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HIGHLIGHTS

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# AMULSAR: Gold mining under criticism

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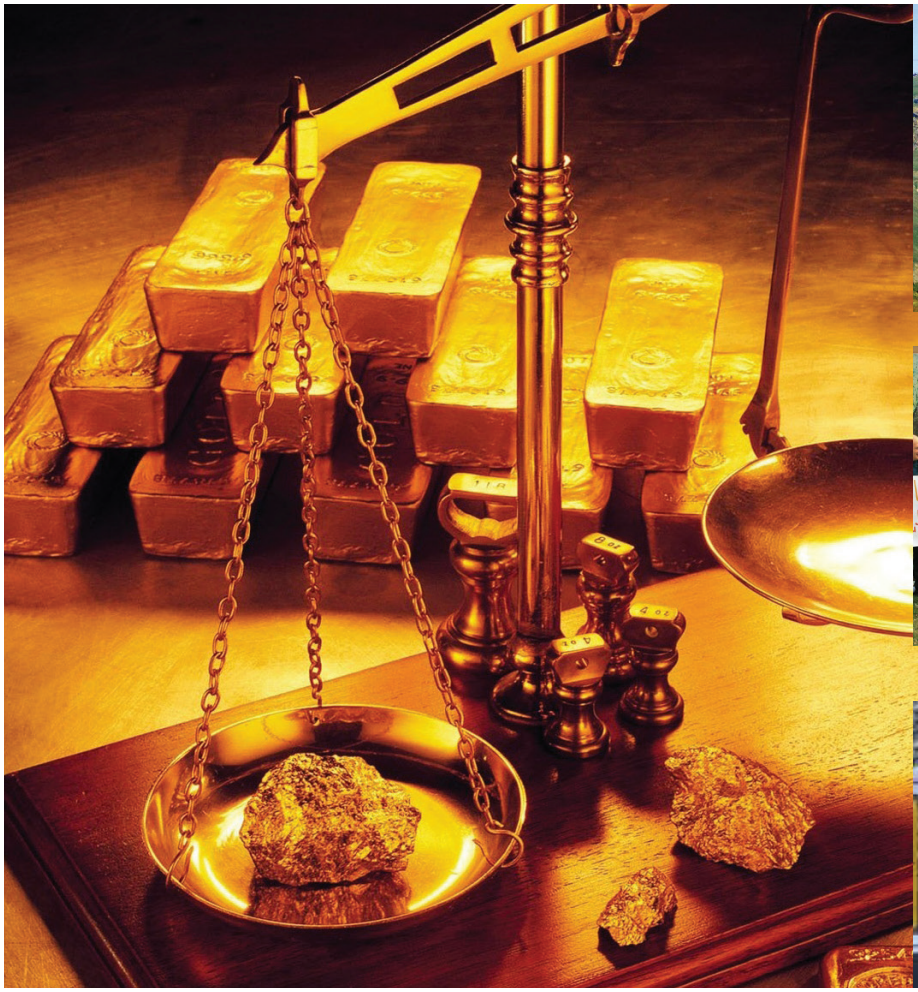


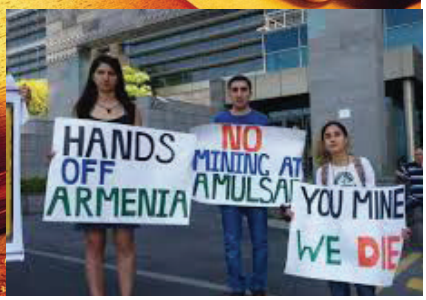


**Dear Reader. This special issue is completely dedicated to Amulsar Gold Mine. We hope it will attract the attention of our readers including RA officials, heads of international organizations, foreign ambassadors, and the international Armenian community, and together we will be able to prevent the disaster.**

According to international acclaimed experts gold project in Amulsar should not start p.2

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# According to international acclaimed experts gold project in Amulsar should not start.

## What has Lydian hidden and what the Armenian government has been "unaware" of?

*For years Armenian scientists, specialists and environmentalists presented from their field of expertise the dangers of gold project in Amulsar planned by Lydian International. They insisted that this project should not be realized. Many times it was mentioned that researches and assessments presented by this inexperienced offshore company stating that all possible risks are manageable not only pose doubts, but also they do not correspond to the reality. It was also mentioned that Armenia's government did not carry out its own expertise and instead it relied on Lydian's assumptions written in the documents neglecting all other objections and justifications brought by independent experts.*

*Now international acclaimed experts in the field have also joined Armenian experts and based on the proposal of the US-based Harout Bronozian, they presented results of three different expertises on this gold project. The results of these researches once again confirm the statement voiced for many years that gold project in Amulsar should not be launched since the assessment carried out by Lydian are extremely incomplete, while the government is basically uninformed about the unmanageable risks posed to our water resources.*

*The first one of these researches is by "Blue Minerals Consultancy" company about "Evaluation of Lydian Amulsar Gold Mining Project: Assessment of Acid Rock Drainage Potential and Effects on Surface Water and Groundwater". It was prepared by the principals of the company Dr. Andrea Gerson and Dr. Roger Smart based on the study of more than dozen of documents found on Lydian International's official website. These experts have combined experience of 45 years in minerals processing and acid rock drainage scientific research and development. The abovementioned research is 125 pages and its English version can be found at (http://www.armecofront.net/wp-content/uploads/2015/03/2017-6-17-Amulsar-Lydian-ARD-Review-Report-BMC.pdf), while the summary is at (http://www.armecofront.net/wp-content/uploads/2015/03/2017-6-18-Summary-Lydian-BMC.pdf).*

We would like to draw attention particularly of the decision makers in Armenia, as well as the shareholders and creditors of offshore Lydian to the main conclusions of the research.

In the foreword, the Australian scientists mention that acid rock drainage (ARD) is internationally the biggest environmental issue facing closed and abandoned mines and mine site rehabilitation. It presents an impending liability to current and future mining operations worldwide and also poses a challenge to the environmental and social acceptance of mining activities. Total cost estimates for remediating ARD-impacted sites in the USA and Canada combined runs into tens of billions of dollars.

Besides, ARD can continue for hundreds of years after a mine is closed and so has potentially long-term and serious environmental impact on downstream water quality, agriculture, fauna and flora. Acidic drainage with associated dissolved metal species some damaging to human health and toxic to biota (e.g. Cd, Cu, Pb, Zn, As, Hg, Se) can result from the weathering of sulfide minerals in mine waste rock and process tailings. The iron sulfide mineral pyrite (FeS2),

found throughout the Amulsar deposit, is the main generator of acid drainage.

For effective ARD control and mitigation the rates of release of acid must be understood in advance. But it is only through understanding the evolution of the rate of acid release that an effective and long-lasting environmental management plan can be put in place. This has not been done adequately in the Amulsar ARD planning.

The main questions and conclusions of the experts are as follows:

Area of Amulsar is part of the catchment basin of Armenia's largest water resources. In the project area the underground waters feed springs and fill the rivers, such as Vorotan, Arpa and Darb, as well as Kechut and Spandaryan water reservoirs and Vorotan-Arpa-Sevan tunnel, which transfers water to Sevan lake.

Lydian acknowledges that the mine will produce ARD but lack sufficient, credible testing of the sources, amounts, rates of release or mitigation measures. There are significant contradictions with missing and inadequate information on the mineralogy, geochemical testing and modeling of surface and groundwater impacts. The geochemical assessment and modeling contains inadequate data on which to base planning for control of acid generation. No details on the geochemical modeling methodology are

provided.

Humidity cell tests for measurement of rates of acid release were conducted on only 5 Lower Volcanic (greater risk) and 3 Upper Volcanic samples (lesser risk) coinciding with 8 samples on which mineralogy had been carried out. This number of samples is manifestly insufficient to be acceptable in international practice.

There are scientific inaccuracies. There is no evidence for the recurring statement justifying an incorrect conclusion of "mild" ARD. The samples chosen to justify this conclusion simply had low sulfide content whereas other samples produced strong acid (pH <3) in a few

Jarosite and alunite are found in the Lower Volcanic (LV) and Upper Volcanic (UV) mineralogy. Acid generation from alunite leaching is discounted by Lydian as not being significant, while acid generation from jarosite leaching is not recognized at all. On-going lime treatment will be required to neutralize acid release from jarosite and alunite in the barren rock storage facility until they are exhausted, as recognized by major international companies. This process is likely to take more than 20 years at Amulsar site.

The ARD from Soviet era waste rock piles is incorrectly interpreted and there are discrepancies in assessments. ARD with pH 3.5 is found after 65 years of storage and weathering. This is strong ARD that contains dissolved toxic heavy metals under in situ conditions confirming the requirement for proper management as set out in the International Network for Acid Prevention Global ARD Guide (http://www.gardguide.com) and international practice.

The only treatment proposed for seepage and runoff is a Passive Treatment Water System (PWTS) to be constructed in 2019. There are major concerns that this PWTS will not be able to neutralize and treat the release, particularly as this has been inadequately characterized, with consequent ARD and metal release to the streams, rivers and water storage below the mine.

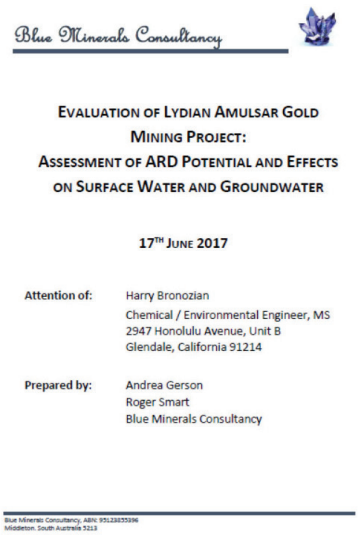
On closure of the major mining pits, ARD is recognized in runoff but no treatment or mitigation is proposed before release to local streams or drainage to springs. This is unacceptable.

In the Lydian Environmental and Social Management Plan (ESMP) to "operationalize" the commitments to environmental and social (as well as occupational health and safety) management and mitigation, there is no mention of direct responsibility for ARD control in the document. This fault is common in poor ARD control in many mines where the Mine Manager, with primary focus on production, can and does override the Environmental Manager in correct dumping, encapsulation and dump management. This is a serious omission requiring correction.

The Armenian government's Environmental Impact Report on this project does not mention ARD in any form, the need to prevent or control ARD, the potential long-term pollution of streams, rivers and water supplies or the environmental or health consequences found downstream of ARD release. It appears that there is no expertise within the Armenian Government to recognize, assess, monitor the Amulsar ARD mitigation or control this potential release for the Armenian people.

Given that acid seepage is likely to peak after this 5 year interval and may continue for decades or centuries, this duration of monitoring is insufficient. As pit seepage will make its way into spring waters these also should be monitored both off and on-site. Moreover, it is not stated what will be done and by whom if these waters fall to below acceptable standard.

This cost of treatment after the mine closure is likely to fall to the Armenian Government. In closure phase, the risk from hundreds of examples internationally is that the company profits decline to below debt level and the local (Armenian) company declares bankruptcy leaving the ARD control for many decades to the government. The major issue shown by these examples is that the on-going cost to the Government of Armenia after life of mine may exceed income to the State during operation. Fifty to sixty tonnes of acid per kT of barren waste will require on-going neutralization. Estimates of acid generation and neutralization rates, not just



Blue Minerals Consultancy

**EVALUATION OF LYDIAN AMULSAR GOLD MINING PROJECT: ASSESSMENT OF ARD POTENTIAL AND EFFECTS ON SURFACE WATER AND GROUNDWATER**

**17TH JUNE 2017**

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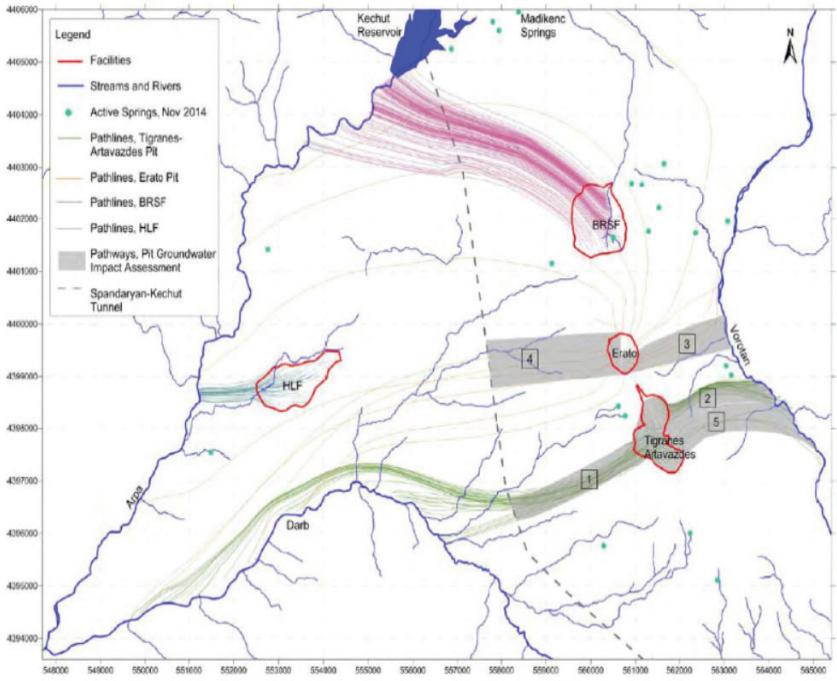
amounts based on sulfide assays, as assessed in these reports, are required to quantify treatment costs.

The reports on the geochemical testing suggest that Lydian lacks the experience and expertise to adequately define the ARD risk, and to construct and operate the geochemical and engineering required to control the ARD that will result from the Amulsar mine. In this combination of inadequate testing, planning and operation by Lydian with absence of government oversight and control, a primary risk is not only extensive pollution of streams, rivers and agricultural practice but also class actions by groups of stakeholders who have been misled (as in the action against BHP Billiton at Ok Tedi).

The potential impacts of improperly-controlled ARD on streams, agriculture, fish, other biota and, in some cases, human health are well known. Based on international examples, the scale of cost to the Armenian Government from post-closure control of ARD release could be in the hundreds of millions of dollars. In the assessments made of ground and surface water impact it has been assumed that leachate from the barren rock storage facility (BRSF) will be effectively treated to acceptable standards for release by the passive treatment system (PTS). The acceptability of such an assumption is questioned as the pH and dissolved solids content of the in-flow to the PTS is based on in-correct and in-complete analyses. Failure of the PTS would have very significant detrimental impacts on down-steam catch-




ment (edit. – in closure phase Lydian plans to clean the emerging water-flows and release them into environment and Arpa river's stream).

Significant impact to water quality at springs located around the pits is predicted with respect to beryllium, cobalt, nickel and nitrate as a result of leakage from the pits. These elements are present in the minerals but are released by the acid reactions in the pits and BRSF. These major additions to apparently already high levels should not be acceptable. Design mitigation measures are proposed, i.e. encapsulation, to limit the leakage from the pits but no further groundwater mitigation options are presented. Given the inadequate characterization of ARD potential and rate there is potential for these impacts to be greater than stated in the Lydian assessments.

Later the Australian scientists enumerate researches that are absent from Lydian's documents.

The mineralogy is not complete. Mineralogy is required on both low and high sulfide S samples with corresponding acid base accounting and standard kinetic leach column tests over at least 1 year for international acceptance of ARD potential.

The leach studies should be in the form of kinetic leach columns (not humidity cells as has been undertaken to date). This would provide a reasonable measure of net acid generation rate since it is this (not net acid generating potential) that will determine requirements for initial and on-going treatment. This is not measured or discussed. In addition on-site drum tests should be initiated immediately to definitely ascertain the effect of local climatic conditions on rates of acid and species release.

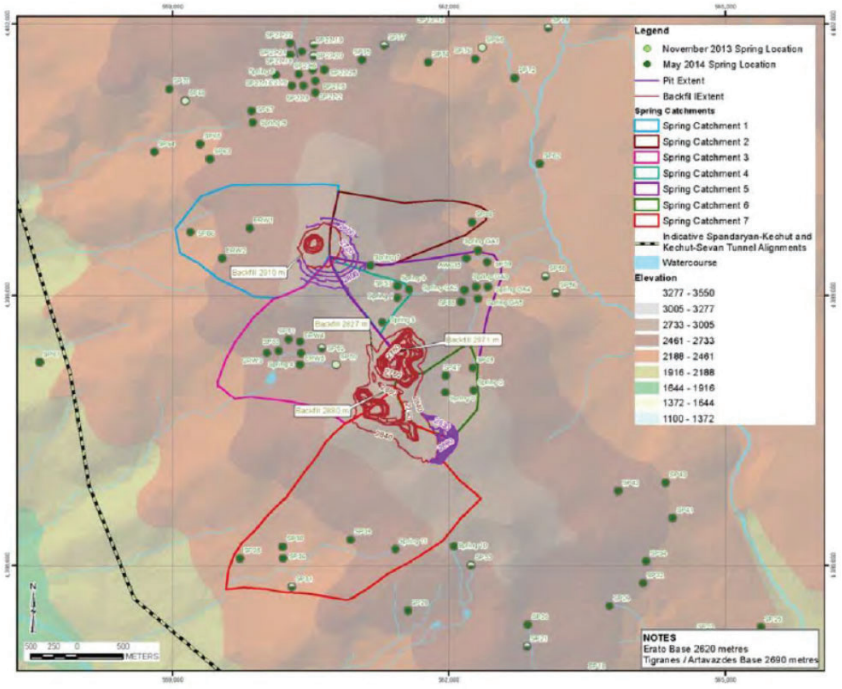
Timing is also problematic since 12-20 week long testing is insufficient. Lydian states that it will start this testing as soon as bulk samples of materials are available from the mine. This testing will be too late to modify waste rock dumping practice and needs to be done now using the more relevant conditions of kinetic leach columns rather than the humidity cell test procedure, most particularly on the Lower Volcanic wastes.

Abovementioned requirement also refers to Upper Volcanics, which also requires much more complete information on mineralogy and kinetic leach column testing on higher sulfide S containing samples (>0.5 wt.%S).

Further examination of the leach rate of alunite and jarosite and their impact on pH are necessary. The percentages of alunite and jarosite in both Upper Volcanic and Lower Volcanic samples need to be properly analysed and incorporated into ARD control estimation.

Later it is mentioned that "there is a lack of understanding of the rates and amounts of ARD release from this mine site with potentially serious downstream consequences. Without proper definition it is not possible to ensure that adequate mitigation is in place to ensure minimal impact on the environment and human endeavors including potable water, agriculture and tourism. All of the missing tests and data specified [in the abovementioned 5 points] should be obtained before proceeding with ARD planning."

Additionally the independent experts



studied "Resources and Reserves of Armenia" section of Amulsar NI 43-101 refined technical report by Samuels Engineering prepared on March 30, 2017 on the order of Lydian company. These sections are about ARD description, mitigation and management. The recommendations in Chapter 26 show the incompleteness of this characterization and detailed planning.

Thirteen tasks are identified to be required to advance the heap leaching facility (HLF) to detailed design level.

Fourteen tasks, several major and long-term, are identified for the detailed BRSF design in Section 26.5

Three tasks, two of which are long-term, will be required to advance the geochemical characterization and ARD management to the detailed design level. These and our recommendations show that the geochemical characterization and ARD management are not acceptable in present testing and documentation.

In Section 26.6 Water Treatment part, it says,

**"Unlike active treatment systems, a Passive Treatment System (PTS) must be designed to function under site-specific conditions. To date, no studies have been performed to ascertain the performance of PTS methods on Amulsar ARD. A process verification study must be performed. This study includes bench scale and pilot-scale tests. The process verification studies are long-duration tests that will start during final design and continue into production."** This is not acceptable. This should be complete before production. Changes after production have carry-over consequences for ARD control.

In Section 26.7 Water Balance part, it states:

**"Additional studies are required to verify predictive models that were used within the water balance. Site runoff, evaporation, seep and spring flow, surface water flow, and pit dewatering models all require additional model verification against field data."**

The mine should not have been approved until these tasks and verification were complete. The detailed ARD assessment and control design has not been done. Finding out after starting the mine that very high cost on-going treatments are required may seriously alter the value to shareholders and the Armenian Government.

Blue Minerals Consultancy suggests as a result of their research not to start the mining before these omissions are not properly studied by independent bodies/advisors, and after the omissions will be inserted in the ARD management plan, which will also include the government's and company's responsibilities and liabilities (the full summary of the research can be found here).

These serious researches once again irrefutably prove that Lydian Armenia/ International have released information to the public regarding gold project in Amulsar which is misleading, incomplete, hide even the important results of the research ordered by themselves. At the same time Armenia's government continues to cite this company and the information provided by it when concerned citizens send inquiries to the government for clarifying data or expertise. It turns out that a private organization is able to keep our whole community misinformed, when the situation is more than worrying, the terrible disaster is concealed, and the critique of concealment is not properly discussed either.

Responsibility for this concealment lies on dividend holders or financiers of the project (especially Armenians), Armenian scientific community, acting according to Lydian's request, international organizations, that pressures local authorities (World Bank, EBRD etc.), also foreign embassies, namely US and UK. Also, a huge responsibility lies on press, that again, forgot its own mission and acts according to Lydian's orders, and most importantly – Armenian government, that subordinates environmental safety, public interest and its accountability towards the community to private interests.

Therefore mine exploitation in Amulsar is impossible in current strategic needs of Armenia, particularly from the perspective of priorities such as protection of water resources and the livelihoods of the population. If informed about real danger of Amulsar, the most of the population, including people living in the immediate affected regions, will start a powerful resistance.

***27.07.2017***
***Armenian Environmental Front (AEF) civic initiative***

# The national security of Armenia is under threat: sulphuric acid, being formed in Amoulsar, will be extremely dangerous

## Gold deposit will become a giant generator, producing sulphuric acid, as only the layers that cover it will be removed

*Public concerns and anxieties on the occasion of exploitation of Amoulsar gold-bearing quartzites' deposit gradually are becoming sharper and sharper. There is quite serious anxiety within specialists, too. The Lydian Armenia Company has already started practical work aimed at the exploitation of Amoulsar gold deposit, located in Vayocdzor province, and plans to get the first lot of gold by next spring.a*

*It seems surprising that Lydian Armenia officials constantly deny sulfide nature of the deposit, and possibility of acid drainage emerging, as well; however, at the same time, the company ordered a plan for the acid drainage management, which clearly specifies that drainage of acid solids will emerge. In this case, the itch to get gold and profit could be fatal for Armenia, and for the Armenian nature it will become fatal, exactly. If the works for exploitation of the deposit will not be suspended, in addition to the mentioned company and several staqte officers, the British Ambassador in Armenia, Armen Sarkissian, former Armenian Prime Minister, and Moscow resident, billionaire Ruben Vardanian, who also takes part in funding of the Amoulsar gold mining programme, will also be among responsible persons.*

*Armen Saghatelyan, Director of the Center for Ecological-Noosphere Studies of the National Academy of Sciences of Armenia, doctor of geological and mineralogical sciences, has some anxieties concerning exploitation of Amoulsar deposit, too.*

*Following interview with this distinguished specialist touches on dangers arising from the implementation of the Amoulsar gold mining project (mine, factory exploitation, etc.).*


**- Which are the main dangers that could arise in the case of implementation of the Amoulsar project?**

- Obviously, in the course of exploitation of any deposit numerous risks are emerging, because anthropogenic activities break the natural balance. In fact, in connection with deposits we deal with two types of risks: physic-technical, when there may be violations of the sustainability of the landscape, may be broken, aquiferous water-bearings may be destroyed, etc. (the row is large enough); and chemical, when the natural content and balance of chemical elements in the environment is broken. The latter is more dangerous, because it is harder to study, and it is harder to deal with it, too. And there are 2 varieties of these risks: manageable and unmanageable.

If we know that some negative occurrence can take place, we, in point of fact, can neutralize this risk by technical means. These risks are manageable ones. However, there are also risks, for the neutralization of which technical means are ineffective, and they do not work. Obviously, these risks are the most dangerous.

**- Will be some unmanageable risks in the case of realization of the Amoulsar project?**

- Yes, they will. Just acid drainage, which will emerge owing to oxidation of different sulphides, is an unmanageable risk. Amoulsar deposit is of sulphide type, because different metals are present there in the shape of sulphur compounds. There are minerals (natural chemical compounds) of iron, copper, and other metals. All natural compounds are metal-sulphur compounds in sulphide deposits, in that number in Amoulsar, as well. For instance, sulphur-ore (iron-sulphur-oxygen), peacock ore (iron-copper-sulphur-oxygen), and other metals' compounds with sulphur.

Sulphide deposits are also known for the fact that gold is present there in very small quantities. It occurs as a micro-admixture in sulphide minerals. Under the influence of natural factors (atmospheric precipitation,

oxygen penetration, etc.), these minerals start being oxidized, and different so-called `secondary minerals` appear there. As far as such deposits contain quite large quantity of sulphur compounds, different types of iron's oxidized compounds also arise, speaking vernacular – rust (scientific wording – limonite). This rust tends to accumulate a very short amount of gold available in the ore, creating a concentration of dozens, and in some places – even hundreds of times greater than the concentration of gold in the unmodified. That is, rusty minefield, unlike the unmodified one, in some places may contain large tenors of gold.

Amoulsar's upper horizons are changed quite heavily, so, according to the researchers, there are places with high gold content. However, there may not be such areas at lower horizons. It should be taken into account that these contents are extremely uneven, since they are the result of a secondary process, and appropriate conditions are necessary for accumulating. In one place gold content can be high, but through 10 meters to be nothing at all, or in scanty amounts. That is, distribution is very uneven.

**- Let's touch on the issue of iron sulphide: is there any calculation regarding iron sulphide content in the Amoulsar minefield?**

- I have not met such calculation in company's documentation. Moreover, I also have not seen any calculation about how much approximately tons or gallons of sulphuric acid will emerge after oxidation of the minefield, and how much sulphur water will appear after this anthropogenic impact.

**- How do sulphuric waters arise in the minefields of this type?**

- A common chemical reaction takes place, when water connects with these sulfide minerals, and sulphuric acid occurs. There is a formula (the elementary chemistry it is), according to which any sulfide mineral, entering reaction with water, as a result, one way or another, produces sulphuric acid – $H_2SO_4$.

**- Is there any conception about concentration that it will arise in Amoulsar with?**

- It seems possible to make calculations. However, I haven't seen such calculations in the Report on Assessment of Impact on the Environment (AIE) submitted by the company.

**- What about water, how does it arise there?**

- The Problem on Amoulsar deposit, first and foremost, is that layers are cracked a lot. Secondly, minefield exploitation will be held in open method, that is, a giant hole ("the quarry") is to be dug, which will play the role of a funnel, and everything, both atmospheric precipitation, and surface streams, and groundwater will infuse in this funnel. And water will retract all inward. Essentially, the flow of water will be formed, which, mixing with sulphur and turning into sulphuric acid of different concentrations, will mixed with underground waters.

**- Have these underground waters any connection with springs of Vorotan and Arpa rivers that these rivers are being fed from?**

- Certainly, underground waters have exits to the surface, which takes place in the deepest areas of the relief, that is, in the gorges. Note that a large part of springs is located in the canyons, from where they come to the surface and then being mixed with surface waters, forming from rains and snowmelts. Here comes the first problem: there is not any mechanism for regulating these underground acid waters, as this is a very difficult technical issue. Secondly, there are not any indications in the AIE report how to regulate the acid drainage. On my mind, this risk is an unmanageable risk.

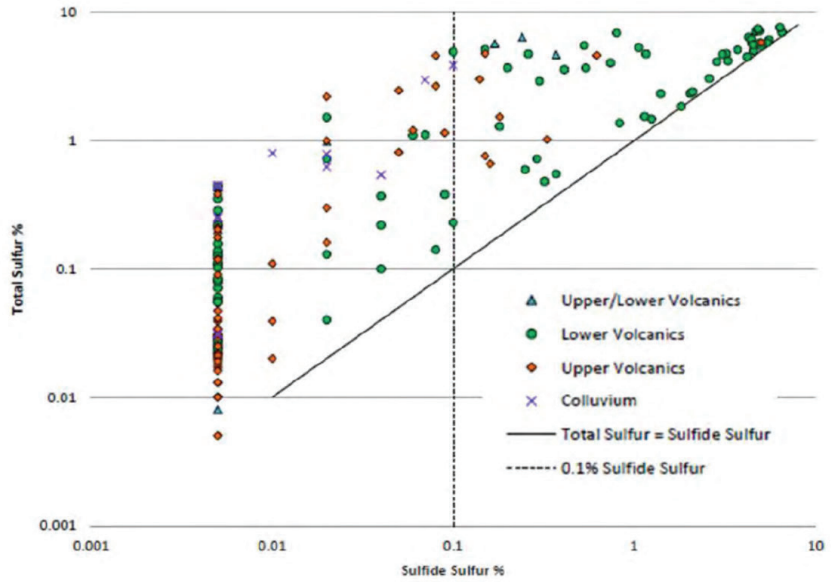
- Which after-effects may occur owing to acid drainage and uncontrollability of this risk?

- First of all, numerous fresh water springs will turn into waters with acid composition and, depending on the size of the acidity, may no longer be useful for irrigation, as well as for drinking for people and livestock.

Secondly, these sources would increase the acidity of major rivers themselves, Arpa and Vorotan, and that will affect the ecological system of these rivers. Serious changes will take place there. You should keep in your mind the fact that everything is mutually connected in nature: if water acidity changes, the quantity of salts dissolved in this water also changes, because the acid water can dissolve more salts and metals, that is, water becomes poisonous and unfit for irrigation.

**- If water becomes poisonous, won't also become poisonous agricultural products grown with irrigation by such water?**

- That's just it: such acid drainage is dangerous not only because of its high acidity, but at the same time due to high acidity it dissolves in itself metals contained in the deposit in the form of free ions, including heavy metals, such as lead, arsenic, chrome, and others. The higher will be water acidity, the more quantity of these elements will be dissolved in the water, much more than in normal water. I will also say that total space of our land




areas, irrigated by water from Arpa and Vorotan, is quite large. It should also be borne in mind that the waters of Arpa irrigate vineyards, used to produce the famous Armenian wines.

**- I n this connection, what was the Lydian Armenia's feedback response after your publication?**

- They mentioned that there have been no sulphides at all, existing sulphides have been fully oxidized, the deposit is 100% oxidized, and not any acid could arise there. However, as it is recorded in AIE report submitted just by the company itself, a sour stream is there on the surface of, besides, there's also a reservoir known as "Benik Leach", water of which is also acidic, even before start of the field exploitation.

Moreover, if judging by the AIE English version, then processes the oxidation on the territory of deposit is going on. Offshore company, which has prepared AIE report, indicated presence of acidic drainage, since some of the springs do not match the quality of drinking water, they are acidic, i.e. the process is described.

In addition to facts that I have already mentioned, English version of the AIE report contains a note regarding "Erato" plot: sulphates have been found on deep horizons. We should keep in mind that sulphates dissolve in the water (much easier than sulphides), and they form sulphuric acid faster than sulphides.

I would like to emphasize that, although the sulphur compounds in the Amulsar deposit are significantly oxidized, and rust and different so-called secondary minerals have arisen there, but they serve as catalysts. There is a lot of scientific proceedings, which describe that iron oxides themselves, in turn, become a catalyst and more quickly oxidize sulphides that are not oxidized yet. As there are sulphides, and solids of this minefield are also sulphidized, a process of faster oxidation and emergence of the sulfuric acid will begin. Mentioned occurrences are partly happening now, that is at the time when the deposit is still considerably isolated from external influences. They occur in part thanks to the fact that there is a layer of clay on the surface, and a layer of soil, and there are pine-trees, which do not allow that plenty of water would penetrate into the deposit. As soon as they open it, remove these layers, go deeper if only for several meters, Amoulsar deposit will turn into a giant generator, producing sulphuric acid, and seemingly it will be impossible to stop. Let's also take into consideration that this acidic generator will produce sulphuric acid not only one year, or ten years, and this dangerous acid will spring up not only during the deposit's exploitation. Production of sulhpuric acid there can last for centuries.

**- In this case, what future is in the store for Spandaryan-Kechout tunnel?**

- This tunnel designed for transport water from Spandaryan to Kechout storage reservoir and then to Sevan Lake, will go to ruins, step by step, because some quantity of contaminated water will unescapably have direct contact with the tunnel. It is a reinforced concrete construction, which, as time passes, definitely will not withstand the ravages of acidic waters. And emergencies will occur there.

By the way, if nevertheless the works aimed on deposit's exploitation will not be suspended, it is necessary that before removal of the top layer of soil and clay from the mine specialized state commission would be created to evaluate the condition of Kechout-Spandaryan tunnel. It means that condition of the tunnel has to be cleared up and recorded on proper state level, before mine opening and acidic drainage problem emerging, in order that we would see what has been done there, and would haw an opportunity to compare. Otherwise, Lydian Armenia Company can declare tomorrow that they are not to blame for anything, and the tunnel have been ruined before they have started appropriate works.

In fact, such necessary and important work, as documenting of tunnel's current technical condition, has not done yet, and till now it has not been recorded in any document.

Company broached the issue concerning possible impacts of acidic drainage on the tunnel in the English version of the AIE report, which is not an official document in Armenia. As for the Armenian version, company tried, as the saying goes, to cover up and get around this issue as much as possible. Generally, there is no wording `acidic drainage` at all, and there is not considered a problem due to the fact that, as a result of the reaction of water with sulfide raw materials and sulphurized solids acidic solution will occur in the deposit. This issue is taught concerning not deposit but those solids that will be removed from the mine. Solids also contain quite a lot of pyrites, which is iron sulphide again. In this connection, as there is written, such dangerous waters can arise, and how these waters must be collected. Well, there it is possible to collect waters; there is a technical solution, so this risk is controllable. Another matter is whether they will collect these waters in practice or not? However, there is not any word about the occurrence of acidic drainage just on the deposit, that is, that deposit itself becomes a giant generator

of acid waters, and an uncontrollable risk will emerge. Acidic drainage that emerges directly in the deposit is an unmanageable risk.

**- But do these waters containing sulphuric acid flow towards the Sevan Lake after destroying of the Spandaryan-Kechout tunnel?..**

- Anyway, these waters will reach Kechout through the tunnel, destroyed in varying degrees. And if then an attempt will be made to transfer water from Kechout storage reservoir to Lake Sevan, acidic water will go there, which along the way, perhaps, over time will destroy the Arpa-Sevan tunnel, too. Thus, the task of strategic importance regarding accumulation of additional fresh water in Lake Sevan, which should be national and state supertask for Armenia, will turn into nothing already at the initial stage of implementation of the project of development of the Amoulsar deposit. We shall leave our descendants with an overwhelming problem, an unenviable legacy, really. We shall leave a giant acidic generator, which will produce water containing sulphuric acid, and which, dissolving incomparably more heavy metals as against ordinary water, will contaminate surface and underground waters, land areas, fruits and vegetables cultivated there, and, in the end, people who eat this production.

**- Will fishes that live in mentioned storage reservoirs, in Arpa and Vorotan rivers, and in Lake Sevan be able to survive in such a poisonous or contaminated environment?**

- I don't know. However, very serious researches and clear calculations must be made before mine opening, which needs hard work and large expenses. It had to be done, but it hasn't been.

**- Have you some preliminary calculations, or do you have a conception, how much cubic meters of sulphuric acid will arise?**

- We cannot calculate, because it requires a lot of data that absent in the documents submitted by the company. It can be assumed that due to purely rain there will be produced about 40.000 cubic meters of water, excluding ground waters and industrial waters. It should also be borne in mind that under the influence hydro-geological conditions can change, and an additional inflow can appear.

**- As director of the Center for Ecological-Noosphere Studies of the National Academy of Sciences of Armenia, whom have you officially informed about it?**

- I haven't informed officially, as our center is a state institution, and as state institution we have not received any instruction, order or at least inquiry concerning assessment this project. On other issues, projects, for example, about Sotq deposit we have received such an order from the Government and then report on the results. As for this case, in spite of the existing high risk, appropriate and alternative studies and evaluations have not been carried out.

- Have you informed, if only unofficially, the Prime Minister of the Republic of Armenia, his Adviser on environmental issues, the Chairman of the Expert Committee on Lake Sevan on the dangers and expected losses that you have mentioned in our interview?

**- But how should I inform them unofficially?**

- Through private conversations.

**- I did not have private conversations with them. It could be said that I informed everyone through the mass media. We work openly, and when any public organization or media applies to us, we try to answer their questions, to voice existing problems. But if governmental body does not apply, what should I answer him?**

- Have you presented the problems that you talked about within the Scientific-Technical Council acting under the RA Minister of Nature Protection?

- Yes, several months ago I presented the issue on the instructions of Minister Artsvik Minasyan. He also was present when I have made my report.

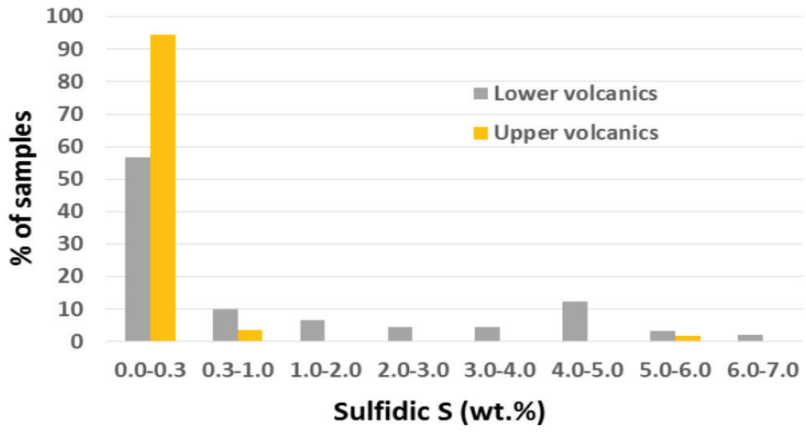
**- What was the respond that Scientific-Technical Council gave regarding your report?**

- A resolution has been passed: to transfer raised issues to Lydian Armenia Company, with mentioning that such problems exist as acidic drainage, sulpurizing, etc., and an exhaustive answer has been expected from the company. Whether company responded or not, and which was its answer, if any, I don't know.

**- Well, we talked on the occurrence of acidic drainage, on the threat it brings, on the expected hazards. But whether the acid drainage is the only danger in case of exploitation of Amoulsar mine? Or there are other risks, too?**

- There are risks to be managed. In addition to acid drainage, seismic situation can also be written in as an unmanaged risk, because I'm not sure that they are correctly calculated the size of seismic hazard. However, in this aspect you are better to talk with experts on seismic. There is quite complicated situation, and terrains located next to each other may have different seismic evaluation.

**- What can you say about the trajectory of dust dispersion with a content of heavy**



**and toxic metals, generated during exploitation of the mine? Whether the majority of this dust is indeed distributed in the range of 1 kilometer, as presented in the AIE report?**

- As for me, all both formulations and calculations presented by the company need to be seriously revised, rechecked, because some dishonesty is seen in the whole this process.

**- What kind of negative impact during operation of the Amoulsar gold mine may be on "Jermuk" mineral water, whose sources are close to the minefield?**

- I can't give a definite answer to this question. Different experts approach this problem in different ways, express different positions. Some geologists say that there is a direct relationship: mine exploitation can harm hydrological regime, and sources of "Jermuk" mineral water will be plainly threatened. But the company insists that, according to their calculations, absolutely no harm expected. I believe that the likely harm cannot be fully ruled out.

**- That is, planned explosions, drilling will not be able to change the mineral composition of "Jermuk"?**


- The concern is that explosions can cause some resonant phenomena. The geological structure itself is very complex, and there can be layers able to enhance resonantly weak shocks and vibrations and spread them pretty far, even down there, where the sources of "Jermuk" mineral water are situated. And it's not so far from Amoulsar, about 10 kilometers. It is impossible to except such damage, so in order to make sure, will there be harm or not, it requires significant research, made by already other specialists – geological engineers. According to Lydian Armenia, the area of Amoulsar deposit is totally separate geological unit, which is in no way affiliated with the terrain of "Jermuk" mineral water. But it does not correspond to the facts, and not any geologist will accept it.

- If shocks resonantly reach Jermuk, can springs of mineral water disappear because of it?

- Yes, they can. Hydrological regime can be broken, too. It is very difficult to foresee the outcome of every impact on this complex hydrological system. Let's remember what happened to our artesian basin in Ararat valley, which have got so much harm made by other people. The big question is how to restore the basin and what will be with him in future. We can make some assumptions concerning the consequences, but these are not clearly predictable. In this respect, the issue should be approached in the following way: if there really is a danger, then it is not necessary to venture, and not to say: let's start and then see what happens. As we have a chronic lack of responsibility, people often think: let's do something today, who will remember tomorrow what we have done? For example, have anyone in the mining sector so far brought to justice for his actions?

*21.07.2017*

*By Arthur Hovhannisyan*
*Translation by Ashot Gareginyan*

# Connect the dots between philanthropists and miners

Lydian Armenia (former Geoteam): the company who intends to mine gold in Amulsar. The company has no prior mining experience whatsoever. Geoteam was founded in 2005. 100% of the company's shares belong to Lydian International open stock company. Lydian International is registered offshore in Jersey, Channel Islands, a financial tax heaven providing "one of the best wealth management services in the world." Jersey is a self-governing jurisdiction under the Crown of the UK, while it has its own legislation, its around 100.000 inhabitants are holders of a UK passport. As a tax heaven, Jersey makes it easy for companies to hide their founders and beneficiary owners, as well as affiliated beneficiaries. Since 2008, Lydian International has also been registered on Toronto Stock Exchange which makes it possible to detect owners of its securities, but not founders and beneficiary owners.

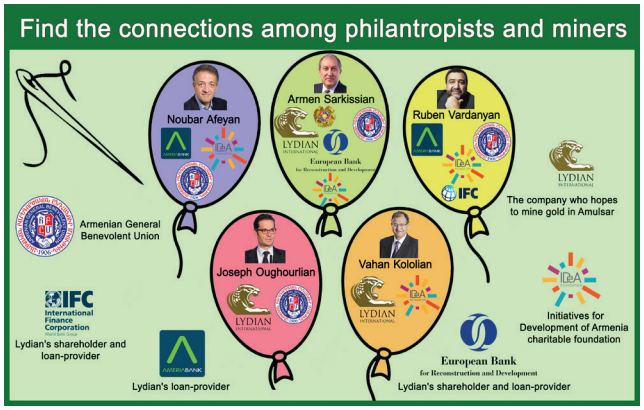
Who supports Lydian in this much criticized gold-mining project? We chose to skip investment companies and hedge-funds here, and instead, we focus on connections of well-known Armenian philantropist-businessmen and development organisations with mining business. Interestingly, all of these businessmen have high-level presence in the Armenian General Benevolent Union (AGBU) and "Initiatives for Development of Armenia" (IDeA) charitable foundation.

European Bank for Reconstruction and Development (EBRD). A major shareholder of Lydian International; provides large loans for Amulsar gold mining project. Was created in 1991 by the governments of the US and European states specifically in order to promote privatization in the former Soviet states and support private business.

International Finance Corporation, World Bank group (IFC). A major shareholder of Lydian International; provides large loans for Amulsar gold mining project. Established in 1956 as the private sector arm of the World Bank has been directly and through intermediary banks been financing for 70 years private business in developing countries with the aim of reducing poverty and developing these countries. In Armenia too, for the past 20 years it has aimed to reduce poverty and support country's privatization.

Ameriabank. An Armenian bank which strives to create an image of a "green and social-oriented" bank, however, signed a $24 million loan agreement with Lydian Armenia for buying mining equipment for Amulsar gold mining. One of Ameriabank's shareholders is EBRD which is directly financing Amulsar project, but also indirectly involved through its Ameriabank decision-making power.

"Initiatives for Development of Armenia" (IDeA): charitable foundation aims at development of social entrepreneurship in Armenia. The foundation endorses 10 development models some of which are quite contradictory, for example development of healthcare and agriculture-farming vs. mining industry. One of the projects of IDeA foundation is Aurora humanitarian initiative. Almost every "philantropist-businessment" presented in the picture affiliated with Amulsar gold mining is either a founder, a trustee or a donor of IDeA foundation.




Armenian General Benevolent Union (AGBU) claims to be the world's largest non-profit organization devoted to upholding the Armenian heritage through educational, cultural and humanitarian programs. Almost every "philantropist-businessmen" presented in the picture and affiliated with Amulsar gold mining is a member of the Central Board of Directors of AGBU.

Armen Sarkissian: Ambassador of Armenia in the UK in 1991-95 and from 2013 till present. Prime Minister of Armenia in 1996-97. Director of Lydian International's board in March-September 2013; during this period he managed to gain important approvals from the government of Armenia, as well as funding support of important financial organisations for Amulsar gold mining. In the period of his directorship in Lydian, he organised a visit of Prince Charles (UK) to Armenia in the framework of a project called "Yerevan, my Love" which deserves further investigation of its own. Sarkissian was the special advisor of the president and governor of EBRD (a shareholder and loan-provider to Lydian) in 1993-2000. On the other angle, he is a member of the Board of Governors and Trustees of UWC Dilijan college, IDeA foundation and is a member of the Central Board of Directors of AGBU.

***Ruben Vardanyan,*** *a Russian businessmen, also creates an image of a philantropist. One of the founders of "Sberbank CIB" business-group in Russia which was created as a result of merger of "Sberbank" and "Troika Dialogue" companies. His name was found in the infamous Panama papers. He recently became known in Armenia for his charity projects: he is the co-founder of IDeA foundation, is a member of the Central Board of Directors of AGBU. In the meanwhile, he is also a member of the Board of Governance of Ameriabank (a loan-provider to Lydian International for mining in Amulsar), and a member of the Economic Council of the International Finance Corporation (a shareholder and loan-provider to Lydian).*

***Noubar Afeyan:*** *American entrpreneur, the founder of Flagship Ventures whih creates and finances start-ups that respond to the needs in healthcare and sustainability. He is a Board member of IDeA foundation, and, together with Ruben Vardanyan, a co-founder of Aurora humanitarian initative. He is also a member of the Central Board of Directors of AGBU. In the meanwhile, Afeyan, together with Ruban Vardanyan, is a board member of Ameriabank, a loan-provider for Amulsar gold mining.*

***Joseph Oughourlian:*** *the founder, managing partner and portfolio manager of Amber Capital, one of the largest shareholders of Lydian International. Amber Capital is also a shareholder in Artsakh HEK (hydro electric power plant of Nagorno Karabagh). Oughourlian is a member of the Central Board of Directors of AGBU since 2010.*

***Vahan Kololian:*** *He is in the list of 10 largest shareholders of Lydian International. He is the founder of Terranova Partners (2004) and has also been in mining exploration business. On the charity hand, he is involved in the list of donors of UWC Dilijan college, IDeA foundation. Although he is not a board member of AGBU but cooperates with the latter, at least as a co-funder of projects.*

***Armenian Environmental Front (AEF) civil initiative***

# Technical gaps and problems of Amulsar mine project:

## interview with chemical/ecological engineer Harout Bronozian (USA)

***Since December 2014 Harout Bronozian has been writing to representatives of Lydian Armenia and Armenia's Ministry of Nature Protection regarding Amulsar gold mine exploitation project. The correspondence has been mainly about the technical aspects of the project, which are within the scope of specialization of Bronozian and which expose many important facts regarding flaws of Lydian and Amulsar mine project. Members of Armenian Environmental Front summarize here the interview with Harout Bronozian and questions and concerns mentioned in his letters.***

*About Harout Bronozian: he got bachelor's degree in chemistry after which he went to England and received master's degree with specialization in petrochemicals and hydrocarbon chemistry. Later he left for the USA where he studied chemical engineering: this specialization studies the planning of structures and process of chemical production. In 1980-1985 Bronozian worked in Saudi Arabia at 3 different companies dealing with water treatment – he was involved in projects turning sea water into drinking water through membrane technology, as well as in a project of installing treatment systems for sewage water and organizing all the steps for this process.*

*In 1985 he returned to LA and 2 years later he founded a consulting and contracting company in industrial water treatment. The latter worked with gold refining companies treating their industrial waters by destroying cyanide and removing heavy metals there. He worked in this sphere for 15 years, until 2000.*

Mr. Bronozian, why are you concerned with Amulsar gold mine project? When did you start sending letters to Lidyan, Armenia's government and other involved bodies? What questions did you raise and what answers did you get?

H.B. I've started writing to them since December 2014, when they came to the USA to make connections with American Armenians for showing that they care for people's or diaspora's opinion. They organized meetings in LA and NY, where I was not present. However, later those present there sent me their 30 page document. I saw only one schematic diagram there and 4-5 photos based on which I wrote around 70 questions and they replied. This is my specialization that's why I know the issue and I am concerned about it.

My questions referred mainly to technical aspects. I also tried to clarify if Armenia's government acted professionally when studying and approving the project. Here are a few questions from the letters:

Until now, after so many years, Lydian does not have a detailed engineering design for this project. Why? How anyone can evaluate what equipment will be supplied, how it will be operated and maintained? Do they have their bill of quantities as to exactly what equipment will be supplied?

Large amounts of hazardous chemical materials will be transported from international sources to the mine site, particularly sodium cyanide and caustic soda. This creates a major risk due to any spills. Also large amount of activated carbon will be imported.

What guarantees exist that there will be zero industrial water discharge from mine, taking into account that huge amount of water will be used (more than 600.000 gallons per day, around 2.400.000litre) and it is forbidden to discharge it into nature.

Hazardous waste from used activated carbon and heavy metal sludges will be produced. Where will they be deposited and in what quantities?

Who is responsible if not enough gold is found or because of any other problem Lydian abandons the site before completion of the project?

How the heavy metal hazardous waste sludges produced during the cyanide heap leaching in gold mining process will be collected, stored and disposed?

Why mining in Jermuk and why not developing other environmentally friendly projects in that area? Have other alternative projects been evaluated for Amulsar location? And why not? Why prior to approving the mining project Armenia's government has not announced a competition for alternative projects?

How can the Armenian government allow such a project in a touristic area like Jermuk, where the cost of destruction will be much higher than the profit? Besides, the management of such a truly hazardous waste facility

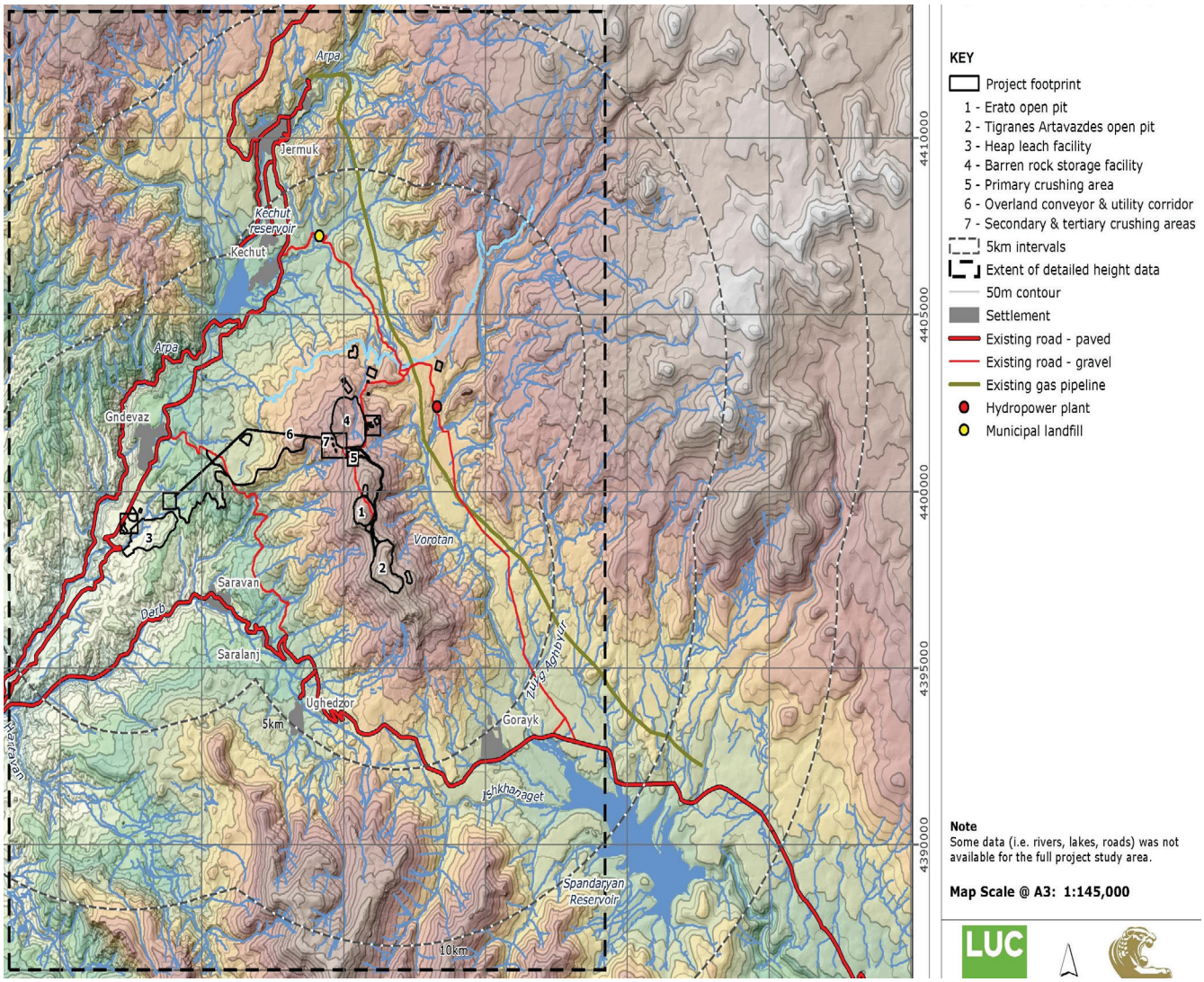
is entrusted to inexperienced company like Lydian in a country where environmental standards are very weak and their enforcement is close to not operating.

What answers did you get and were they satisfying?

H.B. I concluded from Lydian's answers that they have no technical capacities. They are businessmen: they paid a company to design a project for them, then they nicely presented it to different banks for getting money. But there is no background. They have no idea how to solve technical problems when those arise. And they will arise. Even big mining companies such as Barrick Gold which has many years of experience in this sector and a big financial capacity, in 2015 leaked 1 milion litre cyanide in its mine in Argentine. Thus even the biggest company can make mistakes. Then how can Lydian insist that it will make no mistakes. We have the right to know all the details, what equipment will be in place, who will make them work, what oversight mechanisms will be there, so that if problems arise, system automatically stops, who and how will solve the problems?

The ministry is to be blamed for signing under Lydian's project without having answers to these questions. It is the right of Armenia's Ministry of Nature Protection to ask such questions. If we compare with home construction, when we order someone to build a house for us, we will order a project, then we will ask detailed questions to understand what exactly will be done and how, and if we don't like something, we will order a change according to our taste. It should be so in this case as well, especially since we talk about a dangerous project. It should be clearly mentioned in the contract who will be responsible if something goes wrong. If it is not mentioned in the contract, then Lydian will have no obligations. These points if not yet in the contract must thus be added. They insist no mistake will occur; therefore they should provide facts, show the whole production process, answer the questions of specialists and explain each step. This responsibility lies on Lydian, not Republic of Armenia.

There are two reasons to be strict with Lydian. Firstly, they have no experience in mining. If it were experienced, maybe there would be no need for this many questions as we would know their style of working. Now we can't trust their words, we have to study their equipments, understand their quality and to what extent the company is ready to eliminate negative outcomes, if mistakes, accidents or various technical problems arise. It is based on this that we can say what to add in the project, if they want to realize it.



Second, they came to a place which is Armenia's best location, most valuable region and they want to destroy it. For any project the location is important. For example in the USA one can't burn garbage and get energy in Beverly Hills. However 30km away from Beverly Hills there is such a factory there working for the past 25 years. Strategically Jermuk region is very impotant as it is a river basin area. Surface and groundwaters are formed here and thus it is a place like Beverly Hills: if some mistake occurs, the outcomes of cyanide, acids or other contamination will be irreversible.

Today Lydian gives 300, 400, 600 pages of documents to those asking questions and tells them to read them. But this is not what we are asking. We are demanding them to come, have a two day conference and answer all our questions. Based on this we will know the happening. It is also important as to who will participate in the conference and who will ask questions so that no cheating takes place. Experience is very important: they can't cheat me, but they can cheat someone who is not a technical expert.

Up till now Lydian NEVER showed a detailed technical presentation on Amulsar project with the participation of the best experts and scientists, not even with the Ministry of Nature Protection. What are they afraid of?

What technical questions are you speaking about?

H.B. There are many technical questions, the answers to which are not in Environmental and Social Impact Assessment (ESIA). In their responses to my questions Lydian or Ministry of Nature Protection couldn't provide sufficient answers as well. For example, until now Lydian has not presented the plan view of its project. The factory will have two sections. In the first one the mountain rocks will be crushed after excavating them from the mountain. In the second, gold will be extracted with cyanide. The first one will cover a huge area; the second one will have smaller territory. But in the second one chemical industrial refining technology will work of which I am an expert. And I have many questions in this regard; how big will the rocks brought to the factory be? After bringing to the factory there will be need to use calcium hydroxide to process them, where will they get calcium hydroxide?

They say they will bring it from Ararat cement factory.

H.B. Yes, but what quality it has? What control system will be in use for the production line and how it will be mixed with stones? How many cubic meters the tank will be for making cyanide? What material it will be from – stainless steel or ordinary one? All of this must be clear, since wherever there is water, there is the risk of corrosion. Meanwhile that tank will be used for 10 years. Inside the tank there should be rubber surface so that it is not damaged. Since if it is damaged, it is a long process to remove and change it, the whole factory has to stop. These technical issues are not included in the ESIA. Lydian gave some answers to my questions but that is not enough. Besides writing, it should be explained and the Ministry and any person has to have the chance to ask questions, right questions, in order to know all details before installing. If wrong or not sufficient amount of equipment is placed, problems will arise. We want to know what they will do in case of a mistake, how they will solve it?

The whole production process should be presented in detailed scheme, diagram. Everything should be presented there. These are huge graphs, sometimes even several graphs. Meanwhile Lydian's diagram is a schematic diagram, which they either copied from somewhere else or used a standard one, it is of little value.

Lydian has no clue of technical questions, it has no own specialists. When I was in Armenia last October, I agreed to meet their technical specialist to discuss these questions. A few hours before the meeting I learned that they are sending not the technical expert but their public relations specialist. I cancelled the meeting. What were I supposed to discuss with the PR specialist? He/she would have no idea about technical issues, later they would announce that they met me. This company is totally inexperienced.

They say everything is written in ESIA and in technical description.

H.B. In his video interview in August 2016 Howard Stevenson himself said that they have just now started deciding what equipments to use. These people have come without knowing what equipment to use; they made a general project copying from here and there to present to World Bank and other banks to get money. The information they provide is surely not enough: I've always asked about the equipments and there has been no such information.

Lydian says – we will use the best technologies and there will be no pollution of the environment. How will you comment on this? Is it possible to extract gold through cyanide and leave a zero impact? They say if there is a leak from the cyanide heap-leach factory, they will filter it based on regulations of Armenia's laws and will pour it into river Arpa (regulations in Armenia by the way are very different, there might be rivers that are polluted, other rivers might be of agricultural use etc). River Arpa feeds Vayots Dzor region's vineyards and agricultural lands. So to what extent can the water be filtered after gold extraction with cyanide, how clean that water will be?

H.B. It is not possible, since whatever is done that water will not become drinkable. It is impossible.

Will it be fit for irrigation?

H.B. No. Since there is cyanide in the system, there is no guarantee that no cyanide or other dangerous substances will remain in it. According to Ministry of Nature Protection gold will be accompanied by mercury, meaning mercury posining is possible.

They say it is easy to destroy cyanide.

H.B. Cyanide can be neutralized, since it should be in low consistency; however there are heavy metals accompanying cyanide, such as silver, chrome. And if something goes wrong, where will that water go? For example if the water quality is worse than the norm, what will they do in that case? Daily 600.000 gallons of water will be used, where will they take that water and where will it go and how? All of this must be presented in details. In the US when you place a system,

you build a concrete wall on 4 sides, so that if structure has leak the industrial water stays in that circle and doesn't leak out.

What material is cyanide and what effects it may have?

H.B. Sodium cyanide has bigger granules than dust. If one drinks cyanide, they'll die since it absorbs oxygen, so they die because of lack of oxygen. Acidity is also important: it must not be acidic, but alkaline therefore sodium hydroxide must be used in order for Ph to be close to 10. Thus cyanide sticks to heavy metals and when it does, it is difficult to remove it. One can neutralize cyanide with chlorine and hydrogen peroxide. If cyanide is to be released into water, chlorine or hydrogen peroxide must be used.

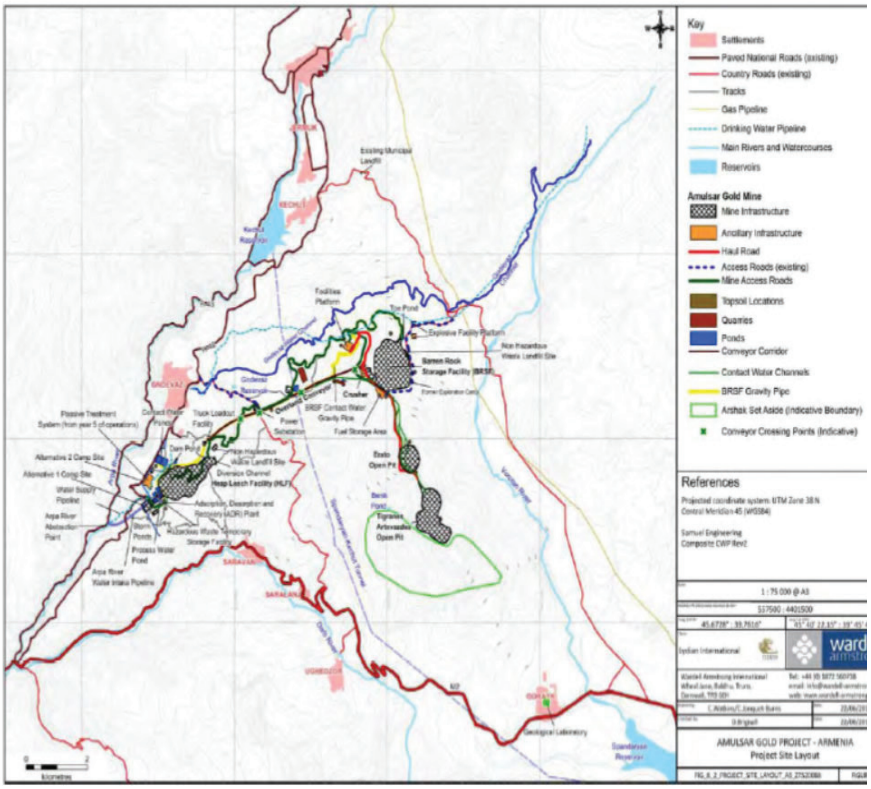
Lydian speaks about hydrogen peroxide, but I don't know where they plan to bring it from. There used to be chlorine in Armenia before, but I don't know if Armenia has liquid chlorine or not. So there are these questions too – where will these chemical substances be brought from, and if there is none in Armenia, what will they do?

Later, heavy metal sludge will be left which must be kept somewhere as dangerous substance, but where will it be kept and how safe that will be? In one of replies to my letter the representative of Ministry of Nature Protection said that there is no hazardous waste management facility in Armenia and that all solid and liquid waste will be kept in the site as a temporary solution; they say that they found several European companies that deal with waste recycling and they can eliminate the hazardous wastes. But this response is very vague similarly like other responses to my questions.

There is a great difference where the mine is. For example in the US there is infrastructure, so if the pump is damamged, you call and 24-48 hours later you have a new pump. Or if you need to change a pipe, it is quickly replaced. Will these guys have additional spare parts or materials, so that if something is damaged, they are capable to change? After all that too means expenses. In 10 years many things may happen in the factory, e.g. corrosion, especially in Armenia with its complex geographic location.

For example, what problems could arise specifically in case of Amulsar based on the information and responses you have?

H.B. There can be any kind of problem, since they are going to use huge amount of water, for example something as simple as freezing of water (like the dam freezes in winter), so how will they dump cyanide into frozen water. When it rains, lots of water will emerge in that huge area, what will they do with that water? They must come and explain to us. This is a multi-million project and so they have to explain us anything we ask them to. They will get a lot of money, so can't they bring specialists to explain? I can't ask many questions now, but once they explain, I will be able to ask precise questions.




In your letters to the Ministry of Nature Protection did you ask how the ministry will monitor the water quality?

H.B. Regarding the water quality I asked who will monitor the process in the factory. Firstly, ministry's experts should be present and working at the factory. But that's not enough, since one cannot even trust the ministry representative. Therefore it is good to have an independent expert who will have the right to carry out such a monitoring.

The government approved Amulsar's mine project without independent expert analysis or technical assessment and without taking into consideration the opposition of scientists and environmentalists. Moreover, Ministry's staff has no proper education and experience in environmental sciences and engineering. The Minister Artsvik Minasyan himself admitted that they have no expert for project assessments. How is that possible? Additionally, the environmental insurance of which the Minister is speaking about doesn't cover underground and overground water pollution. Thus, who needs this project, if large amount of water supplies in Armenia are under contamination threat.

Not only gold will be extracted in Amulsar, other dangerous chemical materials will be used there (sodium cyanide, sodium hydroxide, hydrogen peroxide) and dangerous chemicals will emerge (cyanide laden heavy metal wastewater, heavy metal sludges, spent activated carbon, activated carbon regenerant solution, and especially acid mine drainage). In case of Amulsar, the rocks contain sulfides, which after crushing will expose the sulfides to oxygen and rainwater and can oxidize to sulfuric acid producing acid mine drainage and contaminate

the groundwater and surface water. This is clearly indicated in the Lydian Environmental Impact Assessment, page 26 for example, and will constitute the biggest environmental catastrophe for Armenia's groundwater and surface water contamination, on fish and ecology. Lydian company also is not member of International Network for Acid Prevention, while big companies in the world are its member. How can an inexperienced company be its member?

To justify Amulsar project's approval, Armenia's government also highlights the financial gains.

H.B. If profits played a role, it is also unjustified. My calculations based on Lydian's data are as follows (of course this is guesstimate). They will extract:

Gold: 73,000 kilo, 1 kilo = $40,000; Total=$3 billion dollars

Silver: 300 tons; 1 kilo = $576; Total: $172 million dollars

Therefore the total estimated value of gold and silver production in ten years from Amulsar will be about $3.2 billion dollars (rounded), if everything goes well of course.

Expenses will be as follows:

About $500 million to be paid to the government of Armenia in 10 years, thus 50 million per year.

Equipment and other construction costs will be $370 million.

Assuming a salary per year for one person is $15.000 per year (my generous estimation). For the period 2016-2018, salaries if doubled and for 1300 employees, total salary can be at $600 million for 12 years.

Assume another 300 million for marketing, gold refining, distribution and other expenses.

NET profit thus is around $1.4 billion ($3.2 billion dollars minus all expenses), which is thus pretty attractive for all the investors, irrespective of the environmental, landscape, business, demographic and other consequences for Armenia. The Armenian government will get about $500 million or 15% only. What that money will be used for is another question? We know that $10 billion dollars illicit money were flown out of the country from 2004 to 2013 and is continuing instead of investing in Armenia. While our national debt stands now at close to $6 billion.

Lots of questions raise, for example why AGBU affiliated investors (Ruben Vardanyan, Noubar Afeyan, Joseph Oughourlian), Vahan Kololian, Ameriabank, IDeA Foundation as well as the Ministry of Nature Protection are involved in a detrimental project for Armenia like Amulsar, in cooperation with IFC and EBRD? Did they review the enormous amount of criticisms and published information by the public, attorneys, scientists and engineers in Armenia and abroad for the past 4-5 years? Ameriabank lately extended a loan of $24 million to a company like Lydian. Does it realize its complicity? Money invested in such a project will negatively affect their reputation. And if some mistake happens, Ameriabank will also be responsible. Do they admit this?

Therefore is $500 million worth to destroy this beautiful region for the upcoming hundreds of years. One can get $500 million by making long term projects in tourism, development and export of Jermuk waters, without impacting the nature. How will this project affect tourism? What economic studies have been carried out? Whose interests Armenia's is serving – interests of the US, UK and international banks which promote interests of international mining industry and implement dangerous mining projects in various countries following the path of greed, defend an inexperienced company like Lydian and so Armenia's Ministry of Nature Protection is taking their side? This is crazy.

## Summarizing…

H.B. It is sad that decision makers in Armenia have no expertise, qualification and experience, they are corrupt and thus permited the implementation of such a disastrous project to go this far. This project and company should have been rejected from the very first day taking into account Lydian's inexperience and Amulsar's location.

I think now everyone is in a bad situation if they realize the seriousness of the consequences. Armenia's losses from this project will exceed economic gains. The biggest threat is the mine acid drainage mentioned above. Jermuk and Amulsar cannot be a testing ground.

My professional advice is to annul this project to avoid disastrous outcomes and let Armenia have alternative projects in cooperation with interested investors and with consideration of Amulsar region's specific location.

March-April 2017
Armenian Environmental Front (AEF)
civil initiative

# Gold mining under criticism

*By Zhanna Sargsyan*

Lydian International Limited Company plans to operate a gold mine in Amulsar, Armenia.

Mountain Amulsar is next to Jermuk health resort, famous with its mineral water. The mining area is considered too close to Jermuk resort and around 6000 residents living nearby (some 12km away). Jermuk is an international resort complex. The pool where sanative waters are located has the status of hydrological reserve and is included in the list of Armenia's specially protected areas. Investments are thus made here for developing tourism and mineral water spa centers.

Article 99 of Armenia's law on Water declares that in the areas with underground waters activities such as burial, discharge or release of radioactive or toxic waste, blasts that release toxic waste are prohibited.

Since open pit mining in Amulsar will be accompanied with blasts as well as heap leaching, experts highlight that in this case a detailed legal as well as economic study should be carried in terms of environmental impact for Jermuk and its waters, as well as in terms of economic gains and losses in long-term perspective. The ESIA of the project has no proper assessment of the correlation between economic gains and losses caused by this project. There is a need to assess the decline of the international reputation of Jermuk resort, possible negative effect of the affected rivers that irrigate nearby vineyards (risking the quality of wine and brandy production), as well as effects on development of tourism and agriculture in long-term perspective.

Lydian Armenia is one of some subsidiaries of Lydian International Limited Company, registered in the UK's offshore Jersey island. Presenters of Lydian Armenia say that Amulsar project brings new, modern approach to mining in Armenia and it will raise the bar of environmental and social management in the country. They claim that consultants and experts behind the scenes have spent weeks, months and years at Amulsar to make sure all possible risks are assessed and mitigation measures are incorporated into the mine design before the start of construction.

The 2015 Technical Report outlines a mine development and construction plan for an operation designed to average over 200,000 ounces of gold per year over an initial 10 year mine life.

The President and Chief Executive Officer of "Lydian International" Howard Stevenson assured that his company tries to prove by the example of Amulsar: "We respect international standards so as the mining industry is conducted on a high level from the environmental perspective".

Lydian guarantees that Lake Sevan will not be impacted, there is no physical connection between the water sources, and Amulsar should not operate successfully without negative impacts on Jermuk's environment and reputation and that is what we are committed to doing (http://www.geoteam.am/en/news/view/amulsar-modern-responsible-different.html).

Whereas Amulsar gold mining project has sparked protests among activists and some specialists. Environmental activists, geologists and independent experts warn that Lake Sevan and spring waters of Armenia are endangered, though the mine exploiting company, Lydian Armenia, claims that all the concerns are addressed in their project and the risks are minimized.

The gold of Mountain Amulsar will be extracted from the ore with cyanide. This process is called heap leaching and is considered dangerous. The heap leach facility will be located in Gndevaz village 1km away from the residential area.

According to legal expert of OSCE Aarhus centre Artur Grigoryan, the permission to construct the cyanide heap leaching facility in such proximity to the residential area is one of the factors in need of legal

assessment together with the impact of the method itself on the surrounding environment (http://aarhus.am/?page_id=8811).

According to environmental health experts, both cyanide, as well as the dust caused by blasts in this open-pit mine contain risks for the environment as well as human's health. They highlight that lead emerges in similar mining activities which affects nervous and blood systems. This increases mortality rate and causes birth defects. Dust containing cyanide in its turn will travel about 30km in radius, accumulate in plants, penetrate the animal chain and human bodies. One of the side-effects of cyanide is negative impact on respiration system.

Geologist, Sc.D Armen Saghatelyan believes that there are a number of manageable and unmanageable risks: "The rocks are quite cracked. It is a sulphide mine and therefore, all natural and chemical compounds there contain large amounts of sulphur/brimstone. So when before mine explosions the surface is watered artificially or when it rains, all these waters mixed with sulphur will infiltrate into the deeper layers. There is no existing technology for collecting this water; rocks are cracked and therefore it will all go to the deepest layers".

Saghatelyan says that even a tiny failure will be enough for Armenia to lose a strategic ecosystem; the threat is not manageable because we deal with water here: "It is absolutely unacceptable to endanger Lake Sevan for any gold in the world. We need to state that exploitation of this mine violates the Law on Sevan. The environmental impact assessment was initially done incorrectly; not only the mine exploitation is dangerous but also the further activities with the ore… There have been speculations about law and it is suspicious why the Government of Armenia got involved in such serious speculations".

There is a risk also to long term economic development of Jermuk, there is a doubt about the poor prospects of a health resort with a mining site located next to it. 10 years later, when Amulsar mine exploitation is over, miners will abandon Jermuk, leaving the locals with polluted environment and a distorted reputation of the health resort.

Pan-Armenian Environmental Front civil initiative's member, geographer Levon Galstyan mentioned that in case of exploitation of the gold mine in Amulsar, the spring waters of Armenia will be contaminated. He says that the government did not carry out a realistic assessment of environmental impacts and that there is no alternative or independent expertise which would confirm that spring waters will not be contaminated with this project.

"The exploitation of Amulsar gold mine will endanger strategic resources of spring water in Armenia. It will affect Arpa and Vorotan rivers, the river basins, Kechut and Spandaryan water reservoirs, Vorotan-Arpa-Sevan tunnel and finally also Lake Sevan (technically the quality of the water will change). On the one side of the scales are the dubious profits from Amulsar gold mine, and on the other side is the safety of our national and ecological water reserves". – says evon Galstyan.

The senior manager of Lydian Armenia Armen Stepanyan mentioned that the concerns of environmental activists are already addressed in their project. He says that there is a technology which can fully control the waters: "It is called Surface water management system. Every water that may get in contact with our infrastructures, whether it is underground water or surface water will be collected and directed to a special basin and will be later used during the mine exploitation process. We solve two issues: less impact on the environment and less water extraction. E.g. if a certain quantity of water would have been taken from a certain water basin, this quantity will be less because we have a well-functioning water management system".

But Levon Galstyan don't agree with this opinion: "They can write, bring machines, people, etc but in a 300 hectare area where there is up to 1 meter of snowfall, they won't be able to regulate the melting process of the snow, it is absolutely impossible, it's a fantasy. Anyone who claims this or believes in this is actually misleading the uninformed population. It is impossible to control the melting of the snow; anyone can even google search or read in other re-

sources information about what happens in similar mines, what kind of streams, acid drainage and surface streams happen which finally lead to contamination. Quoting international standards or using complex terminology doesn't change the essence of the problem. The international financial institutions which have participated in this project, namely, the World Bank and the European Bank for Reconstruction and Development, need to understand that they are actually participants of a project which threatens ecological security of Armenia".

In 2014 Armenia's Ministry of Health was questioned about its conclusion on the project. The Ministry said it was not involved in the assessment of the effects caused by the mine. This implies that the positive conclusion of the impact assessment was made without consideration of effects on health and therefore violated Armenia's Law on EIA, article 5, point 1st. It states that: Impact assessments should stem from the human right to favorable environmental conditions that ensure health, adequate standards of living, protection of flora and fauna and preservation of ecological balance.

Environmental activists demand from Armenia's government to reconsider the permissions given to this project with obvious violations of laws and with no thorough environmental impact assessment and stop the exploitation process of Amulsar.

"We are determined in our demands and we will not allow another mining disaster in Armenia and realization of this project that is a threat to ecology, economy and livelihoods. We are responsible for ourselves, for future generations and for nature", it says in the petition "Stop Mining in Amulsar.Don't finance Lydian International" addressed to WB President.

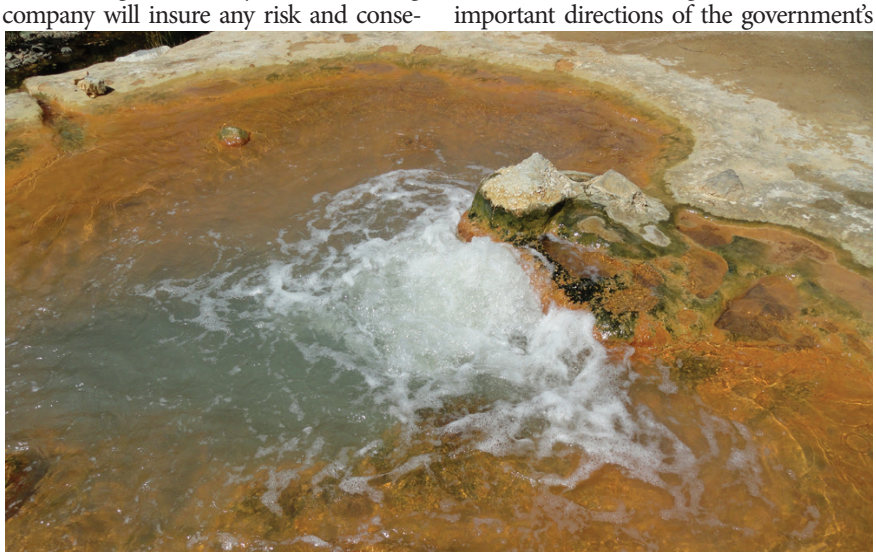
"Taking into account the numerous cases of abuse of political resources and thus decision making which have adjusted Armenian laws to the project, instead of the project conforming to national and international laws, IFC, EBRD and other shareholders seriously risk being accomplice in corrupt processes in Armenia hampering its democratic processes and sustainable development", declare Pan-Armenian Environmental Front (PAEF) civil initiative (http://www.armecofront.net/en/news/case-of-amulsar-gold-mining-by-lydian-international/#).

Jermuk town has been recognized as a project-affected zone in the most recent ESIA presented to government in May 2016.

Minister of Environmental Protection Artsvik Minasyan resently mentioned in the talk with the journalists that the expertise carried out by the Ministry in Amulsar did not record any violations of law.

"This project envisages about $400 million investment. I am not for pushing forward emotional statements and I hold the opinion that any economic project should be debated in case there are realistic alternatives. What can I do in the situation, when there is a project, which has been approved by respecting all the procedures recuired by the existing legislation. What is the solution" the Minister asked.

According to Minasyan, the mining company will insure any risk and consequence.



"Any damage inflicted to a third party will be insured. Third parties may be citizens, juridical persons, the community, the state. Jermuk is being insured as a community, the residents of Jermuk as citizens, the damages inflicted to them are being insured", Mr. Minasyan said.

Most recently, on 12 of December 2016 Armenian Ministry of Nature and Lydian Armenia, future operator of Amulsar gold mine, signed the memorandum of understaning relating to establishment of Jermuk National Park.

The project of a national park in Jermuk is aimed at preservation of nature, introduction and development of eco tourism and eco agriculture.

Lydian Armenia will invest more than USD 5 million in the first 5 years of the Jermuk National Park project. The mining company prepares to involve the best global experts on nature protection in this project. Lydian Armenia Managing Director Hayk Aloyan said: "Lydian Armenia adopted the policy of an exemplary mining industry from the very first day of its activity. We raised the standards we placed on ourselves by partaking in the Jermuk National Park project. This is the first example of a joint project between the Minsitry and a mining company, which I think will achieve success and become a model for other companies" .

According to Armenian Minister of Nature Artsvik Minasyan, this step marks beginning of a new culture of responsibility in Armenian economy and mining industry: "Lydian Armenia makes a real step in this direction, which we appreciate. The initiative will not only create enough a base for nature preservation and flourish in Jermuk, but also will bring to life one of the important directions of the government's program – the policy of expanding national parks and creating one in Jermuk," the Minister said.

Artsvik Minasyan noted it was a good start and a wonderful opportunity for private companies to become involved in realization of the government's policy.

Amulsar is the largest international investment in Armenia. The 2016-2018 construction's capital expenses will total 370 million dollars. Lydian Armenia will employ 700 people during 10 years of mining. Amulsar mining project will make Lydian one of the 5 largest taxpayers in Armenia: about $50 million annually.

In any case, the concerns are not going away. What the ESIA fails to mention is the long-term perspective: mining would tarnish the reputation of Jermuk as a spa resort. After the 9-10 years of mining once the mine closes down and the employees leave, the future of the town residents and their economic situation will be uncertain.

***25. February 2017***

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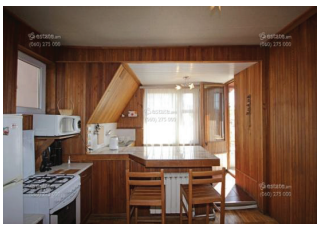

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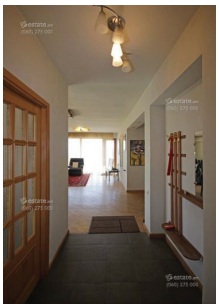

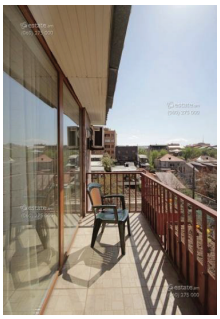

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