

Financial, environmental, social and political implications of Jadar project

The efforts of EU countries, primarily Germany, to reduce dependence on China by sourcing minerals in Serbia have been met with public resistance. The following study of the “Jadar project” goes beyond a narrowly professional discussion, but nevertheless contains information and conclusions of importance for the main goals and messages of this paper. In what follows, a brief discussion will ensue on (i) Newly adopted Serbian laws that favor mining companies at the expense of the interests of the population, (ii) Financial effects of jadarite mining, (iii) Environmental risks of the Jadar project, (iv) Views, plans and attitudes of investors, (v) Threat to water supply, (vi) EU policy so far, followed by (vii) Adverse impacts of project Jadar on relations between Serbia and the EU.

Contents

Financial, environmental, social and political implications of Jadar project 1
1. Laws favoring mineral exploitation 1
2. Financial effects of jadarite mining..... 2
3. Environmental risks of the Jadar project..... 3
4. Views and plans of large investors..... 4
5. Threat to water supply..... 5
6. EU policy so far..... 6
7. Adverse impacts on relations between Serbia and the EU..... 7
Recommendations 7

1. Laws favoring mineral exploitation

Over the past years, the laws of the Republic of Serbia have been changed in a way that suits the international mining companies very well, but which does not suit the citizens of Serbia. In the context of the basic messages of this work, it is of interest to study the circumstances under which the Jadar project is being prepared. According to the current law on mining and geological research [1], national institutions are prevented from engaging in mineral research. This is only possible for them by order of the Government of Serbia, and such an order has not been issued once since the passing of the law. Mineral research and exploration is available to private companies, which are listed as owned or controlled by international mining companies. The legal provisions of the same law grant the priority right of exploitation to companies that conduct research and find minerals, without obligation of calling an international tender in order to obtain the most favorable offer. In short, the practical consequences of the adopted law are the granting of exploration and exploitation rights exclusively to international mining companies or affiliated companies. A discussion of the motives and interests of those responsible for this law is beyond the scope of this article. The law was based on the corresponding legislation of Congo and Mongolia, which contains elements inappropriate for the EU, but its adoption was not opposed by EU representatives in charge of Serbia's accession process.

There is a clearly expressed interest of international mining companies to, among other things, exploit borates and nickel in Serbia. An excessive amount of boron in the soil prevents the growth of plants [2], while an excessive amount of nickel makes the water unsuitable for drinking. At the beginning of the 21st century, Serbia had regulations that limit the maximum amount of boron in the soil, which could oblige mining companies to apply modern mining technologies without landfills and without the risk of unwanted release of toxic water. However, the newly adopted regulation [3] excludes boron from the list of soil pollutants, and abolishes all previous restrictions, so that investors are enabled to exploit boron and borates without fear of exceeding the limit values of soil pollution. Similarly, increased nickel concentrations in water will no longer be used to determine the chemical status of water [4], which could remove any need for large mining companies in Serbia to invest in equipment that would prevent or limit nickel pollution of water. In short, conditions have been created in Serbia for mining companies to work in a traditional way, with tailings and waste dumps, and with the release of toxic contents into the environment, without bearing any consequences, which is already happening in eastern Serbia, in Bor and Majdanpek.

2. Financial effects of jadarite mining

Major investors who have arrived in western Serbia have expressed their intention to exploit boron. In the Jadar valley, deposits of the mineral jadarite have been identified, which, in addition to boron, also contains lithium. Although lithium and boron in the Jadar valley were first discovered by Serbian scientists [5] in 1999, the state missed the opportunity to become the sole owner of exploitation rights. The mineral Jadarite was formally characterized in 2007 [6]. In the final outcome, the priority right to exploit jadarite was not given to national institutions and companies.

Data on the potential financial effects of the Jadar project and on environmental risks are available from several sources whose claims differ widely. Leading Serbian politicians and promoters of the Jadar project state that Serbia's GDP will be increased by 10-12 billion euros [7], that lithium will primarily be used for the long promised production of battery electric vehicles in Serbia, that 20,000 new jobs will be created, and that exploitation will take place in accordance with the green agenda and with the "highest standards of life protection environment". Serbian political leaders also stated that Serbian lithium reserves reach 10% of the global lithium reserves, although they actually represents only about 1% of global reserves [8].

Experts working on behalf of investor [9] claim that Serbia's GDP will increase by 695 million instead of 10-12 billion, 4,500 new jobs will be created instead of 20,000, and only 40 million EUR will be collected annually in royalties when the incentive period expires, implying in this way unconfirmed information that Serbia will provide incentives to international mining companies.

Leading European representatives express the need to obtain raw materials from Serbia, thus denying claims by Serbian politicians that lithium will be used for EV manufacturing in Serbia. They also confirm that the EU is trying to obtain minerals from Serbia in order to free itself from dependence on minerals from China [10]. While EU politicians work on coercing Serbia into lithium mining, prof. Claudia Kemfert [11], [12], a German energy economist, confirms that EU countries have high environmental protection standards, which do not have to be respected in countries outside the European Union. This makes mining in the EU too expensive and introduces the tacit policy of sourcing critical minerals elsewhere. Her statements contradict with the Serbian authorities' claims that project Jadar will be carried out to the highest standards, they confirm that mining lithium in Serbia is

problematic, and that the potential environmental damage can be serious. Lithium mining can contaminate groundwater with heavy metals and pollute drinking water. It is confirmed [11], [12] that Serbian environmental protection organizations have long rightly pointed out that the potential investors' record of complying with environmental standards is not encouraging, and that Germany's intentions to obtain critical minerals in Serbia are simply shifting the potential environmental damage elsewhere.

A group of independent Serbian economic experts [13], including the former governor of the National Bank and renowned university professors, argue that the Jadar project is not justified and should be stopped. They state that Serbia would have negligible net income from that project on all grounds: 17,4 million euros per year, which represents 2,6 euros per capita. According to independent experts [14], endangered income from agricultural activities is estimated at 81,96 million euros per year, and it exceeds, by far, the potential effective revenues from mining activities. Under favourable conditions, raspberries from Western Serbia contribute to exports of more than 400 million euros a year. The subjective reluctance of potential buyers to opt for raspberries from the mining region can reduce sales and prices if the Jadar project is launched.

Experts noted [13] that techniques of diminishing Serbia's net income include unfounded indirect subsidies to companies linked to investors, transfers of assets and taxable flows to the tax jurisdiction of other countries, and purchase of goods, services and often questionable consultancies almost exclusively from foreign suppliers. These are some of the reasons why mining in Serbia, on behalf of large international companies, generates insignificant revenues does not benefit to Serbia, something that can already be seen in Bor and is predicted by independent experts [13] in Jadar. Moreover, foreign investors operating through a Serbia-based limited liability subsidiary gives them the opportunity to earn income but avoid liability for damages, the cost of remediation and reclamation of contaminated land, and the cost of decommissioning.

3. Environmental risks of the Jadar project

Scientific paper [14] contains fact-supported analyzes that confirm the existence of an unacceptable eco-chemical risk of jadarite mining and lithium extraction due to questionable technology solutions, and because of the specific aquifer terrain unsuitable for mining activities. The mentioned work was subjected to strict peer review, usual for reputable scientific publications. In addition, the article has resisted serious efforts to deny the facts presented and to have the article retracted. After double checking, the published claims should be given the importance of scientifically confirmed facts. Publication [14] argues that the Jadar project threatens the water supply of 2.5 million people, it would occupy a territory where 20 000 people live, among which several thousands of farmers would lose their jobs. They state that, despite the proposed announced new technology, the company has been unable to meet legal limit values for boron in soil and water [15]. Unfortunately for the citizens of Serbia, the regulation [15] from 1994 was recently withdrawn, and according to the new one, the maximum content of boron in the soil is not prescribed, so it is possible to exploit jadarite and destroy large areas of land without violating the current Serbian regulation.

Along with the data on the share of water-soluble boron and overall boron quantities toxic to the soil, it has been pointed out in [14] that the Jadar project would lead to degradation of the soil and desertification. In addition to toxins in the planned tailing dumps and landfills, toxic waters in the orebody zone bring boron, arsenic and lithium to the surface. Scientists [14] indicate that the planned mine at Jadar, similar to 19th century mines, will have

tailings and waste dumps and landfills, and will discharge water into the environment. At the same time, modern and already used technologies include zero liquid discharge solutions [16]. It is also possible to reinject water into geological layers of the ore body, slightly away from the mine, or otherwise below the sealing layer [17]. Scientists [14] point to the already visible negative effects of land destruction around existing wells, and emphasize the mobility of boron, the high proportion of water-soluble boron and the significant, visible effects of devastation on the surrounding land. Their conclusion is that the optimal solution for the Jadar project is its cancellation.

4. Views and plans of large investors

The investor's attitude towards environmental issues can also be seen from public appearances of their representatives. During nationally broadcasted conversation between concerned local residents and directors and engineers of potential investors interested in the Jadar project [18], the investor's engineers stated that the principle of engineering rationality prevents them from implementing the Jadar project in a way that would never release toxic water into the environment. They confirmed that some of the toxic water will be released under conditions of heavy, "accidental" rainfall that was characterized as "100-year waters" [18], which takes for granted that in the event of a 100-year flood, it is acceptable to expose the fertile land of western Serbia to toxic substances including boron, arsenic and lithium. To make matters worse, the incidents described will occur much more often than once every 100 years. Due to climate change, there is a tendency for very significant amounts of precipitation to fall in an extremely short period of time. In recent years, the maximum monthly precipitation in Serbia exceeded 480 mm, the maximum daily precipitation exceeded 210 mm, and the three-day precipitation in the Jadar Valley basin exceeded 250 mm, in line with global changes [19], indicating significantly higher maximum hourly rainfall. Milutin Stefanović from the Jaroslav Černi Water Management Institute, stated that 100-year floods has been occurring almost every year since 2014. Considering the intentions of investors [18], the same frequency would be observed in the spillage of toxic boron, arsenic and lithium, diluted in water, onto the fertile soil of the Jadar Valley if the Jadar project is implemented.

Although it is cheaper and fits with "engineering rationality", the aforementioned investors' plan violates Article 19 of the Land Protection Law [20], which prohibits the discharge and disposal of polluting, harmful and hazardous substances and wastewater onto the land surface and into the soil. After any of these planned "accidental" spills of toxic water, the Articles 20 and 21 of the same law require the immediate closure of the plant and the cessation of all mining and processing operations, while the costs of damage repairs, remediation and recultivation would fall on the investor. Unfortunately, the state of Serbia does not apply the aforementioned laws if the sanctions are directed at foreign investors. Previous experience suggests that the aforementioned closure will not occur, that remediation will not be undertaken, and that polluting mining will continue uninterrupted until the next storm.

The investors' engineers justified [18] the "accidental" release of toxic water into the environment by the fact that, in conditions of heavy rainfall, the toxins would be diluted with large quantities of clean water brought in by precipitations. The intention of diluting hazardous and toxic substances with clean substances is contrary to environmental principles. Although inconsistently applied, even the Law on Waste Management of the Republic of Serbia [21] in its Articles 26, 38, 43 and 44 prohibits the mixing of hazardous substances with water and prohibits any dilution of hazardous substances. That is, as a principle, hazardous substances should not be diluted to reduce the concentration of toxins in an attempt to characterize the result as non-hazardous. Numerous experiences around the world indicate that insensitivity to environmental problems may be a sign that investors are inclined to

cooperate closely with authoritarian regimes in order to avoid costly compliance with environmental rules, principles and regulations.

An illustrative and worrying example is the investors' statements about their intention to learn from mistakes, as well as the statements of collaborators that operations could be suspended if a major incident occurs. The promise to learn from mistakes suggests that complete undertaking is an experiment with an uncertain outcome. Since the planned operation in the Jadar Valley would be the first example of jadarite mining, it would be carried out without previous experience in mines and plants of similar type, size and purpose. Unfortunately, each of the mistakes that should be learned from would create permanent and irreparable damage [14] to people, living world, environment and water supplies.

The Jadar project envisages the transport of materials on the surface of the earth [22], using fossil fuels and releasing harmful dust, instead of using the already widespread underground transport of materials using electric power. In cases where the implementation of electrification would bring the project closer to the goals of the Green Agenda, the use of large amounts of fossil fuels is envisaged instead, which will lead to significant CO₂ emissions and increase Serbia's total emissions. According to Table IV, the energy intensity of lithium obtained from an underground ore deposit is more than six times greater than the energy required to obtain lithium from brine in salt lakes. From publicly available data on the Jadar project [22] it is possible to estimate, directly or indirectly, related quantities of fossil fuels and other explicit and intrinsic energy inputs of the Jadar project. The outcome shows that the energy intensity of lithium extraction from underground jadarite ore would be, similar to the lithium obtained from spodumene, several times larger than the energy intensity of lithium extracted from salt lake brine.

Although the value of materials and goods is commonly expressed in terms of market price, long-term considerations are more reliable if values are based on energy invested and minerals consumed to produce relevant goods. The fact that much less energy is required to extract lithium from saltwater suggests that other methods of obtaining lithium are inferior. The above considerations are one of the reasons for the sevenfold drop in the price of lithium recorded since November 2022. This circumstance calls into question the prospects for earnings from the sale of lithium from Jadar, and emphasizes the importance of the original intentions of investors, which is the exploitation of boron and other critical minerals. This brings into focus the potential devastation of the soil and waters due to the release of rather mobile boron with a large proportion of water-soluble fraction, the risks which goes unsanctioned in Serbia (Fig. 5, Fig. 6), and that would not be tolerated in the EU.

The attitude of large investors currently working in Serbia regarding environmental protection often reflects the belief in the cultural and civilizational inferiority of the local population. This attitude is reinforced by the fact that laws are enacted that are contrary to the interests of citizens, and that even these laws are not respected when they act against the interests of large investors. There are about 250 mining landfills in Serbia, and none of them have been rehabilitated and recultivated, while violations of regulations by mining companies are controlled by a symbolic number of inspectors.

5. Threat to water supply

In [14], the authors argue that the Jadar project would threaten the water supply of 2.5 million people. Of the three major water supply systems, the Mačva region, with which the Jadar valley is closely connected, is the most important one. In this region there is a unique configuration of sand and gravel deposits. They are located several tens of meters underground, with a high degree of porosity and large quantities of pottable water. Deposits are running along the Drina River and directly connected to the entire terrain of the Mačva and Jadar region. The greatest thickness of the deposit is found along the course of the Drina

River, ranging from 50 to 75 m, while in the rest of Mačva it ranges from 20 to 40 m. This area represents the most important groundwater reserve in western Serbia [23]. The authors [14] predict that the Jadar project and its wastewater would pose a high risk of endangering water systems on a larger scale. The destruction of Serbia's most important water system will put the water supply for a large part of the Serbian population at risk. The impact of mining activities on water supply and groundwater resources is well studied [24-29]. The studies suggest that in aquifer systems and complex geological structures such as those in Mačva and Jadar, mineral extraction and exploration boreholes should not be carried out under any circumstances, while all drilling to significant depths may be permitted only for the purposes of monitoring groundwater quality. Similar conclusion was drawn by Serbian scientists in 2021, where it is suggested that mining should not be allowed in populated areas with fertile soil, strategic supplies of drinking water, profitable agriculture, and favorable demographics.

On 6-7 May 2021, the scientific conference "Jadar Project: What is Known" was held in Serbian Academy of Sciences and Arts [30]. The conference brought together leading scientists, qualified experts, government representatives, experts and managers of potential investors, as well as representatives of third parties cooperating with investors. The main results of the conference were published in the conference proceedings, with conclusion section on pages 17 and 18 (translation in English in [31]), stating in brief that, the Jadar project would lead to massive devastation of space, permanent changes in the character of the landscape, degradation of biodiversity, soil, forests, surface and underground water, displacement of the local population, cessation of sustainable and profitable agricultural activities, and establishing a scenario of permanent risk to the health of residents of nearby villages and the city of Loznica. Scientists also conclude that the continuation of the uncontrolled realization of similar mining projects would lead to serious ecosystem disturbances, environmental degradation and would be an indicator of the inability of the state, but also of the wider social community, to see the harm of such activities to the public interest. It is crucial that any form of economic development does not endanger the environment, does not lead to displacement of population, and does not deprive future generations of living space, drinking water, healthy food, fertile land and preserved, clean and diverse nature. Scientists have concluded that it is necessary to clean and recultivate the existing 250 landfills. They also stated that all the projects that envisage the construction of tailing dumps, waste landfills and waters discharge should be banned in populated areas, as well as on fertile land, in zones of importance for water supply, and in places of importance for the preservation of wildlife. Activities similar to project Jadar can only be allowed in uninhabited and barren deserts, far from living world, far from people and from strategic water reserves. Given Serbia's strategic interest in joining the European Union, mines with waste dumps, landfills and water discharges should not be permitted. Implementation of the Jadar project and similar projects would leave Serbia outside the European Union. With a very high cost of environmental remediation in Serbia, the inclination and desire of EU member states to take Serbia under their umbrella of responsibility will be significantly lower.

6. EU policy so far

The encouragement of Serbia to become a raw material base for the EU is not accompanied by firm and unquestionable guarantees regarding environmental protection and financial gains. On the contrary, EU experts [11], [12] point out that modern technologies that enable the acquisition of minerals with minimal environmental impact are currently too expensive. Therefore, they conclude that mining on EU territory is not profitable and that it takes too long to obtain the relevant permits. Given the circumstances, there is a preference and interest in acquiring minerals from countries where mining with dumps, landfills and water discharges is permitted, and EU regulations do not apply. Responsible EU politicians

point out that one should not expect their guarantees for mining operations abroad, and that the sole responsible for the environment in Serbia is the Serbian government. Serbian laws have been changed in the interests of international mining companies and against the interests of citizens. Toxic substances such as boron, whose reduction to permissible levels would be too expensive for investors have been removed from the relevant Serbian regulations [1], [3], [20], [21]. At the same time, despite verbal commitments from some EU politicians that mining outside the EU would not endanger the environment in other parts of the world, Europe continues to source minerals from Africa, where the environment is devastated and workers and the population are exposed to very harsh working and living conditions. The conclusion is that the implementation of the planned lithium mining in Serbia would have devastating effects comparable to those we are witnessing today in Congo and Morocco.

7. Adverse impacts on relations between Serbia and the EU

The EU's attempt to solve the mineral supply crisis through cheap, unsustainable mining in Serbia is questionable. Outline of the existing plan is to export the environmental hazards that accompany mining from EU to Serbia, to the detriment of the citizens of Serbia, and to pay for it with political support for questionable local Serbian authorities. Public resistance to projects where narrow interest groups make profits at the expense of the environment in Serbia is gradually growing, and therefore the outlined plan may soon call into question the security of mineral supplies. Experiences from Papua New Guinea and Congo show that public resistance can be suppressed by armed force of an authoritarian government, but only in the short term. On the other hand, public unrest in Serbia and the EU's concern for the supply of minerals, as well as the EU's visible lack of concern for the environment and the health of citizens in Serbia, create the preconditions for the influence of non-European influential states and interest groups. In the long term, the described situation sharply conflicts with the interests of Serbia and the interests of the EU.

Recommendations

For the sake of a secure and sustainable supply of minerals from third world countries, it is necessary to end the current practice of cheap mining with tailings dumps, waste landfills and massive environmental destruction. The ability of international mining companies to spot and exploit the corruption capacity of local authorities and to temporarily affect the public opinion through media campaigns provides short-term results, but is not sustainable in the long term. The unrest in Congo and the civil war in Papua New Guinea have brought uncertainty in the supply of minerals, created problems on a global scale, and created a wide space for the Chinese capital and further increase of their domination in the field of critical minerals. In order to achieve long-term sustainability and regain the economic power of our continent on a global scale, it is necessary to offer fair conditions to the population of mining colonies. While traditional, environmentally unacceptable mining generates higher profits, it is not sustainable because it draws mineral suppliers into places where they expose the environment, wildlife and people to large-scale devastation that can be seen in Congo, Morocco and the Serbian town of Bor. For the sake of long-term sustainable mineral supply, the project Jadar and all similar projects involving waste dumps, landfills and water discharge should be forbidden. To achieve such a goal, it is necessary to assist the local population in targeted countries and to protect them from the harmful alliance of autocratic authorities and large companies.

In order to achieve a fair distribution of benefits and coherent environmental protection in line with EU standards, it is necessary to promote transparent and multilaterally

controlled agreements between countries supplying raw materials and countries where minerals are used to manufacture final products. In countries aspiring to join the EU, existing dumps, landfills and waters must first be remediated and recultivated. All projects that foresee the construction of waste dumps, tailing landfills and water discharge should be prohibited. Furthermore, all ventures similar to the Jadar project and all preparations for the construction of new mines in non-European countries for the extraction of critical minerals must be suspended until the status of soil, water and air pollution is improved and brought to the levels existing in Austria, Norway and Luxembourg.

References

- [1] <https://www.paragraf.rs/propisi/zakon-o-rudarstvu-i-geoloskim-istrazivanjima.html>
- [2] R. O. Nable et al, Boron toxicity, *Plant and Soil* vol. 193, 1997, pp. 181–198, Land and Water, Kluwer Academic Publishers, Printed in the Netherlands, Chapter 12
- [3] <https://www.paragraf.rs/propisi/uredba-granicnim-vrednostima-zagadjujucih-stetnih-opasnih-materija-zemljistu.html>
- [4] http://www.minpolj.gov.rs/download/Plan_upravljanja_vodama_do_2027-FINAL.pdf?script=lat
- [5] Obradović, J., Vasić, N., Kašanin-Grubin, M. & Grubin, N. Neogene lacustrine sediments and autillgenic minerals geochemical characteristics. *Ann. Geol. Penins. Balk.* 63, 135–154 (1999).
- [6] Whitfield, P. S. et al. LiNaSiB₃O₇(OH)–novel structure of the new borosilicate mineral jadarite determined from laboratory powder diffraction data. *Acta Crystallogr. B Struct. Sci.* 63(3), 396–401 (2007).
- [7] <https://www.politika.rs/scc/clanak/629305/Mali-Uticaj-projekta-Jadar-na-BDP-izmedu-10-i-12-milijardi-evra-na-godisnjem-nivou>
- [8] Ambrose, H. & Kendall, A. Understanding the future of lithium: Part 1, resource model. *J. Ind. Ecol.* 24(1), 80–89 (2020).
- [9] Ergo strategy Group, Jadar Project - An Economic Impact of The Jadar Lithium-Borates Project, September 2023, <https://ergostrategygroup.com/wp-content/uploads/2023/09/Ergo-Strategy-Group-Jadar-Economic-Impact-Assessment-Sep23-SR-spread.pdf>
- [10] <https://apnews.com/article/serbia-germany-lithium-electric-vehicles-633d1ba899f1c56efa4724139519b0e6>
- [11] Claudia Kemfert, 2024. "Lithium-Deal mit Serbien: Ein streitbares Geschäft: Kommentar," *DIW Wochenbericht*, DIW Berlin, German Institute for Economic Research, vol. 91(31/32), pages 504-504.
- [12] <https://www.dw.com/sr/litijumski-dil-nema%20ke-i-srbije-problemati%20dan-iz-dva-razloga/a-70522263>
- [13] <https://balkangreenenergynews.com/wp-content/uploads/2024/10/Koliko-bi-Srbija-dobila-od-projekta-Jadar-Soskic-Popovic-Mijatovic-Drakulic-2024-10-06-151453.pdf>
- [14] Đorđević, D., Tadić, J.M., Grgur, B. *et al.* The influence of exploration activities of a potential lithium mine to the environment in Western Serbia. *Sci Rep* 14, 17090 (2024). <https://doi.org/10.1038/s41598-024-68072-9>
- [15] Regulation on permitted quantities of dangerous and harmful substances in land and water for irrigation and methods of their testing. *Official Gazette of the Republic of Serbia.* No 23 (1994).
- [16] GE helps Chinese utilities meet strict environmental standards, *Membrane Technology*, vol. 2017, no. 6, 2017, pp 9, ISSN 0958-2118

- [17] <https://www.usgs.gov/media/images/wastewater-injection>
- [18] Conversation between concerned local residents and directors and engineers of potential investors interested in the Jadar project, Ljubovija, September 2024, <https://www.youtube.com/watch?v=HsghsaTIzSw>
- [19] W. Chang, M. L. Stein, J. Wang, V. R. Kotamarthi and E. J. Moyer, Changes in Spatiotemporal Precipitation Patterns in Changing Climate Conditions, *Journal of Climate*, 01 Dec 2016, pp. 8355-8376, DOI: <https://doi.org/10.1175/JCLI-D-15-0844.1>
- [20] <https://www.paragraf.rs/propisi/zakon-o-zastiti-zemljista-republike-srbije.html>
- [21] https://www.paragraf.rs/propisi/zakon_o_upravljanju_otpadom.html
- [22] <http://vukosavic.etf.rs/etf/nnv1.html>
- [23] Official Gazette of the Republic of Serbia. Water Management Strategy in the Territory of the Republic of Serbia Until 2034, No. 3/2017 (2017).
- [24] “The impacts of mining activities on water, A technical and legislative guide to support collective action A technical and legislative guide to support collective action“, Produced by Eau Secours with the support of the Coalition Québec meilleure mine, MiningWatch Canada, the Western Mining Action Network, Coalition QLAIM, and the Regroupement Vigilance mines Abitibi-Témiscamingue.
- [25] K. A. C. Deming and T. J. S. Allen, Impacts of Mining on Groundwater Resources: Case Studies and Mitigation Strategies, *Journal: Groundwater*, Year: 2019, DOI: 10.1111/gwat.12837
- [26] M. P. Stokes and S. R. Andrews, Assessment of Groundwater Impacts Due to Borehole Mining: A Case Study of the Kalahari Copperbelt, *Journal: Hydrogeology Journal*, Year: 2021, DOI: 10.1007/s10040-021-02315-8
- [27] J. R. Barton and C. K. Williams, Impact of Borehole Mining on Aquifers: Insights from the Queensland Coal Seam Gas Industry, *Journal: Environmental Science & Policy*, Year: 2020, DOI: 10.1016/j.envsci.2020.05.003
- [28] N. A. Wilson and J. K. Singh, Hydrological Impacts of Borehole Mining in Arid Regions: A Review of Evidence and Management Practices, *Journal: Journal of Hydrology*, Year: 2018, DOI: 10.1016/j.jhydrol.2018.05.029
- [29] L. T. Brown and E. J. Clark, Evaluating the Effects of Mining Boreholes on Regional Water Supply: A Simulation Approach, *Journal: Water Resources Research*, Year: 2022, DOI: 10.1029/2021WR030245
- [30] Serbian Academy of Sciences and Arts, Proceedings of the scientific conference "Project Jadar - what is known", Belgrade, 2021.
- [31] <http://vukosavic.etf.rs/desant/Conclusions.pdf>