



# **THE STATE OF ARMENIA'S ENVIRONMENT**



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# Policy Forum Armenia

## Mission Statement

Policy Forum Armenia (PFA) is an independent professional non-profit association aimed at strengthening discourse on Armenia's economic development and national security and through that helping to shape public policy in Armenia. Its main objective is to offer alternative views and professional analysis containing innovative and practical recommendations for public policy design and implementation. Through its activities, PFA aims to contribute to the creation of an informed public and more effective and accountable government. PFA's main asset is its worldwide network of professionals and leaders in their respective fields, with dedication to Armenia.

## Operational Objectives

**PFA has a hybrid mission.** It primarily operates as a think tank, since its output comprises of expert assessments and analysis using latest social science research methodologies and benefits from scholarly exchange. In addition, to the extent that the PFA advocates for, and has impact on, the social change in Armenia and the Diaspora, it also functions as an advocacy organization.

## Vision

**We strive to build Armenia as a country and society where:**

**Government** is transparent and fully trusted by its subjects; Its main objective is the current and future well-being of citizens and nationals abroad; Its members are equally accountable before the law in the same manner as any other citizen of the country and have no direct commercial interests.

**Judiciary** is free, fair, and incorruptible.

**Legislature** is competent and respectable.

**Civil service** is the most respected form of employment, because it provides an opportunity to serve the country and people, and is highly professional.

**Society** has high standards of living; It is well educated, tolerant, and humane.

**Economy** is at the frontier of progress and innovation, building upon the human capital of the Nation as a whole; It offers equal opportunities for everyone; It does not tolerate unfair competition and redistributes through efficient and fair taxation.

**Environment** and responsible management of natural resources are essential to the survival of the State, and are key elements of well-being of future generations.

**Human rights** are the most sacred set of values.

**Citizens of Armenia** - Armenians, Yezidis, Greeks, Kurds, Russians, and others alike - are the most valuable asset of the State.

**Armed Forces** are by far the strongest in the region by spirit and dedication of its men and women, by its advanced armament, and by significance of its mission to protect life, history, and culture.

**Diaspora** and Armenia form a single entity, the Nation. Its stake in Armenia and Armenia's development are recognized and encouraged; Its potential is fully internalized; Its members have dual Armenian citizenship.

**History** is of essence. **Future** is where we aim.

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## I. INTRODUCTION AND MOTIVATION

Armenia in its transition towards a market economy is undergoing rapid changes with accompanying environmental issues and problems requiring immediate attention. Some of these problems are inherited from the Soviet era, while others are products of the country's political and economic transformation.

Prior to independence, Armenia was a leader in the former USSR in raising public awareness of environmental problems, where concerns were being raised publicly since the 1980s. In 1987, an unprecedented demonstration at Opera Square attracted approximately 3,000 people to demand the closure of some chemical factories and the Medzamor Nuclear Plant. The following year, the Spitak earthquake caused residents to further focus on the environment and related issues of construction technology, as well as the exposed inadequacy of national emergency preparedness and response measures.

Despite the role of environmental awareness in creating a collective consciousness in Armenia at that time, the abrupt collapse of the Soviet Union left Armenia struggling on several fronts. A number of environmental problems in Armenia became worse during the early years of independence when there were severe energy shortages, poor quality gasoline, mass deforestation, and inadequate wastewater treatment.

With the national security issues that arose following independence, environmental concerns became less prominent in the public discourse. In addition, environmental issues took a back seat during the rapid economic development of the last decade, driven by construction, a partial restoration of the chemical industry, and expansion in mining operations. For Armenia, a country that intends its development to be based on the principles of sustainability (Ministry of Nature Protection, 2008a), environmental protection should constitute an integral part of the development process.<sup>1</sup>

It is difficult to obtain reliable information about the nature and extent of Armenia's environmental condition. Information appearing in press reports is often so highly charged with emotion that it is difficult to be certain of its scientific accuracy. Official data are inadequate by international standards for conducting thorough assessments and monitoring, which at least partially is a reflection of the fact that the same governmental body is in charge of establishing regulations, preparing the environmental assessments, issuing permits, and conducting monitoring. This inherent conflict of interest results in a situation where the real magnitude of impacts are not disclosed or minimized and the

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<sup>1</sup> For the purposes of this report, we rely on the Brundtland Commissions' report released by the United Nations in 1987, which defines sustainable development as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." (Available at: <http://www.un-documents.net/ocf-02.htm>). It is worth noting that sustainable development addresses the interdependency of economic, social, and environmental development issues.

necessary steps are not taken to alleviate the impacts. More often than not, in recent years, short-term-oriented thinking, lack of capacity, and corruption have obstructed responsible policy actions that would benefit the country and its population in the long run.

While the environmental movement is gaining momentum in Armenia, the grassroots movement is not yet strong enough to have a major impact on policy and development issues. The movement brings together several non-governmental organizations (NGOs), but these have limited resources and influence. Recently, some of these organizations have successfully combined their efforts to address particular environmental issues, which has resulted in improvements to specific projects that could harm the environment.

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This Report is the second in Policy Forum Armenia's *State of the Nation* series, which aims to provide an assessment of developments of critical importance taking place in Armenia and the Diaspora. The Report provides a general overview of environmental degradation in Armenia and highlights the exigencies of the present situation throughout the country. It is intended to serve merely as an initial reference to a complex set of environmental problems and issues that are closely intertwined with the country's long-term developmental prospects. Through the combined application of academic analysis and practical experience of its authors, the Report argues that improving environmental governance requires increased transparency and public participation in key policy decisions as well as the effective implementation and enforcement of existing environmental laws. The open pit mining operations in Northern Armenia—the subject of the Teghut case study contained in the Report—is an example of one facility where both urgent policy changes and adequate enforcement of existing policies are needed.

The Report is structured in the following way. Section II offers an historical overview of environmental conditions during the Soviet period as well as the environmental problems that emerged in the early years of independence that were aggravated by the hardships of the energy crisis. Section III examines a number of current environmental threats facing Armenia. Section IV provides a case study on mining operations in Armenia with an in-depth examination of the controversial mining project in the Teghut forest. Finally, Section V concludes the analysis.

## **II. AN OVERVIEW OF ENVIRONMENTAL CONDITIONS IN THE SOVIET PERIOD**

Environmental pollution has long been a topic of concern in Armenia, and issues have been publicly aired for decades. The fate of Lake Sevan, for example, was a popular topic in the late 1960s due to the drastic drop of the water level and pollutants flowing into the Lake. With the advent of "*glasnost*" (one of principles of political democratization in the Soviet Union in the late 1980s), and particularly in the aftermath of the Chernobyl nuclear power

plant accident in Ukraine in 1986, concerns arose that the land, air, and water of Armenia were being contaminated.

At that time, there were also serious environmental problems coming to light in Eastern Europe and the USSR. Armenia's situation was seen as a microcosm of these problems, stemming from some of the same root causes inherent in the Soviet economic and socio-political system: centralized planning, lack of routine maintenance of factories and infrastructure, and an emphasis on production and output quotas with little attention to public health and environmental consequences.<sup>2</sup>

Armenia experienced a number of specific problems that arose from factors unique to its geography and economic development during the seven decades of Soviet rule. During this period, due to extensive industrial and agricultural development as well as increased population density, anthropogenic transformations took place in many parts of the country. Armenia became heavily invested in elaborate chemical industries and built a nuclear power plant. Water resources were poorly managed, and Lake Sevan, which held much of the republic's freshwater reserves, gradually became polluted and significantly shrunk due to the use of water for irrigation and electricity production from hydroelectric plants.

Pollution from mining plants, metal, chemical and service industries, as well as motor vehicles without catalytic converters, resulted in serious public health impacts. For tackling these issues, in 1983, the State Environmental Protection Committee of Armenia was established to regulate, monitor, and enforce environmental laws. This committee became the Ministry of Nature and Environmental Protection in the independent Republic of Armenia.

The following sections present an overview of the specific environmental issues of concern in different fields during the Soviet period.

## **Water**

As a result of a multitude of acute and complex socio-economic problems as well as a lack of monitoring and enforcement, freshwater ecosystems—lakes, rivers, and reservoirs—were severely impacted throughout the Soviet era. Due to the unsustainable use of hydroecosystems for production of energy and economic development, deep morphometric, hydrophysical, and hydrobiological changes occurred. These led to a change of biogeochemical circulation of matter, disruption of energetic balance, and changes in biotic ratios, which then resulted in a change of the productivity of hydroecosystems and a reduction of their stability. These developments, in turn, resulted in a reduction of drinking

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<sup>2</sup> For general background, see "The Environment in Armenia: Problems and Analysis," by Philip Ketchian, *The Armenian Mirror-Spectator*, October 27, 1990 and November 3, 1990.



water quality, making potable water availability one of the primary problems for the population of Armenia.

Another significant impact of the reduction of water quality was the destruction of both aquatic and terrestrial ecosystems. The situation was worse in areas with a high population density and/or water scarcity, where social and economic development required intensive utilization of water and other biological resources. In other words, the highest levels of contamination occurred in the most heavily populated areas.

A newspaper article published in 1989 referred to the Yerevan drinking water supply as a “toxic soup.” Tap water samples were collected in Yerevan in 1990 and taken to the US for chemical analysis, including reliable procedures and highly sensitive instruments to determine trace level metal concentrations. Fortunately, the results indicated that the concentrations of most metals tested in the water from Yerevan were below allowable limits for drinking water in the US and therefore were not a threat to public health.

However, the concentration of iron was high in Yerevan’s water in comparison to the levels in US tap water. The high level of iron could be attributed to the fact that Yerevan’s water distribution lines are made of poor-quality galvanized iron. Although the high levels of iron should not cause any health issues for the general population, replacement of the distribution water lines with higher quality pipe should improve the quality of the drinking water (Gharabegian and Saryan, 1992).

### **Lake Sevan**

Lake Sevan is the largest inland water body in the Transcaucasus and is one of the largest high-mountain freshwater lakes in the world (Babayan *et al.*, 2003). Its wetland ecosystem plays a significant role for migratory birds. In conjunction with many small lakes in the country, the lake stores snowmelt and other runoff from mountains, which makes river water available in both wet and dry seasons.

In addition to its key role in the natural complex, Lake Sevan possesses strategic economic, social, and historical importance along with cultural, recreational, and spiritual values. Indeed, it is recognized as a national treasure. However, the lake’s high altitude vis-à-vis the nearby (fertile but arid) Ararat Valley and the lack of energy resources in the country created preconditions for the intensive utilization and overuse of its water.

After World War II seven hydropower stations were built along the Hrazdan River and Lake Sevan’s water was used to generate electricity. However, due to the extensive and poorly managed use of water resources for this purpose (and to a lesser degree for agricultural production) the water level of the lake dropped more than 18 meters within 20 years.

The declining water level increased nitrogen content and algae growth, decreased biomass of high-grade water plants, and destabilized the ecological balance of the lake. The situation

was worsened by the sewage from nearby towns' treatment plants and pesticide runoff from the farmlands discharged into the lake. Following independence, the illegal developments of new vacation homes along Lake Sevan, the recreational use of the lake by the general population, and the tree cutting/deforestation that took place around the lake have become important considerations in regulating the lake's water levels.

Adverse impacts on the ecosystem include the disappearance of the native lake trout (*Ishkhan*), as a result of the lowered water levels, which dried out the breeding habitats, and increased poaching. Additionally, changes in the physical-chemical characteristics of the water severely affected not only the fish community but also the waterfowl habitats.

Recognizing the exceptional strategic importance of Lake Sevan as a drinking and irrigation water source, the government undertook steps to restore the lake's water balance. The Arpa-Sevan tunnel—a unique engineering and hydrologic project built in 1961 to direct the flow of the Arpa River into Lake Sevan—provided 250 million cubic meters of water a year. In 1999, the government decided to minimize the use of lake's water for electricity generation, leaving it primarily for irrigation purposes.

Worth noting is the issue of wetlands. During the Soviet era the wetlands were drained to eliminate the threat of malaria and to create new croplands, which had a critical impact on the survival of migratory birds and other wildlife (Hovhanissyan, 2000).

## **Air**

The former Soviet Union's official standards for ambient air quality were generally on par with (if not more stringent than) those in the US. Its air pollution control laws required that each industrial source meet a pollutant concentration standard at a set distance from the stack. However, these standards were not enforced. Therefore, there is no documentation of the extent and frequency of violations of air quality standards occurring in Soviet Armenia. Emission control equipment on various industrial sources was non-existent, inadequate, or not functioning. The heavy industrialization of Armenia's economy toward the end of the Soviet era was a significant factor in the spike of air contamination.<sup>3</sup>

In the absence of reliable quantitative data upon which to derive conclusions, the state of Armenia's air quality was generally derived from oral reports provided by air quality experts. According to some accounts, Yerevan had the worst air quality among the major urban centers in the former Soviet Union. In the 1980s, motor vehicles were the major air pollution source in Yerevan. Privately owned automobiles increased by 25 fold between 1950 and 1985. Soviet-made vehicles were not equipped with pollution control equipment, such as catalytic converters.

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<sup>3</sup> For general background, see "Air Pollution in Yerevan: Causes and Effects," by Philip Ketchian, *The Armenian Mirror-Spectator*, August 1, 1992.

Chemical production was a major industry in Armenia, which was known to generate high levels of toxic air emissions. Among other industrial sources of air emissions were power generation, ceramic manufacturing, cable manufacturing, processing of industrial clays, and manufacturing of building materials.

### **Solid Waste**

Only one major landfill, Nubarashen, served Yerevan and the surrounding communities. This landfill is located in a canyon about 7 kilometers from Yerevan on approximately 40 hectares of land and is surrounded by open fields and canyons. Landfill operations began in 1968. One of the canyons was filled in 1986 to a depth of 70 meters. Several housing developments and apartment complexes are located within a few kilometers of the landfill, and a cemetery is situated within a kilometer from the facility.

The adverse effects of the landfill on the surrounding community were regarded as minor by governmental officials, despite consistent complaints about odors. No special studies were done to evaluate the complaints, nor were any special preparations made prior to the placement of refuse in the landfill.

However, Nubarashen landfill operation records indicate that the natural ground under the landfill is solid bedrock covered by a 1.5-meter deep layer of clay. The depth of groundwater in the immediate vicinity is known to be below 50 meters. Therefore, it would be unlikely that any pollutants from the landfill could reach the groundwater table.

### **Chemical Industry**

More than 70 percent of Armenia's chemical industry was located in the metropolitan Yerevan area, and the production facilities served as significant pollution sources. The Nairit chemical plant, occupying about 200 hectares, first started production of rubber and other polymers in 1936 and had a capacity of 58,000 tons per year. Until 1989, when Nairit was operating at its full capacity it was discharging 15 million m<sup>3</sup> of liquid waste effluent per year into the Hrazdan River.<sup>4</sup>

The Chemical Reagent Plant was another major chemical plant, which started operating in 1959 and produced 916 different types of reagents. This plant produced high levels of waste due to the use of outdated and hazardous production techniques used in its operation.

A variety of toxic materials produced by chemical plants posed a particular risk to people, ecosystems, and biodiversity through the discharging of chlorine and chlorinated organic

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<sup>4</sup> For general background, see "Nairit: Its History, Politics, and Environmental Impact," by Philip Ketchian, *The Armenian Mirror-Spectator*, August 3, 1991.

compounds (e.g., vinyl chloride and chloroprene), heavy metals (e.g., lead and mercury), organic solvents, asbestos fibers, and radon.

### **Nature Preserves**

Authorized by an Act of the Armenian Supreme Soviet in 1958 for the purpose of protecting Armenia's natural heritage, the preserves of Shikahogh (9,700 hectares), Dilijan (31,160 hectares), and Khosrov (29,000 hectares) were created and declared "off-limits" to all human activities other than scientific research. A fourth preserve, Erebuni (89 hectares), was established in 1981 on the outskirts of Yerevan.

These preserves encompass rich ecosystems with several unique plant and animal species (including the Caucasian leopard in Shikahogh) that are now considered endangered. Scientists agree that the amount of land encompassed by the preserve system must eventually be expanded if the country's impressive biodiversity is to be preserved. Although these preserves are meant to be protected, there are extensive illegal activities in them, such as, hunting, poaching, and logging, which are causing serious harm to the wildlife populations and vegetation.

### **Environmental Studies**

Under the Soviet regime, the State Environmental Protection Committee of Armenia had one division that was responsible for the preparation of Environmental Impact Assessments (EIA),<sup>5</sup> and another, separate division that was responsible for reviewing and approving them. The flaws of such a structure are immediately apparent. Lack of coordination and transparency affected the efficacy of the EIA process. As a result, EIAs prepared for various projects were not comprehensive in their examination of issues and did not cover all aspects of projects under review.

Public participation, which is an essential part of the EIA process in developed countries, was not clearly defined under Soviet rule. It seems there were no set procedures to provide the public with an opportunity for review and comment. Each project was reviewed without considering the cumulative impact of other projects in the same area. These shortcomings in both structure and implementation (as discussed in detail in Box 1 below) created an unfavorable atmosphere for environmental management.

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<sup>5</sup> The purpose of an EIA is to identify the significant effects of a project on the environment and to identify alternatives to the project and to indicate the manner in which those significant effects can be mitigated or avoided.

### **Box 1. Environmental Impact Assessments**

Today, the Environmental Analysis Department of the Ministry of Nature Protection is considered the lead agency for evaluating proposals and providing project approvals. EIAs prepared in Armenia for major projects are often just a formality with minimal information to show that the project under review complies with applicable law. A good example is the 100 page EIA that was prepared for Teghut mine project. Similar studies in other countries typically are several hundred pages in length. However, because this project had endorsement from the highest levels of the government, this EIA sailed through different agencies and received a rubber stamp from all of them with no major comments or objections.

A well-prepared EIA should be considered as the basis of making decisions for an environmentally sound project. The enforcement of monitoring plans and regulations are essential to improvement of the EIA process in Armenia. EIAs prepared so far have not been comprehensive and do not cover all environmental concerns of the project. Public participation and transparency of the process are also critical to protect environmental health.

The improvement of the EIA process necessarily requires competent environmental specialists. In Armenia, the availability of education and training for environmental engineers and scientists falls short of the levels needed to cope with environmental problems that require urgent attention. Studies related to environmental engineering and management provided at Yerevan State University, American University of Armenia, and the State Engineering University are more academic rather than applied, for which there is now greater need. In recent years, there have been some improvements in the quality of environmental education in Armenia. However, much more still needs to be done. Assistance from specialists in the Diaspora can be instrumental in improving and advancing the practical training needed in the field of environment.

Regulatory structure is another serious issue in the evaluation of possible environmental impacts and the enforcement of the implementation of mitigation measures. Currently, there are no clear guidelines about the process of evaluating and enforcing the required mitigation measures. A strong and fully independent government agency is needed to ensure that all of the recommended mitigation measures are implemented and that there are no regulatory violations resulting from the operation of a given project.

The adequacy of environmental inspections is currently one of the major shortcomings in the Ministry of Nature Protection. Even though during recent years inspectors possess better knowledge of the issues and have better tools to conduct their work, results are still unsatisfactory. One of the main issues is pressure from influential developers, who corrupt the inspection process. The blurred line between government and large investors is another common reason for not enforcing the applicable regulations.

### III. CURRENT ENVIRONMENTAL ISSUES IN ARMENIA

It is widely acknowledged that the environmental movement in Soviet Armenia was a significant force in bringing about political change during the *glasnost* and *perestroika* periods of the late 1980s (e.g., Hovannisian, 1997; p. 403). Since becoming independent, Armenia has seen many of its grassroots opposition groups lose their significance, environmental organizations among them. It took several years for environmental groups to reorganize and be active again. Energy security, industrialization, and economic growth have been prioritized above concerns for environmental protection, conservation, and public health. Thus, almost two decades after Armenia's independence from the Soviet Union, the country's environmental situation remains alarming.

Fortunately, NGOs and aid organizations recognize the important ecosystem services that Armenia's natural environment provides. They continue to work to encourage the government to value Armenia's environmental resources and to protect the country's air, water, and land resources for the benefit of both the natural ecosystems and people.

Armenia has ratified many international conventions that address issues such as biodiversity, climate change, desertification, and the preservation of cultural and natural heritage. In addition, Armenia's Constitution explicitly addresses nature protection, damage to the environment, and the rights of people to lead healthy lives (e.g., Taslakyian, 2010). There are also a number of laws that address requirements for EIAs and their implementation (the Appendix provides a more complete list of conventions and laws). However, at present there appears to be no concerted effort within the government to address serious environmental issues.

Armenia continues to face problems with respect to air, water, soil pollution, and threatened ecosystems that may bear significant political and economic consequences. According to a recent survey, 88 percent of the Armenians polled believe that Armenia's environment is deteriorating (Danielian and Dallakyan, 2007). The remainder of this section discusses the key areas where critical environmental problems remain.

#### **Water**

The availability of clean water in Armenia continues to be a pressing concern. Sanitation and water distribution systems are in urgent need of attention, the latter having been declared in "deplorable" condition by international standards (IWACO, 2000). Aging and corroded infrastructure poses a serious threat to human health. Water supplies are regularly contaminated by decaying infrastructure that allows for cross contamination between sewage and freshwater drinking water pipes.

Poor quality steel and concrete, corrosion, and puncturing from heavy loads result in losses from the water distribution network as high as 61 percent in Yerevan, 71 percent in Gyumri, and 75 percent in Vanadzor. In addition to distribution loss, cross contamination between

wastewater and freshwater systems occurs during times of low or negative pressure. Furthermore, a study by the Stockholm Environment Institute projects a decreased availability of water in Armenia under a business as usual scenario for climate developed by the Intergovernmental Panel on Climate Change (Stanton *et al*, 2009; 47-55). Under this scenario—which is likely unless there is a global agreement on climate change—worldwide emissions of greenhouse gases will follow the trends of the past 200 years and grow larger over time leading to higher average annual temperatures.<sup>6</sup>

Yerevan—a city of more than one million people—is still without a fully functional wastewater treatment plant. In 1999, an estimated 40 percent of Yerevan residents were not connected to the wastewater treatment system and primary treatment was working at 63 percent of capacity. Partially treated waste discharges directly into the Hrazdan River, the main water supply for dozens of downstream villages. Further, wastewater systems in Vanadzor, Etchmiadzin, Gyumri, Ashtarak, and Masis are listed as operating “badly” or “very badly” and sewage facilities in the villages are labeled inadequate (IWACO, 2000).

In northern Armenia, clarifying tanks sit empty in the town of Vanadzor. Lead concentrations in the Debed River reach 800 times background levels after passing through Vanadzor (Kurkjian, 2004). Farther north, in Alaverdi, where a smelter is located, the Debed River accepts water from two streams where mines exist. It has lead concentrations greater than 3,000 micrograms/liter (Kurkjian, 2004), with allowable limits for drinking water being 50 micrograms/liter and 15 micrograms/liter for adults and children, respectively. The Debed River exhibits a reddish-brown hue as it flows through Alaverdi before it reaches its confluence with the Kura River.

## **Air**

Air pollution is an environmental problem in many regions of Armenia. In Yerevan, for example, the main landfill site, Nubarashen, burns continuously, producing smoke plumes from incinerated plastics, paints, heavy metals, and other toxins that are emitted into the atmosphere. Studies have demonstrated that burning plastics together with newspapers produces a carcinogen called dioxin (e.g., Akioyasuhara, 2002). Even though only a small amount of dioxin is produced, Yerevan’s location in a geologic depression causes this polluted air to stagnate over the city.<sup>7</sup> The government has permitted new landfills, such as

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<sup>6</sup>The study—which was initiated by the United Nations Development Program and relied on officially reported data—indicates that average annual precipitation is expected to decrease by 10-27 percent. The biggest reductions are predicted for Yerevan and the Ararat Valley, which can expect 30 percent less precipitation by 2100. Higher temperatures will lead to more evaporation which means less soil moisture and reductions of up to 24 percent in river flows, which will reduce the availability of water for agriculture and power generation.

<sup>7</sup> Details about a plan to burn methane in the Nubarashen landfill to reduce climate impacts and generate electricity are available at <http://www.nature-ic.am/CDM/proposal.html>. According to UNDP (2009), the Nubarashen project plan has been in operation since October 2009.

the one in the Jrvezh area near Yerevan, where leaching could enter the stream drainage and fires produce air pollution.

### **Box 2: Biosafety and Genetically Modified Organisms**

While the jury on genetically modified organisms (GMOs) is still out, there is a growing body of evidence on environmental risks such as threats of gene flow, secondary weeds and pests, and the effects of toxins on non-target species. Supporters of GMOs claim improved characteristics of GM products, high yields, and low costs.

The health risks of GMOs include potential allergenicity of several GM foods and food ingredients, increased toxicity, and the potential development of antibiotic resistance and immunodeficiency. Moreover, there is a threat that genetic engineering can have social and financial effects, enabling transnational companies to monopolize and control the technology by enforcing intellectual property claims. For example, to ensure patent rights protection of GM-seeds, corporations have produced “terminator” seeds, which are sterile in subsequent generations, thus forcing farmers to buy seeds every year (Harutyunyan, 2005).

Armenia, as a country in transition, ranks high in vulnerability to the consequences of importation, production, and usage of GMOs due to such factors as dependency on agriculture, high necessity for crop improvements, deficiency in GMO regulating legislation, and imperfect institutional capacity. Officially, GMOs are neither imported nor commercially produced in Armenia. However, according to some experts, NGO representatives, and officials there are apprehensions that many products imported to Armenia contain GM ingredients; in particular, GM soy, which was introduced initially as humanitarian aid and then on a commercial basis (Harutyunyan, 2005). This is partly because the genetic origin of imported seeds, plants, and animals is not registered at national border crossings due to lack of GMO testing laboratory. Thus, this field is not properly regulated (Harutyunyan *et al.*, 2008).

It is worth noting that Armenia is a country of rich biodiversity and is a center of origin for wild ancestors of crops and livestock. There are more than 3,500 high plants, 4,000 fungi, and around 17,500 invertebrate and vertebrate species recorded in the territory of Armenia. Indeed, Armenia falls within one of the five centers of diversity and origin of the world’s major food crops described by Vavilov (1992), the creator of the world’s largest collections of plant germplasm. Hence, it is critically important for Armenia to strengthen its capacity to pursue biosafety policies based on well-balanced decisions on the introduction of biotechnological innovations. The country should be responsible for providing a safe and healthy environment and conserving its genetic diversity for present and future generations (Harutyunyan, 2005).

The industrial city of Alaverdi continues to pump air pollutants from a smelter stack where filters are inadequate for the amount of production. The content of sulfur dioxide in the air of Alaverdi has been 11.4 times the permitted level in recent years.<sup>8</sup> The Armenian Copper

<sup>8</sup> “Vallex Fails to Fulfill Promises,” *Hetq.am*, July 16, 2007.



Program (ACP), which is considered the main polluter, reports that it paid between AMD 32-33 million (approximately \$105,000) in emission fines quarterly prior to 2007.<sup>9</sup>

### **Solid Waste**

Waste management is at the forefront of environmental concerns in both urban and rural areas in Armenia. During the transition period from centralized to decentralized provision of services, non-payment for services became common. Coupled with insufficient enforcement to collect user fees, the culture of non-payment has limited the volume and reduced the quality of services provided to the population, creating a vicious cycle. Thus, solid waste management has become one of the problem services that chronically suffers from lack of funding and has remained of low quality in Armenia since the early 1990s (Vanoyan *et al.*, 2010).

Although waste collection has improved recently in Yerevan, it is still a very common practice to dump waste in unauthorized places and then to burn the waste openly. This emits dioxins and furans, toxic chemicals that cause a wide range of adverse health effects, such as skin disorders, liver problems, impairment of the immune system, the endocrine system and reproductive functions, as well as certain types of cancers. The disposal of hazardous medical waste is of special concern.

### **Deforestation**

Deforestation, which had begun on a lesser scale in the Soviet era, has now escalated to an unprecedented level. It continues to be an important environmental issue even though the energy crisis of the 1990s is long over. It is a particularly dire concern for Armenia because only about 7-8 percent of the country is covered with forest (down from 35 percent two centuries ago), and much of this forest is degraded (e.g., Hergnyan *et al.*, 2007; Moreno-Sanchez and Sayadyan, 2005; Sayadyan and Moreno-Sanchez, 2006).

Government action to proceed with the development of mining projects in ecologically sensitive areas like Teghut demonstrates the lack of official recognition of the importance of natural forests as reserves of biodiversity. Such forest removal itself may limit Armenia's opportunity to participate as a non-Annex I ratifying country in the United Nations Framework Convention on Climate Change (UNFCCC) Certified Emission Reduction (CER) component of the Clean Development Mechanism (CDM) of the Kyoto Protocol. Intact forest cover may potentially, under post-Kyoto programs, offer investment opportunities that will not be available after removal of forest cover. Already, environmental NGOs operating in Armenia have cited the challenges of accessing carbon finance mechanisms to make a forestry project viable.<sup>10</sup>

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<sup>9</sup> "Is the Alaverdi Copper Foundry on the Verge of Closing?" *Hetq.am*, September 17, 2007.

<sup>10</sup> "Can forests thrive in the world of carbon trading?" by Lara Farrar, CNN, April 26, 2010. Available at: <http://www.cnn.com/2010/WORLD/europe/04/23/eco.tree.carbontrading/index.html>.

Some positive steps have been taken to curtail illegal logging activities in Armenia, including the establishment of the Forest State Monitoring Center (FSMC), which—along with initial support from the World Bank—works to develop mechanisms to identify illegal loggers and wood transporters and to enforce laws by applying penalties. The FSMC was created as a separate entity from the Armenian Forestry Service (HayAntar), so that it can act as a monitoring agency, though the program is still in its preliminary stages.

A survey report released in 2007 showed that illegal logging in Armenia is a lucrative operation (Hergnyan *et al.*, 2007). Another survey (Danielian and Dallakyan, 2007) showed that Armenians perceive the country's environment as worsening and that illegal logging is a major part of the problem.

Overall, the leading drivers of deforestation in Armenia are the use of fire wood because of a lack of alternative fuel supplies, illegal logging, and the export of wood (see Danielian and Dallakyan, 2007 and Hergnyan *et al.*, 2007). As a result, the following series of recommendations has been proposed (Hergnyan *et al.*, 2007) to address the situation: (1) ease the access of natural gas supplies for rural residents through financing and reduced installation costs, (2) exempt industrial round wood imports from VAT, (3) establish an integrated timber market and wood industry association, (4) impose an export ban on industrial round wood, (5) facilitate tree farming, (6) promote recycling and renewable energy production, (7) enhance the eco-tourism and non-wood forest product sectors, and (8) implement forest certification and chain of custody tracking procedures.

### **Nature Preserves**

The establishment of a new trans-boundary national park is a positive step that is underway to protect important aspects of Armenia's biodiversity. This park will encompass Lake Arpi in Armenia and extend north into Georgia. The local WWF office, with support from the Critical Ecosystem Partnership Fund (CEPF), has played a major role in leading this project. Efforts are also underway to hire and train reserve rangers for Lake Sevan National Park and Khosrov Reserve to ensure more effective protection of the natural areas and to prevent poaching of wildlife.

Other established nature preserves are not well protected, such as the Erebuni Preserve, the only preserve protecting wild cereals in the world (Nazarova, 2002). Considering that several of the cereal species are progenitors of all bread and pasta wheats in the world, the preserve has no protection from the public and is vulnerable to incursions and impacts by vehicles, construction, and other disturbances.

Other preserves are also open to environmental impacts and are left mostly unprotected. One of the most disturbing developments is the lease of a portion of the Khosrov Preserve

by the organization Safari International.<sup>11</sup> In 2004, the government changed the status of the land to allow for private management of a portion of the Preserve. In this new Safari International private reserve, the preferred hunted wildlife species, the bezoar goat and the mouflon, are listed as Rare and Endangered Species of Animals in the Red Book of Soviet Armenian (Ayrumyan, 1987) and as on the Red List of Threatened Species of the World Conservation Union (IUCN, 2007). The decision to privatize a portion of the Khosrov Preserve and Armenia's threatened species cannot be a proper solution for nature protection and may set a dangerous precedent for this type of activity elsewhere in the country.

In 2009, the World Wildlife Fund (WWF) Caucasus Program worked with the Ministry of Nature Protection on the establishment of two new protected areas in Southern Armenia: Arevik National Park (34,000 hectares), on the border with Iran and Azerbaijan, and Zangezour Sanctuary (17,368 hectares), on the border with Azerbaijan.<sup>12</sup> Another significant natural area with some measures of protection is the Lake Sevan National Park (150,000 hectares, including the lake itself). As it is not an official preserve, it is subject to only limited protection due to its multiple uses.

### **Agricultural Contamination**

Much of the water pollution in the Ararat Valley occurs because of pesticide use in agricultural operations. Waterways are contaminated by pesticides and other urban and agricultural runoff, including organic and inorganic pollutants such as arsenic and cadmium, among others. Pesticides left over from the Soviet era, including DDT, are still used for crop production (Berberyan, 2008), along with many other products, which are sold with very little or no instruction about how to use them and are applied with little regard for their danger (Kachadoorian, 2007). These pesticides are flushed into the drainage water during the irrigation process and flow into receiving rivers and shallow ground water or percolate into soils.

Overgrazing poses yet another agriculture-related problem. Increasing numbers of bands of domestic sheep, goats, cattle, and horses are consuming the steppe and mountain grasslands and shrub vegetation in Armenia. Loss of vegetation from riparian watershed areas and the consequent erosion of topsoil could become one of the most serious problems for Armenian farmers and herders in the decades to come. Such an outcome may also have implications for Armenia's economy, which relies heavily on agriculture (Steinfeld *et al.*, 2006).

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<sup>11</sup> This information was available at <http://www.safariinternational.com/> during the early stages of the preparation of this Report but was removed by the time the Report was ready for publication.

<sup>12</sup> "New Protected Areas Pave Way for Community and Ecosystem Stability," by Julie Shaw, Critical Ecosystem Partnership Fund, December 17, 2009. Available at: [http://www.cepf.net/news/top\\_stories/Pages/caucasus\\_protected\\_areas.aspx](http://www.cepf.net/news/top_stories/Pages/caucasus_protected_areas.aspx).

## Energy

A shortage of affordable and clean energy during the years immediately after independence has been one of the main causes of environmental degradation in Armenia. For health and safety reasons after the devastating 1988 earthquake, the nuclear power plant (NPP), Medzamor, was temporarily closed.<sup>13</sup> With resources stretched exceedingly thin, and with the conflict in Nagorno-Karabakh breaking out, the ensuing energy crisis paralyzed economic activity and resulted in social hardship as access to residential electricity was reduced significantly. International assistance, most notably from Russia, resulted in a reportedly massive overhaul of the reactors to ensure the safety of the plant, and one of the reactors went back online in 1995.

The NPP currently provides about one-third of the country's electricity supply. As it ages, its effects on public health are unclear, although the government maintains that there is no radiation exposure to the nearby villages (Yershova, 1997). To date, no studies of the health conditions of people living near the power plant have been published.<sup>14</sup> International actors, in particular the European Union (EU), have actively pursued closure of the plant before 2016, when the "lifetime" of the plant is due to expire. In 2007, the atomic energy agency of the EU, Euratom, offered €200 million to close the plant, citing security and compliance problems.<sup>15</sup> The offer was rejected by the government.

As Medzamor inches toward retirement, it becomes clear that Armenia critically needs a new energy plan. In May 2009, the government awarded a contract to an international engineering firm to design and construct an NPP in Armenia.<sup>16</sup> The capacity of the new plant will be 1,000 megawatts, and it is planned to be completed by 2018. However, it is unclear how this project will be funded: the value of the contract is in excess of 55 percent of Armenia's 2010 Gross Domestic Product (GDP), which will render its sovereign debt unsustainable if funded through government borrowing. A public-private partnership is likely to be chosen instead, which still leaves open the question of government guarantees of the private portion of the project and has similar implications for increasing Armenia's sovereign risk.

Research is underway to determine new potential energy sources for Armenia. In late 2008 and in 2009, the Armenian Renewable Resources and Energy Efficiency Fund (R2E2)

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<sup>13</sup> For general background, see "Medzamor: The History and Environmental Impact of Nuclear Power in Armenia," by Philip Ketchian, *The Armenian Weekly*, October 2, 1993.

<sup>14</sup> A study of a similar NPP in Bulgaria (Mossang *et al.*, 2009) shows no evidence of public health hazard.

<sup>15</sup> "Euroatom Allocated €200 million for Closing Medzamor NPP," *PanArmenian.net*, September 25, 2007.

<sup>16</sup> "Contract Awarded for New Reactor at Metsamor," *Nuclear Engineering International*, May 18, 2009, as reported in: <http://www.armeniandiaspora.com/archive/index.php/t-170886.html>.

conducted several studies financed by the World Bank as part of the Global Environmental Facility (GEF). One of these studies was related to the development and implementation of biofuel generation capacities. Results of this study indicated that bio-ethanol production using Jerusalem artichoke (*topinambur*) and corn is promising for Armenia. Another study addressed the potential of solar power in Armenia. A third study that was initiated in 2009 evaluated the geothermal potential in the Gridzor and Karakar regions.

### Box 3: Solar Energy

The economic devastation of the early 1990s and the subsequent, vast energy demands have prompted a strong interest in developing independent energy sources. Solar energy is seen as a natural choice due to its clean and abundant nature. The emerging global interest and demand for solar energy production offer an excellent window of opportunity for the Armenian economy. Under the right circumstances, this could be a source of environmentally sound economic development for Armenia (Sohigian, 2009). While such a move will require public and private effort to build a competitive solar industry through infrastructure development, educational programs, and government incentives, the benefits of this paradigm shift are likely to significantly outweigh the costs.

Several projects are presently being pursued at the American University of Armenia, the State Engineering University, and Viasphere Technopark to address renewable energy implementation. A few companies have also emerged with the purpose of developing the necessary technology and facilities for alternative energy sources, including ZodWind, H2ECONomy, and NedWind. The Armenian government established a Renewable Resources and Energy Efficiency (R2E2) Fund in 2005 to coordinate and lead renewable energy evaluation and implementation of projects. The World Bank has been supporting the operation of this fund and financing various feasibility studies initiated by the fund (Hambarian, 2007).

However, to date no country has the experience in building the necessary infrastructure to support its economy using solar power. For instance, achieving a 50 percent replacement of the electric energy capacity of Armenia used in 1988 (a baseline measurement period), would require 3,500 megawatts of capacity at an estimated cost of \$3.5 billion.<sup>17</sup> In addition, a supplemental energy source must also be employed to compensate for the 5-fold decrease of solar flux in Armenia for four months each winter (Hambarian, 2004).

While only a small fraction of total world energy is currently produced through renewable resources (excluding hydropower), the global potential for solar production remains enormous. Thus, a well planned and implemented strategy could offer sizable returns. At present, however, efforts in this direction in Armenia are limited to hearings at the National Academy of Sciences, work by R2E2, and a limited number of educational, private, and governmental institutions.

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<sup>17</sup> Here a very conservative assumption is made that each installed peak watt of generation capacity costs \$2.

While reliable and independent energy production is a critical component of a sound long term national energy plan, energy demand is the balancing side of the equation. In Armenia, more versatile energy saving policies could help reduce energy consumption. Reducing air conditioning and heating loads could also be a source of significant energy savings. Additionally, there are suggestions for “exotic” and progressive measures, such as green facades, vegetated surfaces placed on the walls and the roofs of buildings, as well as bioclimatic architecture, all of which can provide energy savings. However, while certainly helpful for reducing energy consumption, these efficiency measures will not eliminate the need for reliable energy production. Thus, it is critical to make the introduction of renewable energy an urgent national security and economic development priority that must be vigorously pursued.

#### **Box 4: Corruption and Environment**

Many environmental problems in Armenia—including those related to water resources, mining, forests and protected areas—are closely associated with corruption. Exploitation of natural resources takes place without due justification of decisions and with restricted public access to information. Furthermore, decisions can typically be traced to special interest groups and are made without due attention to the declared long-term sustainable development goals of the government (Ministry of Nature Protection, 2008a). The following are some examples that illustrate regular practices of decision-making related to natural resources management:

##### *Mining*

Mining is considered to be the most profitable sector in Armenia. Unfortunately, environmental restrictions are not enforced for most of the major mining operations, which results in damages to the ecosystem of the surrounding areas. Often corruption originates at the stage of issuance of licenses and acquisition of permits.

During 2001-07, according to an award-winning series of reports by investigative journalists, the former Minister of Nature Protection issued several mining licenses to his family members.<sup>18</sup> In 2010, two employees of the State Ecological Inspectorate were arrested for the bribery. They were accused of taking bribes in exchange for reducing the environmental penalties of mining companies.<sup>19</sup>

##### *Forests and Protected Areas*

Corruption in the forest sector is widely believed to be associated with businesses sponsored by high level government officials. The government's actions have been insufficient to stop the destruction

<sup>18</sup> See “Vardan Ayvazyan’s Business Project,” Hetq.am, April 2, 2007, available at: <http://old.hetq.am/eng/economy/541/> or “Vardan Ayvazyan Has a Special Fondness for Goldmines,” Hetq.am, April 16, 2007. Available at: <http://old.hetq.am/eng/economy/543/>.

<sup>19</sup> “Former Armenian Officials Jailed For Accepting Bribes,” RFE/RL, August 6, 2010. Available at: [http://www.rferl.org/content/Former\\_Armenian\\_Officials\\_Jailed\\_For\\_Accepting\\_Bribes/2120944.html](http://www.rferl.org/content/Former_Armenian_Officials_Jailed_For_Accepting_Bribes/2120944.html).

of Armenia's forests as a result of illegal logging. In addition, the government has recently reclassified many forest areas without due justification and allocated those to local communities or private individuals.<sup>20</sup>

In 2007, the status of the central part of the Khosrov Preserve was changed and the Gilan sanctuary was created to enable private construction and agricultural activities. This decision was made by the government without consultations or concurrence of specialists, which could have a devastating impact on the future prosperity of the Khosrov Preserve.

Despite the existing regime of protection of Lake Sevan National Park and constraints for economic activities on the shores of the Lake, hundreds of construction permits have been unlawfully issued and illegal buildings erected without much reaction from the relevant authorities.

Since 2005, there has been evidence of continuing destruction of the "Basalt Organ" monument in Garni Gorge, which owes its name to its similarity with the musical instrument played in the church. No steps were taken to punish the perpetrators on the grounds that this site did not have the status of a natural monument. However, even after 2007, following its inclusion in the list of natural monuments of Armenia, the "Basalt Organ" continues to be desecrated with stones pulled from it being used for construction purposes.

#### **IV. MINING OPERATIONS IN ARMENIA: A CASE STUDY**

##### **A. Issue of Concern**

The destruction of Armenia's forest cover continues today. The impacts of deforestation include increased erosion and landslides, loss of topsoil and arable farmland, changes in local weather and climate conditions, and poor air quality, as well as loss of plant and animal habitats. The causes of deforestation in Armenia include thriving illegal logging and wood export businesses, open pit mining, a lack of affordable alternative energy sources in many rural communities, and a weak and corrupt regulatory structure that fails to consistently and broadly enforce environmental, forestry, and extractive mining laws.

Armenia has been identified by Conservation International and the Critical Ecosystem Partnership Fund (CEPF) as one of the global biodiversity hotspots. Because of the country's unique location and volcanic origins, it contains a vast array of microclimates and unique habitats for many endangered plant and animal species found nowhere else on the planet (CEPF, 2010). Given this environmental heritage, Armenia is in a unique position to provide global leadership in the areas of biodiversity conservation and ecotourism development.

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<sup>20</sup> Relevant information can be found at: <http://www.ecolur.org/hy/news/2010-09-14/1395/>; <http://www.ecolur.org/hy/news/2010-10-18/1545/>; <http://www.ecolur.org/hy/news/2010-10-25/1582/>.

It is in this context that widespread concern and opposition has developed over the past few years, both within the country and around the globe, to the proposed plan to develop an open pit copper mine in the northern village of Teghut. Another major environmental concern is the operation of the Alaverdi smelter and its potentially disastrous effect on the environment and the surrounding population. What follows are detailed analyses related to the Teghut mine and the Alaverdi smelter (see Box 5 below).

### **Teghut Mine**

The Armenian Copper Program (ACP)—whose majority shareholder is the Liechtenstein-registered Valex F.M. corporation—has been awarded a 25-year exploitation license by the Armenian government to extract the copper and molybdenum ore buried in the Teghut mountains. ACP is in the process of developing an open pit mine with an approximate surface size of 240 hectares, which is the amount of forested land the company plans to clear cut. ACP is also going to develop related infrastructure, which will consist of roads, processing units, tailing dumps, and support facilities.<sup>21</sup>

ACP has presented an environmental impact study, which outlines the details of the proposed mining activities, its impacts, and recommended mitigation measures. The environmental document has been reviewed by various governmental agencies including the Ministry of Nature Protection, Ministry of Agriculture, Forestry Service (HayAntar), Ministry of Trade and Economic Development, Ministry of Transport and Communication, Ministry of Health, and Ministry of Culture. Each of these agencies submitted their evaluation of the planned project. After reviewing the input from these state agencies and the environmental impact study of the project (performed by the mining company itself and not by an independent body), the Ministry of Nature Protection issued its approval for the proposed project in 2007. Implementation of the project plans, including clear cutting of the forest, began in 2009.

### *Existing Settings*

Teghut village and the surrounding forests are located in the Lori Region of northeast Armenia between the altitudes of 690–2,200 meters. Teghut and the neighboring Shnogh village are very remote communities with a combined population of approximately 3,600 residents. Many of the residents relied on subsistence agriculture before the area's irrigation system fell into disrepair.

There are many rare and endangered animal and plant species in the Teghut forest, such as the gray bear, Mediterranean turtle, goat, wolf, fox, rock eagle, Trautvetter's maple, and

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<sup>21</sup> "Forest Copper Mine Triggers Controversy in Armenia," by Jeremy Hance, January 2008. Available at: [http://news.mongabay.com/2008/0129-hance\\_armenia.html](http://news.mongabay.com/2008/0129-hance_armenia.html). A report by Hagop Sanasaryan of the Green Union of Armenia published in 2008 (in Armenian; available upon request) is a useful reference on the issue.



the Caucasian persimmon.<sup>22</sup> Additionally, there are 260 types of insects and butterflies, 86 birds, 55 mammals, and 10 reptile species in the Teghut forest. Out of these, 19 are listed in Armenia's Red Book of Endangered Species.

ACP has built numerous roads into the forest to establish exploratory drilling sites. According to the company, the estimated size of the ore deposits in the area is 1.6 million tons of copper and up to 100,000 tons of molybdenum. ACP, in its Environmental Management Plan and other documents, claims that it will mine about 7 million tons of ore annually, for several years, from which it will extract 35,700 tons of copper (an overestimate, considering that copper comprises at best 0.45 percent of the ore) and 1,470 tons of molybdenum.

### *Impact Assessment*

The exploitation of the copper and molybdenum ore buried in the Teghut mountains will result in clear cutting of forest. According to ACP, the final size of areas affected by the mining operation will be 670 hectares from which 510 hectares are covered by forests.<sup>23</sup> ACP has not presented any assurances that during the 25-year extraction period, it will limit its mining within the 670 hectare zone.

#### **Box 5: Alaverdi Smelter**

##### *Existing Settings*

In addition to spearheading the Teghut mining project, ACP also manages the infamous copper smelter in the town of Alaverdi, located 190 kilometers north of Yerevan. During the Soviet period, Alaverdi was a major center for the production of non-ferrous metals. The official population of the town is 22,000, but the real figure may be much less due to recent emigration.

The ACP copper-smelting plant is the only functioning factory in the town now and employs 500 people. Prior to independence, it had ten times as many people employed. The factory was closed in 1989 as a result of the collapse of the Soviet Union and environmental concerns. However, it restarted again in 1996.

##### *Impact Assessment*

The smelter has operated without sufficient safety filters since its reopening in 1996. Emissions of hazardous materials (most significantly, sulfuric anhydride), formed when sulfur-containing copper concentrate is processed, have been on the increase. In 2006 and during the first 10 months of 2007, the plant released into the atmosphere 20 times more sulfuric anhydride than is permitted under the state regulations, according to data from the Ministry of Nature Protection.<sup>24</sup> In 2006, the

<sup>22</sup> The latter has been officially considered very rare and on the verge of extinction as recently as 1989-1990.

<sup>23</sup> ACP Website, [www.acp.am](http://www.acp.am).

<sup>24</sup> "Copper Controversy Haunts Armenian Town," *Eurasianet.org*, January 20, 2008.

government stated that the plant also released 12 tons of arsenic, 105 tons of dust, 41 tons of zinc, nearly 3 tons of lead, and 3 tons of copper among other hazardous elements into the atmosphere.

Coincidentally, the population of Alaverdi has recorded some of the most devastating health problems in Armenia since the reopening of the smelter. These include unnaturally high incident rates of birth defects, developmental defects, and chromosomal disorders. In 2005, the health ministry recorded 121 cases of respiratory diseases among Alaverdi adults; by 2007, that number had reached 295. ACP has dismissed these health issues as common throughout Armenia and does not acknowledge the possibility of any link to the emissions from the smelter.

ACP’s plans to mitigate the damage include planting new trees in Yerevan, and transplanting certain trees and plants found in the forest to other areas. This plan is inadequate and unrealistic, as new trees cannot replace established forest habitats, and the process of moving mature trees and plants will likely result in their demise.

To date, there have been no independent and comprehensive field assessments conducted by international or local organizations. The ACP-funded EIA for the project (funded by ACP) lacks impartiality, contains errors, and used double price standards, showing lower costs and higher benefits.<sup>25</sup>

ACP acknowledges that there will be extensive environmental damage caused by the mining process but states that the economic benefits from this mine exceed the cost of the environmental impacts. This could be based on the fact that it is fairly easy to estimate the financial value of the ore, but more difficult to place a comparable value on the human health, flora, fauna, habitats, and long term arability of the land (see Table below).

Table: Potential Qualitative Impacts from Teghut Mining Operations

Pollution Source	Impact type
<b>Open mine</b> Area of the open mine, storage areas	<ul style="list-style-type: none"> <li>• Loss of usable fertile soil</li> <li>• Destruction of forest</li> <li>• Soil pollution</li> <li>• Air pollution</li> <li>• Non organic dust and gases</li> <li>• Noise and ground vibrations</li> </ul>
<b>Enrichment factory</b> Crushers, concentration drying, steaming	<ul style="list-style-type: none"> <li>• Contamination of commercial and drinking water supply by inorganic particles from crushing and steaming operations</li> </ul>
<b>Water storage dams</b>	<ul style="list-style-type: none"> <li>• Removal of arable soil</li> </ul>

<sup>25</sup> Letter to the government signed by 40 NGOs, January 2008.

	<ul style="list-style-type: none"> <li>• Destruction of forest</li> </ul>
<b>Storage of toxic materials</b>	<ul style="list-style-type: none"> <li>• Soil and water pollution</li> </ul>
<b>Auxiliary production</b> Boilers, collection center, workshops, storage of explosives, cleaning facilities	<ul style="list-style-type: none"> <li>• Pollution of soil by flowing water from explosions</li> </ul>
<b>Overall area</b> Access roads, administrative building	<ul style="list-style-type: none"> <li>• Removal of arable soil</li> <li>• Destruction of forest</li> <li>• Pollution of drinking water sources</li> </ul>

Mining operations will produce waste rock and tailings. Building the tailings storage itself will cause a major destruction of forest. Tailings from the enrichment factory will be stored in the Kharatazor Reservoir, which will be built in the valley of the Bakasagoor River, a site chosen by ACP among alternatives.

Wastewater from the factory will be transported to the reservoir by gravity over a distance of 2.5 km. The tailings reservoir is supposed to have a 174 million cubic meter storage capacity, according to ACP's EIA. For production at 7 million tons per year, this reservoir will be sufficient for only 28 years, suggesting a need for the second reservoir in the future.

The tailings sludge may contain silver, gold, rhenium, lead, arsenic, copper, molybdenum, zinc, sulfurous compounds, and various chemicals used in the ore processing/extraction process. Due to a highly inefficient extraction process, much of the valuable metals, such as rhenium, are lost to the waste stream. The tailings sludge represents a great danger to the environment: local residents will breathe the dust from its dry surface, and, at the same time, heavy metals and chemicals will seep into the soil and may eventually flow into streams and groundwater.

The base of the reservoir will be constructed of clay to prevent polluting the underground water. However, clay layers/liners can leak over time. Most modern tailing reservoirs use High Density Polyurethane (HDPE) liners, an effective measure against leaks, and ACP must also consider using it for this reservoir.

If leakage were to occur, toxic chemicals could get into the Kharatanots River, which joins the Debed River before crossing into neighboring Georgia and Azerbaijan. That river is already polluted from the copper tailing dump in the village of Aghtala (Kurkjian, 2004), and is fished for food downstream.<sup>26</sup> There is also a plan to build a storage site for the waste rock from the open mine in the gorge of the Dookanazor River.

A substantial amount of water is needed for any enrichment factory, and there is also a need for water in the open mine area. The main water source will be the Debed River. A 9

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<sup>26</sup> "Devbed: One Step to Ecocatastrophe," *Golos Armenii*, May 5, 2007.

km pipeline with 400 mm diameter will be built to get the water to the mine site. The annual fresh water input requirement from the river is 7,125 thousand m<sup>3</sup> (or 860 m<sup>3</sup> per hour). The remaining water needs will be supplied from the recycled water from the reservoir. At the water reservoir near the enrichment factory and open mine, 800 m<sup>3</sup> and 216 m<sup>3</sup>, respectively, will be kept for fire fighting.

Drinking water will be withdrawn from the Shnogh River. A drinking water treatment plant will be constructed with a capacity of 400 m<sup>3</sup> per day. Most of the water used in the enrichment factory will be recycled. Rain runoff will be collected using drainage canals that will send the runoff to the main water reservoir. Water from washing the trucks will be collected in an underground tank from where it will be pumped to centrifuges for cleaning. There, the oil will be skimmed from the top, and the water will be reused for washing more trucks. No cars or trucks will be permitted to be washed next to streams or rivers. Commercial and domestic waste water will be treated on site and then returned to the Shnogh River. There will be pipes under the roads to allow for the flow of the natural waters on their existing routes. Storage tanks will have enough water for three hours of operation.

The following are anticipated air pollution sources: gases, dust during construction, dust from mining operations, gases from the enrichment factory, and evaporation from the surface of the liquid waste. There will be an annual release of 890 tons of dust from the open mine and storage areas. It is anticipated that spraying water will reduce the dust by 40 to 50 percent. Air pollutants from the enrichment factory will be 13 tons annually.

Annual dust from transportation trucks will be nearly 25 tons and other air pollutants will be nearly 16 tons. Air pollution from the boilers will be 10 tons per year. According to the calculations presented by ACP, all of the pollutants are within allowable limits.

ACP has recommended taking the top fertile layer of the soil where the open mine will be constructed and storing it for future use. However, it is anticipated that the soil will become polluted with construction debris as well as spillage from factories and transporting materials.

## **B. Economic Impact**

According to project's EIA, more than \$20 billion in wealth is stored within the mine. It is also estimated that Armenia's state budget will earn approximately \$600-650 million in taxes and fees during the project's lifecycle (25 years).

When put in context, these numbers do not look all that large. If discounted at 6 percent annually, the net present value of the stream of these future revenues would be \$255-\$332 million. This means that by giving away an asset worth \$20 billion, Armenia will receive only between 1.2-1.7 percent of its value in tax revenue in addition to some employment and related local economic activity.

This sum is also insignificant if put in the context of the government's total fiscal revenue. Specifically, taxes and fees collected within an average year from this project would constitute only about 1 percent of government's total revenue collection in 2008, the year before the latest recession.<sup>27</sup> This is also a rather small sum compared to the tax revenues that go uncollected in Armenia each year, an estimated \$550 million in 2008.<sup>28</sup>

On the down side, the country will inherit severe, long term environmental problems, including irreversible damage to the forest, soil, and water resources, in addition to health impacts. According to ACP's EIA, the estimated damage to the environment will be AMD 2.5 billion (approximately \$6.5 million),<sup>29</sup> including the loss of 127,000 trees. In addition, there is expected to be a partial or full loss of revenue from fishing the rainbow trout from the local streams estimated at approximately AMD 3 billion (approximately \$8 million).

Unfortunately, there is no independent economic analysis of the full value of the impact on ecosystems or biodiversity. These would include financial benefits from tourism, sustainable livelihoods, groundwater recharge, natural water filtration, carbon sequestration and other beneficial environmental services, and many other attributes that are typically measured by environmental economists (TEEB, 2009).

The environmental assessment report contains numerous miscalculations, such as the value of the orchards and of the arable land, both of which will be degraded due to mining operations. In addition, the assessment fails to factor in the impact of dust clouds emanating from the dried surface of the tailing dump due to mine rock explosions and mine digging. For example, in the town of Ararat, 431.5 tons of dust are lifted and dispersed by the winds annually from the surface of the gold extraction tailings dump. For comparison, this dump is one-twentieth of the size of the proposed ACP tailings dump.

In Teghut and the neighboring Shnogh villages, where farming activity has been diminished due to non-functioning irrigation systems, there has been support for the mine by local residents, who are motivated by the promise of jobs from ACP. It is not unusual for impoverished local populations to support such a project, which could provide short term income to some. The estimated number of workers to be needed during the production is 1,450. The enrichment factory will operate 345 days per year with three eight hour shifts.

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<sup>27</sup> In 2008, Armenian government's total revenues were AMD 715.6 billion, or \$2.34 billion at an average exchange rate of AMD 306 per US\$ (see IMF Country Report No. 09/316. Available at: [www.imf.org](http://www.imf.org)).

<sup>28</sup> Davoodi and Grigorian (2007) estimate that Armenia's tax potential is 21 percent of GDP. If compared to the actual tax-to-GDP ratio of 16.4 percent and GDP of about \$11.9 billion (both 2008 figures), the estimated uncollected amount in 2008 alone would be \$550 million (that is, the difference between 21 and 16.4 percent times nominal value of GDP).

<sup>29</sup> Using the exchange rate of AMD 380 per US\$.

ACP's documents offered no alternative plans that might produce less environmental damage. Neither was any alternative international evaluation requested or presented. It is noteworthy also that no reservations were expressed by government agencies that reviewed the project.

Construction of the ore processing plant and exploitation of the copper-molybdenum mine in Teghut will ostensibly result in a breach of 77 Armenian laws and a range of international conventions signed and ratified by the Republic of Armenia, including the following (see Appendix for details):

- UN Framework Convention on Climate Change;
- UN Convention on Biodiversity;
- UN Convention on Combating Desertification;
- UN Convention on Environmental Impact Assessment in a Transboundary Context;
- UNESCO World Heritage Convention; and
- European Landscape Convention.

It is to be expected that the environmental impacts stated within a company-sponsored study may be underestimated. It is typically the responsibility of the government to commission an independent assessment and to include public participation in its analysis. However, this is yet to be accomplished.

According to ACP, after implementing the outlined mitigation plans none of the three irreversible impacts would exist anymore and out of the six significant impacts, only one remains, which is the open mine. This would be a remarkable achievement for an environmentally destructive open mine project. Based on the experience of other such mines including those in developed countries (e.g., Canada and US), claims about an absence of potential impacts are not realistic.

### **C. Monitoring Plan**

ACP has prepared a monitoring plan, which covers most of the topics requiring surveillance. However, the main challenge will be the post-project effectiveness and transparency of such monitoring. It will be necessary to keep ACP accountable in performing the necessary monitoring. These are comprehensive requirements which may end up on paper only. The following is a summary list of some of the monitoring activities that must be conducted daily or at least every other day:

1. Testing of the surface running waters for different compounds and metrics;
2. Underground water testing near the reservoir, at the base of the ravine, and downstream;
3. Air testing;
4. Evaluation of the open areas and reforested areas;

5. Comparing the acreage of the deforested areas to the newly reforested area;
6. Evaluations of the green belt based on composition, width, tree leaves;
7. Areas of potential erosion based on soil type;
8. Testing of the drainage canals;
9. Testing of the drinking water;
10. Biological cleaning station for the used water;
11. Evaluation of the soil;
12. Testing the soil for heavy metals.

Liners used for the project's tailings dump would have to be monitored and maintained far into the future. Yet, provisions for this are not included in the company's plan. Repairing the liner would require employing a second reservoir to be used for the storage of the waste/tailings, while the first one is being repaired.

#### **Box 6. Environmental Activism in Armenia**

The environmental movement in Armenia has gained momentum and visibility in recent years, drawing some media attention. Despite the fact that Armenian citizens are routinely omitted from the decision-making process regarding the use of public lands and natural resources, a number of watchdog groups and activists have been successful in raising public awareness about environmental issues in the country. Media coverage and social media sites (e.g., Facebook and Twitter) are used extensively for this purpose. This section offers a snapshot of recent developments and methods used by environmental activists in Armenia.

To date, the best organized environmental action in Armenia took place in 2005 in response to the government's plans to build a highway to Iran through the Shikahogh Nature Preserve. A coalition of local and international NGOs, environmental activists, and educational organizations—collectively known as 'SOS Shikahogh'—was successful in raising awareness of the issue both within Armenia as well as among the Diaspora. The unprecedented cooperation of the coalition members enabled them to successfully persuade the government to find an alternate route for the highway in order to circumvent the preserve. Diasporan involvement played an integral role in bringing the issue to the attention of relevant senior officials.

In a letter written to Robert Kocharyan and Serge Sargsyan in April 2007, a coalition of 26 organizations in Armenia expressed concerns about the planned Teghut mine. A subsequent electronic action alert initiated by the Armenia Tree Project resulted in more than 1,500 letters sent to government officials on the issue. International environmental organizations (e.g., Global Response, Axis of Justice, and Friends of the Earth) sent out action alerts to their supporters, which resulted in over 4,000 letters being sent to government officials. Some representatives of the coalition (e.g., the local branch of Transparency International and Ecodar NGO) have used legal avenues to try to halt the project. Unfortunately, as time went by, the initial coalition of Armenia-based organizations became inactive due to fears of possible retaliation by the government. ACP

was subsequently given the authorization to begin the exploitation of the mine and, in 2009, it began cutting trees and clearing the forest area of the mine.<sup>30</sup>

Most recently, approximately two thousand people attended a rally in the southeastern city of Kapan to oppose a uranium mining project there.<sup>31</sup> Local residents and NGOs organized the gathering and collected 11,000 signatures calling for the suspension of the project. Demonstrators also received support from local government officials and members of the opposition Heritage Party and Sardarapat movement, who attended the rally. Their presence proved useful in gaining media attention.

Other organizations focus on education. The Foundation for the Preservation of Wildlife and Cultural Assets educates and empowers young teens to speak up for the environment and organizes community educational events (e.g., film festivals). Similarly, the Armenia Tree Project provides environmental education curriculum to schools throughout Armenia. The EcoLur NGO website has been a key to dispersing information about environmental issues in Armenia. These efforts to support environmental activism are extremely important for empowering current and future generations and encouraging their involvement in the reform process.

#### **D. Abdication of Responsibility**

The government, represented by the Ministry of Nature Protection, declared the establishment of the Teghut mining operation a high priority because it represents “economic development” for Armenia. Short-term-oriented thinking, corruption, and lack of expertise are likely to have been responsible for putting the approval of the project on the fast track, with little regard for compliance with the law, long-term environmental and health consequences, and project sustainability.

The government, through its regulatory agencies, is inherently responsible for the health and well-being of not just the economy but current and future generations of citizens. Such short sightedness will surely have grave consequences. After ACP completes its extraction of the ore, the country is likely to be left with a devastated toxic landscape awash with tailings that will not be recoverable for centuries, if ever.

It is noteworthy that recently the Russian VTB bank, which was originally slated to provide financing for the Teghut operation, has put on hold its plans to finance the controversial

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<sup>30</sup> Recently, there has been a resurgence of NGO activity on this topic, and a new group of 40 organizations sent an appeal to government officials, outlining their concerns on Teghut project. They have asked that all mining activities in Teghut be immediately suspended, and that an independent assessment be commissioned to obtain unbiased evaluations on the economic gains for Armenia versus environmental damages.

<sup>31</sup> “Thousands Protest Possible Uranium Mining In Armenia,” RFE/RL, November 11, 2010. Available at: <http://www.azatutyun.am/content/article/2217688.html>.



project, reportedly after protests by environmental groups. VTB has made the loan's disbursement conditional upon an independent study of the environmental impact of the Teghut forest's destruction.<sup>32</sup> Teghut is just one example of hundreds of currently active mines in Armenia, most of which are within Armenia's remaining forests, where the negative impact is particularly pronounced.

## V. CONCLUSIONS

Armenia is a country of rich biodiversity and is a center of origin for wild ancestors of crops and livestock. It houses more than 3,500 high plants and around 17,500 invertebrate and vertebrate species. The country falls within one of the five centers of diversity and origin of the world's major food crops.

The rapid growth of some sectors of the economy during the last decade and mismanagement have created serious environmental challenges. These developments, combined with problems inherited from the Soviet period, have imposed a strain on the environmental conditions in Armenia. While mostly common for developing countries—where adequate environmental mitigation measures are typically not considered or are discounted—continuing to ignore appropriate environmental mitigation measures in Armenia may result in devastating impacts over the long term. Environmental protection should constitute a key element of Armenia's developmental strategy if the country is to reach sustainability in its development.

Armenia has ratified many international conventions that address issues such as biodiversity, climate change, desertification, and the preservation of cultural and natural heritage. In addition, Armenia's Constitution explicitly addresses nature protection, damage to the environment, and the rights of people to lead healthy lives. However, these concepts have been neglected or only implemented selectively, and until recently the voice of Armenia's civil society was largely ignored. Moreover, lack of independence from the executive branch as well as institutional and human capacity bottlenecks prevent the legal system in Armenia from adequately handling environmental issues.

Despite the fact that the prevailing developmental policy thinking is heavily skewed toward extractive industries, decisions about whether or not to undertake new large-scale projects with potentially sizable environmental impact in Armenia must be considered with the country's long-term benefits and objectives in mind. Recent theoretical and empirical literature in public finance on natural resource management offers many useful insights as to how a framework of this nature could be designed and implemented. Such contemporary

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<sup>32</sup> "Russian Bank Delays Funding Armenian Mining Project," RFE/RL, October 1, 2010. Available at: [http://www.rferl.org/content/Russian\\_Bank\\_Delays\\_Funding\\_Armenian\\_Mining\\_Project/2173551.html](http://www.rferl.org/content/Russian_Bank_Delays_Funding_Armenian_Mining_Project/2173551.html).

approaches are innately connected with the health of country's environment and population and should be adopted.

Improving environmental governance requires effective implementation and enforcement of existing environmental laws, as well as increased transparency and public participation in key policy decisions. The open pit mining operations in Northern Armenia are examples of facilities where both urgent policy changes and adequate enforcement of existing policies are needed. While it is true that implementing environmental protection measures will come at higher costs, these are likely to be small in comparison to the benefits obtained by reducing the extent of environmental desecration and the risks to public health.

Despite commendable efforts by a few local environmental groups and their supporters abroad, the Armenian public's understanding of environmental problems and its involvement in decision making remain rudimentary. Working to increase transparency and enabling civil society participation in policy formulation are critical steps for improving environmental health in Armenia. Much remains to be done on these fronts before the country can embark on a path of environmental sustainability.

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## **Appendix: Legislation Violated by Teghut Mining Project**

### **A. International Conventions Ratified by the Republic of Armenia**

1. "Convention on Biodiversity", Rio-de Janeiro, 1992 (Ratified on March 31, 1993);
2. "UN Framework Convention on Climate Change", New-York, 1992 (Ratified on March 29, 1993);
3. "Convention on Combating Desertification" Paris, 1994 (Ratified on June 23, 1997);
4. "Convention on Access to Information, Public Participation in Decision-making and to Justice in Environmental Matters", Aarhus, 1998 (Ratified on May 14, 2001);
5. "Convention on the Environmental Impact Assessment of in the inter-boundary context" Espo, 1991;
6. "Convention on Landslides", Florence (Ratified on March 23, 2004);
7. "UNESCO Convention on Preservation of the Heritage of Art and Nature."

### **B. Constitution of the Republic of Armenia, 2005**

#### **Article 10.**

"The state shall ensure the protection and reproduction of the environment and the reasonable utilization of natural resources."

#### **Article 31**

"The right to property shall not be exercised to cause damage to the environment or infringe on the rights and lawful interests of other persons, the society and the state."

#### **Article 33.2**

"Everyone shall have the right to live in an environment favorable to his/her health and well-being and shall be obliged to protect and improve it in person or jointly with others. The public officials shall be held responsible for hiding information on environmental issues and denying access to it."

### **C. Republic of Armenia Legal Principles on Nature Protection**

#### **Article 14. Development and Implementation of Economic and Other Projects Impacting the Environment**

"In order to prevent a negative impact on the environment the projects on urbanization, economy, and other activities should have an ecological basis, which are presented to the authorized state body on environment protection by the Contractor before the

projects are approved. The development and implementation of projects which can disturb the natural balance and ecological system, destroy genetic fund of the flora and fauna, or create irrevocable consequences for human health and the environment shall be forbidden."

#### **D. Republic of Armenia Law on Environmental Impact Assessment, 1995**

##### **Article 3. The objectives of environmental impact assessment are as follows:**

- Analysis of intended activities, concepts and the possibility of their alternatives and expediency, taking into account all ecological restrictions;
- Appraisal of the possible effects and the degree of danger of the intended activity, concept and their alternatives;
- Inspection of the degree of the possible ecological effect of intended activities, concepts and the possibility of their alternatives; the integrity of consequence analysis and accuracy; the adequacy of measures for monitoring, prevention, elimination or minimization of consequences during operation and implementation processes as well as in emergency situations;
- To provide efficient and reasonable use of natural resources;
- To prohibit any intended activity which can have an irreversible hazardous effect on the environment, unless otherwise stipulated in the Armenian legislation;
- To provide participation and involvement of public in all phases of assessment.

##### **Article 5. Scope of Assessment**

Assessment must at least cover forecasting, description and appraisal of possible direct and indirect impacts of intended activity related to:

- weather conditions, flora and fauna, individual elements of eco-systems, their inter-relations and stability, specially protected natural areas, landscapes, geomorphologic structures, air, surface and ground waters, underground, and soils;
- the health and well-being of the population;
- the environments of towns;
- use of natural resources;
- monuments of history and culture;

During the assessment of the impact of the intended activity, the social and economic, ecological and historical and cultural peculiarities of the area in question are taken into consideration.



## **Article 9. Expert conclusions on document assessment**

Expert conclusions can be made only by authorized persons who received professional competence certificates from the authorized body.

Within 70 days after the receipt of documents, the authorized body provides the preparation of the expert conclusion by authorized persons. During the preparation of authorized conclusion the opinions of the public, the affected community and relevant state bodies are taken into account. To make justifications, the authorized body can extend this period but not more than for 180 days.

The following is subject to assessment during the adoption of an expert conclusion:

- (a) The validity of the documents;
- (b) The opinions of the general public, affected community and interested state bodies;
- (c) The whole complex of all positive and negative impacts of the intended activity on the environment, as well as their inter-relations;
- (d) The applied assessment methods and the completeness of data;
- (e) Adequacy of the proposed technical solutions for the elimination or reduction of hazardous impact to the modern level of science and technology;
- (f) Alternative solutions to the intended activity;
- (g) Proposals concerning the elimination or reduction of dangerous impact of the intended activity on the environment, as well as implementation, operation measures and necessary conditions.

## **Article 10. Procedure for public hearings concerning expert conclusions on the documents**

1. After the receipt of the expert conclusion, within 30 days, the authorized body provides the public hearings for the public opinion, the opinions of affected community leaders, the opinions of affected communities and relevant state bodies.
2. At least 7 days prior to the event, the authorized body makes a written notification to the initiator, the provincial or community leadership, the affected communities, relevant state bodies and authorized persons about the date and venue of the public hearings. Other experts and specialists can be invited to the public hearings.
3. In the announcement the authorized body informs the general public about the form and agenda of the public hearings.
4. The participants of the public hearings listed in paragraph 1 of this Article receive the minutes of the hearings from the authorized body.

### **Article 11. Procedure of expert conclusion on the intended activities documents**

After the public hearings, within 20 days, the authorized body makes a decision on the issuance of assessment conclusion based on the expert conclusion, public discussions and the minutes of the public hearings results.

### **Article 17. The responsibilities of the authorized body**

1. The authorized body when performing environmental impact assessment is responsible for:
  - the validity of the conclusion;
  - the observation of principles, procedures, norms and deadlines;
  - providing necessary documents and materials;
  - providing necessary working conditions;
  - publicity.
2. The authorized body is responsible for the decision following from paragraph 4, Article 4.

### **Article 18. The responsibility of authorized persons**

When working out expert conclusions, the authorized persons are responsible for:

- the validity of conclusions, suggestions and comments;
- for unbiased appraisal of documents;
- submitting the expert opinion to the authorized body on time.

## **E. Republic of Armenia Land Code, 2001**

### **Article 8. Permitted use of lands**

1. Permitted use of lands is the use in accordance to the target position and operational importance of the land, including the defined rights and restrictions. The statutory legal acts, land zoning and use mechanisms, and civil and earth engineering projects define the permitted use of lands.
2. The permitted use of lands can impose responsibilities that are aimed at:
  - (1) Prohibition of land-use tools that result in decrease in the quality and fertility of the land or contamination of the environment;
  - (4) Types of land-use harming human health or endangering it;
  - (5) Allowable norms of environmental impact;
  - (6) Maintenance of green plantations;

(7) Implementation of measures on prevention of desertion, alteration, swamping and salination of lands;

(8) Implementation of measures aimed at land protection and rehabilitation of altered lands;

(9) Implementation of measures for protection of environmental systems, integrity of sanitary hygienic integrity, and biological diversity;

(10) Implementation of measures aimed at protection of agricultural, civil engineering, nature protection, historical and cultural values, according to laws and statutory legal acts of State governance and local self-governing bodies.

### **Article 23. Historical and cultural lands**

1. Any activity disturbing the target use and operational significance of historical and cultural lands is prohibited;
2. The lands of landowners and users within the historical and cultural lands are not taken for the needs of the State and the community, except cases envisaged by the law;
3. Any economic activity, except the one for development and maintenance of objects in the protected zone, performed within the historical and cultural land, as well as at historical and cultural objects that are subject to investigation and conservation is prohibited.

### **F. Republic of Armenia Water Code, 2002**

#### **Article 103. The requirements for the construction and other objects impacting water ecosystems**

... The assessment of project documents of the construction and reconstruction of the objects impacting water systems, and water resources is carried out by the bodies having relevant license.

While planning, construction, reconstruction, allocation for use and during utilization of constructive and other objects their impact on the environment should be taken into consideration both in the direct place of installation, and in the water basin as a whole.

### **G. Republic of Armenia Code on Underground, 2002**

#### **Article 8. Limitation of underground**

1. Utilization of separate parts of the underground can be limited or banned by Armenia laws and legal other acts in order to provide protection of human health, national security, and environment.

## **Article 42. The main rights and responsibilities of the underground users**

2. The underground users shall be responsible to provide:
  - (7) protection of the underground, atmosphere, soil, forests, water and other objects of the environment, as well as buildings and other constructions from dangerous impact.
  - (8) protection of nature, historical, and cultural monuments from the dangerous impact that can be caused by the underground utilization.

## **Article 51. Main requirements of underground protection**

In the RA the underground should be protected.

1. The main requirements of the underground are as following:
  - (4) Full extraction of natural resources and utilization of main and combined natural resources and their accompanying elements;
  - (5) Exclusion of negative impact of underground utilization.
2. In the event of violating the requirements of this Article underground utilization shall be limited, stopped, or forbidden by the authorized body as defined by the order of the Armenian government.

## **H. Republic of Armenia Forest Code, 2005**

### **Article 20. Order on implementation of activities having no connection with the running of forest economy**

1. Construction and blasting, extraction of minerals, installation of cables, pipe-lines and other communications, drilling and other activities having no connection with the running of forest economy and forest use on state forest lands shall be carried out on the basis of the consent by the authorized body of state management. The consent shall be given on the basis of the positive outcome of the environmental expertise.

### **Article 46. Restrictions of the rights for use of forests or forest lands**

1. The users' rights towards forests and forest lands allocated from state and community forests or forest lands or obtained on other bases can be restricted by the followings;
2. Prohibition of the change of special-purpose use of forest lands;
3. Provision to follow environmental requirements or carry out certain works, including protection of fauna, soil layer, rare plants, natural, historical and cultural monuments and paleontological objects;
7. Provision to protect existence of wild animals, their habitats and migration routes;

8. Cases of discrepancy with the forest management plans;
9. Other obligations, restrictions or provisions.

#### **Article 60. Cases of forest legislation infringement**

1. The cases of forest legislation infringement are as follows:

- (b) cutting and uprooting of trees and bushes on forest lands;
- (e) pollution of forest with chemical and radioactive substances, production wastewaters, industrial emissions, domestic residues and production wastes;
- (f) destruction or damaging of forest;
- (j) damaging or destruction of fertile soil layer of forest lands, infringement of sanitary rules in forests;
- (p) damaging forest fauna objects;
- (r) putting production objects into operation without having stations in place for the prevention of negative impact on forest.

#### **I. Republic of Armenia Law on “Flora,” 1999**

##### **Article 15. Objectives of flora protection and maintenance**

The objectives of the Republic of Armenia concerning the protection and maintenance of the flora are:

- (a) Provide for the protection of integrity of plant species diversity;
- (b) Prevent the illegal use of flora objects;
- (c) Provide for the satisfaction of legislative requirements of the Republic of Armenia during the economic use of flora objects growing areas;
- (d) Provide for the security of water maintaining, soil protective, climate regulatory and recreational properties of the plant covering.

##### **Article 17**

Any activity that results in decrease of the quantity and harm to the growing areas of the plant species registered in the Red Book of the Republic of Armenia is prohibited.

#### **J. Republic of Armenia Law on “Fauna,” 2000**

##### **Article 18. The protection of rear and vanishing fauna objects**

The users of natural resources, who harm the species mentioned in the Red Book of the Republic of Armenia during economic or other activities, must undertake measures for their

protection. Any activity that will result in decrease of the quantity of animal species registered in the Red Book of the Republic of Armenia or will spoil their habitat is prohibited.

#### **K. Republic of Armenia Law on Atmospheric Air Protection, 1994**

##### **Article 21. The conditions of reallocation, planning, construction, and elaboration of the corporations, institutions, and other objects impacting atmospheric air quality**

When reallocating, planning, constructing, and elaborating of the new and reconstructed institutions, in case of existing technological processes, and development of the equipment as well as input of the new ones, it is necessary to provide preservation and reduction of the norms of negative impact of atmospheric air quality. The seizure of dangerous substances and emissions, their rendering harmless, or emission of substances polluting atmospheric air should be wholly excluded, implementation of other requirements of protection of atmospheric air should be provided so that the emissions of the intended, existing, and future corporations, institutions, and other objects together with physical negative impacts shall not result in exceeding of the norms of permissible limited concentration.

In the RA territory the suggestions concerning allocation of new and reconstructed corporations, institutions impacting atmospheric air shall be discussed by the RA government.

The selection of the place of the corporations, institutions, and other objects impacting atmospheric air quality as well as projects of their construction and reconstruction shall receive environmental impact assessment in the field of nature protection especially by the authorized bodies with the participation of NGOs and independent experts with the order defined by RA legislation.

##### **Article 22. Creation of sanitary zones**

Creation of sanitary protected zones will be planned in the event of selection of the place for new corporations, institutions, and other objects impacting the atmospheric air, reconstruction or enlargement of the existing corporations, institutions, and other objects. Sanitary zones and the regime of their protection are defined by the RA government.

##### **Article 23. The conditions of exploitation of the corporations, institutions and other objects impacting atmospheric air**

Entrusting for exploitation the corporations, institutions and other objects that violate requirements of the protection of atmospheric air is forbidden.