

ENVIRONMENTAL RESPONSIBILITY



A responsible approach to environmental management is one of the most important components of our activities.

In 2017, we continued to improve waste management practices and put into operation compost for the treatment of biowaste and their further use in research on mine closure. The company attaches great importance to the conservation of biodiversity in the region; and from the very beginning of production activities cooperated with stakeholders specializing in environmental protection, in particular, took a direct part in the establishment of the Sarychat-Eertash State Nature Reserve (SENR) in 1995. We

continued our relationship with the Fauna and Flora International, the international biodiversity organization with the longest history of existence, in order to support biodiversity conservation projects implemented in the territory of the SENR. The KGC is proud of its support in this area and the fact that since the beginning of mining operations, the number of key species of wild animals such as snow leopard and Marco Polo sheep has increased.

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- Environmental responsibility
- Environmental monitoring
- Biodiversity
- Waste management
- Mine Closure
- Glacier management

ENVIRONMENTAL MONITORING

Our monitoring programs follow both national and international standards, and include:

- Water quality and flow;
- Air quality;
- Acid rock drainage;
- Effluent quality and flow;
- Waste streams;
- Meteorology.
- Biodiversity;

BIODIVERSITY MANAGEMENT

OUR COMMITMENT

We are committed to our obligations to preserve natural biodiversity, reduce negative impact of operations on the environment during operation of the mine and cooperate with our partners to increase biodiversity. Further information is available on our website via the link below from where our full Biodiversity Management Strategy and Plan (2012) can be downloaded: www.kumtor.kg/en/environment-protection/biodiversity.

REGIONAL CONTEXT

The Tien Shan mountain range is one of the longest in Central Asia, stretching approximately 2,800 km through mostly the Kyrgyz Republic and China. The peculiarity of the region is in its unique biodiversity. Moreover, it is home to a number of endangered animals, including snow leopard and the Marco Polo sheep (Argali).

The snow leopard is an important cultural symbol in Central and South Asia and features widely in local folklore. Like the snow leopard, an aquatic plant in the Ranunculus family (*Hedysarum kirgizorum*), endemic species of dandelion (*Taraxacum syrtorum*) and a tulip (*Tulipa tetraphylla*) are included in the Kyrgyz Red Data book. Glacier-fed rivers, including the Kumtor River, which originates from the Petrov Lake, form part of an important

ecosystem service for a broader range of communities in the Kyrgyz Republic and for the Kumtor Mine itself. The Tien Shan region also contains significant grasslands, which provide carbon storage and sequestration services.

ECOSYSTEM SERVICES

Ecosystem services are the benefits that people and businesses derive from ecosystems. Kumtor Mine is remote, with no villages close to its boundaries that could be impacted by operations at the mine site.

The nearest village, Ak-Shyirak, with a population of approximately 120, is located approximately 80 km from the mine in another valley. Agricultural activities for the Ak-Shyirak community, such as crop growing, are very limited due to the harsh high altitude climate. Their livelihoods rely on grazing sheep, goats, and other livestock, in addition to government-funded support. There is also seasonal sheep grazing in the valleys leading to the Kumtor Mine site.

While there is little scope for KGC's operations to negatively impact ecosystem services of Ak-Shyirak, our support – alongside contributions by other key nature conservation players – for biodiversity conservation (see below) is expected to generate positive benefits for the wider region.



USE OF BIOREMEDIATION METHOD TO REDUCE CONTENT OF OIL PRODUCTS IN SOILS (TEST WORKS)

The key priorities in improvement of KGC waste management strategy are reduction of negative impact on the environment and effective use of land resources.

Among numerous anthropogenic contaminants received by the environment, oil products are in the first place. As a result of overloading, significant interruptions of self-purification processes may occur. Natural restoration of contaminated environment takes long time.

When contamination level is 5g/kg, auto remediation of oil-contaminated soils lasts from 2 to 30 years or more. This environmental problem is of particular importance due to the extent of contamination when soil excavation and ex-situ restoration (beyond the contaminated area) are impossible.

The main role in in-situ-remediation (within the contaminated area) belongs to the biological factor – the activity of microorganisms participating in petroleum hydrocarbons utilization and transformation processes.

Percentage of oil products in the Oily Rags Landfill waste is 2-15%. Currently, a bioremediation method is used to reduce content of oil products in contaminated

soils. This method helps minimize technological operations, as well as contributes to land restoration and rational use of land resources.

In 2017, with KGC financial assistance, KTU “Manas” students conducted an analysis of contaminated soil to determine the content of oil products in the site landfill with a purpose of its further reclamation. It was found that the content of oil products was 10,440 mg/kg. With support of the project supervisor, the students also conducted a bioremediation analysis using local microorganisms. In 2016, in laboratory conditions, the content of oil products was reduced from 10,440 to 3,097 mg/kg, or by 70%. In 2017, scientific works continued, but already in the field, directly on site. The use of this method helped achieve destruction of oil products up to 90.1%. In 2018, the works will continue directly at the Landfill.



PILOT- AND DEMONSTRATION-SCALE TESTS OF TAILINGS SUPERNATANT

While the INCO SO₂/Air cyanide destruction process employed at the Effluent Treatment Plant (ETP) has been effective for 20 years, the ammonia produced by this process makes it challenging for Kumtor to comply with its Total Ammonia discharge criterion. To address this, the feasibility of using biochemical cyanide treatment process referred to as the “cyanohydrin process” was studied in 2017. The primary benefit of the cyanohydrin process for Kumtor is that, unlike many other cyanide destruction methods, this process destroys cyanide without producing ammonia or nitrate. The principal of this method is in applying a certain amount of organic carbon (glucose or fructose) and phosphoric acid.



Following preliminary test work, a series of pilot-scale tests was conducted at the mine in July 2017. Full- and pilot-scale tests amended with organic carbon showed a significant decrease in cyanide concentration without the production of ammonia.

KGC ENVIRONMENTAL PROTECTION EXPENDITURES AND INVESTMENTS (USD)

	2015	2016	2017
Waste disposal, emissions treatment	3,456,740	3,803,376	4,593,077
Pollution Prevention & Environmental Management Costs	3,344,100	3,018,788	2,633,312
Environmental Capital Projects	0	105,100	0
Total	6,800,840	6,927,264	7,226,389

“Total annual expenditure on environmental management was \$7 million in 2017”

WILDLIFE MONITORING ON THE TAILINGS MANAGEMENT FACILITY

In 2017, the daily wildlife census monitoring program continued on the KGC TMF. The program was developed to identify and count all avian and mammalian wildlife on the TMF and its immediate surrounds, and confirm that the facility was not having an adverse effect on wildlife. The daily monitoring is undertaken by trained KGC environmental personnel, with regular review and supervision by a recognized expert in the Kyrgyz Republic. The monitoring data is also reviewed by an independent internationally recognized ornithologist. Observations around the TMF were completed on 362 days out of possible 365 days in 2017 – which equates to 99.7% daily coverage. Table 4.6 presents a summary of the daily wildlife observations. The information is presented as 'bird-days' and 'mammal-days' which provide a comparative parameter and quantitative measure of the TMF usage or occupancy by wildlife. It is calculated by multiplying the number of animals (birds or mammal) seen by the number of days on which they were seen. This is valuable in the context of the TMF as it presents a broad measure of potential

contact of wildlife with the tailings and supernatant water and exposure to their cyanide content. In 2017, four mammal species were recorded on the TMF (Grey Marmot, Red Fox, Wolf and Argali) and 30 species of birds – predominantly made up of wildfowl and waders. Two bird carcasses were recorded during the year – a duck and a grey heron (the same number was recorded in 2016). In both cases these are widespread species that died most likely by natural reasons or were attacked by predators. The duck's death was caused by its poor physical condition aggravated by severe weather conditions, while the weakened grey heron became easy prey for vultures. It is unlikely that the birds' exhaustion was caused by the impact of the TMF.

In summary, the extreme weather conditions and low food resources at the high altitude TMF continue to present a low-visitation and unsuitable habitat for birds and other wildlife. For most of the year, the TMF pond remains frozen, preventing wildlife exposure to the supernatant water. Monitoring indicates that the Kumtor TMF system continues to present a relatively low cyanosis risk to avian or other wildlife despite the periodic elevated cyanide concentrations in the tailings. The daily wildlife census monitoring program will continue in 2018.

SUMMARY OF WILDLIFE OBSERVATIONS ON THE TMF:

Indicator	Total
No. of days No wildlife observed	188/362
No of days mammals observed	85/362
No. of mammal days 2017	196
No. of mammal days 2016	201
No. of mammal days 2015	446
Max. mammal group size seen	11
No. of birds observed	127/362
No. bird days 2017	1,499
No. of bird days 2016	1,111
No. of bird days 2015	6,505
Max. bird flock size seen	150



REGIONAL FAUNA SPECIES WITH CONSERVATION STATUS IDENTIFIED WITHIN THE STUDY AREA*

Common Name	Latin Name	Kyrgyz Red Book (2006)	IUCN Red Book	Kumtor Concession	SCER
Mammals					
Snow leopard	<i>Uncia Uncia</i>	Critically Endangered	Vulnerable	Yes	Yes
Brown bear	<i>Ursus Arctos</i>	Locally Rare	Least Concern	No	Yes
Mountain sheeps	<i>Ovis Ammon</i>	Vulnerable	Near Threatened	Yes	Yes
Pallas's cat	<i>Otocolobus Manul</i>	Near Threatened	Near Threatened	No	Yes
Stone marten	<i>Martes Foina</i>	Lower Risk/Least Concerned	No	Yes	Yes
Eurasian lynx	<i>Lynx lynx</i>	Near Threatened	Least Concern	Near	Yes
Birds					
Golden eagle	<i>Aquila Chrysaetos</i>	Near Threatened	Least Concern	Yes	Yes
Lammergeyer	<i>Gypaetus Barbatus</i>	Near Threatened	Least Concern	Yes	Yes
Saker Falcon	<i>Falco Cherrug</i>	Endangered	Endangered	Yes	Yes
Black Stork	<i>Ciconia Nigra</i>	Near Threatened	Least Concern	Yes	Yes
Whooper swan	<i>Cygnus Cygnus</i>	Least Concern	Least Concern	Near	Yes
Eurasian Black Vulture	<i>Aegypius Monachus</i>	Near Threatened	Near Threatened	Yes	Yes
Himalayan Griffon	<i>Gyps Himalayensis</i>	Least Concern	Least Concern	Yes	Yes
Demausel Cranes	<i>Anthropoides Virgo</i>	Near Threatened	Least Concern	Yes	Yes
Eastern imperial eagle#	<i>Aquila heliaca</i>	Vulnerable	Vulnerable	M	M
Eurasian Eagle Owl	<i>Bubo bubo</i>	Least Concern	Least Concern	Near	Yes
Ibisbill	<i>Ibidorhyncha struthersii</i>	Vulnerable	Least Concern	Near	Yes

Note: SCER is Sarychat – Eertash Nature Reserve; IUCN is the International Union for Conservation of Nature.

* In 2016, KGC improved the technical equipment of specialists conducting wild animals and birds monitoring near the mine. More powerful optical surveillance equipment was purchased, photo and video equipment updated. Moreover, the frequency and duration of animal observation was increased. This allowed to detect and register six species of animals (rendered in bold) included in the red book and the IUCN list.

M – marked on a span (seasonal migrant).

KGC'S SUPPORT TO THE SARYCHAT-EERTASH NATURE RESERVE (SCER)

KGC has cooperated with Fauna & Flora International (FFI) to deliver biodiversity conservation and management in the SCER and the wider surrounding Central Tien Shan landscape area of Kyrgyzstan. In 2015 KGC provided financial support of \$50,000 to enable FFI to work with the SCER administration and local stakeholders to develop and deliver effective conservation actions in line with the updated SCER Management Plan. Activities in 2017 were built on the achievements of previous years and took forward priority actions from the Management Plan.

SARYCHAT-EERTASH STATE RESERVE MANAGEMENT PLAN

The SCER Management Plan that was first developed by FFI with earlier support from IFC/EBRD and ongoing support from KGC, was approved in the summer of 2016. Now the reserve staff can officially rely on and be guided by the activities included in the management plan that was designed with inputs from Sarychat-Eertash management and staff, as well as international and local specialists in relevant fields.

TRAINING ON WILDLIFE MONITORING SCHEME

In 2017, the project activity was focused on strengthening the potential of field workers. The training developed by scientists from the KR National Academy of Sciences (NAS KR) in 2015 was improved after feedbacks received from rangers in the course of the training sessions held in 2016. Another two-day training was held in June 2017 and included both theoretical and practical modules during which employees were familiarized with the biology and ecology of animals and birds inhabiting the nature reserve, identification of species by various signs, including tracks, and methods for fauna monitoring. Refresher training on the use of GPS-navigator and maps was held.

GRANTS FOR POSTGRADUATE STUDENTS

In 2017, a tender was announced for a grant program to conduct biodiversity research in the nature reserve. A total of 12 applications was submitted by various universities of the Republic. After selection and interviews, two projects received such grants. The first group conducted a biochemical analysis of water resources in the Sarychat-Eertash Nature Reserve and the Kumtor Valley. Currently, hydrological, water and zoobenthos samples are collected for analyses from 18 sampling stations. Results of analyses will be used to update the Reserve Management Plan. The second group of botanists studied vegetation using advanced methods of analysis. The group is expected

to provide results of ecological and floristic monitoring of plant species, assess the human impact on the local flora, identify the distribution area of medicinal and odoriferous plants, as well as other vegetation species.

STUDY OF VERTEBRATE ANIMALS AND BIRDS AT THE KUMTOR MINE AND ON ADJOINING AREAS

Objectives of the study included the following: assessment of quantity of animals and birds; identification of species composition of vertebrate animals and birds, distribution by habitats, characteristics of stay at the habitat, abundance of species (population density), common species, population trends (natural dynamics); assessment of impact of the mine's activity on vertebrate animals and birds, especially on protected species – rare, endemic, endangered, listed in the Red Book species; identification of especially valuable habitats – areas of mass reproduction of specially protected species, foraging areas, rest areas of migratory species, migration routes; identification of animal species especially sensitive to the mine's operations.

Wildlife census was conducted on the pre-determined transects where location (start and end of transect) was recorded by the GPS-navigator. 10-zoom binoculars and 60-zoom telescope were used to identify to species level and count animals.

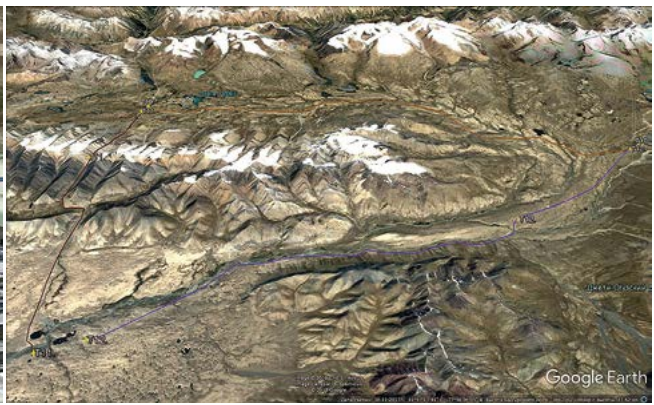
When signs of vital activity of mammals (burrows, tracks, excrements, etc.) were found, mammals were identified to species level. But in many cases, presence of mammals on site was visually observed. Presence of individual species of animals was recorded by various signs of their stay – paw prints on snow or ground, food remnants, flocks or feathers, paths, burrows and lairs, etc. An aerial census was conducted with the use of a quadcopter DJI Inspire 2, X5S. The apparatus flew around the areas of possible wildlife habitats and after that made photo and video recordings of the identified habitats.

During the entire period of observations in 2017, 4 species of mammals with 1,389 individuals were recorded at the mine, and 4 species of mammals with 608 individuals were recorded outside the mine.

Industrial development of the Kumtor deposit is an example of one of the most advanced industries where animals are strictly protected and not exposed to any anthropogenic impact. Despite the fact that heavy equipment constantly operates at the mine's area, animals, especially ungulates and predators, are not afraid of the presence of human activity, i.e. disturbance factor does not affect animals. On the contrary, in some cases during the hunting season wild animals move from the nearby hunting farms to the mine's area where they are safe. This indicates that the Kumtor mine operations does not have any adverse impact on wildlife.



Map of census route (transect) within the mine



STUDY OF VEGETATION COVER AT THE KUMTOR MINE AND IN BARSKOON GORGE

To study vegetation cover of the deposit, a field expedition was organized, study areas of which included the mine itself and its surrounding area.

The purpose was to study the current condition of flora, to identify the main patterns and factors of impact on the environment at the Kumtor deposit, to determine impact of the mine's activity on rare and endemic plant species, to determine impact of dust on the vegetation in Barskoon gorge, to determine the need for further measures to reduce the negative impact, to provide recommendations on plant species suitable for use as a screen for protection against dust.

Description of vegetation was based on 100m² plots. Plants growing within the same community outside the plot were also taken into account. No less than six plots in total were set up within one community, the results of which were summarized (Fig.4.8). Abundance of species was estimated according to the Drude scale.

IMPACT OF KGC ACTIVITY ON VEGETATION COVER OF THE DEPOSIT

It should be understood that vegetation cover is affected in the production zones where vegetation cover is destroyed in the course of industrial operations necessary for development of the deposit. However, vegetation cover is not significantly affected outside the production zones, even in close proximity to roads, facilities and the mine itself.

This is evidenced by a good preservation of vegetation cover of the deposit which does not differ from that on the areas outside the mine, being often even in a better condition. All people and vehicles move through the territory of the mine on existing roads with almost no one moving beyond the roads. Vegetation cover on the territory of the mine is stressed by the activity of wild animals which are its only users because grazing of domestic animals on the territory of the mine is not permitted and domestic animals graze outside the mine.



Areas of flora and vegetation study in Barskoon gorge

IMPACT OF DUST ON VEGETATION IN BARSKOON GORGE

The road from Barskoon village is used by KGC transport, the frontier patrol covering At-Bashi village over Suek pass and Jetimi range. It is also used for herding cattle to summer pastures and back, as well as by tourists visiting Barskoon Gorge. The road serves many other purposes and people beyond KGC. During the study, visual dustiness of plants in Chichkan gorge was found. Leaves covered with dust were found only on plants growing directly near the road. It is apparent that dust on them comes directly from wheels of passing vehicles. No dust was found on plants growing more than one meter from the road. This is due to significant precipitation in this gorge, as well as measures taken by KGC to reduce the level of dust produced on the road. The plants growing directly by the road receive most of the dust thereby protecting the remainder of the plants. Observations have shown that dust does not have a significant impact even on the plants growing directly by the road (see image).

Measures taken by KGC to reduce the amount of dust produced (daily road surface watering) appear to be sufficient to ensure preservation of the surrounding vegetation.

CONCLUSION



Flora of the Kumtor Mine (from 1993 to 2013) consists of about 180 species, and in adjacent areas the number increases to 208 species from 33 families.



The 2017 survey did not show any significant differences in the flora composition. The flora composition was supplemented with one more species – *Stellaria irrigua* Bunge, which was not found during the initial survey. One more species of lichen belonging to the genus *Aspicillia*, was also found but was not identified to species level.



During the survey of areas adjacent to the road in Barskoon gorge 70 species of vascular plants were identified. A thorough survey of flora in Barskoon gorge requires repeated visits to the gorge in different vegetation periods.



Significant impact of KGC activity on vegetation cover was not identified. Uncontrolled grazing of cattle, as well as recreational load, have a much greater impact on vegetation cover.



Impact of dust on vegetation cover is mitigated by regular road surface watering.



Planting of various species of willow (*Salix* spp.) can be recommended as a protection against dust generation. As an additional row of plants to fill the space between trunks of willow trees, sand thorn bushes (*Hippophae turkestanica* (Rousi) Tzvelev.) can be planted.



Vegetation cover beyond the production area within the Kumtor mine territory is not exposed to any significant impact.



Flora at the mine and on surrounding areas include two species listed in the KR Red Book – *Allium semenovii* Regel and *Tulipa tetraphylla* Regel, as well as a conditional endemic species of Kyrgyzstan – *Taraxacum syrtorum* Dzan.



Any impact of KGC on *Allium semenovii* Regel и *Tulipa tetraphylla* Regel was not identified. These species do not require any special protection measures. *Taraxacum syrtorum* Dzan. is exposed to a certain impact, however, the main habitats of this species within site boundaries are located beyond the territory of active production.



Absence of dust on the needles of fir-trees growing directly near the road

IMPACT OF KGC ON RARE AND ENDEMIC PLANT SPECIES

Flora composition of the deposit and surrounding areas includes two species of plants listed in the KR Red Book (KR RB) - *Allium semenovii* Regel (Fig. 4.10) and *Tulipa tetraphylla* Regel (Fig. 4.11) as well as a conditional endemic species of Kyrgyzstan – *Taraxacum syrtorum* Dzan (Fig. 4.12).



4.10 *Allium semenovii* Regel

Allium semenovii Regel. Although compilers of the Red Book did not have any data on numbers of this species, it was included in the KR RB. Within the KGC mine area, this species was found by us only in mountains on the left side of the Kumtor River flowing out from the Petrov Lake where actual KGC activity is not conducted and, therefore, threat to this species does not exist in the KGC impact zone.



4.11 *Tulipa tetraphylla* Regel

Like the afore-mentioned species, compilers of the Red Book did not have any data on numbers of this species, but *Tulipa tetraphylla* was included in the KR RB. Within its habitat, the species is abundant enough, and given that it is not decorative enough, real threat to this species from humans does not exist. Despite all the above, this species is included in the KR RB. However, within the KGC impact area, this species was found only in forest belt in Barskoon gorge by Usupbaev A. Real threats to this species in Barskoon gorge do not exist because it grows apart from the road.



4.12 *Taraxacum syrtorum* Dzan

Taraxacum syrtorum Dzan belongs to conditional endemics of Kyrgyzstan.

Unfortunately, it is impossible to take any measures to protect this species. However, even with complete extinction of this species within the KGC area (which is unlikely, because most of plants are concentrated in the areas that are not currently exposed to direct impact), this species will continue to grow in many other regions of Kyrgyzstan.

REFERENCES

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WASTE MANAGEMENT

KGC understands the importance of minimization of negative impact of waste on the environment and operates in compliance with Good International Industry Practice. We are committed to the ongoing improvement of our waste management strategy.

WASTE MANAGEMENT STRATEGY

In 2013, KGC developed an integrated waste management strategy with input from international consultants. This strategy includes principles such as minimizing the negative impact of waste on the environment and effective use of financial resources spent on labour and purchase of equipment. In 2017, KGC achieved the previously set objectives for waste management, namely:

- 100 % recycling of industrial waste;
- Reduction of the volume of solid domestic waste to be landfilled by 50%;
- 100 % recycling of food waste from the camp kitchen on site.

MAJOR WASTE STREAMS

Three major types of waste (not including waste rock and tailings) result from the mine operation: solid domestic waste, industrial and hazardous waste. Solid domestic waste includes food waste, various types of packaging, as well as other out-of-service household items. Industrial waste includes scrap metal, waste tires, plastic, waste oil and fluids, and other low hazard waste, generated in large volumes and subject to recycling and further use as a secondary raw material. Hazardous waste includes packaging materials, polypropylene bags and wooden boxes used for transportation of toxic agents, batteries, mercury lamps, medical waste and expired reagents. An important part of effective waste management is the accurate recording of waste generation. In previous years, KGC used mainly visual observation as a method of recording the volume of waste generation. Starting from 2017, all waste taken out to landfills or for processing are weighed.

IMPROVEMENT OF WASTE HANDLING PRACTICES

Reducing the negative impact on the environment and the effective use of financial resources related to waste management are the key priorities in improving our waste management strategy. As part of the implementation of the strategy objectives, KGC seeks for partners able to provide waste processing/recycling services, contributing to reduction in waste volumes disposed at site landfills.

Since 2014, not a single kilogram of industrial waste has been disposed on site. Scrap metal, plastic, rubber, wood, paper, waste oil and other waste are removed from the mine to our local partners to reuse and recycle. The reuse of scrap metal in the production of grinding balls is of particular note. The local company "Vulkan Plus" produces different size steel balls used for ore grinding at the Mill. In 2016, KGC spent \$4.5 million on the purchase of grinding balls, which demonstrates KGC's commitment to support local producers and suppliers. Solid domestic and hazardous waste are disposed at two landfills commissioned in 2015.

These landfills were designed and constructed in full compliance with all engineering and environmental requirements of the KR applicable regulatory documents. When designing and constructing the landfills, the following factors were taken into account: prevention of negative impact on ground and surface water, minimization of pollutant emissions into the atmosphere, preservation of pasturelands, effect of runoff and melt water on generation of leachate products and their safe utilization, and prevention of negative impact on local fauna. The landfills are operated in full compliance with the approved design and required environmental, sanitary and technical standards. Operation of the landfills involves placing and compacting the waste in batches, followed by covering the waste with a 20-30 cm soil layer to prevent access by wild animals. According to the mine closure plan, the whole area of landfills is subject to reclamation.

PROCESSING OF BIODEGRADABLE WASTE AT THE MINE

As part of implementation of the strategy to optimize waste management system, as well as to reduce volume of waste to be buried at the Kumtor Mine, in 2017, KGC introduced a partial separate collection and recycling of solid domestic waste in the camp. In particular, a four-component separate collection of waste was introduced in the camp kitchen. Waste was divided into: 1) food waste, 2) recyclable packaging (plastic, cardboard, glass, metal), 3) used vegetable oil, 4) non-recyclable waste. About 2 tonnes of solid domestic waste are generated in the camp kitchen per day, of which only one third is waste that cannot be recycled easily, two thirds can be recycled without the need for burial of waste in the site landfill.

In 2017, a biodegradable waste processing station, or compost unit, was designed and constructed. Food waste is processed by aerobic decomposition producing compost – an organic fertilizer that will be used for restoration of fertile properties of top soil, reclamation of disturbed fertile soil areas. Laboratory tests confirmed that the chemical-biological composition of the final product – compost – fully complies with the properties of organic fertilizers. In this way, about 1 ton of food waste is processed per day.

Recyclable waste is sent to processors of plastic, paper and metal. This has made it possible to reduce the amount of waste to be buried on site 2-2.5 times and, therefore, extend life of the waste landfills, reduce negative impact on the environment, reduce expenses for maintenance of

landfills and partially solve the problems with wild animals feeding on food waste.

The biodegradable waste processing station project underwent all stages of designing, government assessment, and obtained a construction permit. In 2018, an official commissioning of the facility is expected. It should be noted that this is the first such project in Kyrgyzstan demonstrating a high level of environmental responsibility of KGC.

In 2017, the mine produced 545 tons of hazardous waste, of which 116.5 tons were shipped off site for recycling by a specialized company. Hazardous waste includes various packaging materials used for transportation and storage of toxic chemicals, car batteries and other types of batteries, mercury-containing lamps, medical waste, as well as ground contaminated with hazardous materials. Chemicals packaging materials are buried on site in the authorized Hazardous Waste Landfill, commissioned in 2015. Car batteries are collected separately and shipped off site for recycling, which was done in 2017. In addition, collection of other types of batteries was started – AA batteries, typically used in communications and computer equipment. As this type of hazardous waste accumulates, it is shipped off site to Bishkek for safe utilization by a specialized company. In 2017, with assistance of local companies, KGC started the process of utilization of oily rags and big bags. In general, in 2017, KGC considerably improved its waste management practices, adhering to the main priorities for reduction of negative impact on the environment, effective use of financial resources and introduction of the best waste management practices.



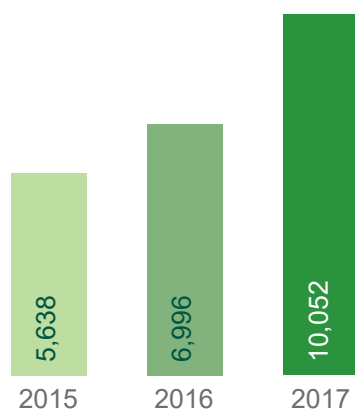
KGC WASTE GENERATION 2017 (TONNES)

	Generated	Disposal Method
Industrial Waste		
Metal	7,511.2	100% Recycled
Paper	97.2	Partially recycled since 2015
Wood	425.4	100% recycled and donated to local communities
Plastic	300.4	100% Recycled
Oil	1,718.2	100% Recycled
Total	10 052.4	
Hazardous Waste		
Packaging	438.0	Landfilled
Oily rags	87.8	Landfilled
Batteries	18.4	100% recycled*
Mercury lamps	0.8	Temporarily stored
Total	545.0	
Tires		
Used tires	947.8	100% recycled

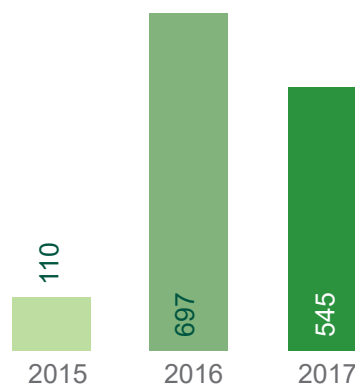
***Note:** An additional 7.6 tonnes of batteries were recycled from temporary storage areas.

WASTE PRODUCED AT KUMTOR MINE SITE (TONNES)

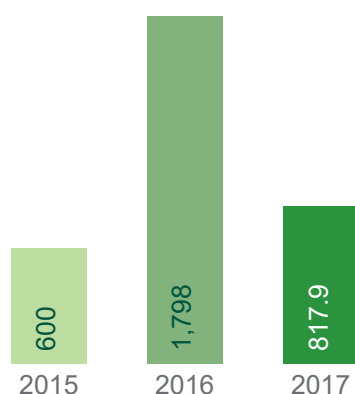
INDUSTRIAL WASTE



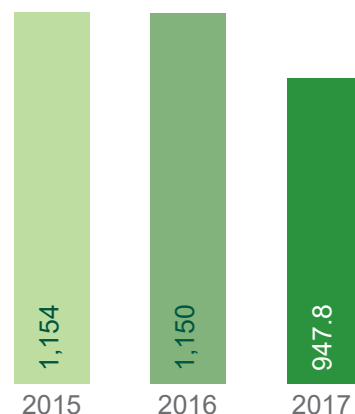
HAZARDOUS WASTE



DOMESTIC WASTE



WASTE TIRES



MINE CLOSURE

CONCEPTUAL CLOSURE PLAN

The recent life of mine plan is for open-pit mining to end in 2023 and milling operations to conclude in 2026. As agreed with Kyrgyz authorities and outlined in the Environmental Management Action Plan (EMAP), KGC is required to update the Conceptual Closure Plan (CCP) for the operation every three years, and complete a Final Closure Plan (FCP) two years prior to closure. This approach allows for a period of testing and monitoring for several years to evaluate the various options provided by the CCP, and time to consider any changes to the environmental, regulatory and social environment that may have occurred over the life of the mine. KGC has prepared CCP's in 1999, 2004, 2008, 2011, 2013 and most recently in 2016. The latest CCP covers the existing components of the Kumtor operations including the open pits, waste rock dumps, tailings management facility and related water treatment facilities, and the mill complex and associated mine infrastructure. Closure and land use objectives of KGC include:

- materially comply with regulatory requirements;
- minimize residual environmental impacts;
- ensure mine site features are geotechnically stable;
- ensure the protection of public health and safety;
- return the land to suitable post-mining land use;
- identify and mitigate social risks/impacts on the community, the business and the overall success of the closure process.

All CCPs have been previously submitted to the relevant Kyrgyz regulatory agencies for their information and in 2016, the conceptual closure plan was also provided to the Government's international technical advisors involved in the ongoing negotiation to restructure Kyrgyzaltyn's ownership in Centerra and Kumtor.

FUNDING CLOSURE LIABILITIES

As outlined in the 2016 CCP, the uninflated life of mine closure cost is estimated at \$56.7 million. It is also estimated it would cost \$54.4 million to rehabilitate the known impacts and disturbance as of December 31, 2017. Kumtor is required to re-calculate closure liability on an annual basis, in accordance with International Financial Reporting Standards to take account of future discount and inflation rates. In 1995, Kumtor established a reclamation trust fund to accrue cash funds for mine closure liabilities. This is funded by sales revenue, annually in arrears.

As of December 31, 2017, the balance in the fund was \$26.4 million, with the remaining cost to be funded over the life of the mine.





“ In 2017, KGC continued implementing a scientific program to study and develop the most effective land reclamation methods ”

THE PROGRAM OF SOIL AND VEGETATION STUDIES

KGC is carrying out a program of soil and vegetation studies at the Kumtor mine with the purpose of further reclamation of disturbed lands. The program includes field expeditions to both the mine site and adjoining areas, as well to high-mountain valleys of the Kyrgyz Republic. The aim of the expeditions is to identify plant species suitable for reclamation works at the mine site. Studies, field expeditions, analyses of soil and vegetation at the mine are conducted by KGC Environment Department employees in cooperation with representatives from the Kyrgyz National Agrarian University named after Skryabin K. I., national experts in the sphere of agronomy and soil science are also

involved. Representatives of the University has been conducting studies at the mine since 2012. The scientific program on the most effective reclamation methods includes collection of local plants and seeds, as well as establishment of trial plots with different soils and conditions.

The program of soil and vegetation studies is a set of measures aimed at improving environmental conditions and restoring lands, suitable for land use in post-closure period. After all the work is done, the restored lands and surrounding areas should become optimally organized and stable balanced landscapes for further use.



GLACIER RESEARCH AND ASSESSMENT OF TECHNOGENIC IMPACTS ON AK-SHYIRAK MASSIF GLACIERS

Studies of the Ak-Shyirak massif glaciers have been conducted for more than 140 years. As a result of the studies it was found that the area of glaciation of the Ak-Shyirak massif in the late 1950s - early 1960s was 436 km² (Katalog lednikov SSSR [Glacier Catalogue of the USSR] 1969, 1970). In 2016, KGC continued funding the glacier research covering the glaciers within and outside the KGC concession area. The study was conducted by two research groups. One group was represented by the Kyrgyz Institute of Water Problems and Hydropower (IWPH) of the KR National Academy of Sciences and the second group was represented by the research experts from the Moscow State University named after M.V. Lomonosov (MSU) and Institute of Geography, Russian Academy of Sciences (IG RAS). Studies conducted by IWPH scientific team in 2017 continued research from previous years 2014-2016 and based on the approved by both parties expanded glacier and hydro-meteorological monitoring program covering KGC concession area. The monitoring program aims to assess of natural (due to global warming) and technogenic (caused by the Kumtor mine activities) factors affecting the shrinkage of glaciers in KGC concession area.

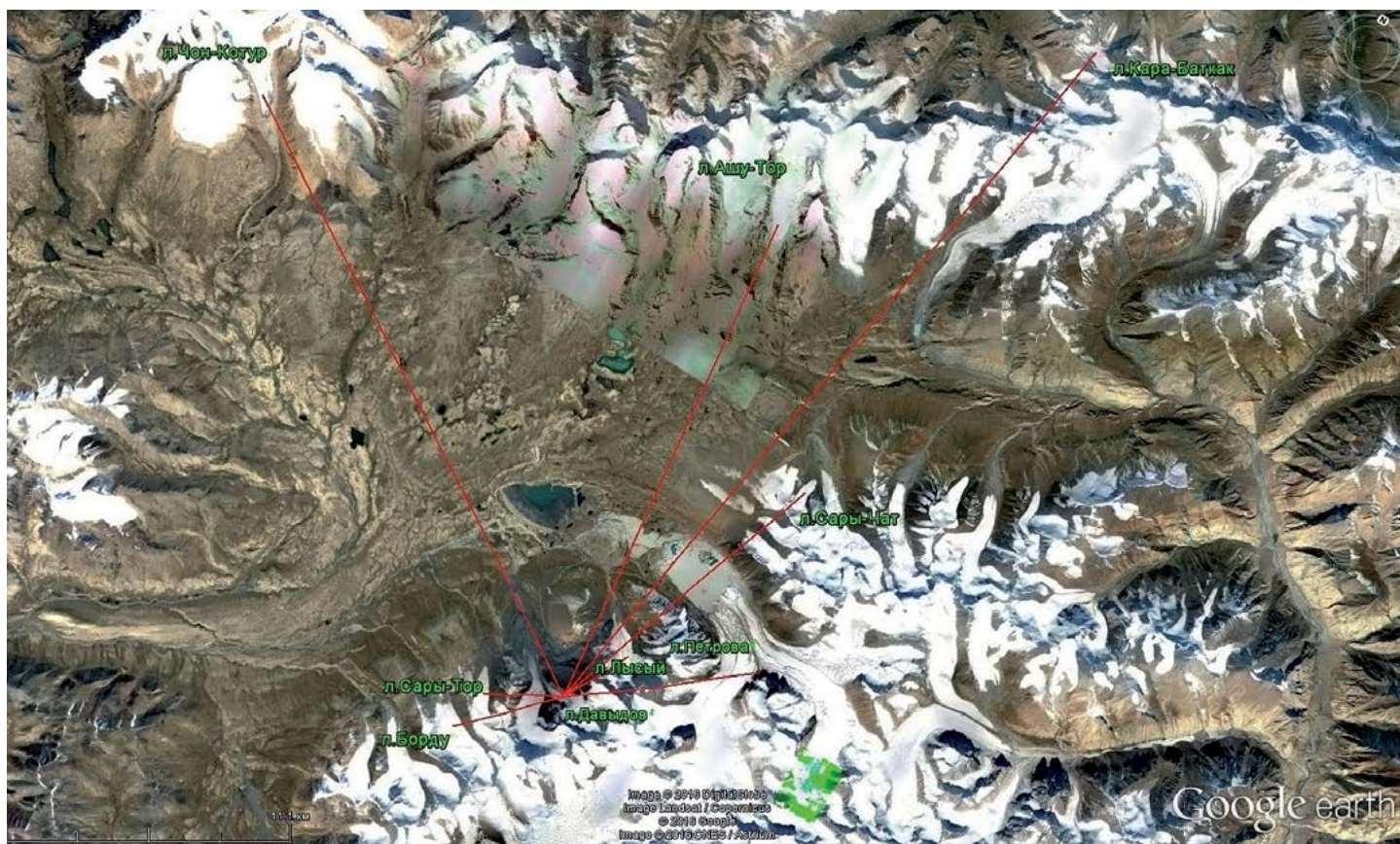
THE MAIN CONCLUSIONS FROM THE OBSERVATIONS IN 2017

In 2017, from all observed glaciers of a northern macroslope of the Ak-Shyirak ridge (Sarytor, Lysyi, Sarychat, Bordu) the Lysyi glacier underwent the greatest ablation. For the period 2014-2017, all the observed glaciers underwent a persistent retreat of the front tongue sections. This can be most associated with such natural causes as the apparent global warming. In 2014-2017 the highest movement rate was recorded at glaciers Sarychat and Ashu-Tor (11.2 m/year and 11.0 m/year, respectively).

In general, according to the calculations of the air temperatures adjusted in one line made by the Tian-Shan-Kumtor Weather Station, the average annual air temperature increase trend made up 1.20C for the period of 1930-2017.

The increased dust concentration in seasonal snow of the Sarytor glacier in 2017 in comparison with 2016 possibly may be related to the technogenic activities – beginning of mining operations in 2017 at a new pit (within the Sarytor valley). This year spectral assay results confirmed the 2016 report conclusion that the increased contamination with dust of the Lysyi glacier is a result of the technogenic impact of the mine. The main technogenic dust contamination sources are the waste rock dumps, adjoining the glacier.

Research of glaciers surrounding the Kumtor Mine will be continued in 2018.



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