

## **EXPLOITATION AND USE OF NON-METAL MINERAL RESOURCES OF THE TUZLA CANTON**

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### ***Abstract***

#### **Exploitation and use of non-metal mineral resources of the Tuzla Canton**

This paper analyzes the spatial distribution of potential non-metallic mineral resources in the area of Tuzla Canton. Available non-metallic mineral resources of the Tuzla Canton are classified into three groups: energy (coal), industrial processing (rock salt, limestone, quartz sand, brick clay and magnesite) and construction materials (gravel and sand). Identification of non-metallic mineral resources of Tuzla Canton described and enumerated all the resources by their importance and use, giving a brief analysis of their economic exploitation. Based on field research, current knowledge, collection of various information and documents, the author tries to point out in the paper the economic importance of non-metallic mineral resources and their participation in the economic development of the Tuzla Canton.

#### ***Key words***

Tuzla Canton, non-metallic mineral resources, exploitation.

## **1. Introduction**

Tuzla Canton is located in the northeastern part of Bosnia and Herzegovina and its one of ten cantons in the Federation of Bosnia and Herzegovina. Tuzla Canton has an area of 2,652 km<sup>2</sup> (10.10% of the Federation of Bosnia and Herzegovina and 5.17% of Bosnia and Herzegovina) with 477,278 inhabitants (Agency for Statistics of Bosnia and Herzegovina, Census 2013). It has a favorable geo-traffic position and is connected to the Pannonian Plain and the Adriatic coast. There are 13 municipalities in the Tuzla Canton: Banovići, Dobož-Istok, Čelić, Gradačac, Gračanica, Kalesija, Kladanj, Lukavac, Srebrenik, Sapna, Tuzla, Teočak and Živinice (Spatial Plan for the Tuzla Canton 2005-2025). Tuzla canton disposes of non-metallic mineral resources that formed the backbone of the economic development of this region, which is primarily thought of as coal as the primary source of lean energy production and stone salt on the basis of which the chemical industry developed.

## **2. Materials and Methods**

The exploration of the resource base in this work required an analysis of the spatial distribution of non-metallic mineral resources in the Tuzla Canton. The analysis of the natural resources utilization of the Tuzla Canton was done according to the sustainable development indicators. The selection of indicators is based on the comparison of reserves, production, consumption and needs, on the basis of which indicators were obtained on the use and protection of mineral non-metallic resources of the area. The description gives an overview of the relationship between these indicators for particular issues, their limitations, availability and usability. In addition to each of the segments covered in this paper, thematic cartographic contributions are presented. In addition to cartographic, other graphical and tabular indicators are included in the paper. The methodology of work required the application of a combined qualitative and quantitative comparative method, analysis and synthesis methods. The complexity of the research required the use of data from various sources, in addition to professional literature, statistical indicators, planning and strategic documents of municipalities and business enterprises of the Tuzla Canton were used. The collected material and data are according to their structure, processed by modern geographical methods including GIS technology for presentation of the geographical reality of the Canton.

## **3. Non-metallic mineral resources of Tuzla Canton**

The non-metallic mineral resources present in the area of Tuzla Canton in this paper are classified into three groups: energy (coal), industrial-processing non-metallic resources (rock salt, limestone, quartz sand, brick clay and magnesite) and construction materials (gravel and sand) (Spatial plan for the area of Tuzla Canton for the period 2005-2025).

### **3.1. Energy resources**

The main energy resource is coal. There are three types of coal in this area: lignite, brown coal and coal. Lignite is located in the area of Tuzla, Živinice and Lukavac. The balance reserves of lignite are estimated at 266,689,000 tonnes. The lignite basin "Kreka" (Tuzla) is divided into two synclines (North and South) that extend between the southern slopes of Majeвица and the Spreča valley in the northwest-southeast direction. The northern "Kreka syncline" is located in the territory of Tuzla municipality. The thickness of the coal bed ranges from 8 m to 25 m with the floor

slightly sloping to steep. Tuzla Canton is the most important mining and industrial basin in Bosnia and Herzegovina. Brown coal is located in the area of the Đurđevik (Živinice), Grivice and Turija (Banovići) basins. Reserves of brown coal in the area of Živinice municipality are estimated at 34.253.26 tons (surface mines), in the pit of the Đurđevik mine 35.217.767 tons, and in the area of Banovići municipality 176.842 million tons. (Banovići Municipality Development Strategy 2017-2027). Coal deposits are represented on the Majeвица Mountain (western, central and eastern sides) in the following locations: Straža, Jasenica, Lemeši, Rožanj, Veselinovići and Perda. The thickness of these layers ranges from 3 to 7.5 m, with the balance reserves amounting to 1.1 million tons. Coal is not currently being exploited in this area.

### 3.2. Non-metallic mineral industrial resources

The terrain of this area is rich in significant reserves of rock salt, limestone, quartz sand, magnesite and brick clay. In Bosnia and Herzegovina, only salt rock deposits in the Tuzla area are known from the salt beds to this day. The rock salt deposits around Tuzla formed in the Miocene are of younger geological age, in comparison with the already known deposits in Europe and in the world. The total geological potential reserves of brine in the Tuzla Canton are estimated at 374,377,552 m<sup>3</sup>. The present rock salt exploitation field has been activated at a new reservoir in the „Tetima“ mine, 10 km away from the town of Tuzla. The reservoir covers an area of 393.24 ha and its reserves are estimated at 54,720,000 tonnes ([Http://www.vladatk.kim.ba](http://www.vladatk.kim.ba)).

In the area of Tuzla Canton different lithologic-stratigraphic species of limestone are present. The total geological reserves of limestone so far have been estimated at 62,280,213 m<sup>3</sup>. The largest quartz sand deposits in Bosnia and Herzegovina are located in the area of Tuzla Canton, mainly on the part of the Krekanska Syncline. The „Moluška River“ exploration field covers an area of 50 hectares and extends in an elongated belt about 2400 meters long, from Delić stream in the southwest, and across the Moluška river to the Pasha-bunar stream in the northeast. The width of the investigated part of the layer is 100-200 meters. The direction of delivery is northwest-southeast, with a decrease in a southeast direction, at an angle of 50° to 88°. The thickness of the sand layer ranges from 11 to 130 meters.

The bearing is divided into two separate parts: the larger "west" and the smaller "east". The determined geological balance reserves amount to 4,587, 206 tons. The exploitation field "Bukinje" extends from the stream "Joševica" in the northwest, to the stream "Jezera" in the southeast, about 1100 meters long, the width of the investigated part of the layer ranges from 180-250 meters (sandy substrate of the first roof layer) and occupies an area of about 40 hectares. The direction of delivery is northwest-southeast, with a decrease in the northeast direction of 80-100 meters syncline (Spatial Plan for the area of Tuzla Canton for the period 2005-2025). Potential total reserves of quartz sand were estimated at 14,600,632 tonnes, in the area of the Kreka basin (Tuzla) at around 6 million tonnes, and at the „Šikulje“ mine (Lukavac). The occurrence of quartz sand is at the sites of Pećnik, Kaluđerski brook near the settlement Klokotnica (Gračanica) (<http://tuzla-kvarc.ba>). Magnesite deposits are represented in the southeastern part of the Konjuh Mountains. The contingency reserves are 1,687,000 tons with only 20% of exploration, and exploitation reserves in two of the five lakes are 1.1.74,000 tons. The deposits of brick clays are known at the localities Džebe and Kulići (Gračanica), at the sites Ratiš, Lipje, Seona, Dedići and Gornji Moranjci (Srebrenik). Potential reserves of brick clay in the area of Tuzla Canton are 200,000 tons.

### 3.3. Construction materials

Gravel and sand as a river bed occurs in river valleys. Rentable beds are along the Spreča, Tinja and Turija rivers, and certainly one of the most interesting beds is the "Begove Maline" on the left side of the Spreče River near Živinice. The potential reserves of the investigated area of this gravel pit is approximately 684,000 m<sup>3</sup>. Northwest of Živinice towards Dobošnica and Lukavac there are four potential locations as possible gravel deposits in the Tuzla Canton. Depending on the grain size of the raw granules or the purity of the composition, the raw pebbles can be sorted into specific classes, shredded or specially processed depending on use. In the territory of Tuzla Canton, as regards the use of gravel, no activity was recorded in the direction of hydro-amelioration works, as well as activities regarding the extraction of materials from river watercourses. According to the current Law, this type of activity is also subject to concession. If one of the economic entities is interested in extracting material from Lake Modrac, the possibility of concession should be considered since its long existence has partially filled it, thus increasing its accumulation capacity (<http://vladatg.gov.ba/>, 2016).

Tab. 1: Available non-metallic mineral resources of Tuzla Canton.

ENERGY RESOURCES				INDUSTRIAL PROCESSING			
Resource	Locality	Geological reserves tons/ m <sup>3</sup> .	Exploited reserves tons/ m <sup>3</sup> .	Resource	Locality	Geological rezerves tons/ m <sup>3</sup>	Exploited reserves tons/ m <sup>3</sup>
Lignite	Tuzla, Kreka basin	1.126.194 t	456.008 t	Rock salt	Tetima 393,24ha	374.377.552 t	54.720.000 t
Brown coal	Banovići, Živinice	245.582 71.596 t	220.000 t	Quartz sand	Kužići, Bukinje and Moluška River layer 30-100m.	100.million t	14.600.632 t
Stone coal	Srebrenik	1.572.300 t	1.100.000t	Limestone	Gračanica, Lukavac, Srebrenik Živinice, Kladanj	62.280.213 m <sup>3</sup>	-
CONSTRUCTION MATERIALS				Magnesite	Kladanj	1.687.000 t	1.1.74.000 t
Gravel and sand	Živinice Begove maline	684 000 m <sup>3</sup> .	-	Brick clays	Gračanica Srebrenik	2000.000t	-

Source: Author, according to the source: Spatial Plan for the area of Tuzla Canton for the period 2005-2025 and Tuzla Canton Development Strategy 2016-2020.

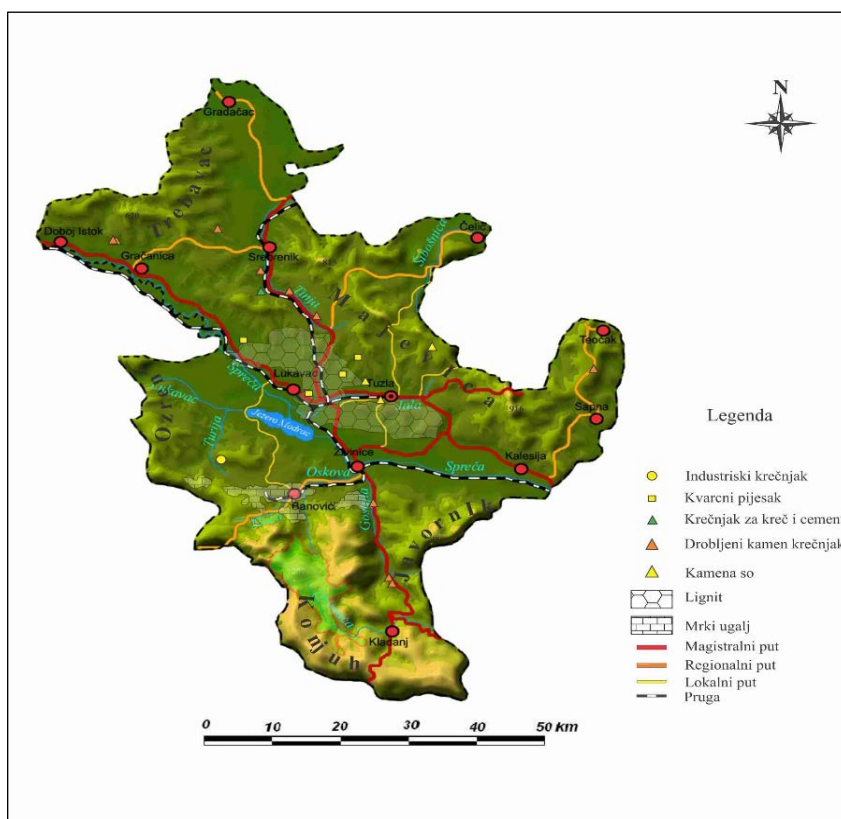


Fig. 1: Spatial distribution of non-metallic mineral resources in the Tuzla Canton.  
Source: Author.

#### 4. Analysis of production and consumption of non-metallic mineral resources

##### 4.1 Production and distribution of energy resources

The most important energy resource for the production of secondary energy (electricity, heat and steam) is lignite (also known as brown coal). Until 1992, coal miners in the Tuzla basin produced about 3.9 million tonnes of brown coal annually and up to 5 , 8 million tons of lignite. The current production capacity in the Kreka basin is 2,200,000 tonnes of coal, Banovići 1,500,000 tonnes, and Đurđevik 600,000 tonnes. The Kreka and Đurđevik mines market over 80% of their quantities at the „Tuzla“ Thermal Power Plant, while the Banovići Mine markets about 30% of their production in the same period to other markets.

Tab. 2: Analysis of coal placements in the Tuzla Canton.

Area of consumption	Delivery %	Distributor-Supplier
Thermal power plants	63,5	Mines Kreka and Đurđevik
Industry	17,9	
General consumption	18,4	
Own consumption	0,2	

Source: Report on the work of the Concession Commission for 2012, in the area of Tuzla Cnton, Tuzla.

#### 4.2. Electricity production and distribution

Currently, the basis for the functioning and development of the electricity sector in the Tuzla Canton is the Tuzla Thermal Power Plant (730 MW) and the Tuzla Power Distribution Company, as well as the small hydropower plants Modrac (1.9 MW) and Snježnica (0.4 MW). The initial phase is the construction of the replacement Unit 7 at the Tuzla Thermal Power Plant, and the construction of the 350 MW Thermal Power Plant Banovići, which will provide further continuation of brown coal production at the Banovići mine (<http://government.kim.ba>).

Tab. 3: Technical parameters of production capacities of Tuzla thermal power plant for 2013.

The facility of a thermal power plant	Block	Intalleg aggregate power	Power	Tehnnical minimum	Apparent power	A kind of coal	Specific consumption	Average annual production
		(MW)	(MW)	(MW)	(MVA)		kJkWh	GWh
Tuzla	G3	100	90	60	118	LM	14.396	300
	G4	200	180	125	235	LM	12.159	1.020
	G5	200	180	125	235	LM	12.169	1.030
	G6	223	200	115	270,6	M	10.703	1.150
TOTAL		730	650	-	858,6			3.500

Source: Author made according to source of electric power company BiH.

The public utility company "Elektroprenos BiH" is directly responsible for the electricity transmission networks. The distribution of electricity managed by the Tuzla Power Distribution Branch covers the area of the entire Tuzla Canton, including the City of Tuzla and all 12 municipalities, and runs over 10 kV and 35 kV voltage levels. One of the bigger problems is the electricity supply to the city of Tuzla, which is currently only being made from two hubs: the Tuzla Center transformer station and the Tuzla Thermal Power Plant (with a 35 kV mains transformer used primarily to power its own consumption). The total number of customers at all voltage levels in 2013 was 180,071, and the total realized electricity consumption was 1,082 GWh. The number of customers in the last 5 years has increased at both voltage levels: at the high voltage level by 5.5% per year and at the low voltage level by 1.12% (households) and 2.32% (other consumption). As the ratio of the amount of electricity produced and consumption consumed by customers from this area is 12: 1, it is evident that the Tuzla Canton, by its energy potentials, far exceeds its own needs and that it is secured to enter the surrounding markets (<http://pwww.vladatk.kim.ba>).

#### 4.2 Production and distribution of thermal energy

In addition to generating electricity, the Tuzla Thermal Power Plant for the needs of the electricity system also produces and supplies thermal energy for district heating systems in the urban areas of Tuzla and Lukavac, technological steam for the needs of industry, as well as industrial water for the narrower area of the Tuzla Canton.

The system will need to be upgraded to connect all the facilities that need heat in the city of Tuzla, the development of the district heating network in Lukavac, the construction of hot water systems for the towns of Živinice, Srebrenik, Gračanica and Kalesija (<http://www.epbih.ba>).



Fig. 2: Thermal power plant „Tuzla“ in Tuzla  
Source: Electric Power Industry of Bosnia and Herzegovina, 2019.

The great opportunities in the supply of heat in the coming period can be exploited for agricultural purposes in greenhouses that can be raised in areas where the heating network is being developed. Modern heating systems in the world and in the environment tend to develop hot water networks as close as possible to customers, which ensures reduction of losses in the distribution network and enables greater savings in heat supply. Tuzla Canton is in a more favorable situation than other cantons, due to the fact that the thermal power plant "Tuzla" is in the immediate vicinity of urban and economic centers. In the coming period, the energy sector plans to renew and expand the capacity of energy plants (primarily Tuzla Thermal Power Plants), as well as to expand the central heating system of the city of Tuzla and the Lukavac municipality, as well as the commencement of district heating of the Živinice municipality (<http://www.government.kim.ba>).

#### 4.3 Production and distribution of industrial non-metallic mineral resources

##### Exploitation and use of brine

After coal, the exploitation of brine on the basis of which the chemical industry is developing is significant. From the shale deposit of the Tušanj Mine in Tuzla, the exploitation of the stone solis was performed by dry cave methods, and partly by controlled leaching, by the system of exploitation wells. The production capacity of the Tušanj Mine at the existing reservoir was 150,000 tons of rock salt per year.

The second part of the Tuzla rock salt deposit in the area "Trnovac-Hukalo" was exploited by the method of exploitation wells. The brine was pumped from great depths and piped to the wooden reservoirs and then piped for further distribution. These sites provided brine for the needs of the salt and chemical industries in Tuzla and Lukavac. Salt-based industrial production has initiated the development of technologically interdependent and economically related capacities, namely: exploitation of salt water and rock salt in the Tušanj Mine, finalization of salt water in the vacuum salt for eating at the Tuzla Salt Factory, production of soda products: calcined soda, caustic soda and bicarbonate of soda at the Lukavac Soda Factory, production of chlorine, propylene oxide, polyols at the Polihem Tuzla and production of detergents and cosmetics at the DITA Tuzla factory. During 2005, the production

facility of the pit "Tušanj" closed. Due to ecological reasons and exhaustion of existing reservoirs, orientation is directed to the new reservoir of rock salt "Tetima" mine, located 8 km northeast of Tuzla (<http://www.vladatk.kim.ba.>).

Finalization of salt water, with ammonia and carbon dioxide, as a raw material component, is represented at the Lukavac Soda Factory, the only one of its kind in Bosnia and Herzegovina. The new development direction of the Tuzla Salt Factory is infusion solutions, spices and special types of salts. In addition to nutrition, salt is also used in the herbicide industry, then in metallurgy, construction, textile and other industrial segments (Kurtović 2000).



Fig. 3: Tuzla Salt products on the market.  
Source: [www.solana.ba](http://www.solana.ba).

The medicinal properties of the brine are used for tourist purposes on the Pannonian Lakes and for medical purposes at the Aqua Bristol Spa in Tuzla, which offers Halotherapy as part of its services.

Halotherapy is an auxiliary and completely natural method for the prevention and improvement of the health of pulmonary function and the respiratory system (Aqua Bristol Spa, Tuzla 2019).





Fig. 4: Aqua Bristol Spa, Salt room.

Source: Aqua Bristol Spa, Tuzla, 2019.

#### Quartz sand exploitation and use

Company "Tuzla-Kvarc" is actively engaged in the exploitation of quartz sand and has geological reserves in the area of the northern Kreka Synclinarium of the Tuzla basin, which is also the best explored part with the highest quality reserves in Bosnia and Herzegovina. The fields of exploitation available to the mine are: "Kužići", "Bukinje" and "Moluška River". Sandstones and quartzites find application in many segments of the modern industry, such as metallurgy, chemical, civil engineering, glass, ceramics and other industries. In the casting industry, quartz is an essential ingredient in the production of molds and cores as it is highly resistant to high temperatures and can therefore accommodate liquid metals. However, the most common area of application of quartz is in the construction industry: in the production of stone, concrete, tiles and slabs, in the composition of cover materials. In construction, sandstones are used as either a decorative stone or as a technical stone for road filling. In chemical production, quartzite is a very important filler for paints and varnishes like many other synthetic products. In the glass industry pure quartz is used in the production of optical and electronic products. Quartz has significant potential that can be utilized in the production of modern and high-tech products in the production of computer chips, optical devices and technical ceramics.

For the time being, quartz sand is used in construction and in the manufacture of certain filter backfills, for the purification of some fluids and for the production of gas concrete.

It should also be emphasized that more significant use of this mineral resource in other industries can be expected in the future, such as the production of flat and

packaging glass, water glass, silicate products, different applications in foundry and certainly more diverse applications in the field of construction.  
Limestone exploitation and use

In thirteen registered limestone sites in the Tuzla Canton, ten have been identified and exploited by various entities. At the remaining three sites of "Hrdar Kos" near Kladanj (investigations have been completed and reserves have been confirmed, but no exploitation is being carried out), the sites "Zeketuša" near Srebrenik and "Ravni Bor" near Živinice are under investigation.

Tab. 4: Limestone exploitation in Tuzla Canton.

	Municipality	Locality	Exploit
1	Lukavac	Vijenac - Lukavac	RK "Vijenac" Lukavac
2	Srebrenik	Duboki Potok - Srebrenik	"Ingram" Srebrenik
3	Srebrenik	Drenik - Srebrenik	"Ingram" Srebrenik
4	Srebrenik	Orlova Klisura-Srebrenik	"Jata" Srebrenik
5	Živinice	Oštro Brdo- Gračanica	"Terakop" Tuzla
6	Kladanj	Stupari - Kladanj	"Tuzlaputevi" Tuzla
7	Kladanj	Hrastić-Kladnja	"Geoinženjering" Tuzla
8	Živinice	Bučje-Đurđevik	"Kamenolom Kotornica" Živinice
9	Gračanica	Sklop-Malešici - Gračanica	"Gramat" Gračanica
10	Gračanica	Drijenča-Malešici-Gračanica	"Drijenča" Gračanica

Source: Author, based on <http://vladat.k.gov.ba,2016>.

In addition to these active quarries and those in the exploration phase, it should be noted that in the area of Tuzla Canton there are several other potential sites that, if interested companies are interested, should be investigated or defined from the aspect of reserves and quality and included in the existing production. These are the localities in the Teočak and Gradačac municipalities. Limestones are widely used in various segments of the industry. The most important consumers of limestone are construction, metallurgy, chemical industry, sugar, paper and glass industries. Limestones in civil engineering are used as technical stones.

#### Magnesite exploitation and use

The exploitation rights to this mineral are at the disposal of the Kladanj magnesite mine, which started operating again in 2014. Magnesite as a non-metallic mineral resource, according to its characteristics, is used in the ceramics industry, construction, chemical industry, pharmaceutical industry, and especially in the refractory industry is the most important industrial mineral. Magnesite as a very light element is widely used in military and other special industries.

## 5. Conclusion

Coal remains the highest priority in the use of energy resources in the Tuzla Canton. Construction of a new Unit 7 based on the best technologies Tuzla Thermal Power Plant should enable high-efficiency production in new coal production capacities and reduction of greenhouse gas (CO<sub>2</sub>) emissions. This approach will allow coal to be used to produce heat and electricity for the next two to three decades. The planned development and upgrading of the electricity generation sector, as well as sufficient energy reserves, are the basis for expanding the district heating system, primarily for households and industry, but the opportunities offered to agriculture and other economic activities should not be neglected. This will overcome one of the biggest problems in the use of energy in individual combustion plants, especially in larger urban centers.

When it comes to the production and distribution of industrial mineral non-metallic resources, rock salt is of the greatest importance. The current exploitation of brine is carried out in four boreholes and 11 in industrial production. In the next period, it is planned that 15 wells will be in production and two will be leaked, which will increase production by 25% relative to needs. Also, it is planned to open a new production facility on the second part of the bearing. Exploitation from the Tetima Mine, according to an annual production of 2.6 million m<sup>3</sup> of brine, could last for five to six decades. The current main consumers of brine besides the factory in Tuzla and Lukavac are Panonika and the Aqua Bristol Spa in Tuzla.

According to the above indicators, the current use of other non-metallic resources in the Tuzla Canton is not satisfactory. In the territory of Tuzla Canton, as regards the use of gravel, no activity was recorded in the direction of hydro-amelioration works, as well as activities regarding the extraction of materials from river watercourses. As a whole, the exploration reserves of mineral non-metallic resources have not been sufficiently explored and known throughout the Tuzla Canton, this is particularly true for the investigation of potential deposits of gabbro-spillite and gabbro-dolerite in the Konjuh Mountain area (in the municipalities of Banovići and Kladanj, dacites and andesite in the surrounding area) Soap, marl in the vicinity of Banovići, diabase, dolerite near Tuzla and Srebrenik.

## **References**

- Agency for Statistics of Bosnia and Herzegovina, Final Results of the Census of Bosnia and Herzegovina 2013. Sarajevo.
- Agencies of Statistics of Bosnia and Herzegovina (2015): Statistical Yearbooks, Federal Bureau of Statistics, Sarajevo.
- Tuzla Municipality Energy Sustainable Development Action Plan (SEAP), 2011, Tuzla.
- Pannonica Public Utility Company Ltd. (2018): Pannonian Lakes Complex and Tuzla Tourism Offer, History, Present and Future, Tuzla.
- Ćatović, A. (2010): Tourism in the Economic Structure of Northeast Bosnia, Novi Sad.
- Concession Policy Document in the Tuzla Canton: 2006, Commission for Concessions, Tuzla.
- Federal Ministry of Energy, Mining and Industry (2017): Statistical production indicators for the field of mineral exploration and exploitation.
- Indicative production development plan for the period 2019-2028, Independent System Operator in Bosnia and Herzegovina (ISOBiH), Sarajevo, 2019.
- Report on the work of the Concession Commission for 2012 in the area of TK, Tuzla.
- Report on Electricity Flows in BiH in 2017 - NOBiH, Sarajevo, 2017.
- Kurtanović R., 2000: Non-metallic mineral deposits, Zenica.
- Nezirović, S. (2012): Natural-geographical and socio-geographical determinants of tourism-geographical development of the region of Northeast Bosnia, doctoral thesis defended on 27.11.2012 at the Faculty of Science, University of Sarajevo.
- Nezirović, S. (2018): Scientific Monograph, Tourism Resources of the Northeast Bosnia Region, Faculty of Science, University of Sarajevo, Sarajevo
- Spatial plan for the area of Tuzla Canton for the period 2015-2025 (2006): Institute for Urban Planning, Tuzla.
- Economic Development Strategy of TK for the period 2016-2020, Tuzla, 2015.
- Government of Tuzla Canton (2009): Law on the designation of a part of the Konjuh Mountain as a protected landscape of "Konjuh", Tuzla.

Government of Tuzla Canton (2018): Ministry of Trade, Tourism and Transport of TK, Tuzla.

<http://www.vladatk.kim.ba>

<http://tuzla-kvarc.ba>

[www.geology.ba](http://www.geology.ba) decomposition of diabase on quarry in Ribnica

<https://www.epbih.ba/novost/17334/daljinsko-grijanje-za-opcinu-zivinice->

<http://vladatg.gov.ba/>, 2016, information on revenues and level of payment under concession contracts under the jurisdiction of the Ministry of Industry, Energy and Mining for 2016.

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### **Summary**

Tuzla Canton is located in the northeastern part of Bosnia and Herzegovina and its one of ten cantons in the Federation of Bosnia and Herzegovina. Tuzla Canton has an area of 2,652 km<sup>2</sup> (10.10% of the Federation of Bosnia and Herzegovina and 5.17% of Bosnia and Herzegovina) with 477,278 inhabitants. It has a favorable geo-traffic position and is connected to the Pannonian Plain and the Adriatic coast. There are 13 municipalities in the Tuzla Canton: Banovići, Dobož-Istok, Čelić, Gradačac, Gračanica, Kalesija, Kladanj, Lukavac, Srebrenik, Sapna, Tuzla, Teočak and Živinice

The area of Tuzla Canton has significant non-metallic mineral resources, which is an economic basis in economic development. The most significant energy resource is coal. Lignite coal exploitation reserves are estimated at 266,689,000 tons and are distributed in the areas of Tuzla, Živinica and Lukavac. Lignite is exploited in the Kreka basin (Tuzla). It is the main energy source in the production of electricity in the Tuzla Thermal Power Plant. The brown coal exploitation reserves are estimated at 220,000,000 tons and are distributed in the area of Banovići and Živinice. When it comes to the production and distribution of industrial mineral non-metallic resources, rock salt is of the greatest importance. The geological potential reserves of brine are estimated at 374,377,552 m<sup>3</sup>. In the course of 2018, 3.5 million m<sup>3</sup> of brine was exploited at the Tetima mine. The main consumers of the brine are the factories in Tuzla and Lukavac, the Spa and Panonika in Tuzla. Quartz sand deposits are located in the vicinity of Tuzla and Gračanica. Quartz sand potential reserves are estimated at 14,600,632 tonnes. Limestone reserves are estimated at 62,280,213 m<sup>3</sup>. Limestone is exploited in the area of Gračanica, Lukavac, Srebrenik, Živinice and Kladanj.

Coal remains the highest priority in the use of energy resources in the Tuzla Canton. Construction of a new Unit 7 based on the best technologies Tuzla Thermal Power Plant should enable high-efficiency production in new coal production capacities and reduction of greenhouse gas (CO<sub>2</sub>) emissions. When it comes to the production and distribution of industrial mineral non-metallic resources, rock salt is of the greatest importance. The current exploitation of brine is carried out in four boreholes and 11 in industrial production. In the next period, it is planned that 15 wells will be in production and two will be leaked, which will increase production by 25% relative to needs. Also, it is planned to open a new production facility on the second part of the bearing. Exploitation from the Tetima Mine, according to an annual production of 2.6 million m<sup>3</sup> of brine, could last for five to six decades. The current main consumers of brine besides the factory in Tuzla and Lukavac are Panonika and the Aqua Bristol Spa in Tuzla.

According to the above indicators, the current use of other non-metallic resources in the Tuzla Canton is not satisfactory. In the territory of Tuzla Canton, as regards the use of gravel, no activity was recorded in the direction of hydro-amelioration works, as well as activities regarding the extraction of materials from river watercourses.

As a whole, the exploration reserves of mineral non-metallic resources have not been sufficiently explored and known throughout the Tuzla Canton, this is particularly true for the investigation of potential deposits of gabbro-spillite and gabbro-dolerite in the Konjuh Mountain area (in the municipalities of Banovići and Kladanj, dacites and

andesite in the surrounding area) Soap, marl in the vicinity of Banovići, diabase, dolerite near Tuzla and Srebrenik.