

Monitoring and information needs for the establishment of the environmental objectives

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Environmental Objectives

- Established according with the Article 4 of the WFD
- For surface waters
 - good water status
 - maximum ecological potential
- For groundwaters
 - good water quantity status
 - good chemical status

Defining environmental objectives

- According with Annex V of the WFD dealing with water status
- Establish water status for rivers, lakes, transitional waters, coastal waters, artificial and heavily modified water body, groundwater

Elements defining water status

- For surface waters
 - Biological
 - Hydromorphological
 - Chemical and physico-chemical
- For groundwaters
 - Quantitative status
 - Chemical status

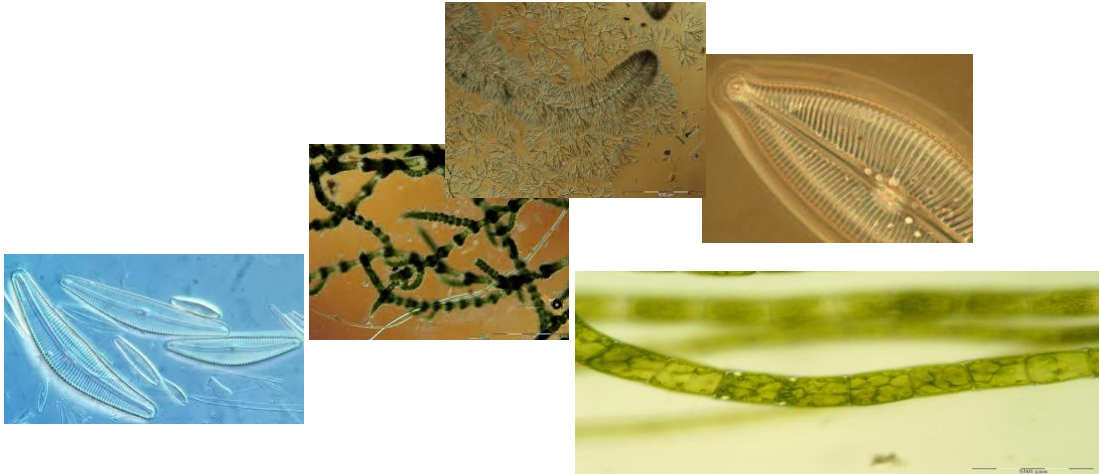
Biological Status Elements

- Phytoplankton
- Macrophytes
- Phytobentos
- Macroinvertebrate
- Fish

Macrophytes



Phytobentos

















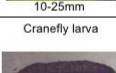





Macroinvertebrate



Macroinvertebrate Identification Key

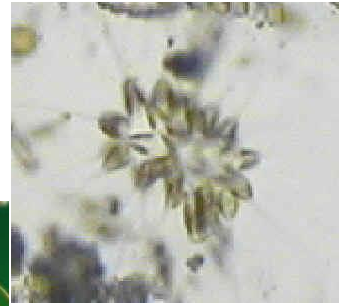
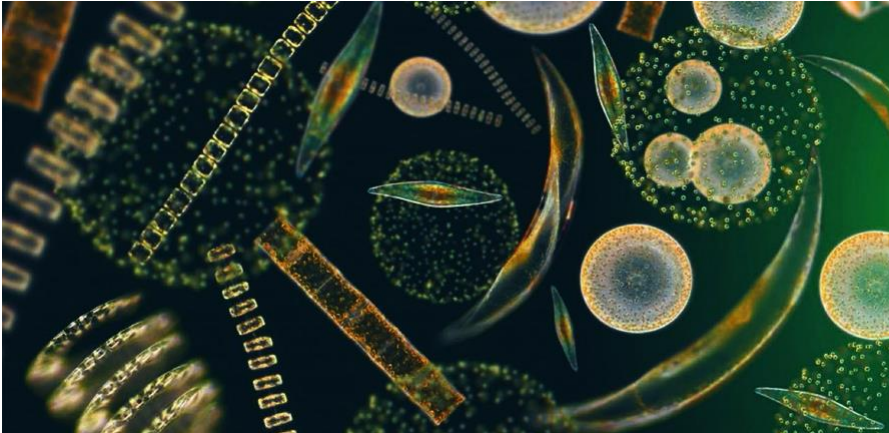
GROUP 2

TOLERATE SOME POLLUTION

 15-50mm	 10-50mm	 2-6mm	 3-15mm	 2-4mm
 30-50mm	 10-50mm	 3-40mm	 3-12mm	 10-25mm
 17-200mm	 25-55mm	 5-16mm	 5-16mm	 10-25mm
 5-21mm	 10-150mm	 20-43mm	 5-22mm	 30-270mm



Phytoplankton



5.General aspects

- Taxonomic composition
- Abundance
- Algae /Bacteria prevailance

Sampling/Analysis

- Quantitative and qualitative sampling
- 6-20 cm² area scraping out
- Intake gear?
- Invertoscope
- Sedimentation cells

1.Assessment

- Potential parameters:
 - Taxonomic composition
 - No. of taxa
 - Taxa density (ex/sqm)
 - Total taxa density (ex/sqm)
 - Taxa abundance (%)
 - No. of taxa abundance (%)

2.Assessment

- Potential parameters:
 - Diatoms abundance (%)
 - Centric diatoms abundance (%)
 - Cyanobacteria abundance (%)
 - Diversity Index Shannon-Wiener
 - Saprobic Index (Pantle-Buck/Zelinka-Marvan)
 - Diatoms Biological Index

3.Assessment

- Correlations with physical-chemical support elements
 - Total phosphorous
 - Orthophosphates
 - Nitrates
 - Silica
 - BOD
 - Permanganat Index
 - COD
 - Chlorophyll a

4.Assessment

- Discussions:
 - Only diatoms?
 - Lack of data
 - Sampling campaigns
 - Data collection. Processing

5.Assessment

- Based on existing data statistical analysis will be done (univariate statistical analysis):
- Indexes selection
- Confirmation of references in situ
- Establishing the benchmarks between different ecological status
- Rivers/lakes. Types. Indexes.

Fish fauna



1. General aspects

- Key element for ecological status assesement of NWB and HMWB
- Parameters:
 - Species composition
 - Abundance
 - Sensitive species
 - Age structure

2.General Aspects

- The fish reflect:
 - Hydromorphological degradation
 - General degradation (unspecific pressures)
 - Flow modification
 - Aquatic habitat destruction
 - Riparian habitat alteration
 - Pollution by organic matter
 - Toxic substances
 - Impact of alien species

1.Sampling

- Nets
 - Benthic
 - Pelagic
- Safety equipment
- Boat
- Electric fishing apparatus

Sampling/Analysis

- Fish handling – avoid losses and tissue damages
- Fish identification – immediately on field
- Fish measurements
- Filling in the field protocol with hydromorphological and fish data (species, abundance, age structure, sizes)
- Record data and transmission to Wien (BOKU University) receive results on ecological status

2.Assesement

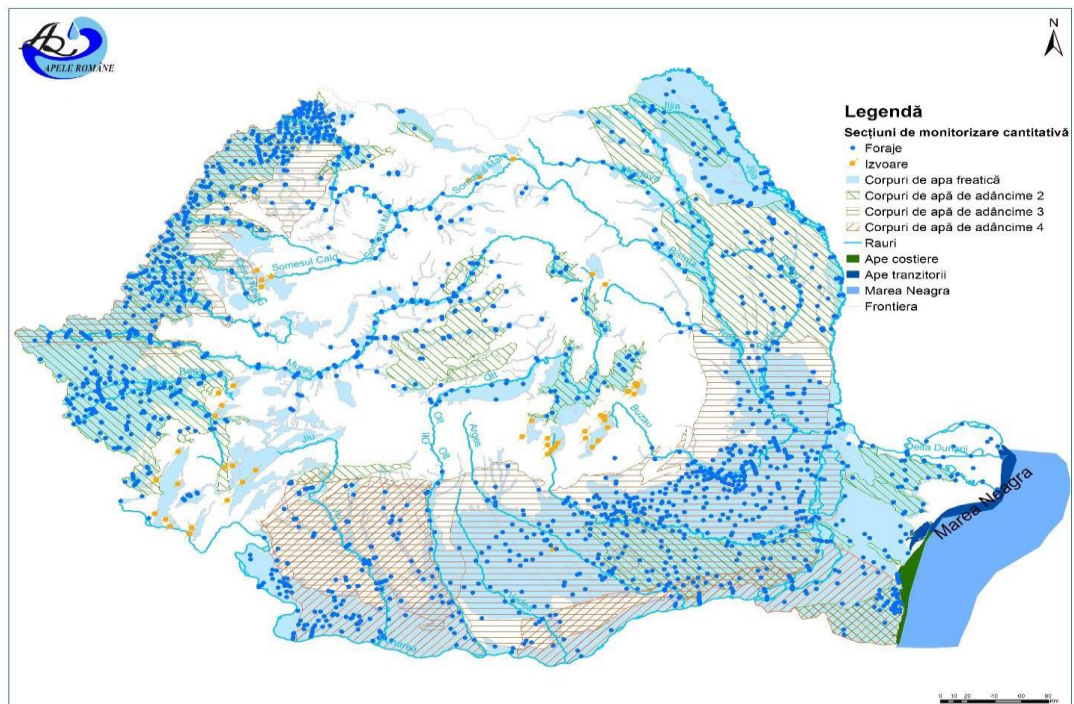
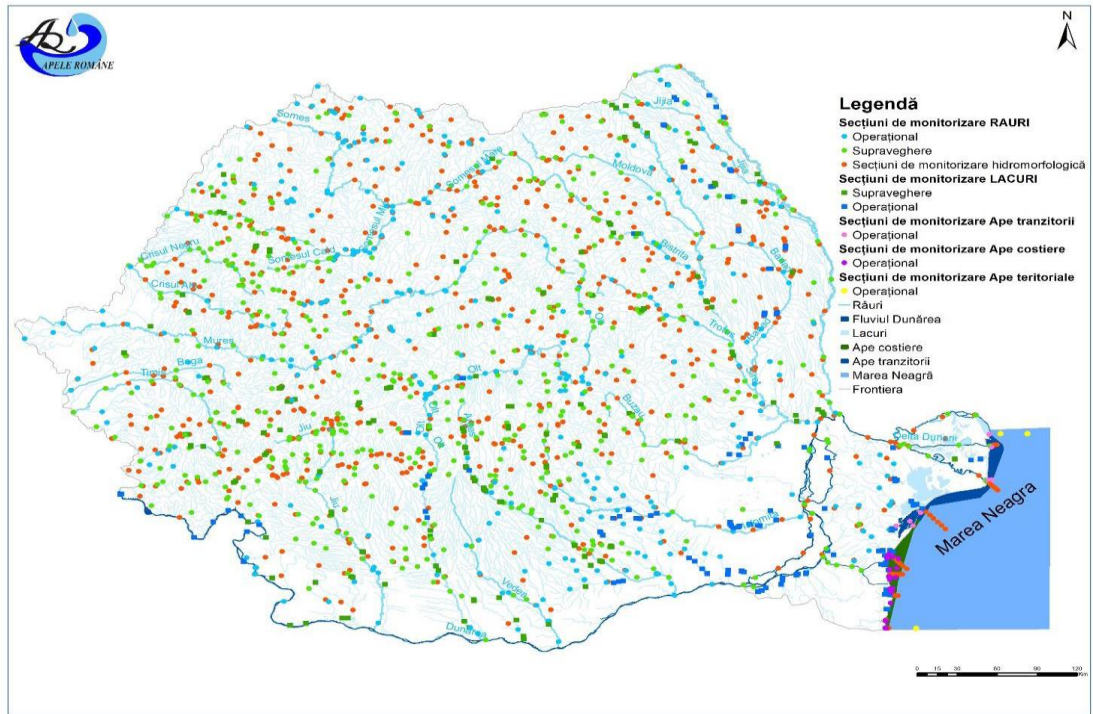
- EFI+ (European Fish Index)
- 254 fish species grouped in 15 ghilds categories, each of them with 3 and 7 groups of species

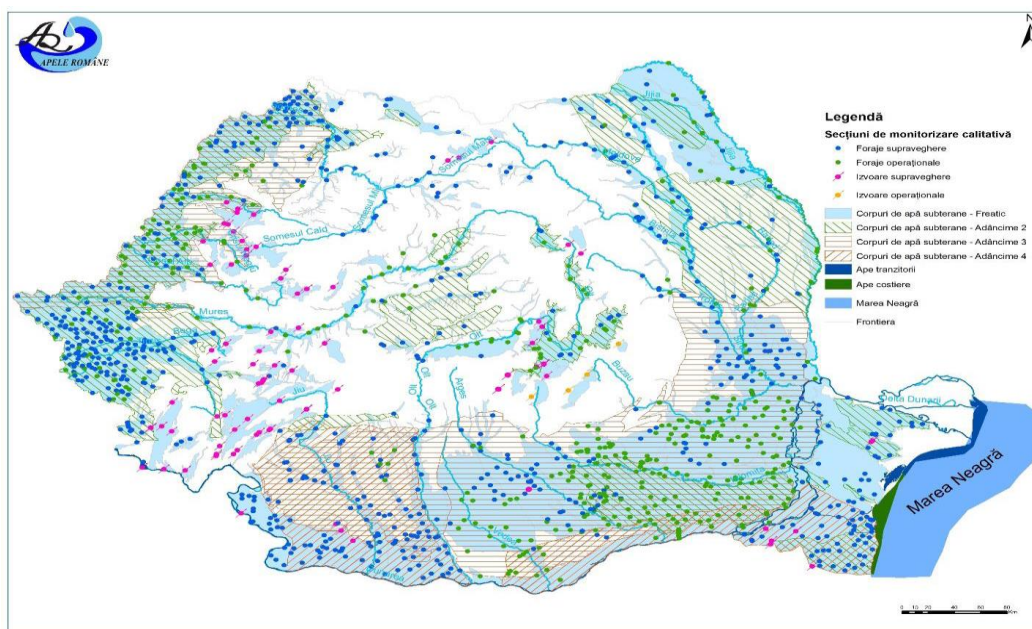
3. Assesement

- EFI+ selected **metrics**:
- **Salmonicol WB**:
 - relative density of intolerant individuals with length below 150 mm
 - relative density of intolerant species to dissolved oxygen depletion
- **Cyprinicol WB**:
 - relative density of reophyl species
 - relative density of litophyl species

4. Assesement

Quality/Calitatea	Salmonicol waters Ape Salmonicole Types/Tipurile RO 01, RO 02, RO 03 si RO 17, RO18	Cyprinicol waters Ape Cyprinicole Types/Tipurile RO 04 - RO 15 si RO 19, RO 20	
		Sampling/Prelevare by foot/„la picior”	Sampling/Prelevare boat/ambarcatiune
High status/Starea FB	0,912-1,000	0,940-1,000	0,918-1,000
G/B	0,756-0,911	0,656-0,939	0,563-0,917
M/M	0,504-0,755	0,438-0,655	0,376-0,562
P/P	0,253-0,503	0,219-0,437	0,188-0,375
B/FP	0,000-0,252	0,000-0,218	0,000-0,187





Surface waters – water bodies and monitoring sections

WB/sectiuni	Rivers	Natural lakes	Reservoirs	Transitional Waters	Coastal waters	Total
WB	3497	53	165	6	3	3724
WB at risk	453	21	165	6	3	648
WB possible at risk	357	14	0	0	0	371
Surveillance	1517	102	381	18	39	2057
Out of which: fizico-chemical and biological	847	102	361	18	39	1367
Sectiuni operational	642	78	232	18	39	1009
Out of which: fizico-chemical and biological	397	78	212	18	39	744

Groundwaters – water bodies and stretch

- **129 – WB (GWB)**
- **20 – GWB at risk**
- **7 – GWB possible at risk**

Monitoring sites	Drills	Springs	Total
Program quantitative	3166	116	3282
Chemical Programme Surveillance	2035	80	2115
Chemical Program Operational	1274	49	1323

29

Tabel 6.1. Elements, parameters and frequency of monitoring – surveillance programme - rivers

QualityElements		Parameters	Frequency	
biological elements	Phytoplankton	Composition of taxa (list and nr. of species) density (expl/l)	2/year	3/year
	Microfitobentos	Composition of taxa (list and nr. of species) density (expl/m ²)	2/year	3/year
	Macrofites	Composition of taxa (list and nr. of species) density (expl/m ²)	1/3 years	1/3 years
	Zoobentos	Composition of taxa (list and nr. Of species) density (expl/m ²)	2/year	3/year
	Fish fauna	Composition of taxa (list and nr. of species) density (exp/100 m ²) structure on age	1/3 years	1/3 years
Hydro morfological elements	Hydrological regime	Level and flow	H = 2 / day * Q = 20-60 /year*	H = 2 / day * Q = 20-60/year*
		Connectivity with GWB	1/3 days	1/3 days
		River continuity	1/6 years	1/6 years
	Morphological parameters	Depth variation and river width	1/year	1/year
		Structure and river bed substrate	1/6 years	1/6 years
		Structure of riparian area	1/6 years	1/6 years

Tabel 6.1. Elements, parameters and frequency of monitoring in the surveillance program

QualityElements		Parameters	Frequency	
	Transparency	Suspended matters, Turbidity, Colour	4/year	8/12/year**
	Temperature conditions	Temperature	4/year	8/12/year**
	Oxygen condition	Oxigen dizolvat COD – Cr, BOD ₅ și în unele cazuri COT și COD	4/an	8/12/an**
	Salinity	Conductivitate/reziduu fix	4/an	8/12/an**
	Starea acidifierii	pH Alcalinity	4/an	8/12/an**
	Nutrients	Azotiți, Azotați, Amoniu Ntotal, Ortofosfați Ptotal Clorofila „a”	4/an	8/12/an**
	Nutrients (suspended matters)	N _{total} , P _{total}	4/year	8/ year
	Priority substances – water	1)	12/year	12/year
	Priority substances (suspended matters)	Heavy metals: Cd, Ni, Pb, Hg	4/year	8/year
	Priority substances (sediments)	2)	1/year	1/year
	Specific pollutants	3)	4/year	8/year
	Other pollutants	4)	4/year	8/year

Tabel 6. 2 Elements, parameters and frequency of monitoring – surveillance and operational programmes - lakes

Quality elements		Parameters	Frequency			
			Natural lakes Program surveillance	Reservoirs Program surveillance	Natural lakes Program operational	reservoirs Program operational
Biological elements	Phytoplankton	Composition of taxa (list and nr. of species) density (expl./l) biomass (mg/l)	4/year	4/year	4/year*	4/year*
	Microfitobentos	Composition of taxa (list and nr. of species) density (exp./m ²)	1/year	1/year	2/year	2/year
	Macrofites	Composition of taxa (list and nr. of species) density (exp./m ²)	1/3 years	1/3 years	1/3 years	1/3 years
	Zoobentos	Composition of taxa (list and nr. of species) density (exp./m ²)	1/year	1/year	1/year	1/year
	Fish fauna	Composition of taxa (list and nr. of species) density (exp /100m2) structure on ages	1/3 years	1/3 years	1/3 years	1/3 years
Hydro morphological elements	hydrological parameters	Water level and inflow and outflow rates	1-30 / 30 days	1/day	1-30 / 30 days	1/day
		Retention time	1/6 years	1/6 years	1/6 years	1/6 years
		Connectivity of lake to GWB	1/3 days	1/3 days	1/3 days	1/3 days
	Morphological parameters	Variation of depth	1/6 years	1/6 years (variable)	1/6 years	1/6 years (variable)
		Volume and structure of lake bed	1/6 years	1/6 years (variable)	1/6 years	1/6 years (variable)
		Structure of lake bank	1/6 years	1/6 years	1/6 years	1/6 years

Tabel 6. 2 Elements, parameters and frequency of monitoring – surveillance and operational programmes-lakes

physico-chemical elements	Transparency	Disk Secchi turbidity colour	4/an	4/an	4/an*	4/an*
	Temperature conditions	Temperature	4/an	4/an	4/an*	4/an*
	Oxygen conditions	Oxygen dizolvat COD - Mn și/sau COD - Cr BOD ₅ și în unele cazuri COT și COD	4/an	4/an	4/an*	4/an*
	Salinity	Conductivity fixed/residue	4/an	4/an	4/an*	4/an*
	Acidification	pH alcalinity	4/an	4/an	4/an*	4/an*
	Nutrients	Nitrites, nitrates, amonia, Ntotal, ortophosphates, P _{total} , clorofil „a”	4/an	4/an	4/an*	4/an*
	Priority substances- water	1)	12/an	12/an	12/an	12/an
	Priority substances- (sediments)	Heavy metals and organic micro pollutants relevant for sediments	1/an	1/an	1/an	1/an
	Priority substances(biota)	Heavy metals and organic micro pollutants relevant for biota			1/an	1/an
	Specific pollutants	2)	4/an	4/an	4/an	4/an
	Non-priority specific pollutants (sediments)	Priority substances list I and II relevant for sediments	1/an	1/an	1/an	1/an
	Non-priority specific pollutants (biota)	Priority substances list I and II relevant for biota			1/an	1/an
	Other pollutants	3)	4/an	4/an	4/an	4/an
Microbiological Elements	bacteriological parameters **	coliformi totali, coliformi fecali, streptococi fecali, Salmonella	4-12/an	4-12/an	4-12/an	4-12/an

Tabel nr. 6.3 Elements of quality and frequency of monitoring – surveillance and operational programmes - transitional waters

Quality elements		Parameters	surveillance Program		Operational programme	
			Ape tranzitorii lacustre	Ape tranzitorii marine	Ape tranzitorii lacustre	Ape tranzitorii marine
Biologic elements	Phytoplankton	Composition of taxa (list and nr. of species) density (exp./l), biomass (mg/l)	4/an	**	4/an****	4/an***
	Macroalgae	Composition of taxa (list and nr. of species) density (exp./m ²)	1/an	1/an	2/an*****	2/an***
	Angiosperme	Composition of taxa (list and nr. of species) density (exp./m ²)	1/3ani	1/3ani	1/3 ani	1/3ani
	Zoobentos	Composition of taxa (list and nr. of species) density (exp./m ²)	1/an	1/an	1/an	1/an
	Faună piscicolă	Composition of taxa (list and nr. of species) density (exp/100m ³) structure on ages	1/3 ani	1/3ani	1/3 ani	1/3ani
Hydro morphological elements	Morphological Parameters	Depth variation	1/6ani	1/an	1/6 ani	1/an
		Volume and structure of transitional waters bed	1/6 ani	1/an	1/6 ani	1/an
		Retention time	1/6 ani	NA	1/6 ani	NA
	Hydrological parameters	Water level	1/zi	1/zi	1/zi	1/zi
		Freshwater flow	NA	NA	NA	NA
		Exposure to waves	NA	4/an	NA	4/an

physico-chemical elements	Transparency	Suspended matters, colour, turbidity, disk Secchi	4/an	**	4/an****	4/an****
	Temperature (Thermal conditions)	temperatura	4/an	**	4/an****	4/an****
	Oxygen conditions	oxigen dizolvat CCO - Mn și/sau CCO- Cr CBO5 și în unele cazuri COT și COD	4/an	**	4/an****	4/an****
	Salinity	salinity-conductivity	4/an	**	4/an****	4/an****
	Acidification	pH alcalinity	4/an	**	4/an****	4/an****
	Nutrients	Nitrites, nitrates, amonia, Ntotal, ortophosphates, Ptotal, clorofil'a", siliciu	4/an	**	4/an****	4/an****
	Nutrients (suspended matters)	N total, P total				
	Priority substances – water	1)	12/an	12/an	12/an	12/an
	Priority substances (suspended matters)	Heavy metals: Cd, Ni, Pb, Hg				
	Priority substances (sediments)	Heavy metals and organic micro pollutants relevant for sediments	1/an	1/an	1/an	1/an
	Substanțe prioritare (biota)	Heavy metals and organic micro pollutants relevant for biota			1/an	1/an
	Non-priority specific pollutants	2)	4/an	**	4/an	4/an
	Non-priority specific pollutants (suspended matters)	Other heavy metals (list II)				
	Non-priority specific pollutants (sediments)	Priority substances list I and II relevant for sediments	1/an	1/an	1/an	1/an
	Non-priority specific pollutants (sediments) (biota)	Priority substances list I and II relevant for biota			1/an	1/an
microbiological elements	Other pollutants	3)	4/an	4/an	4/an	4/an
	bacteriological parameters	*, **	NA		NA	

