PRESSURES, BASIC PoM AND ECONOMIC ANALYSIS

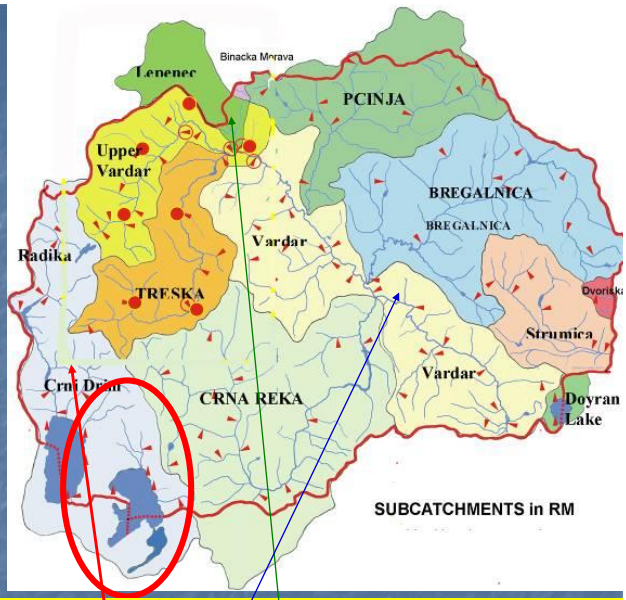
HMS and MOEPP

Podgorica, 15-17.02.2016

The total water resources $6,37*10^9$ m^3 (normal year) $4,80*10^9$ m^3 dry year), out of which 80% are carried in the Vardar basin.

3100 m^3/capita

Uneven spatial and timely distribution over the country, more favorable conditions in the WM but being characterized over all the national territory by a timely distribution which presents long drought spells and high intensity rainfalls which constitute at the same time a threat for crops and which prone erosion phenomena.



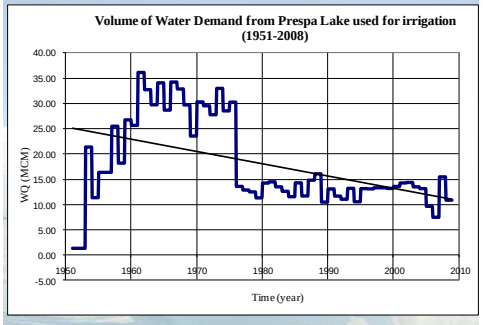
-Black Sea basin - (44 km^2 or 0.17 %) ;
- Adriatic Sea basin (3359 km^2 or 13.07 %)
-Aegean Sea basin (22310 km^2 or 86.76%)

- **Prespa Region: Unique Values Of The Ecosystem Under Continuous Stress**

- Underlying causes for stress on ecosystem health:
  - Ecosystem objectives not sufficiently incorporated into the sectoral legal and regulatory instruments, plans, policies etc.
  - Waste management practices (agricultural, indust., domestic)
  - Wastewater management
  - Pollution from pesticides, fertilizers and industrial compounds

- Need for coordinated transboundary action

Water use and pressures



#	Settlement	Connection to WS and WW systems	Percentage of coverage by the central WW system	Untreated wastewater discharge (m3/day)	Effective Pollution Load (kg BOD/day)	Effective Pollution Load (kg TSS/day)	Effective Pollution Load (kg P/day)	Effective Pollution Load (kg N/day)	Type of Impact to Golema Reka
1	Resen	WS + WW	70%	356.9	131.2	183.7	5.8	7.7	Direct
2	Krusje	WS	0%	10.4	4.3	6.0	0.2	0.2	Indirect
3	Leva Reka	WS	0%	5.9	2.4	3.4	0.1	0.1	Indirect
4	Isbiste	WS	0%	17.2	7.0	9.9	0.3	0.4	Indirect
5	Kriveni	WS	0%	2.6	1.1	1.5	0.0	0.1	Indirect
6	Jankovec	WS + WW	60%	84.2	28.1	39.3	1.2	1.6	Direct
7	G. Bela Crkva	WS	0%	18.2	7.5	10.5	0.3	0.4	Direct
8	D. Bela Crkva	WS	0%	23.1	9.5	13.3	0.4	0.6	Direct
9	Ezerani	WS	15%	16.8	8.1	11.4	0.4	0.5	Direct
10	Podmocani		0%	29.8	12.2	17.1	0.5	0.7	Indirect
11	Gocari		0%	40.7	16.7	23.4	0.7	1.0	Indirect
12	Sopotsko		0%	21.6	8.9	12.4	0.4	0.5	Indirect
13	Zlatari	WS	0%	11.5	4.7	6.6	0.2	0.3	Indirect
14	Kozjak	WS	0%	11.4	4.7	6.6	0.2	0.3	Indirect
	Total		55%	650	246	345	11	14	

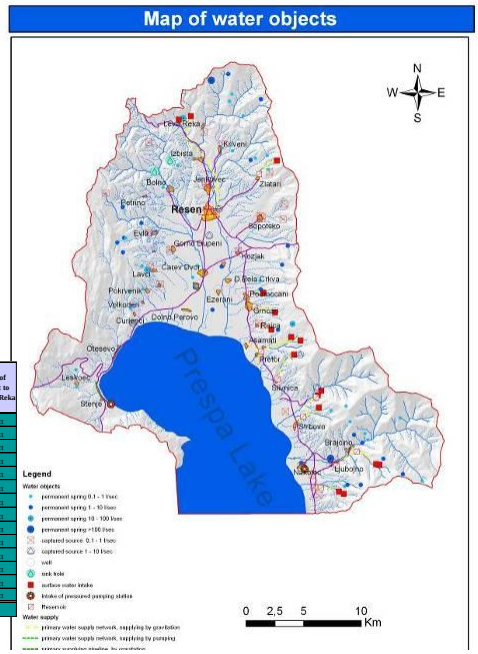


Table 4.3-8. Characteristics of main water objects – Sheet: Lerin 1

Map - Lerin 1	Cadastral number	Type of water object and location	capacity [m³/day]	Volume of object [m³]	depth of groundwater [m]	Possibility for pollution	Possibility for drinking
1	2	3	4	5	6	7	8
1		wells .Asamati(11)					
2	469	water supply. Asamati & Kurbinovo					
2./2	469	reservoir Asamati, Pretor				no	yes
3	470	captured source .Rajca	86,4		0	no	yes
4	3455/2	spring	25,92		0	no	yes
5	3454	spring	302,4		0	no	yes

- City of Resen and few villages connected to common water supply system
- The second WSS is local (Kurbinovo-Asamati-Pretor) 500 inhabitants.
- Other settlements – independent local systems

- Daily Water needs
- - for industry 700 m³/ден
- - For citizens 110 l/capita

- Experience from the latest dry period – lack of 30 l/s

Irrigation

- **WUC - 2500 ha** (300ha system, 2200 wells and rivers)
- Irrigation techniques: drip irrigation (70%), furrows (30%)

- **Irrigation system Prespa (more then 60 years old)**
- **3 sub-systems - needed rehabilitation / reconstruction**
- **In operation 15 June – 15 September**
- **Designed capacity** 1,8 m³/s or 15.552.000 m³/annualy
- Year 2000 – 88,98% of total water demand used for irrigation (83,2% from lake, 10,9 % groundwater, rivers - 4,98%, springs 1,71%)

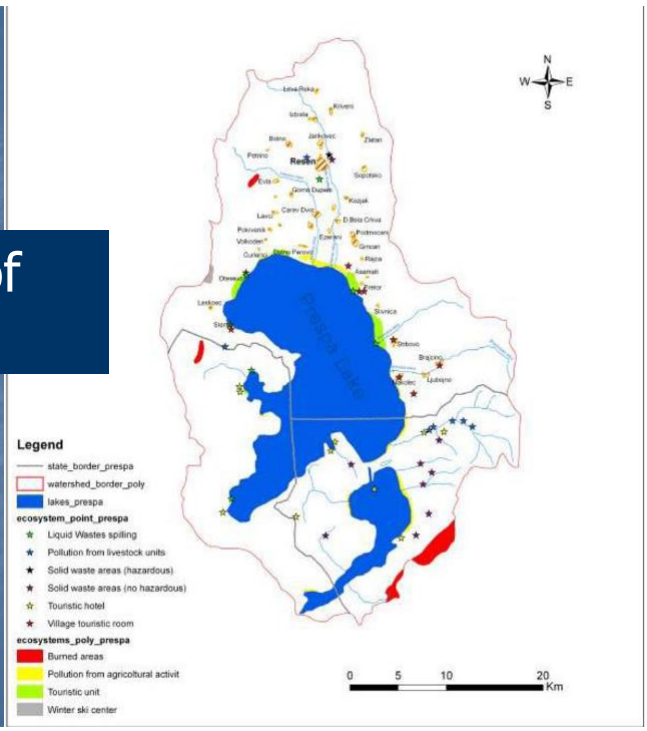
- CCA **8000-1000 wells on private land**
- **Beside wells, there are intakes fro irrigation - illegal**
- Generally significant water loss

Drip irrigation system:
2 sprinklers 6-8 l/h
Apple stand - 1000 trees/ha - 12000-16000 l/h
Duration 4-7 days - **1152 – 2688 m³/ha**

WATER RESOURCES and WATER USE

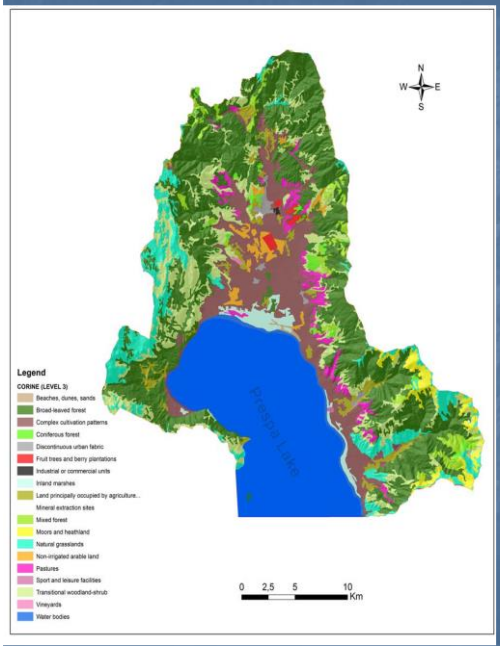
- Total water resources - 250x10^6 m^3/ann.
- Lack of water in the east part of the basin. Following the strategy for development of tourism, increase of lack of water
- Lake level fluctuation dominantly depend on natural factors.
- **"Illegal" water use**
  – wells (impact on groundwater and the lake ecosystem too)
  - intakes on streams – cause dry stream beds and impact ecological status

Sources of pollution



Indicator:	SwissLion (Agroplod) doo (5.11.2008) 3rd point (biscuits-napolitana)	SwissLion (Agroplod) doo (5.11.2008) 2nd point (resana cakes)	SwissLion (Agroplod) doo (5.11.2008) 1st point (coffee & peanuts)	Algreta AD Resen (14.10.2009) Recipient Golema River	CD Frut, Carev Dvor (28.11.2008) Recipient Bolsnica river	MDK (II class waters)*	Total:
Fe (mg/L)	/	/	/	>1	0,25	0,3	1,25
Mn (mg/L)	/	/	/	0,315	0,3	0,05	0,615
Al (mg/L)	/	/	/	0,009	/	1-1,5	0,009
Cd (mg/L)	/	/	/	/	0,0005	0,0001	0,0005
Cl_2 (mg/L)	14,9	17,7	82,2	/	0,0025	0,002	114,8
Cr total (mg/L)	/	/	/	/	0,038	0,05	0,038
Cu (mg/L)	/	/	/	/	0,012	0,01	0,012
Ni (mg/L)	/	/	/	/	0,035	0,05	0,035
Zn (mg/L)	/	/	/	/	0,075	0,1	0,075
Turbidity (NTU)	20	10	20	393	/	0,5-1	443
Total *N* (mg/L)	/	/	/	/	/	0,2 -0,32	
TDS *(mg/L) in: surface waters, ground waters*	385	290	580	/	146	500	1.401
Total *P* (mg/L)	/	/	/	/	/	10 – 25	
Eutrophication Indicators – *Most probable number of thermo-tolerant coli form bacteria No/100 ml*	240.000	240.000	240.000	/	/	5 – 50	240.000

Land Cover / Use



Apple stands

Table 29: Land cover/use distribution

CORINE - Class	ha	%
Beaches, dunes, sands	85,82	0,1
Broad-leaved forest	24828,78	32,6
Complex cultivation patterns	9653,27	12,7
Coniferous forest	619,19	0,8
Discontinuous urban fabric	361,34	0,5
Fruit trees and berry plantations	251,44	0,3
Industrial or commercial units	23,09	0,0
Inland marshes	1114,03	1,5
Land principally occupied by agriculture, with significant areas of natural vegetation	2027,16	2,7
Mineral extraction sites	22,88	0,0
Mixed forest	1716,77	2,3
Moors and heathland	1371,80	1,8
Natural grasslands	5033,95	6,6
Non-irrigated arable land	910,61	1,2
Pastures	1693,68	2,2
Sport and leisure facilities	23,83	0,0
Transitional woodland-shrub	8102,53	10,6
Vineyards	35,81	0,0
Water bodies	18258,29	24,0

Land use

Code	Land cover/use type	Area [ha]	Cumulative Area [ha]
311	Broad-leaved forest	2581,45	8615,60
242	Complex cultivation patterns	2165,40	3413,45
312	Coniferous forest	169,90	264,35
112	Discontinuous urban fabric	40,38	244,96
222	Fruit trees and berry plantations	101,11	174,78
121	Industrial or commercial units	1,36	23,09
411	Inland marshes	0,86	0,86
243	Land principally occupied by agriculture, with significant areas of natural vegetation	191,45	625,50
131	Mineral extraction sites	9,83	9,91
313	Mixed forest	495,27	703,48
321	Natural grasslands	69,55	207,70
211	Non-irrigated arable land	188,57	276,67
231	Pastures	471,28	767,47
324	Transitional woodland-shrub	659,71	1694,44
	total	7146,15	17022,27

Water body or Sub-catchment	Apple area [ha]	Input of N [kg]	Input of P2O5 [kg]	Input of K2O [kg]	Total input of fertilizers [kg]	Input of fungicides [kg]	Input of herbicides [kg]	Input of insecticides and acaricides [kg]	Total input of pesticides [kg]
Istočka Reka 1	309,5	73970,1	38377,8	83874	*196221,9*	3095	257,2	1808,8	*5161*
Istočka Reka 2	402,5	96197,7	49910,1	109077,7	*255185,5*	4025	334,5	2352,3	*6711,8*
Istočka Reka 3	45,1	10773,3	5589,5	12215,7	*28578,5*	450,8	37,5	263,4	*751,7*
Golema Reka 1	22	5267,3	2732,8	5972,5	*13972,6*	220,4	18,3	128,8	*367,5*
Golema Reka 2	14,1	3360,1	1743,3	3810	*8913,4*	140,6	11,7	82,2	*234,4*
Golema Reka 3	135,1	32288,9	16752,4	36612,1	*85653,4*	1351	112,3	789,5	*2252,8*
Golema Reka 4	45,6	10909,9	5660,4	12370,7	*28941*	456,5	37,9	266,8	*761,2*
Golema Reka 5	260,4	62244	32294	70577,9	*165115,9*	2604,4	216,5	1522	*4342,8*
Golema Reka 6	116,8	27911	14481	31648,1	*74040,1*	1167,8	97,1	682,5	*1947,4*
Golema Reka 7	935,6	223597,1	116008,5	253534,8	*593140,4*	9355,5	777,6	5467,5	*15600,6*
Golema Reka 8	49,9	11936,9	6193,2	13535,1	*31665,2*	499,5	41,5	291,9	*832,9*
Kurbinska Reka	16,8	4007,1	2079	4543,6	*10629,7*	167,7	13,9	98	*279,6*
Kranska Reka 1	4	952,8	494,3	1080,3	*2527,4*	39,9	3,3	23,3	*66,5*
Kranska Reka 2	110,5	26412,8	13703,7	29949,3	*70065,8*	1105,1	91,9	645,9	*1842,9*
Brajčinska Reka 1	0	0	0	0	*0*	0	0	0	*0*
Brajčinska Reka 2	83,2	19883,5	10316,1	22545,8	*52745,4*	831,9	69,1	486,2	*1387,3*
Galičica with Prespa Lake	757,6	181067,9	93943,2	205311,3	*480322,4*	7576,1	629,7	4427,6	*12633,3*
Istočka Reka- Golema Reka	9,3	2233,2	1158,7	2532,3	*5924,2*	93,4	7,8	54,6	*155,8*
Golema - Kurbinska	194,5	46488,5	24119,5	52712,9	*123320,9*	1945,1	161,7	1136,8	*3243,6*
Kurbinska - Kranska	166,7	39837,9	20669	45171,9	*105678,8*	1666,9	138,5	974,1	*2779,5*
Kranska - Brajčinska	72,5	17330,5	8991,6	19651	*45973,1*	725,1	60,3	423,8	*1209,2*
Brajčinska – Markova noga	98,2	23479,5	12181,8	26623,2	*62284,5*	982,4	81,7	574,1	*1638,2*
Total	3850	920150	477400	1043350	2440900	38500	3200	22500	64200

ESTIMATION OF DIFFUSE SOURCE POLLUTION

- EU directives whose implementation is considered as a minimum requirement

- Legal base Importance for water quality **Urban waste water treatment directive**. All agglomerations ≥ 2000 population equivalent (p.e.) have to have collection systems in place, or use individual or appropriate systems provided they achieve the same level of environmental protection.
- **Nitrates directive** - Member States have to monitor surface and ground waters and to designate nitrate-vulnerable zones. In order to reduce water pollution caused by nitrates Member States must adopt action programmes compulsory in nitrate-vulnerable zones. Moreover, Member States have to establish a code of good agricultural practice to be applied on the whole territory on a voluntary basis.
- **Integrated pollution prevention and control directive** replaced by the industrial emissions directive. The emission limit values included in the permits of industrial installations are to be based on the application of best available techniques, which are the most effective techniques to achieve a high level of environmental.

PROGRAMME OF MEASURES

analysis, prioritization & implementation plan

ENVIRONMENTAL OBJECTIVES

- **The objective is that all water bodies should achieve "Good status".**
- **In addition, any deterioration in the existing status of both surface waters and groundwater is to be prevented.**

Overall Objecti1	Improvement of environmental conditions to ensure good water and soil quality for human health and ecosystem by 2025.
Indicator	Measurable decline in levels of the main pollutant groups and pressures in water, sediment and biota
1a:	Good surface water quality: -Reduce / prevent further eutrophication/organic pollution -Reduce / prevent further hydromorphological changes -Reduce / prevent further habitat fragmentation -Maintain biological water quality (phytoplankton, macrophytes, invertebrates and fish) - Reduce / prevent hazardous substances pollution
1b:	Good groundwater quality: -Control water abstraction -Reduce / prevent water pollution from point and non-point sources -Maintain good physical and chemical characteristics
1c:	Good ecological potential for HMWB and AWB: -Reduce / prevent further eutrophication/organic pollution -Reduce / prevent further hydromorphological changes -Reduce / prevent further habitat fragmentation -Improve biological water quality (phytoplankton, macrophytes, invertebrates and fish) - Reduce / prevent hazardous substances pollution

Programme of measures

Analyzed in detail for:

- Priority
- Responsible institution
- Schedule/duration of implementation
- Indicators
- Cost (CBA, NPV, cost-effectiveness…)
- Impact to waterbodies / ecosystems (Rivers, Lake, HMWB, Artificial , Wetlands, Groundwater, Terrestrial/natural Habitats)
- Expected effects (Nitrogen, Phosphorus, Physical Pressure, Natural Habitats, Priority substances, Water supply security, Harmful impacts of water, Other)

Programme of measures – prioritization - MCA

The measures have been ranked and prioritized in accordance with the following:

- Environmental effectiveness
- Legal requirement, and
- Multi-criteria analysis (MCA) score (highest score) according to the following criteria:
  - Legal requirement 0-20 points
  - Environmental extent 0-10 points
  - Environmental effect 0-10 points
  - Security & resources preservation 0-20 points
  - Prevention of harmful impacts 0-5 points
  - Economic benefits 0-10 points
  - Financial costs 0-10 points
  - Social benefits 0-15 points
- **Total** **0-100 points**

Programme of measures – sensitivity analysis

Ranking of measures has been checked with different weights to particular criteria

- **Environmental** (impact, extent, security or preservation of resource, protection from harmful effects of water)
  - 16/20.
- **Socio-economic** (economic benefit, financial costs, social benefits)
  - 10/20.

Programme of Measures	Priorit	Respon-sible institu-tion	Implemented by:	Indicators	[EURO]
Measure 414c- Construction of WWTP for smaller agglomerations (<2000 PE) in the region	3	USG Resen	PCEP	- WWTP rehabilitated & improved treatment	2,500,000

Waterbodies and terrestrial natural habitats affected by the measure						Expected Effects							
Rivers	Lake	HMUB, Artificial	Wetlands	Groundwater	Terrestrial natural Habitats	Nitrogen	Phosphorus	Physical Pressure	Natural Habitats	Priority substances	Water supply security	Harmful impacts of water	Other
						Reduction of input	Reduction of input	Reduction	Re-establishment and improvement of quality	Reduction of input	Safe & timely supply	Reduction	
+++	+++	+++	+++	+++		+++	+++		+++	+			

Possible Implementation Strategies

Три (3) алтернативи...

- A '***Business as Usual***' *Strategy ,*
- A ***Water Framework Directive Implementation Strategy*** in which all the measures are implemented in full accordance with the WFD, ensuring the achievement of the environmental objectives**.**
- A *Realistic Implementation Strategy* in which some of the above measures are implemented based on the availability of economic resources, manpower and skills. → **<u>Prioritization</u>**

Programme of measures - prioritization

Ранг	Бодови	ID	Програми на мерки: Мерки	Трошоци Вкупно: (ПР-€)	Год. (ПР-€)	Период-шпилни. /Траење (год)	Предлож. алтернат. 0 (BAU)	1 R	2 WFD	Почетен
1	68.3	23	Регулација на бучари за наводнување	200		3				
2	66.2	22	Регулација на зафати на реки за наводнување	0		3				
3	65.3	425	Санирање во сеоштетници	300		6				
4	63.3	34	Протиерозивни мерки	7,500		10				
5	63	421	Надградување на системот за наводнување	300		5				
6	62.3	422	Затворање на дивите депонии и изградба на контролирана санитарна депонија	250		6				
7	62.2	413	Надградба на системите за пречистување на индустриските води			12				
8	62	414a	Надградбена колектори за отпадни води во Езерани	500		2				
9	61.7	62	Рехабилитација на рибниците и конструкција на затворачки/капи на Голема река	250		3				
10	61.5	33	Протиерозивни планови базирани на процена на ризиците од ерозија и тревнаци	500		6				
11	61.5	61	Имплементација на планови за управување на заштитените подрачја: Пелистер, Галичица и Езерани	0		3/cont				
12	61.3	431	Имплементација на РЗВ мониторинг на Преспанското езеро		20	3/cont				
13	60.3	411	Имплементација на ВРРС	0		3/cont				
14	59.8	424	Едукација на фармерите за добри земјоделски и неспоиши практики вклучувајќи компостирање на отпадот од сеоштетниците	100		2				
15	59.7	31	Подготовка на планови за ризици од поплави и некво спречување	250		3				
16	57.8	423	Тест проект за намалено ситурно користење на фертилизатори и пестициди	100		2				
17	57.7	24	Внесување на системот капки по капки на 4,000 ha	4,000		4+4				
18	55.4	22b	Изградба на брана на Чешинска река	30,000		6				
19	55.2	432b	Одредување на подрачја за мониторинг и рефренција		40	3/cont				
20	53.8	418	Надградба на управувачкото-рибарскиот биорон на процена на извозот и уловот	150		3/cont				
21	53.7	25	Оформување на бања на подетоци за наводнување	100		2				
22	53	32	Имплементација на контролни мерки против поплави	5,000		12				
23	53	414c	Изградба на пречистителни станици за отпадни води за помали агломерации (<2000 ЕЖ)	2,500		12				
24	52.5	63	Вклучување на инвентаризација на приватните бучари	200		3/cont				
25	52.2	427	Надградување на капацитетот на фармерите за соодветно одлагање на опасен отпад и користење на пестициди	50		2				
26	51.8	56	Планови за фармерите за соодветно управување со напојувалиштата	0		1				

Effects – Environmental objectives

Objectives	Sub-objective	Indicators		Alternatives		
				"0" No action	1 Realistic	2 Full WFD
Overall Objective 1: Improvement of environmental conditions ensuring good water and soil quality for human health and ecosystem by 2025 Indicator: Measurable decline in levels of the main pollutant groups and pressures on water, sediment and biota	1a: Good surface water quality:	Reduce/prevent further eutrophication/organic pollution				
		Reduce/prevent further hydromorphological changes				
		Reduce/prevent further habitat fragmentation				
		Maintain biological water quality (phytoplankton, macrophytes, invertebrates and fish)				
		Reduce/prevent hazardous substances pollution				
	1b: Good groundwater quality:	Control water abstraction				
		Reduce/prevent water pollution from point and non-point sources				
		Maintain good physical and chemical characteristics				
	1c: Good ecological	Reduce/prevent further eutrophication/organic pollution				
		Reduce/prevent further hydromorphological changes				
		Reduce/prevent further habitat				

- **ECONOMIC ANALYSIIS**

- **Cost-based valuation method** –

based on the assumption that the cost of maintaining an environmental benefit is a reasonable estimate of its value.

- **Necessity of Assessing Disproportionate Costs**

an approach for determining whether the total costs of the programme of measures are disproportionately costly is relevant for justifying derogation.

- In a **cost-effectiveness analysis**, the costs of a particular environmental measure are expressed in monetary units, while the environmental effect of the measure is expressed in physical units such as the reduction in the number of tonnes of nitrogen or phosphorus loaded in the aquatic environment.

- **The following assumptions were taken into account:**

The expense of each measure has been estimated/calculated by the expert team. Each expense is increased for running costs. Direct costs (made up of mainly financial and administrative costs) are included in all components of the economic assessment. Financial costs are the costs of providing and administering water services. Operating costs are all the costs incurred to keep an environmental facility running (e.g. material and staffing costs). The operating costs should take into account additional costs to ensure new capital investments. Maintenance costs are the costs of maintaining existing (or new) assets in good functioning order until the end of their useful life. Capital costs include new investments, the cost of new investment expenditures and associated costs (e.g. site preparation costs, start-up costs, legal fees). Associated costs are also substantial.

- C. The **discount rate** used for the calculation of expenses is 6%. The factors taken into consideration in determining the discount rate include the following: the reference rate of the Central Bank of the Republic of Macedonia (4% at the moment of the determination of the discount rate); the annual rate of EURIBOR (2.14% at the moment of determining the discount rate); and the macroeconomic policy of the Republic of Macedonia, according to which the rate of inflation is expected to be between 3% and 5%

- D. The measures are divided into **two groups**.

- The first group of measures refers to water used for irrigation. The first group of users consists of farmers who will use the water for irrigation. In this group, one hectare of agriculture area is considered as the cost unit. The total irrigation area is 4,000 hectares.

- The second group of measures refers to the treatment of wastewater. The reason for this classification is to enable the distribution of the costs for the measures per unit. The second group of users consists of the legal entities that will be included in the treatment of wastewater, in which group households and legal entities are considered as cost units. There are 4,000 households and legal entities (companies and institutions) in the area.

- E. Two periods have been taken into consideration in determining the payback period: 40 years and 20 years.
- In the first case, the expenses for the implementation of the measures are expected to be recovered over a longer period, i.e. 40 years, which represents the average useful life of the dam.
- In the second case, if the measures are implemented by issuing concessions for operation of the dam or the establishment of PPP, the private investor is interested in recovering the investment in a shorter period and therefore the payback period is calculated as 20 years.
- F. The Annual Equivalent Cost (AEC) method allows for converting the Net Present Value (NPV) of a new capital expenditure into an annuity (or rental) which has the same value. This is done as follows:
- 1. By listing all capital expenditures as they are incurred;
- 2. By calculating the net present value of expenditures, using the chosen discount rate;
- 3. By converting this net present value into an annual equivalent cost (AEC)

ECONOMIC ANALYSIS

Table17. Municipal and industrial water supply, consumption and revenue

	Covered Area	Number	Water Consumption m3	Price MKD/ha	Cost MKD
Population connected to public WS system	Resen	13.600	720.000	22,3	16.056.000
Population with self-supply	16 villages	4.000	200.000	22,3	4.460.000
WS – industry & companies	Resen	300	180.000	37,73	6.791.400

Table 19. Revenues from water delivered to users

Description	Monthly Quantities In m3	Current Price	Monthly Revenues	In %
Citizens	43.765 м^3	16.25 MKD/м^3	711.181 MKD/мес	69.56%
Companies	11.317 м^3	27.50 MKD/м^3	311.217 MKD/мес	30.44%
Total:	**55.082** м^3		**1.022.398 MKD/мес**	**100.00%**

Net present value (NPV) calculated for the two groups of measures f0r 2 alternatives

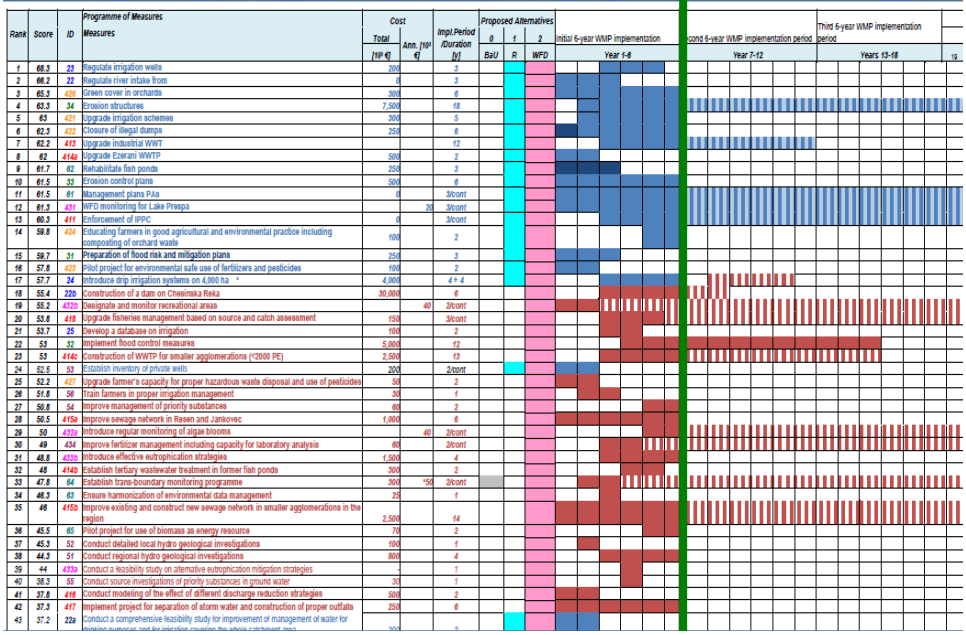
Table 29. NPV - group of measures on water supply & irrigation

Measures for treatment of water for irrigation	NPV ('000 €)	Repayment period 40 years		Repayment period 20 years	
		Annual equivalent cost ('000 €)	Annual cost per ha (4.000 ha) in €	Annual equivalent cost ('000 €)	Annual cost per ha (4.000 ha) in €
Alternative 1 - Full WFD Implementation	42.838	1.071	268	2.142	535
Alternative 2 -Realistic Implementation Strategy	11.035	276	69	552	138

Table 30. NPV – group of measures for treatment of wastewater

Measures for treatment of wastewater	NPV ('000 €)	Repayment period 40 years		Repayment period 20 years	
		Annual equivalent cost ('000 €)	Monthly cost per entity (4.000) in €	Annual equivalent cost ('000 €)	Monthly cost per entity (4.000) in €
Alternative 1 - Full WFD Implementation	8.843	221	4,5	442	9
Alternative 2 -Realistic	472	12	0,2	24	0,5

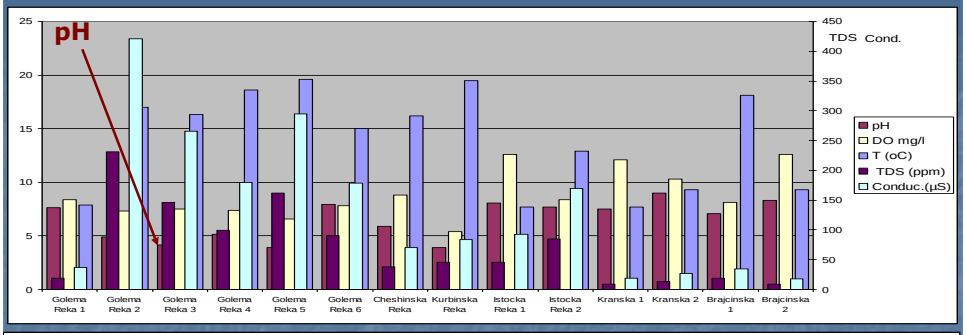
PoM – implementation schedule

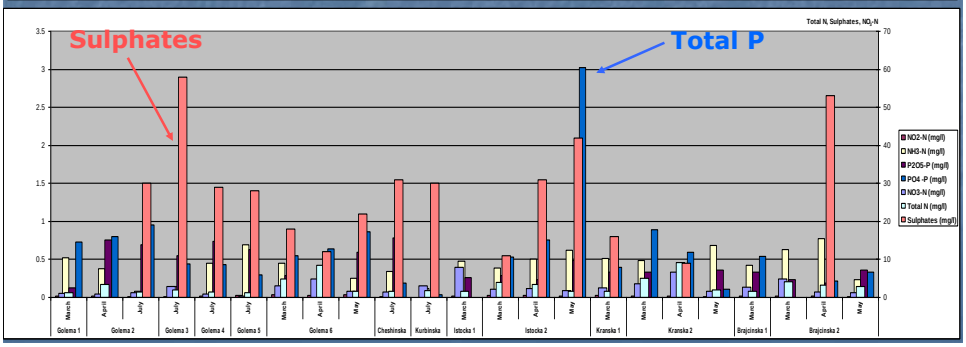


Other EU directives and regulations playing a role with regard to water quality

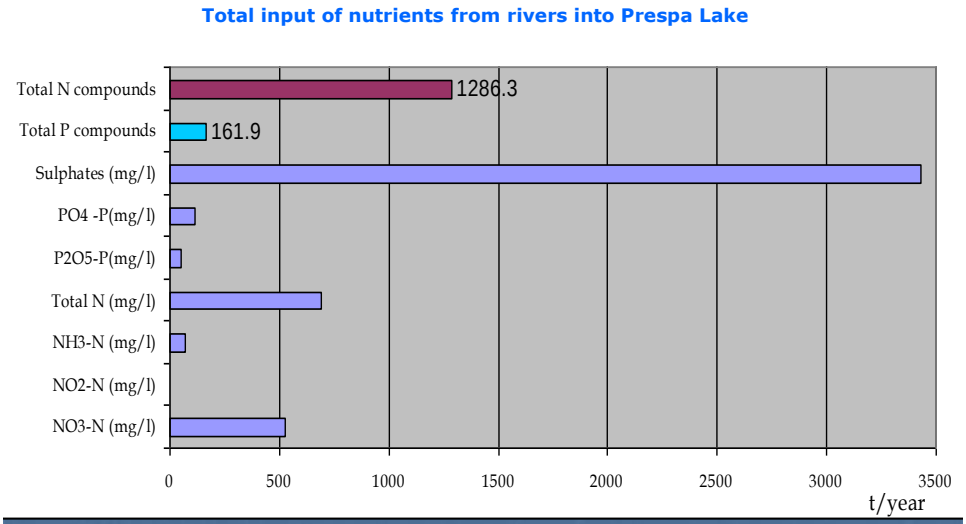
- Legal base Importance for water quality **Regulation on detergents.** Detergents contain an important pollutant: phosphorus. Consumer laundry detergents and consumer automatic dishwasher detergents that exceed aspecified quantity of phosphorus are not allowed to be placed on the market from 2013 .
- **Pesticides directive** - Member States had to adopt and communicate action plans to the Commission by 26 November2012 including measures to reduce the risk and impact of pesticide use on human health and the environment

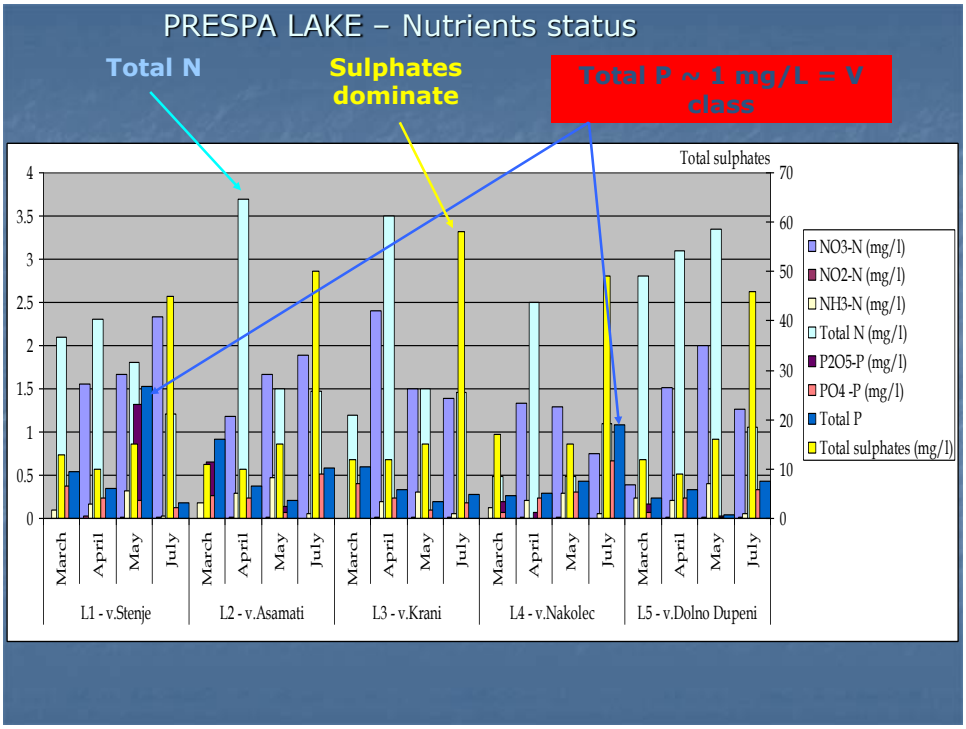
RIVERS – basic physic-chemical parameters



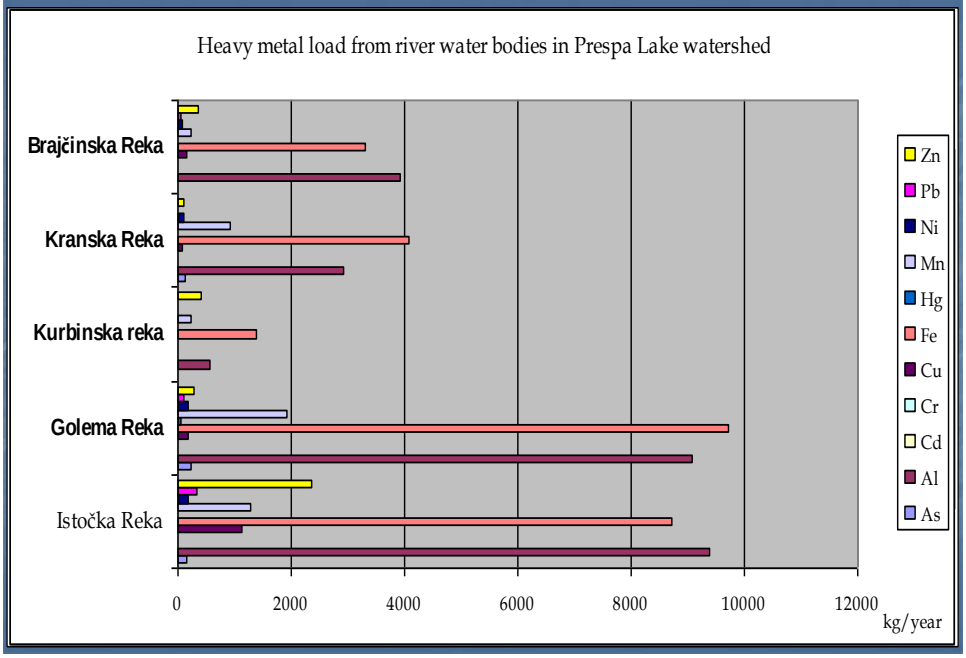


RIVERS – nutrient load to Prespa Lake

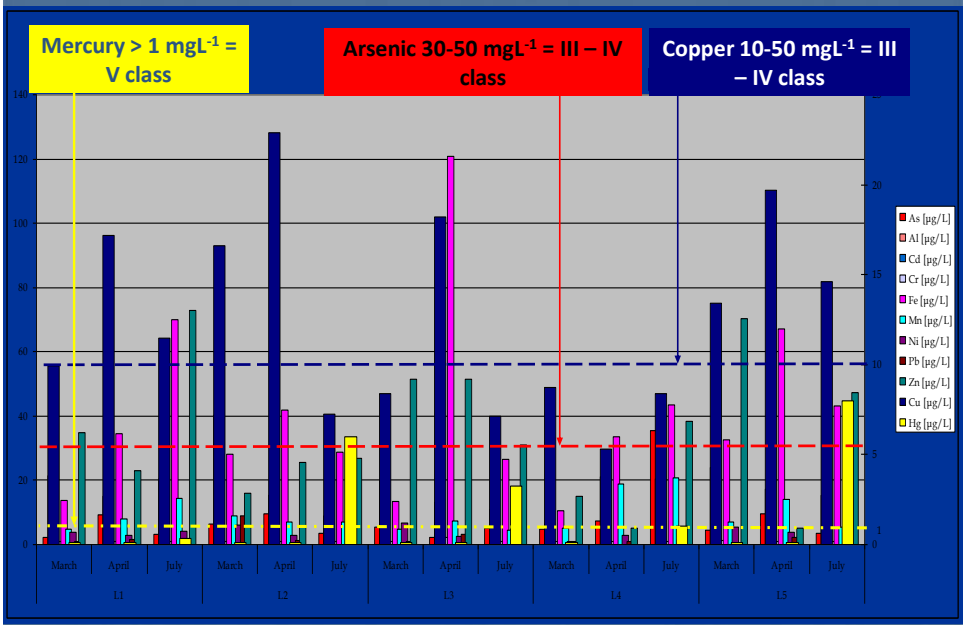




RIVERS – heavy metals load to Prespa Lake

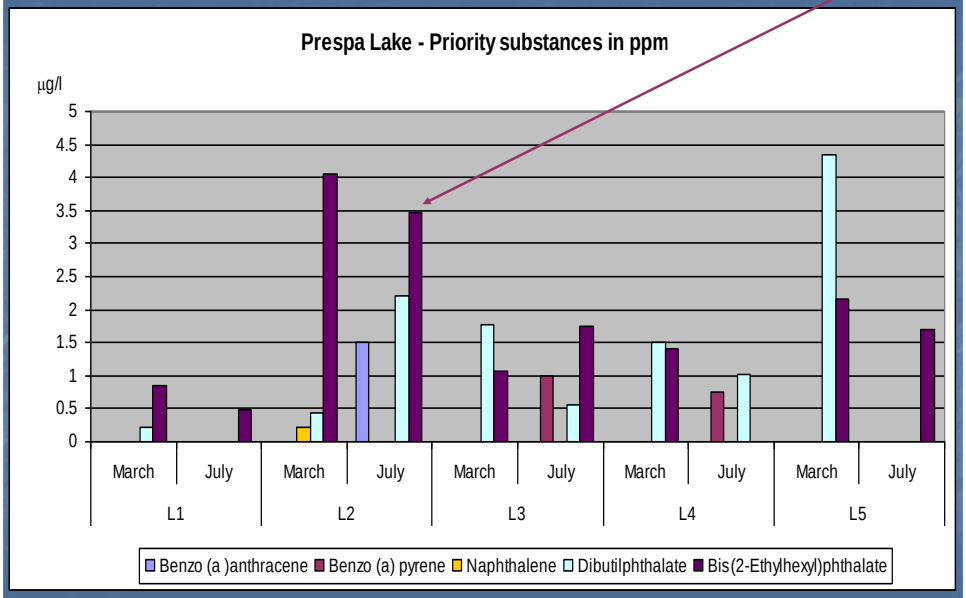


PRESPA LAKE – Heavy metals

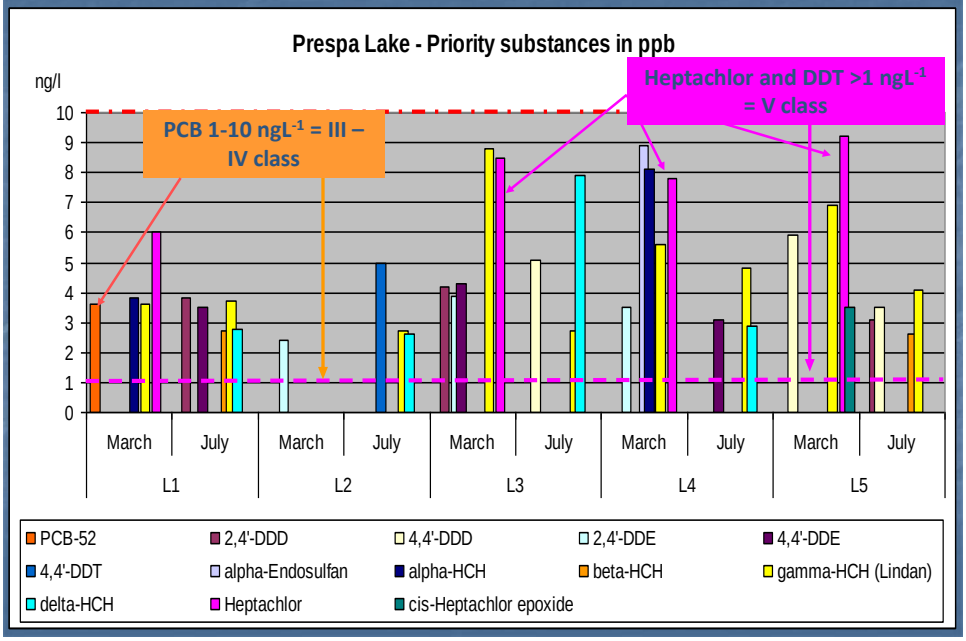


PRESPA LAKE – Priority substances

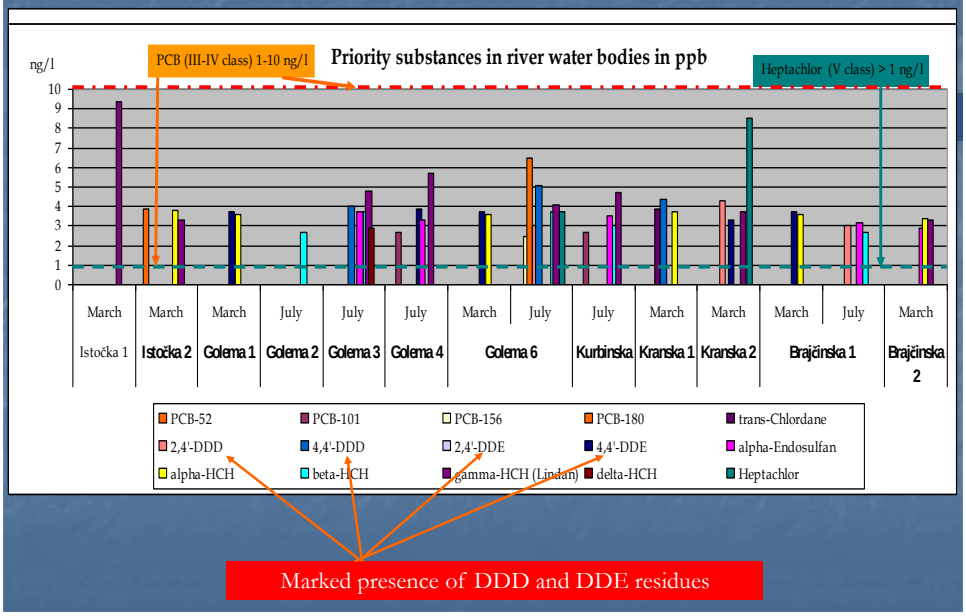
Phthalates dominate as in rivers



PRESPA LAKE – Priority substances



RIVERS – priority substances



Quality elements – Rivers – Biological elements

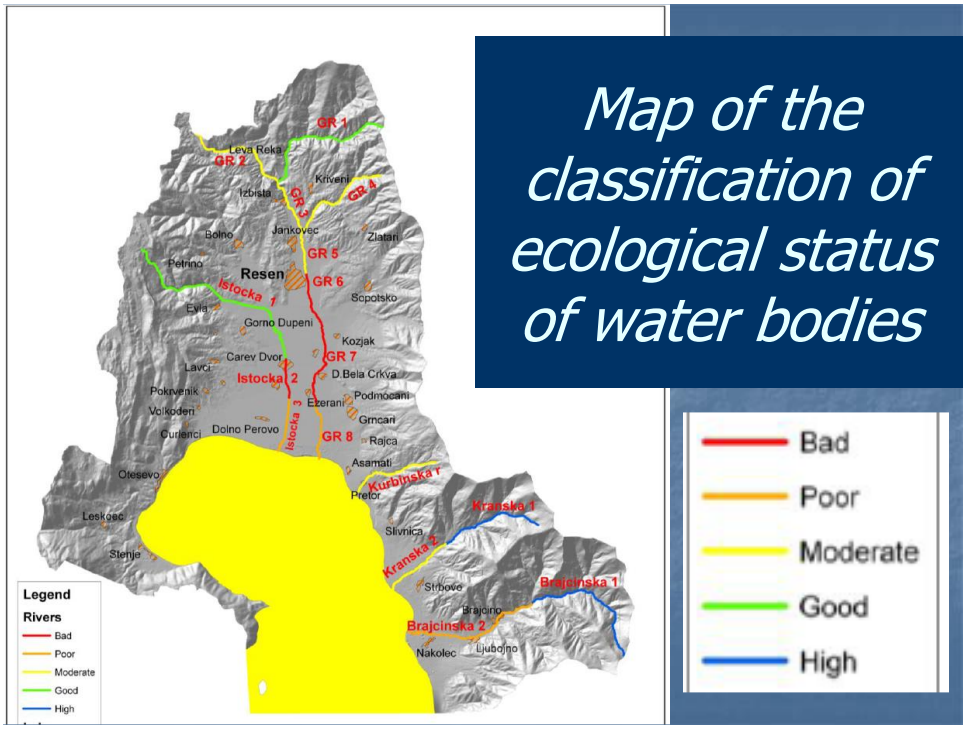
1	Composition and abundance of algae	Ulnaria ulna, Fragilaria capucina, Meridion circulare, Fragilaria pinnata, Navicula phyllepta, Achnanthidium lanceolatum, Amphora pediculus, Achnanthidium jackii, Reimeria sinuata, Navicula lanceolata, Surirella pinnata, Nitzschia linearis, Nitzschia macedonica. Mass development of the filamentous bottom dwelling Pseudoanabaena limnetica.
2	Composition and abundance of benthic invertebrate fauna	Bithynia tentaculata; Bithynia leachii; Tubifex tubifex; Pentapedilum exectum; Chironomus riparius; Cricotopus bicinctus; Erpobdella octoculata

Chemical and physicochemical elements supporting the biological elements – general

1	*Thermal conditions*	Normal
2	*Oxygenation conditions*	Variable
3	*Salinity*	Increased
4	*Acidification status*	Alkaline variable
5	*Nutrient conditions*	Increased

Chemical and physicochemical elements supporting the biological elements – specific pollutants

Pollution by all priority substances	YES
Pollution by other substances (significant quantities)	Yes
Pollutant 1	Bis(2-Ethylhexyl)phthalate
Pollutant 2	Alfa-HCH
Pollutant 3	4,4'-DDE
Pollutant 4	Al
Pollutant 5	Fe
Pollutant 6	Mn
Pollutant 7	Zn
Pollutant 8	Ni
Pollutant 9	Cu
Pollutant 10	As



THE FINAL STATUS OF DELINEATED WATER BODIES

WATER BODY NAME	WB TYPE	STATUS					ACTION NEEDED UNDER	
		High	Good	Moderate	Poor	Bad	UWWTD or ND	WFD
SURFACE Water Bodies - RIVERS								
Istočka Reka 1	1		Good				no	no
Istočka Reka 2	1					Bad	yes	yes
Istočka Reka 3	1				Poor		yes	yes
Golema Reka 1	1		Good				no	no
Golema Reka 2	1			Moderate			yes	yes
Golema Reka 3	1			Moderate			yes	yes
Golema Reka 4	1			Moderate			yes	yes
Golema Reka 5	1			Moderate			yes	yes
Kurbinska Reka 1	1			Moderate			yes	yes
Kranska Reka 1	1	High					no	no
Kranska Reka 2	1			Moderate			yes	yes
Brajčinska Reka 1	1	High					no	no
Brajčinska Reka 2	1				Poor		yes	yes
SURFACE WATER BODIES – HEAVILY MODIFIED WB								
Golema Reka 6	1h					Bad	yes	yes
SURFACE WATER BODIES – ARTIFICIAL WB								
Golema Reka 7	1a					Bad	yes	yes
Golema Reka 8	1a				Poor		yes	yes
SURFACE WATER BODIES – LAKE								
PRESPA LAKE	1L			Moderate			yes	yes


Thank you for your attention