

MONITORING NETWORK IN DRINA RIVER BASIN

Bosnia and Herzegovina

Republic of Srpska

River Drina is the

- right tributary of Sava River
- transboundary river
- catchment area app.19.946 km²
- in BA app. 37 %
- length 345.9 km

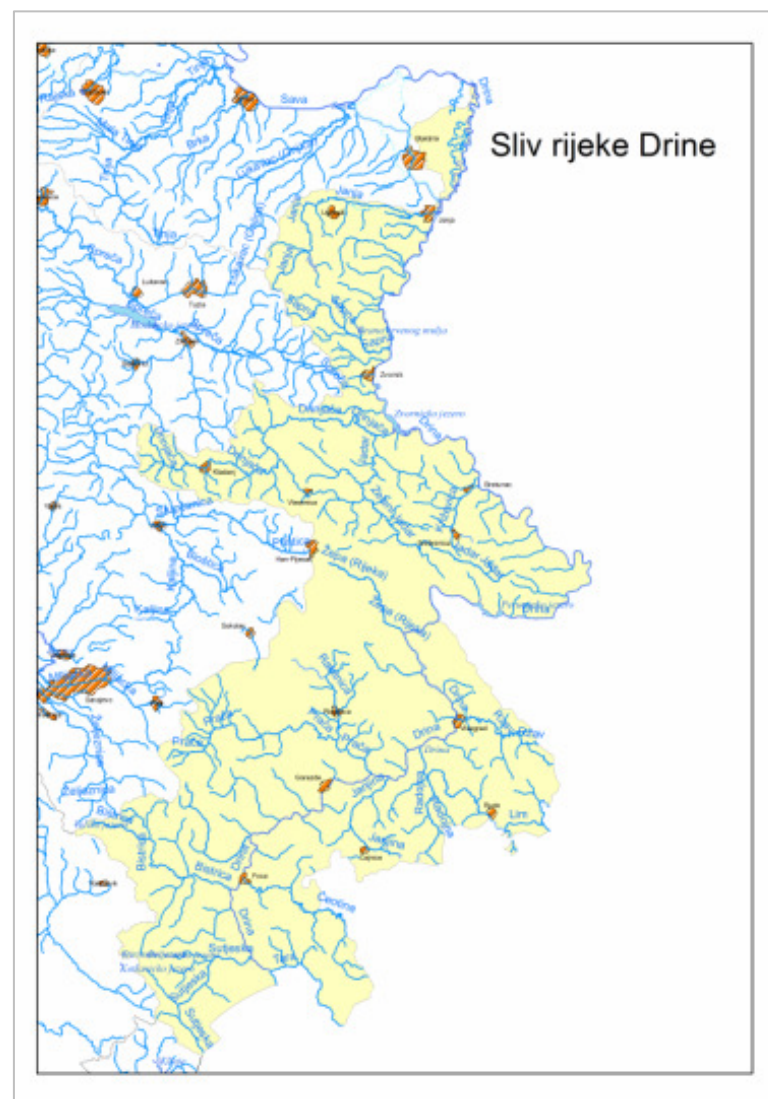
Main tributaries in Rep. Srpska

Left tributaries:

Janja, Drinjača, Žepa, Prača,
Bistrica i Sutjeska.

Right tributaries:

Lim, Rzav i Četina.





Surface water monitoring in DRB **has been performed since 2000**





Monitoring Program

- prepared by the Public institution "Waters of Srpska" Bijeljina
- approved by the Ministry of Agriculture, Forestry and Watermanagement Republic of Srpska

Measurements and analysis were carried out by the Institute for Water Ltd. Bijeljina

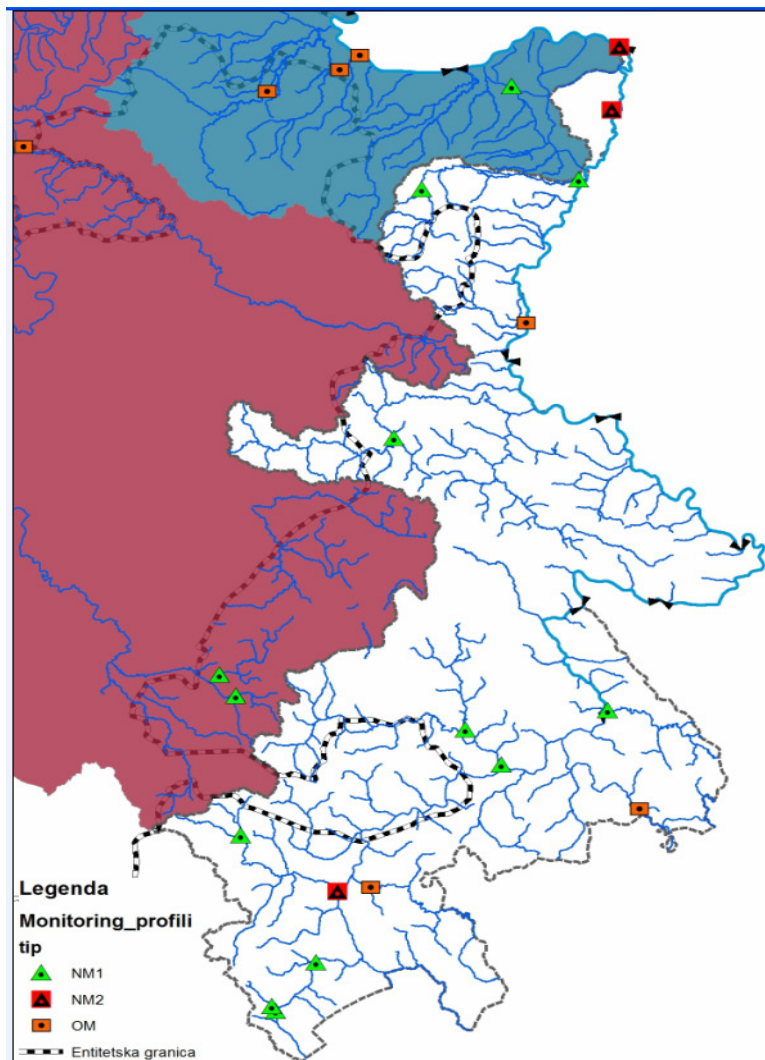


SURFACE WATER MONITORING OBJECTIVES

-  assessment of the ecological and chemical surface waters status in line with Water Law (Official gazette RS 50/06, 121/12) and Decree on Water classification and water courses characterization (Official gazette RS 42/01)
-  fulfilling international obligations of Bosnia and Herzegovina and Republic of Srpska
-  providing data for Trans National Monitoring Network (TNMN) in ICPDR
-  protection and achievement of good ecological and chemical status in all surface water bodies, as well as water use for existing and planned needs.



SURFACE WATER MONITORING SITES IN DRB



In DRB is identified 233 WBs, of which 95 WBs on the rivers with catchment area $> 1,000.0 \text{ km}^2$)

There are 14 monitoring sites on 13 WBs:

- surveillance monitoring
- national (NM1)-
9 sampling points
- surveillance monitoring
- international (NM2)- TNMN-ICPDR-
2 sampling points
- operational monitoring (OM)
- 3 sampling points

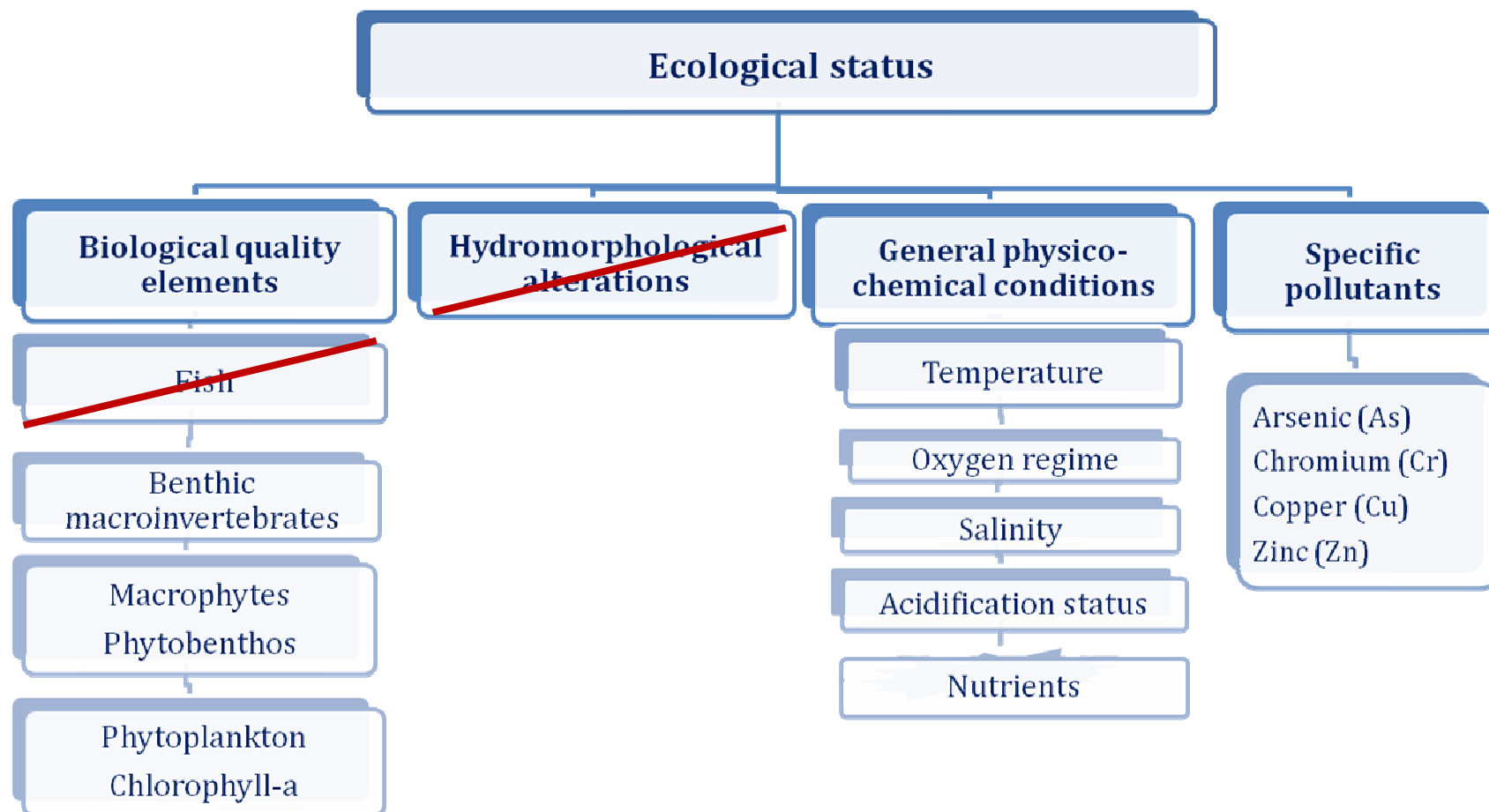


LIST OF SURFACE WATER MONITORING SITES IN DRB

River	Profil	Mon_Tip	Sampling frequency			
			Biological QE (PhP,PhB, Minv)	General PhCh Par	Specific substances	Priority substances
Sutjeska	Petkovina	NM1	2-4	4/year	4/year	1/year
Jabušnica	Sastavci	NM1	2-4	4/year	4/year	12/year
Sutjeska	Tjentište	NM1	2-4	4/year	4/year	1/year
Drina	Foča	NM2	2-4	12/year	12/year	12/year
Bistrica	Gunjak	NM1	2-4	4/year	4/year	1/year
Ćeotina	Brioni	OM	2-4	4/year	4/year	10/year
Rakitnica	Sastavci	NM1	2-4	4/year	4/year	1/year
Prača	Ustiprača	NM1	2-4	4/year	4/year	1/year
Lim	Rudo	OM	2-4	4/year	4/year	10/year
Drinjača	Tišća	NM1	2-4	4/year	4/year	1/year
Drina	Karakaj	OM	2-4	4/year	4/year	
Janja	Debelac	NM1	2-4	4/year	4/year	1/year
Janja	Janja	NM1	2-4	4/year	4/year	12/year
Drina	Pavlovića most	NM2	2-4	12/year	12/year	12/year



WATER QUALITY ELEMENTS IN LINE WITH WFD





List of monitored Physico-chemical parameters

Parameters for national surveillance/operational monitoring

No	Parameter	Unit
1	Temperature	°C
2	Dissolved oxygen	mg/l
3	Oxygen saturation	%
4	COD (Mn)	mg/l
5	COD (Cr)	mg/l
6	BOD (5)	mg/l
7	Suspended solids	mg/l
8	Conductivity	µS/cm
9	Total hardness	mg/l
10	pH	-
11	Alkalinity - total	mgCaCO ₃ /l
12	Total phosphorus	mg/l
13	Orthophosphate (PO ₄ -P)	mg/l
14	Nitrite (NO ₂ -N)	mg/l
15	Nitrate (NO ₃ -N)	mg/l
16	Ammonium (NH ₄ -N)	mg/l
17	Kjeldal nitrogen	mg/l
18	Total nitrogen	mg/l
19	Arsenic (As), dissolved	µg/l
20	Copper (Cu), dissolved	µg/l
21	Chromium (Cr), total dissolved	µg/l
22	Zinc (Zn), dissolved	µg/l

Parameters for transnational surveillance (NM2) monitoring

No	Parameter	Unit
1	Temperature	°C
2	pH	
3	Alkalinity - total	mmol/l
4	Total hardness	mg/l
5	Conductivity	µS/cm
6	Suspended solids	mg/l
7	Dissolved oxygen	mg/l
8	BOD (5)	mg/l
9	COD (Mn)	mg/l
10	COD (Cr)	mg/l
11	Total phosphorus	mg/l
12	Total phosphorus, dissolved	mg/l
13	Orthophosphate (PO ₄ -P)	mg/l
14	Nitrite (NO ₂ -N)	mg/l
15	Nitrate (NO ₃ -N)	mg/l
16	Ammonium (NH ₄ -N)	mg/l
17	Total nitrogen	mg/l
18	Calcium (Ca ⁺⁺)	mg/l
19	Magnesium (Mg ⁺⁺)	mg/l
20	Chloride (Cl ⁻)	mg/l
21	Atrazine	µg/l
22	Cadmium (Cd), dissolved	µg/l
23	Lead (Pb), dissolved	µg/l
24	Mercury (Hg)	µg/l
25	Nickel (Ni), dissolved	µg/l
26	Arsenic (As), dissolved	µg/l
27	Copper (Cu), dissolved	µg/l
28	Chromium (Cr), total dissolved	µg/l
29	Zinc (Zn), dissolved	µg/l



WATER QUALITY ELEMENTS IN LINE WITH WFD

Chemical status - list of priority substances (DIRECTIVE 2008/105/EC)

ENVIRONMENTAL QUALITY STANDARDS FOR PRIORITY SUBSTANCES AND CERTAIN OTHER POLLUTANTS						
PART A: ENVIRONMENTAL QUALITY STANDARDS (EQS)						
AA: annual average;						
MAC: maximum allowable concentration.						
Unit: [µg/l]						
(1)	(2)	(3)	(4)	(5)	(6)	(7)
No	Name of substance	CAS number (°)	AA-EQS (°) Inland surface waters (°)	AA-EQS (°) Other surface waters	MAC-EQS (°) Inland surface waters (°)	MAC-EQS (°) Other surface waters
(1)	Alachlor	15972-60-8	0,3	0,3	0,7	0,7
(2)	Anthracene	120-12-7	0,1	0,1	0,4	0,4
(3)	Atrazine	1912-24-9	0,6	0,6	2,0	2,0
(4)	Benzene	71-43-2	10	8	50	50
(5)	Brominated diphenylether (°)	32534-81-9	0,0005	0,0002	not applicable	not applicable
(6)	Cadmium and its compounds (depending on water hardness classes) (°)	7440-43-9	≤ 0,08 (Class 1) 0,08 (Class 2) 0,09 (Class 3) 0,15 (Class 4) 0,25 (Class 5)	0,2 	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)	≤ 0,45 (Class 1) 0,45 (Class 2) 0,6 (Class 3) 0,9 (Class 4) 1,5 (Class 5)
(6a)	Carbon-tetrachloride (°)	56-23-5	12	12	not applicable	not applicable
(7)	C10-13 Chloroalkanes	85535-84-8	0,4	0,4	1,4	1,4
(8)	Chlorfenvinphos	470-90-6	0,1	0,1	0,3	0,3
(9)	Chlorpyrifos (Chlorpyrifos-ethyl)	2921-88-2	0,03	0,03	0,1	0,1
(9a)	Cyclodiene pesticides: Aldrin (°) Dieldrin (°) Endrin (°) Isodrin (°)	309-00-2 60-57-1 72-20-8 465-73-6	Σ = 0,01	Σ = 0,005	not applicable	not applicable
(9b)	DDT total (°) (°) para-para-DDT (°)	not applicable 50-29-3	0,025 0,01	0,025 0,01	not applicable not applicable	not applicable not applicable
(10)	1,2-Dichloroethane	107-06-2	10	10	not applicable	not applicable
(11)	Dichloromethane	75-09-2	20	20	not applicable	not applicable
(12)	Di(2-ethylhexyl)-phthalate (DEHP)	117-81-7	1,3	1,3	not applicable	not applicable
(13)	Diburon	330-54-1	0,2	0,2	1,8	1,8
(14)	Endosulfan	115-29-7	0,005	0,0005	0,01	0,004
(15)	Fluoranthene	206-44-0	0,1	0,1	1	1
(16)	Hexachloro-benzene	118-74-1	0,01 (°)	0,01 (°)	0,05	0,05
(17)	Hexachloro-butadiene	87-68-3	0,1 (°)	0,1 (°)	0,6	0,6
(18)	Hexachloro-cyclohexane	608-73-1	0,02	0,002	0,04	0,02

(1)	(2)	(3)	(4)	(5)	(6)	(7)
No	Name of substance	CAS number (°)	AA-EQS (°) Inland surface waters (°)	AA-EQS (°) Other surface waters	MAC-EQS (°) Inland surface waters (°)	MAC-EQS (°) Other surface waters
(19)	Isoproturon	34123-59-6	0,3	0,3	1,0	1,0
(20)	Lead and its compounds	7439-92-1	7,2	7,2	not applicable	not applicable
(21)	Mercury and its compounds	7439-97-6	0,05 (°)	0,05 (°)	0,07	0,07
(22)	Naphthalene	91-20-3	2,4	1,2	not applicable	not applicable
(23)	Nickel and its compounds	7440-02-0	20	20	not applicable	not applicable
(24)	Nonylphenol (4-Nonylphenol)	104-40-5	0,3	0,3	2,0	2,0
(25)	Octylphenol ((4-(1,1',3,3'-tetramethylbutyl-phenol))	140-66-9	0,1	0,01	not applicable	not applicable
(26)	Pentachloro-benzene	608-93-5	0,007	0,0007	not applicable	not applicable
(27)	Pentachloro-phenol	87-86-5	0,4	0,4	1	1
(28)	Polycyclic aromatic hydrocarbons (PAH) (°)	not applicable	not applicable	not applicable	not applicable	not applicable
	Benzofluoranthene	50-32-8	0,05	0,05	0,1	0,1
	Benzofluoranthene	205-99-2	Σ = 0,03	Σ = 0,03	not applicable	not applicable
	Benzofluoranthene	207-08-9				
	Benzofluoranthene	191-24-2	Σ = 0,002	Σ = 0,002	not applicable	not applicable
	Indeno(1,2,3-cd)pyrene	193-39-5				
(29)	Simazine	122-34-9	1	1	4	4
(29a)	Tetrachloro-ethylene (°)	127-18-4	10	10	not applicable	not applicable
(29b)	Trichloro-ethylene (°)	79-01-6	10	10	not applicable	not applicable
(30)	Tributyltin compounds (Tributyltin-cation)	36643-28-4	0,0002	0,0002	0,0015	0,0015
(31)	Trichloro-benzene	12002-48-1	0,4	0,4	not applicable	not applicable
(32)	Trichloro-methane	67-66-3	2,5	2,5	not applicable	not applicable
(33)	Trifluralin	1582-09-8	0,03	0,03	not applicable	not applicable



Chemical status - list of priority substances monitored in DRB

No.	Priority and other hazardous substances	
1	Alachlor	
2	Anthracene	
3	Atrazine	
4	Benzene	
5	Cadmium (Cd), dissolved	
6	Chlorphenvinphos	
7	Aldrin	LOQ ≥ EQS
	Dieldrin	LOQ ≥ EQS
	Endrin	LOQ ≥ EQS
	DDT total	LOQ ≥ EQS
	4,4'-DDT	LOQ ≥ EQS
8	1,2-dichlormethane	
9	Dichloromethane	
10	Di-(2-ethylhexyl)phthalate (DEHP)	
11	Diuron	
12	Endosulphane	
13	Fluoranthene	
14	Hexachlorobenzene	LOQ ≥ EQS
15	Hexachlorobutadiene	
16	Hexachloro-cyklohexane	
	Lindane (gamma-HCH)	
17	Isoproturon	
18	Lead (Pb), dissolved	
19	Mercury (Hg)	LOQ ≥ EQS

No.	Priority and other hazardous substances	
20	Naphtalene	
21	Nickel (Ni), dissolved	
22	Nonylphenol	
23	Octylphenol	
24	Pentachlorobenzene	LOQ ≥ EQS
25	Pentachlorophenol	
26	PAHs	
	Benzo(a)pyrene	
	Benzo(b)fluoranthene	
	Benzo(g,h,i)perylene	
	Benzo(k)fluoranthene	
	Indeno((1,2,3)-c,d)pyrene	
27	Trichloromethane (Chloroform)	
28	Trifluralin	
29	Simazine	
Missing Priority Substances		
1	Brominated diphenylether	
2	C10-13 Chloralkanes	
3	Chlorpyrifos (Chlorpyrifos-ethyl)	
4	Tributyltin compounds	



METHODES

Physico -chemical and Chemical parameters

Measuring on-site: water temperature, air temperature, pH, conductivity, dissolved oxygen, percentage of oxygen saturation in the water and water flow.

Sampling in line with methods: BAS ISO 5667-2, BAS ISO 5667-3 i BAS ISO 5667-6.

Method for Water flow measuring is ISO 748:1997(A)

Method of analysis - ISO methods, APHA-AWWA-WEF (Standard Methods-American Public Health Association, American Water Works Association, Water Environment Federation) and EPA methods (Environmental Protection Agency)

Lab has cetified methods according to ISO 17025



METHODES

Biological parameters

PARAMETER	METHODS
Sampling for microbiological analysis	BAS ISO 19 458:2006
Sampling of plancton	BAS ISO 5667 -2,3,4,6
Sampling of benthic macroinvertebrates	BAS ISO 7828:1985 (hand net) BAS EN 28 265:1994 (Surber sampler) BAS ISO 9391:1993 (Ekman-Birge sampler)
Samling and pretreatment of benthic diatoms*	BAS ISO 13 946:2003

PARAMETER	METHODS
Determination of concentration of chl-a	BAS ISO 10 200:1990
Qualitative and quantitative analysis of phyto- and zooplankton	Standard methods, 10 200, A, C, D, E, F, G, APHA-WEF-AWWA, 21 st ed. 2005.
Identification, enumeration and interpretation of benthic diatom samples from running water	BAS ISO 14 407:2004
Qualitative and quantitative analysis of benthic macroinvertebrates	Standard methods, 10 500, A, C, D, APHA-WEF-AWWA, 21 st ed. 2005.



MAIN GAPS IN DRB SURFACE WATERS MONITORING **-in Republic of Srpska-**

There is no monitoring programme fully in compliance with WFD

- Insufficient number of monitoring sites
- There is no monitoring of some quality elements (fish, hydromorphology, some of PS)
- Less sampling frequency for some quality elements
- LOQ > EQS for some of PS
- There are no type specific class boundaries
- There was no the participation in the process of intercalibration

Main reasons:

- Humane recourses,
- Financial recourses,
- Equipment.



WATER QUALITY ASSESSMENT

Based on the monitoring results and the existing relevant sub-legislation water quality in DRB adversely affects

- untreated urban waste water, point and diffuse sources

- untreated industrial waste waters (including mines, power plants)

- hydromorphological alteration to water bodies (sand and gravel extraction, hydroelectricity production)

_____ + _____ + _____

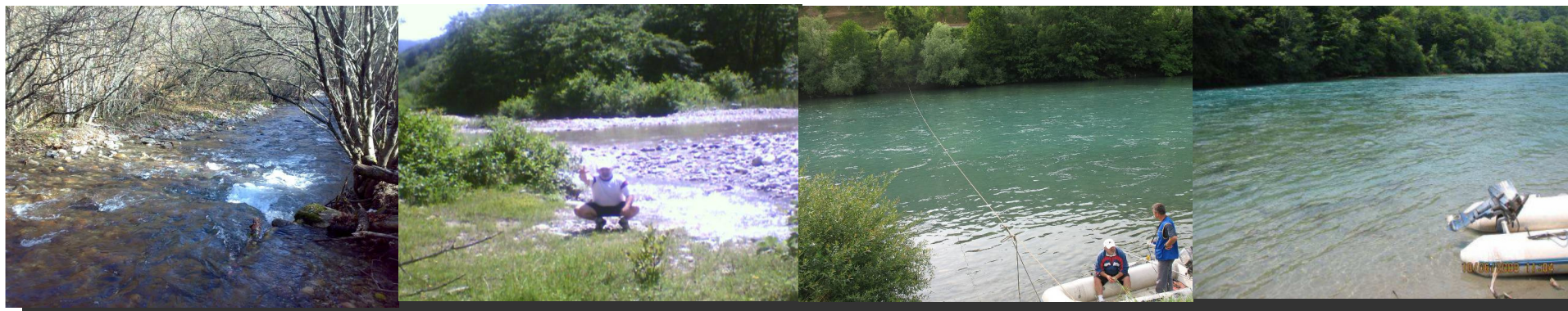
Anthropogenic impacts



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THANK YOU

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ECRAN-TAIEX Multi-beneficiary (3rd) Screening Workshop at Pilot-DRB, Podgorica 10-12 March 2015