

## ABANDONED OPEN PIT MINE AND ECOLOGICAL TOURISM

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***Abstract:** The paper presents a brief overview of the impact of mining works on the environment, the attitude of the local community and the authorities towards abandoned mining facilities. On the concrete example of the abandoned surface mine Šićki Brod, this type of route is presented, as well as the way in which the local community successfully fought for the preservation of its environment and the needs of the population of Tuzla and Tuzla Canton. Also, a critical review was given of the mining company that left the care of preserving the abandoned mining area to the local community and the interests of the authorities that go to the advantage of the energy community of Bosnia and Herzegovina, and not looking at the health of its own population.*

***Keywords:** open pit mine, lake, re-cultivation, ecology, tourism.*

### 1. INTRODUCTION

The coal has long been a traditional fuel and a very important energy source. After the cessation of exploitation of the mineral raw material, not all works are completed, but the arrangement of the area for the future purpose must be done. In some cases, there is a conflict of interest between the economic and political community and the local community and environmental associations. An example of such a case is discussed in this paper. At the closed surface mine Šićki Brod during the time after the closure, a lake with 7 underground sources of clean water was formed. Over the years, the surrounding terrain has taken its current form through natural processes and partly through the process of reclamation of the company Kreka Mines, and partly through the involvement of the local community in arranging the area. The interest of the economic-industrial-political top was to form a slag dump from a nearby thermal power plant (TPP) on that site. Since the opening of the TPP, the local population has been exposed to various forms of pollution, primarily air and soil, both due to the products of combustion and due to the proximity of the first landfill for residues from

the TPP. With this idea, there would be additional pollution, but now it would lead to pollution of drinking water sources. Against such a decision was the local population that organized and fought for 20 years in order to prevent the formation of slag dumps. At the same time, they fought for the formation of a recreational and sports park in that place.

## **2. METHODOLOGY AND MATERIALS**

### **2.1. Mining industry**

The economic potentials of many countries are largely built on coal, which should be kept in mind when assessing the dynamics of its development for the 21st century. Today, however, the situation with regard to coal is largely different. Ecological processes in coal production as well as the consequences of these processes are continuously analysed, so today they are approached scientifically [Studija energetskeg sektora u BiH]. As foreseen by the Law on Mining, companies that have exploited mineral resources should, in stages or at the latest after the completion of mining works, protect all degraded areas, sanitize and technically regulate them [Kodir A., Hartono D. M., Haeruman H., Mansur I., 2017]. After that, the land should be biologically reclaimed or its conversion should be carried out, in accordance with approved projects [Antwi E. at all, 2014, Jiang C., Hua Z., Min J., and Xiao-lu C., 2009]. The transformation of the excavated areas, created by the exploitation of mineral resources, is spatially planned, shaped and adapted to the form that will, after the primary, obtain a new function-purpose, appropriate environment and requirements of the spatial plans of the local area and community [Mavrommatis E. and Menegaki M., 2017, Cobârzan B., 2008, Nuric at all, 2019].

### **2.2. Lakes on abandoned pit mine**

There are almost no natural lakes in the Tuzla Canton, but there are several larger artificial lakes, created by building dams that block rivers. Also, it is characterized by numerous water surfaces that were formed after the completion of mining works on surface mines [taken from <https://www.bastina.ba>]. The most famous artificial lake in Tuzla Canton, which was created by the natural accumulation of water in an abandoned mining mine, is the lake Kop, Šićki Brod in Tuzla (Figure 1).



**Figure 1** The lake Kop Šićki Brod in Tuzla

The accumulation area of Lake Kop Šićki Brod in its current form is the result of coal exploitation at the surface mine Šićki Brod in the period from 1971 to 1987, the disposal of overburden and partial re-cultivation of this area. The lake was formed in 1987, after the cessation of surface exploitation, when the final crater remained, on which no technical reclamation of the area was done, but there was an accumulation of groundwater and water from seven small springs and streams. After finishing of surface exploitation, there was no need for further drainage and lowering of groundwater levels, so that the final crater was filled with water, up to 33.8 meters deep. The surface of the lake is 208770 m<sup>2</sup>, the longer length is about 800 meters and the smaller about 500 m, for the water level elevation of 207.8 m above sea level, and the lowest point of the lake is at the elevation of 174 m above sea level. The morphological characteristics of the narrower coastal area and the surrounding terrain are the result of mining works in the final phase of exploitation, and not targeted technical reclamation (Figure 2). This is especially evident on straight and steep banks with a slope of 25°-33°, with pronounced abrasion. The total catchment area of the lake is 1.73 km<sup>2</sup> [taken from <https://www.bastina.ba>]. The configuration of the bottom varies a lot, and only the bottom is gravelly like the shore of this beautiful water which is surrounded by a somewhat extra-terrestrial ambience. The lake is full of small bays and coves surrounded by aquatic vegetation [taken from <https://www.visitmycountry.net>].



**Figure 2** Arrangement at the lake Kop after closure of the pit mine

The lake Kop Šićki Brod is located on the ex-mine of the same name, for which the Kreka Mines have an environmental permit to dispose of 300 ha of reclaimed land. Of that, Lukavac city owns 250 ha and Tuzla 50 ha. No document from this area from the City of Tuzla and the City of Lukavac has been signed that someone allowed a slaughterhouse to be built in this area [taken from <https://energis.ba>; <https://antikorupcija.info>].

According to the new urban plan of Tuzla Canton, toxic slag from TPP Tuzla should be disposed of on the lake Kop Šićki Brod, which would contaminate the land and pollute drinking water, and thus endanger the health of the population. All indicators show that Tuzla is the second most polluted city in Europe. There are three landfills that do not work according to the law. This is an example of how those who decide on such projects today do not care about the future or what they leave to the younger generations [taken from <https://www.slobodnaevropa.org>].

### 3. ANALYSIS AND RESULTS

Obligations remediation of damaged land and the re-utilization of spatial units of the area, prescribes laws at the entity level in B&H, Law on Spatial Planning, Law on Agricultural Land, the Law on Mining, Law on geological research, the Law on environmental protection, and secondary legal acts. The laws have incorporated mechanisms which enable the monitoring of the implementation of that legislation, which is harmonized with European legislation in the field of environmental protection. One of the important documents for the implementation of these laws is the Aarhus Convention, an internationally binding act, above national law. Since the Aarhus Convention enables the local community to actively participate in the decision-making process concerning the quality of the environment and

spatial interventions, it also participates in creating the development of the local community. Finding the right balance between the desires, needs, opportunities, interests of various groups and individuals and achieving compliance with the legal procedure and prescribed norms, often seems an unrealistic goal. Why? First, therefore, it is to respect the above acts, whether they are material or intellectual nature, needed a good capability to their users. Knowledge and proper use of the Aarhus Convention is equally necessary for responsible persons and operators in the competent institutions of the public sector, professional staff of all profiles in the economy (legal entities), in the education sector, NGOs and citizens in general. The procedure for remediation of areas with techno-genic soils and the selection of the most acceptable new purpose must be transparent, so that stakeholders can be involved in the process in a timely manner. The preparation of spatial planning documentation and the creation of development strategies at the local levels of self-government, justifies activities aimed at remediation of damaged areas [Sufi-Micic, Djuric, 2007].

The spatial plan of Tuzla Canton, which was sent to the parliamentary procedure by the parliamentary commission, envisages the construction of a new slag for the Tuzla Thermal Power Plant not far from the TPP, but 200 meters from Lake Kop in the settlement of Šićki Brod, which is why this place was chosen as the most economically viable. At the former surface mine Šićki Brod, after the end of exploitation, one of the cleanest accumulations of water was formed, with the potential for use for drinking. Senad Isaković Roko, president of the Association "Eko-sport" from Šićki Brod near Tuzla, appealed to the deputies in the Assembly of Tuzla Canton do not to adopt the document which defines the destruction of the lake. It was pointed out that there is nothing against the Thermal Power Plant or the State, but that in this case, a new, acceptable solution must be found. If a slag pit is built over the lake, about three million cubic meters of drinking water will be left without it [taken from <https://faktor.ba>; <https://avaz.ba>; <https://rtvbk.ba>].

The slag dump has been the subject of a dispute for a long time between the residents of Tuzla and Lukavac local communities who live near the Tuzla TPP. **If this landfill built in a way that previously built, there will be pollution of groundwater by leaching of certain heavy metals (cadmium, lead and chromium) contained in slag and ash. Sources of drinking water will be permanently polluted** [taken from <https://energis.ba>; <https://antikorupcija.info>].

The earlier controversial proposal of the Spatial Plan of Tuzla Canton was in conflict with the Regulation Plan of Tuzla, which envisages the construction of a modern recreation centre on the site of the lake. Activists are demanding that the area around the lake be used as soon as possible, ie that it be turned into an ecological park that could even bring profit. Otherwise, the damage would be incalculable, because this lake has a huge tourist potential, and if it were arranged with quality approaches, bicycle paths and accompanying elements and facilities, it could be used throughout the year [taken from <https://faktor.ba>; <https://www.klix.ba>].

The Ombudsmen for Human Rights of Bosnia and Herzegovina, after the investigation, determined that the complaint of the Association of Citizens "EKO SPORT" from Tuzla, that a landfill for the disposal of slag and ash, combustion products from the Thermal Power Plant "Tuzla" was formed on the site of this local community, established. The Ombudsmen underlined the provision of the Law on Environmental Protection of the Federation of Bosnia and Herzegovina which stipulates that every human being has the right to live in an environment suitable for health and wellbeing, therefore it is an individual and collective duty to protect and improve the environment, and sent a recommendation to the Federal Ministry of Environment and Tourism Sarajevo and the Ministry of Physical Planning and Environmental Protection of Tuzla Canton Tuzla:

- having in mind the allegations of this recommendation, exclude any possibility of forming a landfill for the disposal of slag and ash, combustion products from the Thermal Power Plant "Tuzla" in the area of the Local Community Šićki Brod Tuzla, ie. re-cultivated land above Lake Kop;

- to take measures within their competence that will enable the citizens of the subject locality to enjoy the right to life in an environment suitable for health and well-being, in the absence of danger to human health, but also to the environment [taken from <https://www.ombudsmen.gov.ba>].

The Government of Tuzla Canton on September 17, 2019. determined the proposal of Amendments to the Spatial Plan of Tuzla Canton for the period from 2005 to 2025. This document definitely established that the area of the former surface mine Šićki Brod will not be a slag dump from the Tuzla Thermal Power Plant. As a slag dump for Block 7 of TPP Tuzla, two options have been left, and which of them will be realized depends on the studies that have yet to be done. The spatial plan will now be adopted by the Assembly of Tuzla Canton, and only after it is finally adopted, the

residents of Tuzla settlements at the western entrance to the city and their neighbours from Lukavac will be able to breathe a sigh of relief.

After 20 years of fighting between the citizens of Lukavac and Tuzla and the industrial lobby, where since 2000, walking literally from house to house, they have collected as many as 4,000 signatures, with the desire to protect the lake, today they finally put an end to it! It was agreed between the representatives of the Municipality of Tuzla and the Municipality of Lukavac that the area around the lake Kop be left as it was - a recreational zone [taken from <https://www.agroklub.ba>; <http://miruhbosne.com>]. There are four other smaller lakes near this lake (Figure 3). Excess water flows from this lake into Mramor creek, and the water is so clean that it can be used for drinking [taken from <https://avaz.ba>].



**Figure 3** The lake Kop with tree smaller lakes nearby

In the past, the lake was never stocked until last year's founding of the Sports Fishing Section "Šićki Brod", and at the Sports Fishing Association "Rudar-Kreka" from Tuzla (Figure 4) [taken from <https://www.visitmycountry.net>; <https://www.agroklub.ba>].



**Figure 4** Stocking of the lake Kop



Some sports and non-governmental organizations have already started arranging the area around the lake, but they have also invited all other citizens to get involved. The members of the Shooting Club "TargeTZ" Tuzla showed how it can be done. They are organized a working voluntary action of cleaning and arranging the coast. Volunteers set up tables and a mini playground for children (Figure 5).



**Figure 5** Playground for children on the lake Kop

They say that this lake is a natural pearl, which has a lot of potential, which has not been used yet [taken from <https://tuzlanski.ba>; <https://tuzlainfo.ba>]. The lake, full of life, under the cover of night shows its wealth. Lake Kop Šićki Brod is an oasis of life, which divers have the opportunity to enjoy, and everyone else through the photos taken (Figure 6, 7) [taken from <https://www.rtvslon.ba>].



**Figure 6** Diving club on the lake Kop





**Figure 7** Underwater world of the lake Kop Šićki Brod

#### **4. CONCLUSION**

There are numerous localities in both entities of Bosnia and Herzegovina, where there is land damaged by surface mining of mineral resources. Thousands of hectares were accumulated about twenty years ago, and the areas with re-cultivation are very small. In addition, new damages occur, for which the adequate measures envisaged by the existing laws and secondary legislation in the field of environmental protection are still not applied. In accordance with the requirements of the new approach to the development of society: damaged mining areas are a chance and a challenge to choose the most acceptable new purpose. It has been shown in practice that there are some key problems, caused by poor coordination, insufficient knowledge of procedures, legal obligations and international norms in the field of environmental protection. The process of transition of society requires more active involvement of the public in decision-making concerning the development of the local community and raising the quality of the environment. This process requires a critical mass, in all profiles and all populations, which knows new skills, adopts new knowledge and obligations in the field of environmental protection. Only in this way, the goal can be achieved, and that is the direction of development with a new better outcome [Sufi-Micic and Djuric, 2007]. The role and obligation of the mining industry in contributing to the preservation of the environment is obvious. The output value of the mine should not only be a ton of ore produced, but also that the mining space after closing should be in line with the needs of the local community while meeting the conditions of environmental friendliness.

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