Opinion

On project documents and environmental impact assessment (EIA) of the production of Amulsar gold-bearing quartzite of the Republic of Armenia.

The study of project documents and EIA of the production of Amulsar gold-bearing quartzite of the Republic of Armenia (including the amended project of exploitation presented in 2016 and the EIA of the changes of mining complex) shows that the project documents are developed and drafted on a rather high professional standards. However, there are fundamental and significant shortcomings in the project and EIA.

The complex evaluations of current reference conditions of the affected river ecosystems of mining exploitation and supervisory complex monitoring projects (Hydromorphology, Hydrobiology, hydrochemistry) on quality assessment of the dynamics of river ecosystems in periods of mining exploitation and post-exploitation are incomplete.

There are only hydrochemical and water metering monitoring applications for river basins and groundwater. Some side-effects of possible impact on the environment, crops, and ecosystem services of the affected areas are not taken into account in the project Documents and EIA that arise or may arise during the operation of mines. The supervisory monitoring and assessment programs of impact effects, in particular for chemical composition of plants and mineral caused by mining exploitation are not presented in EIA.

The first drawback. The morphological and chemical studies on benthic substrates of Arpa, Darb, and Vorotan rivers and their tributaries and the assessments of the current reference conditions are not presented in the EIA of Amulsar mining. The monitoring of benthic substrates and the assessment on the dynamic of the quality are also not planned in the monitoring project.

The second drawback. Hydromorphological assessments of the current reference conditions of the ecosystems of Arpa, Darb, and Vorotan rivers and their tributaries are not presented in the EIA. The components of hydromorphological monitoring of the rivers are absolutely not presented in the monitoring project. It is planned to conduct only water metering monitoring.

The third drawback. The assessments of the current hydrobiological reference conditions of the ecosystems of Arpa, Darb, and Vorotan rivers and their tributaries are not presented in the EIA. It is absolutely not planned to conduct hydrobiologocal monitoring.

Suggestion: It is necessary to study the benthic substrates and the chemical compositions of Arpa, Darb, and Vorotan rivers and their tributaries, and Kechut and Spandaryan reservoirs, assess and fix the available hydrobiological and hydromorphological reference conditions of the affected river basins, the available hydrobiological reference conditions of reservoirs before the operation of the mining (ecological condition, ecological status).

Complex supervisory monitoring and assessment project consistent with EU WFD principles and methods are planned to be prepared and implemented for the river ecosystems (river basins and sub-basins) during mine operation and closure. The monitoring of water ecosystems being implemented with EU WFD principles and methods is more comprehensive and informative, in modern times it has no practical alternative. According to WFD, only the implementation of complex monitoring will practically allow to check and control the scientific thoroughness and accuracy of models and project calculations of used forecasts and EIA. At the same time, the implementation of complex monitoring of river basins will allow to identify, evaluate, and effectively manage environmental risks and side-effects of impact associated with the phases of mine operation and reclamation, organize adequate processes aimed at reducing the risks, mitigating and neutralizing interference side-effects.

The fourth drawback. It is related to the possible changes in the chemical composition of cultivated crops in settlements and adjacent areas in just the same zone of the mine-affected areas, and wild plants used by the population, and assessing its effects. Because of the exploitation of the bearing mine, the agriculture of the communities of Gorayk, Saravan (including Saralanch, Ughedzor) Gndevaz, Jermuk (including Kechut) and ecosystem services in the surrounding areas will be at risk. However, the data and assessments of the researches of chemical composition of crops and utilized wild fruits, berries, the analysis and assessments of possible side effects on the chemical composition, quality and quantity of the harvest of that plants because of mining operation are not presented in the EIA. The issue is important because the chemical contamination of crops and wild plants used by the population can have ecological, social, economic and, most importantly, health care serious negative consequences

for the population in the affected communities. It even could significantly reduce the expected socio-economic positive expectations as a result of mining operation.

Suggestion: Currently, before opening of the mine, it is necessary to study chemical composition of crops in the affected settlements and adjacent areas and wild plants, berries used by the population (Some selected indicated or essential species) and fix the existing condition. Then carry out the supervisory monitoring on the chemical composition of selected plant species during mine operation and closure. Then supervisory monitoring of chemical composition of the selected plant species must be carried out during mine operation and closure.

The monitoring of chemical composition of crops and the plants used by the population will allow to identify the decline in the quality or quantity of the harvest of the plants used, and the possible reasons for the decline of ecosystem services related to mine development, if necessary, assess the damage caused, develop plans for their recovery or schemes for fair compensation

Fifth drawback. It is related to the absence of the supervisory project for the possible side-effects on the composition of Jermuk mineral waters because of Amulsar mining operation. Isotope research data are presented in the project documents which shows that the mineral waters of Jermuk are not related to the underground and surface water available on Amulsar. However, it is the current reference condition before mining operation. Given the importance of mineral waters of Jermuk, this issue cannot be considered to be solved based on the research results. *First*. For the scientific validity of the given conclusion, subsequent studies should be carried out with other isotopes and other methods available.

Second. Currently, before the mining operation, the lack of connection between the waters of Amulsar and mineral waters of Jermuk does not necessarily mean that there will be no connection between the bodies of water or there will be no penetration from the bodies of water of Amulsar into the body of mineral water of Jermuk after the beginning of mining operation when there will be earthworks, movements of rocks and land, explosions, use of chemical compounds for thousands of tons in the location over the years, changes of natural outer coating and landscapes of the surface areas up to 600 hectares.

In particular, it is indicated in the submitted documents that the analyses of samples were carried out in the Czech Republic, while isotopic studies were carried out in the UK. We

believe that the monitoring program of mining operation of Amulsar gold-bearing quartzite for the environmental impact **should be implemented in Armenia with the participation of responsible public authorities and research institutions, and the data must be made available to the public.**

It is necessary to impose the "Geoteam" to establish mass-spectrometry laboratory studies of isotope relations in Armenia, the main purpose and function of which is to be the supervision and the disclosure of the impact of mining operation on the mineral waters of Jermuk.

The implementation of re-analysis of monitoring samples of certain quantity in the Czech Republic or another referent laboratory is praiseworthy. Currently, the implementation of such re-analysis is an accepted practice and behavior in technologically advanced countries. The Geoteam can announce that the data are now available, with which we agree. However, the mine is not still operational and the area is in immaculate condition, so it is natural to access monitoring data. At the stage of the mine exploitation, the surrounding environment of the affected zone will objectively and inevitably undergo changes. Will the current level of accessibility be maintained? The public must be confident that the data will be available to the public even in the case of identifying big negative impact on the environment at the stage of operation.

The state and the public must be confident that any side-effect on the environment and especially mineral waters of Jermuk will already be identified during the initial stages of mining operation when the side-effects will be controllable and reversible, while research data will be available.

Suggestion: Special monitoring program for the composition of Jermuk mineral waters must be conducted during mining operation, exploitation and reclamation periods and be included in EIA with the use of at least two analytical methods: isotope relations (including at least hydrogen, carbon, oxygen, nitrogen and sulfur isotopes) and the methods of relations of rare elements (including lanthanides and other rare elements).

Sixth drawback. The RA Government adopted N 539 decision of "**THE MANAGEMENT PLAN OF THE SOUTH BASIN DURING THE PERIOD OF 2016-2021 AND THE APPROVAL OF PRIORITY MEASURES AIMED AT EFFECTIVE GOVERNANCE**." The draft of the management plan was already submitted for consideration in 2015. The condition of Vorotan

river basin is presented and discussed in detail in the management plan. The list of management measures is presented in the management plan. However, the plan is not taken into consideration in EIA. It turns out that the state plans the management and measures of the river basin, while the mining company, whose activities will have an impact on the river ecosystem in practice, does not make its programs: the measures aimed at mitigating the negative impact of mining on the river basin, in consistent with state programs. **Here there is not only the issue of comparability of the water usage, environmental objectives, management and quality improvement activities related to Vorotan river basin, but also a legal problem: On one hand, a plan for the management of the river basin is adopted by the decision of the Government, on the other hand, the Government, in the face of the MEP, provides the permission for mining activities in the upper stream of the river basin. What would be the case if "Geoteam" activities are contrary to the river basin management plan, or at least different from the approved plan?**

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