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and
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Transposition and Implementation of the EU Water Framework Directive in Latvia

Technical Report No. 3

Action Plan -
How to define ecological status of surface water

Final

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List of Abbreviations

AWB	Artificial Water Bodies
BOD	Biological Oxygen Demand
CIS	Common Strategy on the Implementation of the Water Framework Directive
CM	Cabinet of Ministers
DANCEE	Danish Co-operation for the Environment in Eastern Europe
DEPA	Danish Environmental Protection Agency
DSD	Dangerous Substances Directive
EC	European Commission
EIA	Environmental Impact Assessment
ELV	Emission Limit Value
EP	Ecological Potential
EPD	Environmental Protection Department
ES	Ecological Status
EU	European Union
FFD	Fresh Water for Fish Directive
GEP	Good Ecological Potential
GES	Good Ecological Status
HES	High Ecological Status
HMWB	Heavily Modified Water Bodies
LEA	Latvian Environmental Agency
LHMA	Latvian Hydrometeorological Agency
LWM	Latvian Law on Water Management
MEP	Maximum Ecological Potential
MoE	Ministry of Environment
RB	River Basin
RBD	River Basin District
RBM	River Basin Management
RBMA	River Basin Management Authorities
RBMP	River Basin Management Plan
REB	Regional Environmental Board
SEI	State Environmental Inspectorate
SGS	State Geological Survey
ToR	Terms of reference
TR	Technical Report
TN	Technical Note
UWWTP	Urban Waste Water Treatment Plant
WB	Water Body
WFD	Water Framework Directive (2000/60/EC)
WG	Working Group
WQO	Water Quality Objectives
WQS	Water Quality Standard
WRUP	Water Resource Use Permit

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1 Introduction

The present report is part of the reporting for the project financed by the Danish Environmental Protection Agency (DEPA):

Transposition and implementation of the EU Water Framework Directive in Latvia.

The main objective of **TR 3** is to support MoE in preparation of Action Programme to complete the implementation of WFD and to provide general guidance on the assessment of ecological status (or ecological potential) leading to the overall ecological classification of water bodies for the purpose of the WFD.

Technical Report No.3:

- Describes requirements of WFD with regard to classification of water bodies;
- Provides proposed classification scheme, including proposal for indicative parameters which characterise quality elements and evaluation of current status for defining of parametric values to characterise quality elements;
- Defines necessary further steps to define ecological status for surface water body types; and
- Provides recommendations how to define the borders between good, high and moderate status.

In the list of main project outputs this report is numerate as **TR 3**. Summary of main project outputs is presented in Figure 1.

Figure 1-1: List of project outputs

Technical reports:

- TR 1A: Typology of waters and procedure for characterisation of waters
- TR 1B: Classification and presentation of status of waters
- TR 2: Recommendations for the monitoring programs for surface, coastal and groundwater and CM Regulations on requirements for establishment of monitoring programs
- **TR 3: Draft Action Plan on how to define ecological status of fresh and coastal water;**
- TR 4: Revision of the draft Regulation on WRUP
- TR 5: Elaboration of a specification of requirements and ToR for a data management/information system

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Other outputs:

- Draft legal acts for the transposition of Annexes II and V of the WFD
- Assistance to MoE in preparation of information material on the WFD
- Specification of requirements and ToR for a data management/information system

This TR are based on the following EU guidance documents:

- Overall Approach to the Classification of Ecological Status and Ecological Potential (ECOSTAT, Working Group 2 A);
- Guidance on Establishing Reference Conditions and Ecological Status Class Boundaries for Inland Surface Waters;
- Guidance on Typology, Reference Conditions and Classification Systems for Transitional and Coastal waters;
- Guidance Document on Identification and Designation of Heavily Modified and Artificial Water Bodies; CIS Working Group 2.2; 10 December 2002.

2 Water Framework Directive requirements with regard to classification of water bodies

2.1 Classification of ecological status for surface water bodies

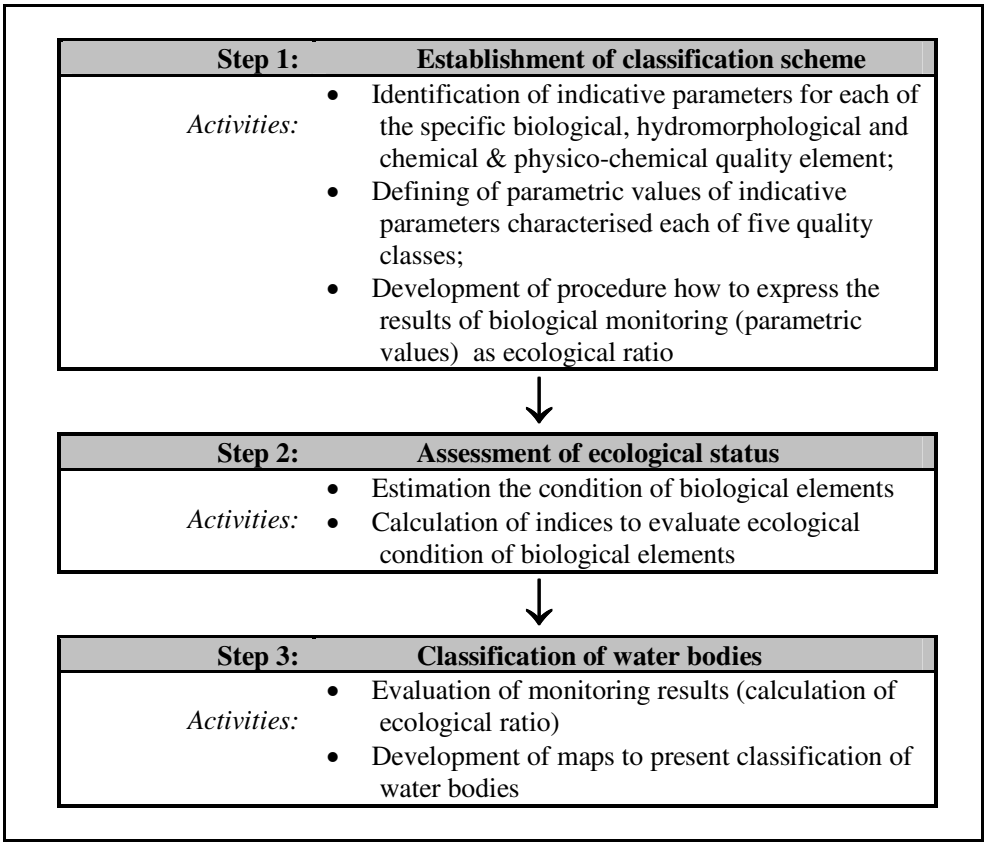
The Directive requires surface water classification through the assessment of ecological status (or ecological potential) and defines the quality elements (*Annex V; Table 1.1*) that must be used for assessment of ecological status (or ecological potential), provides a general definition of ecological status (or ecological potential) for each of five quality classes (*Annex V; Table 1.2.1-1.2.5).*

For the purpose of classification of surface water the establishment of classification scheme and evaluation of ecological status are consecutive activities which are directly linked to classification of surface water (Figure 2-1)

From the implementation point of view it means that the classification scheme has to:

- identify indicative parameters which will be measured or calculated in order to assess the condition of specific biological, hydromorphological and chemical & physico-chemical quality elements; and
- define parametric values of indicative parameters that characterise each of five quality classes.

Figure 2-1: Classification of surface water – implementation steps



2.1.1 Quality elements for assessment of ecological status

The purpose of typology is to group sites where the biology is similar in the absence of human impact, while purpose of classification is to address each of water body to one of five class of ecological status - high, good, moderate, poor and bad.

The WFD defines the quality elements that must be used for the assessment of ecological status (or ecological potential) and categorizes it into three groups:

- Biological quality elements
- Hydromorphological quality elements supporting the biological elements; and
- Chemical and physico-chemical quality elements supporting the biological elements.

Taking into account that natural condition of river ecosystems is determined by physio-geographical condition of area the hydro-morphological and physico-chemical parameters are put in basement for typology. Therefore for characterisation of ecological status the WFD is focused on the biological elements, while hydromorphological elements, chemical and physicochemical elements are considered primarily as descriptive ones.

Descriptive quality elements means that the values of the physicochemical and hydromorphological quality elements are such as to support a biological community

of a certain ecological status, as this recognises the fact that biological communities are products of their physical and chemical environment.

According to EU guidance document - *Overall Approach to the Classification of Ecological Status and Ecological Potential*: "The reference conditions of heavily modified (HMWB) and artificial water bodies (AWB) mainly depend on the hydromorphological changes necessary to maintain the specified uses listed in Article 4(3)(a), while maximum ecological potential (MEP), as the reference conditions for HMWB&AWB, is intended to describe the best approximation to a natural aquatic ecosystem that could be achieved given the hydromorphological characteristics that cannot be changed without significant adverse effects on the specified use or the wider environment".

Accordingly, the MEP biological conditions should reflect, as far as possible, the biological conditions associated with the closest comparable natural water body type at reference conditions, given the MEP hydromorphological and associated physico-chemical conditions (refer - HMWB Guidance Document Section 6.2.3).

(a) Biological quality elements for classification of ecological status

WFD provides a general definition for each of five classes of ecological status (*Annex V; Table 1.2*) and more specific definitions for ecological status at high, good and moderate status (*Annex V; Table 1.2.1 –1.2.5*). The quality elements for the classification of ecological status (ecological potential) are listed in *Annex V Section 1.1* of WFD.

For the purpose of classification of surface water the separate lists are provided for each of category of surface water:

- Rivers
- Lakes
- Transitional waters
- Coastal waters.

The biological quality elements for each of the surface water categories required by the WFD are summarised in Table 2-1.

Table 2-1: Biological quality elements to be used for the assessment of ecological status (or ecological potential)

Rivers	Lakes	Transitional waters	Coastal waters
1. Composition and abundance of aquatic flora (1); 2. Composition and abundance of benthic invertebrate fauna; 3. Composition, abundance and age structure of fish fauna	1. Composition, abundance and biomass of phytoplankton; 2. Composition and abundance of other aquatic flora (2); 3. Composition and abundance of benthic	1. Composition, abundance and biomass of phytoplankton; 2. Composition and abundance of other aquatic flora (3); 3. Composition and abundance of benthic	1. Composition, abundance and biomass of phytoplankton; 2. Composition and abundance of other aquatic flora (3); 3. Composition and abundance of benthic

Rivers	Lakes	Transitional waters	Coastal waters
	invertebrate fauna; 4. Composition, abundance and age structure of fish fauna	invertebrate fauna; 4. Composition and abundance of fish fauna	invertebrate fauna;

Note: (1)- Phytoplankton as a biological quality element is essential and representative only for large rivers. According to Regulation No.93 (adopted on February 17, 2004) "*Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures*" for Type 5: Big fast-floating river and Type 6: Big slow-running river is required;
(2)- The other aquatic flora for lakes are macrophytes and phytobentos;
(3)- The other aquatic flora for transitional waters & coastal waters are macroalgae and angiosperms

(b) Hydromorphological elements supporting the biological elements quality elements for classification of ecological status

WFD provides a general definition for each of five classes of ecological status (*Annex V; Table 1.2*) and more specific definitions for ecological status at high, good and moderate status (*Annex V; Table 1.2.1 –1.2.5*). The quality elements for the classification of ecological status (ecological potential) are listed in *Annex V Section 1.1* of WFD.

For the purpose of classification of surface water the separate lists are provided for each of the categories of surface water:

- Rivers
- Lakes
- Transitional waters
- Coastal waters.

The biological quality elements for each of surface water category required by WFD are summarised in Table 2-2.

Table 2-2: Hydromorphological elements to be used for the assessment of ecological status (or ecological potential)

Rivers	Lakes	Transitional waters	Coastal waters
1- Hydrological regime			
1. Quantity and dynamics of water flow; 2. Connection to groundwater bodies	1. Quantity and dynamics of water flow; 2. Residence time; 3. Connection to groundwater bodies	-	-

Rivers	Lakes	Transitional waters	Coastal waters
2- River continuity			
1. River continuity	-	-	-
3- Morphological conditions			
1. River depth and width variation; 2. Structure and substrate of the river bed; 3. Structure of the riparian zone	1. Depth variation; 2. Quantity, structure and substrate of the lake bed; 3. Structure of the lake shore	1. Depth variation; 2. Quantity, structure and substrate of the bed; 3. Structure of the intertidal zone	1. Depth variation; 2. Structure and substrate of the coastal bed; 3. Structure of the intertidal zone
4- Tidal regime			
-	-	1. Freshwater flow; 2. Wave exposure	1. Direction of dominant currents; 2. Wave exposure

(c) Chemical and physico-chemical quality elements supporting the biological elements for classification of ecological status

The list of quality elements required by the Directive is subdivided into 3 groups of elements. One of mentioned subgroups are chemical and physico-chemical elements supporting the biological elements, which includes:

- General physico-chemical quality elements[1];
- Specific non-priority pollutants identified by Member States as being discharged in significant quantities; and
- Specific priority pollutants as being discharged[2]

Nevertheless it is noted in WFD Common Implementation Strategy document – *Overall Approach to the Classification of Ecological Status and Ecological Potential*, that priority substances listed in Annex X "should only be taken into account in the classification of surface water chemical status and should **not be used as supporting elements for the classification of ecological status**". Classification through the assessment of chemical status more detail is discussed in Chapter 2.2 of given Report and also in the report **TR1B**.

The chemical and physico-chemical quality elements for the classification of ecological status (ecological potential) are listed in *Annex V Section 1.1* of WFD and definitions of the condition of the quality elements in each status class for each surface water category are provided in *Annex V Section 1.2.1 – 1.2.5*.

The chemical and physico-chemical quality elements for each of the surface water categories required by WFD are summarised in Table 2-3. Guidance on getting better

[1] **WFD:** Annex V, Table 1.1
[2] **WFD:** Annex X

results from classification of ecological status and chemical status are discussed in given Report and is provided in **TR1B**.

Table 2-3: Chemical and physico-chemical quality elements to be used for the assessment of ecological status (or ecological potential)

Rivers	Lakes	Transitional waters	Coastal waters
1- General			
1. Thermal conditions; 2. Oxygenation conditions; 3. Salinity; 4. Acidification status; 5. Nutrient conditions	1. Transparency; 2. Thermal conditions; 3. Oxygenation conditions; 4. Salinity; 5. Acidification status; 6. Nutrient conditions	1. Transparency; 2. Thermal conditions; 3. Oxygenation conditions; 4. Salinity; 5. Nutrient condition	1. Transparency; 2. Thermal conditions; 3. Oxygenation conditions; 4. Salinity; 5. Nutrient condition
2- Specific pollutants			
1. Pollution by all priority substances identified as being discharged into the body of water; 2. Pollution by other substances identified as being discharged in significant quantities into the body of water	1. Pollution by all priority substances identified as being discharged into the body of water; 2. Pollution by other substances identified as being discharged in significant quantities into the body of water	1. Pollution by all priority substances identified as being discharged into the body of water; 2. Pollution by other substances identified as being discharged in significant quantities into the body of water	1. Pollution by all priority substances identified as being discharged into the body of water; 2. Pollution by other substances identified as being discharged in significant quantities into the body of water

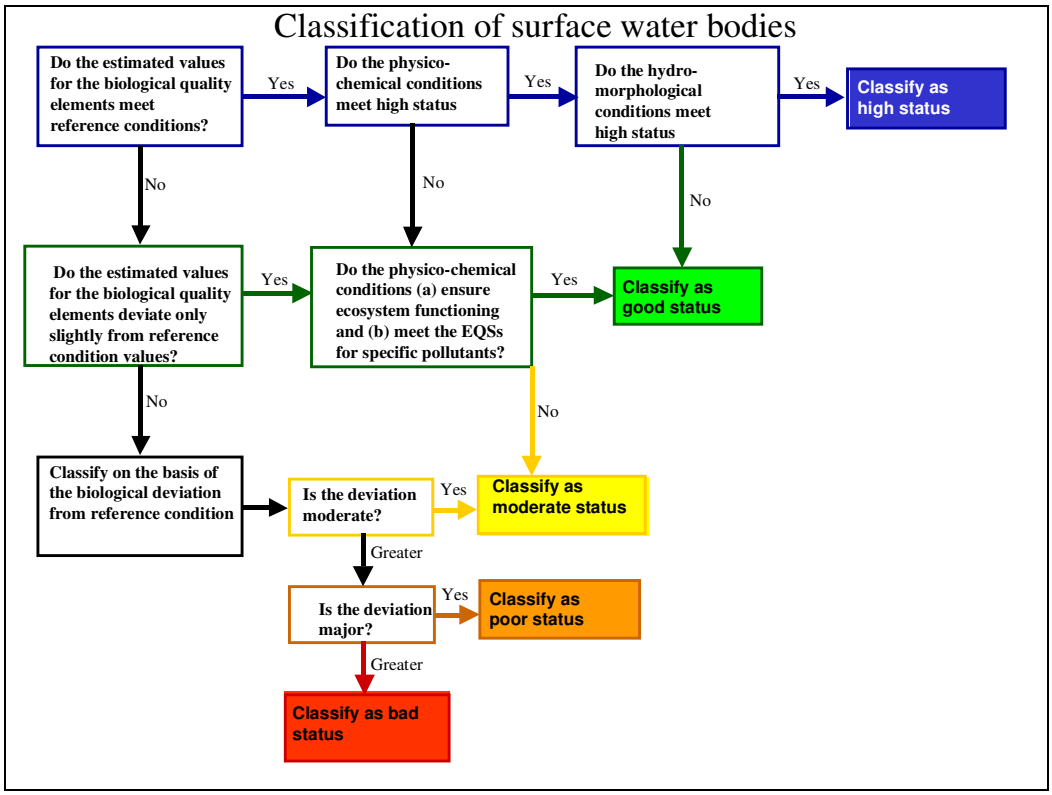
2.1.2 Evaluation of ecological status of surface water bodies and relations between the biological, hydromorphological and physico-chemical quality elements

The procedure defined by WFD anticipate that the values of the hydromorphological quality elements must be taken into account to asses high ecological status (or maximum ecological potential) class, while for other status (potential) classes given elements are required to have "conditions consistent with the achievement of the values specified for the biological quality elements". This is because if the values of biological quality elements characterising good, moderate, poor or bad status (or ecological potential) are achieved the condition of the hydromorphological quality

must be consistent with that achievement and therefore would not affect the classification of ecological status (or ecological potential).

The step by step evaluation of ecological status and the relations between the biological, hydromorphological and physico-chemical quality elements are presented in Figure 2-2.

Figure 2-2: The relations between the biological, hydromorphological and physico-chemical quality elements for evaluation of ecological status of surface water bodies



Taking into account that reference conditions of heavily modified and artificial water bodies mainly depend on the hydromorphological changes of water body the evaluation of ecological potential status have to be start with evaluation of hydromorphological quality elements. The relations between the biological, hydromorphological and physico-chemical quality elements when heavily modified water bodies and artificial water bodies are addressed to ecological potential class are presented in Figure 2-3.

Figure 2-3: The relations between the biological, hydromorphological and physico-chemical quality elements for evaluation of ecological potential of surface water bodies

Annex V No. 1.2.5:

[Maximum Ecological Potential (MEP) is defined as the state where] "the values of the relevant biological quality elements reflect, as far as possible, those associated with the closest comparable surface water body type, given the physical conditions which result from the artificial or heavily modified characteristics of the water body."

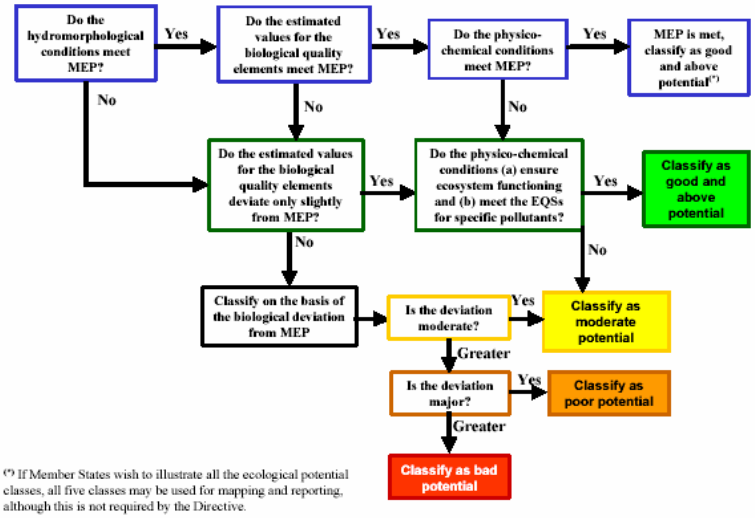


Figure 2. *Indication of the relative roles of biological, hydromorphological and physico-chemical quality elements in ecological* ***potential*** *classification according the normative definitions in Annex V:1.2. The two upper classes MEP and GEP are combined for reporting purposes to good and above potential. The color code of the classification shows equal green/yellow/orange/red and light (AWB) or dark grey stripes (HMWB). For further information see HMWB&AWB guidance document.*

Similarly with hydromorphological quality elements according to procedure defined by WFD the values of the chemical and physico-chemical elements quality elements must be taken into account to asses high ecological status (or maximum ecological potential) class, while for other status (potential) classes given elements are required to have "conditions consistent with the achievement of the values specified for the biological quality elements". This is because if the values of biological quality elements characterising good, moderate, poor or bad status (or ecological potential) are achieved the condition of the chemical and physico-chemical elements quality must be consistent with that achievement and therefore would not affect the classification of ecological status (or ecological potential).

2.2 Classification of chemical status for surface water bodies

Regarding to chemical status two quality classes is defined by WFD:

- Good chemical status;
- Failing to achieve good chemical status.

Chemical status has to be addressed to requirements defined by each definite dangerous substances daughter directive which will be repealed by the WFD from December 2013. In the transition period until the WFD is fully implemented the requirements of mentioned directives are still in force and quality of water bodies have to characterised as good or failing to achieve good chemical status. Requirements for water quality standards in the mentioned directives are addressed to all categories of surface water – rivers, lakes, coastal water and transitional water. Taking into account bioaccumulation capacity of each definite dangerous substance the WQS are defined either for water column (including suspended sediments) or sediment or biota.

Requirements of dangerous substances Daughter directives - 82/176/EEC, 84/156/EEC, 83/513/EEC, 86/280/EEC, 84/491/EEC, 88/347/EEC, 90/415/EEC, are summarised in Table 2-4.

Table 2-4: Summary of monitoring requirements of directives according to water type and matrix.

EU dangerous substances daughter directives	Category of surface water											
	Rivers			Lakes			Transitional water			Coastal water		
	W	S	B	W	S	B	W	S	B	W	S	B
82/176/EEC – for Mercury from Chlor-alkali	X	X	X	X	X	X	X	X	X	X	X	X
84/156/EEC – for Mercury from Other Sectors	X	X	X	X	X	X	X	X	X	X	X	X
83/513/EEC - Cadmium	X	X	X	X	X	X	X	X	X	X	X	X
86/280/EEC - for Carbon Tetrachloride	X	X(1)	X(1)	X	X(1)	X(1)	X	X(1)	X(1)	X	X(1)	X(1)
84/491/EEC - for Hexachlorocyclohexane	X	X	X	X	X	X	X	X	X	X	X	X
88/347/EEC – for Aldrin, .etc.	X	X(2)	X(2)	X	X(2)	X(2)	X	X(2)	X(2)	X	X(2)	X(2)
90/415/EEC - for Dichloroethane, etc.	X	X(3)	X(3)	X	X(3)	X(3)	X	X(3)	X(3)	X	X(3)	X(3)

Notes: B – biota; S – sediment; W - water column; (1) - only for DDT and pentachlorophenol (PCP); (2) - only for aldrin, dieldrin, endrin and isodrin, hexachlorobenzene (HCB), hexachlorobutadiene (HCBD); (3) - only for trichlorobenzene (TCB)

Chemical status describes whether or not the concentration of any pollutant exceeds standards that have been set at the European level. That means that it is only for substances, where Environmental Quality Standards are adopted at the Commission level, chemical status are assessed. For other substances the EQS shall be established at the national level and then included in the assessment of ecological status (see also **TR1B**).

3 Recommendations for the establishment of classification scheme

WFD requires monitoring of parameters indicative of the conditions of biological quality elements as part of established monitoring programmes[3] and assessment of the ecological status (or ecological potential) class of a water body based on the estimate of the condition of the quality elements provided by these monitored parameters. It means that obtained monitoring date initially have to be used for defining of parametric values for parameters indicative of the quality elements.

A list with all parameters and quality elements required by WFD is summarised in Tables 2-1 to 2-3. In most cases achieving a reliable assessment of the condition of a particular quality element may require consideration of the monitoring results for several parameters indicative of that element. Therefore in practice mentioned list of quality elements could be interpreted in different ways and sorts of parameters may be useful for evaluation of ecological status additionally. The sorts of parameters that may be useful in estimating the condition of a biological element are summarised in Tables 3-1 to 3-4.

Recommendations on parameters indicative of the quality elements was developed by project team based on:

- Analyses of existing monitoring data;
- Evaluation of existing scientific experience and knowledge;
- Monitoring practice of Danish EPA and Swedish EPA; and
- EU guidance documents.

Detailed Action plan how to define ecological status of surface water body types is presented in Chapter 5 of this Report.

3.1.1 Rivers

Table 3-1: Recommended parameters indicative of the quality elements for rivers

Quality element	General parameter required by WFD	Recommended indicative parameter
1- Biological elements		
Aquatic flora	Composition and abundance of macrophytes	- Overall surface coverage in percents; - Species composition; - Presence of *Potamogeton alpinus*
	Composition and abundance of phytoplankton (1)	- Presence of blue green algae - % of biomass; - Presence of blue green algae – number of cells in %

[3] **WFD**: Annex V, Section 1.3.1 and 1.3.2; **Cabinet of Ministers Regulation No.92** (adopted on February 17, 2004) "Requirements for monitoring of surface waters, groundwater and protected areas and development/elaboration of monitoring programs";

Quality element	General parameter required by WFD	Recommended indicative parameter
Benthic invertebrate fauna	Composition and abundance	- Saprobic index; - Some of diversity indexes; - Species composition
Fish fauna	Composition, abundance and age structure	- Shannon index - Number of native species - Age structure - Presence of sensitive taxa - Degree of abnormities, diseases, external parasites
2- Hydromorphological elements supporting the biological elements		
Hydrological regime	Quantity and dynamics of water flow;	- Velocity; - Flow rate;
	Connection to groundwater bodies	- Water table height; - Surface water discharge
River continuity	River continuity	- Number and type of barrier; - Provisions for passage of aquatic organisms
Morphological conditions	River depth and width variation	- Depth; - Width
	Structure and substrate of the river bed	- Substrate composition; - Size of particles - Structure of bed
	Structure of the riparian zone	- Structure of the riparian zone
3 - Chemical and physico-chemical elements supporting the biological elements		
General	Thermal conditions	- Water temperature
	Oxygenation conditions	- Dissolved oxygen; - BOD; - COD
	Salinity	- conductivity
	Acidification status	- pH
	Nutrient conditions	- Total P; - Total N; - N- NO3 - N- NO2; - N-NH4 - P- PO4
Specific pollutants	Pollution by all priority substances identified as being discharged into the body of water	- Taking into account bioaccumulation capacity for each definite pollutant - Concentration in water; and/or - Concentration in sediment; and/or - Concentration in biota
	Pollution by other substances identified as being	- Taking into account bioaccumulation

Quality element	General parameter required by WFD	Recommended indicative parameter
	discharged in significant quantities into the body of water	capacity for each definite pollutant - Concentration in water; and/or - Concentration in sediment; and/or - Concentration in biota

Note: (1)- Phytoplankton as a biological quality element is essential and representative only for large rivers. According to Regulation No.93 (adopted on February 17, 2004) "*Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures*" for Type 5: Big fast-floating river and Type 6: Big slow-running river is required

3.1.2 Lakes

Table 3-2: Recommended parameters indicative of the quality elements for lakes

Quality element	General parameter	Indicative parameter
1- Biological elements		
Aquatic flora	Composition, abundance and biomass of phytoplankton	- Presence of blue green algae - % of biomass; - Presence of blue green algae – number of cells in %; - Nygaard – Thunmark's index (1) - Some of diversity indices; - Presence of Chrysophyta; - Presence of Desmidiales; - Dominating taxa; - Bloom frequency/intensity
	Composition and abundance of macrophytes	- Overall surface coverage in percents; - Species composition; - Presence of sensitive taxa
	Composition and abundance of phytobenthos	- Presence of red algae; - Presence of filamentous algae; - Analyses of Diatoms (2)
Benthic invertebrate fauna	Composition and abundance	- Saprobic index (3, 4); - Some of diversity indices; - Number of organisms; - Biomass; - Species composition
Fish fauna	Composition, abundance and age structure	- Shannon index - Number of native species

Quality element	General parameter	Indicative parameter
		- Age structure - Presence of sensitive taxa - Degree of abnormities, diseases, external parasites
2- Hydromorphological elements supporting the biological elements		
Hydrological regime	Quantity and dynamics of water flow;	- Quantity of water flow; - Dynamics of water flow
	Residence time	- Residence time
	Connection to groundwater bodies	- water table height; - surface water discharge
Morphological conditions	Depth variation	- mean depth; - max depth
	Quantity, structure and substrate of the lake bed	- Quantity of bed; - Substrate composition; - Structure of bed
	Structure of the lake shore	- Length; - Bank features; - Vegetation cover
3 - Chemical and physico-chemical elements supporting the biological elements		
General	Transparency	- Secchi depth; - Colour; - turbidity
	Thermal conditions	- Temperature of epilimnion; - Temperature in deepest horizonts
	Oxygenation conditions	- Dissolved oxygen; - BOD; - COD
	Salinity	- - conductivity
	Acidification status	- pH
	Nutrient conditions	- total P; - total N; - total N/total P - N- NO3 - N- NO2; - P- PO4
Specific pollutants	Pollution by all priority substances identified as being discharged into the body of water	- Taking into account bioaccumulation capacity for each definite pollutant - Concentration in water; and/or - Concentration in sediment; and/or - Concentration in biota
	Pollution by other substances identified as being discharged in significant quantities into the body of water	- Taking into account bioaccumulation capacity for each definite pollutant - Concentration in water;

Quality element	General parameter	Indicative parameter
		and/or - Concentration in sediment; and/or - Concentration in biota

Note: (1) phytoplankton indices that characterise the condition in a lake, were based upon on the number of taxa from different classes or orders. Originaly Nygaard – Thunmark's index describes relation between Chloroccales and Desmidiales. It is recommended that for Latvian condition the modified Nygaard – Thunmark's index developed in Estonian can be used;
(2) it is recommended by EU experts. There is no corresponding experience in Latvia;
(3) taking into account that species composition of bentic communities in litoral zone are presented by large number of taxa, while bentic communities of pelagic zone are presented mainly by Chironomus and Oligochaeta, it is recommended only characteristics of bentic communities of litoral zone to use as indicative parameters to evaluate quality of biological element – bentic invertebrate fauna;
(4) although saprobic index is used to evaluate water quality of running water this parameter can be used also for evaluation of biological quality of lakes if following precondition is considered:

- sample are collected only in zone of wave where ecological conditions are similar with running water;
- parameter cannot be used for shallow polyhumic lakes which are located in massive of rised bog;

3.1.3 Transitional waters

Table 3-3: Recommended parameters indicative of the quality elements for transitional waters

Quality element	General parameter	Indicative parameter
1- Biological elements		
Aquatic flora	Composition, abundance and biomass of phytoplankton	– Species composition in spring season; – Species composition in summer season; – Species composition in autumn season; – Abundance in spring season; – Abundance composition in summer season; – Abundance composition in autumn season; – Biomass in spring season; – Biomass composition in summer season; – Biomass composition in autumn season
	Composition and abundance of macroalgae	– Depth limit of macroalgae – Depth limit of macroalgal community
	Composition and abundance of angiosperms	– Not present
Benthic invertebrate fauna	Composition and abundance of benthic invertebrate fauna	– Biotic Coefficient; – Biotic Index
Fish fauna	Composition and abundance of fish fauna	– Abundance; – Species composition
2- Hydromorphological elements supporting the biological elements		
Morphological conditions	Depth variation	– mean depth; – max depth
	Quantity, structure and substrate of the bed	– Quantity of bed; – Substrate composition; – Structure of bed
	Structure of the intertidal zone	– Structure of the riparian zone
Tidal regime	Freshwater flow	– Freshwater flow
	Wave exposure	– Wave exposure
3 - Chemical and physico-chemical elements supporting the biological elements		
General	Transparency	– Secci depth in spring season; – Secci depth in summer season

Quality element	General parameter	Indicative parameter
	Thermal conditions	– Thermal conditions
	Oxygenation conditions	– Oxygen content (ml/l) in summer season; – Oxygen saturation (%) in summer season;
	Salinity	– Salinity
	Nutrient conditions	– Phosphate concentration (μmol/l) in winter (late January – early February); – Nitrate concentration (μmol/l) in winter (late January – early February); – Total phosphorus in winter (late January – early February), spring (late April – early May) and summer (July – August) – Total nitrogen in winter (late January – early February), spring (late April – early May) and summer (July – August) – Phosphate in spring (late April – early May) – Nitrate in spring (late April – early May)
		– Silicate concentration (μmol/l) in winter (late January – early February) – Silicate in spring (late April – early May)
Specific pollutants	Pollution by all priority substances identified as being discharged into the body of water	– Taking into account bioaccumulation capacity for each definite pollutant – Concentration in water; and/or – Concentration in sediment; and/or – Concentration in biota
	Pollution by other substances identified as being discharged in significant quantities into the body of water	– Taking into account bioaccumulation capacity for each definite pollutant – Concentration in water; and/or – Concentration in sediment; and/or – Concentration in biota

3.1.4 Coastal waters

Table 3-4: Recommended parameters indicative of the quality elements for coastal water

Quality element	General parameter	Indicative parameter
1- Biological elements		
Aquatic flora	Composition, abundance and biomass of phytoplankton	– Species composition in spring season; – Species composition in summer season; – Species composition in autumn season; – Abundance in spring season; – Abundance composition in summer season; – Abundance composition in autumn season; – Biomass in spring season; – Biomass composition in summer season; – Biomass composition in autumn season
	Composition and abundance of macroalgae	– Depth limit *Furcellaria lumbricalis* (Baltic coast) or *Fucus vesiculosus*(Riga Gulf) – Depth limit of macroalgal community
	Composition and abundance of angiosperms	– Presence
Benthic invertebrate fauna	Composition and abundance of benthic invertebrate fauna	– Biotic Coefficient; – Biotic Index
2- Hydromorphological elements supporting the biological elements		
Morphological conditions	Depth variation	– mean depth; – max depth
	Structure and substrate of the coastal bed	– Substrate composition; – Structure of bed
	Structure of the intertidal zone	– Structure of the intertidal zone
Tidal regime	Direction of dominant currents	– Direction of dominant currents
	Wave exposure	– Wave exposure
3 - Chemical and physico-chemical elements supporting the biological elements		
General	Transparency	– Secci depth in spring season; – Secci depth in summer season

Quality element	General parameter	Indicative parameter
	Thermal conditions	– Thermal conditions
	Oxygenation conditions	– Oxygen content (ml/l) in summer season; – Oxygen saturation (%) in summer season
	Salinity	– Salinity
	Nutrient conditions	– Phosphate concentration (μmol/l) in winter (late January – early February); – Nitrate concentration (μmol/l) in winter (late January – early February); – Total phosphorus in winter (late January – early February), spring (late April – early May) and summer (July – August) – Total nitrogen in winter (late January – early February), spring (late April – early May) and summer (July – August) – Phosphate in spring (late April – early May) – Nitrate in spring (late April – early May)
Specific pollutants	Pollution by all priority substances identified as being discharged into the body of water	Taking into account bioaccumulation capacity for each definite pollutant - Concentration in water; and/or - Concentration in sediment; and/or - Concentration in biota
	Pollution by other substances identified as being discharged in significant quantities into the body of water	Taking into account bioaccumulation capacity for each definite pollutant - Concentration in water; and/or - Concentration in sediment; and/or - Concentration in biota

4 The establishment of classification scheme for surface water bodies

The defining of parametric values for indicative parameters which characterise quality elements is very essential activity to develop the classification scheme. The Directive requires that classification scheme and classification of surface water bodies in practice have to be based on monitoring results. Nevertheless in order to evaluate applicability of existing monitoring data and to test recommended procedure for defining of ecological status of surface water bodies it was decided that project team in close cooperation with LEA will develop proposal for classification scheme (the first step of classification of water bodies), including:

- Development of list of parameters indicative for the evaluation of condition of biological quality; and
- Drafting proposal with parametric values describing quality classes for biological elements and chemical elements where data is available.

Taking into account that parametric values describing the parametric values of biological quality elements have to be defined based on monitoring results of water bodies the term "preliminary classification" is introduced and used to characterised present status for defining of ecological status of surface water.

The preliminary classification is also needed for the identification of water bodies at risk not to achieve good status. The identification shall be carried out as a part of characterisation during 2004.

4.1 Ecological classification of river types

The preliminary classification of ecological status was done by project team in close cooperation with Latvian Environmental Agency. The following monitoring data is used to define parametric values of indicative parameters that characterise chemical elements of ecological status and biological element - Saprobity index:

- long-term monitoring database - *number of stations*: 67; *period*: 1991-2002; *chemical parameters*: BOD5, COD, N/NH4, N/NO2, N/NO3, total N, P/PO4, total P, pH, conductivity, O2, *biological parameter* – saprobity index;
- small rivers monitoring database - *number of stations*: 1477; *period*: 1995-2002; *chemical parameters*: BOD5, N/NH4, N/NO2, N/NO3, total N, P/PO4, total P, pH, conductivity, O2; *biological parameter* – saprobity index;
- small rivers monitoring database - *number of stations*: 134; *period*: 2002-2002; *chemical parameters*: BOD5, N/NH4, N/NO2, N/NO3, total N, P/PO4, total P, pH, conductivity, O2; *biological parameter* – saprobity index
- Hydrobiological monitoring database of Northern Vidzeme Biosphere reserve - *number of stations*: 40; *period*: 1991-2002, 2003; *biological parameter* – species composition, coverage

Table 4-1: Preliminary classification of ecological status for rivers

General parameter	Indicative parameter	Type 1: Fast-floating stream	Type 2: Slow-running streams	Type 3: Fast-floating rivers	Type 4: Slow-running river	Type 5: Big fast-floating river	Type 6: Big slow-running river
1- Biological elements							
1.1- Aquatic flora							
Composition and abundance of macrophytes	– Overall surface coverage in percents:	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– Species composition:	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– Presence of *Potamogeton alpinus*	*R*	*R*	*R*	*R*	*R*	*R*
1.2- Benthic invertebrate fauna							
Composition and abundance	– Saprobic index	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
3 - Chemical and physico-chemical elements supporting the biological elements							
3.1- General							
Oxygenation conditions	– Dissolved oxygen	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– BOD	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
Nutrient conditions	– Total P	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– Total N	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– N- NH4	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*

Note: R – parametric values characterising reference condition is defined; C – parametric values characterising quality classes are defined

Directive for rivers requires to define parametric values for 3 biological quality elements, 7 chemical and physico-chemical quality elements supporting the biological elements and 6 hydromorphological quality elements supporting the biological elements in total (refer Table 2-1 to 2-3). In order to characterised mentioned quality elements it is recommended use 36 (+ specific pollutants) indicative parameters in total, which is 12 (+ specific pollutants) indicative parameters of chemical and physico-chemical quality elements, 12 indicative parameters of hydromorphological quality elements and 12 indicative parameters of biological quality elements accordingly (refer Table 3-1).

Taking into account that existing network of surface monitoring was developed to characterise - the location of pollution sources and land use; structure and amount of emissions of polluting substances; economic importance of the region; transboundary pollution, existing monitoring data currently only partly can be used for characterisation purposes of water bodies. Table 4-1 summarise indicative parameters for which parametric values have been defined.

4.2 Ecological classification of lake types

The preliminary classification of ecological status was done by project team in close cooperation with Latvian Environmental Agency. In order to develop typology of Latvian lakes monitoring data of 2407 lakes is used (refer Annex 1). The following monitoring data is used to define parametric values of indicative parameters characterised chemical and biological elements of ecological status:

- Long-term monitoring data – *number of lakes:* 8; *chemical parameters*: total N, total P, Secci depth, chlorophyll-a; *biological parameter* : phytoplankton biomass;
- Summer season lake data – *number of lakes:* 165; *chemical parameters*: total nitrogen Ntot,, total phosphorus Ptot, Secci depth, chlorophyll-a; *biological parameter* : phytoplankton biomass;
- Monitoring data of Institute of Biology– *number of lakes:* 70 lakes; *chemical parameters*: total N, Secci depth; *biological parameter* : phytoplankton biomass, species composition; species composition of machrophytes, coverage by macrophytes.
- Lake survey database of Northern Vidzeme Biosphere reserve - *number of stations*: 65; *period*: 1992; *biological parameter* – species composition, coverage.

Table 4-2: Preliminary classification of ecological status for lakes

Quality element	General parameter	Type 1: Very shallow hard water oligohumic lake	Type 2: Very shallow hard water polyhumic lake	Type 3: Very shallow soft water oligohumic lake	Type 4: Very shallow soft water polyhumic lake	Type 5: Shallow hard water oligohumic lake	Type 6: Shallow hard water polyhumic lake	Type 7: Shallow soft water oligohumic lake	Type 8: Shallow soft water polyhumic lake	Type 9: Deep hard water oligohumic lake	Type 10: Deep soft water oligohumic lake
1- Biological elements											
1.1- Aquatic flora											
1.1.1- Macrophytes											
Composition and abundance of macrophytes	– Indicator species	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– Presence of indicator species	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– Indicator species coverage	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
	– Total coverage with macrophytes	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*	*R/C*
1.1.2- Phytoplankton											
Composition, abundance and biomass of phytoplankton	– Biomass	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
	– Dominating taxa	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
	– Presence of red algae (Rhydophyta)	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
	– Presence of blue algae	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
1.2- Benthic invertebrate fauna											
Composition and abundance of benthic invertebrate fauna	– Number of species	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
	– Number of organisms	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
	– Biomass	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*

Quality element	General parameter	**Type 1: Very shallow hard water oligohumic lake**	**Type 2: Very shallow hard water polyhumic lake**	**Type 3: Very shallow soft water oligohumic lake**	**Type 4: Very shallow soft water polyhumic lake**	**Type 5: Shallow hard water oligohumic lake**	**Type 6: Shallow hard water polyhumic lake**	**Type 7: Shallow soft water oligohumic lake**	**Type 8: Shallow soft water polyhumic lake**	**Type 9: Deep hard water oligohumic lake**	**Type 10: Deep soft water oligohumic lake**
	– Dominating taxa	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*	*R*
3 - Chemical and physico-chemical elements supporting the biological elements											
3.1- General											
Nutrient conditions	– Total P	*R/C*	*R*	*R*	*R*	*R/C*	*R/C*	*R/C*	*R*	*R/C*	*R*
	– Total N	*R/C*	*R*	*R*	*R*	*R/C*	*R/C*	*R/C*	*R*	*R/C*	*R*
	– Chlorophyll-a	*R/C*	*R*	*R*	*R*	*R/C*	*R/C*	*R/C*	*R*	*R/C*	*R*

Note: R – parametric values characterising reference condition is defined; C – parametric values characterising quality classes are defined

Directive for lakes requires to define parametric values for 4 biological quality elements, 8 chemical and physico-chemical quality elements supporting the biological elements and 6 hydromorphological quality elements supporting the biological elements in total (refer Table 2-1 to 2-3). In order to characterised mentioned quality elements it is recommended use 51 (+ specific pollutants) indicative parameters in total, which is 16 (+ specific pollutants) indicative parameters of chemical and physico-chemical quality elements, 13 indicative parameters of hydromorphological quality elements and 22 indicative parameters of biological quality elements accordingly (refer Table 3-2).

Taking into account that existing network of lake monitoring was developed to characterise - the location of pollution sources and land use; structure and amount of emissions of polluting substances; economic importance of the region; transboundary pollution, existing monitoring data currently only partly can be used for characterisation purposes of water bodies. Table 4-2 summarise indicative parameters for which parametric values have been defined.

4.3 Ecological classification of coastal water and transitional water types

Table 4-3: Preliminary classification of ecological status for coastal waters

General parameter	Indicative parameter	South-eastern exposed Sandy coast	South-eastern exposed Stony coast	Gulf of Riga Sandy Coast	Gulf of Riga Stony Coast	Transitional water of Riga Gulf
1- Biological elements						
1.1- Aquatic flora						
Composition, abundance and biomass of phytoplankton	– Species composition in spring season;					*R/C2*
	– Species composition in summer season;					*R/C2*
	– Species composition in autumn season;					*R/C2*
	– Abundance in spring season;					*R/C2*
	– Abundance in summer season;					*R/C2*
	– Abundance in autumn season;					*R/C2*
	– Biomass in spring season;					*R/C2*
	– Biomass in summer season;					*R/C2*
	– Biomass in autumn season					*R/C2*
Composition and abundance of macroalgae	– Depth limit of macroalgae (1)	N	*R/C2*	N	*R/C2*	
	– Depth limit of macroalgal community	NP	*R/C2*	NP	*R/C2*	
1.2- Benthic invertebrate fauna						
Composition and abundance of benthic invertebrate fauna	– Biotic Coefficient;	*R/C3*		*R/C3*		*R/C3*
	– Biotic Index	*R/C3*		*R/C3*		*R/C3*
3 - Chemical and physico-chemical elements supporting the biological elements						

General parameter	Indicative parameter	South-eastern exposed Sandy coast	South-eastern exposed Stony coast	Gulf of Riga Sandy Coast	Gulf of Riga Stony Coast	Transitional water of Riga Gulf
3.1- General						
Transparency	– Secci depth in summer season	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*
Oxygenation conditions	– Oxygen content (ml/l) in summer season;	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*
	– Oxygen saturation (%) in summer season;	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*
Nutrient conditions	– Phosphate concentration (μmol/l) in winter (late January – early February);	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*
	– Nitrate concentration (μmol/l) in winter (late January – early February);	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*
	– Total phosphorus in winter (late January – early February),	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*
	– Total nitrogen in winter (late January – early February),	*R/C2*	*R/C2*	*R/C2*	*R/C2*	*R/C2*

Note: (1) - Depth limit of *Furcellaria lumbricalis* (Stony coast of Baltic Proper) or *Fucus vesiculosus* (Stony coast of Riga Gulf); N – is not required by WFD; NP – not present; R – parametric values characterising reference condition is defined; C2 – parametric values characterising 2 quality classes (high & good quality) are defined; C3 – parametric values characterising 2 quality classes (high & good & fair quality) are defined

Directive requires to define parametric values for 4 (transitional water) and 3 (coastal waters) biological quality elements, 7 (transitional water) and 7 (coastal waters) chemical and physico-chemical quality elements supporting the biological elements and 5 (transitional water) and 5 (coastal waters) hydromorphological quality elements supporting the biological elements in total (refer Table 2-1 to 2-3). In order to characterised mentioned quality elements it is recommended use 38 and 34 (+ specific pollutants) parameters accordingly for transitional and coastal water indicative in total, which is 14 and 12 (+ specific pollutants) indicative parameters of chemical and physico-chemical quality elements, 8 and 7 indicative parameters of hydromorphological quality elements and 16 and 15 indicative parameters of biological quality elements accordingly (refer Table 3-3 and 3-4).

Existing monitoring data currently only partly can be used for classification of water bodies. Table 4-3 summarise indicative parameters for which parametric values have been defined.

5 Action plan for defining of ecological status of surface water

5.1 Implementation steps of the WFD in relation to ecological status of surface water

The main objective of **TR 3** is to support MoE in preparation of Action Program to complete the implementation of WFD and to provide general guidance on the assessment of ecological status (or ecological potential) leading to the overall ecological classification of water bodies for the purpose of the WFD.

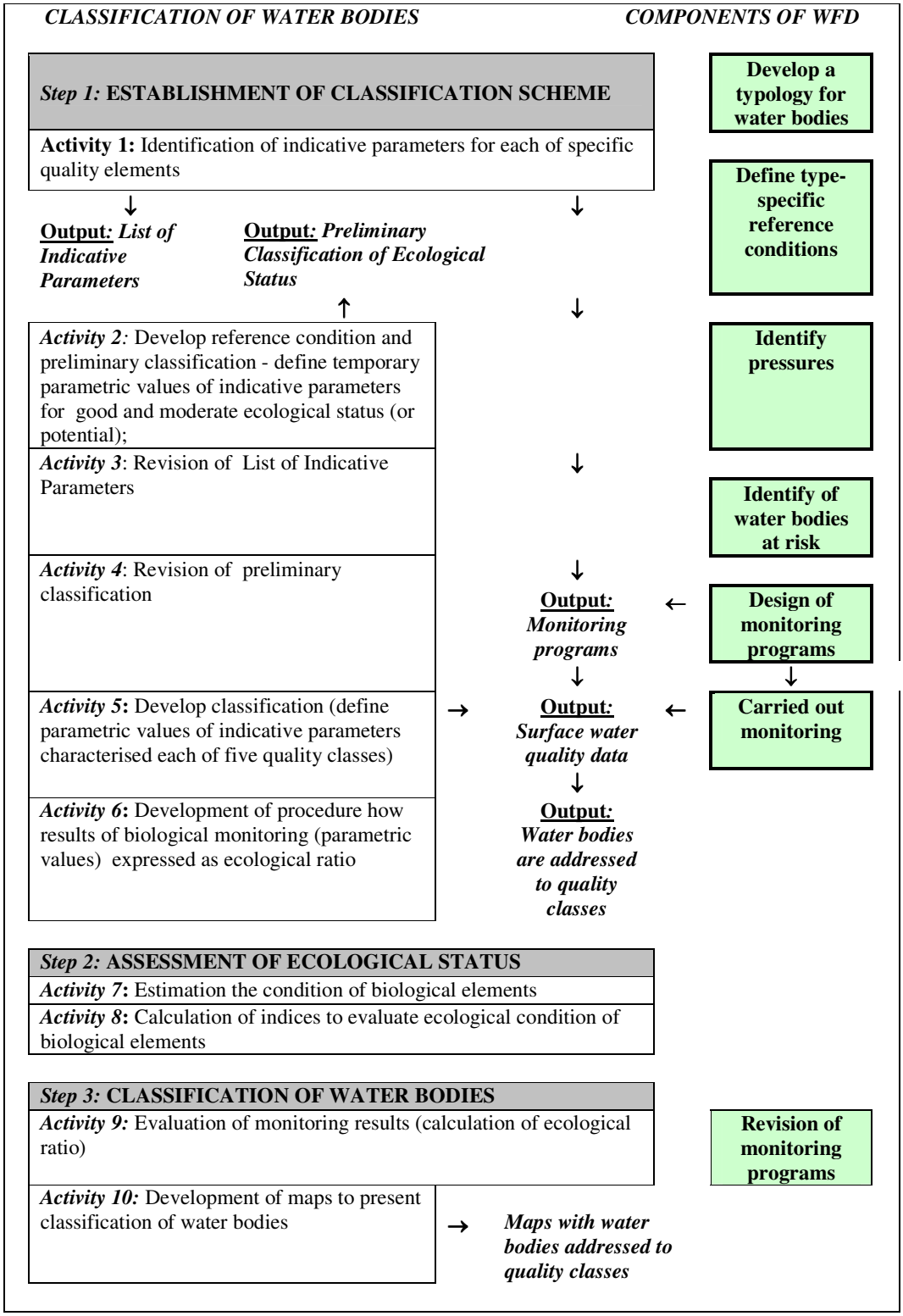
From the implementation point of view the different components of directive (definite activities required by WFD) are closely linked to each other. With regard to classification of Water Bodies such components are:

- Monitoring,
- Classification of water bodies; and
- Reference condition.

Reference conditions correspond to high ecological status and therefore can be addressed to be a part of the procedure for classification of water bodies as well. Nevertheless the different deadlines for establishing type-specific reference condition and for classification of water bodies are set by the Directive. Existing monitoring data have to be used for determination of reference conditions, while data provided by new monitoring programmes have to be put as basement for development of classification scheme for water bodies.

However, taking into account that the same indicative parameters have to be used both for reference conditions and classification of water bodies, the development of classification scheme (Activity 1- identification of indicative parameters to characterise quality elements) have to be initiated together with determination of reference conditions (refer Figure 5-1). The preliminary classification shall also be used to identify water bodies at risk by the end of 2004. This activity is linked also to development of monitoring programmes (refer – Figure 5-1).

Figure 5-1: Implementation steps of WFD in relation to ecological status of surface water and links between definite components of WFD



The classification of water bodies is a step by step process consisting of the following steps:

- *Step 1*- Establishment of classification scheme;
- *Step 2* - Assessment of ecological status; and
- *Step 3* - Classification of water bodies.

This is long lasting process and is closely linked to monitoring and reference condition components.

Step 1: Establishment of classification scheme – include the following activities:

- ***Activity 1:*** Identification of indicative parameters for each of the specific quality elements;
- ***Activity 2****:* Develop reference condition and preliminary classification - define temporary parametric values of indicative parameters for good and moderate ecological status (or potential);
- ***Activity 3***: Revision of lists of indicative parameters;
- ***Activity 4***: Revision of preliminary classification;
- ***Activity 5*****:** Develop classification (define parametric values of indicative parameters characterised each of five quality classes); and
- ***Activity 6*****:** Development of procedure how to express the results of biological monitoring (parametric values) as ecological ratio

Development of classification scheme is initiated already and proposal for indicative parameters (*Activity 1*) is developed by project team and discussed in Chapter 3 of this report. Similarly the proposal for reference condition (refer - **TR1B**) and preliminary classification (*Activity 2*) is developed (refer Chapter 5.3 and Annexes 1-4). The establishment of classification scheme will be complete when:

- Parametric values will be defined for all indicative parameters; and
- Preliminary values of indicative parameters will be test by using new data set (new monitoring data)

Step 2: Assessment of ecological status - include the following activities:

- ***Activity 7*****:** Estimation the condition of biological elements; and
- ***Activity 8*****:** Calculation of indices to evaluate ecological condition of biological elements.

This is practical activities where monitoring data are used to assess the quality of water bodies. Primarily the values of the biological quality elements must be taken into account when water bodies are addressed to any of the ecological status (ecological potential) classes (*Activity 7*). Expression of ecological quality ratio is the next step to evaluate status of water bodies and is used in order to ensure comparability the results of the biological monitoring systems (*Activity 8*).

Step 3: Classification of water bodies – include the following activities:

- ***Activity 9:*** Evaluation of monitoring results (calculation of ecological ratio)
- ***Activity 10:*** Development of maps to present the classification of water bodies.

This is final stage of classification which results in maps presenting status of the water bodies.

5.2 Implementation deadline for classification of water bodies

Figure 5-2 presents how different steps of classification of water bodies are linked to other components of the Directive and include implementation deadlines set by the Directive as well.

Figure 5-2: Deadlines for implementation of requirements of the WFD in relation to classification of water bodies

Classification of surface water	***Component of WFD***	***Deadline***
	2003	
***Step 1:* Establishment of classification scheme**	Identification the individual river basins. List of their competent authorities*(Article 3, Annex I)*	2003-12-22
Activity 1: Identification of indicative parameters for each of specific biological, hydromorphological and chemical & physico-chemical quality element;	Implementation: laws, regulations and administrative provisions*(Article 24)*	2003-12-22
	2004	
	Analysis of river basin (characteristics, impact of human activity, economic analysis) *(Article 5, Annex II, III)*	2004-12-22, rev. *2012-12-22* and every 6 years
	Type-specific reference conditions and reference network	2004-12-22
Activity 2: Develop reference condition and preliminary classification - define temporary parametric values of indicative parameters **for good and moderate ecological status (or potential)**	– Identification of Pressures	2004-12-22
	– Assessment of Impact	2004-12-22
	– Economic analysis	2004-12-22
	Identification the water bodies at risk	
	List of protected areas *(Article 6, Annex IV)*	2004-12-22
	List of priority substances (Commission) *(Article 16, Annex X)*	2004-12-22, rev. every 4 years
	2006	
	Operational programmes for the monitoring of water status *(Article 8, Annex V)*	2006-12-22
Activity 3: Revision of List of Indicative Parameters	Environmental quality standards on priority substances*(Article 16)*	2006-12-22, new substances 5 years after inclusion on the list
Activity 4: Revision of preliminary classification	Public information and consultation: *(Article 14)* - timetable and work programme	2006-12-22

Classification of surface water	***Component of WFD***	
	2007	
***Step 2:* Assessment of ecological status**	Public information and consultation: *(Article 14)* - significant water management issues	2007-12-22
Activity 5: Defining of parametric values of indicative parameters - **for all of five quality classes**		
***Activity 6*:** Development of procedure how results of biological monitoring (parametric values) expressed as ecological ratio		
Activity 7: Estimation the condition of biological elements		
Activity 8: Calculation of indices to evaluate ecological condition of biological elements		
	2008	
***Step 3:* Classification of water bodies**	Public information and consultation: *(Article 14)* - draft copies of the River Basin Management Plan	2008-12-22
Activity 9: Evaluation of monitoring results (calculation of ecological ratio)		
Activity 10: Development of maps to present classification of water bodies		
	2009	
	Programmes of measures - established - operational - revised*(Article 11, Annex VI)*	2009-12-22 2012-12-22 every 6 years
	River basin management plans*(Article 13, Annex VII)*	2009-12-22, rev. every 6 years
	Reporting, art. 5, 8 and 13*(Article 15)*	Within 3 months of their completion.
	2010	
	Pricing, recovery of costs*(Article 9, Annex III)*	2010
	2012	
	Discharges into surface waters are controlled according to the combined approach*(Article 10, IX)*	2012-12-22
	2015	
	Good surface water status (objectives for environmental quality fulfilled)	2015-12-22

(Article 4,1, Annex VI)

5.3 Defining of parametric values of indicative parameters that characterise each of the five quality classes

This section determines activities needed to develop classification of water bodies. Determination of parametric values for indicative parameters which characterises quality elements is very essential for classification scheme. This is long lasting and resources consuming process which is based both on already existing monitoring data and as data sets obtained during implementation of new monitoring programs.

In order to develop Action Plan for classification of water bodies indicative parameters is categorized as:

- Parameters which can be defined and tested based on already existing databases and monitoring data;
- Parameters which can be defined based on new data set (new monitoring programmes).

Summary of the analyses is presented in Tables 5-1 to 5-4.

Table 5-1: Action plan to determine parametric values of indicative parameters of biological quality elements, hydromorphological elements supporting the biological elements and chemical and physico-chemical elements supporting the - rivers

General parameter required by WFD	Recommended indicative parameter	Temporary parametric values are defined (1)	Temporary parametric values are defined as additional project task (2)	Existing monitoring data can be used to determine parametric values	Monitoring data is needed to determine parametric values
1- Biological elements					
1.1-Aquatic flora					
Composition and abundance of macrophytes	Overall surface coverage in percents;	✓			
	Presence of *Potamogeton alpinus*	✓			
	Species composition	✓			
Composition and abundance of phytoplankton (1)	Presence of blue green algae - % of biomass	✓			
1.2- Benthic invertebrate fauna					
Composition and	Saprobic index;	✓			

	Some of diversity indexes;			✓ (3)	
	Species composition			✓ (3)	
1.3- Fish fauna					
Composition, abundance and age structure	Shannon index		✓		
	Number of native species		✓		
	Age structure		✓		
	Presence of sensitive taxa		✓		
	Degree of abnormities, diseases, external parasites		✓		
2- Hydromorphological elements supporting the biological elements					
2.1- Hydrological regime					
Quantity and dynamics of water flow;	Velocity		✓		
	Flow rate		✓		
Connection to groundwater bodies	water table height;		✓		✓ (5; 6)
	surface water discharge		✓		✓(5; 6)
2.2 -River continuity					
River continuity	number and type of barrier;		✓		✓
	provisions for passage of aquatic organisms		✓		✓
2.3 - Morphological conditions					
River depth and width variation	depth		✓		✓
	width		✓		✓
Structure and substrate of the river bed	Size of particles				
	Substrate composition		✓		✓
	Structure of bed		✓		✓
Structure of the riparian zone	Structure of the riparian zone		✓		✓
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1 - General					
Thermal conditions	Water temperature		✓		
Oxygenation conditions	Dissolved oxygen;	✓			
	BOD;	✓			
	COD			✓ (3)	✓
Salinity	conductivity			✓ (3)	✓
Acidification status	pH				
Nutrient conditions	total P;	✓			
	Total N;	✓			
	N- NO3			✓ (3)	✓
	N- NO2;			✓(3)	✓
	N-NH4	✓			
	P- PO4			✓(3)	✓
3.2 - Specific pollutants					

Pollution by all priority substances identified as being discharged into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓
Pollution by other substances identified as being discharged in significant quantities into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓

Note : (1)- Parametric values are presented in Annex 1 ; (2) – Parametric values are presented in Technical Note "Proposal for Amendments of CM Regulation No.93 "Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures"; (3) Based on following data sources - long-term monitoring database (LEA); small rivers monitoring database (LEA) , small rivers monitoring database (LEA) Hydrobiological monitoring database of Northern Vidzeme Biosphere reserve, River monitoring data (Latvian University; Institute of Biology); (4) hydrological data base - (HMA); (5) hydrological data base - (HMA); (6) data base (Geological Survey)

Table 5-2: Action plan to determine parametric values of indicative parameters of biological quality elements, hydromorphological elements supporting the biological elements and chemical and physico-chemical elements supporting the - lakes

General parameter required by WFD	Recommended indicative parameter	Temporary parametric values are defined (1)	Temporary parametric values are defined as additional project task (2)	Existing monitoring data can be used to determine parametric values	Monitoring data is needed to determine parametric values
1- Biological elements					
1.1 - Aquatic flora					
Composition, abundance and biomass of phytoplankton	Presence of blue algae - % of biomass			✓ (3)	✓
	Presence of blue algae – number of cells in %			✓ (3)	✓
	Nygaard – Thunmark's index			✓(3)	✓
	Some of diversity indices			✓(3)	✓

	Presence of Chrysophyta			✓(3)	✓
	Presence of Desmidiales			✓(3)	✓
	Dominating taxa			✓(3)	✓
	Bloom frequency/intensity			✓(3)	✓
Composition and abundance of macrophytes	Indicator species	✓			
	Presence of indicator species	✓			
	Indicator species coverage	✓			✓
	Total coverage with macrophytes	✓			
Composition and abundance of phytobenthos	Presence of red algae			✓(3)	✓
	Presence of filamentous algae			✓(3)	✓
	Analyses of Diatoms			✓(3)	✓
1.2 - Benthic invertebrate fauna					
Composition and abundance	Saprobic index				✓
	Some of diversity indices;			✓(3)	✓
	Number of organisms;			✓(3)	✓
	Biomass;			✓(3)	✓
	Species composition			✓(3)	✓
1.3 - Fish fauna					
Composition, abundance and age structure	Shannon index			✓ (7)	✓
	Number of native species			✓ (7)	✓
	Age structure			✓ (7)	✓
	Presence of sensitive taxa			✓ (7)	✓
	Degree of abnormities, diseases, external parasites			✓ (7)	✓
2- Hydromorphological elements supporting the biological elements					
2.1 - Hydrological regime					
Quantity and dynamics of water flow;	Quantity of water flow		✓		✓
	Dynamics of water flow		✓		✓
Residence time	Residence time		✓		✓
Connection to groundwater bodies	water table height		✓		✓
	surface water discharge		✓		✓
2.2. - Morphological conditions					
Depth variation	mean depth		✓		✓
	max depth		✓		✓
Quantity, structure	Quantity of bed		✓		✓

	Substrate composition		✓		✓
	Structure of bed		✓		✓
Structure of the lake shore	Length		✓		✓
	Bank features		✓		✓
	Vegetation cover		✓		✓
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1. - General					
Transparency	Secchi depth		✓		
	Colour		✓		✓
Thermal conditions	Temperature of epilimnion		✓		✓
	Temperature in deepest horizonts		✓		✓
Oxygenation conditions	Dissolved oxygen			✓ (3)	✓
	BOD			✓ (3)	✓
	COD			✓ (3)	✓
Salinity	- conductivity		✓		✓
Acidification status	pH		✓		✓
Nutrient conditions	total P	✓			
	total N	✓			
	total N/total P			✓ (3)	✓
	N- NO3			✓ (3)	✓
	N- NO2			✓ (3)	✓
	P- PO4			✓ (3)	✓
3.2 - Specific pollutants					
Pollution by all priority substances identified as being discharged into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓
Pollution by other substances identified as being discharged in significant quantities into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓

Note: (1)- Parametric values are presented in Annex 2; (2) – Parametric values are presented in Technical Note "Proposal for Amendments of CM Regulation No.93 "Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures"; (3) Based on following data sources - long-term monitoring database (LEA); small rivers monitoring database (LEA), small rivers monitoring database (LEA) Hydrobiological monitoring database

of Northern Vidzeme Biosphere reserve,Lake monitoring data (Latvian University; Institute of Biology); (4) hydrological data base - (HMA); (5) hydrological data base - (HMA); (6) data base (Geological Survey); (7) Data base of Fish Research Institute

Table 5-3: Action plan to determine parametric values of indicative parameters of biological quality elements, hydromorphological elements supporting the biological elements and chemical and physico-chemical elements supporting the - transitional waters

General parameter required by WFD	Recommended indicative parameter	Temporary parametric values are defined (1)	Temporary parametric values are defined as additional project task (2)	Existing monitoring data can be used to determine parametric values	Monitoring data is needed to determine parametric values
1- Biological elements					
1.1 - Aquatic flora					
1.1.1 - phytoplankton					
Composition, abundance and biomass of phytoplankton	Species composition in spring season	✓			
	Species composition in summer season	✓			
	Species composition in autumn season	✓			
	Abundance in spring season	✓			
	Abundance composition in summer season	✓			
	Abundance composition in autumn season	✓			
	Biomass in spring season	✓			
	Biomass composition in summer season	✓			
	Biomass composition in autumn season	✓			
1.1.2 - macroalgae					
Composition and abundance of macroalgae	Depth limit of macroalgae				✓
	Depth limit of macroalgal community				✓
Composition and abundance of angiosperms	Not present				
1.2 - Benthic invertebrate fauna					
Composition and abundance of benthic invertebrate fauna	Biotic Coefficient;	✓			✓
	Biotic Index	✓			✓
1.3 - Fish fauna					
Composition and	Abundance				✓

	Species composition				✓
2- Hydromorphological elements supporting the biological elements					
2.1 - Morphological conditions					
Depth variation	mean depth				✓
	max depth				✓
Quantity, structure and substrate of the bed	Quantity of bed				✓
	Substrate composition				✓
	Structure of bed				✓
Structure of the intertidal zone	Structure of the riparian zone				✓
2.2 - Tidal regime					
Freshwater flow	Freshwater flow				✓
Wave exposure	Wave exposure				✓
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1 - General					
Transparency	Secci depth in spring season				✓
	Secci depth in summer season	✓			
Thermal conditions	Thermal conditions				✓
Oxygenation conditions	Oxygen content (ml/l) in summer season	✓			
	Oxygen saturation (%) in summer season	✓			
Salinity	Salinity				✓
Nutrient conditions	Phosphate concentration (µmol/l) in winter (late January – early February)	✓			
	Nitrate concentration (µmol/l) in winter (late January – early February	✓			
	Total phosphorus in winter (late January – early February)	✓			
	Total phosphorus in spring (late April – early May)				✓
	Total phosphorus in summer (July – August)				✓
	Total nitrogen in winter (late January – early February)	✓			
	Total nitrogen in spring (late April – early May)				✓

	Total nitrogen in summer (July – August)				✓
	Phosphate in spring (late April – early May)				✓
	Nitrate in spring (late April – early May)				✓
	Silicate concentration (μmol/l) in winter (late January – early February)				✓
	Silicate in spring (late April – early May)				✓
3.2 - Specific pollutants					
Pollution by all priority substances identified as being discharged into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓
Pollution by other substances identified as being discharged in significant quantities into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓

Note: (1)- Parametric values are presented in Annex 3; (2) – Parametric values are presented in Technical Note "Proposal for Amendments of CM Regulation No.93 "Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures"

Table 5-4: Action plan to determine parametric values of indicative parameters of biological quality elements, hydromorphological elements supporting the biological elements and chemical and physico-chemical elements supporting the - coastal waters

General parameter required by WFD	Recommended indicative parameter	Temporary parametric values are defined (1)	Temporary parametric values are defined as additional project task (2)	Existing monitoring data can be used to determine parametric values	Monitoring data is needed to determine parametric values
1- Biological elements					
1.1 - Aquatic flora					
1.1.1 - Pytoplankton					
Composition, abundance and biomass of phytoplankton	Species composition in spring season	✓			
	Species composition in summer season	✓			
	Species composition in autumn season	✓			
	Abundance in spring season	✓			
	Abundance composition in summer season	✓			
	Abundance composition in autumn season;	✓			
	Biomass in spring season	✓			
	Biomass composition in summer season	✓			
	Biomass composition in autumn season	✓			
Composition and abundance of macroalgae	Depth limit of macroalgae (3)	✓			
	Depth limit of macroalgal community	✓			
Composition and abundance of angiosperms	Not present				
1.2 - Benthic invertebrate fauna					
Composition and abundance of benthic invertebrate fauna	Biotic Coefficient	✓ (4)			✓
	Biotic Index	✓ (4)			✓
2- Hydromorphological elements supporting the biological elements					
2.1 - Morphological conditions					

Depth variation	mean depth				✓
	max depth				✓
Structure and substrate of the coastal bed	Substrate composition				✓
	Structure of bed				✓
Structure of the intertidal zone	Structure of the intertidal zone				✓
2.2 - Tidal regime					
Direction of dominant currents	Direction of dominant currents				✓
Wave exposure	Wave exposure				✓
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1 - General					
Transparency	Secci depth in spring season				✓
	Secci depth in summer season	✓			
Thermal conditions	Thermal conditions				✓
Oxygenation conditions	Oxygen content (ml/l) in summer season;	✓			
	Oxygen saturation (%) in summer season	✓			
Salinity	Salinity				✓
Nutrient conditions	Phosphate concentration (µmol/l) in winter (late January – early February);	✓			
	Nitrate concentration (µmol/l) in winter (late January – early February	✓			
	Total phosphorus in winter (late January – early February)	✓			
	Total phosphorus in spring (late April – early May)				✓
	Total phosphorus in summer (July – August)				✓
	Total nitrogen in winter (late January – early February)	✓			
	Total nitrogen in spring (late April – early May)				✓
	Total nitrogen in summer (July – August)				✓
	Phosphate in spring (late April – early				✓

	May)				
	Nitrate in spring (late April – early May)				✓
3.2 - Specific pollutants					
Pollution by all priority substances identified as being discharged into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓
Pollution by other substances identified as being discharged in significant quantities into the body of water	Taking into account bioaccumulation capacity for each definite pollutant				✓
	Concentration in water; and/or				✓
	Concentration in sediment; and/or				✓
	Concentration in biota				✓

Note: (1)- Parametric values are presented in Annex 4; (2) – Parametric values are presented in Technical Note "Proposal for Amendments of CM Regulation No.93 "Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures"; (3) Depth limit of *Furcellaria lumbricalis* (Stony coast of Baltic Proper) or *Fucus vesiculosus* (Stony coast of Riga Gulf); (4) - are defined only for TYPE 3: Gulf of Riga sandy Coast and TYPE1**:** South-eastern exposed Sandy coast

5.4 Recommendations for the establishment of classification scheme

The normative definitions of the ecological status of surface water provides the basis for classifying the ecological status (or potential) of surface water bodies. Normative definitions of the ecological status of surface water, mentioned above, are defined by Directive - *Annex V, Table 1.2*, and national legislation – Cabinet Ministers Regulation No.93 (adopted on February 17, 2004) "*Regulations on surface water body types, their characterization, classification and procedure for identification of anthropogenic pressures"* (refer Annex 5 of this Report).

5.4.1 Data to be used for the definition of ecological status (ecological potential) of surface water

In order to collect data needed to establish a coherent and comprehensive overview of water status within each river basin district and to permit the classification of all surface water bodies into one of five classes and groundwater into one of two classes the Monitoring programmes will be developed until the end of 2006.

The legal basis for the development of the mentioned Monitoring programme is Cabinet of Ministers Regulation No.92 (adopted on February 17, 2004) "*Requirements for monitoring of surface waters, groundwater and protected areas and development of monitoring programmes*", which defines the requirements for:

- Monitoring of Ecological Status and Chemical Status for Surface Waters;
- Monitoring for Groundwater Quantitative Status; and
- Monitoring of Groundwater Chemical Status.

The definition of the parametric values to characterise ecological status (or potential) has to be based on results obtained during implementation of programmes mentioned before. Nevertheless the assessment of available information carried out by the Project demonstrates that there are sufficient amount of data already collected by different science and research institutions as well responsible authorities of MoE. Therefore the existing information and data bases can be used to define ecological status as well (refer Tables 5.1-5.4).

Similarly, the considerable amount of data will be collected during implementation of EU financed STAR project (Latvian project partner is Laboratory of Hydrobiology of Institute of Biology). It is recommended by Project to use also the data of mentioned project for definition of parametric values of indicative parameters to be used for the ecological classification of surface water.

5.4.2 Guidance documents to be used for the definition of ecological status (ecological potential) of surface water

Several guidance documents have been developed already by EU to support implementation of WFD. The ecological classification of surface water is discussed in the following EU guidance documents:

- Overall Approach to the Classification of Ecological Status and Ecological Potential (ECOSTAT, Working Group 2 A);
- Guidance on Establishing Reference Conditions and Ecological Status Class Boundaries for Inland Surface Waters;
- Guidance on Typology, Reference Conditions and Classification Systems for Transitional and Coastal waters;
- Guidance Document on Identification and Designation of Heavily Modified and Artificial Water Bodies; CIS Working Group 2.2; 10 December 2002.

Taking into account that research and technological development play an important role for the implementation of the Water Framework Directive and in particular for definition of ecological status of surface water the 5th Framework Programme supports research in the field of surface water. The following research programmes which relate to ecological classification are defined as high priorities by EU Commission:

- The development of methods for indication and assessment of the ecological status of rivers (AQEM project & STAR project);
- The development of methods for indication and assessment of the ecological status of shallow lowland lakes (ECOFRAME project);
- The understanding of functional aspects within rivers in relation to their loads and other impacts from the catchment (TARGET project);

- The assessment and prediction of anthropogenic pressures and their impacts on sensitive freshwater systems to acidification and their potential of recovery (RECOVER-2010 project) etc.

Three of projects mentioned before – AQEM project (www.aqem.de), STAR project (www.eustar.at) and ECOFRAME project (Contact Brian Moss, University of Liverpool, UK), are estimated as the most applicable for purposes of ecological classification of surface water.

The STAR project will develop and test an assessment procedure for streams and rivers by using benthic macroinvertebrates. The method developed will be tested in many parts of Europe and will, hence, be applicable for selected stream types in most ecoregions in Europe. The Laboratory of Hydrobiology, Institute of Biology (University of Latvia) acts as the Latvian STAR Project partner and is involved for testing mentioned methods in Latvian natural condition.

5.5 Recommendations for the classification of water bodies

Biological quality elements, as well as supporting hydromorphological and physico-chemical quality elements have to be used for the assessment of ecological status or potential of water bodies (refer Table 2-1 -2.3). The relative roles of hydromorphological and physico-chemical quality elements are discussed in Chapter 2.1.2 and are illustrated in Figures 2-2 and 2-3.

5.5.1 Indicative parameters to be used for classification of water bodies

Taking into account that different parameters are sensitive to different pressures, it is recommended to estimate the ecological status of surface water by using several parameters that are indicative to definite quality elements (bearing in mind the normative definitions for the element).

In the latter case, the condition of the element should be estimated by the results for the worst affected parameter, or group of parameters, indicative of the effects of different pressures on the element.

5.5.2 Approach for the ecological classification of water bodies

WFD (*Annex II Article 1.3*) requires establishing the type-specific biological, hydromorphological and physico-chemical conditions representing the values defined in *Tables 1.2.1 – 1.2.5 of Annex V* for a natural water bodies and for a heavily modified water bodies (HMWB) or an artificial water bodies (AWB).

It is required by Directive to define the ecological status for natural water bodies and ecological potential for HMWB or AWB. A slightly different approach has to be used for natural and for HMWB or AWB (refer Figures 2-2 and 2-3).

For the definition of ecological status (or potential) the following stepwise approach defined by EU guidance document – *Overall Approach to the Classification of Ecological Status and Ecological Potential*, shall be used:

- **Step 1:** Definition of High Ecological Status and Maximum Ecological Potential;
- **Step 2:** Definition of Good Ecological Status and Good Ecological Potential;

- **Step 3:** Definition of Moderate Ecological Status and Moderate Ecological Potential;
- **Step 4:** Definition of Poor Ecological Status and Poor Ecological Potential**;**
- **Step 5:** Definition of Bad Ecological Status and Bad Ecological Potential.

(a) High Ecological Status and Maximum Ecological Potential

For natural water bodies, the values of the relevant biological quality elements at high ecological status (HES) reflect those normally associated with that type under undisturbed conditions, and show no, or only very minor, evidence of distortion; i.e. the biological quality elements correspond totally, or nearly totally, to undisturbed conditions.

For HMWBs & AWBs, the values of the relevant biological quality elements at Maximum Ecological Potential (MEP), reflect, as far as possible given the MEP hydromorphological and associated physico-chemical conditions, those of the closest comparable surface water body type.

The general precondition for the defining of HES or MEP is that only in case if the values for all the biological, hydromorphological and physico-chemical quality elements reflect their type-specific conditions the High Ecological Status or Maximum Ecological Potential can be defined.

The defining of the HES and MEP in details are discussed in Annex 6 of this Report.

(b) Good Ecological Status and Good Ecological Potential

For natural water bodies, the values of the relevant biological quality elements for the surface water body show low levels of distortion resulting from human activity, but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions.

For an HMWB or AWB to be classified as being at "good ecological potential" (GEP) there must be no more than slight changes in the values of the relevant biological quality elements as compared to their values at MEP.

The general precondition for the defining of "good ecological status"(GES) or GEP is that only if the values for the biological and physico-chemical quality elements reflect, as relevant, the values defined for GES or GEP should a water body be classified as GES or GEP.

The defining of the GES and GEP in details are discussed in Annex 6 of this Report.

(c) Moderate Ecological Status and Moderate Ecological Potential

A water body should be classified as moderate status/potential where:

- The values for the biological quality elements differ moderately[10] from the type specific communities;
- The values for the biological quality elements differ moderately and the physico-chemical quality element values are less than good or;
- The values for the biological quality elements are better than moderate but the physicochemical quality element values are less than good.

If the biological quality elements are at moderate status or potential, the condition of the physico-chemical and hydromorphological quality elements must, by definition, be consistent with the achievement of those biological values.

The defining of the moderate ES and moderate EP in details are discussed in Annex 6 of this Report.

(d) Poor Ecological Status and Poor Ecological Potential

In accordance with requirements of WFD (Annex V, Section 1.2), if the values for the relevant biological quality elements show evidence of major alteration from their type specific values, the water body must be classified as ”poor”.

The decision on whether a water body is at poor status/potential or not is dictated by the condition of the biological quality elements. The condition of the physico-chemical and hydromorphological quality elements only affects that decision indirectly through their influence on the condition of the biological elements.

The defining of the poor ES and poor EP in details are discussed in Annex 6 of this Report.

(e) Bad Ecological Status and Bad Ecological Potential

In accordance with requirements of the WFD (*Annex V, Section 1.2*), if the values for the relevant biological quality elements show evidence of severe alteration from their type specific values, the water body must be classified as bad”.

The decision on whether a water body is at bad status (or potential) or not is dictated by the condition of the biological quality elements. The condition of the physico-chemical and hydromorphological quality elements only affects that decision indirectly through their influence on the condition of the biological elements.

The defining of the bad ES and bad EP in details are discussed in Annex 6 of this Report.

Annex 1 – Preliminary classification of ecological status for rivers

Preliminary classification of ecological status for rivers

TYPE – 1: Fast-floating stream with medium size catchment area

Characteristics of river:	Streams are fast-floating (velocity is >0,2 m/s) and shallow with sandy and stony riverbed. Water temperature in summer months is below 20^0C

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Dominant macrophyte communities	– *Hildebrandia rivularis, Fontinalis antipyretica, Amblystegium riparium, Potamogeton alpinus*;	– *Sparganium emersum;* – *Cladophora* agglomerations only sporadic	– *Cladophora* agglomerations occurs; – *Bryophytes* present; – Sporadic presence of Blue green algae on stones	– *Cladophora* agglomerations occurs; – *Bryophytes* occassional – Blue green algae constitute mats on stones	– Blue green algae mats on stones; – Bryophytes absent
Overall surface coverage in percents:	Never exceeds 30%	Never exceeds 30%			
1.2- Benthic invertebrate fauna					
Saprobic index	< 1,8	1,8 – 2,0	2,0 - 2,3	2,3 – 2,7	> 2,7
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Dissolved oxygen	>8	6 - 8	4 - 6	2 - 4	<2
BSP5 (mg/l)	<2,0	2,0 – 2,5	2,5 – 3,0	3,0 – 3,5	> 3,5
N/NH4 (mg/l)	0,09	0,09 - 0,12	0,12 – 0,15	0,15 – 0,18	> 0,18
N kop (mg/l)	< 1,5	1,5 - 2,0	2,0 – 2,5	2,5 – 3,0	>3,0
P kop (mg/l)	<0,04	0,04 – 0,065	0,065 – 0,090	0,090– 0,115	> 0,115

TYPE – 2: Slow-running stream with medium size catchment area

Characteristics of river:	Streams are slow-running (velocity is <0,2 m/s) and shallow with sandy and silty sediments which are covered by organic debris. Water temperature in summer months is over 20^0C

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Dominant macrophyte communities	– *Potamogeton praelongus, Sium erectum, Sium latifolium f.submersus*;	– *Potamogeton perfoliatus, P.praelongus, Sium latifolium f.submersus, Nuphar lutea, Sparganium emersum*;	– *Nuphar lutea, Sparganium emersum, Myriophyllum spicatum, Potamogeton pectinatus, Elodea canadensis*; – *Cladophora* agglomerations occurs	– *Nuphar lutea, Sparganium emersum, Lemna minor* occasional; – *Cladophora* agglomerations in mass	– Blue green algae mats on fallen trunks and twigs; – Macrophytes absent
Overall surface coverage in percents:	Overall surface coverage 5 – 30%	Overall surface coverage with macrophytes never exceeds 30%	Overall surface coverage with macrophytes exceeds 30%	Overall surface coverage with macrophytes less than 30%	
1.2- Benthic invertebrate fauna					
Saprobic index	< 2,0	2,0 – 2,3	2,3 – 2,7	2,7 – 3,0	> 3,0

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Dissolved oxygen	>7	5 - 7	3 - 5	1 - 3	<1
BSP5 (mg/l)	<2,0	2,0 – 3,0	3,0 – 4,0	4,0 – 5,0	> 5,0
N/NH4 (mg/l)	<0,1	0,1 - 0,16	0,16 – 0,24	0,24 – 0,32	> 0,32
N kop (mg/l)	< 1,5	1,5 – 2,5	2,5 – 3,5	3,5 – 4,5	>4,5
P kop (mg/l)	<0,045	0,045 – 0,090	0,090 – 0,135	0,135 – 0,180	> 0,180

TYPE – 3: Fast-floating river with large size catchment area

Characteristics of river:	Rivers are fast-floating (velocity is >0,2 m/s) and medium deep with sandy and stony riverbed Water temperature in summer months is below 20^0C

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Dominant macrophyte communities	– *Hildebrandia rivularis, Fontinalis antipyretica, Amblystegium riparium, Butomus umbellatus f.submersus, Schoenoplectus lacustris f.submersus, Potamogeton praelongus, P alpinus, Callitriche sp.*	– *Potamogeton praelongus, P.perfoliatus, Ranunculus sp Nuphar lutea, Sparganium emersum, Butomus umbellatus f.submersus, Schoenoplectus lacustris f.submersus, Callitriche sp.*; – *Bryophytes* present	– *Nuphar lutea, Sparganium emersum, Myriophyllum spicatum, Potamogeton pectinatus, P.crispus, Elodea canadensis, Ranunculus sp.*; – *Cladophora* agglomerations occurs; – *Bryophytes* present	– *Nuphar lutea, Sparganium emersum, Potamogeton pectinatus, Myriophyllum spicatum* occasional; – Blue green algae constitute mats on stones; – *Cladophora* agglomerations occurs; – *Bryophytes* occassional	– Blue green algae mats on stones; – *Bryophytes* absent
Overall surface coverage in percents:	Overall surface coverage 5 – 30%	Overall surface coverage with macrophytes never exceeds 30%	Overall surface coverage with macrophytes exceeds 30%	Overall surface coverage with macrophytes less than 30%	

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
1.2- Benthic invertebrate fauna					
Saprobic index	< 1,7	1,7 – 2,0	2,0 - 2,3	2,3 – 2,7	> 2,7
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Dissolved oxygen	>8	6 - 8	4 - 6	2 - 4	<2
BSP5 (mg/l)	<2,0	2,0 – 2,5	2,5 – 3,0	3,0 – 3,5	> 3,5
N/NH4 (mg/l)	0,09	0,09 - 0,12	0,12 – 0,15	0,15 – 0,18	> 0,18
N kop (mg/l)	< 1,8	1,8 - 2,3	2,3 – 2,8	2,8 – 3,3	>3,3
P kop (mg/l)	<0,05	0,05 – 0,075	0,075 – 0,100	0,100– 0,125	> 0,125

TYPE – 4: Slow-running river with large size catchment area

Characteristics of river:	Rivers are slow-running (velocity is <0,2 m/s) and medium deep with sandy and silty sediments which are covered by organic debris. Water temperature in summer months is over 20^0C

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Dominant macrophyte communities	– *Potamogeton praelongus, P.lucens, P.perfoliatus, Lemna trisulca, Sium erectum, Nymphaea sp., Hydrocharis morsus- ranae*;	– *Nuphar lutea, Nymphaea sp., Potamogeton praelongus, P.lucens, P.perfoliatus, Sagittaria sagittifolia, Lemna trisulca, Schoenoplectus lacustris, Hydrocharis morsus-ranae*;	– *Nuphar lutea, Sparganium emersum, Elodea canadensis, Myriophyllum spicatum, P.crispus, Lemna minor*; – *Cladophora* agglomerations occurs	– *Nuphar lutea, Sparganium emersum, Elodea canadensis, Myriophyllum spicatum*; – *Cladophora* agglomerations occurs	– Blue green algae mats on fallen trunks and twigs
Overall surface coverage in percents:	Overall surface coverage 5 – 30%	Overall surface coverage with macrophytes never exceeds 30%	Overall surface coverage with macrophytes exceeds 30%	Overall surface coverage with macrophytes less than 30%	

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
1.2- Benthic invertebrate fauna					
Saprobic index	< 2,0	2,0 – 2,3	2,3 – 2,7	2,7 – 3,0	> 3,0
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Dissolved oxygen	>7	5 - 7	3 - 5	1 - 3	<1
BSP5 (mg/l)	<2,0	2,0 – 3,0	3,0 – 4,0	4,0 – 5,0	> 5,0
N/NH4 (mg/l)	<0,16	0,16 – 0,24	0,24 – 0,32	0,32	0,32 -0,40
N kop (mg/l)	< 2	2,0 – 3,0	3,0 – 4,0	4,0 – 5,0	>5,0
P kop (mg/l)	<0,06	0,06 – 0,090	0,090 – 0,135	0,135 – 0,180	> 0,180

TYPE – 5: Big fast-floating river with very large size catchment area

Characteristics of river:	Rivers are fast-floting (velocity is >0,2 m/s) and medium deep to deep with sandy and stony sediments. Water temperature in summer months is below 20^0C

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Dominant macrophyte communities	– *Hildebrandia rivularis, Fontinalis antipyretica, Amblystegium riparium, Butomus umbellatus f.submersus, Schoenoplectus lacustris f.submersus, Potamogeton praelongus, P.perfoliatus*,	– *Butomus umbellatus f.submersus, Nuphar lutea, Schoenoplectus lacustris f.submersus, P.perfoliatus, Ranunculus sp., Sparganium emersum*,	– *Myriophyllum spicatum, Potamogeton pectinatus, Elodea canadensis, Ranunculus sp.*; – *Cladophora* agglomerations occurs; – *Bryophytes* present	– *Nuphar lutea, Sparganium emersum, Potamogeton pectinatus, Myriophyllum spicatum* occasional; – *Cladophora* agglomerations occurs; – *Bryophytes* occassional	– Blue green algae mats on stones;
Overall surface coverage in percents:	Overall surface coverage 5 – 30%	Overall surface coverage with macrophytes never exceeds 30%	Overall surface coverage with macrophytes exceeds 30%	Overall surface coverage with macrophytes less than 30%	

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
1.2- Benthic invertebrate fauna					
Saprobic index	< 2,0	2,0 – 2,3	2,3 - 2,7	2,7 – 3,0	> 3,0
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Dissolved oxygen	>8	6 - 8	4 - 6	2 - 4	<2
BSP5 (mg/l)	<2,0	2,0 – 2,5	2,5 – 3,0	3,0 – 3,5	> 3,5
N/NH4 (mg/l)	0,09	0,09 - 0,12	0,12 – 0,15	0,15 – 0,18	> 0,18
N kop (mg/l)	1,8	1,8 - 2,8	2,8 - 3,8	3,8 - 4,8	>4,8
P kop (mg/l)	<0,04	0,04 – 0,065	0,065 – 0,090	0,090– 0,115	> 0,115

TYPE – 6: Big slow-running river very large size catchment area

Characteristics of river:	Rivers are slow-running (velocity is <0,2 m/s) and medium deep to deep with sandy and silty sediments which are covered by organic debris. Water temperature in summer months is over 20^0C

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Dominant macrophyte communities	– *Potamogeton praelongus, P.lucens, Lemna trisulca, Butomus umbellatus, Schoenoplectus lacustris*;	– *Nuphar lutea, Nymphaea sp., Sparganium emersum, Butomus umbellatus, Schoenoplectus lacustris, Potamogeton lucens, P.perfoliatus, Potamogeton pectinatus, Sagittaria sagittifolia*;	– *Nuphar lutea, Sparganium emersum, Elodea Canadensis, Potamogeton pectinatus*;	– *Nuphar lutea, Sparganium emersum, Elodea Canadensis, Typha latifolia*;	– Blue green algae mats on fallen trunks and twigs;
Overall surface coverage in percents:	Overall surface coverage 5 – 30%	Overall surface coverage with macrophytes do not exceeds 30%	Overall surface coverage with macrophytes exceeds 30%	Overall surface coverage with macrophytes less than 30%	

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1.2- Benthic invertebrate fauna					
Saprobic index	< 2,25	2,25 – 2,5	2,5 – 2,75	2,75 – 3,0	> 3,0
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Dissolved oxygen	>7	5 - 7	3 - 5	1 - 3	<1
BSP5 (mg/l)	<2,0	2,0 – 3,0	3,0 – 4,0	4,0 – 5,0	> 5,0
N/NH4 (mg/l)	< 0,1	0,1 - 0,16	0,16 – 0,24	0,24 – 0,32	> 0,32
N kop (mg/l)	< 1,8	1,8 – 2,8	2,8 – 3,8	3,8 – 4,8	>4,8
P kop (mg/l)	<0,045	0,045 – 0,090	0,090 – 0,135	0,135 – 0,180	> 0,180

Annex 2 – Preliminary classification of ecological status for lakes

Preliminary classification of ecological status for lakes

TYPE 1: Shallow lakes with **hard** water (>2 m) **oligohumic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Chara sp., Nitella sp., dominating Najas marina, Stratiotes aloides*	*Chara sp., Nitella sp., Cladium mariscus Najas marina Stratiotes aloides*	*Chara sp., Nitella sp.*	*Chara sp., Nitella sp.*	
Presence of indicator species	dominating	dominating	frequently	rare	absent
Indicator species coverage	>50%	<50%	10-30%	<10%	
Total coverage with macrophytes	>80%	>80%	>80%	>80%	>80%

TYPE 2: Shallow lakes (>2 m) with hard water polyhumic

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Myriophyllum alterniflorum Cladium mariscus Chara sp., Nitella sp., Najas marina*	*Cladium mariscus Myriophyllum alterniflorum Chara sp., Nitella sp.,*	*Chara sp., Nitella sp.,*		
Presence of indicator species	dominating	frequently	frequently	rare	absent
Indicator species coverage	>50%	>50%	<10%	<1%	
Total coverage with macrophytes	>50%	>70%	>70%	>50%	>50%

TYPE 3: Shallow lakes (<2 m) with **soft** water **oligohymic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Subularia aquatica, Sparganium affine*	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Subularia aquatica, Sparganium affine*	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Subularia aquatica, Sparganium affine*		
Presence of indicator species	frequently	frequently	rare	absent	absent
Indicator species coverage	>5%	<5%	<1%		
Total coverage with macrophytes	<30%	<30%	>30%	>30%	>30%

TYPE 4: Shallow lakes (<2 m) with **soft** water **polyhymic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Sphagnum riparium fluitans Utricularia minor, Nuphar lutea*	*Sphagnum riparium fluitans Utricularia minor, Nuphar lutea*	*Sphagnum riparium fluitans , Utricularia minor, Nuphar lutea*		
Presence of indicator species	frequently	frequently	frequently	rare	absent
Indicator species coverage	>5%	<5%	<5%	<1%	
Total coverage with macrophytes	<30%	<30%	<30%	<30%	<10%

TYPE 5: Medium depth lakes with **hard** water **(2 – 9 m) oligohymic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Chara sp., Nitella sp., Myriophyllum alterniflorum, Stratiotes aloides, Potamogeton lucens*	*Chara sp., Nitella sp., Myriophyllum alterniflorum Stratiotes aloides, Potamogeton lucens*	*Chara sp., Nitella sp., Myriophyllum alterniflorum Stratiotes aloides, Potamogeton lucens*	*Chara sp., Nitella sp., Potamogeton lucens*	
Presence of indicator species	frequently	frequently	frequently	rare	absent
Indicator species coverage	>5%	<5%	<5%	<1%	
Total coverage with macrophytes	>30%	>50%	>50%	>50%	>50%

Type 6: Medium depth lakes with **hard** water **(2 – 9 m) polyhymic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Chara sp., Nitella sp., Myriophyllum alterniflorum, Stratiotes aloides, Potamogeton lucens*	*Chara sp., Nitella sp., Myriophyllum alterniflorum, Stratiotes aloides, Potamogeton lucens*	*Chara sp., Nitella sp., Myriophyllum alterniflorum, Stratiotes aloides, Potamogeton lucens*		
Presence of indicator species	frequently	frequently	rare	rare	absent
Indicator species coverage	>5%	<5%	<5%	<1%	
Total coverage with macrophytes	>30%	>50%	>50%	>50%	>50%

Type 7: Medium deep depth lakes with **soft water (2 – 9 m) oligohymic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Myriophyllum alterniflorum*	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Myriophyllum alterniflorum*	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Myriophyllum alterniflorum*		
Presence of indicator species	frequently	frequently	rare	absent	absent
Indicator species coverage	>5%	<5%	<1%		
Total coverage with macrophytes	>10%	>30%	>50%	>50%	>30%

TYPE 8: Medium depth lakes with **soft water (2 – 9 m) polyhumic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Nuphar lutea Isoetes lacustris, Sphagnum riparium fluitans*	*Nuphar lutea, Isoetes lacustris, Sphagnum riparium fluitans*	*Nuphar lutea Sphagnum riparium fluitans*	*Nuphar lutea*	
Presence of indicator species	present	present	rare	rare	absent
Indicator species coverage	>1%	<1%	<1%	<1%	
Total coverage with macrophytes	>5%	>5%	>5%	>5%	>5%

TYPE 9: **Deep lakes with hard water (>9 m) oligohymic**

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Chara sp.,* *Nitella sp.,*	*Chara sp.,* *Nitella sp.,*	*Chara sp.,* *Nitella sp.,*		
Presence of indicator species	present	present	rare	absent	absent
Indicator species coverage	>1%	<1%	<1%		
Total coverage with macrophytes	<10%	<10%	>10%	>10%	>10%

TYPE 10: Deep lakes with soft water (>9 m) oligohymic

Indicative parameter of quality element	**High**	**Good**	**Moderate**	**Poor**	**Bad**
1- Biological elements					
1.1 - Aquatic flora					
1.1.1- Macrophytes					
Indicator species	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Subularia aquatica, Myriophyllum alterniflorum*	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Subularia aquatic Myriophyllum alterniflorum a,*	*Isoetes lacustris, I.echinospora, Lobelia dortmanna, Litorella uniflora, Subularia aquatica, Myriophyllum alterniflorum*		
Presence of indicator species	present	present	rare	absent	absent
Indicator species coverage	>1%	<1%	<1%		
Total coverage with macrophytes	<10%	<30%	>30%	>30%	>30%

Annex 3 – Preliminary classification of ecological status for transitional waters

Preliminary classification of ecological status for transitional waters

Transitional water of Riga Gulf

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
1- Biological elements					
1.1 - Aquatic flora					
1.1.1. Composition, abundance and biomass of phytoplankton					
Species composition in spring season	Bacillariophyceae (60-75% of total biomass): Achnanthes taeniata, Thalassiosira spp., Aulacoseira spp., Chaetocerus spp., Nitzschia spp., Navicula spp., Sceletonema costatum, Diatoma spp., Fragillaria spp., etc.	Bacillariophyceae (35-55% of total biomass): Achnanthes taeniata, Thalassiosira spp., Sceletonema costatum, Aulacoseira spp., Chaetocerus spp., Nitzschia spp., Navicula spp., Diatoma spp., Fragillaria spp., etc.			
	Dinophyceae (20-30% of total biomass): *Peridiniella catenata, Protoperidinium spp., Gymnodinium spp., Glenodinium spp.*, etc.	Dinophyceae (35-45% of total biomass): *Peridiniella catenata, Protoperidinium spp., Gymnodinium spp., Glenodinium spp.*, etc.			
	Others (5-10% of total biomass): Scenedesmus spp., Pediastrum spp., Oocystis spp., Aphanizomenon	Others (10-20% of total biomass): Scenedesmus spp., Pediastrum spp., Oocystis			

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
	flos-aquae, Teleaulax spp., etc.	spp., Aphanizomenon flos-aquae, Teleaulax spp., Ebria tripartita, Eutreptiella spp., Pyramimonas spp., etc.			
Species composition in summer season	Cyanophyceae (60-80% of total biomass): N2- fixing species (80-90% of Cyanophyceae biomass): *Aphanizomenon flos-aquae, Nodularia spumigena, Anabaena spp.*, etc. Not-N_2-fixing species (10-20% Cyanophyceae biomass): *Snowella lacustris, Woronichinia compacta*, etc.	Cyanophyceae (40-60% of total biomass): N2- fixing species (60-80% of Cyanophyceae biomass): *Aphanizomenon flos-aquae, Nodularia spumigena, Anabaena spp.*, etc.; Not-N_2-fixing species (20-40% Cyanophyceae biomass): Microcystis spp., Snowella lacustris, Woronichinia compacta, Merismopedia spp., Chroococcus spp., etc.			
	Chlorophyceae (5-10% of total biomass): Oocystis spp., Pediastrum spp., Scenedesmus spp., etc.	Chlorophyceae (10-15% of total biomass): *Oocystis spp., Pediastrum spp., Scenedesmus spp., Monoraphidium spp.*, etc.			
	Bacillariophyceae (10-20% of total biomass): Actinocyclus octonarius,	Bacillariophyceae (20-30% of total biomass): Actinocyclus octonarius,			

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
	Thalassiosira spp., Coscinodiscus spp., Aulacoseira spp., Chaetocerus spp., Diatoma spp., Asterionella spp., etc.	Thalassiosira spp., Nitzschia spp., Skeletonema costatum, Coscinodiscus spp., Aulacoseira spp., Chaetocerus spp., Diatoma spp., Asterionella spp., etc.			
	Others (5-10% of total biomass): Dinophyceae: Dinophysis spp., Prorocentrum spp., Protoperidinium spp., Heterocapsa rotundata, etc.	Others (10-15% of total biomass): Dinophyceae: *Dinophysis spp., Prorocentrum spp., Protoperidinium spp., Amphidinium spp., Heterocapsa rotundata, Gymnodinium spp.*, etc. Cryptophyceae: *Teleaulax spp., Plagioselmis spp.*, etc. Prasinophyceae: *Pyramimonas spp.*, etc.			
Species composition in autumn season	Bacillariophyceae (40-50% of total biomass): *Actinocyclus octonarius, Coscinodiscus granii, Chaetocerus spp., Thalassiosira baltica*, etc.	Bacillariophyceae (50-70% of total biomass): *Actinocyclus octonarius, Coscinodiscus granii, Skeletonema costatum, Chaetocerus spp., Thalassiosira baltica*, etc.			
	Others (50-60% of total	Others (30-50% of total			

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
	biomass): Cyanophyceae: *Aphanizomenon flos-aquae, Snowella spp., Woronichinia spp.,* etc. Dinophyceae: *Dinophysis spp., Protoperidinium spp., Heterocapsa spp., etc.,* Chlorophyceae: *Pediastrum spp.,* etc.	biomass): Cyanophyceae: *Aphanizomenon flos-aquae, Microcystis spp., Snowella spp., Woronichinia spp.,* etc. Dinophyceae: *Dinophysis spp., Protoperidinium spp., Ebria tripartita, Heterocapsa spp., etc.* Chlorophyceae: *Pediastrum spp.,* etc. Cryptophyceae*: Teleaulax spp., Plagioselmis spp.,* etc. Euglenophyceae: *Eutreptiella spp., Euglena spp*., etc.			
Abundance in spring season	$1.5*10^6$-$3.0*10^6$ count.units/m^3	$3.0*10^6$-$4.5*10^6$ count.units/m^3			
Abundance in summer season	$\geq 2*10^6$ count.units/m^3	$1*10^6$-$2*10^6$ count.units/m^3			
Abundance in autumn season	$\leq 1.5*10^6$ count.units/m^3	$1.5*10^6$-$2.0*10^6$ count.units/m^3			
Biomass in spring season	2000-7000mg/m^3	7000-14000mg/m^3			
Biomass in summer season	$\geq$1000mg/m^3	500-1000mg/m^3			
Biomass in autumn season	$\leq$1000mg/m^3	1000-3000mg/m^3			
1.2.3 - Composition and abundance of angiosperms					
Angiosperms	Angiosperms not present				
1.2- Benthic invertebrate fauna					
Biotic Coefficient	0-1	1-3	>3		
Biotic Index	0-1	2	>2		

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Secci depth in summer season	4-5 m	3-4 m			
Oxygen content (ml/l) in summer season;	> 6 ml/l	5.5-6.0 ml/l			
Oxygen saturation (%) in summer season;	>95%	>90%			
Phosphate concentration (µmol/l) in winter (late January – early February)	0.40-0.55 µmol/l	0.55-0.80 µmol/l			
Total phosphorus in winter (late January – early February)	0.55-0.75 µmol/l	0.75-1.10 µmol/l			
Nitrate concentration (µmol/l) in winter (late January – early February)	3.5-5.5 µmol/l (6.5-9.0 µmol/l)*	5.5-9.0 µmol/l (9.0-13.0 µmol/l)*			
Total nitrogen in winter (late January – early February)	8-13 µmol/l (16-22 µmol/l)**	13-22 µmol/l (22-31 µmol/l)**			

Note: (*) - Total phosphorus and total nitrogen levels are calculated from phosphate and nitrate data, respectively applying the coefficient 1.31 for phosphorus and the coefficient 3.0 for nitrogen; (**) - Total nitrogen values are also calculated from the total phosphorus data using the coefficient 32

Annex 4 – Preliminary classification of ecological status for coastal waters

Preliminary classification of ecological status for coastal waters

TYPE – 1: South-eastern exposed Sandy coast

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
1- Biological elements					
1.1 - Aquatic flora					
Macroalgae	Not relevant for soft bottom				
Angiosperms	Angiosperms not present				
1.2- Benthic invertebrate fauna					
Biotic Coefficient	0-1	1-3	>3		
Biotic Index	0-1	2	>2		
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Secci depth in summer season	7.0-8.0 m	5.5-7.0 m			
Oxygen content (ml/l) in summer season;	>6.5 ml/l	6.0-6.5 ml/l			
Oxygen saturation (%) in summer season;	>98%	>95%			
Phosphate concentration (µmol/l) in winter (late January – early February)	0.15-0.30 µmol/l	0.30-0.50 µmol/l			
Total phosphorus in winter (late January – early February)	0.20-0.40 µmol/l	0.40-0.65 µmol/l			
Nitrate concentration (µmol/l) in winter (late January – early February)	2.0-4.0 µmol/l	4.0-6.5 µmol/l			
Total nitrogen in winter (late January – early February)	6.0-12.0 µmol/l (6.5-13.0 µmol/l)**	12.0-19.5 µmol/l (13.0-21.0 µmol/l)**			

Note: (*) - Total phosphorus and total nitrogen levels are calculated from phosphate and nitrate data, respectively applying the coefficient 1.31 for phosphorus and the coefficient 3.0 for nitrogen; (**) - Total nitrogen values are also calculated from the total phosphorus data using the coefficient 32

TYPE – 2: South-eastern exposed Stony coast

Indicative parameter of quality element	High	Good	Fair	Poor	Bad
1- Biological elements					
1.1 - Aquatic flora					
Depth limit *Furcellaria lumbricalis*	15 - 20 m	10 – 15 m			
Depth limit of macroalgal community, Baltic coast	15 - 22 m	10 – 15 m			
Angiosperms	Angiosperms not present				
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Secci depth in summer season	7.0-8.0 m	5.5-7.0 m			
Oxygen content (ml/l) in summer season;	>6.5 ml/l	6.0-6.5 ml/l			
Oxygen saturation (%) in summer season;	>98%	>95%			
Phosphate concentration (µmol/l) in winter (late January – early February)	0.15-0.30 µmol/l	0.30-0.50 µmol/l			
Total phosphorus in winter (late January – early February)	0.20-0.40 µmol/l	0.40-0.65 µmol/l			
Nitrate concentration (µmol/l) in winter (late January – early February)	2.0-4.0 µmol/l	4.0-6.5 µmol/l			
Total nitrogen in winter (late January – early February)	6.0-12.0 µmol/l (6.5-13.0 µmol/l)**	12.0-19.5 µmol/l (13.0-21.0 µmol/l)**			

Note: (*) - Total phosphorus and total nitrogen levels are calculated from phosphate and nitrate data, respectively applying the coefficient 1.31 for phosphorus and the coefficient 3.0 for nitrogen; (**) - Total nitrogen values are also calculated from the total phosphorus data using the coefficient 32

TYPE – 3: Gulf of Riga Sandy Coast

Indicative parameter of quality element	High	Good	Moderate	Poor	Bad
1- Biological elements					
1.1 - Aquatic flora					
Macroalgae	Not relevant for soft bottom				
Angiosperms	Angiosperms not present				
1.2- Benthic invertebrate fauna					
Biotic Coefficient	0-1	1-3	>3		
Biotic Index	0-1	2	>2		
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Secci depth in summer season	5-6 m	4-5 m			
Oxygen content (ml/l) in summer season;	> 6 ml/l	5.5-6.0 ml/l			
Oxygen saturation (%) in summer season;	>95%	>90%			
Phosphate concentration (µmol/l) in winter (late January – early February)	0.25-0.45 µmol/l	0.45-0.65 µmol/l			
Total phosphorus in winter (late January – early February)	0.35-0.60 µmol/l	0.60-0.90 µmol/l			
Nitrate concentration (µmol/l) in winter (late January – early February)	2.5-4.0 µmol/l (4.0-7.0 µmol/l)*	4.0-7.0 µmol/l (7.0-10.5 µmol/l)*			
Total nitrogen in winter (late January – early February)	6-10 µmol/l (10-17 µmol/l)**	10-17 µmol/l (17-25 µmol/l)**			

Note: (*) - Total phosphorus and total nitrogen levels are calculated from phosphate and nitrate data, respectively applying the coefficient 1.31 for phosphorus and the coefficient 3.0 for nitrogen; (**) - Total nitrogen values are also calculated from the total phosphorus data using the coefficient 32

TYPE – 4: Gulf of Riga Stony Coast

Indicative parameter of quality element	High	Good	Fair	Poor	Bad
1- Biological elements					
1.1 - Aquatic flora					
Depth limit of *Fucus vesiculosus*	> 10 m	6 – 10 m			
Depth limit of macroalgal community	> 11 m	10 – 11 m			
Angiosperms	Angiosperms not present				
3 - Chemical and physico-chemical elements supporting the biological elements					
3.1- General					
Secci depth in summer season	4.5-5.5 m	3.5-4.5 m			
Oxygen content (ml/l) in summer season;	> 6	5.5-6.0 ml/l			
Oxygen saturation (%) in summer season;	>95%	>90%			
Phosphate concentration (µmol/l) in winter (late January – early February)	0.35-0.50 µmol/l	0.50-0.75 µmol/l			
Total phosphorus in winter (late January – early February)	0.50-0.70 µmol/l	0.70-1.00 µmol/l			
Nitrate concentration (µmol/l) in winter (late January – early February)	3.0-4.5 µmol/l (5.5-8.0 µmol/l)*	4.5-8.0 µmol/l (8.0-12.0 µmol/l)			
Total nitrogen in winter (late January – early February)	7-11 µmol/l (9-13 µmol/)**	11-19 µmol/l (19-29 µmol/l)			

Note: (*) - Total phosphorus and total nitrogen levels are calculated from phosphate and nitrate data, respectively applying the coefficient 1.31 for phosphorus and the coefficient 3.0 for nitrogen; (**) - Total nitrogen values are also calculated from the total phosphorus data using the coefficient 32

Annex 5 – Normative definitions of ecological status classifications

Normative definitions of ecological status classifications – RIVERS

RIVERS	High status	Good status	Moderate status
Biological quality elements			
Phytoplankton	The taxonomic composition of phytoplankton corresponds totally or nearly totally to undisturbed conditions. The average phytoplankton abundance is wholly consistent with the type-specific physicochemical conditions and is not such as to significantly alter the type specific transparency conditions. Planktonic blooms occur at a frequency and intensity which is consistent with the type specific physicochemical conditions.	There are slight changes in the composition and abundance of planktonic taxa compared to the type-specific communities. Such changes do not indicate any accelerated growth of algae resulting in undesirable disturbances to the balance of organisms present in the water body or to the physicochemical quality of the water or sediment. A slight increase in the frequency and intensity of the type specific planktonic blooms may occur.	The composition of planktonic taxa differs moderately from the type specific communities. Abundance is moderately disturbed and may be such as to produce a significant undesirable disturbance in the values of other biological and physico-chemical quality elements. A moderate increase in the frequency and intensity of planktonic blooms may occur. Persistent blooms may occur during summer months.
Macrophytes and phytobebenthos	The taxonomic composition corresponds totally or nearly totally to undisturbed conditions. There are no detectable changes in the average macrophytic and the average phytobenthic abundance	There are slight changes in the composition and abundance of macrophytic and phytobenthic taxa compared to the type-specific communities. Such changes do not indicate any accelerated growth of phytobenthos or higher forms of plant life resulting in undesirable disturbances to the balance of organisms present in the water body or to the physico-chemical quality of the water or sediment. The phytobenthic community is not adversely affected by bacterial tufts and coats present due to anthropogenic activity.	The composition of macrophytic and phytobenthic taxa differs moderately from the type-specific community and is significantly more distorted than at good status. Moderate changes in the average macrophytic and the average phytobenthic abundance are evident. The phytobenthic community may be interfered with and, in some areas, displaced by bacterial tufts and coats present as a result of anthropogenic activities.
Benthic invertebrate fauna	The taxonomic composition and abundance correspond totally or nearly totally to undisturbed conditions. The ratio of disturbance sensitive taxa to insensitive taxa shows no signs of alteration from undisturbed levels The level of diversity of invertebrate taxa shows no sign of alteration from undisturbed levels.	There are slight changes in the composition and abundance of invertebrate taxa from the type-specific communities The ratio of disturbance sensitive taxa to insensitive taxa shows slight alteration from type specific levels. The level of diversity of invertebrate taxa shows slight signs of alteration from type specific levels.	The composition and abundance of invertebrate taxa differ moderately from the type-specific communities. Major taxonomic groups of the type-specific community are absent. The ratio of disturbance sensitive taxa to insensitive taxa, and the level of diversity, are substantially lower than the type specific level and significantly lower than for good status.
Fish fauna	Species composition and abundance correspond totally or nearly totally to undisturbed conditions. All the type specific disturbance sensitive species are present.	There are slight changes in species composition and abundance from the type specific communities attributable to anthropogenic impacts on physicochemical and hydro-morphological quality elements.	The composition and abundance of fish species differ moderately from the type specific communities attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements.

RIVERS	High status	Good status	Moderate status
	The age structures of the fish communities show little sign of anthropogenic disturbance and are not indicative of a failure in the reproduction or development of any particular species.	The age structures of the fish communities show signs of disturbance attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements, and, in a few instances, are indicative of a failure in the reproduction or development of a particular species, to the extent that some age classes may be missing.	The age structure of the fish communities shows major signs of anthropogenic disturbance, to the extent that a moderate proportion of the type specific species are absent or of very low abundance.
Hydro-morphological quality elements			
Hydrological regime	The quantity and dynamics of flow, and the resultant connection to groundwaters, reflect totally, or nearly totally, undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
River continuity	The continuity of the river is not disturbed by anthropogenic activities and allows undisturbed migration of aquatic organisms and sediment transport.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Morphological conditions	Channel patterns, width and depth variations, flow velocities, substrate conditions and both the structure and condition of the riparian zones correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Physico-chemical quality elements			
General conditions	The values of the physico-chemical elements correspond totally or nearly totally to undisturbed conditions. Nutrient concentrations remain within the range normally associated with undisturbed conditions. Levels of salinity, pH, oxygen balance, acid neutralising capacity and temperature do not show signs of anthropogenic disturbance and remain within the range normally associated with undisturbed conditions.	Temperature, oxygen balance, pH, acid neutralising capacity and salinity do not reach levels outside the range established so as to ensure the functioning of the type specific ecosystem and the achievement of the values specified above for the biological quality elements. Nutrient concentrations do not exceed the levels established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific synthetic pollutants	Concentrations close to zero and at least below the limits of detection of the most advanced analytical techniques in general use	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.

RIVERS	High status	Good status	Moderate status
Specific non synthetic pollutants	Concentrations remain within the range normally associated with undisturbed conditions (background levels = bgl).	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.

Normative definitions of ecological status classifications - LAKES

LAKES	High status	Good status	Moderate status
Biological quality elements			
Phytoplankton	The taxonomic composition and abundance of phytoplankton correspond totally or nearly totally to undisturbed conditions. The average phytoplankton biomass is consistent with the type-specific physicochemical conditions and is not such as to significantly alter the type specific transparency conditions. Planktonic blooms occur at a frequency and intensity which is consistent with the type specific physicochemical conditions.	There are slight changes in the composition and abundance of planktonic taxa compared to the type-specific communities. Such changes do not indicate any accelerated growth of algae resulting in undesirable disturbance to the balance of organisms present in the water body or to the physico-chemical quality of the water or sediment. A slight increase in the frequency and intensity of the type specific planktonic blooms may occur.	The composition and abundance of planktonic taxa differ moderately from the type specific communities. Biomass is moderately disturbed and may be such as to produce a significant undesirable disturbance in the condition of other biological quality elements and the physico-chemical quality of the water or sediment. A moderate increase in the frequency and intensity of planktonic blooms may occur. Persistent blooms may occur during summer months.
Macrophytes and phytobenthos	The taxonomic composition corresponds totally or nearly totally to undisturbed conditions. There are no detectable changes in the average macrophytic and the average phytobenthic abundance.	There are slight changes in the composition and abundance of macrophytic and phytobenthic taxa compared to the type-specific communities. Such changes do not indicate any accelerated growth of phytobenthos or higher forms of plant life resulting in undesirable disturbance to the balance of organisms present in the water body or to the physicochemical quality of the water. The phytobenthic community is not adversely affected by bacterial tufts and coats present due to anthropogenic activity.	The composition of macrophytic and phytobenthic taxa differ moderately from the type-specific communities and are significantly more distorted than those observed at good quality. Moderate changes in the average macrophytic and the average phytobenthic abundance are evident. The phytobenthic community may be interfered with, and, in some areas, displaced by bacterial tufts and coats present as a result of anthropogenic activities.
Benthic invertebrate fauna	The taxonomic composition and abundance correspond totally or nearly totally to the undisturbed conditions. The ratio of disturbance sensitive taxa to insensitive taxa shows no signs of alteration from undisturbed levels The level of diversity of	There are slight changes in the composition and abundance of invertebrate taxa compared to the type-specific communities. The ratio of disturbance sensitive taxa to insensitive taxa shows slight signs of alteration from type specific levels. The level of diversity of invertebrate taxa shows slight signs of alteration	The composition and abundance of invertebrate taxa differ moderately from the type-specific conditions Major taxonomic groups of the type-specific community are absent. The ratio of disturbance sensitive to insensitive taxa, and the level

LAKES	High status	Good status	Moderate status
	invertebrate taxa shows no sign of alteration from undisturbed levels	from type specific levels.	of diversity, are substantially lower than the type specific level and significantly lower than for good status
Fish fauna	Species composition and abundance correspond totally or nearly totally to undisturbed conditions. All the type specific sensitive species are present. The age structures of the fish communities show little sign of anthropogenic disturbance and are not indicative of a failure in the reproduction or development of a particular species.	There are slight changes in species composition and abundance from the type specific communities attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements. The age structures of the fish communities show signs of disturbance attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements, and, in a few instances, are indicative of a failure in the reproduction or development of a particular species, to the extent that some age classes may be missing.	The composition and abundance of fish species differ moderately from the type specific communities attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements. The age structure of the fish communities shows major signs of disturbance, attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements, to the extent that a moderate proportion of the type specific species are absent or of very low abundance.
Hydro-morphological quality elements			
Hydrological regime	The quantity and dynamics of flow, level, residence time, and the resultant connection to groundwaters, reflect totally or nearly totally undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Morphological conditions	Lake depth variation, quantity and structure of the substrate, and both the structure and condition of the lake shore zone correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Physico-chemical quality elements			
General conditions	The values of physico-chemical elements correspond totally or nearly totally to undisturbed conditions. Nutrient concentrations remain within the range normally associated with undisturbed conditions. Levels of salinity, pH, oxygen balance, acid neutralising capacity, transparency and temperature do not show signs of anthropogenic disturbance and remain within the range normally associated with undisturbed conditions.	Temperature, oxygen balance, pH, acid neutralising capacity, transparency and salinity do not reach levels outside the range established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements. Nutrient concentrations do not exceed the levels established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific synthetic	Concentrations close to zero and	Concentrations not in excess of the	Conditions consistent with the

LAKES	High status	Good status	Moderate status
pollutants	at least below the limits of detection of the most advanced analytical techniques in general use.	standards set in accordance with procedure for the setting of chemical quality standards.	achievement of the values specified above for the biological quality elements.
Specific non synthetic pollutants	Concentrations remain within the range normally associated with undisturbed conditions (background levels = bgl).	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.

Normative definitions of ecological status classifications – TRANSITIONAL WATERS

TRANSIT. WATERS	High status	Good status	Moderate status
Biological quality elements			
Phytoplankton	The composition and abundance of the phytoplanktonic taxa are consistent with undisturbed conditions. The average phytoplankton biomass is consistent with the type-specific physicochemical conditions and is not such as to significantly alter the type specific transparency conditions. Planktonic blooms occur at a frequency and intensity which is consistent with the type specific physicochemical conditions	There are slight changes in the composition and abundance of phytoplanktonic taxa. There are slight changes in biomass compared to the type-specific conditions. Such changes do not indicate any accelerated growth of algae resulting in undesirable disturbance to the balance of organisms present in the water body or to the physicochemical quality of the water. A slight increase in the frequency and intensity of the type specific planktonic blooms may occur.	The composition and abundance of phytoplanktonic taxa differ moderately from type specific conditions. Biomass is moderately disturbed and may be such as to produce a significant undesirable disturbance in the condition of other biological quality elements. A moderate increase in the frequency and intensity of planktonic blooms may occur. Persistent blooms may occur during summer months.
Macroalgae	The composition of macroalgal taxa is consistent with undisturbed conditions. There are no detectable changes in macroalgal cover due to anthropogenic activities.	There are slight changes in the composition and abundance of macroalgal taxa compared to the type-specific communities. Such changes do not indicate any accelerated growth of phytobenthos or higher forms of plant life resulting in undesirable disturbance to the balance of organisms present in the water body or to the physicochemical quality of the water.	The composition of macroalgal taxa differs moderately from type-specific conditions and is significantly more distorted than at good quality. Moderate changes in the average macroalgal abundance are evident and may be such as to result in an undesirable disturbance to the balance of organisms present in the water body.

TRANSIT. WATERS	High status	Good status	Moderate status
Benthic invertebrate fauna	The level of diversity and abundance of invertebrate taxa is within the range normally associated with undisturbed conditions. All the disturbance sensitive taxa associated with undisturbed conditions are present.	The level of diversity and abundance of invertebrate taxa is slightly outside the range associated with the type specific conditions Most of the sensitive taxa of the type specific communities are present.	The level of diversity and abundance of invertebrate taxa is moderately outside the range associated with the type specific conditions. Taxa indicative of pollution are present Many of the sensitive taxa of the type specific communities are absent
Fish fauna	Species composition and abundance is consistent with undisturbed conditions.	The abundance of the disturbance sensitive species shows slight signs of distortion from type specific conditions attributable to anthropogenic impacts on physicochemical or hydro-morphological quality elements	A moderate proportion of the type specific disturbance sensitive species are absent as a result of anthropogenic impacts on physicochemical or hydro-morphological quality elements
Hydro-morphological quality elements			
Tidal regime	The freshwater flow regime corresponds totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Morphological conditions	Depth variations, substrate conditions, and both the structure and condition of the inter-tidal zones correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Physicochemical elements			
General conditions	Physicochemical elements correspond totally or nearly totally to undisturbed conditions. Nutrient concentrations remain within the range normally associated with undisturbed conditions. Temperature, oxygen balance and transparency do not show signs of anthropogenic disturbance and remain within the range normally associated with undisturbed conditions.	Temperature, oxygenation conditions and transparency do not reach levels outside the ranges established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements. Nutrient concentrations do not exceed the levels established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific synthetic pollutants	Concentrations close to zero and at least below the limits of detection of the most advanced analytical techniques in general use.	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific non synthetic pollutants	Concentrations remain within the range normally associated with undisturbed conditions (background levels = bgl).	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.

Normative definitions of ecological status classifications – COASTAL WATERS

COASTAL	High status	Good status	Moderate status
Biological quality elements			
Phytoplankton	The composition and abundance o phytoplanktonic taxa are consistent with undisturbed conditions. The average phytoplankton biomass is consistent with the type-specific physicochemical conditions and is not such as to significantly alter the type specific transparency conditions. Planktonic blooms occur at a frequency and intensity which is consistent with the type specific physicochemical conditions.	The composition and abundance of phytoplanktonic taxa show slight signs of disturbance. There are slight changes in biomass compared to type-specific conditions. Such changes do not indicate any accelerated growth of algae resulting in undesirable disturbance to the balance of organisms present in the water body or to the quality of the water. A slight increase in the frequency and intensity of the type specific planktonic blooms may occur.	The composition and abundance of planktonic taxa show signs of moderate disturbance. Algal biomass is substantially outside the range associated with type specific conditions, and is such as to impact upon other biological quality elements. A moderate increase in the frequency and intensity of planktonic blooms may occur. Persistent blooms may occur during summer months.
Macroalgae and angiosperms	All disturbance sensitive macroalgal and angiosperm taxa associated with undisturbed conditions are present. The levels of macroalgal cover and angiosperm abundance are consistent with undisturbed conditions.	Most disturbance sensitive macroalgal and angiosperm taxa associated with undisturbed conditions are present. The level of macroalgal cover and angiosperm abundance show slight signs of disturbance.	A moderate number of the disturbance sensitive macroalgal and angiosperm taxa associated with undisturbed conditions are absent. Macroalgal cover and angiosperm abundance is moderately disturbed and may be such as to result in an undesirable disturbance to the balance of organisms present in the water body.
Benthic invertebrate fauna	The level of diversity and abundance of invertebrate taxa is within the range normally associated with undisturbed conditions. All the disturbance sensitive taxa associated with undisturbed conditions are present.	The level of diversity and abundance of invertebrate taxa is slightly outside the range associated with the type specific conditions Most of the sensitive taxa of the type specific communities are present.	The level of diversity and abundance of invertebrate taxa is moderately outside the range associated with the type specific conditions. Taxa indicative of pollution are present Many of the sensitive taxa of the type specific communities are absent

COASTAL	High status	Good status	Moderate status
Hydro-morphological quality elements			
Tidal regime	The freshwater flow regime and the direction and speed of dominant currents correspond totally or nearly totally to undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Morphological conditions	The depth variation, structure and substrate of the coastal bed, and both the structure and condition of the inter-tidal zones correspond totally or nearly totally to the undisturbed conditions.	Conditions consistent with the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Physico-chemical quality elements			
General conditions	The physicochemical elements correspond totally or nearly totally to undisturbed conditions. Nutrient concentrations remain within the range normally associated with undisturbed conditions Temperature, oxygen balance and transparency do not show signs of anthropogenic disturbance and remain within the ranges normally associated with undisturbed conditions.	Temperature, oxygenation conditions and transparency do not reach levels outside the ranges established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements. Nutrient concentrations do not exceed the levels established so as to ensure the functioning of the ecosystem and the achievement of the values specified above for the biological quality elements.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific synthetic pollutants	Concentrations close to zero and at least below the limits of detection of the most advanced analytical techniques in general use.	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.
Specific non synthetic pollutants	Concentrations remain within the range normally associated with undisturbed conditions (background levels = bgl)	Concentrations not in excess of the standards set in accordance with procedure for the setting of chemical quality standards.	Conditions consistent with the achievement of the values specified above for the biological quality elements.

Annex 6 – Stepwise approach for the ecological classification

STEP 1 - High Ecological Status (HES) and Maximum Ecological Potential (MEP)

WFD (Annex II 1.3) requires to establish type-specific biological, hydromorphological and physico-chemical conditions representing the values defined in Tables 1.2.1 – 1.2.5 of Annex V for HES or MEP. A slightly different approach has to be used for natural and heavily modified or artificial water bodies according to Figures 2-2 and 2-3 of given Report. Generally, the assessment of whether a HMWB or an AWB is
at MEP should start with an assessment of whether the condition of the hydromorphological quality elements is consistent with the condition expected for them if all mitigation measures were taken to ensure the best approximation to ecological continuum.

The mitigation measures must be compatible with the use for which the water body is designated, making them and the resulting values for MEP hydromorphology potentially very specific to particular water bodies or groups of water bodies. Since the MEP hydromorphology dictates the MEP biological and physico-chemical conditions, it is appropriate in the case of those AWBs and HMWBs that may be at MEP to check if their hydromorphology is at MEP before considering the condition of the other quality elements.

Only if the values for all the biological, hydromorphological and physico-chemical quality elements reflect their type-specific conditions can the resulting class be high ecological status or MEP.

Biological Quality Elements

For natural water bodies, the values of the relevant biological quality elements at high status reflect those normally associated with that type under undisturbed conditions, and show no, or only very minor, evidence of distortion; i.e. the biological quality elements correspond totally, or nearly totally, to undisturbed conditions (HES).
5.1.6 For HMWBs & AWBs, the values of the relevant biological quality elements at MEP, reflect, as far as possible given the MEP hydromorphological and associated physico-chemical conditions, those of the closest comparable surface water body type.

Physico-chemical Quality Elements

For natural water bodies, the values for the general physico-chemical quality elements at high ecological status correspond totally or nearly totally to undisturbed conditions. A further qualification specifies that the values for the physico-chemical quality elements must remain within the ranges normally associated with undisturbed conditions.

For HMWBs and AWBs, the MEP values for the general physico-chemical quality elements are derived from the ”undisturbed conditions” for the surface water body type most closely comparable to the artificial or heavily modified water body concerned, given the MEP hydromorphological conditions. The CIS guidance on HMWBs and AWBs recognises that in the case of some MEP hydromorphological conditions, the values for some of the general physicochemical quality elements will

be very different to those of the closest comparable type. The guidance therefore suggests that, provided the differences are an inevitable and direct result of the MEP hydromorphological conditions, they may be taken into account when establishing the MEP values for the general physico-chemical quality elements. The following example illustrates how to define MEP physico-chemical reference conditions: The hydromorphological characteristics of impoundment created for hydropower and water supply can dictate the oxygen and temperature conditions in the impounded water and the downstream river. These may be different from those in a natural water body. These differences can be taken into account when defining MEP.

The specific pollutant quality elements have been subdivided into specific synthetic pollutants and specific non-synthetic pollutants. For HES/MEP to be achieved the concentrations of the specific synthetic pollutants must be close to zero and at least below the limits of detection of the most advanced analytical techniques in general use. The concentrations of the specific nonsynthetic pollutants must be within the range normally associated with undisturbed conditions. CIS IMPRESS provides guidance on the identification of specific pollutants.

Hydromorphological Quality Elements

For HES, the values for the hydromorphological quality elements correspond totally or nearly totally to undisturbed conditions.

For MEP, the hydromorphological conditions are consistent with the only impacts on the surface water body being those resulting from the artificial or heavily modified characteristics of the water body once all mitigation measures have been taken to ensure the best approximation to ecological continuum, in particular with respect to migration of fauna and appropriate spawning and breeding grounds. The mitigation measures should not include those that would have a significant adverse effect on the specified uses of the water body or the wider environment.

STEP 2 - Good Ecological Status (GES) and Good Ecological Potential (GEP)

For natural and heavily modified or artificial water bodies the same approach has to be used according to Figures 2-2 and 2-3 of this Report.

Only if the values for the biological and physico-chemical quality elements reflect, as relevant, the values defined for GES or GEP should a water body be classified as GES or GEP.

Biological Quality Elements

For natural water bodies, the values of the relevant biological quality elements for the surface water body show low levels of distortion resulting from human activity, but deviate only slightly from those normally associated with the surface water body type under undisturbed conditions (HES).

For an HMWB or AWB to be classified as being at GEP there must be no more than slight changes in the values of the relevant biological quality elements as compared to their values at MEP.

Physico-chemical Quality Elements

For a water body to be classified as being at good ecological status/potential, the values for the general physico-chemical quality elements must comply with the ranges or levels established so as to ensure:

- The functioning of the type specific ecosystem; and
- The achievement of the values specified for the relevant biological quality elements.

Where the levels or ranges proposed for a general physico-chemical quality element in a type are being exceeded, a checking procedure should be used to assess whether the established levels or ranges for the elements are more stringent than is necessary to ensure the functioning of the ecosystem and the achievement of the values specified for the biological quality elements at good status/potential. An outline checking procedure is presented in Figure 5 of EU guidance document - Overall Approach to the Classification of Ecological Status and Ecological Potential (ECOSTAT, Working Group 2 A).
Similarly, where the levels or ranges proposed for a general physico-chemical quality element in a type are not exceeded but, because of anthropogenic alterations to the general physico-chemical conditions:

- The good status/potential values for the biological quality elements are not being met; or
- There is evidence of impairment to ecosystem functioning

a second checking procedure could be used as a means of assessing whether the established levels or ranges meet the Directive's requirements or are insufficiently stringent to ensure the functioning of the ecosystem and the achievement of the good status/potential values for the biological quality elements. An outline checking procedure is presented in Figure 6 of EU guidance document - Overall Approach to the Classification of Ecological Status and Ecological Potential (ECOSTAT, Working Group 2 A). Good ecological status/potential also requires that the concentrations of the specific pollutant quality elements are not in excess of the environmental quality standards (EQS) set at Member State level in accordance with the procedure laid down in Annex V, Section 1.2.6 of WFD.

Hydromorphological Quality Elements

The conditions of the hydromorphological quality elements at GES and GEP must be consistent with the achievement of the values specified for the relevant biological quality elements at GES/GEP level.

STEP 3 - Moderate Ecological Status and Moderate Ecological Potential

For natural, heavily modified and artificial water bodies the same approach has to be used according to Figures 2-2 and 2-3 presented in this Report. A water body should be classified as moderate status/potential where:

- The values for the biological quality elements differ moderately10 from the type specific communities;
- The values for the biological quality elements differ moderately and the physico-chemical quality element values are less than good or;
- The values for the biological quality elements are better than moderate but the physicochemical quality element values are less than good.

If the biological quality elements are at moderate status or potential, the condition of the physico-chemical and hydromorphological quality elements must, by definition, be consistent with the achievement of those biological values.
If the biological quality elements reflect good status/potential, but the values of the general physico-chemical quality elements do not ensure the functioning of the type specific ecosystem or the concentrations of one or more of the specific pollutant quality elements are not in compliance with relevant EQSs, the resulting ecological status/potential is "moderate"

STEP 4 - Poor Ecological Status and Poor Ecological Potential

For natural, heavily modified and artificial water bodies the same approach has to be used according to Figures 2-2 and 2-3 presented in this Report.

In accordance with Annex V, Section 1.2 of WFD, if the values for the relevant biological quality elements show evidence of major alteration from their type specific values [i.e. the relevant biological communities deviate substantially from those normally associated with the surface water body type under undisturbed conditions], the water body must be classified as "poor". The decision on whether a water body is at poor status/potential or not is dictated by the condition of the biological quality elements. The condition of the physico-chemical and hydromorphological quality elements only affects that decision indirectly through their influence on the condition of the biological elements.

STEP 5 - Bad Ecological Status and Bad Ecological Potential

For natural, heavily modified and artificial water bodies the same approach has to be used according to Figures 2-2 and 2-3 presented in this Report. .

In accordance with Annex V, Section 1.2 of WFD, if the values for the relevant biological quality elements show evidence of severe alteration from their type specific values [i.e. large portions of the relevant biological communities normally associated with the type are absent], the water body must be classified as bad". The decision on whether a water body is at bad status/potential or not is dictated by the condition of the biological quality elements. The condition of the physico-chemical and hydromorphological quality elements only affects that decision indirectly through their influence on the condition of the biological elements.

Annex 7 – Monitoring data used for the development of lake typology

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
1	LEA	45 lakes	1998/1999	T/Oxygen profile	2 (summer, winter)	Excel
				pH	2 (summer, winter)	
				Conductivity	2 (summer, winter)	
				P-total (surface)	2 (summer, winter)	
				Colour	2 (summer, winter)	
				Secchi depth	1 (summer)	
				chlorophyll-a	1 (summer)	
				phytoplankton (species, biomass)	1 (summer)	
				zooplankton (species, number)	1 (summer)	
				macrophytes (species, covering)	1 (summer)	
2	LEA	57 lakes	2001	T/Oxygen profile	1 (summer)	Excel
				pH	1 (summer)	
				Conductivity	1 (summer)	
				Secchi depth	1 (summer)	
				Colour	1 (summer)	
				P-total (surface)	1 (summer)	
				N-total (surface)	1 (summer)	
				chlorophyll-a	1 (summer)	
				phytoplankton (species, biomass)	1 (summer)	
				zooplankton (species, number)	1 (summer)	
				macrophytes (species, covering)	1 (summer)	
3	LEA	56 lakes	2002	T/Oxygen profile	1 (summer)	Excel
				pH	1 (summer)	
				Conductivity	1 (summer)	
				Secchi depth	1 (summer)	
				Colour	1 (summer)	
				P-total (surface)	1 (summer)	
				P-total (integrated)	1 (summer)	
				N-total (surface)	1 (summer)	
				N-total (integrated)	1 (summer)	
				chlorophyll-a	1 (summer)	
				phytoplankton (species, biomass)	1 (summer)	
				zooplankton (species, number)	1 (summer)	
				macrophytes (species, covering)	1 (summer)	
4	LEA	8 lakes, 3 reservoirs, 21 rivers	1990-2002	T/Oxygen (horizont 0.5 m)	10	LEA database, Excel
				pH	10	
				Conductivity	10	
				Colour	10	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
				Secchi depth (lakes)	10	
				BOD_7	10	
				Flow rate (rivers)	10	
				suspended matter	10	
				Hardness-total	10	
				Mineralization	10	
				CO_2	10	
				COD	10	
				P-total	10	
				N-total	10	
				N/NH_4	10	
				N/NO_2	10	
				N/NO_3	10	
				P/PO_4	10	
				Si	10	
				Ca++	10	
				Mg++	10	
				Na+	10	
				K+	10	
				HCO_3-	10	
				SO_4^{2}-	10	
				Cl-	10	
				Fe, Cu, Zn, Cd, Pb	10	
				chlorophyll-a	3	
				phytoplankton (species, biomass)	3	
				bentic invertebrates	2	
5	LEA	69 lakes	2001	mean depth (1970)	1	Excel
				annual water exchange	1	
				covering by emerged macrophytes	1	
				littoral zone	1	
		139 waterbodies with controllable water level	2001	minimum water level	1	
				average water level	1	
				maximum water level	1	
				littoral zone	1	
				efficiency volume	1	
				description of hydroconstruction	1	
6	State Geological	>1000 lakes	~1990	sediment scheme	1	paper
				river basin	1	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
	Survey (SGS)			geomorphological region	1	
				kind of dip	1	
				average depth	1	
				maximum depth	1	
				filling up coefficient of dip	1	
				hydrological regime	1	
				covering by macrophytes	1	
				trophic state	1	
				water mineralization	1	
				sapropel deposit description	1	
				results of sapropel analyses	1	
7	NBR	53 lakes, 16 man-made waterbodies	1990	bathymetrical and topographical map	1	paper, database Ezeri.lv
				water levels	1	
				description of lakeshore	1	
				list of fish species	1	
				catchment area (area, composition)	1	
				flow rate (spring, summer)	1	
				annual water exchange	1	
				Secchi depth	1 (summer)	
				Colour	1 (summer)	
				Conductivity	1 (summer)	
				pH	1 (spring)	
				Oxygen, saturation (surface)	1 (spring)	
				BOD_5	1 (spring)	
				COD	1 (spring)	
				N/NH_4	1 (spring)	
				N/NO_2	1 (spring)	
				N/NO_3	1 (spring)	
				P/PO_4	1 (spring)	
				Fe-total	1 (spring)	
				covering by macrophytes (total, emerged)	1	
				list of dominant macrophyte species	1	
				polluters of lake	1	
				mud chemical analyses	1	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
				description of lake bottom	1	
8	ESI	~800 lakes	1971-1975	bathymetrical maps 1:10 000	1	jpg
9	M.Leinerte	67 lakes	~1985	T/Oxygen profile	1 (summer)	Excel
				pH	1 (summer)	
				Secchi depth	1 (summer)	
10	LEA	6 lakes (Kemeri National Park)	1995-2002	T/Oxygen profile	3-4	Excel
				pH	3-4	
				Conductivity	3-4	
				Colour	3-4	
				Secchi depth	3	
				BOD_5	3-4	
				COD	3-4	
				P-total	3-4	
				N-total	3-4	
				N/NH_4	3-4	
				N/NO_2	3-4	
				N/NO_3	3-4	
				P/PO_4	3-4	
				TOC	3-4	
				Hardness	3-4	
				Alcalinity	3-4	
				F+	1	
				Cl-	1	
				SO_4^{2}-	1	
				chlorophyll-a	3	
				phytoplankton (species, biomass)	3	
				zooplankton (species, number)	3	
				bentic invertebrates	1	
				macrophytes (species, covering)	1	
11	Institute of Biology	1 lake (Engures, 6 sampling sites)	1995-2002	Ca++	1 (summer)	Word
				Mg++	1 (summer)	
				K+	1 (summer)	
				Na+	1 (summer)	
				HCO3-	1 (summer)	
				SO42-	1 (summer)	
				Cl-	1 (summer)	
				T/Oxygen	1 (summer)	
				pH	1 (summer)	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
				Conductivity	1 (summer)	
				Colour	1 (summer)	
				Hardness	1 (summer)	
				BOD5	1 (summer)	
				COD	1 (summer)	
				N/NH4	1 (summer)	
				N/NO2	1 (summer)	
				N/NO3	1 (summer)	
				P/PO4	1 (summer)	
				Fe	1 (summer)	
				Si	1 (summer)	
				chlorophyll-a	1 (summer)	
				phytoplankton (species, biomass)	1 (summer)	
				zooplankton (species, number)	1 (summer)	
				bacterioplankton	1 (summer)	
				bentic invertebrates	1 (summer)	
				Pb, Zn, Ni, Cu, Cd, Fe, Mn (in sediment)	1 (summer)	
12	Institute of Biology	1 lake (Kanieris, 7 sampling sites)	2001/2002	Ca++	4	Word
				Mg++	4	
				K+	4	
				Na+	4	
				HCO3-	4	
				SO42-	4	
				Cl-	4	
				T/Oxygen profile	4	
				pH	4	
				Conductivity	4	
				Colour	4	
				Hardness	4	
				BOD5	4	
				COD	4	
				N/NH4	4	
				N/NO2	4	
				N/NO3	4	
				P/PO4	4	
				Fe	4	
				Si	4	
				humic substances	4	
				Pb, Zn, Ni, Cu, Cd, Fe, Mn (in sediment)	1 (spring)	
				chlorophyll-a	2 (spring, summer)	
				bacterioplankton	3	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
				phytoplankton (species, biomass)	3	
				zooplankton (species, number)	3	
				bentic invertebrates (species, biomass)	3	
13	Institute of Biology	4 rivers (Salaca - 3-6 sampling sites, Briede, Seda, Rūja)	1997-2002	Ca++	1-3	Word
		1 lake (Burtnieku)		Mg++	1-3	
				K+	1-3	
				Na+	1-3	
				HCO3-	1-3	
				SO42-	1-3	
				Cl-	1-3	
				T/Oxygen	1-3	
				pH	1-3	
				Conductivity	1-3	
				Colour	1-3	
				Hardness	1-3	
				BOD5	1-3	
				COD	1-3	
				N/NH4	1-3	
				N/NO2	1-3	
				N/NO3	1-3	
				P/PO4	1-3	
				Fe	1-3	
				Si	1-3	
				bacterioplankton	1-3	
				phytoplankton (species, biomass)	1-3	
				zooplankton (species, number)	1-3	
				bentic invertebrates (species, biomass)	1-3	
				chlorophyll-a	1-3	
14	Institute of Biology	1-3 lakes (Ziemelvidzeme peat bogs)	1997-2002	Ca++	1 (summer)	Word
				Mg++	1 (summer)	
				K+	1 (summer)	
				Na+	1 (summer)	
				HCO3-	1 (summer)	
				SO42-	1 (summer)	
				Cl-	1 (summer)	
				T/Oxygen profile	1 (summer)	
				pH	1 (summer)	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
				Conductivity	1 (summer)	
				Colour	1 (summer)	
				Hardness	1 (summer)	
				BOD5	1 (summer)	
				COD	1 (summer)	
				N/NH4	1 (summer)	
				N/NO2	1 (summer)	
				N/NO3	1 (summer)	
				P/PO4	1 (summer)	
				Fe	1 (summer)	
				Si	1 (summer)	
				Secchi depth	1 (summer)	
				chlorophyll-a	1 (summer)	
				bacterioplankton	1 (summer)	
				phytoplankton (species, biomass)	1 (summer)	
				zooplankton (species, number)	1 (summer)	
				bentic invertebrates (species, biomass)	1 (summer)	
15	Institute of Biology	6 lakes (Krustkalni and Teici nature reserve)	1988-2002	Ca++	1-2 (summer)	
				Mg++	1-2 (summer)	
				K+	1-2 (summer)	
				Na+	1-2 (summer)	
				HCO3-	1-2 (summer)	
				SO42-	1-2 (summer)	
				Cl-	1-2 (summer)	
				T/Oxygen profile	1-2 (summer)	
				pH	1-2 (summer)	
				Conductivity	1-2 (summer)	
				Colour	1-2 (summer)	
				Hardness	1-2 (summer)	
				BOD5	1-2 (summer)	
				COD	1-2 (summer)	
				N/NH4	1-2 (summer)	
				N/NO2	1-2 (summer)	
				N/NO3	1-2 (summer)	
				P/PO4	1-2 (summer)	
				humic substances	1-2 (summer)	
				Fe	1-2 (summer)	
				Si	1-2 (summer)	
				Secchi depth	1 (summer)	
				chlorophyll-a	1 (summer)	
				bacterioplankton	1 (summer)	

	Data holder	Number of lakes (rivers)	year	Investigated parameters	Sampling frequency (per year)	Data format
				phytoplankton (species, biomass)	1 (summer)	
				zooplankton (species, number)	1 (summer)	
				bentic invertebrates (species, biomass)	1 (summer)	