

**In the shadow of day-to-day political problems, countries in the region are avoiding adopting a strategic decision based on a basic consensus - will their countries go through the development of agriculture and eco-tourism or heavy mining industry?**

### **Gordian's Knot Ilovica-Stuka**

This issue is of particular importance in North Macedonia, where citizens stopped a construction of a gold mine on the Kozuf Mountain in Gevđelija in a local referendum. This, however, has not come to an end to the anguish of the inhabitants of North Macedonia - are they now asking how to cut the "Gordian knot" of Ilovica-Stuk?

From the very beginning, there have been numerous problems, dilemmas, even serious allegations by activists and experts on the one hand, and Euromax Resources on the other, around the Ilovica-Stuk gold mine. Will the mine cause pollution of soil, water and air, will there be problems with the quality of agricultural products, is it envisaged to protect the entire surface of the hydrofield, in order to preserve the groundwater from the sinking of a part of the tailings, all these issues are in the last the weather aroused great public interest. Angel Nakov, president of the Citizens Association Spas za nas, told the New Macedonia newspaper that the opening of the mine would devastate the natural relief at the site, with the formation of a huge crater, 700 meters deep on one side, and a huge plateau of excavated ore and dams, hydrofield, on the other side. According to him, this will mean disturbance of soil, groundwater and above ground water. He called the Government and the relevant institutions responsible for providing a reasoned explanation on the matter, relying on thorough research. Nakov emphasizes that the Government should take an objective position, since it has the widest resources (information, facts, scientific studies, material and human resources) that can be put to the highest interest, in order to give a clear position and answer public questions.

"I believe that the North Macedonian Government should answer to the citizens whether the 1,500 hectares of forest will be initially cut, whether a crater of seven square kilometers and a depth of 700 meters will be opened, whether a lake with a 200 million cubic meters hydro-reservoir will be formed, will a tailings dump with an area of over eight square kilometers be formed? Is there a mine pit in the world in a clean agricultural region with 80,000 farmers? "Asks Nakov.

He says that except for salaries and contributions of employees, taxes on oil consumption

and two percent of the gold and copper obtained, there is no other share in North Macedonia's GDP.

"This, calculated according to data from the Euromax study, will amount to 0.2% of North Macedonia's GDP, while agriculture accounts for 10% of GDP and employs 100,000 people. Open pit mines are being opened in desert areas, unpopulated areas, and never in agricultural regions, forest areas, clean groundwater and groundwater sources, tourist destinations," explains Nakov.

On the other hand, from a scientific perspective, Goce Delchev University professor at Stip, Dejan Mirakovski, argues that with today's technology, it is possible that mines do not cause environmental pollution, which should be explained in detail to citizens.

"Particulate matter emissions from the future mine and associated processes are elaborated in detail in an Environmental Impact Study produced by renowned international consultants. This document has a separate appendix describing the assessment procedures, the current air quality in the project area and the expected impact of the planned activities. The models show a negligible impact on air quality, both directly on land and in the wider area of activity, without exceeding the value of any pollutant," explains Mirkovski.

Another independent expert in the field, Professor Blagoj Golomeov, says that the technological process at the Ilovica-Stuka mine, designed to enrich useful mineral components in the form of copper concentrates with gold content, is a process of flotation concentration that is widely used in the world.

"Because it is a monomineral raw material, the reagent regime that is applied is very simple and with a small number of components. This process consists of the concentration of useful minerals, the carriers of copper, whereby the chemical composition of the mineral resource does not change at all. In principle, the reagent regimen consists of the addition of xanthate (collector), penlivec and slaked lime. Xanthate is almost completely absorbed on the surface of useful mineral grains. This allows them to be bonded to the air bubbles generated in the pulp by the injection of air, and as the air bubble-mineral grain complex floats to the surface of the flotation cell, it is converted to concentrate with enriched copper content, which is the final product being transported into a copper smelter," Golomeov explains.

He adds that water recirculation is necessary, since it takes about 23 million cubic meters of water to process 10 million tons of ore a year.

"It is impossible and unprofitable to get so much fresh water every year. That is why the process is designed so that there is no discharge of water into the environment and there is recirculation. Only three million cubic meters of water will be brought into the process annually. That amount of water will remain on a yearly basis in the tailings pond," the

professor explains.

He says that such a technological process for copper concentration is the most widespread in the world.

“In the immediate neighborhood alone, we have Bor and Majadanpek in Serbia, with a capacity of 20 million tons a year, Elacite in Bulgaria with 40 million tons a year, etc.,” says Golemov.

The dam problem was discussed by Professor of the Faculty of Civil Engineering in Skopje, Ljupco Petkovski. He says that the dam has a trapezoidal cross-section, that is, there is no vertical wall like in concrete dams.

According to the International Commission on Dams, there are about 60,000 dams registered in the world, although the number of dams built is much higher. These are the buildings with the highest degree of reliability. It is more likely that the Vodno mountain falls on Skopje than the Stuk dam is demolished.

He added that the embankment is a structure for retaining and storing waste rock from the mine.

## **Greece can(not) do without Eldorado**

Two gold mines in Halkdiki, Greece, have for years been the subject of heated discussions between tourism officials and representatives of the mining industry, as well as the cause of mass demonstrations and even violent protests, which the epilogue will have in court.

The small Greek town of Jerisos is the center of a protest against the Canadian company Eldorado, which owns two nearby mines, the Skoruiies and Olympias.

The clashes over the mines began in 2012, at the height of the Greek debt crisis. A year later, police used extreme force during local protests against the gold mine. Tensions peaked in November 2017 when Eldorado threatened to withdraw all of his Greek investments before entering into arbitration with the Greek government over his activities in the mines. Meanwhile, 450 lawsuits are pending.

At the heart of the dispute is a technique for metal production called Flash-Smelting in expert jargon. Thanks to this process, raw material is obtained from gold, but the raw material contains arsenic. “Flash-Smelting is suitable for raw materials with low arsenic content. In the case of these mines, the arsenic concentration is more than nine percent,” physicist Amri Kadoglu told DW.

In doing so, arsenic dust is generated during production - up to 20,000 tonnes per year. And

the maximum allowed is 20 kg, says there is no air purification technique. In addition, the mine is located on just one displacement - in the event of an earthquake, millions of tons of toxic waste would be blown into the air, as the locals fear.

"In order for such a mine to work, the land needs to be dry. That is why they had to lower the groundwater level, "with beign said land being the most important source of drinking water in the otherwise dry Chalkidiki. And the Ministry of the Environment - keeps quiet. So these are three problems that Eldorado, in the opinion of mine opponents, has not considered: water, air and waste. The main argument of mine supporters is - jobs. "For many generations people in the mountain villages have been working in the mines. They are not thinking about the consequences of the industrial exploitation of gold ore, "complains Jota Sisopol, one of the protesters. "We live in Jerissos almost exclusively from tourism. Then who would come to us? What will we live on? ".

The whole issue was further complicated in September 2018, when Eldorado requested the Greek Government out-of-court payment of € 750 million due to delays in issuing licenses for the Skouries project, in order to avoid arbitration pricing.

This is not Eldorado's first dispute with Greece, since in 2017 the company froze investment and stalled operations in Skouries seeking the issuance of all necessary approvals.

In 2018, the company submitted a new technical report for a gold project that should "significantly" reduce environmental impact. Shortly thereafter, the arbitration panel ruled that Eldorado's technical plan to build a concentrate processing plant, which is being mined at the Skouries and Olympias mines, was valid. However, the company has yet to obtain the necessary permits to begin construction.

Since 2012, Eldorado Gold has invested about \$ 3 billion in Greece, and these figures would double, the company said, if it were allowed to fully develop all its Greek projects.

## **Environmental catastrophe in Romania, a reason to ban cyanide technology**

One of the biggest environmental incidents in Europe, after Chernobyl, occurred in January 2000 in Romania, when tailings ponds broke out at the facilities of the Aurul SA Company plant, in the north-west of Baja Mare. On that occasion, about 100,000 cubic meters of landfilled leachate containing between 50 and 100 tonnes of cyanide and heavy metals, including copper, leaked.

Damage to the dam was due to a failure in the design of the dam and unforeseen working

conditions, in very adverse weather conditions. The poisonous wave traveled the Saar, Lapo, Some, Tisza and Danube rivers for about four weeks before reaching the Black Sea. Thus, about 2,000 kilometers of the Danube basin were affected by the outflow of toxic waste. Romanian sources say that in Romania, this spill caused interruptions in the supply of water in 24 cities, as well as a halt in production in many factories due to lack of water needed for production.

The Aurul mine operator, owned by the Australian company Esmeralda and the Romanian company Remin, used a process and technology for extracting precious metals that were completely new to Romanian conditions and were expected to be safe.

The Baja Mare plant is projected to process 2.5 million tonnes of tailings a year, which would result in the extraction of about 1.6 tonnes of gold and 9 tonnes of silver annually.

The project is expected to last 10 to 12 years, with the possibility of being extended.

The whole technology is based on the use of highly concentrated cyanide to extract precious metals from tailings. As part of the process, tailings were transported from a distance of 6.5 km from Baja Mara to the new stop dam near the village of Bozanta Mara.

The whole process is designed to prevent any release of waste into the environment.

However, back in 1999, shortly after the system was put into operation, two cases of leaks on the pipeline system were registered and reported.

In 2017, Romania decided to ban cyanide-based technology at all stages of silver and gold mining for a period of ten years.

## **Environmental risks and regulations**

The main risks in mining, as one of the high-risk industries, are: risks to the health and safety of employees; environmental risks; social risks; land use risks; legal and financial risks; and technical risks.

Mining and mining pits are by themselves the largest ecological focal point, since they have a dangerous impact on the environment, air, water, soil. In addition, ore processing facilities fall into the G1 category - a heavy and polluting industry.

Environmental risks cannot be completely eliminated from mining projects. Therefore, it is necessary to carry out a risk assessment at all stages of the project.

The main reason for this is the ability to manage, reduce or eliminate risk. It is generally accepted that the risk assessment process should be separate from managerial decisions.

Environmental risks associated with mining projects relate to the full range of negative

environmental impacts, from problems at the mine site (the consequences of ore extraction, erosion, rehabilitation of abandoned mines), through challenges related to infrastructure and mining waste, to the transportation of ore and chemical substances and the ore processing process. These problems are, as a rule, most acute in low- and middle-income countries.

One of the biggest risks, as we have seen, relates to the processing of gold and copper ores, and particular suspicion is caused by the use of leaching technology with cyanide or sulfuric acid.

Pollution is most expected from the treatment of the ore with sulfuric acid solution. Sulfuric acid is one of the most toxic and corrosive sulfur compounds. The treatment of the ore with sulfuric acid aims at chemical extraction to lead to the extraction of copper and other elements of the ore, by forming an aqueous solution of copper sulphate. This solution undergoes an electrolysis process to separate the copper from the aqueous solution. After treatment with the sulfuric acid ore, it will evaporate, with local acid dew and even acid rain, environmental consultant Stole Georgiev explains.

In addition, the process of electrolysis and leaching of the ore material requires an enormous amount of water, which is why water from rivers and streams is abstracted. The inclusion of watercourses will have an impact on the availability of water for irrigation of agricultural land in the mine operation. The use of polluted water in agriculture can lead to the destruction of microflora and micro fauna and the pollution of agricultural products with heavy toxic metals.

With blasting (use of explosives), in addition to vibrations, groundwater regime is often disturbed. There are cases of complete or partial drying of wells due to vibration from blasting.

Dust generated by ore mining, as well as sulfuric acid solution and copper sulfate, are a threat to soil contamination.

There is also a high risk of accidents, especially when it comes to seismically active areas, such as in the case of Valandov in North Macedonia.

Also, storing and delivering sulfuric acid is always a risky operation and is an eco-friendly time bomb. Sulfuric acid storage near the mine is also a potential hazard, and can have serious consequences in the event of a spill, Georgiev adds.

With regard to cyanide, following the disaster in Romania, the EU has tightened its laws and the use of cyanide in the exploitation of ores is allowed under very strict conditions.

Germany, Hungary and the Czech Republic were among the first to completely ban the use of cyanide in mining, and the European Parliament called for the ban to be extended across

Europe to protect water resources and biodiversity.

Today the so-called primacy over this method has taken over the so-called flotation concentration, which is accepted as less risky for the environment.

The environmental regulations governing the mining sector are very extensive. In addition to the umbrella law on environmental protection, this area is governed by a number of laws relating to waste management, environmental impact assessment, air protection, protection of land, water, etc., as well as a number of by-laws.

In addition to the Environmental Impact Assessment Study, which is mandatory for mining projects and conducted in accordance with national law, international financial institutions require an Environmental and Social Impact Assessment (ESIA), which at the level of individual projects it can prevent and remedy numerous problems and impacts on ecosystems and biodiversity.