

ANTHROPOLOGICAL INFLUENCES OF THE TISA RIVER

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Abstract

The area of the Tisa river-basin situated in Yugoslavia represents the region of the first-rate economic importance. Connected with this, water quality of the Tisa river is viewed from the aspect of influence exerted by agriculture, population, industry and transport. To make this aspect of influence complete, marking of pollutant according to the belonging branch of industry was performed in this paper. On this basis, it was concluded that when degradation of water quality of the Tisa river is concerned, the region of Senta should be particularly stressed. By monitoring water quality of the Tisa river before and after flowing out of drainage and industrial waste waters from Senta region, it was tried in the exact and reproductive way to demonstrate and analyse the changes in the Tisa river quality. Besides the marking of the pollutants and determination of the Tisa ecological status, the first step in the planning of protection and saving the ecosystem represents the markings of zones which are protected as natural goods. The emphasis is given to protected zones and their marking on the map.

Key words: Tisa, protected zones, cadaster, pollutant, water quality.

Introduction

The beginning of the research of the Tisa and Potisje dates back from the end of the XIX and the beginning of the XX centuries. This research was mostly realized by Hungarian and Serbian geographers, botanists, hydrologists, and ihtiologists. After the incident with cyanide in February 2000, an initiative was proposed and the cadaster of the pollutants for the region of Rumania, the Ukraine, Hungary and Slovakia [1,2] and Serbia [3] was made. Almost two centuries long human activity on the regulation of the Tisa river basin (reduced length by 463 km) and its bank area and the introduction of intensive scientific farming measures have caused damage to the ecosystem of this region. The consequences of this occurrence are evident changes, some of them irreparable, which imposes a need for a long term research and registration of certain pollutants. Since the Tisa entering our country passes through the regions of Backa and Banat, which are predominantly arid agrarian area, water for irrigation, water quality monitoring of the river Tisa as well as sanction application to pollutants are of great importance. In recent years a lot of work has been done on making the register of pollutants and water quality inspection of the river Tisa itself and the waste waters flowing into it as well as on the possible

protection of the river Tisa and Potisje with special regard to protection of particular, geographically protected areas [4-7].

Methods and materials

Noting and systematization have been used to recognize the anthropogenic effects on the river Tisa and establish to which extent they are measurable. It is not possible to list the effect of all pollutants in such a short report so the region of North Banat was chosen as a representative one since it is agrarian and water for irrigation is of great importance. Classification of the pollutants according to their area of activity has been done based on data obtained from the cadaster of pollutants [3], information obtained in field around the Tisa and material from the Ministry of Ecology [8] and the Institute for Nature Protection [9]. On the basis of this systematisation the pollutants are marked on the map as well as the natural resources under state protection (figure 1). Since it has been observed that in the area around Senta the most pollutants releasing waste water into the Tisa are located, the effect of industry waste waters and municipal waste waters of the town Senta on the water quality of the Tisa has been investigated. Samples of water were taken at two points, at 122 km of the water stream immediately before waste waters from Senta flow into it (location 1) and at 104 km in Padej immediately before the Zlatica inlet (location 2). Taking samples was done twice and that was at a high water level flow (380 m³/s), which is shown in figure 2. and at a low water level (568m³/s), which is shown in figure 3. On basis of the obtained results it has been tried to show and analyse exactly and reproductively, to certain extent, the quality changes of the river Tisa.

Results and discussion

The pollution of the Tisa in Serbia is due to various human activities performed either on the river banks or along the whole waterstream of the river Tisa. Figure 1. shows a map with pollutants which release their waters into the Tisa and its tributaries and whose water quality can affect water quality of the Tisa. The pollutants are classified according to industry branches and those are: food-processing (sugar refinery), oil, chemical, machine tool, building material, agricultural, textile, electric, pharmaceutical, paper, leather and plastic industries and farms. This classification provides an easier approach to establishing the ecological status of the river Tisa and suggesting the measures needed to cleanse the water and remove negative impacts caused during the degradation of the Tisa river-basin. As regards to the impacts on the water quality of the Tisa, they can be classified into groups according to impacts caused by:

a) agricultural activity

It is known that the Tisa comes to Serbia with degraded water quality. Being a navigable river it is also exposed to pollution due to transport activity. The area of the river-basin in Serbia represents an area of major economy importance. The Tisa is part of a large hydro system Canal Danube-Tisa-Danube (DTD) which covers the largest part of Vojvodina. Considering that the water from the Canal DTD is being used for irrigation of the land, its importance for food production is immense. Irrigation system in North Banat is of great importance for this is exceptionally arid agrarian area where water for irrigation has a great importance [7].

The largest and at the same time the most important in this area, when it comes to transport pollution in the Tisa, is Kikinda Canal with its tributary the Veliki Canal [5].

Apart from irrigation and drainage, this canal network is being used to drain both treated and not treated waste water from settlements, industries and farms. The map shows that a large number of individual and state farms, which discharge large quantities of waste waters, are located in this part of North Banat. Waste waters from farms and dairy Gornji Banat flow into the Veliki Canal. Considering the great economic potential and usage of all scientific farming measures in modern agriculture, many pesticides, heavy metals, nitric and phosphoric compounds can be washed away into the Tisa from this cultivated land. The river Zatica which can "import" pollution from Rumania also flows into the Kikinda Canal. During the period October-March when the canals are in function of draining, a considerable amount of pollution from them is brought into the Tisa.

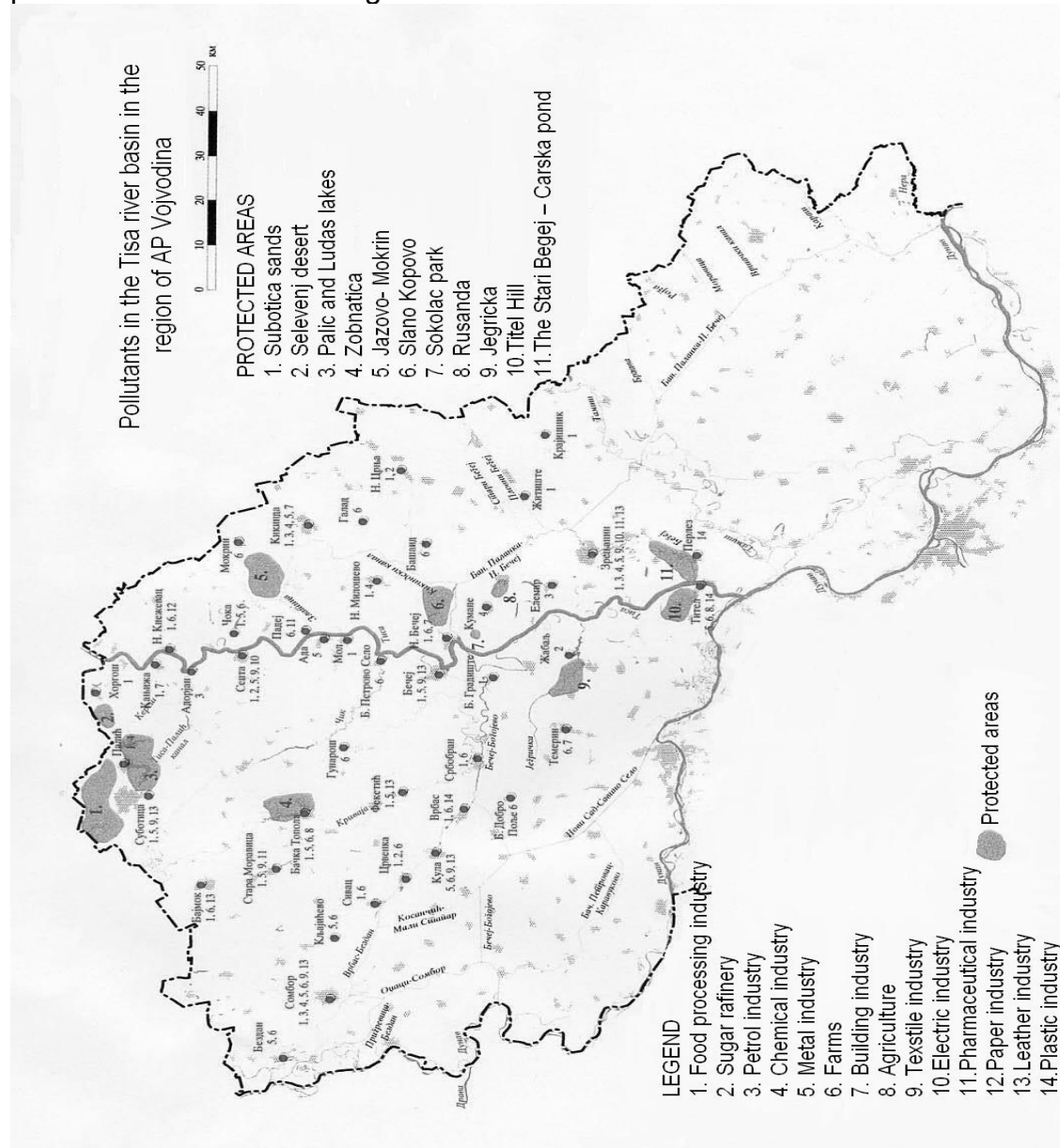


Figure 1. Pollutants in the Tisa river basin
b) settlements

Big settlements such as Kanjiza, Novi Knezevac, Senta, Ada, Mol, Backo Petrovo Selo, Becej, Novi Becej and Titel as well as a large number of small settlements are located on the Tisa banks and so large quantities of municipal waste waters which besides feces contains various organic and inorganic pollution are discharged into

the Tisa. On this relation waste waters from Kanjiza and Novi Knezevac along with the water from the fishpond which has a high organic load flow in. Via the tributary Keres, waste waters from the region of Subotica flow into the Tisa. It has already been found that the deterioration of water quality of the Tisa in its upper stream from Djala to Senta was caused anthropogenically by higher contents of “nutritious substances” (phosphate and certain kinds of nitrogen [8]. Pollutants of this kind besides industry are mostly agriculture and municipal waste water.

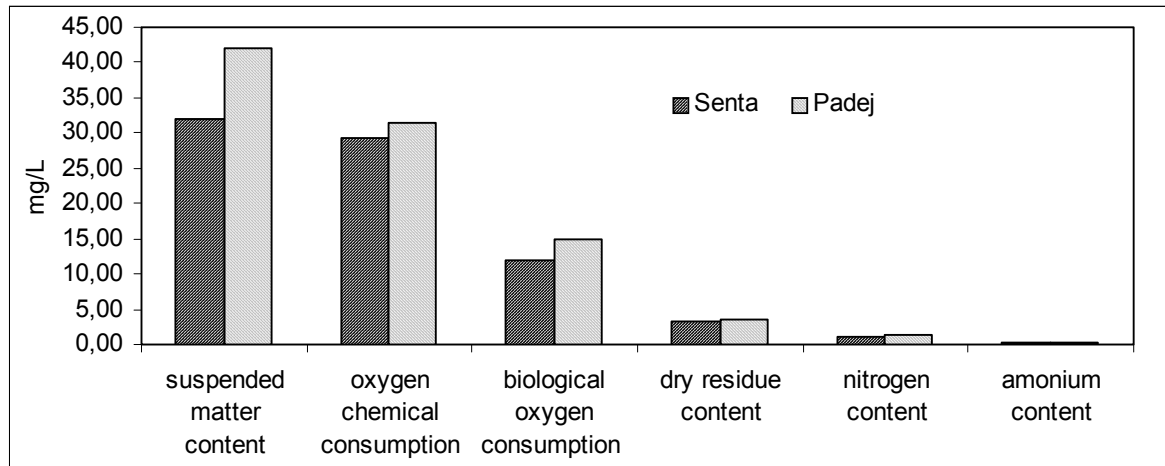


Figure 2. Water quality parameters of the river Tisa (27.09.2001, flow rate 1300 m³/s)

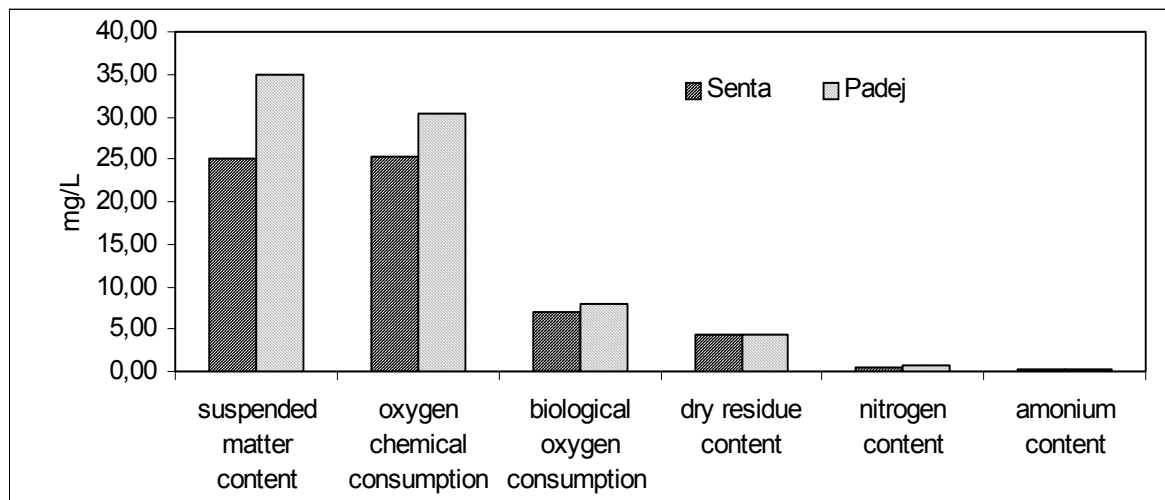


Figure 3. Water quality parameters of the river Tisa (23.10.2001, flow rate 568 m³/s)

c)oil refining activities
 In this region there is a large number of geothermal and oil borings which cause problems because of lying waters (high contents of minerals, oil, phenol various salts and substances used to demulsify oil). In the middle part of the river stream after the inlet of the Keres into the Tisa, the increase of the pollution by oil hydrocarbons was noticed and that is the consequence of water inlet near the place of Adorjan where large oil tanks are situated and where lying waters occur. Similarly in the region of Upper Banat near the Veliki Canal there are three lagoons where lying waters collect and then flow into the Tisa via the Kikinda Canal.

d) industry production

The map shows that in this region there is a wide variety of industry (chemical, paper, textile, machine tools, building materials) and sugar refineries which discharge large quantities of waste water. Of all these very few have a system for purification of waste water so many of them discharge waste water directly into the

Tisa or sewage, septic tanks or canals which again transport polluting materials to the Tisa. Waste waters from food processing and paper industries in the region of Knezevac flow into the Tisa without previous treatment. Waste waters from industry (machine tools, chemical, food processing) from the region of Kikinda get into the Tisa via the Kikinda Canal. Industry waste water from the region of Coka flow into the Tisa via the Coka Canal. For the impact on water quality of the Tisa, the region of Senta is worth mentioning. At this point waste water from sugar refinery and fermenting industry as well as municipal waste water flow in. Waste waters from these industries have a large organic load, which is also significant during campaigns in the refineries. As the river Tisa has been classified in the second category by the decree of water classification [10,11]. Waste water effects on this already partly degraded water quality of the Tisa in the region of Senta are represented by quality parameters of chemical investigation of the river Tisa performed at 122 km of the river stream before the waste water inlet from Senta (location 1) and at 104 km at Padej (location 2). On basis of these diagrams it is evident that suspended matter, dry residue, chemical oxygen consumption, biological consumption, nitrogen and ammonia were higher on location 2. In addition to total organic matter content, biologically degradable matter content was increased indicating that in this region, waters loaded with biodegradable matter flow into the Tisa. These analyses show that according to water quality parameters of the river Tisa, quality degradation on the relation from Senta Bridge to Padej may be stated. The intensity of this degradation depends on the flow rate on the dam in Novi Becej.

Conclusion

The data collected from the previous investigations and the results of the Tisa samples analyses show that anthropogenic effect on the water quality of the Tisa is expressed in the region of North Banat. The quality of the river Tisa downstream from Djala is deteriorated both through anthropogenic habitats and direct effects on the river Tisa. It may be stated for sure that significant degradation of water quality and eco system is due to pollution emission which occurred in the Senta region, which is confirmed by compared parameters of water quality from the location of Senta and Padej. Although certain industries in this region were identified as the cause of the water quality degradation of the Tisa, other pollutants such as fish ponds, farms, agriculture and municipal waste water should be taken in consideration.

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