



## EC project on Integration of Natural Water Retention Measures in river basin management

### The 1<sup>st</sup> Danube Region Workshop

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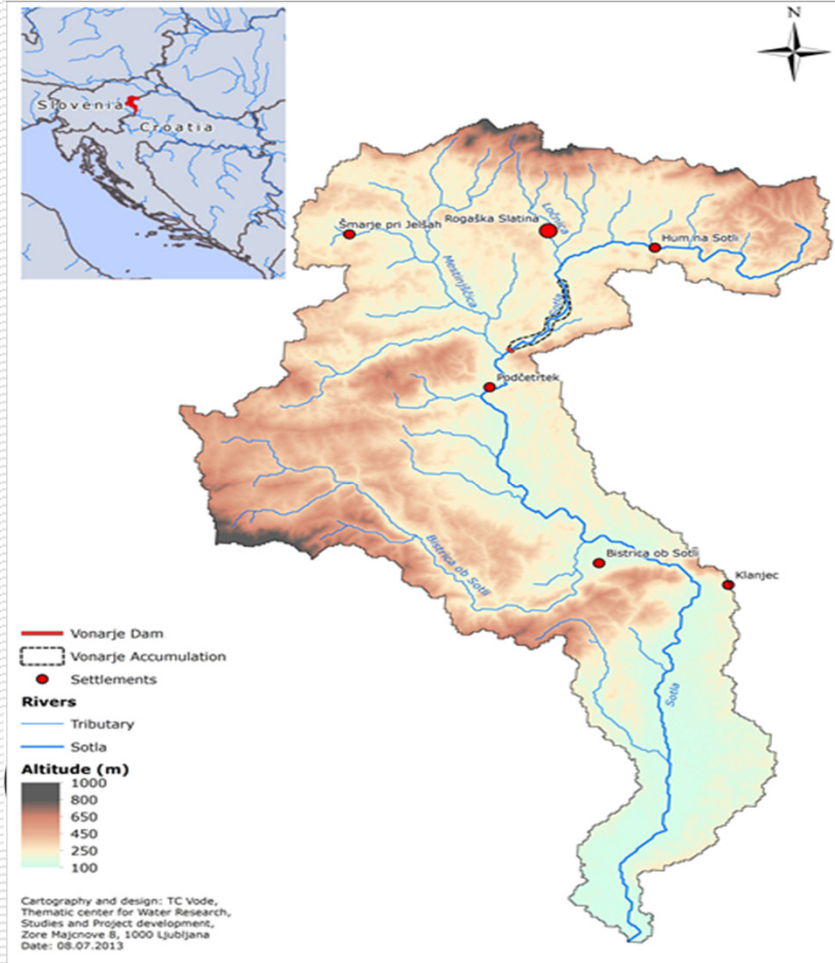
# ANALYSIS OF INADEQUATE WATER QUALITY OF THE RESERVOIR VONARJE/SUTLA LAKE AND POSSIBILITY OF RESTORATION AND UTILIZATION



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# The Sutla River Basin Management Plan not exist



The *Sutla (Sotla) river* forms the border between the Republic of Slovenia and Republic of Croatia.

It is 89 kilometres long and has a watershed area of 584 square kilometres.

The Vonarje reservoir or Sutlansko Lake of 12.4 million m<sup>3</sup> was built and filled in 1980 as drinking water supply and for flood.

# Sutlansko Lake

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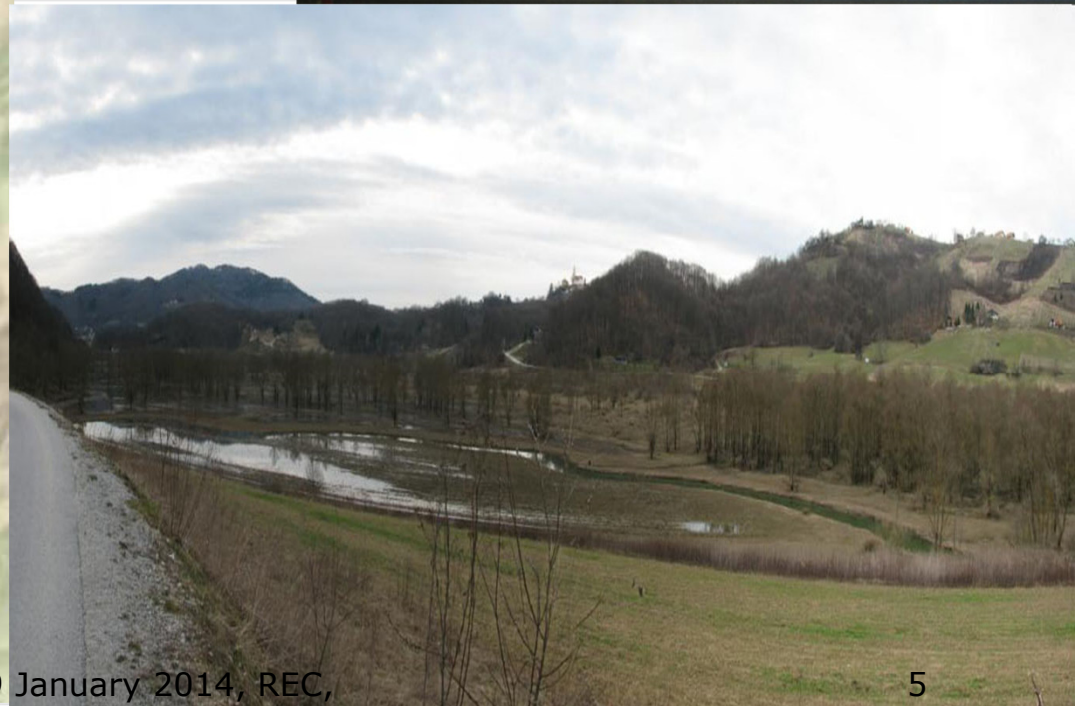
- Immediately after filling, the reservoir showed extreme water quality problem, degrading the use of water
- Due to high risk to human and environmental health that has hardly been managed successfully, the reservoir was drained in 1988.
- Now it operates as a dry retention basin for flood protection.

# Sutlansko Lake in the past and today

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# Sutlansko Lake



28-29 January 2014, REC, Szentendre, Hungary

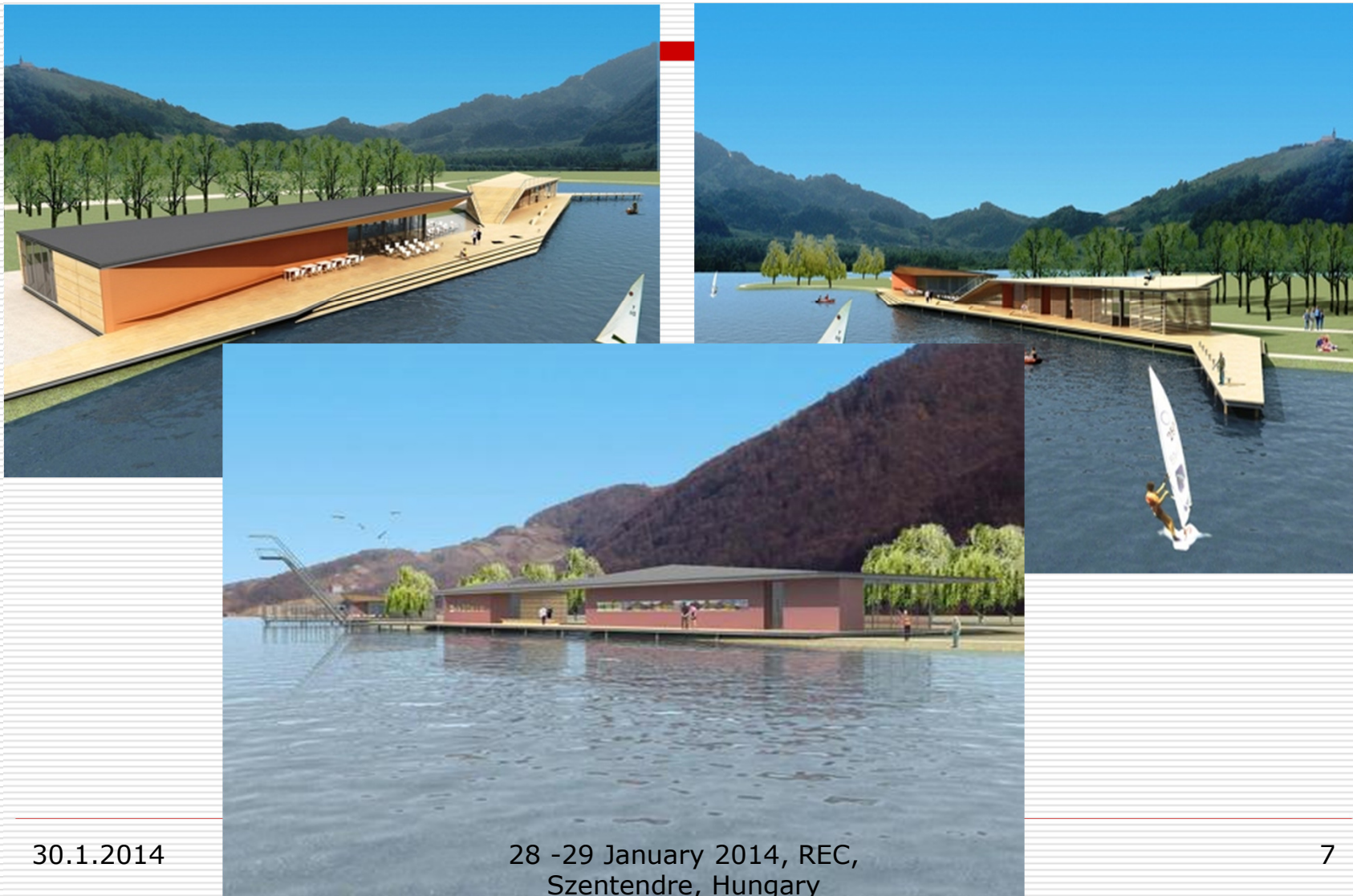
# Sutla river



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# Ideas for Sutlansko Lake as touristical and recreational area



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# Sutlansko Lake - learning with nature

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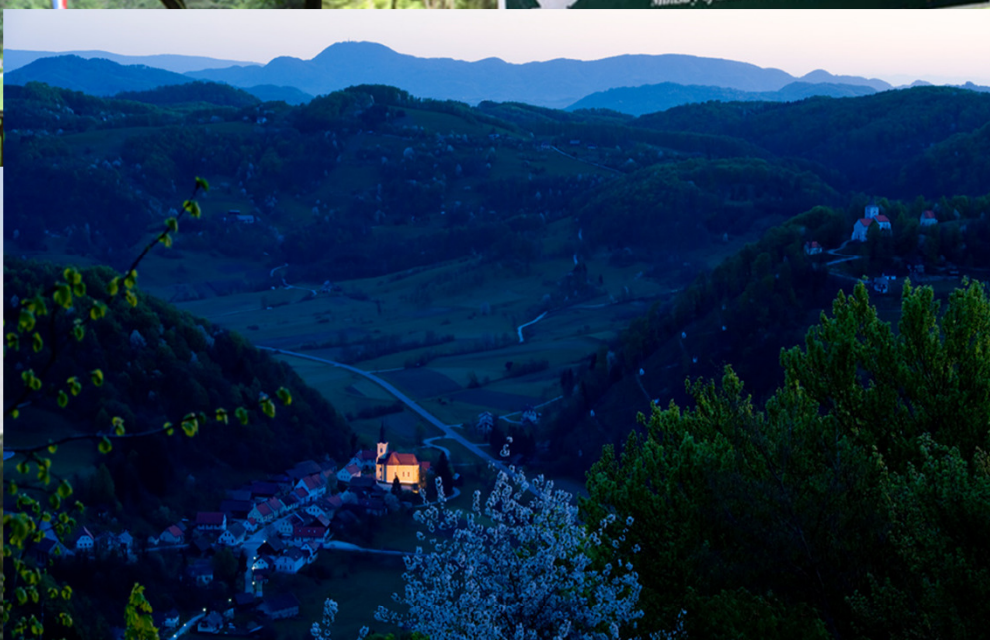
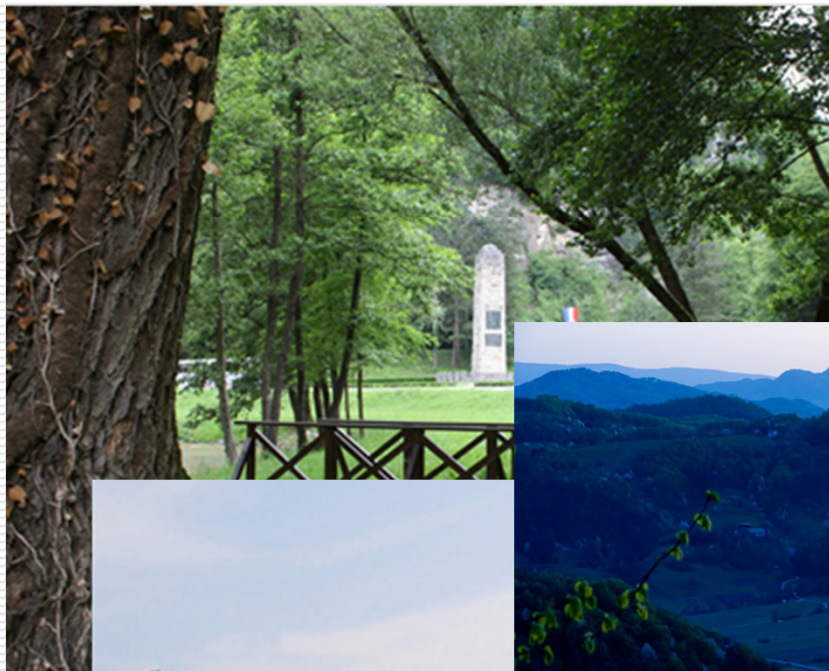
The Sutlansko Lake area with its specific geographical features, as well as ecological and economic characteristics, has numerous water resources and an extremely rich flora and fauna.

This area is considered a wetland, the value of which is reflected in the biological diversity of the flora and fauna, ecosystems, and landscapes.

This region is also extremely important for research and education. In short, there are many reasons for preservation and protection.



# Protected areas



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# Agglomerations and monitoring stations

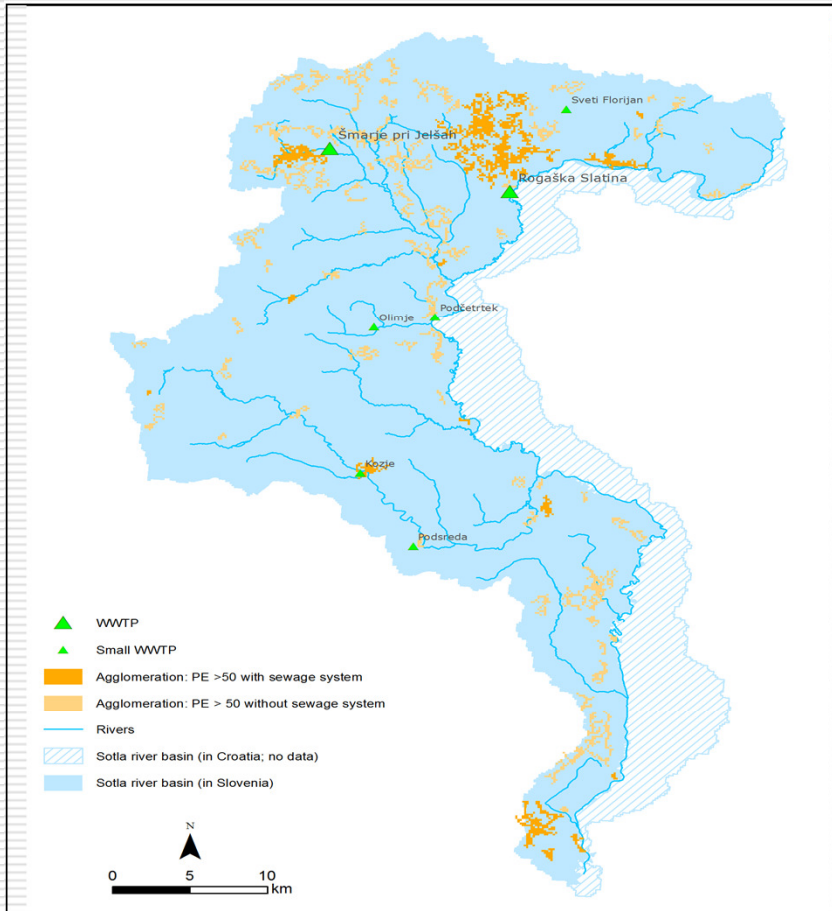


Figure 2: Waster water treatment locations in Slovenia and agglomeratons with more than 50 population equivalents (PE) and with or without sewerage systems.

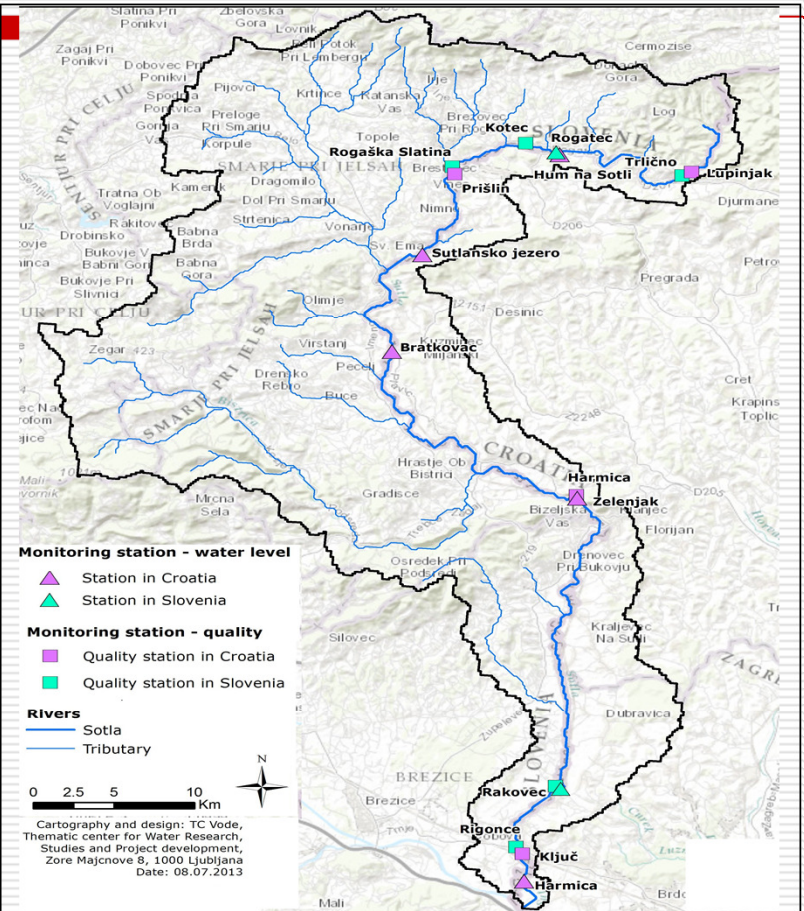
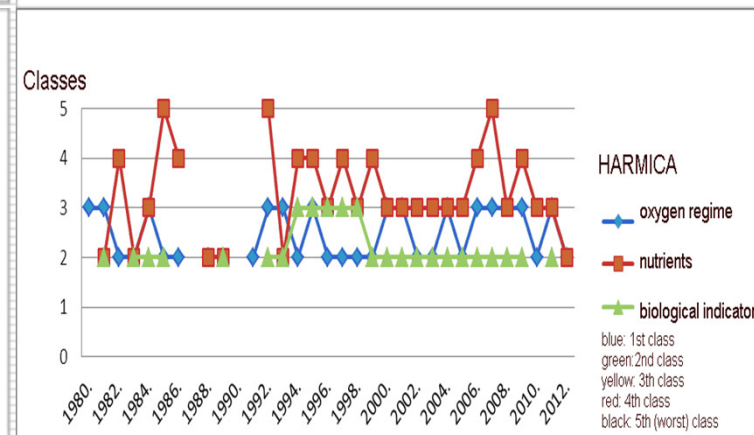
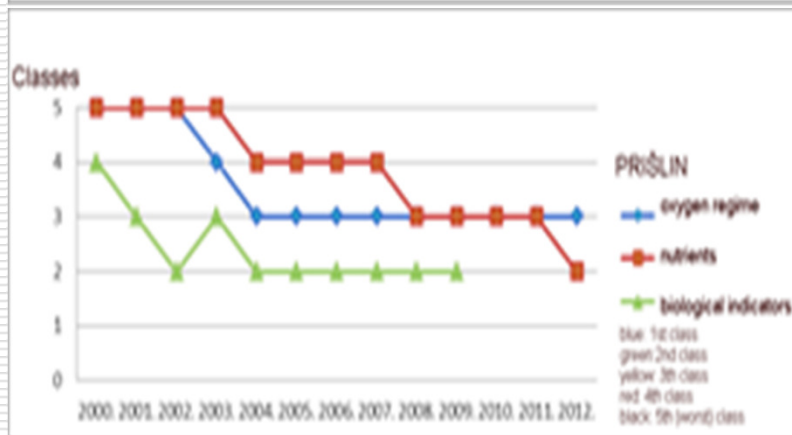
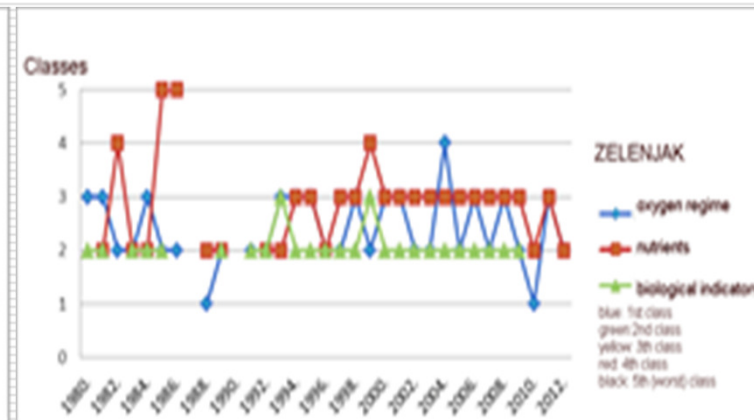
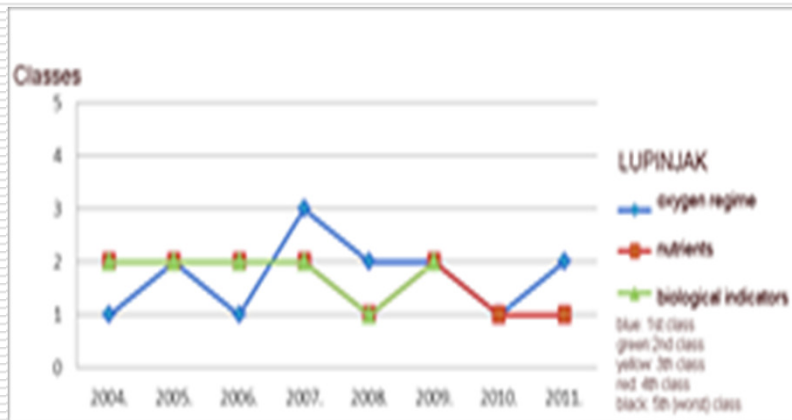


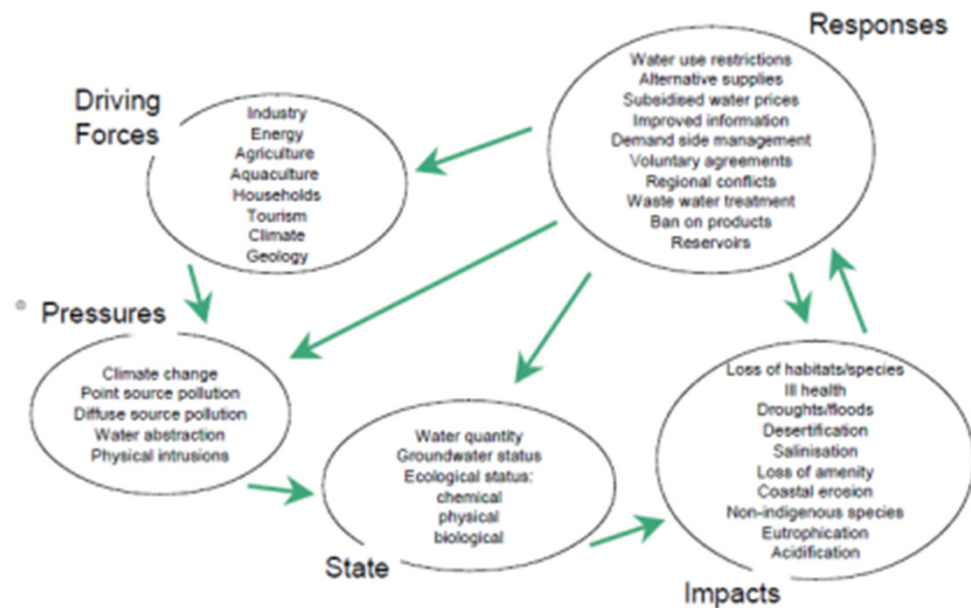
Figure 3: Monitoring stations of water level and monitoring station of water quality

# Trends of water quality classes for four monitoring stations in Croatia



# CONCEPT OF WATER QUALITY MANAGEMENT

The model for the Sutla (Sotla) river and the Sutlansko Lake reservoir applies a life-cycle concept with the the DPSIR framework approach.



# Driving Forces/Pressures on the Slovenian and Croatian side of the Sutla river catchment

	Catchment on the right side of the Sutla (Sotla) river, Slovenian part	Catchment on the left side of the Sutla (Sotla) river, Croatian part		
Surface of the catchment area	459.9 (78% of the whole)	130.7 (22% of the whole)		
<b>Driving forces:</b>	<b>Tourism and recreation (wellness, spa, one one-day), protection of cultural and natural heritage (park, protected monuments), traffic, agriculture, industry</b>	<b>Agriculture, protection of cultural and natural heritage, traffic</b>		
urbanisation: Number of settlements by range of number of inhabitants	Number of :		Number of:	
	inhabitants	settlements	inhabitants	settlements
	<100	33	<100	21
	101-500	47	101-500	41
	501-1000	1	501-1000	3
	1001-1500	0	1001-1500	1
	>1500	3	>1500	1
	<b>Total</b>	<b>84</b>	<b>total</b>	<b>67</b>
Two largest urban areas and number of inhabitants	Rogaška Slatina: 4800 Šmarje pri Jelšah: 1600	Klanjec: 3230 Hum na Sutli: 1240		
Population	38139*	16700		
Population density	85 inhabitant / km <sup>2</sup>	120 inhabitants / km <sup>2</sup>		

# Driving Forces/Pressures on the Slovenian and Croatian side of the Sutla river catchment

Land use**	km <sup>2</sup>	%	km <sup>2</sup>	%
Agricultural land:	285.3	62	85.6	65
Forests	167.1	36.3	28.8	22.0
Inland wetlands	0.7	0.2	0.2	0.2
Urban, Industrial, commercial and transport units	4.6	1.0	2.8	2.1
<b>Total</b>	<b>459.9</b>	<b>100</b>	<b>130.7</b>	<b>100</b>
Agriculture:	km <sup>2</sup>	%	km <sup>2</sup>	%
Arable land	14.0	3.1	0.1	0.1
Heterogeneous agricultural areas	229.7	49.9	59.2	45.3
Pastures	39.6	8.6	26.3	20.1
Permanent crops	2.0	0.4		0.0
Scrub and/or herbaceous vegetation associations	2.2	0.5	13.4	10.2
<b>Total</b>	<b>285.3 km<sup>2</sup></b>	<b>62% of total land</b>	<b>85.6 km<sup>2</sup></b>	<b>65% of total land</b>
	rural population: 10% of the population; the main agricultural activity: livestock; farms are fragmented;		rural population: 30% of the population; the main agricultural activity: vineyards, livestock; farms are fragmented;	
Industry/Entrepreneurship and Tourism/Recreation	Glass manufacturing; sparkling water - drink production; 250 small enterprises (commerce, consulting, banking, construction services)		Industrial facilities in Hum na Sutli, Crafts and manufacturing	
Tourism/Recreation/Parks	Health Center Rogaška Slatina; Spa Center Olimje; Regional park Kozjansko; Landscape parks Boč and Jovsi;			

# CONCLUSION or learning from history

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The Sutla river is a national border between Croatia and Slovenia, but nevertheless the important bridge linking inhabitants on both side of the river that live together for centuries.

The importance of controlling pollution sources confirmed the negative experiences from 1988. when the Sutlansko Lake have been heavily eutrophised and emptied therefore. The downstream quality has deteriorated for years.

The past common practice of the overexploitation of river water for various uses should be limited.

The rising need for development should be coincided with environmental policy avoiding overexploitation of natural resources including protection of aquatic resources.

The increasing hydrological extremes point to greater need for the integreted river basin management that include construction of retention on the upper part of the river basin (Slovenian) to protect downstream parts of river basin (Croatian and Slovenian).



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# Thank you for your attention !