

Social, economic and environmental impacts of gold mining in Halkidiki

Political dimension

In December 2003, the assets of the Cassandra Mines (N.E. Halkidiki, Greece) of TVX HELLAS S.A., were transferred by law, ratified by the Greek Parliament, to the Greek State for 11 million euros. They were sold the same day to HELLAS GOLD S.A. for the same price without prior economic assessment of the assets and without an open competition ^[19]. The assets include mining and exploration concessions covering 317 square kilometers, 310 homes, 11,000 square meters of urban land, 2.5 square kilometers of land, 30,000 square meters of offices and industrial buildings, 2 underground mines with shafts and underground tunnels, pumping systems, two ore-treatment plants, vehicles and mine machinery.

The concession exempts the company from any transfer tax or other taxes and relieves it in advance from any financial obligations concerning environmental damage resulting from previous operation of mines. The European Commission has decided that the terms of the contract amount to an illegal State aid in favor of the company equivalent to 15.3 million euros ^[20]. The Greek government immediately appealed ^[21] for an annulment of the decision while the hearing of the appeal is pending to date.

In March 2012, 4.1 square kilometers of public forest was conceded for the company to begin the implementation of the mining projects. This is essentially a transfer of social surplus from the State to the company ^[14].

Hellas Gold S.A., today 95% owned by the international gold producer Eldorado Gold Corporation based in Vancouver, has a market capitalization of 2.3 billion euros and the value of the minerals in Halkidiki is estimated to 15.5 billion euros. According to the Greek Mining Regulation the mining company has full possession of the minerals contained in the concessions granted and there are no royalties for the State ^[10, 16].

Brief description of the project

The "investment" plan of HELLAS GOLD SA includes the existing mine in "Mavres Petres", a new open pit and underground mine in "Skouries", an underground mine in "Olympiada", a 8.5 kilometer underground tunnel for the transport of ore (Olympiada – Madem Lakkos), a copper-gold metallurgy plant, a sulfuric acid plant (1000 t / d), four tailing disposal and storage sites, an industrial port, storage tanks and exploration of 14 other potential mining areas ^[18].

The phases of the projects in brief ^[18]:

- Deforestation of a forest area greater than 2.5 square kilometers
- Surface crater mining (open pit), with initial estimated diameter of 705 meters and 220 meters depth
- Tailing dams, buildings and ancillary facilities
- Nine boreholes for drainage around the crater to a depth of 750 meters (140 meters of which are below sea level)
- Open pit mining of 24,000 tons per day, with excavation and blasting (daily use of 6 tons of explosives)
- Transfer, pre-crushing and deposit of ore in covered storage area with 80,000 tons capacity
- Trituration - chemical processing (enrichment) of ore
- Transferring of (a) the final product, which represents only 1.97% of the ore, to the metallurgical factory and (b) waste enrichment, constituting 98.03% of the ore to the tailing disposal and storage sites.

Environmental Impact Assessment (E.I.A)

According to independent scientific institutes, the company's EIA has many problems. There are deficiencies in the documentation ^[1, 5, 7], incomplete scientific data and problematic methodologies ^[1, 5, 7, 14, 16, 17], deviations from the procedures of the European Commission ^[1] and misinterpretation of statutory limits of pollutants ^[5].

For example the method of "flash smelting" that is proposed (a) has never been applied on an industrial scale for the production of gold ^[16, 17] and (b) does not give pure gold but mixtures with copper, lead and iron and there is no reported separation method ^[3, 10]. The company, most probably, will eventually implement the method of cyanation ^[18]. Additionally, the geometric characteristics of the surface exploitation (depth and diameter of the open pit) depend exclusively on the price of gold. With the revision of prices, the expected surface area is multiplied, thus overturning the whole design of the EIA regarding the geometry of the intervention as well as the chemistry of all deposits ^[17].

In July 2011 the Greek State approved the Environmental Impact Assessment ^[22], after a shockingly ostensible public consultation ^[1].

Economic dimension

A United Nations report concerning economic and social development in the world observes that countries which export raw materials such as ores, grow at a slower pace and diverge from developed economies [25].

In theory, mining activity can be sustainable only if it does not alter the character of a region, and developmental if it is carried out in the overall interest of society [3,12]. This amounts to the assurance of public interest, the existence of reliable inspection mechanisms, and long-term preponderance of overall benefits over negative impacts. None of those criteria are met by the "investment" plan of the Hellas Gold S.A. [3, 8]. Instead it is estimated that this is a definitive and irreversible major destruction of physical capital at local, national and European level [11] and a violent alteration of the region's development model [1]. The positive economic externalities are absent, while the negative externalities will continue having an impact on other economic activities for several years after the mining operation has ended [14].

In order to assess the social benefit from the operation of the company, the EIA uses the methodology of the European Commission [26]. However, this methodology was developed for public investments in which a significant part of the economic effects are not subject to the market and cannot be valued using market prices. This is not the case with the specific private investment and the question remains as to why its impact on social benefits was estimated using shadow prices rather than market prices [14].

One argument frequently used to support the mining activities is job creation in the region. Not only are those jobs limited to the duration of the mining operations, but they also compete with the other economic activities in the region, such as:

Tourism: The contribution of tourism to GDP of Northeast Halkidiki is estimated at 15-20% [4]. The mining activity will bring a fatal blow to the touristic character of the area, will degrade the life quality of residents and visitors and will not replace the stable benefits of existing and future sustainable development of the area [4].

Agricultural sector: Halkidiki shows significant activity in the agricultural sector. There are 108.9 square kilometers of farmland and 276 square kilometers of pasture land [2], 814 beekeepers and 152,385 beehives (9.7% of the national total) [2], organic farming, fishing and aquaculture. A significant contribution to the local economy is also managed wood logging, forest fruits, game preys and aromatic herbs [11]. All these activities are at fatal risk due to the deforestation of Kakkavos mountain, the drying up of the aquifer, dust that impedes the vital functions of plants, acid runoffs, and bioaccumulation of heavy metals in the food chain [2, 13].

The aspect of social welfare in the case of gold mining is practically zero [14]. According to the Greek Mining Regulation, any activity that disturbs mining is prohibited in designated mining areas, private land can be expropriated, and any protection status

for areas designated as protected by national and international conventions does not hold. Finally the mining company has full possession of the ore contents and there are no royalties, meaning zero profits for the State ^[10, 16].

Environmental impacts

Water resources. The Kakkavos mountain supplies water to the entire N.E. Halkidiki ^[10, 17]. The proposed mining activity will directly and irreversibly affect the region's water resources. The EIA does not meet any of the goals of the Framework Directive 60/2000/EK - "Establishing a framework for Community action in water policy" which has been incorporated into Greek law ^[15].

The current mining runoff amounts to 350 m³ / h, which corresponds to the supply needs of 40,000 inhabitants, while the future pumping of fresh water only in "Skouries" is expected to reach 480 m³ / h and is probably underestimated ^[3]. The fresh water pumping in "Olympiada" will reach 663 m below sea level, which will cause saltwater intrusion to the coastal aquifer ^[3, 15]. The company's plan of reintroducing the pumped water back into the aquifer and repositioning part of the mined material as backfill in conditions where drainage has occurred ^[10] will result in permanent pollution of groundwater by infiltration of pollutants once the aquifer has returned to surface level ^[2, 3, 7, 10, 12, 15].

Atmosphere. The air pollution estimates found in EIA violate the statutory limits for gaseous and particulate pollutants ^[3]. Only in "Skouries" the particulate emissions are estimated to 430 t / y PM₁₀, with high concentrations of heavy metals, particularly arsenic ^[3]. The ore dust production sums up to 4.324 t / h ^[18] with high concentrations of sulfur compounds such as heavy metals antimony, arsenic, barium, cadmium, chromium, copper, iron, manganese, nickel, lead, mercury, zinc, etc. ^[2]. The emission of carbon monoxide, nitrogen oxides, volatile organic compounds, sulfur dioxide and particulate matter PM₁₀ and PM_{2,5}, is in total 715 t / y in the first two years of operation and over 950 t / y over the next years ^[2, 16]. These atmospheric pollutants will be transported over long distances ^[5].

Soil. Soil is considered a non-renewable natural resource. In almost all countries that operate or have operated gold mines, the land adjacent to mines, and even land at a great distance, remain contaminated with heavy metals for several decades - or even centuries - after the closure of the mines ^[13]. The decrease in soil pH due to acidic runoff and the high heavy metal concentration makes the soil unsuitable for organisms and plant growth ^[2, 13]. The mining activity will cause drying topsoil within kilometers of the open pit ^[2, 13] and severe soil erosion with subsequent catastrophic flood events ^[13, 15].

Ecosystems. The planned intervention is characterized as violent and will irretrievably change both the landscape and ecosystem functions ^[3, 9, 17]. The area of exploita-

tion covers 264 square kilometers ^[18] with 90% forest cover. Much of it belongs to the NATURA 2000 network and other protected areas, with primeval forests and rich flora and fauna with rare, endangered and strictly protected, by international conventions, species ^[2, 3, 11]. Bioaccumulation of heavy metals at various levels of the food chain is extremely dangerous to the functioning of ecosystems, agro-pastoral products and ultimately to human health ^[2, 3, 12, 13]. Deforestation and forest drainage of the aquifer is a threat to ecosystems within a radius of several kilometers from the site ^[16]. The pollution of the marine environment by mining pollutants and the construction and operation of a large-scale industrial port would damage the quality of sea water both as a natural habitat of marine organisms as well as bathing waters ^[3].

Mining Waste. The solid extraction waste exceeds 182 million cubic meters^[18]. The slurry of arsenic-bearing / iron-oxides (scorodite) and gypsum is 70% of the waste and is dangerous because of high arsenic content. The stability of the crystalline scorodite in conditions of co-deposition with other solid waste ^[3, 8] is challenged. The proposed method for arsenic removal from metallurgy's water and stabilization of the crystalline scorodite in order to achieve environmentally safe disposal, was developed by the Laboratory of Metallurgy of the National Technical University of Athens for the purposes of the investment of Hellas Gold. S.A. Nevertheless, this is a completely new method that has not been applied – not even in pilot tests – and it will be implemented in the “Madem Lakkos” unit, where 120 t/d of arsenic will be burned ^[1].

Human health. The mining activity poses serious risks for workers, residents and visitors to the region. Workers in gold mines have a lower life expectancy. They often suffer from many kinds of cancer (trachea and bronchi, lung, stomach and liver), pulmonary tuberculosis, silicosis, pleural diseases, malaria, dengue fever, hearing loss, increased prevalence of bacterial and viral infections, diseases of the blood, skin and musculoskeletal system ^[6]. The presence of heavy metals, even at very low concentrations, causes anemia, hypertension, disorders in the child's nervous system, disruption of respiratory function, renal failure, acute and chronic poisoning, gastroenteritis, kidney disease, liver damage, cancer, hepatitis, liver cirrhosis, jaundice ^[2, 6]

Social Impacts

The impact of mining on local communities can be devastating. Most notable are the disruption of social cohesion, internal migration due to loss or deterioration of economic activities, intense inequality against women who are primarily affected by a predominantly male activity ^[23, 24].

It is generally accepted that multinational mining companies follow certain tactics aiming at ensuring social license ^[23] . Specifically, they seek alliances with friendly adjacent local authorities and groups who do not represent anyone but are easily manipulated - gradually creating a rupture in the social network - while they finance compensatory social projects. They consider submitted job applications as referendums in their favor and they purchase strategic land. They use aggressive methods

against opposing citizens' groups, such as terrorism, violence, blackmails, infiltration, surveillance, lawsuits that exhaust these groups' finances, spread of false rumors, manufacturing of false crimes and trumped-up charges, even death threats. Finally, they use private security while they closely cooperate with militias and public police forces ^[23]. Many, if not all, of these strategies are applied by Hellas Gold S.A. in NE Halkidiki (see Amnesty's International October's 2012 report ^[27]).

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