

## **CONTRIBUTION OF HIGH WATER LEVEL TO SELF-REFINEMENT OF THE TISA IN THE YEAR 2000**

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### **Abstract**

The Tisa river with its hydrological characteristics succeeds in resisting human negligence. Nature has given it enough strength to fight the great pollution of the year 2000. By self refinement the level of cyanide is now decreased to the normal value. A sudden rise of the Tisa river after that pollution influenced the intensity of the decrease of cyanide concentration in the river and the river bank belt which can be concluded on the basis of cyanide concentration.

### **Introduction**

The Tisa is an international river with its source in the western piedmont area of the wooded Karpati in Ukraine. The Tracians used to call it "Patissus", and with the coming of the Slavs in the Panonian Plain it was named the Tisa. One of its branches, the Black Tisa has its piedmont area under Svidovica. The Black Tisa's spring is on 960 m height above sea level and its flow to the first tributary is 30 km long. Another branch is called the white Tisa, which has two springs, Lemski and White. The White spring flows on 1700 m height above sea level and it is under the mountain peak of Govela whose height is 2061 m. There fore the Tisa was formed by joining together the white and Black Tisa in Ukraine near the place called Rahov. The length of the Tisa from Rahov up to its flow was before the regulation, 1429 km with an average fall of 3,68 m/km and after the regulation in 1870, its fall was increased up to 4,5 m/km. The river was shortened 452 km so its present length is 977 km [1,2]. The Tisa flows through Ukraine, Romania, Slovakia, Hungary and Serbia & Montenegro. The size of the river Tisa basin is 153 220 km<sup>2</sup>, of which the largest part is in Romania, 47,5% and Hungary 30%, and the smaller part of the basin is in Yugoslavia, 5%. On the mentioned length the Tisa, receives the most of its most important tributaries, such as: Bodrog, Sajó, Zádva, Keres and Moris. Along, with these tributaries a considerable amount of pollution gets into the Tisa.

## Method and material

In the period from 9<sup>th</sup> to 13<sup>th</sup> February 2000, samples of water from the river Tisa were taken in Dala at the entrance of the Tisa in Serbia. The samples were taken every two hours and cyanide concentration was examined. The influence of cyanide pollution on the coasts of the Tisa was determined by taking samples, of water from coastal wells and water from the Channel connected with the Tisa. There was a written record about taking samples from wells, concerning both their depth and the distance from the river Tisa. The samples were alkaliied right after taking them, and then with standard spectrophotometrical method with pyridin-barbitural acid the concentration of cyanide was determined [3].

## Results and discussion

The tributaries of the river Tisa as well as the towns in Potisje are shown in picture 1.



Picture 1: The survey of the river Tisa Basin

From the map you can see that the course of the Tisa can be divided into upper, from the source up to the mouth of Samos middle course from the mouth of Samos to the mouth of Moris and lower course from the mouth of Moris to the Danube. Serbia has lower mouth of the Danube, excluding 12 km which belong to Hungary. In the upper mouth of the Tisa there are gold mines which have waters loaded with elements from flotation (heavy metals, cyanides....). Building dams on flotation lagoons brings to pollution in the flow of water which, was the cause of the great cyanide pollution of the great cyanide pollution of the river Tisa in February, 2000.

Cyanides and increased concentrations of heavy metals in the Tisa appeared on 7<sup>th</sup> February, 2000. Testing the origin of this pollution it was found that this pollution came from the Tisa's tributary Somez in Romania at the place called Baja Mare. A considerable amount of barren soil came into this river from the gold mine. The first indicator of the pollution of water was the pestilence of fish and other aquatic fauna noticed at the Hungarian place Solnoka. According to the data published in newspapers the concentration of cyanide at Solnok that day was 2,8 mg/L. About 50 km downstream in Congrad the recorded concentration was 2,0 mg/L, and 50 km downstream from Szegeed the concentration decreased to 1,1 mg/L. The movement of the pollution wave, actually cyanide concentration in the river Tisa at Dala, at the river entrance in Serbia, as shown on diagram 1.

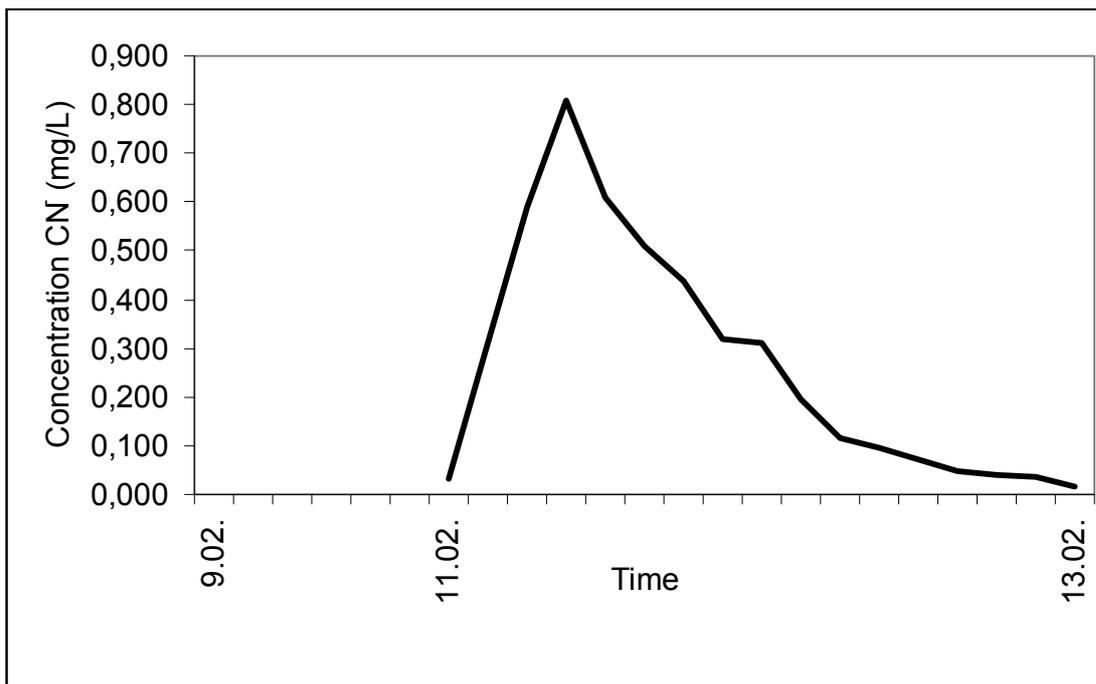


Diagram 1. The movement of cyanide waves in the water of the river Tisa at Dala. The recording of the concentration started at 9 o'clock, on February 9<sup>th</sup>, 2000. The highest level of concentration of 0,810 mg/L was on February 11<sup>th</sup>, 2000 at 5 o'clock p.m. From that time period at that place of taking samples the concentration of cyanide was decreasing, and on February 13<sup>th</sup>, 2000 at 7<sup>30</sup> it was 0,015 mg/L. It is important to mention that on the very spot with the concentration of 0,030 mg/L on February 11<sup>th</sup>, 2000, fish began to die. According to the available data, it was only on February 18<sup>th</sup>, 2000 when cyanide concentration decreased under 0,01 mg/L. In order to be able to

see the influence of pollution better, some surveys and analyses were taken near the course of the Tisa. Since the underground waters of Potisje are closely connected to the Tisa, in the period from 10<sup>th</sup> to 18<sup>th</sup> February 2000, some surveys and analyses of cyanide were done in some wells near the Tisa.

Table 1. the values of cyanide concentration in the underground water from a well near the Tisa

| Place         | Depth of the well ( m ) | Distance of the well from the Tisa ( m ) | Maximal concentration of cyanide |
|---------------|-------------------------|--|----------------------------------|
| Padej         | 90                      | 150                                      | 0.006                            |
| Novi Knezevac | 200                     | 2000                                     | 0.001                            |
| Sanad         | 150                     | 500                                      | 0.002                            |

From this table you can conclude that underground cyanides came to the wells from which sample water was taken. The wells which were lower and closer to the Tisa had higher concentration, while those which were farther from the Tisa and deeper had lower levels of concentration. Beside the analysis of underground waters the concentration of cyanide in the channels connected with the Tisa also followed. Therefore in the channel near Nov Knezevac the recorded concentration was 0.012 mg/l, while the concentration at the place where the river Zlatica flows into the Tisa was 0.016 mg/l. Ecological consequences of this pollution of the Tisa have been more or less lowered by a sudden coming up of water level at the Tisa, by letting the water flow from accumulations. After this period nature itself seemed to have a good ear, so the water level of the Tisa was quickly increasing thanks to melting snow from the Karpati. Very high flows in the period from March to May brought with them all the same time there were no bog deposits of suspended substances, so the river cleared very quickly.

### **Conclusion**

The pollution of the river Tisa surely had its influence on the flora and fauna of the river Tisa as well as its coastal parts. Hundreds of kilos of fish died, as well as crabs, shells, planktons, insects, birds in coastal areas. According to the available data we can conclude that the river Tisa with its all hydrological features has managed to resist all the impacts of human coming up of the water level of the river, a great ecological catastrophe in Potisje was prevented. With a very high spring coming up of the water level from the melting of snow from the Karpati (March-May) it seems as if nature itself took part in the struggle for its preserving, so the river Tisa has been very well cleared.

### References:

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3. Drinking water, Standards methods for research of hygienic validity, Federal Institute for Health Care, NIP "Privredni pregled", Belgrade, 1990.