EAP Task Force

PROPOSED SYSTEM OF SURFACE WATER QUALITY STANDARDS FOR MOLDOVA:

Technical Report

This report was prepared by Paul Buijs (The Netherlands) and Carmen Toader (Romania) for the EAP Task Force Secretariat/OECD in the framework of the project "Support for Convergence with EU Water Quality Standards in Moldova. The project is supported by UK DEFRA.

For further information, please contact Eugene Mazur, OECD Project Manager: eugene.mazur@oecd.org.

ABOUT OECD AND THE EAP TASK FORCE

Organisation for Economic Co-operation and Development (OECD)

The OECD is a unique forum where the governments of 30 democracies with developed market economies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The OECD provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.

EAP Task Force

The Environmental Action Programme (EAP) was adopted in 1993 by Environment Ministers in Lucerne, Switzerland as part of the "Environment for Europe" process. Its members comprise the governments of Western, Central and Eastern Europe, North America, the Caucasus and Central Asia. International Organisations and Financial Institutions, business, and NGOs also participate in the work of the Task Force. The secretariat of the EAP Task Force is located in OECD's Environment Directorate, Environment and Globalisation Division. The Task Force works in conjunction with the Project Preparation Committee (PPC), a network of International Financial Institutions and donors, that aims to accelerate environmental investments. For further information, please visit dedicated webpages at: www.oecd.org/env/eap

TABLE OF CONTENTS

Annexes

ABBREVIATIONS AND ACRONYMS

AA	Annual average
BAT	Best available technique
BG	Natural background level
BOD	Biochemical oxygen demand
COD	Chemical oxygen demand
DEFRA	Department for Environment, Food and Rural Affairs (United Kingdom)
DO	Dissolved oxygen
EAP TF	Task Force for Implementation of the Environmental Action Programme for Eastern Europe, Caucasus and Central Asia
EC	European Commission
ELV	Emission/effluent limit value
EQS	Environmental quality Standard
EQR	Environmental quality ratio
EU	European Union
G	Guide value (*commonly used in tables with EU standards*)
Hydromet	State Hydro-meteorological Service
HR	Hygienic Regulation
I	Mandatory value (*commonly used in tables with EU standards*)
ICPDR	International Commission for the Protection of the Danube River
IPPC	Integrated pollution prevention and control
MENR	Ministry of Ecology and Natural Resources
N_{tot}	total nitrogen
NIS	New Independent States
OECD	Organisation for Economic Cooperation and Development
P_{tot}	total phosphorus
POP	Persistent organic pollutant
RC	Reference condition

RPSW	Rules for Protection of Surface Waters
Sanepid	National Centre of Preventive Medicine
SEI	State Ecological Inspectorate
SS	Suspended Solids
SWQS	Surface water quality standard
TNMN	Trans-national Monitoring Network (under ICPDR)
UNECE	United Nations Economic Commission for Europe
WFD	Water Framework Directive

1. INTRODUCTION

1.1. Background

The protection of water resources is one of the key priorities established in the Concept of the Environmental Policy of the Republic of Moldova (2001), which also calls for the "revision of existing laws and regulations, convergence with European norms, and adjustment or elaboration of necessary mechanisms for their implementation." The same orientation is expressed in the EU-Moldova Action Plan which was signed in 2005. Moldova is party to the Danube River Protection Convention (1994) and a subsequent inter-governmental agreement with neighbouring Romania (1997) which emphasises the harmonisation of legislation and technical standards in the water sector. These commitments give an additional impetus to Moldova's convergence with the EU environmental norms, which were recently adopted by Romania.

Moldova's existing system of surface water quality standards (SWQSs) is comprehensive and ambitious, covering hundreds of pollutants and mandating very low concentrations of contaminants. To date, some reform of the system has been carried out but it is still based primarily on the approach established under the Soviet Union.

Some practical work has already been undertaken in Moldova over the last few years to support convergence with EU environmental legislation in the water sector. In particular, the Moldova subproject of the TACIS project "Support for the Implementation of Environmental Policies and NEAPs in the NIS" (2002-2003) focused on reforming the country's system of water quality regulation. It proposed an EU-modelled, use-based surface water quality classification scheme for Moldova and discussed legal and institutional issues of reforming the WQS system, setting the stage for further work.

In response to a request from Moldova's Ministry of Ecology and Natural Resources, the EAP Task Force Secretariat (located at the OECD Environment Directorate in Paris) solicited and received a grant from the UK Department for Environment, Food and Rural Affairs to implement a project "Support for Convergence with EU Water Quality Standards in Moldova".

1.2. Project Description

1.2.1. Project Objective

The project's objective is to make Moldova's surface water quality standards fairer, more economically feasible and realistic, thereby converging the country's water quality legislation with that of the European Union.

The project work will focus on supporting the reform of the system of surface water quality classification in Moldova and the implementation of new sets of SWQSs for each use-based class. This will be consistent with the EU Water Framework Directive and earlier EU Directives which defined particular quality requirements for certain pollution parameters and user categories of surface water bodies. However, the EU norms should be adapted, as appropriate, to the local conditions (e.g., with respect to the particularities of the natural environmental and the monitoring capacity).

1.2.2. Planning

The project will be carried out between period April 2006 and June 2007 and is divided into three phases.

The preparation of this Technical Report constitutes the first phase of the project. This report seeks to describe and justify a proposal for a new system of Surface Water Quality Standards (SWQS) and discuss it in a series of stakeholder workshops in Moldova.

In Phase 2, the proposed new SWQS system will be tested through two pilot projects in locations where specific water bodies (or distinct parts thereof) will be selected in order to (1) define, through stakeholder dialogue, a water quality objective for each of them based on environmental and socio-economic criteria; and (2) illustrate the environmental and economic impact of the proposed changes. A joint report on the results of the pilot projects will be produced.

In the project's third phase, a draft Policy Report will be prepared on the basis of the Technical Report, incorporating the pilot project results. It will comprise:

- Proposals for amendments of Moldova's environmental/water primary and secondary legislation.
- Proposals for possible adjustments of institutional responsibilities and procedures.
- Description of linkages to necessary reforms of related policy instruments (permitting, compliance assurance, economic instruments).
- Implementation plan for the new SWQS system.

1.3. Purpose and Outline of the Report

The purpose of this report is to analyse the current Moldovan system of surface water quality standards and develop a proposal for an improved system, using relevant EU Directives as a benchmark and considering Moldova's obligations under various international agreements. This new SWQS system will comprise three principal components:

- a use-base hierarchical (i.e., ranked in order of decreasing water quality) classification of water bodies;
- a list of water pollution parameters to be regulated, consistent with the existing monitoring capacity; and
- numerical values of water quality standards for each class of water quality.

Chapter 2 describes the regulatory basis and specifics of the system of SWQS currently in place in Moldova. *Chapter 3* contains an overview of systems of SWQS in the EU and Moldova's neighbouring countries, Romania and Ukraine. With convergence with EU regulations being an important underlying driving factor, the EU Directives dealing with surface water quality and standards are described. Because Moldova's major rivers (the Prut, the Dniester and a small section of the Danube) are all trans-boundary, the major features of SWQSs in place in Romania and Ukraine, the classification scheme used by the International Commission for the Protection of the Danube River (ICPDR), and guidance from the UN Economic Commission for Europe (UN ECE) are also presented. In *Chapter 4*, Moldova's existing system of water quality standards is assessed and compared with the respective EU system. *Chapter 5* contains the

actual proposal for a new system of SWQSs for Moldova. Besides presenting the system as such, the chapter discusses the considerations underlying the proposal and gives a brief overview of some of the possible consequences of introducing the proposed system. The latter is an important subject for further elaboration during Phases 2 and 3 of the project.

1.4. Stakeholder Consultations on the Draft Report

The first draft Technical Report was released in September 2006 and disseminated among various stakeholders. It was presented and discussed during a series of sessions:

- a stakeholder workshop in Chisinau on 18 October 2006;
- consultation sessions with representatives of Hydromet, Apa-Canal Association, Apele Moldovei, Aquaproject, and the Institute for Ecology and Geography (1 November 2006), as well as the National Centre of Preventive Medicine (10 November 2006); and
- meetings organised in the framework of preparation of the pilot projects, with representatives of the Criuleni and Calarasi districts on 16-17 October 2006.

The proposed system of SWQS has generally been endorsed by the stakeholders. Nevertheless, the consultation sessions raised a number of ideas for amending the proposal (including the addition of a number of parameters – e.g., nitrites, sulphates, phenols, oil products – to the list of regulated substances). Most of them have been incorporated in the final version of the report. .

2. OVERVIEW OF THE CURRENT SYSTEM OF SURFACE WATER QUALITY STANDARDS IN MOLDOVA

This chapter provides a general overview of Moldova's laws and regulations that contain either actual surface water quality standards or rules that are directly related to them. An exhaustive overview and review of Moldova's water management regulations is outside the scope of this report. It should also be noted that effluent standards are not a subject of this report.

2.1. Overview of Relevant Laws and Regulations

The basic principle of the Concept of National Water Policy adopted by the Parliament in 2003 is an integrated approach to the management of surface waters. With respect to water quality requirements for the different water uses, the Concept mentions the need to apply requirements of international conventions and EU Directives while maintaining the country-specific characteristics of and approaches to aquatic ecosystems, including vulnerable aquatic species.

The two major pieces of legislation relevant in the context of current surface water quality standards are:

- the Law on Environmental Protection of 1993 (amended in 1998), and
- the Water Code of 1993 (amended in 2003)

Both are framework laws formulating only major principles and mechanisms for surface water management. The Law on Environmental Protection stipulates requirements that are mainly applicable to pollution sources, including a ban for discharges of untreated wastewater to a surface water body. The Water Code stipulates that discharge of wastewater is allowed only if it does not increase the concentration of pollutants in ambient water to the levels higher than the maximum allowable concentrations (MACs). The Water Code also lists the main uses of Moldova's surface waters:

- drinking and other communal uses;
- recreation;
- agricultural uses;
- industrial and hydropower uses;
- transportation;
- fishery;
- hunting and nature protection; and
- discharges of wastewater.

The Law on Natural Resources (1997) classifies all surface waters as national water resources and states that the rivers Dniester and Prut, as well as the lakes Cahul and Ialpug, are trans-boundary water bodies.

The Law on Sanitary-Epidemiological Safety of the Population (1993, amended 1996), requires that the quality of raw water used for communal/domestic (drinking) and recreational purposes be in accordance with hygienic requirements. In addition, the Law on Drinking Water of 1999 indicates that protection of drinking water sources is obligatory and should be done in accordance with sanitary-ecological requirements, by applying pollution prevention and other measures.

In addition, the legislation governing fisheries has serious implications for water management in Moldova. The Law on the Animal Kingdom of 1995 (Annex II) stated that "all water bodies… located on the territory of the country, which are or potentially can be used for breeding and catching of fish and other aquatic organisms… are designated as *fishery waters*." The Law on Fish Reserve (Fund), Fishing and Fish-farming (August 2006) defines natural and artificial "fish management water bodies" and contains a respective list of ponds, lakes, fish breeding stations, which practically includes all Moldova's surface waters of any significance.

In addition to the basic national legislation, Moldovan ministerial regulations have defined surface water quality standards for three designated uses:

- water abstraction for drinking and domestic needs of population and food industry;
- different varieties of recreation activities (socio-cultural use) and for irrigation of crops, which are consumed without thermal pre-treatment;
- commercial fishery and fish farming, including protection of any aquatic organisms.

The actual surface water quality standards are stipulated in:

- the Rules for Protection of Surface Waters (RPSW) of 1991 (adopted by the State Committee for Environmental Protection of USSR);
- Hygienic Regulation (HR) No. 06.6.3.23. of 3 July 1997 "Protection of Water Bodies against Pollution" issued by the Ministry of Health of the Republic of Moldova.

Box 1. A Legal Framework in Transition

Moldova is still in the process of redefining the legal system it inherited from the former USSR. The country's surface water quality regulations are a case in point.

According to the "Law on the Revision and Optimisation of Regulation" (No. 424-XV of 16.12.04), all ministerial regulations, norms, instructions, etc. which had not been published in the Official Monitor should be considered void until new versions are published in the Official Monitor.

Following this law, the Government issued a Decree "On the Adoption of a Register for Official Acts" (No. 1030 of 03.10.05) whose Annex I contained a list of documents that are legally valid in Moldova. Neither the Rules for Protection of Surface Waters (RPSW) of 1991 nor any water quality related hygienic regulations (issued by the Ministry of Health) are included in this annex. It means that they are not in the official Register. In Annex IV of the same Decree, there is a list of documents that should be reauthorized and officially published, including the Rules for Protection of Surface Waters (RPSW) of 1991. The Hygienic Regulation (HR) No. 06.6.3.23. of 3 July 1997 is not included in either of these Annexes.

Following this law, the Government issued a Decree "On the Adoption of a Register for Official Acts" (No. 1030 of 03.10.05) whose Annex I contained a list of documents that are legally valid in Moldova. Neither the Rules for Protection of Surface Waters (RPSW) of 1991 nor any water quality related hygienic regulations (issued by the Ministry of Health) are included in this annex. It means that they are not in the official Register. In Annex IV of the same Decree, there is a list of documents that should be reauthorized and officially published, including the Rules for Protection of Surface Waters (RPSW) of 1991. The Hygienic Regulation (HR) No. 06.6.3.23. of 3 July 1997 is not included in either of these Annexes.

2.2. Standards for Surface Waters Used for Drinking Water Supply, Recreation and Irrigation

The HR (1997) stipulate the general principles of protection of natural waters against pollution and contain the following provisions:

- Water quality norms for water bodies used for drinking and social-cultural purposes (recreation);
- Requirements for protection of water bodies in case of various economic activities;
- Requirements for wastewater discharges;
- Hygienic requirements for allocation, design, construction, reconstruction, re-equipment of facilities which can pollute surface waters;
- Hygienic rules for operation of facilities;
- A list of 238 chemical substances for which sanitary Maximum Allowable Concentrations (MAC) are established; and
- A classification scheme for assessment of water bodies in accordance with hygienic requirements.

Annex I of the Regulation presents the requirements for water bodies differentiated under two different water use groups as shown in Table 1.

Table 1. Moldovan Standards for Surface Waters Used for Drinking Water Abstraction, Recreation and Irrigation

Parameter	Unit	Maximum Allowable Value			
		Water bodies for drinking water production and food industry water supply			**Water bodies** for bathing, sport, recreation, irrigation and within urban areas
		category 1	category 2	category 3	
Turbidity	mg/l	20	1500	10000	-
Floating materials	-	floating materials should not present on the surface of water			
Colour	grade	35	120	200	-
Odour (20 ^{o}C and 60 ^{o}C)	point	2	3	4	2
Mineralization	mg/l	should not exceed 1000, including for Cl – 350 and SO_4 - 500			
pH	-	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5	6.5 - 8.5
Dissolved Oxygen	mg/l	should not be less than 4			
Fe	mg/l	1	3	5	1
Mn	mg/l	0.1	1	2	0.1
Phytoplankton	mg/l or	1	5	50	-
	cells/cm^3	1,000	10,0000	100,000	-
COD_{Mn}	mgO_2/l	7	15	20	-
BOD_{total}	mgO_2/l	3	5	7	6
Pathogens	-	should not be detected			
Lactozo-positive bacteria	number of microbes per litre	1,000	10,000	50,000	5,000
Colifages	-	absence	100	100	100
Ovum of helmintes	number per l	should not be detected			
Other chemical substances		should not be found in concentrations exceeding Maximum Allowable Concentration			

The 'other chemical substances' are mentioned in Annex II of the HR (1997), containing MACs for 238 substances. Besides (total) ammonia, fluorine and sulphates, this list includes (heavy) metals and organic micro-pollutants.

The regulation distinguishes three classes of water which can be used for the production of drinking water. Depending on the quality class, a certain type of treatment is prescribed. Surface waters exceeding the quality limits for category 3 cannot be used for the production of drinking water.

2.3. Fishery Waters

The rules and criteria for fishery waters are regulated in the RPSW (1991). Fishery waters comprise waters for living, reproduction and migration of fish and other water organisms. There are three categories of fishery waters:

1. superior – important reproduction and feeding areas, wintering areas of high value fish species and other commercially valuable organisms, as well as protected areas of any aqua-farm;

2. first – water bodies used for protection and reproduction of valuable fish species with living requirements to high oxygen content in the water; and

3. second – other water bodies used for fishing activities.

Table 2 . General Water Quality Requirements for Fishery Water Bodies

Parameter	Qualitative requirement	Fishery water body	
		Superior and first class	Second class
Suspended solids (SS)	The concentration at the control point should not exceed the natural level by more than	0.25 mg/l	0.75 mg/l
	For water streams with SS concentration over 30 mg/l at the low water level period, it may be exceeded by:	5%	5%
	The discharge of wastewater containing SS with sedimentation rate of 0.2 mg/l (for lakes) or 0.4 mg/l (for rivers) is:	prohibited	prohibited
Floating substrates	The presence of the oil product, fats, oils and other substrates on the surface of water is:	prohibited	prohibited
Colour	Presence of an artificial colour is:	prohibited	prohibited
Temperature		Water temperature should not exceed the natural temperature by more than 5 ^{0}C and should not exceed 20 ^{0}C in the summer and 5 ^{0}C in the winter for cold waters and 28 ^{0}C in the summer and 8 ^{0}C in the winter for other waters	
pH		6.5 - 8.5	6.5 - 8.5
Mineralization (total salt content)		Should be in accordance with the taxonomy of fishery waters	Should be in accordance with the taxonomy of fishery waters
Dissolved oxygen		No less than 6 mg/l	No less than 6 mg/l in the summer and 4 mg/l in the winter
BOD_{total}	At 20 ^{o}C temperature should not exceed:	3 mg O_2/l	3 mg O_2/l
Toxic substances		Water quality should not exceed MAC	
Pathogens		Water should not contain any pathogens	
Toxicity		Wastewater at the discharge should not show acute or chronic toxicity for the test organisms.	

The list of MACs for fishery waters consists of 1072 substances (plus 11 which were added after its publication). Furthermore, for 48 parameters there is a list with “guidance safety levels” temporary to be applied to the substances for which a MAC is not established.

3. OVERVIEW OF SQWS SYSTEMS IN THE EU, ROMANIA, UKRAINE AND UNDER THE ICPDR

This chapter describes a number of SWQS systems in order to:

- show examples of how SWQSs have been elaborated in other, including neighbouring, European countries, at the same time allowing comparison with the current Moldovan SWQSs; and

- provide comparative background information for the proposed new SWQS system described in Chapter 5.

The following SWQS systems are considered:

- *European Union*. With convergence with the EU water quality legislation being an important direction of the reform of the current SWQS system in Moldova, an overview has been prepared of relevant EU legislation with respect to surface water quality.

- *Ukraine*. Moldova shares a number of trans-boundary water courses with Ukraine, most importantly the Dniester. The information in this chapter can be used to get an indication for how the proposed SWQS may deviate from the ones currently in place in Ukraine. This will help in assessing the possible implications of the proposed SWQS system with respect to bilateral arrangements with Ukraine.

- *Romania*. Romania shares the other major Moldovan river, the Prut, and several bilateral agreements have already been adopted for this river. Besides serving as a reference for the proposed SWQSs, the Romanian system is interesting since it has experienced significant changes in the past decade (it is expected to change further due to Romania's 2007 EU accession and the resulting need to comply with the Water Framework Directive).

- *International Commission for the Protection of the Danube River (ICPDR).* The ICPDR is a trans-national body established to implement the Danube River Protection Convention which Moldova ratified in 1999. The ICPDR has developed a water classification scheme, among others, for assessment of the surface water quality data collected in the Trans-national Monitoring Network.

- *UN Economic Commission for Europe*. The UNECE Standard Statistical Classification of Surface Freshwater Quality for the Maintenance of Aquatic Life was published in 1992. The classification is a statistical description of surface freshwater quality from the point of view of suitability for aquatic life. As such, it can be used as an example for what standards may look like when protection of aquatic life is a major objective.

3.1. European Union

3.1.1. Overview of Relevant Legislation

Water is one of the most comprehensively regulated areas of the EU environmental legislation. The early European water policy took shape in the 1970s with the First Environmental Action Programme in 1973 followed by a first wave of legislation, starting with the 1975 Surface Water Directive and culminating in the 1980 Drinking Water Directive. This first wave of water legislation included water quality standard legislation on fish waters (1978), shellfish waters (1979), bathing waters (1976) and groundwater (1980). In the field of emission limit value legislation, the Dangerous Substances Directive (1976) and its daughter Directives governed various individual substances.

A second wave of water legislation followed a review of existing legislation and identification of necessary improvements and gaps to be filled. This phase of water legislation included the Urban Waste Water Treatment Directive (1991) and the Nitrates Directive (1991). The other elements identified were revisions of the Drinking Water and Bathing Water Directives to bring them up to date (proposals for revisions adopted in 1994 and 1995, respectively), the development of a Groundwater Action Programme and the 1994 proposal for an Ecological Quality of Water Directive.

After an extended discussion at the Member States and Community level, it became increasingly clear that efficient protection of water required application of effluent limit values as well as water quality standards, in a so-called "combined approach". The combined approach is manifested in the IPPC Directive (96/61/EEC) which regulates large industrial installations by mandating integrated permits that must include, among others, effluent limit values that should not lead to exceeding of local water quality standards. Recognising the need for an integrated Community water policy, the European Commission developed the Water Framework Directive (2000/60/EC) which was adopted in 2000.

Some Directives include explicit quality standards for surface waters (like the Directive for abstraction of drinking water, 75/440/EEC) while other Directives, although generally aiming at improvement of surface water and groundwater, do not contain explicit water quality standards (e.g. the Urban Wastewater Directive 91/271/EEC or the Nitrate Directive 91/676/EEC).

The following sections further describe most relevant of these Directives, since they serve as references for the proposed SWQSs for Moldova.

3.1.2. Abstraction of Surface Water for Drinking Water Supply

The Surface Water Directive 75/440/EEC "concerning the quality required of surface water intended for the abstraction of drinking water" lays down requirements to ensure that it meets certain minimum standards specified in the Directive. Wherever a water body used or intended for use for drinking water abstraction does not meet the requirements, Member States have to establish and implement plans of action.

The Directive distinguishes three different categories of treatment, depending on the actual surface water quality. The definition of the standard methods of treatment for transforming surface water of categories A1, A2 and A3 into drinking water are:

- Category A1: Simple physical treatment and disinfection, e.g., rapid filtration and disinfection.
- Category A2: Normal physical treatment, chemical treatment and disinfection, e.g., pre-chlorination, coagulation, flocculation, decantation, filtration, disinfection (final chlorination).

- Category A3: Intensive physical and chemical treatment, extended treatment and disinfection, e.g. chlorination to break-point, coagulation, flocculation, decantation, filtration, adsorption (activated carbon), disinfection (ozone, final chlorination).

Surface waters having physical, chemical and microbiological characteristics falling short of the mandatory limit values corresponding to treatment type A3 may not be used for the abstraction of drinking water[1].

The Directive contains a list of 46 parameters in its Annex II (included in Annex 2 of this report). In principle, for each of the categories A1, A2 and A3, two quality standards are mentioned: guide values G and mandatory values I (for some parameters no actual quality standards are stipulated). Member States are to set values which may not be less stringent than those given in the "I" columns of Annex II. The "G" values should be used by the Member States as guidelines. Article 6 of the Directive mentions that "Member States may at any time fix more stringent values for surface water than those laid down in this Directive."

This Directive will be repealed in 2007 and subsumed in the Water Framework Directive (WFD).

3.1.3. Bathing Waters

Directive 76/160/EEC "on the quality of bathing waters" seeks to ensure the quality of bathing waters throughout the EU, both for fresh water and coastal water bathing areas. The Directive lays down 19 physical, chemical and microbiological (groups of) parameters and requires Member States to monitor their bathing areas according to the rules for sampling frequencies and parameters. Member States have to take all appropriate measures in order to comply with the mandatory quality standards laid down in the Directive. Annex 2 of this report contains a table with quality standards of this Directive. As with most EU directives, G and I standards are distinguished, although for several parameters the Directive does not mention numeric values.

Published in early 2006, Directive 2006/7/EC "concerning the management of bathing water quality and repealing Directive 76/160/EEC" will replace Directive 76/160/EEC. Member States must bring their laws, regulations and administrative provisions into conformance with this new Directive by 24 March 2008.

Directive 2006/7/EC is an example where the WFD 'takes over' previous Directives. With Directive 76/160/EEC having specified 19 physical, chemical and microbiological (groups of) parameters, only 2 microbiological parameters remain (see Annex 2 of this report).

3.1.4. Fishery Waters

Directive 78/659/EEC "on the quality of freshwaters needing the protection or improvement in order to support fish life" seeks to protect those fresh water bodies identified by Member States as fishery waters. For those it sets water quality standards (G and I values) for salmonid fish waters and cyprinid fish waters. Salmonid waters must be capable of supporting fish belonging to species such as salmon, trout, grayling and whitefish while cyprinid waters must support fish belonging to the cyprinids (Cyprinidae) or other species such as pike, perch and eel. Where the water quality in such designated waters is not in compliance with the standards, programmes to reduce pollution have to be set up. Requirements on sampling and monitoring are also specified. The standards of this Directive are included in Annex 2 herein.

[1] However, such lower quality water may be used in exceptional circumstances provided suitable processes, including blending, bring the water quality characteristics up to the level of the quality standards for drinking water.

The WFD states that this Directive will be repealed as of 31 December 2013.

3.1.5. Dangerous Substances Directive

Directive 76/464/EEC of 1976 "on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community" must be considered jointly with a number of "daughter Directives":

- Directive 82/176/EEC of 1982 on limit values and quality objectives for mercury discharges by the chlor-alkali electrolysis industry;

- Directive 83/513/EEC of 1983 on limit values and quality objectives for cadmium discharges;

- Directive 84/156/EEC of 1984 on limit values and quality objectives for mercury discharges by sectors other than the chlor-alkali electrolysis industry;

- Directive 84/491/EEC of 1984 on limit values and quality objectives for discharges of hexachlorocyclohexane; and

- Directive 86/280/EEC of 1986 on limit values and quality objectives for discharges of certain dangerous substances included in list I of the Annex to Directive 76/464/EEC.

Directive 76/464/EEC requires Member States to control all emissions of dangerous substances by a permit or authorisation system. The Directive and its daughter Directives target individual dangerous substances or groups of substances (refer to Annex 2 of this report for an overview). The Directive introduced the concept of list I and list II substances. The purpose of the Directive is to eliminate pollution from list I substances and to reduce pollution from list II substances.

- *List I* includes a number of groups and families of pollutants from which certain individual substances were to be selected on the basis of their persistence, toxicity and bioaccumulation. In total, there are 132 "candidate list I substances". Up to now, 18 individual substances of the "candidate list I" are regulated in five daughter Directives which set emission limit values and quality objectives at the Community level. These Directives were the first mandatory minimum requirements for an approach based on best technical means (later known as best available techniques, BAT). The regulation of other "candidate list I substances" was suspended in the beginning of the 1990s due to the preparation of a more comprehensive integrated permitting system for industrial installations. The Integrated Pollution Prevention and Control (IPPC) Directive (96/61/EC) adopted in 1996 includes emission limit values for 18 list I substances of the specific Directives as minimum requirements for large installations.

- *List II* includes groups and families of substances that have a deleterious effect on the aquatic environment. It also consists of all the individual list I substances that have not yet been regulated at the Community level. As there are only 18 'real' list I substances, all the other 114 substances of the "candidate list I" and the groups and families of substances under list I must be considered as list II substances. For the relevant pollutants of list II, Member States must establish pollution reduction programmes, including water quality objectives.

A significant number of pollutants addressed by Directive 76/464/EC are now grouped among the Water Framework Directive's Priority Substances (see next section). In order to incorporate these changes, Directive 76/464/EEC was replaced in February 2006 by Directive 2006/11/EC "on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community".

The Proposal for a Directive "on environmental quality standards in the field of water policy and amending Directive 2000/60/EC" (COM(2006) 397 final) states that Directives 82/176/EEC, 83/513/EEC, 84/156/EEC, 84/491/EEC and 86/280/EEC will be repealed effective 22 December 2012.

3.1.6. Water Framework Directive

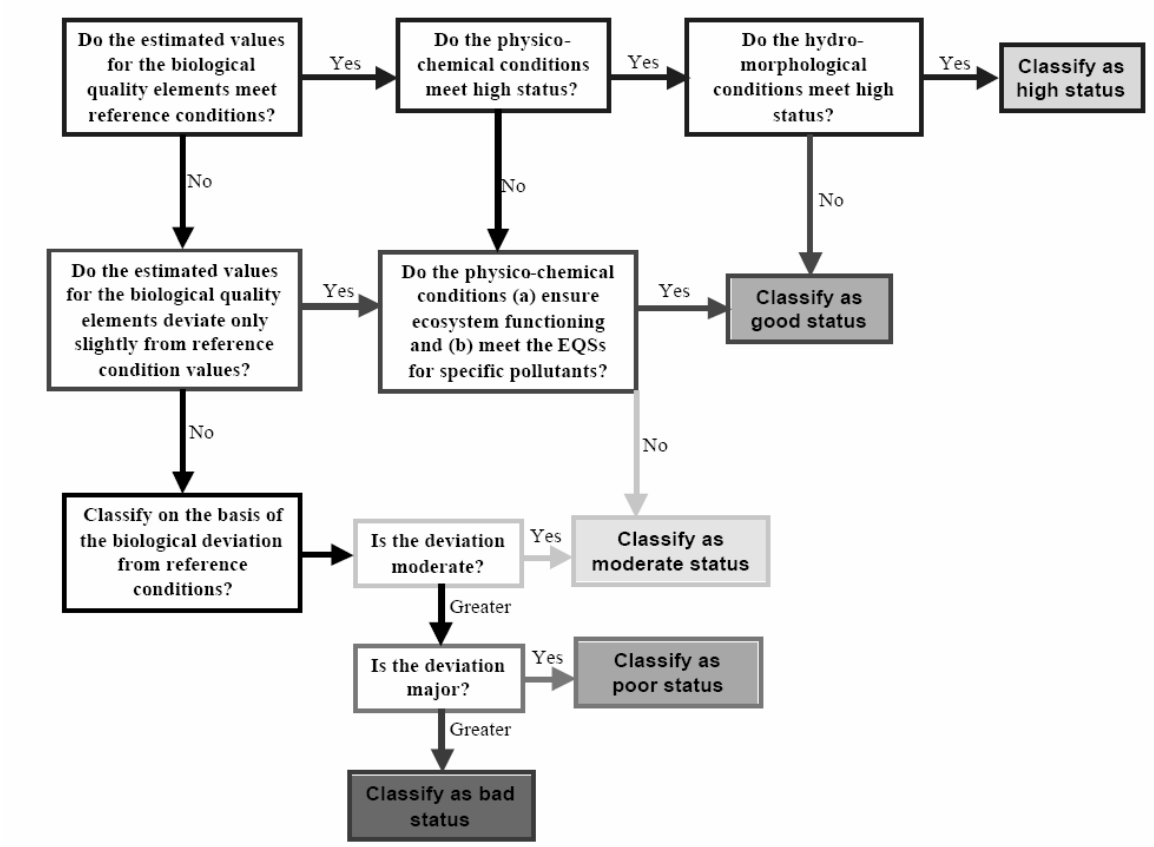
The Water Framework Directive 2000/60/EC "on establishing a framework for Community action in the field of water policy" introduces new approaches towards water management. The WFD has far-reaching consequences at institutional and technical levels.

The overall objective of the WFD is "good status" of all waters[2] (surface water and groundwater) by the year 2015. For water bodies which are (expected to be) of less than good status, plans of measures have to be prepared and implemented in order to improve the status to become at least "good". Whether or not the water bodies are of "good status" has to be determined through monitoring and assessment.

One of specific features of the WFD is its integrated approach. This also applies to the assessment of the status of surface waters. The figure below (copied from [EC, 2003]) contains a convenient scheme for assessment of the status of a water body, at the same time introducing several typical WFD features.

[2] or "good ecological potential" for "heavily modified and artificial water bodies"

Figure 1. Indication of Relative Roles of Biological, Hydro-morphological and Physico-chemical Quality Elements in the Ecological Status Classification [EC, 2003]



As illustrated in Figure 1, the WFD assessment of the status of surface water bodies includes biological, physico-chemical, and hydro-morphological quality elements, implying that a surface water monitoring network must be able to monitor the various quality elements and use the collected data for an assessment in line with the criteria put forward by the WFD. The quality elements are specified in Table 3.

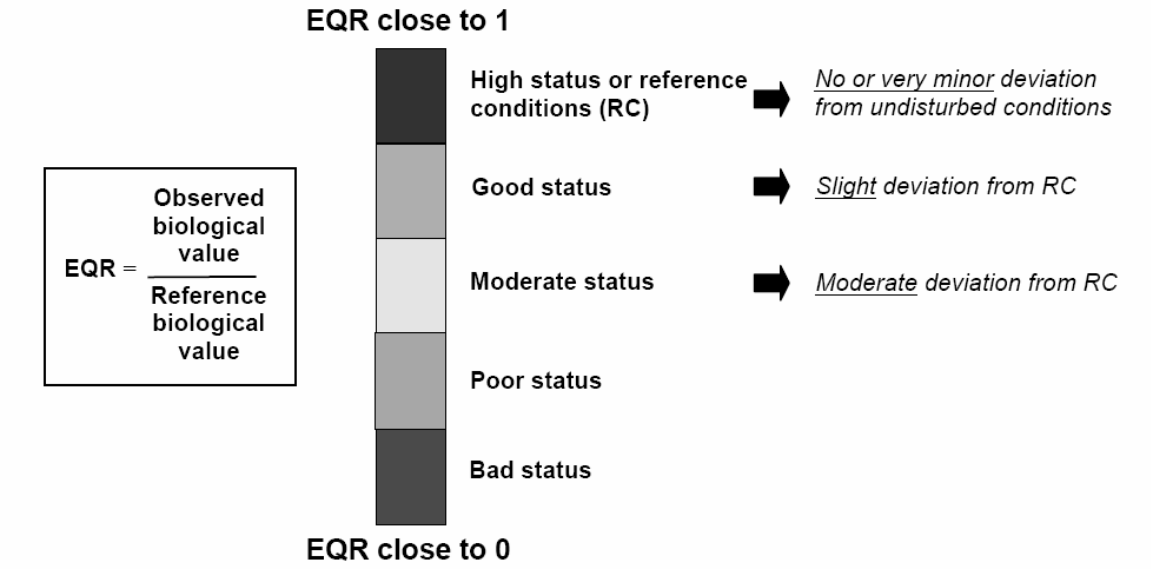
Table 3. Quality Elements for Assessment of Ecological Status in Rivers and Lakes [EC, 2003]

RIVERS	LAKES
Biological elements	
• Composition, abundance of aquatic flora • Composition, abundance of benthic invertebrate fauna • Composition, abundance and age structure of fish fauna	• Composition, abundance of aquatic flora • Composition, abundance of benthic invertebrate fauna • Composition, abundance and age structure of fish fauna • Composition, abundance and biomass of phytoplankton
Hydro-morphological elements supporting the biological elements	
• Quantity and dynamics of water flow • Connection to ground water bodies • River continuity • River depth and width variation • Structure and substrate of the river bed • Structure of the riparian zone	• Residence time • Connection to the groundwater body • Lake depth variation • Structure and substrate of the lake bed • Structure of the lake shore
Chemical and physico-chemical elements supporting the biological elements	
• Thermal conditions • Oxygenation conditions • Salinity • Acidification status • Nutrient conditions • Specific pollutants o pollution by Priority Substances discharged into the water body. o pollution by other substances discharged in significant quantities into the water body.	• Transparency • Thermal conditions • Oxygenation conditions • Salinity • Acidification status • Nutrient conditions • Specific pollutants o pollution by priority substances discharged into the water body. o pollution by other substances in significant quantities into the water body.

In order to be able to meet the WFD requirements, surface water monitoring networks in principle should be able to monitor the full range of quality elements stipulated by the WFD.

The establishment of "good status" actually comprises two assessments: the *ecological status* and the *chemical status*. The *ecological status* comprises both biological quality elements and physico-chemical elements indicated as general conditions: thermal conditions, oxygenation conditions, salinity, acidification status, and nutrient conditions. For the biological quality elements, Member States are expected to establish so-called Ecological Quality Ratios (EQR), as indicated in the WFD. The basic WFD principles for classification of ecological (biological) status based on Ecological Quality Ratios are shown in Figure 2. It is considered as one of the most complicated monitoring features introduced by the WFD.

Figure 2. Basic Principles for Classification of Ecological Status Based on Ecological Quality Ratios [EC, 2003]



In principle, for the assessment of the *chemical status* it suffices to assess whether or not water bodies are of "good chemical status". However, this assessment also has introduced a number of complications. The WFD has selected a group of 33 so-called Priority Substances[3]. These substances must be progressively reduced or, in the case of priority *hazardous* substances, phased out. Many substances that were included in the Dangerous Substances Directive 76/464/EC have become Priority Substances.

The EU has provided Environmental Quality Standards for the Priority Substances that can be used to assess whether or not water bodies are of "good chemical status". An overview of the Priority Substances and the EQSs is included in Annex 2 of this report. In addition, for a few other pollutants (DDT, drins, carbontetrachloride, tetrachloroethylene and trichloroethylene) the EU has issued EQSs (also included in Annex 2). For other specific synthetic and non-synthetic pollutants, the WFD prescribes the "Procedure for the setting of chemical quality standards by Member States" requiring thorough eco-toxicological research.

3.2. Ukraine

The legislative framework for water resources management in Ukraine includes the Law for Environmental Protection (1992), the Water Code (1995) and other regulations.

There are many similarities between the Ukrainian and Moldovan standards going back to the Soviet legacy of regulation: most quality standards originate from the related USSR GOST and other norms. For instance, Ukraine's "General Requirements for Water Composition and Properties for Water Bodies and Watercourses Used for Drinking Water Supply, Municipal and Household Purposes and Fishery" are almost identical to the ones in the RPSW (1991) still used in Moldova, with the exception of standards for temperature and BOD_{total} [UN/ECE, 2002]. For example, the Ukrainian standard for BOD_{total} for municipal

[3] Decision No. 2455/2001/EC of the European Parliament and of the Council of 20 November 2001 establishing the list of priority substances in the field of water policy and amending Directive 2000/60/EC. In July 2006, the European Commission adopted the Proposal for a Directive of the European Parliament and of the Council on environmental quality standards in the field of water policy and amending Directive 2000/60/EC.

and household uses is 5 mg O_2/l (6 mg O_2/l in Moldova), the same for second category fishery uses (3 mg O_2/l in Moldova).

There is a significant difference between the systems of SWQS for the abstraction of drinking water. Ukraine uses a system with only one category, while Moldova, as explained in Section 2.2, distinguishes three classes of surface water quality, each with different requirements for treatment. This automatically also implies different water quality standards, at least for the parameters mentioned in Table 1.

The MACs for toxic substances for drinking water supply, municipal and household purposes and fishery appear to be virtually identical.

3.3. Romania

Romania's legislation went through a series of changes in the past decade and still has substantial changes ahead. The major driving factor remains the EU accession. As for water quality standards, three stages of development can be distinguished.

Old Romanian Water Quality Classification Systems (1988-2002)

The classification scheme used in Romania between 1988 and 2002 was based on the intended water use:

- Class 1, the highest, suitable for public water supply and salmonid fish;
- Class 2 suitable for fish other than salmonid, public water supply after treatment and industrial use;
- Class 3 suitable for agricultural irrigation; and
- Class 4 (other waters) defined as degraded.

The standards for the classes are shown in Annex 3. Compliance with these standards was assessed on the basis of flow-weighted means.

Intermediate Romanian System (2002-2005)

The intermediate Romanian standards were based on those recommended by the ICPDR for the Trans-national Monitoring Network (TNMN), with several additional parameters (filterable residue, sodium, calcium, magnesium, total iron, total manganese, chlorides and sulphates. The water quality classification used for TNMN purposes is dealt with in Section 3.4.

Water Quality Assessment System as of 2006

After being used in 2002-2005, the system of standards was considered no longer appropriate under the new water legislation. It included very low values of dissolved metals rather than the values from Directive 75/440/EEC for assessment of raw water used for drinking purpose, creating a distorted impression of water quality. At the same time, very low values for nutrients imposed very high investment levels on municipal wastewater treatment plants.

The main purpose of the new system introduced in 2006 was to include biological elements that need to be monitored for assessment of ecological status and to remove the parameters considered to be of natural origin and not relevant for the plans of measures and investments. In addition, new standards for

nutrients were established in order to connect the values with Fish Water and Abstraction of Surface Water for Drinking Water Supply Directives, as well as the Nitrate Directive and the Urban Waste Water Directive.

Also, some organic micro-pollutants and heavy metals were included, despite the fact that they belong to lists I and II of dangerous substances (see Section 3.1.5) and/or list of Priority Substances (see Section 3.1.6). Under the WFD, these substances are to be considered for chemical status assessment only and not included in the list of parameters for assessment of ecological status. The standards were included in Governmental Decision No. 161 of 16.02.2006 "On approval of norms concerning water surface quality classification in order to establish qualitative status of water bodies". The classification of each water body is defined by considering the measured concentrations of water quality parameters over a year[4]. However, in view of the WFD, these parameters and standards should still be considered as transitional.

Transposition of the EU Directives into the Romanian Legislation

Besides the definition of the above-mentioned water quality standards, various EU Directives have been transposed into the Romanian legislation in 2002-2006. Embedding these Directives into the legislation is a pre-accession requirement, despite the fact that several Directives will be repealed (or modified) by the Water Framework Directive. The WFD as such has been transposed into the Romanian legislation the by Water Law 310/2004 and 112/2006, both complementary to the Water Law 107/1996.

3.4. ICPDR

In 2001, the International Commission for Protection of the Danube River introduced its water classification scheme to serve international purposes for the presentation of current status and improvements of water quality in the Danube River and its main tributaries [ICPDR, 2006]. It is not designed to be a tool for implementation of national water policy.

The ICPDR describes the scheme as follows [ICPDR, 2006]: "The classification scheme covers 37 determinands. Five classes are used for assessment, with target values being limit values of class II. Class I represents reference conditions or background concentrations. For a number of determinands it was not possible to establish real reference values, due to the existence of many types of water bodies in the Danube river basin differing naturally in physico-chemical characteristics. For synthetic substances, the detection limit or minimal likely level of interest was chosen as limit value for class I. Classes III-V are on the "non-complying" side of the classification scheme and their limit values are usually 2-5 times more than the target values. These should indicate the seriousness of exceeding the target value, and help recognition of the positive tendency in water quality development. For compliance testing, a 90-percentile value[5] of at least 11 measurements in a particular year should be used." The classification scheme is included in Annex 3.

3.5. UNECE Classification

The UNECE Standard Statistical Classification of Surface Freshwater Quality for the Maintenance of Aquatic Life was published in 1992 [ESC, 1992]. The classification aims at statistical description of surface freshwater quality from the point of view of suitability for aquatic life. The first objective of this

[4] Where 12 samples have been taken, the 90-percentile value of those 12 samples is compared to the published limits and a class is assigned. Where less than 12 samples have been taken then the maximum value of each concentration is compared to the limits for each parameter.

[5] 10-percentile value for dissolved oxygen.

classification is to provide conceptual and methodological guidance to the collection and compilation of water quality statistics for water bodies of international importance.

The classification distinguishes five quality classes, from class I representing a situation with no or slight, occasional anthropogenic pollution to class V being extensively polluted waters. The document does not provide explicit criteria for sampling frequencies and testing criteria (like 90-percentile values).

This UNECE classification has not been directly transposed into water quality standards of any European country. Nevertheless, it has been included in this report because it represents a scheme specifically developed from the point of view of “maintenance of aquatic life”. Compared to the other water quality standards and classification schemes presented and used in this report, the UNECE classification generally contains the most stringent values. As such, it can be used as an example for what standards may look like when protection of aquatic life is a major objective.

4. ANALYSIS OF THE CURRENT SYSTEM OF SURFACE WATER QUALITY STANDARDS IN MOLDOVA

The current system of surface water quality standards in Moldova were extensively analysed in the report "Moldova: A Framework for Water Quality Standards in Rivers and Point-Source Discharges" prepared in 2003 under the Tacis project "Support for the Implementation of Environmental Policies and NEAPs in the NIS" [Tacis, 2003]. This chapter expands on the major conclusions of this report with respect to the current Moldovan SWQS system, incorporating additional observations made during the project team's fact-finding mission in May 2006. Considering the overall context of this report, the analysis will primarily focus on comparisons of the Moldovan and EU standards.

4.1. Scope of Regulation

As discussed in Chapters 2 and 3, the systems of SWQSs in Moldova and in the EU both distinguish comparable functions and uses of surface waters: abstraction for drinking water supply, recreational uses and fishery[6]. For drinking water supply purposes, both systems comprise three classes of surface water quality, each requiring a certain prescribed treatment procedure for the production of drinking water.

At the same time, the range of regulated parameters in Moldova is vastly larger than in the respective EU Directives. The HR (1997) mentions 255 parameters (17 in its Annex 1 plus 238 in Annex 2) while Directive 75/440/EC for surface waters suitable for drinking water abstraction mentions only 46 parameters, and Directive 76/160/EC for bathing waters governs 19 groups of parameters (in effect, more parameters are implied). The RPSW (1991) regulate 10 "general conditions" parameters and 1083 parameters in the list of MACs, while the fishery waters Directive 78/659/EEC contains just 14 parameters (see Annex 4 of this report).

An excessively large number of regulated pollutants imposes unrealistic monitoring and enforcement requirements on Moldova's regulatory agencies. At the same time, some key contaminants are unregulated (for example, carcinogenic substances). This issue is discussed in more detail in the next section.

4.2. Maximum Allowable Concentrations

Already at a conceptual level, one can recognise differences in the perception of MAC in the Moldovan regulations versus the EU ones: all the relevant EU Directives contain both "G" and "I" values, whereas the HR (1997) contains just one set of values. The RPSW (1991) also include one set of MACs for all types of fish[7] whereas Directive 78/659/EEC distinguishes two different sets of quality standards, with the standards for salmonid fish waters generally being more stringent than those for the cyprinid fish waters. If salmonid fish are not (indigenously) present in the waters, there is no need to achieve more stringent standards (see Table 4).

[6] The difference in fishery waters regulation is that the relevant EU Directives do not apply "*to waters in natural or artificial fish ponds used for intensive fish-farming*" while the Moldovan regulation covers fish farming.

[7] The RPSW (1991) distinguish three categories (super, first and second) of waters but these are not explicitly linked to fish species, and there are very few differences between them.

Table 4. Comparison of Moldovan and EU freshwater fish-related standards for copper and zinc

	RPSW (1991)	78/659/EEC, Salmonid waters		78/659/EEC, Cyprinid waters	
	MAC	G	I	G	I
Copper, total [µg/l]	1[a]	-	-	-	-
Copper, dissolved [µg/l]	-	40[b]	-	40[b]	-
Zinc, total [µg/l]	10[a]	-	300[b]	-	1000[b]

a From the available documents it is not clear whether the MACs apply to total or dissolved concentrations (total is presumed).
b Correspond to hardness of 100 mg/l $CaCO_3$

For total zinc, the EU Directive "I" values are, respectively, 30 (salmonid) and 100 (cyprinid) times higher than the MAC applied in Moldova. The difference between the MAC for copper applied in Moldova of 1 µg/l versus 40 µg/l *dissolved* copper as Guide value in the EU 78/659/EEC Directive is *40 times*[8]. Guide values in EU Directives tend to be lower than the mandatory "I" values, implying that the actual difference would be even larger. It is difficult to assess the intrinsic robustness of different sets of quality standards just from their values. Nevertheless, such differences are striking, taking into account that both regulations aim at surface water quality supporting fish life.

Similar examples can be found in the standards for the abstraction of surface water for the potable water supply. Directive 75/440/EEC in several cases has defined different I-values for categories A1 to A3. Although the I-values as such can be considered as maximum allowable, such differentiation indicates that one can allow for higher concentrations in the raw water that has to be treated with more intensive methods. This principle is illustrated in the table below.

Table 5. Comparison of Moldovan and EU standards for Copper and Zinc for Abstraction of Drinking Water

	HR (1997)	75/440/EEC					
	MAC	**A1**		**A2**		**A3**	
		G	I	G	I	G	I
Copper [µg/l]	1000	20	50	50	-	1000	-
Zinc [µg/l]	1000	500	3000	1000	5000	1000	5000

Again, it is interesting to observe that what is defined as *MAC* in the HR (1997) compares to the *Guide values* of category A3 of the Directive 75/440/EEC.

The examples for copper and zinc show that the MACs in HR (1997) are substantially higher than the MACs in RPSW (1991). A larger sample of parameters indicates that in many cases the standards for freshwater fish are more stringent than those for the abstraction of surface water for potable water supply, as shown in Table 6.

[8] In order to compare the values for copper, one might roughly approximate the total concentration by multiplying the dissolved concentration with a factor of about 2.5, implying ≈100 µg/l as "G" values in the EU 78/659/EEC Directive.

Table 6. Comparison of Moldovan Standards for Public Health and Environmental Protection for some parameters

Parameter	**Water bodies for drinking and food industry water supply (HR, 1997)**				**Freshwater fish (RPWS 1991)**
units: [mg/l]	**class 1**	**class 2**	**class 3**	**MAC**	**MAC**
BOD_{tot}	3	5	7	-	3
Dissolved oxygen	>4			-	>6
total iron (Fe)	1	3	5	-	0.005
NH_4	-	-	-	2	0.5
NO_3	-	-	-	50	40
NO_2	-	-	-	3.3	0.8
phenols	-	-	-	0.001	0.001
oil products	-	-	-	0.3	0.05
cadmium (Cd)	-	-	-	1	5
chromium VI (Cr^{6+})	-	-	-	0.05	0.001
copper (Cu)	-	-	-	1	0.001
lead	-	-	-	30	100
nickel	-	-	-	0.1	0.01
mercury	-	-	-	0.0005	0.00001
zinc	-	-	-	1	0.01

Only in two cases in Table 6, the HR (1997) standards are more stringent: cadmium and lead. So those are first and foremost the freshwater fish standards imposing (more) stringent water quality conditions. Water bodies that would only be used for drinking water supply in many cases could allow for higher concentrations. However, all Moldovan surface waters are effectively designated as fishery waters, the fishery waters standards have to be complied with.

Nonetheless, the impression that Moldova has extremely strict surface water quality standards cannot be supported for all parameters. When the Moldovan MACs are compared with the EQSs for the WFD Priority Substances, the situation is less straightforward. Table 7 contains an overview of substances that appear both on the list of WFD Priority Substances (and some other substances; see Annex 2) and among the Moldovan quality standards.

Table 7. Comparison of EU Water Framework Directive EQSs with Moldovan MACs

Name of substance	EU Water Framework Directive*		Moldova	
	AA-EQS Inland surface waters	MAC-EQS Inland surface waters	MAC HR (1997)	MAC RPSW (1991)
Atrazine	0.6	2.0	500	5
Cadmium and its compounds** **(*depending on water hardness classes*)**	≤0.08 (Class 1) 0.08 (Class 2) 0.09 (Class 3) 0.15 (Class 4) 0.25 (Class 5)	≤ 0.45 (Class 1) 0.45 (Class 2) 0.6 (Class 3) 0.9 (Class 4) 1.5 (Class 5)	1	5
1,2-Dichloroethane	10	*not applicable*	20	100
Diuron	0.2	1.8	-	1.5
Hexachlorobenzene	0.01	0.05	50	-
Hexachlorocyclohexane	0.02	0.04	20	absent (0.01 µg/l)
Lead and its compounds**	7.2	*not applicable*	30	100
Mercury and its compounds**	0.05	0.07	0.5	0.01
Naphthalene	2.4	*not applicable*	10	4
Nickel and its compounds**	20	*not applicable*	100	10
Pentachlorophenol	0.4	1	10	0.5
Simazine	1	4	-	2.4
Trichlorobenzenes (all isomers)	0.4	*not applicable*	30	1
Trichloromethane (Chloroform)	2.5	*not applicable*	60	5
DDT total	0.025	*not applicable*	100 (*dichlorodiphenyldiethane*)	absent (0.01 µg/l)
Aldrin	∑= 0.010	*not applicable*	2 (*aldrin*)	-
Dieldrin				
Endrin				
Isodrin				
Carbontetrachloride	12	*not applicable*	6	-
Trichloroethylene	10	*not applicable*	60	10

* Refer to Annex 2 for explanatory notes

** The EQS for trace metals under the WFD apply to the *dissolved* fraction and should be considered as the concentration *added to the natural background concentration*

In a few cases, the Moldovan MACs are considerably higher (less stringent), like for DDT and drins. In other cases, the standards actually compare quite well (especially when interpreting the generally lower RPSW standards in a wider environmental protection context as is the case with the WFD).

A comparison of the standards for trace metals is a bit more complicated since the WFD quality standards apply to the dissolved fraction while the Moldovan MACs (are presumed to) apply to the total concentration. Using Dutch standards for trace metals in inland surface waters presented in Table 8 for illustration, one might infer that the Moldovan MACs and WFD EQSs are in similar orders of magnitude; only the RPSW MAC for mercury is comparatively low.

Table 8. Dissolved and Total Metal Concentrations: Example for the Netherlands

Substances	Target Dissolved [µg/l]	Total [µg/l]	MAC Dissolved [µg/l]	Total [µg/l]
arsenic (As)	1	1.3	28	32
cadmium (Cd)	0.08	0.4	0.4	2
chromium (Cr)	0.3	5.3	8.7	84
copper (Cu)	0.5	1.1	1.5	3.8
inorganic mercury (Hg)	0.01	0.07	0.2	1.2
methylene mercury (Hg)	0.01	0.06	0.02	0.1
nickel (Ni)	3.3	4.1	5.1	6.3
lead (Pb)	0.3	5.3	11	220
zinc (Zn)	2.9	12	9.4	40

While some parameters the Moldovan fishery MACs and WFD quality standards are comparable in terms of concentrations, there is one significant difference. The WFD standards represent the criteria for "good chemical status", which is part of the overall "good status". However, Member States are expected to achieve "good status" of their surface waters and groundwater by the year 2015. For the Moldovan standards no such terms are defined, with compliance expected immediately upon the regulation's entry into force. Not having defined a certain period (and pathways) for achieving water quality complying with the MACs is considered a serious handicap of the former Soviet regulations.

Finally, no standards for hydro-biological quality elements are defined in the Moldovan regulations for surface waters. This is not a typical feature for Moldova: many European countries (including EU Member States) have no regulated standards for biological quality of surface waters. However, as indicated in Section 3.1.6, biological quality will play a major role in the Water Framework Directive. See Chapter 5 for more discussion on this issue.

4.3. Laboratory Capacity

The following three major organisations are involved in monitoring and assessment of surface water quality in Moldova:

- The National Centre of Preventive Medicine ("Sanepid"), a subdivision of the Ministry of Health and Social Protection. Sanepid is, among others, responsible for monitoring surface waters used for abstraction of drinking water supply and for recreational purposes.

- The State Ecological Inspectorate (SEI), subordinated to the Ministry of Ecology and Natural Resources (MENR). The SEI takes water samples downstream (and upstream) of wastewater discharges as part of the compliance verification procedures.

- The State Hydro-meteorological Service (Hydromet), another subdivision of MENR. Hydromet conducts ambient surface water monitoring[9].

The following table contains the detection limits for a number of micro-pollutants, with the sanitary and fishery MACs added for easy reference.

[9] During the project team's visits to SEI and Hydromet in May 2006, a rapid scan of the laboratory equipment was made. Furthermore, the three organisations submitted lists with the parameters included in their routine surface water monitoring programmes and the limits of detection for laboratory analysis for these parameters.

Table 9. Comparison of Detection Limits and MACs in Moldova for Selected Micropollutants

Parameter	MAC RPSW (1991)	MAC HR (1997)	Detection limit		
			Sanepid	Hydromet	SEI
	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]
arsenic	50	50	x	x	x
cadmium	5	1	5	0.5	(5**)
chromium 3+	-	500	*50**	*2**	*50**
chromium 6+	1	50	*50**	*2**	*50**
copper	1	1000	20	2	20
mercury	0.01	0.5	x	x	x
nickel	10	100	40	2	20
lead	100	30	100	2	100
zinc	10	1000	5	2	5
atrazine	5	500	10	1	x
simazine	2.4	-	10	1	x
hexachlorocyclohexanes	absent (0.01 µg/l)	20	0.1 - 6	0.002 - 0.01	0.005
DDT	absent (0.01 µg/l)	100	0.1 - 6	0.005 - 0.02	0.05
Dieldrin	-	2	0.1 - 6	0.025	x
Endrin	-	-	0.1 - 6	0.025	x

x Not analysed
* total Cr
** Instrumental capacity; parameter not routinely monitored in surface water

In order to obtain reliable results, the limit of detection should be 30% or lower than the quality standard. For instance, with a standard of 1 µg/l, the detection limit should be 0.3 µg/l or lower. In the case of Hydromet, the detection limit for cadmium is lower than the sanitary MAC, but may not suffice to produce reliable results at a level of 1 µg/l.

Table 9 indicates that the three organisations are not able to analyse some of the trace metals at the levels needed for a reliable assessment against the MACs. The detection limits attained by Hydromet are lower than those of Sanepid and SEI. None of the organisations is able to analyse copper at a level of 1 µg/l. This means that compliance checking with the MAC for copper for freshwater fish is not possible at all.

With pesticides, the picture appears to be more favourable, although more specific details are needed to make statements for each pesticide (e.g., for dieldrin the actual detection limit is within the given range). But, for instance Sanepid would not be able to analyse atrazine and simazine at the levels required by the MAC for freshwater fish.

Many parameters included in the regulations are not monitored in the surface waters (e.g., arsenic and mercury). So although a MAC has been set, there is no basis for concluding whether or not the surface water quality complies with it.

Annex 4 contains an overview of the physico-chemical and bacteriological parameters included in the current routine monitoring programmes of the three organisations[10]. The total numbers of parameters included in each programme are:

- Sanepid: 41 (including 7 microbiological parameters)
- SEI: 38
- Hydromet: 47

Only 15 parameters are monitored by all three organisations[11]. From the comparison of 255 parameters included in the HR (1997) and over a thousand parameters included in the RPSW (1991), the number of actually monitored parameters is rather modest, giving a poor match between the number of regulated parameters and actually monitored parameters.

The physico-chemical quality elements of the group of 'general conditions' (thermal conditions, oxygenation conditions, salinity, acidification status and nutrient conditions) are more or less covered[12]. The bacteriological group comprises seven monitored parameters, but does not include the intestinal enterococci which are one of the two key bacteriological in the new EU bathing water Directive 2006/7/EC.

The major discrepancies can be found in the group of specific pollutants (contained in the lists with MACs of HR (1997) and RPSW (1991)). With the previously mentioned problem of (too) high detection limits for several trace metals, the effectively monitored number of parameters becomes even smaller. Less than a quarter of the WFD Priority Substances are included in the present routine surface water monitoring programmes in Moldova.

This is partially due to the lack of proper analytical equipment and methods and other laboratory requirements. More in-depth investigation would be needed to delineate the actual laboratory capacity (analytical equipment and methods, consumables and reference and calibration material, staff capacity) with respect to the analysis of various pollutants. Such assessment will also be required to assess which WFD Priority Substances could be analysed (and with sufficient accuracy) with the current setup. Such in-depth assessment is outside the reach of this project.

4.4. Conclusions

Several conclusions can be drawn from the previous sections concerning the current SWQS system in Moldova.

a. Compared with equivalent EU regulations, Moldova generally applies more stringent standards to surface water quality for water bodies to be used for abstraction of drinking water, for protection/breeding of freshwater fish, and for recreation. At the same time, the MACs for fishery

[10] Hydromet also monitors five biological parameters: phytoplankton, zooplankton, benthos, peryphyton, and chlorophyll-a.

[11] In practice, more types of parameters are shared: for instance, the SEI analyses sum α-HCH + γ-HCH or sum DDE+DDT+DDD, whereas Hydromet and Sanepid analyse individual compounds.

[12] Except for total nitrogen and total phosphorus, which can be relevant parameters in the context of eutrophication and currently only monitored by Hydromet. No quality standards for total N and P are defined in the current Moldovan regulations.

waters for several parameters are quite comparable with the EQSs for WFD-defined Priority Substances.

b. The Moldovan SWQS system does not contain a grace period for achieving water quality complying with MACs, as opposed to, for instance, the WFD which defines the year 2015 as a horizon for achieving "good status" of surface waters and groundwater.

c. Since all Moldovan surface waters are designated as (potentially) suitable for fishery, surface water bodies that are merely used for abstraction of drinking water or recreation also have to comply with the more stringent MACs for fishery waters in the RPSW (1991).

d. The Moldovan system of SWQS contains a substantially larger number of parameters expected to be regulated (including monitoring and assessment) than the equivalent EU Directives. However, the WFD Priority Substances are covered for about one-third of the parameters only.

e. Compared to the large number of regulated parameters, the number of actually monitored parameters is rather small. Notably, the toxic pollutants are poorly covered in the current monitoring programmes. In addition, the main central laboratories are not always able to analyse monitored micro-pollutants at concentration levels corresponding to the MACs.

The overall conclusion is that Moldova will have to put in place a more concise, practical and economically feasible system of SWQS, as well as converge with the EU legislation. This will be further elaborated in the next chapter which describes a proposed new SWQS system.

5. PROPOSED SYSTEM OF SURFACE WATER QUALITY STANDARDS

The analysis of the current SWQS system in Moldova leads to a conclusion that the country's environmental regulatory framework will benefit from the convergence with the respective EU norms. This chapter elaborates details recommendations on the main features of such convergence and the principal elements of the new system.

The report "Moldova: A Framework for Water Quality Standards in Rivers and Point-Source Discharges" [Tacis, 2003] proposed to implement a classification scheme based upon surface water use as Moldova's first task in bringing about the necessary reforms. The proposed system was based upon the one that is working in the United Kingdom[13]. The present report incorporates the core features of the Tacis report's proposal but goes further in the design of a new surface water quality classification scheme and specific standards.

5.1. Departure Points

The following are major departure points for developing the proposed system of surface water quality standards:

1. The SWQSs should allow Moldova to implement a use-based water management framework, reflecting the actual and anticipated:

    (a) use of water bodies;
    (b) capacities for monitoring and assessment of surface waters; and
    (c) capacities and means (financing included) for pollution abatement measures and other surface water protection interventions.

2. The SQWS should be compatible with the existing EU legislation. While appropriate EU standards should already be incorporated to the extent possible, the new SQWS system should be open to more direct adoption of the EU legislation in the future.

3. The SWQS should be in line with Moldova's trans-boundary agreements and commitments, notably those with Romania (on the Prut) and Ukraine (on the Dniester and several small rivers), and the ICPDR.

Existing elements of the present system of SWQS should be retained to the extent they satisfy the above criteria.

[13] Details about the UK "Surface Waters (River Ecosystem) (Classification) Regulations 1994" can be found at http://www.opsi.gov.uk/si/si1994/Uksi_19941057_en_1.htm#tcon.

5.2. Use-based Water Management Framework

As mentioned in Chapter 2, the Moldovan Water Code (1993) defines a range of principal water uses, indicating the drinking and domestic water use as a priority. The approach of considering water bodies and their related quality in terms of uses/functions is also used by the UN ECE Task Force on Monitoring and Assessment under the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992)[14]. Table 10 (adapted from UNECE, 1996) compares the UNECE guidelines with the provisions of Moldova's Water Code. From top to bottom the uses/functions generally correspond to increasingly demanding water quality standards (i.e., more regulated parameters with often more stringent limit values). As can be seen from the table, the uses/functions distinguished in the UNECE Guidelines generally match those in Moldova's Water Code.

Table 10. Water Uses with Ranking According to Water Quality Requirements

	UNECE Guidelines	Moldovan Water Code
Category 1: Uses without quality	• Transport system (water, wastewater, shipping) • Extraction of minerals • Power generation (hydropower dams)	• Discharge of wastewater • Transportation • Hydropower generation
Category 2: Uses with defined quality standards	• Process/cooling water in industry • Irrigation in agriculture • Fishery • Recreation and tourism • Domestic water supply	• Industrial uses • Agricultural uses • Fishery • Recreation • Drinking and other communal uses
Category 3: Use with 'undisturbed' quality	• Ecosystem functioning	• Hunting and nature protection

Distinguishing the specific (intended) uses of water bodies is an important basis for water management. A preliminary estimate of the actual uses of surface water bodies in Moldova is presented in Table 11.

Table 11. Tentative overview of uses of surface waters in Moldova[15]

	Prut	Other inland waters	Dniester
Ecosystem functioning	√	√	√
Fishery	√	√	√
Drinking water supply	√	-[16]	√
Recreation and tourism	-	√	√
Irrigation	-	√	√
Process/cooling water	√	√	√
Power generation	√	-	√
Extraction of minerals	-	-	-
Transportation	-	-	√

√ use/function applies
- use/function does not apply

[14] Moldova is one of the 35 parties to this Convention, having ratified it in 1994.

[15] The use of inland waters becomes more differentiated if one zooms in at the level of water bodies. The uses of the Prut and the Dniester may also be differentiated along their courses.

[16] There is one exceptional drinking water intake in the lower reach of the Racovet river (tributary to Prut). Originally, the intake was built on the Prut river, but due to siltation and disrepair of pumps, the intake was reallocated to the Racovet.

Despite being a sketchy overview, Table 11 already indicates several related water management and planning issues. For instance, only surface water from the Prut and the Dniester is abstracted for the production of drinking water. Therefore, no additional measures or monitoring have to be considered for this specific function for other inland surface waters (unless they are designated for drinking water supply at some point in the future). Similar principles can be applied to the fishery function: it seems unreasonable to implement a policy safeguarding fisheries when the water bodies concerned are not used for this purpose. At the same time, one should also take into account how a downstream water body used for a certain purpose may be affected by an upstream one that is not used for that purpose.

Since water bodies used for different purposes may have different water quality requirements, their further differentiation is required for a transparent and coherent system of SWQS. Such differentiation can be achieved by distinguishing five different ***use classes***, with each of the classes defining which uses are supported given certain surface water quality. Besides distributing the different uses and requirements into five classes, this approach would be an important step towards the WFD with its five classes of quality status.

The proposed surface water use classes' scheme is shown in Table 12. The descriptions of water uses are slightly modified compared to the examples above in order to use more generally applicable terms. Two uses are divided into sub-categories:

- *Drinking water supply*: both Directive 75/440/EEC and Moldova's HR (1997) distinguish three categories of treatment, depending on the water quality of the surface water abstraction for drinking water production.

- *Fish breeding/protection*: Directive 78/659/EEC distinguishes salmonid and cyprinid waters, thereby differentiating quality standards depending on the type of fish of predominant importance.

Table 12. Proposed Use Classes Scheme for Surface Waters

Use / function	*use differentiation*	Use Class I	Use Class II	Use Class III	Use Class IV	Use Class V
Ecosystem functioning		√	√	-	-	-
Fish breeding/protection	*salmonid*	√	√	-	-	-
	cyprinid	√	√	√	-	
Drinking water supply	*simple treatment*	√	√	-	-	-
	normal treatment			√	-	-
	intensive treatment				√	-
Bathing/recreation		√	√	√	-	-
Irrigation		√	√	√	√	-
Industrial water use (process, cooling)		√	√	√	√	-
Power generation		√	√	√	√	√
Minerals extraction		√	√	√	√	√
Transportation		√	√	√	√	√

√ use/function supported
- use/function not supported/allowed

The various use classes can be characterised as follows:

- Use Class I may be considered an equivalent of the WFD's "high status", a virtually undisturbed, natural aquatic system. All intended uses are supported by waters of this use class.

- Use Class II should not necessarily be considered equivalent to WFD's "good status", although it may be seen as an important step in this direction. Water with quality complying with the standards for Use Class II will support all uses adequately, including properly functioning aquatic ecosystems. Simple treatment methods will suffice for the preparation of drinking water.

- Use Class III is where some uses get under pressure. Simple treatment methods no longer suffice for drinking water preparation. The conditions required by salmonid fish waters (such as salmon, trout, grayling and whitefish) may no longer be supported. One can expect a deterioration of the aquatic ecosystem.

- Use Class IV will allow only for low/no quality demanding uses and will require intensive treatment of the raw surface water abstracted for drinking water production. Here even the conditions for cyprinid fish (belonging to the cyprinids or other species such as pike, perch and eel) may no longer be supported.

- Use Class V waters only will suffice for no-quality demanding uses like power generation. In WFD terminology these would be waters of a "bad status".

It is important to stress that the proposed scheme is not primarily designed to be used as a passive assessment tool (e.g., used in annual reports to characterise the quality of water bodies, although it may also be used for such purposes). In principle, the scheme is supposed to be used as an active water management and decision making tool. The proposed quality standards (presented further below) are considered to be decisive for whether or not a certain use is allowed/supported in the water bodies concerned. Refer to Section 5.7.1 for more details on how the proposed scheme is expected to be applied.

5.3. Compatibility with the Existing EU Legislation

It is important to compare the proposal for a new SWQS system in Moldova with the EU Water Framework Directive because the WFD will soon become the dominating Directive for water quality management in the EU (see Chapter 3).

As can be inferred from Section 3.1.6, the assessment of surface water quality under the WFD is a complex scheme. The emphasis on the (hydro-)biological status of surface waters is unprecedented in Europe, and laboratory analysis of the Priority Substances requires state-of-the art analytical equipment and methods and experienced staff. The requirements for monitoring and assessment (in order to determine the quality status of water bodies) impose considerable demands on all EU Member States. Given the experiences in the EU Member States, it is obvious that it would take Moldova several years (and a considerable amount of resources) to develop a properly tuned system for monitoring and assessment of the surface waters in accordance with the WFD that would support the regulation. Therefore, in the short term, proposing a system of SWQSs in full accordance with the WFD requirements is not an realistic option.

Nevertheless, the WFD requirements have been taken into account to some extent in designing the proposed system of SWQSs. The following features of the proposed system would be significant steps in convergence with the WFD:

- Applying five use classes, each with defined boundaries for water quality, is considered an adequate precursor towards the WFD approach with its five quality status classes.

- The "general conditions" (thermal conditions, oxygenation conditions, salinity, acidification status and nutrient conditions) in the WFD are considered an important group of physico-

chemical quality elements to be assessed in conjunction with the biological quality elements. The proposed system of SWQS includes a representative selection of such parameters.

- A number of Priority Substances are operationally included in proposed system of SWQSs.

Biological quality elements are not included in the proposed system of SWQS. Moldova has a good tradition in monitoring macro-invertebrate fauna (macrozoobenthos), which is quite exceptional even for many EU Member States. But the current monitoring and assessment practices are not yet sufficient for meeting WFD requirements (which govern four more biological quality elements). This is also an issue still to be solved, for instance, by the ICPDR for the Danube River and by many EU Member States. The developments are too premature for inclusion in Moldova's system of SWQSs.

Acknowledging the fact that it is too early to introduce a system in accordance with the WFD, the proposed system of SWQSs will partially use existing Directives like 75/440/EEC, even though the latter will be repealed as of 31 December 2006. However, it is important to stress that repealing a Directive like 75/440/EEC is not so much a matter of losing substantive validity, but merely of its redundancy under the provisions of the WFD. Including principles of the EU Directives developed prior to the WFD can still be considered as proper steps in convergence with the EU legislation.

5.4. Conformance to Trans-boundary Agreements and Commitments

While determining proposed standards for Moldova, the country's international obligations have been taken into account. Standards were selected so that they will not contradict standards (to be) adopted in Romania or used by the ICPDR. In several cases, values from either Romanian or ICPDR classification schemes are transposed directly (see data sheets in Annex 1 for details).

Ukraine is the only case where trans-boundary compatibility can no longer be maintained: the system in place in Ukraine has similar roots as the current Moldovan system of SWQSs. Abandoning this system automatically implies deviation from the Ukrainian system. This is not considered a decisive argument that should affect the new proposed system. Ukraine also promotes reforms of its water management framework in order to become more in line with the EU legislation, and respective changes can be expected in the coming years. Furthermore, it is common practice in many trans-boundary basins to agree on additional provisional objectives and quality standards in bilateral or multilateral arrangements on top of national regulations.

5.5. Selection of Parameters to Be Regulated

An important basis for selecting parameters is provided by the Moldovan regulations RPSW (1991) and HR (1997) and EU Directives 75/440/EEC, 76/160/EEC and 78/659/EEC. These regulations directly provide for the three uses/functions recognised under the proposed new system of SWQS: abstraction of surface water for drinking water supply, freshwater fish breeding/protection, and bathing/recreation. The primary selection of parameters from the RPSW (1991) and HR (1997) was limited to the parameters mentioned in Tables 1 and 2 (Chapter 2) as these are clearly delineated, contrary to the long lists of parameters and their respective MACs included in other annexes to these regulations.

5.5.1. General Conditions

As mentioned earlier above, the "general conditions" (thermal conditions, oxygenation conditions, salinity, acidification status and nutrient conditions) under the WFD are considered an important group of physico-chemical quality elements to be assessed in conjunction with the biological quality elements. A representative selection of such parameters is already mostly covered by the existing Moldovan and EU

regulations. In addition, total nitrogen and total phosphorus were explicitly included because of their importance in the context of eutrophication.

5.5.2. Bacteriological Conditions

It is interesting to note that the WFD actually does not mention bacteriological conditions, which does not imply that they are of no importance. The bacteriological conditions are addressed in the drinking water supply and bathing water Directives.

The lacto-positive coli and colifagi, as well as ovum of helmintes mentioned in the HR (1997) are not included in the EU legislation. As a matter of fact, "lacto-positive coli" and "colifagi" normally *are* included in total coliforms, according to the European analysis methods. For the sake of completeness, the standards of the HR (1997) are included, but the list is extended with Coliforms total, Coliforms faecal Streptococci faecali and Intestinal enterococci.

5.5.3. Toxic and Other Specific Pollutants

Problem Description

Paradoxically, the lists of over 1000 parameters in Moldova's RPWS (1991) and HR (1997) do not cover all potentially relevant hazardous substances (e.g., the WFD Priority Substances brominated diphenylethers and C10-13-chloroalkanes).

The existence of long lists of parameters does not mean that all these pollutants actually occur in Moldova's surface waters. The current surface water monitoring programmes in Moldova are not a good indicator of an appropriate scope for regulation, either: only about 30 toxic substances are monitored. Even when information is available about sources of pollution (e.g., via emission inventories, inventories of industrial and agricultural activities, etc.), it is still not possible to precisely predict whether or not certain pollutants are present in the surface waters, pesticides being a notorious example. It is difficult to get reliable data about actual applications of pesticides, and even when such data are known, it is still hard to predict how much pesticides will end up in water. Some pollutants can enter the system via complicated routes, like atmospheric deposition or dump sites or via leaching of pollutants stored in sediment decades ago.

The WFD uses the following criteria concerning the selection of quality elements for surveillance monitoring:

- priority list pollutants which are discharged into the river basin or sub-basin; and
- other pollutants discharged in significant quantities in the river basin or sub-basin.

It is obvious that these are very generic criteria. Finding out which pollutants actually are discharged (in "significant" quantities) is yet another example of a series of complicated exercises and tasks under the WFD. It is simply *impossible to define in advance a list of pollutants* that will mirror actual pollution stresses on Moldovan surface waters.

Additional complicating factors are the constraints imposed by the current *laboratory capacities*. Although a more in-depth investigation would be needed to outline the possibilities and constraints, it can be presumed that currently not more than half of the list of Priority Substances can be analysed with the available instrumentation. The situation is aggravated by the fact that some parameters are analysed at too high detection limits for proper comparison with standards.

Last but not least, there are insufficient data for establishing *natural background concentrations* specific for Moldovan surface waters. This issue is not only relevant for trace metals but also, for instance, for parameters like chlorine or nutrients.

Proposed Selection

An important consideration helps resolve this selection problem: the expected lifetime of the proposed new SWQS. While it is not recommended to frequently revise the core requirements of the SWQS system, periodic reviews are still common regulatory practice in OECD countries. The proposed system should become a proper instrument for surface water quality management in Moldova for at least the next ten to fifteen years, a sufficiently long period to upgrade laboratories or collect now missing data. Still, presuming further continuing convergence with the EU legislation, the presently proposed system will be an intermediate one in the plausible trend towards implementation of the WFD in Moldova.

It is, therefore, proposed to include the *complete list of Priority and other Substances* of the WFD (as included in Annex 2 of this report). This not only provides a clear pathway for the next years, but also will serve as one more bridge towards the possibilities for actual introduction of the WFD in Moldova. It is important to stress the following:

- Not all EU Member States are currently able to cover the full range of Priority Substances with adequate laboratory analysis.

- As EU Member States are expected to achieve good chemical status within 15 years (2000-2015), it may take an even longer time in Moldova.

- EU Member States must provide strong arguments to the European Commission to be able to exclude certain Priority Substances from their national regulation. Moldova may go through a similar justification process to exclude specific irrelevant pollutants[17].

Of course, certain provisions will have to be added on the introduction and implementation of the proposed new system of SWQS in order to deal with the current limitations (like insufficient laboratory capacity). These issues are expected to be addressed in the pilot exercises and in the project's Policy Report.

Last but not least, is should be noted that copper and zinc are also included in the proposed new system, since they are included in the Directive 78/659/EEC and, furthermore, are on the ICPDR list of additional substances considered to be of priority for the Danube basin.

5.5.4. Selection of Parameters

The proposed SWQSs have been established in such a way that the key parameters and their quality standards can be directly linked to the intended use(s) of water bodies. For instance, when the major purpose of a water body is bathing, then the significant parameters for monitoring and assessment (including compliance checking) are bacteriological parameters, odour, colour, and floating materials. Table 13 contains an overview of these relationships.

[17] One example presumably can be tackled rather easily. Tributyltin compounds are biocides that often are applied as anti-fouling on hulls of vessels. Since there is a very few shipping in Moldova and no industry that is formulating tributyltin compounds, one may expect zero pollution. As a consequence, there would be no need for monitoring and thus upgrading of laboratory capacity for analysis of tributyltin compounds.

Table 13. Overview of Uses and Regulated Parameters

Parameters		Ecosystem	Fish propagation/ protection	Potable water supply	Bathing/ recreation	Irrigation	Industrial water use
GENERAL CONDITIONS							
Thermal conditions	water temperature	o	X			o	
Oxygenation conditions	O_2, BOD_5,	X	X				
	COD_{Mn}			X			
Nutrient conditions	P_{tot}, PO_4, NO_3, N_{tot},	X	o	o	o		o
	NH_4,	o	X				
	NO_2	o	o	o			
Salinity	total mineralization, chloride, sulphates			o		X	o
Acidification status	pH	o	o	o		o	
Other parameters (notably for compatibility with HR (1997))	odour, colour, floating material	o	o	X	X		
	Mn, Fe, phenols, oil products		o	X			
TRACE METALS	Cd, Cu, Hg, Ni, Pb, Zn	X	X	X			
BACTERIOLOGICAL CONDTIONS	various			X	X		
WFD PRIORITY SUBSTANCES	various	X	o	X/o			
OTHER SPECIFIC POLLUTANTS	various	X	o	X/o			

X Parameter(s) influence the use/function directly: mandatory for compliance checking in case a water body is used for related purpose(s).
o Parameter(s) influence the use/function indirectly (e.g., nutrient conditions causing eutrophication of bathing waters); monitoring required at least in case problems related (or presumed to be related) to certain parameters actually occur, but preferably conducted on a routine basis if the means allow.

5.6. Proposed Numerical Values for Surface Water Quality Standards

Only *existing* quality standards were used in the proposed system, meaning that no standards have been developed from scratch.

Besides a different approach for the Priority Substances (see below), standards were derived from:

- EU Directives 75/440/EEC, 76/160/EEC (complemented with 2006/7/EC), and 78/659/EEC
- Romanian classification scheme of 2006
- ICPDR classification scheme
- RPWS (1991) and HR (1997)

Environmental quality standards are now available for the Priority and some other Substances (see Annex 2)[18]. It is important once more to stress that these EQSs represent the good chemical status to be achieved in the year 2015. No Member State is expected to have reached the good status earlier (of course this prevails, but it is not mandatory). Two types of EQS are set, Annual Average (AA-EQS) concentrations and Maximum Allowable Concentrations (MAC-EQS), one for protection against long-term

[18] For the sake of completeness it is good to mention that "other surface waters" comprise transitional waters (like river estuaries) and coastal waters. They are not relevant for land-locked Moldova.

and chronic effects, the other for short-term, direct and acute ecotoxic effects, respectively. In terms of compliance checking, the two types of EQSs are to be used as follows (refer to Annex 2 for more details):

- For any given surface water body, compliance with an AA-EQS requires that for each representative monitoring point within the water body, the arithmetic mean of the concentrations measured at different times during the year is below the standard.

- For any given surface water body, compliance with a MAC-EQS means that the measured concentration at any representative monitoring point within the water body does not exceed the standard.

In order to make the EQSs immediately operational, the following approach has been followed:

- The AA-EQSs are used as the boundaries for Use Class I.

- The values of MAC-EQSs are used as the boundaries for Use Class IV, but tested as the annual average concentration.

- The boundaries for Use Classes II and III are set as AA-EQS plus 50% and 80%, respectively, of the differences in concentration between the values of the AA and MAC EQSs. (In case no MAC-EQS is provided, the AA-EQS is multiplied by 3).

For the four priority trace metals (cadmium, mercury, lead and nickel), the WFD SWQSs contain additional complications in their implementation: the compliance regime is adapted by allowing Member States to take background levels and bioavailability into account. Since these are not yet known for Moldovan surface waters, the SWQSs have not been set using the above method. Instead, the concentrations for Use Classes I–V for cadmium, lead and mercury were set as the *total* concentrations of Directive 75/440/EEC, also taking into account the quality objectives of the Dangerous Substances Directive 76/464/EEC and its daughter directives. Directive 75/440/EEC does not contain values for nickel. In this case, the concentrations of the Romanian GD 161 were used. The resulting standards are considered to be in the ranges comparable with those in the WFD. For the sake of completeness, standards for dissolved concentrations have been calculated (see Annex 1 for details).

The resulting matrix of surface water quality standards is presented in Table 14. For more details on the procedure followed for the selection of the standards for each of the parameters see the data sheets in Annex 1.

Table 14. Proposed Surface Water Quality Standards

Parameter (*group*)	Acronym	Unit	Use Class I	Use Class II	Use Class III	Use Class IV	Use Class V
GENERAL CONDITIONS							
Thermal conditions							
Water temperature	T_{water}	[^oC]	*natural temperature variations*	cold waters: 20 ^oC summer, 5 ^oC winter warm waters: 28 ^oC summer, 8 ^oC winter	cold waters: 20 ^oC summer, 5 ^oC winter warm waters: 28 ^oC summer, 8 ^oC winter	cold waters: >20 ^oC summer, >5 ^oC winter warm waters: >28 ^oC summer, >8 ^oC winter	cold waters: >20 ^oC summer, >5 ^oC winter warm waters: >28 ^oC summer, >8 ^oC winter
Oxygenation conditions							
Dissolved oxygen	O_2	[mg O_2/l]	≥7 (*or BG*)	≥7	≥5	≥4	<4
Biochemical oxygen demand (5 days)	BOD_5	[mg O_2/l]	3 (*or BG*)	5	6	7	>7
Chemical oxygen demand, permanganate method	COD_{Mn}	[mg O_2/l]	<7 (or BG)	7	15	20	>20
Nutrient conditions							
Total nitrogen	N_{tot}	[mg N/l]	1.5 (*or BG*)	4	8	20	>20
Nitrate	NO_3	[mg N/l]	1 (*or BG*)	3	5.6	11.3	>11.3
Nitrite	NO_2	[mg N/l]	0.01 (*or BG*)	0.06	0.12	0.3	>0.3
Ammonium	NH_4	[mg N/l]	0.2 (*or BG*)	0.4	0.8	3.1	>3.1
Total phosphorus	P_{tot}	[mg P/l]	0.1 (*or BG*)	0.2	0.4	1	>1
Ortho-phosphates	PO_4	[mg P/l]	0.05 (*or BG*)	0.1	0.2	0.5	>0.5
Salinity							
Chloride	Cl^-	[mg/l]	200 (*or BG*)	200	350	500	>500
Sulphates	SO_4	[mg/l]	<250 (*or BG*)	250	350	500	>500
Total mineralization	Min_{tot}	[mg/l]	<1000 (*or BG*)	1000	1300	1500	>1500
Acidification status							
pH	pH	[-]	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	<6.5 or >8.5
Other parameters							
Floating materials		*[visual inspection]*	absent	absent	absent	absent	might be present
Total iron	Fe_{tot}	[mg/l]	<1 (*or BG*)	1	3	5	>5
Manganese	Mn	[mg/l]	<0.1 (*or BG*)	0.1	1	2	>2
Odour (20 ^oC and 60 ^oC)		[point]	*<2 (or natural smell)*	2	2	4	>4
Colour		[grade]	*<35 (or natural colour)*	35	120	200	>200
Phenols		[mg/l]	0.001 (*or BG*)	0.001	0.005	0.1	>0.1
Oil products		[mg/l]	0.05	0.1	0.5	1	>1
TRACE METALS							
Cadmium total (*SS= 30 mg/l*)	Cd_{tot}	[µg/l]	<1 (*or BG*)	1	5	5	>5
dissolved	Cd_{diss}	[µg/l]	<0.2 (*or BG*)	0.2	1	1	>1
Lead total (*SS= 30 mg/l*)	Pb_{tot}	[µg/l]	<50 (*or BG*)	50	50	50	>50
dissolved	Pb_{diss}	[µg/l]	<2.5 (*or BG*)	2.5	2.5	2.5	>2.5
Mercury total (*SS= 30 mg/l*)	Hg_{tot}	[µg/l]	<1 (*or BG*)	1	1	1	>1
dissolved	Hg_{diss}	[µg/l]	<0.2 (*or BG*)	0.2	0.2	0.2	>0.2
Nickel total (*SS= 30 mg/l*)	Ni_{tot}	[µg/l]	10 (*or BG*)	25	50	100	>100
dissolved	Ni_{diss}	[µg/l]	8 (*or BG*)	20	40		
Copper total (*SS= 30 mg/l*)	Cu_{tot}	[µg/l]	<50 (*or BG*)	50	100	1000	>1000
dissolved	Cu_{diss}	[µg/l]	<20 (*or BG*)	20	40	400	>400
Zinc total (*SS= 30 mg/l*)	Zn_{tot}	[µg/l]	<300 (*or BG*)	300	1000	5000	>5000
dissolved	Zn_{diss}	[µg/l]	<70 (*or BG*)	70	233	1163	>1163
BACTERIOLOGICAL PARAMETERS							
Lacto positive bacteria		[№/l]	1,000	10,000	50,000	>50,000	>50,000
Colifages		[№/l]	absence	100	100	100	>100
Ovum of Helmintes		[-]	should not be detected	should not be detected	should not be detected	should not be detected	might be detected
Coliforms total		[№/100 ml]	500	5,000	10,000	50,000	>50,000
Coliforms faecal		[№/100 ml]	100	2,000	10,000	20,000	>20,000
Streptococci faecali		[№/100 ml]	20	1,000	5,000	10,000	>10,000
Intestinal enterococci		[cfu/100 ml]	<200	200	400	>400	>400
Escherichia coli		[cfu/100 ml]	<500	500	1,000	>1,000	>1,000

Parameter (*group*)	Acronym	Unit	Use Class I	Use Class II	Use Class III	Use Class IV	Use Class V
WFD PRIORITY SUBSTANCES (organic micropollutants)							
Alachlor		[µg/l]	0.3	0.5	0.6	0.7	>0.7
Anthracene		[µg/l]	0.1	0.25	0.34	0.4	>0.4
Atrazine		[µg/l]	0.6	1.3	1.7	2	>2
Benzene		[µg/l]	10	30	42	50	>50
Pentabromodiphenylether		[µg/l]	0.0005	0.001	0.0013	0.0015	>0.0015
C10-13-chloroalkanes		[µg/l]	0.4	0.9	1.2	1.4	>1.4
Chlorfenvinphos		[µg/l]	0.1	0.2	0.26	0.3	>0.3
Chlorpyrifos		[µg/l]	0.03	0.065	0.086	0.1	>0.1
1,2-Dichloroethane		[µg/l]	10	20	26	30	>30
Dichloromethane		[µg/l]	20	40	52	60	>60
Di(2-ethylhexyl)phthalate (DEHP)		[µg/l]	1.3	2.6	3.4	3.9	>3.9
Diuron		[µg/l]	0.2	1	1.5	1.8	>1.8
Endosulfan		[µg/l]	0.005	0.0075	0.009	0.01	>0.01
Fluoranthene		[µg/l]	0.1	0.55	0.82	1	>1
Hexachlorobenzene		[µg/l]	0.01	0.03	0.04	0.05	>0.05
Hexachlorobutadiene		[µg/l]	0.1	0.35	0.5	0.6	>0.6
Hexachlorocyclohexane		[µg/l]	0.02	0.03	0.036	0.04	>0.04
Isoproturon		[µg/l]	0.3	0.65	0.86	1	>1
Naphthalene		[µg/l]	2.4	4.8	6.2	7.2	>7.2
Nonylphenol		[µg/l]	0.3	1.1	1.7	2	>2
Octylphenol		[µg/l]	0.1	0.2	0.26	0.3	0.3
Pentachlorobenzene		[µg/l]	0.007	0.014	0.018	0.021	0.021
Pentachlorophenol		[µg/l]	0.4	0.7	0.9	1	1
(Benzo(a)pyrene)		[µg/l]	0.05	0.075	0.09	0.1	>0.1
(Benzo(b)fluoranthene)		[µg/l]	∑= 0.03	∑= 0.06	∑= 0.08	∑= 0.09	∑ >0.09
(Benzo(g,h,i)perylene)		[µg/l]	∑= 0.002	∑= 0.004	∑= 0.005	∑= 0.006	∑ >0.006
(Benzo(k)fluoranthene)		[µg/l]					
(Indeno(1,2,3-cd)pyrene)		[µg/l]					
Simazine		[µg/l]	1	2.5	3.4	4	>4
Tributyltin compounds		[µg/l]	0.0002	0.00085	0.00124	0.0015	>0.0015
Trichlorobenzenes (all isomers)		[µg/l]	0.4	0.8	1.04	1.2	>1.2
Trichloromethane (Chloroform)		[µg/l]	2.5	5	6.5	7.5	>7.5
Trifluralin		[µg/l]	0.03	0.06	0.078	0.09	>0.09
OTHER SPECIFIC POLLUTANTS							
DDT total		[µg/l]	0.025	0.05	0.065	0.075	>0.075
para-para-DDT		[µg/l]	0.01	0.02	0.026	0.03	>0.03
Aldrin		[µg/l]	∑= 0.010	∑= 0.020	∑= 0.026	∑= 0.030	∑ >0.030
Dieldrin		[µg/l]					
Endrin		[µg/l]					
Isodrin		[µg/l]					
Carbontetrachloride		[µg/l]	12	24	31	36	>36
Tetrachloroethylene		[µg/l]	10	20	26	30	>30
Trichloroethylene		[µg/l]	10	20	26	30	>30

BG Natural background level

Unless mentioned otherwise, the required concentrations should be “less than or equal to” (mathematically: ≤) the standards in Table 15.

5.6.1. Sampling Frequencies and Compliance Checking

The proposed sampling frequencies and criteria for compliance testing are based on Article 6 of Directive 78/659/EC. For all parameters, except water temperature, suspended solids, and Priority Substances the following is proposed:

- Monthly sampling is expected (12 samples per year). In the case of bathing/recreation waters, monthly samples should be taken during from May through October.

- The 95-percentile (5-percentile in the case of dissolved oxygen) value of the dataset should be used for checking the compliance with the class boundaries. In case less than twelve samples have been taken, the maximum (minimum for dissolved oxygen) value should be used for compliance testing.

- For water temperature, the following provisions should apply (in accordance with Directive 78/659/EC):

    - Weekly sampling (up and downstream from the thermal discharge).
    - Temperature limits may be exceeded for 2% of the time[19].

- For the WFD Priority Substances (organic micro-pollutants) and Other Specific Pollutants, an annual average concentration should be used for compliance checking.

Directive 78/659/EC mentions in Article 6.2 that "Instances in which the values … are not respected shall not be taken into consideration in the calculation of the percentages … when they are the result of floods or other natural disasters." The same principle is applied in the proposal for Moldova as well.

The system is expected to apply the "one out – all out" principle. This principle (also used in the WFD) means that if the quality standards for certain Use Class(es) for just one parameter is not met with (while the others do), the water body in principle is disqualified for the related use(s). In practice, the actual judgement should be made by a competent group of experts after a critical evaluation of the situation. For example, prohibiting to use a certain water body as bathing water just because the ortho-phosphate concentration is higher than the boundary of Use Class III (0.2 mg P/l) would not really be a sensible decision when no actual eutrophication phenomenon is observed.

5.6.2. Comparison of the Proposed Versus Existing System of SWQSs

This section is used to highlight the main differences and similarities between the proposed new system and the one existing in Moldova.

General Features

Although the proposed system overall looks quite differently from the present one described in Chapter 2, it actually uses the same pillars as its basis. The major Moldovan uses that require certain surface water qualities (drinking water supply, fish breeding/protection and recreation) represent an important part of the system's characteristics. Most general parameters are still there as well.

The important differences with the existing system SWQS are:

a) *The integration of all uses, parameters and quality standards into one system*. In the present situation, the 'sanitary regulations' of the HR (1997) seem to be implemented more or less independently from of the "fishery regulations" of the RPSW (1991). The new system will facilitate more integrated water management, since links are more explicit and transparent. Furthermore, the new system explicitly distinguishes ecosystem functioning, a function now dispersed in various regulations.

b) *Abandoning the use of MACs as a straight 'yes/no' criteria*. The new system often uses differentiated quality standards as boundaries for various use classes.

[19] It is important to note that these provisions only apply to locations with significant thermal discharges.

c) *A clearly outlined and relatively small number of specific pollutants*. Instead of more than 1000 pollutants, 77 parameters of potential interest are included, which are fully up to date with the Water Framework Directive. Future work should decide which of the Priority Substances should indeed be regulated .

d) *Several new parameters for which currently there is no laboratory analysis capacity or expertise.* This situation is not unique for Moldova since several EU Member States faces similar constraints.

Drinking Water Supply

The proposed system is mainly in line with the a number of characteristics of the current HR (1997):

- It distinguishes three use classes (categories) of surface water quality based upon which the type of treatment is adjusted.

- The HR (1997) Annex 1 parameters (except for phytoplankton, currently not routinely monitored) have been maintained.

- In several cases, the concentration levels of the relevant Use Class boundaries are comparable to the current standards for categories I–III and the MACs of the HR (1997) (refer to the data sheets in Annex 1 for details on individual parameters).

The differences with the present system (in addition to the ones already mentioned under the "general features" above) include:

- The extension of the set of bacteriological quality parameters by adding Coliforms total, Coliforms faecal Streptococci faecali and Intestinal enterococci.

- Using BOD_5 instead of BOD_{total} for determining biochemical oxygen demand.

- Sometimes more and sometimes less stringent standards than those currently applied (see Annex 1 for details on individual parameters).

Bathing/Recreation

Several observations (e.g., the extension of the list of bacteriological parameters) mentioned above with respect to drinking water supply also apply to bathing waters and other recreational water uses. The biggest difference is the proposal to no longer include specific pollutants for the assessment of quality of bathing and other recreational water bodies.

Fish Breeding/Protection

The biggest changes were introduced for this use:

- Contrary to the minor differences in the existing quality standards for the "superior and first class" versus "second class" fishery waters (see Chapter 2), the new proposed system distinguishes different water quality conditions for salmonid and cyprinid fish while setting standards based on use classes.

- The concentration values of the SWQSs are in many cases higher (less stringent) than the existing MACs. The best example is copper where instead of a MAC of 1 µg/l the SWQS is set at 100 µg/l (total concentration).

5.7. Some Considerations for Implementation of the New System of SWQSs

This section touches upon some issues that will accompany the introduction of the new system of SWQSs. In the project's third phase, a Policy Report will be prepared that will address them in more detail.

5.7.1. Using the SWQS System as a Water Management Tool

As indicated in section 5.2, the proposed scheme is expected to become an active water management tool. Often systems with water quality classes are solely used for assessment purposes ("the water of the river in the year 2003 was of Class III quality"). Although such assessments implicitly should have certain consequences (either for water use or for taking remediation measures), the results are often not used for more than statistical and descriptive purposes. The proposed system should be used as a water management tool in the following way:

- The (intended) uses should be defined and agreed explicitly for all water bodies. (As long as all Moldovan surface waters are assigned as water bodies for (potential) fishery, the proposed new system of SWQS cannot be implemented effectively.) Based on the use(s) selected and an assessment of ensuing costs of both drinking water treatment (if potable water supply is one of the uses), and reduction of wastewater discharges, a competent authority should assign a target use class to the water body. The related water quality requirements are then dictated by the new system of SWQSs.

- The applicable SWQSs should serve as one of the factors in determining permitting requirements for individual pollution sources (this is consistent with making best available techniques the basis of permitting for large installations, as required by the IPPC Directive). However, ambient monitoring may not be necessary for all the parameters regulated under a certain use class. The surface water quality monitoring requirements would depend of the (intended) use (see Table 13). For example, it would not be necessary to monitor priority substances in a lake intended solely for bathing and other recreational activities. If there are any discharges of such substances into the water body, they should still be monitored and controlled at the source.

- The new system of SWQS offers the needed flexibility in setting water management options. The system can be used as an instrument to set Moldova's water management objectives, e.g., "All water bodies should comply with Use Class III quality requirements by the year 2015 and with Use Class II quality requirements by the year 2025".

5.7.2. Extending Laboratory Capacity

In order to be able to cover the potentially relevant Priority Substances and other specific pollutants, including the parameters currently already analysed like cadmium or hexachlorohexanes, the existing laboratory capacity must be increased.

Without assessing the current situation and expected demands for laboratory analyses in more detail, it is difficult to make proper estimates about procurement costs of new analytical equipment and other expenditures (e.g., possible expansion and training of staff). However, one should anticipate investments in orders of magnitude starting with hundreds of thousands of euros. Since the intended changes also mean important steps towards convergence with the EU, it seems reasonable to seek support from the EU for its implementation. Such support will definitely facilitate the introduction and effective implementation of the new system of SWQSs in Moldova.

Besides issues like investments or training of staff, strategic considerations will also apply. For instance, it may well be that one properly equipped and staffed laboratory can cover all surface water analysis for the Priority Substances. From a financial point of view, but also for better consistency of the results this may be a better option than increasing the capacities of the three central laboratories of Sanepid, SEI and Hydromet. Such choice would also affect the sampling programmes.

Upgrading the laboratory capacity may take several years even assuming the necessary funds will be allocated. During this period, there is no possibility to monitor the parameters in question, including the Priority Substances. In the meantime, the SWQSs for these parameters should continue to be used for other regulatory purposes such as setting ELVs in environmental permits.

REFERENCES

EC, 2002 Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL concerning the quality of bathing water. COM(2002) 581 final. http://europa.eu/eur-lex/en/com/pdf/2002/com2002_0581en01.pdf

EC, 2003 Guidance document no 10 River and lakes – Typology, reference conditions and classification systems. http://forum.europa.eu.int/Public/irc/env/wfd/library?l=/framework_directive/guidance_documents&vm=detailed&sb=Title

EC, 2006 Guide to the Approximation of European Union Environmental Legislation. European Commission. http://ec.europa.eu/environment/guide/guidfin.pdf

ECS, 1992 ECE Standard Statistical Classification of Surface Freshwater Quality for the Maintenance of Aquatic Life. CES/733, 13 April 1992. United Nations, Economic and Social Council.

ICPDR, 2006 Water Quality in the Danube River Basin. TNMN Yearbook 2001. http://www.icpdr.org/icpdr-pages/tnmn_yearbooks.htm

OECD, 2000 Environmental regulatory reform in the NIS: the case of the water sector. Http://www.oecd.org/dataoecd/62/13/1876109.pdf

SOE, 2004 State of the environment in the Republic of Moldova. Popular report, 2004. http://cim.moldova.md/raport2004/en/policy/envpp.htm

Tacis, 2003 Moldova A Framework for Water Quality Standards in Rivers and Point- Source Discharges. (Published under the Tacis project "Support for the Implementation of Environmental Policies and NEAPs in the NIS")

UNECE, 1996 Guidelines on Water-Quality Monitoring and Assessment of Transboundary Rivers. Background document Volume 5: State of the Art on Monitoring and Assessment of Rivers. RIZA report nr.: 95.068. RIZA Institute for Inland Water Management and Waste Water Treatment, Lelystad, The Netherlands, January 1996. http://www.iwac-riza.org)

UNECE, 2002 Bug Report 2. Identification and Review of Water Management Issues. http://www.iwac-riza.org/