to regulate chemicals and protect human health by protecting the natural environment: air, water and land. The USEPA began operations in 1970. There USEPA has produced and holds an extensive collection of guidance materials, testing standards and monitoring information

|   |   |
|---|---|
| USEPA Compilation of National Recommended Water Quality Criteria            | <a href="http://www.epa.gov/waterscience/pc/revcom.pdf">http://www.epa.gov/waterscience/pc/revcom.pdf</a>   |
| USEPA Drinking Water Standards-List of Drinking Water Contaminations & MCLS | <a href="http://www.epa.gov/safewater/mcl.html#mcls">http://www.epa.gov/safewater/mcl.html#mcls</a>   |
| USEPA Water Quality Guidelines  | <a href="http://www.epa.gov/waterscience/standards/states">http://www.epa.gov/waterscience/standards/states</a>                                   |
| USEPA National Ambient Air Quality Standards (NAAQS)                        | <a href="http://www.epa.gov/ttn/naaqs">http://www.epa.gov/ttn/naaqs</a>   |
| USEPA Numeric Criteria – Water Quality Standards Database                   | <a href="http://oaspub.epa.gov/wqsdatabase/wqsi_epa_criteria.rep_parameter">http://oaspub.epa.gov/wqsdatabase/wqsi_epa_criteria.rep_parameter</a> |

|  |   |
|--|---|
| USEPA Sediment Quality Guidelines  | <a href="http://www.epa.gov/waterscience/cs/guidelines.htm">http://www.epa.gov/waterscience/cs/guidelines.htm</a>                         |
| USEPA, An Introduction to Water Quality Monitoring                                       | <a href="http://www.epa.gov/owow/monitoring/monintr.html">http://www.epa.gov/owow/monitoring/monintr.html</a>                             |
| USEPA, Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies        | <a href="http://www.epa.gov/oust/cat/mason.pdf">http://www.epa.gov/oust/cat/mason.pdf</a>   |
| USEPA, SUPERFUND PROGRAM REPRESENTATIVE SAMPLING GUIDANCE VOLUME 1: SOIL , Interim Final | <a href="http://www.clu-in.org/download/char/SF_Rep_Samp_Guid_soil.pdf">http://www.clu-in.org/download/char/SF_Rep_Samp_Guid_soil.pdf</a> |
| USEPA Numeric Criteria – Water Quality Standards Database                                | <a href="http://www.epa.gov/waterscience/standards/">http://www.epa.gov/waterscience/standards/</a>                                       |
| USEPA Ecotox Database  | <a href="http://cfpub.epa.gov/ecotox/">http://cfpub.epa.gov/ecotox/</a>   |
| USEPA Integrated Risk Information System (IRIS)  | <a href="http://www.epa.gov/iris/">http://www.epa.gov/iris/</a>   |
| USEPA – Clean Up Information   | <a href="http://clu-in.org/techfocus/">http://clu-in.org/techfocus/</a>   |
| USEPA – Innovative Technologies  | <a href="http://www.epa.gov/tio/">http://www.epa.gov/tio/</a>   |

## Canadian Guidelines and Standards

|   |   |
|---|---|
| Canadian Water Quality Guidelines   | <a href="http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/water/default.cfm">http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/water/default.cfm</a>             |
| <ul style="list-style-type: none"> <li>» Canadian Water Quality Guidelines for the Protection of Aquatic Life</li> <li>» Canadian Water Quality Guidelines for the Protection of Agricultural Water Uses</li> <li>» Guidelines for Canadian Drinking Water Quality</li> <li>» Guidelines for Canadian Recreational Water Quality</li> </ul> |   |
| Canadian Soil Quality Guidelines (CSoQGs)   | <a href="http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Soil/default.cfm">http://www.ec.gc.ca/CEQG-RCQE/English/Ceqg/Soil/default.cfm</a>               |
| Canadian Sediment Quality Guidelines (CSeQGs)   | <a href="http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/sediment/default.cfm">http://www.ec.gc.ca/ceqg-rcqe/English/ceqg/sediment/default.cfm</a>       |
| Canada's National Ambient Air Quality Objectives (NAAQOs)   | <a href="http://www.hc-sc.gc.ca/ewh-semt/pubs/air/naaqo-onqaa/index-eng.php">http://www.hc-sc.gc.ca/ewh-semt/pubs/air/naaqo-onqaa/index-eng.php</a> |

## Australian Guidelines and Standards

|   |   |
|---|---|
| National Environmental Protection Measures - Ambient Air NEPM                                       | <a href="http://www.ephc.gov.au/taxonomy/term/23">http://www.ephc.gov.au/taxonomy/term/23</a>   |
| National Environmental Protection Measures – Air Toxics NEPM  | <a href="http://www.ephc.gov.au/taxonomy/term/35">http://www.ephc.gov.au/taxonomy/term/35</a>   |
| Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales | <a href="http://www.environment.nsw.gov.au/air/faqammodelling.htm">http://www.environment.nsw.gov.au/air/faqammodelling.htm</a>   |
| EPHC/NEPC Assessment of Site Contamination National Environment Protection Measures – NEPM 2000     | <a href="http://www.ephc.gov.au/taxonomy/term/44">http://www.ephc.gov.au/taxonomy/term/44</a>   |
| Australia’s and New Zealand’s Guidelines for Fresh and Marine Water Quality 2000                    | <a href="http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality">http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality</a> |
| NHMRC Australian Drinking Water Guidelines 1996   | <a href="http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm">http://www.nhmrc.gov.au/publications/synopses/eh19syn.htm</a>   |
| ENHEALTH Human Health Risk Assessment Guidance  | <a href="http://enhealth.nphp.gov.au/council/pubs/pdf/envhazards.pdf">http://enhealth.nphp.gov.au/council/pubs/pdf/envhazards.pdf</a>   |
| Chemicals Information Gateway   | <a href="http://hermes.erin.gov.au/pls/cig_public!/CIGPPUBLIC.pStart">http://hermes.erin.gov.au/pls/cig_public!/CIGPPUBLIC.pStart</a>   |
| ANZECC Water Quality Guidelines   | <a href="http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality">http://www.mincos.gov.au/publications/australian_and_new_zealand_guidelines_for_fresh_and_marine_water_quality</a> |

**New South Wales Government - Department of Environment, Climate Change and Water (DECCW) (<http://www.environment.nsw.gov.au/>)**

|   |   |
|---|---|
| Guidelines under the Contaminated Land Management Act, 1997   | <a href="http://www.environment.nsw.gov.au/clm/guidelines.htm">http://www.environment.nsw.gov.au/clm/guidelines.htm</a>   |
| Guidelines for Consultants Reporting on Contaminated Sites Act                                      | <a href="http://www.environment.nsw.gov.au/resources/clm/97104consultantsglines.pdf">http://www.environment.nsw.gov.au/resources/clm/97104consultantsglines.pdf</a>         |
| Guidelines for Assessing Service Station Sites  | <a href="http://www.environment.nsw.gov.au/clm/servicestation.htm">http://www.environment.nsw.gov.au/clm/servicestation.htm</a>   |
| Guidelines for the Assessment and Management of Groundwater Contamination                           | <a href="http://www.environment.nsw.gov.au/resources/clm/groundwaterguidelines07144.pdf">http://www.environment.nsw.gov.au/resources/clm/groundwaterguidelines07144.pdf</a> |
| Soil Survey Standard Test Methods   | <a href="http://www.environment.nsw.gov.au/soils/testmethods.htm">http://www.environment.nsw.gov.au/soils/testmethods.htm</a>   |
| Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in New South Wales | <a href="http://www.environment.nsw.gov.au/air/faqammodelling.htm">http://www.environment.nsw.gov.au/air/faqammodelling.htm</a>   |

### Victoria Environment Protection Authority

|  |   |
|--|---|
| Sampling and Analysis of Waters, Wastewaters, Soils and Wastes | <a href="http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG701?OpenDocument">http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG701?OpenDocument</a> |
| Soil Hazard Categorisation and Management                      | <a href="http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG621?OpenDocument">http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG621?OpenDocument</a> |
| Soil Sampling  | <a href="http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG702?OpenDocument">http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG702?OpenDocument</a> |
| Solid industrial waste hazard categorisation and management    | <a href="http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG631?OpenDocument">http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG631?OpenDocument</a> |
| Solid Industrial Waste Sampling                                | <a href="http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG703?OpenDocument">http://epanote2.epa.vic.gov.au/EPA/publications.nsf/PubDocsLU/IWRG703?OpenDocument</a> |

**Other International Guidelines and Tools**

|   |   |
|---|---|
| MOEE, 1996. Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario  | <a href="http://www.ene.gov.on.ca/envision/gp/326601.pdf">http://www.ene.gov.on.ca/envision/gp/326601.pdf</a>                     |
| Agency for Toxic Substances and Disease Registry (ATSDR)  | <a href="http://www.atsdr.cdc.gov">http://www.atsdr.cdc.gov</a>   |
| ATSDR Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)  | <a href="http://www.atsdr.cdc.gov/cercla/">http://www.atsdr.cdc.gov/cercla/</a>   |
| ATSDR Minimal Risk Levels   | <a href="http://www.atsdr.cdc.gov/mrls/">http://www.atsdr.cdc.gov/mrls/</a>   |
| The Australian Inventory of Chemical Substances (AICS) Online   | <a href="http://www.nicnas.gov.au/Industry/AICS.asp">http://www.nicnas.gov.au/Industry/AICS.asp</a>                               |
| USGS Acute Toxicity Database  | <a href="http://www.cerc.usgs.gov/data/acute/multiselect.asp">http://www.cerc.usgs.gov/data/acute/multiselect.asp</a>             |
| USGS National Contaminant Biomonitoring Program Database  | <a href="http://www.cerc.usgs.gov/data/ncbp/ncbp.html">http://www.cerc.usgs.gov/data/ncbp/ncbp.html</a>                           |
| Jaagumagi, R. and Persuad, D., 1993. Sediment Assessment: A Guide to Study Design, Sampling and Laboratory Analysis. The Ontario Ministry of Environment and Energy | <a href="http://www.archive.org/details/sedimentassessme00jaaguoft">http://www.archive.org/details/sedimentassessme00jaaguoft</a> |

|  |   |
|--|---|
| German Guidelines on Environmental Monitoring – General                                  | <a href="http://www.umweltbundesamt.de/umweltbeobachtung-e/publikationen/index.htm">http://www.umweltbundesamt.de/umweltbeobachtung-e/publikationen/index.htm</a>                                       |
| Overview of Air Quality Measurement Methods – Czech Republic                             | <a href="http://www.chmi.cz/uoco/isko/tab_roc/1997_enh/ENG/kap_01/komentar_1_1.html#A_AUTO">http://www.chmi.cz/uoco/isko/tab_roc/1997_enh/ENG/kap_01/komentar_1_1.html#A_AUTO</a>                       |
| MOEE, 1994a. Protocol for the Sampling and Analysis of Industrial / Municipal Wastewater | <a href="http://www.ene.gov.on.ca/envision/gp/2724e01.pdf">http://www.ene.gov.on.ca/envision/gp/2724e01.pdf</a>   |
| Lake and Stream Bottom Sediment Sampling Manual  | <a href="http://ilmbwww.gov.bc.ca/risc/pubs/aquatic/lake-stream/index.htm">http://ilmbwww.gov.bc.ca/risc/pubs/aquatic/lake-stream/index.htm</a>   |
| Department of Ecology, State of Washington – Water Quality                               | <a href="http://www.ecy.wa.gov/programs/wq/wqhome.html">http://www.ecy.wa.gov/programs/wq/wqhome.html</a>   |
| Department of Ecology, State of Washington – Air Quality                                 | <a href="http://www.ecy.wa.gov/programs/air/Air_Monitoring_Data/WAQA_Intro_Page.html">http://www.ecy.wa.gov/programs/air/Air_Monitoring_Data/WAQA_Intro_Page.html</a>                                   |
| Department of Ecology, State of Washington – Managing and Reducing Waste                 | <a href="http://www.ecy.wa.gov/waste.html">http://www.ecy.wa.gov/waste.html</a>   |
| Department of Ecology, State of Washington – Monitoring Environmental Toxics             | <a href="http://www.ecy.wa.gov/programs/eap/toxics/index.html">http://www.ecy.wa.gov/programs/eap/toxics/index.html</a>   |
| The World Bank – Strategic Planning Guide for Municipal Solid Waste Management           | <a href="http://www.worldbank.org/urban/solid_wm/erm/Edited%20Word%20Files/The%20Planning%20Guide.pdf">http://www.worldbank.org/urban/solid_wm/erm/Edited%20Word%20Files/The%20Planning%20Guide.pdf</a> |
| UNIDO POPs Portal  | <a href="http://www.unido.org/index.php?id=6213">http://www.unido.org/index.php?id=6213</a>   |

## Appendix 1: EU Drinking Water Standards

Council Directive 98/83/EC on the quality of water for human consumption, adopted by the Council, on 3 November 1998:

### Chemical Parameters

| Parameter          | Symbol/Formula                        | Parametric Value (mg/l) |
|--------------------|---------------------------------------|-------------------------|
| Acrylamide         | $C_3H_5NO$                            | 0.0001                  |
| Antimony           | Sb                                    | 0.005                   |
| Arsenic            | As                                    | 0.01                    |
| Benzene            | $C_6H_6$                              | 0.001                   |
| Benzo(a)pyrene     | $C_{20}H_{12}$                        | 0.00001                 |
| Boron              | B                                     | 1.00                    |
| Bromate            | Br                                    | 0.01                    |
| Cadmium            | Cd                                    | 0.005                   |
| Chromium           | Cr                                    | 0.05                    |
| Copper             | Cu                                    | 2.0                     |
| Cyanide            | CN =                                  | 0.05                    |
| 1,2-Dichloroethane | Cl CH <sub>2</sub> CH <sub>2</sub> Cl | 0.003                   |
| Epichlorohydrin    | $C_3H_5OCl$                           | 0.0001                  |
| Fluoride           | F                                     | 1.5                     |
| Lead               | Pb                                    | 0.01                    |
| Mercury            | Hg                                    | 0.001                   |
| Nickel             | Ni                                    | 0.02                    |
| Nitrate            | $NO_3$                                | 50                      |

|                                       |  |        |
|---------------------------------------|--|--------|
| Nitrite                               | NO <sub>2</sub>  | 0.50   |
| Pesticides                            |  | 0.0001 |
| Pesticides - Total                    |  | 0.0005 |
| PAHs                                  | C <sub>2</sub> H <sub>3</sub> N <sub>1</sub> O <sub>5</sub> P <sub>1 3</sub> | 0.0001 |
| Selenium                              | Se   | 0.01   |
| Tetrachloroethene and Trichloroethene | C <sub>2</sub> Cl <sub>4</sub> /C <sub>2</sub> HCl <sub>3</sub>              | 0.01   |
| Trihalomethanes - Total               |  | 0.1    |
| Vinyl Chloride                        | C <sub>2</sub> H <sub>3</sub> Cl   | 0.0005 |

### Indicator Parameters

| Parameter  | Symbol/<br>Formula | Parametric Value                               |
|--|--------------------|--|
| Aluminium  | Al                 | 0.2 mg/l                                       |
| Ammonium   | NH <sub>4</sub>    | 0.50 mg/l                                      |
| Chloride   | Cl                 | 250 mg/l                                       |
| <i>Clostridium Perfringens</i><br>(including spores) |                    | 0/100 ml                                       |
| Colour   |                    | Acceptable to consumers and no abnormal change |
| Conductivity   |                    | 2500 μS/cm @ 20°C                              |
| Hydrogen ion concentration                           | [H <sup>+</sup> ]  | ≥ 6.5 and ≤ 9.5                                |
| Iron   | Fe                 | 0.2 mg/l                                       |

|                            |                 |  |
|----------------------------|-----------------|--|
| Manganese                  | Mn              | 0.05 mg/l                                      |
| Odour                      |                 | Acceptable to consumers and no abnormal change |
| Oxidisability              |                 | 5.0 mg/l O <sub>2</sub>                        |
| Sulfate                    | SO <sub>4</sub> | 250 mg/l                                       |
| Sodium                     | Na              | 200 mg/l                                       |
| Taste                      |                 | Acceptable to consumers and no abnormal change |
| Colony count 22°           |                 | No abnormal change                             |
| Coliform bacteria          |                 | 0/100 ml                                       |
| Total organic carbon (TOC) |                 | No abnormal change                             |
| Turbidity                  |                 | Acceptable to consumers and no abnormal change |
| Tritium                    | H <sub>3</sub>  | 100 Bq/l                                       |
| Total indicative dose      |                 | 0.10 mSv/year                                  |

### Microbiological Parameters

| Parameter                                  | Parametric Value |
|--|------------------|
| <i>Escherichia Coli</i> ( <i>E. coli</i> ) | 0 in 250 ml      |
| Enterococci                                | 0 in 250 ml      |
| <i>Pseudomonas Aeruginosa</i>              | 0 in 250 ml      |
| Colony count 22°C                          | 100/ml           |
| Colony count 37°C                          | 20/ml            |



## Appendix 2: WHO Drinking Water Standards

WHO, Guidelines for Drinking-water Quality, THIRD EDITION INCORPORATING THE FIRST AND SECOND ADDENDA; Volume 1, Recommendations, Geneva 2008

### Chemical Parameters

|                         | Guideline Value <sup>a</sup> |  |
|-------------------------|------------------------------|--|
| Chemical                | (mg/litre)                   | Remarks  |
| Acrylamide              | 0.0005 <sup>b</sup>          |  |
| Alachlor                | 0.02 <sup>b</sup>            |  |
| Aldicarb                | 0.01                         | Applies to aldicarb sulfoxide and aldicarb sulfone |
| Aldrin and Dieldrin     | 0.00003                      | For combined aldrin plus dieldrin                  |
| Antimony                | 0.02                         |  |
| Arsenic                 | 0.01 (P)                     |  |
| Atrazine                | 0.002                        |  |
| Barium                  | 0.7                          |  |
| Benzene                 | 0.01 <sup>b</sup>            |  |
| Benzo[ <i>a</i> ]pyrene | 0.0007 <sup>b</sup>          |  |
| Boron                   | 0.5 (T)                      |  |
| Bromate                 | 0.01 <sup>b</sup> (A,T)      |  |
| Bromodichloro-methane   | 0.06 <sup>b</sup>            |  |
| Bromoform               | 0.1                          |  |

|  |          |   |
|--|----------|---|
| Cadmium                                | 0.003    |   |
| Carbofuran                             | 0.007    |   |
| Carbon Tetrachloride                   | 0.004    |   |
| Chlorate                               | 0.7 (D)  |   |
| Chlordane                              | 0.0002   |   |
| Chlorine                               | 5 (C)    | For effective disinfection, there should be a residual concentration of free chlorine of $\geq 0.5$ mg/litre after at least 30 min contact time at pH $< 8.0$ |
| Chlorite                               | 0.7 (D)  |   |
| Chloroform                             | 0.3      |   |
| Chlorotoluron                          | 0.03     |   |
| Chlorpyrifos                           | 0.03     |   |
| Chromium                               | 0.05 (P) | For total chromium  |
| Copper                                 | 2        | Staining of laundry and sanitary ware may occur below guideline value   |
| Cyanazine                              | 0.0006   |   |
| Cyanide                                | 0.07     |   |
| Cyanogen Chloride                      | 0.07     | For cyanide as total cyanogenic compounds   |
| 2,4-D (2,4-Dichlorophenoxyacetic Acid) | 0.03     | Applies to free acid  |
| 2,4-DB                                 | 0.09     |   |

|                             |                          |  |
|-----------------------------|--------------------------|--|
| DDT and Metabolites         | 0.001                    |  |
| Di(2-ethylhexyl) phthalate  | 0.008                    |  |
| Dibromoacetonitrile         | 0.07                     |  |
| Dibromochloromethane        | 0.1                      |  |
| 1,2-Dibromo-3-chloropropane | 0.001 <sup>b</sup>       |  |
| 1,2-Dibromoethane           | 0.0004 <sup>b</sup> (P)  |  |
| Dichloroacetate             | 0.05 <sup>b</sup> (T, D) |  |
| Dichloroacetonitrile        | 0.02 (P)                 |  |
| Dichlorobenzene, 1,2-       | 1 (C)                    |  |
| Lead                        | 0.01                     |  |
| Manganese                   | 0.4                      |  |
| Mercury                     | 0.006                    | For inorganic mercury                      |
| Molybdenum                  | 0.07                     |  |
| Nickel                      | 0.07                     |  |
| Nitrate (NO <sub>3</sub> )  | 50                       | Short term exposure                        |
| Nitrite (NO <sub>2</sub> )  | 3                        |  |
| Uranium                     | 0.015                    | Only chemical aspects of uranium addressed |



## Glossary of Terms

### **Acute toxicity**

The ability of a substance to cause severe biological harm or death soon after a single period of exposure or dose. Also, any poisonous effect resulting from a single short-term period of exposure to a toxic substance

### **Acute-to-chronic ratio (ACR)**

The ratio of acute toxicity to chronic toxicity of a chemical or sample that can be used to predict acute toxicity from chronic data and vice-versa.

Example: LC50 = 100 µg/l and Chronic Value = 5 µg/l, ACR = 20.

### **Acceptable daily intake (ADI)**

An estimate of the amount of a substance in food or drinking water, expressed in a body to mass basis (usually mg/kg body weight), which can be ingested daily over a lifetime by humans without a significant health risk.

### **Assessment factor (AF)**

The method of dividing the lowest toxicity value by an assessment factor, the magnitude of which is based on the number, character and quality of available toxicity data. The more data, and the more realistic it is, the lower the magnitude of the assessment factor. Typical assessment factors used are 10, 100 and 1,000. The aim of such a method is to protect all species from lifetime exposure to toxicants. This type of approach is used in a variety of countries including: Australia, New Zealand, USA, Canada, Denmark, the Netherlands and South Africa. It is recommended by OECD.

### **Bioavailability**

Is a unit-less measure of the ratio of the amount of chemical exposure to the amount of chemical that enters the blood of an exposed biota

### **Bio-concentration**

A process by which there is a net accumulation of a chemical takes place directly from water into aquatic organisms, resulting from simultaneous uptake (e.g. by gill or epithelial tissue) and elimination.

**Bio-magnification**

A cumulative increase in the concentration of a persistent substance in successively higher trophic levels of the food chain. The process by which the concentration of a substance increases in different organisms at higher levels in the food chain. For example, if another organism eats an organism, these substances move up the food chain and become more concentrated at each level.

**Biota**

Plants and animals, including humans, fungi or bacteria.

**Catchment**

Areas of land which collect rainfall and contribute to surface water (streams, rivers, wetlands) or to groundwater.

**Chronic toxicity**

A long-term toxic effect, produced in an organism by a toxicant, a substance or a mixture of substances.

**Contamination**

The impairment of water, sediments, plants or animals, by chemicals or bacteria, to such an extent that a hazard is created to public and environmental health through poisoning, bio-concentration (bio-accumulation), or through the spread of disease. Contamination can be occur naturally or be manmade.

**Criteria**

Statements of the conditions presumed to support or protect the designated use or uses of an environment. Criteria may be narrative or numeric.

**Critical limit**

A prescribed tolerance that must be met to ensure that a CCP effectively controls a potential health hazard; a criterion that separates acceptability from unacceptability (Codex Alimentarius).

**Decision framework or Decision tree**

A series of steps for tailoring guidelines which trigger values to a specific site or region and for assessing water quality by considering local or regional environmental factors that will modify the effect of the particular water quality parameter. Decision frameworks or trees begin with the simplest steps and finish with the most difficult and expensive

**Dose-response**

The quantitative relationship between the dose of an agent and an effect caused by that agent

**Drinking water quality monitoring**

The wide-ranging assessment of water quality in the distribution system as supplied to the consumer; includes regular sampling and testing performed for assessing conformance with guideline values and compliance with regulatory requirements and/or agreed levels of service.

**EC50 (median effective concentration)**

Effective concentration; the dosage at which the desired response is present for 50% of the population.

**Environmental concern level (ECL)**

ECLs are designed for chemicals for which there is no trigger value. They should only be used as working levels until more data can be obtained or the guidelines can be independently derived

**Environmental values**

Particular values or use of the environment which are important for a healthy ecosystem or for public benefit, welfare, safety or health and which require protection from the effects of pollution, waste discharges and deposits. Several environmental values may be designated for a single specific water body.

**EPHC**

Environment Protection and Heritage Council

**Exposure**

Contact of a chemical, physical or biological agent with the outer boundary of an organism, e.g. inhalation, ingestion or dermal contact.

**Exposure assessment**

The estimation (qualitative or quantitative) of magnitude, frequency, duration, route and extent of exposure to one or more contaminated media.

**Ground level concentration**

Concentration of chemicals in air at ground level.

**Groundwater**

Water stored underground in rock crevices and in the pores of geologic materials that make up the Earth's crust; water that supplies springs and wells.

**Guideline**

Numerical concentration limit or narrative statement recommended to support and maintain a designated environmental use.

**Guideline trigger values**

These are the concentrations (or loads) of the key performance indicators measured for an ecosystem, below which there exists a low risk that adverse biological (ecological) effects may occur. They indicate a risk of impact if exceeded and should 'trigger' some action, either further ecosystem specific investigations or the implementation of management/remedial action.

**Guideline value**

The concentration or measure of a water quality characteristic which, based on present knowledge, either does not result in any significant risk to the health of the consumer (health-related guideline value), or is associated with good quality water (aesthetic guideline value).

**Half-life**

Time required to reduce, by one-half, the concentration of a material in a medium (e.g. soil or water) or organism (e.g. fish tissue) by transport, degradation, transformation or depuration.

**Hazard analysis and critical control point (HACCP)**

A systematic methodology designed to control safety hazards in a process which applies a two part technique: first, an analysis that identifies hazards, their severity and likelihood of occurrence; and second, the identification of critical control points and their monitoring criteria to establish controls that will reduce, prevent, or eliminate the identified hazards.

**Health risk assessment**

The process of estimating the potential impact of a chemical, biological or physical agent on a specific human population system under a specific set of conditions.

**High reliability guideline trigger values**

Trigger values which have a higher degree of confidence because they are derived from an adequate set of chronic toxicity data and, hence, require less extrapolation from the data to protect ecosystems.

**ISO 14001:1996 (Environmental Management Systems)**

An internationally accredited standard that provides a generic framework for guidance on the development and implementation of an environmental management system to minimize the impact of business operations on the environment and to foster environmental sustainability.

**ISO 9001:1994(Quality Systems)**

An internationally accredited standard that provides a generic framework for quality systems. Designed to assure conformance to specific requirements by a supplier at all stages during the design, development, production, installation, and servicing of a product. It sets out the requirements needed to achieve an organisation's aims with respect to guaranteeing a consistent end product.

**ISQG**

Interim Sediment Quality Guideline

**LC100**

The lowest concentration of a toxicant that kills all test organisms.

**LC50 (median lethal concentration)**

The concentration of material in water that is estimated to be lethal to 50% of test organisms. The LC50 is usually expressed as a time-dependent value, e.g. 24-hour or 96-hour LC50, the concentration estimated to be lethal to 50% of the test organisms after 24 or 96 hours of exposure.

**LD50 (median lethal dose)**

The dose of material that is estimated to be lethal to 50% of test organisms. Appropriate for use with test animals such as rats, mice and dogs, it is rarely applicable to aquatic organisms because it indicates the quantity of a material introduced directly into the body, by injection or ingestion, rather than through the concentration of the material in water in which aquatic organisms are exposed during toxicity tests.

**Lowest observed effect concentration (LOEC)**

The lowest concentration used in a toxicity test that has a statistically significant adverse effect on the exposed population of test organisms, as compared with controls; the statistical significance is measured at a rate of 95% confidence intervals.

**Lowest observed effect level (LOEL)**

The lowest concentration that produces an observable effect in a test species. Below this concentration there are no observed effects in the test species.

**Long-term trigger value (LTV)**

The maximum concentration of a contaminant in irrigation water that can be tolerated, assuming 100 years of irrigation, and based on key irrigation loading assumptions.

**Low reliability guideline trigger values**

Trigger values that have a low degree of confidence because they are derived from an incomplete set of data . They are derived either by using assessment factors or from data modeled using the statistical method. They should only be used as interim indicative working levels.

**Moderate reliability guideline trigger values**

Trigger values which have a moderate degree of confidence because they are derived from an adequate set of acute toxicity data and, hence, require more extrapolation than high reliability trigger values, including acute-to-chronic conversion.

**NEPC**

National Environment Protection Council

**NEPM**

National Environment Protection Measure

**NHMRC**

National Health and Medical Research Council

**No observed effect concentration (NOEC)**

The highest concentration of a toxicant at which no statistically significant effect is observable, compared with controls; the statistical significance is measured at a rate of 95% confidence intervals.

**OECD**

Organization for Economic Co-operation and Development

**pH**

A value that represents the acidity or alkalinity of an aqueous solution. It is defined as the negative logarithm of the hydrogen ion concentration of the solution.

**Practical quantization limit (PQL)**

The practical quantization limit (PQL) is the lowest level achievable among laboratories, within specified limits, during routine operations. The PQL represents a practical and routinely achievable detection level with a relatively good certainty that any reported value is reliable. The PQL is often around 5 times the level of the method detection limit.

### **Quantitative structure activity relationship (QSAR)**

This is the quantitative prediction of the biological, eco-toxicological or pharmaceutical activity of a molecule. It is based upon structure and activity information gathered from a series of similar compounds.

### **Reference condition**

An environmental quality or condition which is defined from as many similar systems as possible, and is used as a benchmark for determining the environmental quality or condition to be achieved and/or maintained in a particular system of an equivalent type.

### **Risk**

The probability of a specified hazard causing harm; estimated in terms of consequences and likelihood

### **Risk assessment**

The overall process of using available information to predict how often hazards or specified events may occur (likelihood) and the magnitude of their consequences

### **Salinity**

The presence of soluble salts in or on soils or in water.

### **STV (short-term trigger value)**

The maximum concentration of a contaminant in irrigation water that can be tolerated for a short period of time (20 years) assuming the same maximum annual irrigation loading to soil as to the long-term trigger value (qv).

### **Standard**

Legally enforceable numerical limits or narrative statements specified in permits, approvals, regulations, legislation and orders.

### **Tolerable intake (TI)**

An estimate of the intake of a substance that can occur over a lifetime without an appreciable health risk. It may have different units depending on the administration route (WHO, 1994).

**Toxicity**

The quality or degree of being poisonous or harmful to plant, animal or human life.

**Toxicology**

Study of poisons, their effects, antidotes and detection.

**Trigger values**

These are the concentrations (or loads) of key performance indicators measured in an ecosystem, below which there exists a low risk that adverse biological (ecological) effects will occur. They indicate a risk of impact if exceeded and should 'trigger' some action, either further ecosystem specific investigations or the implementation of management/remedial actions.

**Water quality criteria**

Scientific data evaluated to achieve the recommended quality of water for various uses.

**Water quality objective**

A numerical concentration limit or narrative statement that has been established to support and protect the designated uses of water at a specified site. It is based on scientific criteria or water quality guidelines, but may be modified by other inputs, such as social or political constraints.

CIP – Каталогизација у публикацији  
Цетрална народна библиотека Црне Горе, Цетиње

502/504 (035)

MARSTIJEPOVIĆ, Snežana

Environmental Monitoring and Field Surveillance  
Reference Guide / [authors Snežana Marstijepović,  
Stewart Williams]. – Podgorica : UNDP Montenegro,  
2009 (Belgrade : Publikum). – 70 str.: tabelle; 30 cm

Podatak o autorima preuzet is impresuma. – Tiraž  
700.

ISBN 978-9940-9245-3-9

Gl. stv. nasl. 2. Williams, Stewart [аутор]

а) Животна средина – Праћење – Водичи

COBISS.CG-ID 14821136