

Report on Classification of Energy
and Mineral Resources and its Management
in the Kyrgyz Republic

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Executive summary

Territory of the Kyrgyz Republic is characterized by very complicated geological structure. There are many types of sedimentary, magmatic and metamorphic rocks which have been formed in different geodynamic conditions. Basement of Pre-Mesozoic age and crustose of Mesozoic-Cenozoic age are distinctly stood apart in the structure of the Kyrgyz Tien Shan.

The investigation of Earth's tectonosphere and mineral deposits occurrences were started from the geophysical works. The last one helped to understand the Earth's crust and structure at the large depth.

The Kyrgyz Republic has a great potential for many types of the mineral resources. It has been discovered more than 10,000 different deposits and occurrences of ore, non-ore, energy and non-metallic minerals during the intensive geological investigations since establishment of the Kyrgyz Geological Department in 1938.

During the Soviet period the mining industry of the Kyrgyz Republic was one of leading sectors of economy. Five mining and metallurgical combines, tens coal mines, tens oil and gas fields and enterprises for mining of building and chemical raw materials successfully worked. Kyrgyzstan was the large supplier of mineral raw materials for the Soviet Union and world market. By the end of the 1980s, up to 100% of antimony, up to 64% of mercury, up to 80% of rare earth commodity, up to 25% of monocrystalline silicium and up to 15% of uranium produced in USSR were produced at its enterprises. In some years the coal mining achieved 4,5 mln tons, oil was produced at the volume of 490 thousand tons, and natural gas - 350 mln m³.

Now the mining industry is a priority direction in economic development of republic. It gets up to 10% of global domestic production. Exploration and development of mineral resources are taking on special economical and political significance. The main sectors of mining industry are producing of gold, antimony, mercury, tin, coal, oil, gas and construction materials. Fresh, mineral and thermal waters are exploited for local use. There are possibilities for mining of tungsten, platinum, iron, titanium, vanadium, aluminium, copper, strontium, molybdenum, beryllium, tantalum, silver, bismuth, arsenic, cobalt, some traced elements, coloured stones, graphite deposits and a lot of non-metallic minerals.

Introduction

Kyrgyzstan is a landlocked, mountainous, lower middle-income country with an economy dominated by minerals extraction, agriculture, and reliance on remittances from citizens working abroad. Cotton, wool, and meat are the main agricultural products, although only cotton is exported in any quantity. Other exports include gold, mercury, uranium, natural gas, and - in some years - electricity. The country has sought to attract foreign investment to expand its export base, including construction of hydroelectric dams, but a difficult investment climate and an ongoing legal battle with a Canadian firm over the joint ownership structure of the nation's largest gold mine deter potential investors. Remittances from Kyrgyz migrant workers, predominantly in Russia and Kazakhstan, are equivalent to more than one-quarter of Kyrgyzstan's GDP.

Following independence, Kyrgyzstan rapidly implemented market reforms, such as improving the regulatory system and instituting land reform. In 1998, Kyrgyzstan was the first Commonwealth of Independent States country to be accepted into the World Trade Organization. The government has privatized much of its ownership shares in public enterprises. Despite these reforms, the country suffered a severe drop in production in the early 1990s and has again faced slow growth in recent years as the global financial crisis and declining oil prices have dampened economies across Central Asia. The Kyrgyz government remains dependent on foreign donor support to finance its annual budget deficit of approximately 3 to 5% of GDP.

Kyrgyz leaders hope the country's August 2015 accession to the Eurasian Economic Union (EAEU) will bolster trade and investment, but slowing economies in Russia and China and low commodity prices continue to hamper economic growth. Large-scale trade and investment pledged by Kyrgyz leaders has been slow to develop. Many Kyrgyz entrepreneurs and politicians complain that non-tariff measures imposed by other EAEU member states are hurting certain sectors of the Kyrgyz economy, such as meat and dairy production, in which they have comparative advantage. Since acceding to the EAEU, the Kyrgyz Republic has continued harmonizing its laws and regulations to meet EAEU standards, though many local entrepreneurs believe this process as disjointed and incomplete. Kyrgyzstan's economic development continues to be hampered by corruption, lack of administrative transparency, lack of diversity in domestic industries, and difficulty attracting foreign aid and investment.

The Kyrgyz Republic is administratively divided into 7 regions and 2 republic cities. Further subdivision is 40 areas and 12 regional cities. The lowest unit is 453 aiyams and 17 district cities. Fourteen settlements of different types have arisen near the mines.

Electricity is the most reliable infrastructure in Kyrgyzstan. In the country there are 18 hydroelectrostations and two thermal ones. Kyrgyzstan is incorporated in an integrated power grid with Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan. The republic exports 2.5 billion kW of electric power.

The total length of railways in Kyrgyzstan is 422 km and consists of the route Osh - Kok-Yangak, the route Balykchi - Bishkek - Lugovoe (Kazakhstan). These routes connect with Russia through Kazakhstan and Uzbekistan. The civil-engineering project of the railway to China through the Torugart pass is being designing. Because of the mountain relief the largest part of cargo carriage inside country is realised by trucks. The total extent of roads is 18600 km. The part of roads of strategic significance (Bishkek - Osh) is modernised under the international standards.

Four civil-engineering designs of international highways are developed: Bishkek - Kazakhstan - China - Karachi, Bishkek - Uzbekistan - Turkmenistan - Iran (Bander Abbas), Bishkek - Kazakhstan - Ural and Osh - Khorog - Irkeshtam.

The map of the Kyrgyz Republic is presented in Annex I.

Role of energy and minerals production in national economy

Kyrgyzstan has a long-lived history of mining. There were 27 coal mines at the beginning of the 1900s in the south of republic, which supplied the whole Central Asia with coal. Besides coal, lead, silver, mercury and antimony were being mined.

The exploration for oil and gas were begun in the Kyrgyz part of Fergana valley since 1900. By 1913 the crude oil production reached 3000 tons. The oil fields and coal deposits were being developed predominantly with participation of German, French, Belgian, English and American investors. About one thousand workers were taken up at coal mines and crude oil production. 50 per cent of gross production and 60 per cent of working places of all industry of Kyrgyzstan belonged to foreign enterprises.

During the Second World War on the territory of Kyrgyzstan 10 mining combines were active. They developed lead, silver, antimony, zinc, mercury, gold, tungsten and arsenic. In the post-war time four uranium mines were added to them, the commercial production of rare-earth metals, molybdenum, rhenium, gold, fluor spar has begun later.

Six lead-zinc, two tungsten, four uranium, four mercury, one rare-earth, two antimony and about ten coal deposits have been developed over last 50 years on the territory of Kyrgyzstan. In the late 1980s the enterprises of Kyrgyzstan were producing up to 100 per cent of antimony, up to 64% of mercury, up to 30% of rare-earths, and up to 20% of uranium in the USSR.

At the Soviet time more than 50 thousand workers were occupied in the mining sector of Kyrgyzstan. At the current moment the total number of workers in mining industry is estimated to less 10,000.

To the moment of the break up of the USSR, in the republic were five mining-metallurgical plants: Makmal Gold-Mining Combine, Kadamzhai Antimony Combine, Khaidarkan Mercury Combine, Kara-Balta Uranium Combine and Aktuz Rare-Earth Mine. The Kadamzhai plant and Kara-Balta plant were proceeded the tolling ore-sources. Aktuz and Khaidarkan, having difficulties in sale of products already at the Soviet time, had the budgetary subsidies and were in a high-gravity financial position under market conditions.

After the break up of the USSR, the mining sector of Kyrgyzstan, like other industries, has gone through crisis. The changes of the forms of managing under the market conditions, losses of economic relations, absence of the niche in the world market were the reason of this crisis. Nevertheless, the gold mining have been developed successfully.

All the products of the mining sector are being exported. The overall dynamics of the mining industry with exception of gold, is sharply declining after 1990 cause of subsequent destruction of economic relations between republics of the former USSR. The main resources mined at present on the territory of republic are gold, antimony, mercury, tin, tungsten, which are being exported to China, Commonwealth of Independent State (CIS) countries and Europe. Hydrocarbon raw materials (oil, gas, coal), the construction raw materials and water resources are manly consumed inside the country.

Coal mining, crude oil production and gas recovery covers 40% of the needs of republic in energy. The import of fuel and energy resources is 30 % of total import of republic. For the last 30 years in the republic three big and five small refineries have been put into operation with total petroleum refining output up to 800,000 tons annually.

During the 1940s-1960s there were 7 coal mines and 5 coal open pits with an annual output up to 3,5 mln tons in total. During the 1970s there were 10 coal mines and 2 coal open pits. The maximal output was 3,7 mln tons, while in Kyrgyzstan the demand for coal is 3 mln tons. The republic held the fourth place on reserves up to 1,3 milliard tons and coal mining in the USSR, after Russia, Ukraine and Kazakhstan. Kyrgyzstan has the limited resources of mineral oil and gas. The coal is the basic combustible.

The outlooks of deposits were sharply increased after an adoption of a decision about building of the Kyrgyz part of the transcontinental railway Europe - China going near the Uzgen coal basin, and railway Balykchi – Kara-Keche – Djalal-Abad, connecting the south and the north of Kyrgyzstan. A number of Russian, Turkish, German and other companies are interested in hereinafter study and industrial development of coal deposits in Kyrgyzstan.

In the Fergana valley about 10 mln tons of crude oil, 7,5 bln m³ of gas has been produced in total. More than 40 per cent of mineral oil, and 60 per cent of gas recoverable reserves has been worked out.

By 1958 the crude oil production grew up to 490 thousand, and gas – up to 380 mln m³ annually. But since 1991 there was a decline in an output till 80 thousand tons of mineral oil and 30 mln m³ of gas in 2014, from 2014 till 2018 oil production increased till 200 thousand of mineral oil per year. Production of gas remains the same. Domestic oil and gas production cover only 10% of needs of the country.

The gas line connecting Kyrgyzstan through Kazakhstans with gas fields of Uzbekistan, is used for deliveries of imported natural gas.

Since the 1980s the mining of nonmetallic minerals for production of construction materials was rather successfully developed, completely supplying the construction industry in the country. Now the industry of construction materials is presented by the operations producing cement, slates, asbestos-cement, brick, glass, porcelain, asphalt-concrete, ceramics, gypsum, facing stones, etc. Cement, bricks, basaltic casting, facing stones are supplied to neighbouring countries.

Government policies and programmes in energy and mineral resources

Kyrgyzstan has gained independence in 1991 as a result of the disintegration of the USSR and has accepted the parliament republican form of government that was proved on the few referendums.

The Constitution of the Kyrgyz Republic proclaims following principles: The Kyrgyz Republic is a sovereign, unitary, democratic republic constructed on the basis of lawful secular state.

The citizens of the Kyrgyz Republic elect the President, deputies of the Jogorku Kenesh (Parliament) and deputies of local authorities.

A variety of forms of ownership and their equal legal protection are guaranteed.

The land can be state, municipal, private and other ownership. Foreigners can be land users for mineral resources with some exceptions due to environmental (forestry lands) and safety (border control) reasons.

The state power in the Kyrgyz Republic is based on the following principles:

- The executive power is exercised by the President. He is elected by popular vote.
- Division of legislative, executive, judicial power, their agreed operation and interplay.

Under the Constitution, the state power in the Kyrgyz Republic is represented by the President, Jogorku Kenesh (Parliament), Government and local state administrations, Supreme Court, Regional courts, District Courts and judges of the system of justice.

In the Kyrgyz Republic there can be political parties, labour unions and other public associations. The state ensures the observance of rights and legitimate interests of public associations.

It is forbidden to the military servicemen, officers of law-enforcement bodies, national security, justice, prosecutor's office and courts to be members of parties and to support of any political party. Creation of political parties on a religious base is forbidden too.

Religion and all cults are separated from the state. The religious organisations should not pursue political aims; priests are forbidden to intervene in activity of state organs.

The private property is recognised and is guaranteed as inalienable human rights, the natural source of welfare, business and creative activity, warranty of his economic and personal independence.

The President is the head of state, highest official of the Kyrgyz Republic.

The President determines directions of internal and external state policy, represents the Kyrgyz Republic at international relations, takes measures for protection of the sovereignty and territorial integrity of country, provides unity and continuity of state power, agreed operations and interplay of state organs, their responsibility before the people.

The supreme legislative power is vested in the Jogorku Kenesh (the Parliament of the Kyrgyz Republic).

Jogorku Kenesh consists of two chambers:

The following refers to management of Jogorku Kenesh:

- Introduction of modifications and amendments in the Constitution;
- Enactment of laws;
- Official interpretation of the Constitution and laws enacted by it;
- Change of borders of the Kyrgyz Republic;
- Approval of laws.

In the Kyrgyz Republic the executive power is exercised by the Government and its subordinated ministries, state committees, administrative departments and local state administrations (Annex II).

The Government is headed by the Prime Minister who appointed by the President and approved by Jogorku Kenesh. The Government consists of the Prime Minister, First vice-prime minister, vice-prime-ministers, ministers, chairmens of state committees and directors of state agencies and services of the Kyrgyz Republic.

The Prime Minister determines trends of activity of the Government, organises its work and personally is answerable for its activity, annually introduces the report on Government activity into the Assembly of National Representatives.

The Government of the Kyrgyz Republic supervises over activities of ministries, state committees, administrative departments and organs of local state administration.

The executive authority in areas, regions and cities is exercised by local state administrations.

Decrees of local state administrations adopted within the limits of its competency are obligatory for execution on the applicable territory.

The supervision of exact and uniform execution of the legislative acts is exercised by Prosecutor's Office of the Kyrgyz Republic.

Courts of the Kyrgyz Republic are the Supreme Court, Regional Courts (courts of areas, Bishkek and Osh city, regions and cities), District Courts and regional courts (courts martial).

A judge obeys only to the Constitution and the law. A judge has right to inviolability and immunity, is provided according to his status with social, material and other guaranties of his independence.

Judges are elected by the Parliament on presentation of the President.

The local self-management in the Kyrgyz Republic is exercised by local communities, which in accordance with the law and under their own responsibility manage local affairs.

The local management is exercised by local Keneshes and other organs formed by people itselfs. Local Keneshes approve and control the programs of social and economic development of territory and social protection of the population. Local Keneshes act irrespective of local state administration.

The Kyrgyz Republic has the diplomatic relations with 67 countries and is the member of the United Nations, Commonwealth of Independent States, Organisation on Safety and Co-operation in Europe, World Trade Organisation, World Bank, International Monetary Fund, Asian Development Bank, European Bank for Reconstruction and Development, Islam Development Bank and other international organisations.

An activity of exploring or mining enterprises is regulated by the common codified laws regulating any business, such as the Tax code, Labor code, Civil code, Land code etc., with special sections with a specificity of mining. Besides there are laws with the relations to the mining. First of all, it is the Subsoil Law, next the laws "On Coal", "On Mineral Oil and Gas", "On Concessions", etc. Totally in the Kyrgyz Republic there are 24 direct regulatory acts and up to 37 indirect. Susoil users should pay up to 35 different taxes and payments.

The last Subsoil Law was adopted 12 April 2018 by #49 with the following main items:

- The state ownership for subsoil mineral resources.
- The licenses could be acquired for geological research, exploration, mining and special activity (gas-storages etc.).
- The state ownership to the geological information, but with the permission of it using by third parties by different ways.
- Land and other natural objects disturbed during mining should be recovered for their further usage by special funds of subsoil user.
- No matter type or origin of subsoil user.
- A license may be put in pledge or be transferred to the third parties.
- Proved mineral resources of mineral deposits are subjects to the state expertise.
- The state control for prevention of losses of mineral resources and elective mining.

Licensing of subsoil usage is realised by the State committee of industry, energy and mineral resources. At the present time about 2400 licenses are acting on 7 types of mineral deposits (petroleum, coal, metals, precious metals, non-metals, underground waters, regional exploration) and 3 types of subsoil usage (prospecting, exploration and development).

All kinds of subsoil usage and mining of all kinds of mineral raw materials, including underground waters being in municipal, private and diverse pattern of ownership are subject to licensing. The exceptions are for small-scale mining of raw materials and artisanal gold mining based on special regulatory acts.

The right to use the subsoil is granted by direct negotiations, tenders and auctions.

The tenders are announced and are conducted by the Commission based on special Government decree for the each of strategic deposit. Strategic deposits are relevant objects of national value approved by a special decree of the Government. Currently there are 35 strategic deposits in the list.

The auctions are organized by State committee of industry, energy and mineral resources for the deposits which are not in the strategic list or for the blocks who receive more than 2 applications for direct negotiations.

The direct negotiations are based on the application of the investor which can be approved or disapproved by Commissions organized by State committee of industry, energy and mineral resources.

The conditions of the direct negotiations, auctions and tenders are regulated by special regulatory acts but have few similars: form of application, information about the final beneficiary of investor, interim program of deposit development or exploration and financial wealth of investor.

The exploration and development of subsoil mineral resources by several licenses for different kinds of mineral resources can be conducted. The mutual relation and disputes between the licensees in such cases is regulated State committee of industry, energy and mineral resources.

The investor has the right, with the consent of a state organ on usage of subsoil mineral resources, to pass in the deposit the right to use subsoil mineral resources to the third persons for collateral security of financing of the mining project.

All taxes and payments are regulated by the Tax Code

Classification and management framework for energy and mineral reserves/resources

The State system of reserves calculation is based on the following regulatory acts:

- Decree on the State Commission on Mineral Resources by Government of the Kyrgyz Republic;
- Decree of the State Balance on Mineral Resources by State committee of industry, ebergy and mineral resources of the Kyrgyz Republic;
- Decree of the State Cadastre on Mineral Resources by State committee of industry, ebergy and mineral resources of the Kyrgyz Republic;
- The instructions of a reserve calculatuin for some mineral resources;
- The instructions on the application of the classification of reserves of various branches of minerals.

In the Kyrgyz Republic there is the Classification system of mineral resources of 1981. This is the last Classification which were accepted by the Soviet Government. There are few changes in instructions of reserve calculation but the base is still the same.

In accordance with the level of geological assurance, four reserve categories are established under the Soviet classification scheme: A, B, C₁ and C₂. Reserves under categories A, B and C₁ are assigned to the proved or explored reserves while those under category C₂ are assigned to preliminary assessed reserves.

Category A

These resources consist of the most highly proved part of explored resources. They have been extensively investigated, and the mode of occurrence, shape and structure of an ore-body are known. These data are derived from drilling and mine works.

With A category resources, the technological properties of the ore minerals, including the hydro-geological, engineering-geological and other natural, environmental features, have been studied in detail, ensuring the acquisition of preliminary date necessary for designing ore processing flow-sheets and compiling a detail technical report for the development of the deposit. The contour of the mineral reserves is established in accordance with data from boreholes and mine works.

Category B

These reserves include those deposits whose characteristics have not been studied quit so thoroughly although some of their major characteristics have been delineated. The extent of these resources is determined with the help of information from drilling and mining operations, but their explorations is permitted to a limited extent only.

With B category resources, economic minerals are defined and delineated where possible; in cases where definition is impossible, the spatial distribution of industrial mineral types and grades is established. The technological properties of category B minerals are studied to a detail needed for the selection of a basic processing flow-sheet while hydro-geological, engineering-geological, geotechnical and other natural

conditions are examined to a degree which enables a qualitative and quantitative characterization of their principal parameters and determination of their influence on the development of the mineral deposit.

Category C₁

These reserves are even less well delineated. Only their most general characteristics are known.

The changeability and possible discontinuity of mineral bodies are assessed while hydro-geological, engineering-geological and other natural features are studied to a degree that allows only a preliminary characterization of their main parameters.

Category C₂

Preliminary explored resources, category C₂, are established on the basis of geologic, geophysical and geochemical studies, and measurements of the ore-body in exploratory activities.

Resources in this category can also be estimated by extrapolation of geologic data. With category C₂ reserves, the quality and technological properties of the minerals are determined through analysis of only a few laboratory samples or by analogy with better-studied portions of the same or similar deposits. Hydro-geological, engineering geological and other natural conditions are assessed based on evidence and observations in mine working and boreholes from other sites and by analogy with data available from the vicinity of the deposit.

Projected or probable resources consist of an undiscovered portion of the mineral base. Their appraisal is based on geological data from similar and explored deposits elsewhere. In contrast to reserves, probable resources are not computed but evaluated in a numerical form. Project or probable resources are also known as prognostic resources.

As with reserves, probable resources are evaluated for an entire country, for economic areas, ore basins and fields and individual deposits. Probable resources provide an indication of the expansion possible of a mineral-raw materials base and form a basis for current and long-term economic planning and defining geological exploration and prospecting activities.

Based on the level of geological assurance, probable resources fall into three categories: P₁, P₂ and P₃.

Category P₁

These probable resources are those of explored deposits or those currently being explored as well as the resources of new deposits where prospecting has been completed.

Category P₁ probable resources can be reclassified into reserves with an expansion of the mineral distribution area or discovery of new ore-bodies at the deposit. The quantitative appraisal of the deposit is based on an understanding of the type of deposit and its origin.

Category P₂

Project resources of undiscovered deposits thought to exist on the basis of evidence from geologic surveys, prospecting and geophysical and geochemical tests comprise category P₂.

The availability of resources in this category is deduced from the estimation of ore occurrences as well as geophysical and geochemical anomalies whose nature has been determined through the course of large-scale (1:50000) mapping. Category P₂ probable resources form a basis for planning long-term prospecting and assessment programs.

Category P₃

These probable resources are those of potentially promising areas, districts, basins, and ore fields which do not contain mineable mineral deposits but based on stratigraphic, lithological, tectonic and paleogeographic evidence may reveal new deposits.

Quantitative estimates of this resource category are based on analogy with better studied regions, areas and basins, where explored mineral deposits of the same genetic type occur. Category P₃ probable

resources from a basis for planning future large-scale geological mapping and prospecting programs for mineral deposits.

The State Committee of industry, energy and mineral resources of Kyrgyz Republic expresses interest in implementing by the Kyrgyz Republic the International reporting standards of results of geological exploration, resource assessment and reserves calculation according to the CRIRSCO template.

Committee for Mineral Reserves International Reporting Standards (CRIRSCO) was formed in 1994 with the aim - to contribute to earning and maintaining that trust by promoting high standards of reporting of mineral deposit estimates (Mineral Resources and Mineral Reserves) and of exploration progress (Exploration Results).

At the Annual Meeting of International Council of CRIRSCO in Jakarta, Indonesia 30 October 2017 it was signed three sides memorandum between the State committee of industry, energy and mineral resources, the International Council of CRIRSCO and Kyrgyz Mining Association about Implementing international standard KyrRC based on CRIRSCO template.

Plan for the transition to international standards was agreed by State committee of industry, energy and mineral resources and it was established intergovernmental Working Group.

The transition of the entire system of requirements for geological materials, including the necessary changes in legislation, in full compliance with the CRIRSCO template, will allow a broader presentation of mineral resources and mineral resources of the Kyrgyz Republic for specialized mining, geological and investment institutions of the world, which, in turn, more broadly integrates the mountain sector and the economy of the Kyrgyz Republic into the world economic system and will lead to the expansion and deepening of investment in the mining sector of Kyrgyzstan.

By now, it was approved draft of KyrRC Standard by Working group, consultants of the International Council CRIRSCO, especially appointed for Kyrgyz Republic for advising and facilitating the implementation of the procedures of the Kyrgyz Republic to join CRIRSCO family. Currently KyrRC Standard is reviewed by specialists of the mining industry in the Kyrgyz Republic.

Membership of CRIRSCO is open to all country or regional National Reporting Organisations (NROs) whose application demonstrates that they meet the criteria for membership. For this purpose, it was established Kyrgyz Society of Subsoil Experts for creating National Institute of Competent person.

Absence of approving generally world-wide accepted standards to a large extent isolates the mining industry of the Kyrgyz Republic from world financial investment institutions and, in fact, discriminates foreign mining companies that are forced to work according to “the best practise” standards, but the results of the work carried out according to the standards of the former USSR, which have already been abandoned in many post-soviet countries.

Energy and mineral resource endowments

Fifteen petroleum deposits have been discovered to this time, including: 6 oil deposits (Changyrtash, Chigirchic, Mailisai, Karagachi, Beshkent-Togap-Tashrvat, Tamchi), 5 gas-oil deposits (Mailisu IV Vostochny Izbaskent, Mailisu III, Niyazbek-Severny Karakchikum, Northern Rishtan), 4 gas deposits (Suzak, Southern Rishtan, Sarykamysh, Sarytok). Total perspective area for oil and gas exploration is 22.3 thousand km² in the Kyrgyz Republic and from them more than 5 thousand km² is placed in the Fergana depression. Produced reserves of oil are about 12 mln tons and reserves of gas are 6.5 bln m³. It has been produced about 10 mln tons of oil and 7.5 bln m³ of gas since beginning of reservoir engineering in the Fergana depression. There are 313 oil and gas wells, including 247 producing wells on the balance of “Kyrgyzneftegas” joint-stock company. Extraction of produced oil and gas are 43% and 50% accordingly. There aren't large oil gas deposits within the Kyrgyz Republic. Host rocks composed of: sandstones and

limestones of Triassic, Cretaceous, Paleogene and Neogene ages. Sandstones of Paleogene age are spread most widely than others. There are two reservoir types - porous and mixed. Porosity of rocks is 6-24.1% and permeability is 0.02-3360 mD. Roof-sheet pools have clay lithological or tectonic screen.

Seventy deposits of coal and coal-showings have been discovered to this time. They have formed four coalfields (South Ferganski, Uzgenski, North Ferganski, Kavakski) and three coal areas (Alai, South Issyk-Kul, Alabuka-Chatyrkulski). Sediments of Triassic and Jurassic ages, which consist of: interstratified clays, argillites, siltstones, sandstones, and conglomerates with coal layers composed these deposits. Commercial coal beds of Early Jurassic age are spread in the low part of sedimentary rocks sequence. Number of coal seams in the deposits is ranged from 1 to 50 with thickness from 0.5 up to 100m. There are 1345000 thousand tone of coal on the State balance on 01.01.1999, including 1026800 thousand tone by A+B+C₁ category and 318200 thousand tone by C₂ category. Total and probable reserves are estimated at 6.73 bln tones. Coal production was ranging 3 to 4 mln tones per year until 1991. For the time being coal production are 300-400 thousand tones per year on the Kok- Yangak, Tashkumyr, Abshyr, Uch-Korgon, Almalyk, Sulyukta, Dzhergalan, Kara-Kiche, Minkush and others more small deposits. For supplying Bishkek city with coal, it is planning to increase coal production on Kara-Kichi deposit (1 mln tones per year). Building of railway has started to this deposit.

Several tens of iron deposits and iron showings have been discovered in the Kyrgyz Republic, but their reserves are not registered in the State balance. Probable resources of iron within the Kyrgyz Republic are considered as 3 bln tones. The stage of their exploration is low. Only the surface of these deposits has been studied without any types of underground working.

All well-known world types of iron deposits are marked out within the Kyrgyz Republic: iron quartzites (Dzhetymyski, Baidulinski deposits), titanium-magnetite ores in ultrabasites (Bala-Chichkan deposits), skarn-magnetite (Gava, Oi-Kain, Kalmakashu, Ortotokoiski deposits), sedimentary-sideritic (Narynski deposit). There are unique deposits, as in their construction take part haematite-magnetite bodies in contact of gabbro-peridotite intrusive (Nadir deposit) and magnetite bodies in limestones (Nizhni Kemin deposit). There are run of mine ores (30-50%) and low-grade ores (<30%) by containing of iron. Two deposits can be considered as large (Dzhetymyski, Bala-Chichkan), one as middle (Baidulinski – 210 mln t.) and others as small - <100 mln tones of iron. Small skarn deposits with reserves of iron less than 1 mln tones, at a grading of 30-50%, spread most widely. The future perspective of ferrous metallurgy can be connected with development Dzhetymyski and Bala-Chichkan deposits. Nadir, Gava and Nizhni Kemin small deposits can be used as base for not big metallurgical works.

Several tens of aluminum deposits have been discovered in the Kyrgyz Republic. Two genetic types of deposits marked out from them: sedimentary bauxites and intrusives of nepheline-syenites. Bauxite showings were found in limestones of Late Devonian-Middle Carboniferous age in Southern Fergana area, where they occurred in Pre-Jurassic crust of weathering. Small nepheline-syenite intrusive stocks of Permian age have been discovered in Middle and Southern Tien Shan. The largest aluminum deposits are shown on the map, which include: three bauxite deposits and two deposits of nepheline-syenite. They reserves are not registered in the State balance. Total reserves and probable resources of Al₂O₃ are estimated as: 47.2 mln tones in bauxites and more than 411.3 mln tones in syenites within the Kyrgyz Republic. Small deposits represent bauxite showings with reserves of each deposit about 1-25 mln t of Al₂O₃. Deposits of nepheline-syenites have been considered as middle by their reserves (more than 200 mln tones of Al₂O₃). Grading of aluminium oxide is ranged from 18% till 46.8%. Sedimentary deposits have been divided by flinty modulus (Al₂O₃ /SiO₂) on bauxite (Akshygylski, Katranbashynski deposits – modulus > 2.0) and allite (Karanglinski deposit – modulus <2.0). Quality of nepheline-syenite ores (K₂O + Na₂O/Al₂O₃ relation not more than 3.3-3.4 and SiO₂/Al₂O₃ relation is close to 1) is satisfying industrial demands. The stage of investigations of these deposits is low – level of prospecting and geological study.

It has been found more than one thousand showings of copper mineralization within the Kyrgyz Republic. Copper mineralization most spread in Kyrgyz range, Chatkalski region and Eastern Alai. Mainly this is a quartz-chalcopyrite vein in different rocks, which are not profitable for mining. It hasn't been discovered any large deposits with reserves more than 3 mln tones. Four deposits can be considered by their reserves as middle (0.5-3 mln t.) while the others are small. There are 226.4 thousand t. by C₁ category (0.81%), 116.8 thousand t. by C₂ category (0.92%), total – 343.2 thousand tones on the State balance (Kuru-Tegerk, Uchkoshkon, Mironovskoe deposits).

General mineral-raw base of the Kyrgyz Republic by copper are about 2 mln tones of total reserve and more than 6 mln t. of probable resources. Average content of copper in ore is 0.2-1.0%. The largest deposits by their reserves are: Kutu-Tegerk (1.02 mln t., content – 0.6%), Taldybulak (0.75 mln t., content – 0.2%), Oital (0.6 mln t., content – 0.17%). The stage of exploration of these deposits is low. On Kuru-Tegerk and Bozymchak deposits was conducted only preliminary exploration and others prospecting works were stopped on the prospecting stage.

There are hundreds of lead and zinc deposits and their showings of mineralization within the Kyrgyz Republic. Several mining enterprises have been processed lead and zinc ores of Boordu, Aktyuz, Sumsar, Kan, Kan-and-Gut and Kyrgan deposits till recently. For the time being they are closed because of exhausting of rich ores. There are 23 thousand tones by B+C₁ category and 3.9 thousand t. by C₂ category of lead (Kutessai II, Mironovski deposits), 14.8 thousand t. by C₁ category and 1.7 thousand t. by C₂ category of zinc (Kutessai II deposit). 226.1 thousand t. of lead (Kutessai II, Mironovski, Ikichatski, Temir-Bulak, Chaar-Kuduk and Arsy deposits) and 7.3 thousand t. of zinc (Kutesai II deposit) are over balance reserves. Deposit Kan-and-Gut is on the brunch-wise balance with reserves of lead 3.4 thousand t and zinc 1.6 thousand t. by C₂ category.

General mineral-raw base of these two metals by several tens deposits and showings of mineralization can be estimated as 1 mln t. of lead and 389 thousand t. of zinc. Total reserves of lead are estimated at 1.273 mln t and probable reserves of zinc are 283 thousand t. In most cases they are not active. Except worked-out deposits there are others where were conducted detailed exploration, such as Ichikatski, Chaar-Kuduk, Ken-Shanyk, Chat-Karagaiski, Arsy, Cholok-Terek, Ak-Kul. Geological study was conducted on Dzhartash, Belenteke, Tash-Tyube, Kuvakinski, Tura-Bulak and Taldybulak deposits in 1950-1960.

There are 8 tin deposits, 31 large showings of tin mineralization and a lot of others small ones within the Kyrgyz Republic. Four deposits are shown on the map from them. There are reserves of two deposits on the State balance (Trudovoe, Uchkoshkon; 125.76 thousand t. by B+C₁ category (0.59%), 84.03 thousand t. by C₂ category). 25.6 thousand t. (0.27%) are in over balance reserves. 11.34 thousand t. (1.22%) of tin reserves are on the balance of extractive industries. Most part of tin mineralization is situated in the Northeast of country including 8 deposits and 13 ore points. Other showings of tin mineralization haven't been detailed explored or spreading of tin mineralization on the depth has been explored weakly.

There are several tungsten-tin deposits and ore showings within the Kyrgyz Republic, including 11 explored deposits and 37 large ore showings. Two tungsten deposits (Kensu, Meliksu) and four complex deposits, with tin (Trudovoe, Terekty) and molybdenum (Keptash, Vodopadnoe) mineralization are shown on the map.

There are 52.4 thousand t (0.38%) by C₁ category and 72.7 thousand t. (0.41%) by C₂ category of tungsten in two deposits (Trudovoe, Kensu). These reserves are registerd in the State balance. Total reserves and probable resources are estimated at 431.8 thousand tones within Republic. The most part of commercial deposits is located in the northeast of country. Almost all deposits have been explored and ore showings are partially evaluated in depth.

There are 200 ore showings of arsenic, but only Uch-Imchek, Bel-Alma, Turuk and Uchkolski of them have mono-arsenic mineralization. Mainly, arsenic is as an admixture – in gold, polymetallic and rare metal deposits. Two deposits (Uch-Imchek, Bel-Alma) are shown on the map. Total reserves of arsenic in only arsenic deposits are estimated as 204.09 thousand t. These reserves are not registered in the State balance.

There are 6 deposits and a lot of ore showings of molybdenum including 20 large ones. On the map are shown Chon-Tash and Koksaiski molybdenum deposits, Sary-Dzhaz uranium-molybdenum-vanadium deposit, Keptash and Molodyozhnoe molybdenum-tungsten deposits. There aren't only molybdenum deposits on the State balance. Kutessai II molybdenum-rare-earth detail explored deposit has 2.4 thousand t. of molybdenum (0.012%) by B+C₁+C₂ categories. Total reserves and probable resources of molybdenum are 247.187 thousand t. with contents – 0.012-0.08%; 0.39%. The stage of exploration is low. Main reserves of molybdenum ores are concentrated on Sary-Dzhaz and Kutessai II deposits. Others deposits badly explored on the depth, mainly only their surfaces have been investigated.

There are several tens of deposits and ore showings of beryllium. But commercial potential of beryllium oxide is concentrated in 7 deposits and 8 ore showings. Only four of them, mostly largest deposits, are shown on the map: Kalesai, Uzun-Tashty, Chetendy, Tyuktu-Archa. Three last are located near each other, forming one ore-junction. Reserves of only one deposit – Kalesai, are registered in the State balance - 11.6 thousand t of beryllium by C₁+C₂ categories at a grade of 0.127%. Total reserves and resources of beryllium oxide on the base of 14 largest deposits and ore showings are estimated at 95.166 thousand t. Mainly beryllium mineralization is concentrated in lithium-beryllium deposits. The stage of exploration of beryllium deposits is high.

In the extensive group (about 400) of different types and different scales of mercury deposits and its ore showings, which have been discovered within the Kyrgyz Republic, stand out 15 deposits and 36 ore showings. Almost all of them, including explored deposits and those that are for the time being under exploitation, are located in the South of country. Chonkoi, Khaidarkan, Chauvai, Zardobuka largest mercury deposits are located in the South of the Kyrgyz Republic too. Six deposits are shown on the map, including Khaidarkan deposit that at present are being developed and Chonkoi, Chauvai, Symap suspended deposits. There are reserves of three deposits (Khaidarkan, Chonkoi, Chauvai) on the State and branch of mining industry balances. Reserves of mercury on these balances are 42.04 thousand t including 12152t. (0.176%) by B+C₁ categories and 29887t (0.22%) by C₂ category. There are 2275t (0.17%) by C₁ category in over balance ores. Total reserves and probable resources of mercury are 73.3 thousand tones within the Kyrgyz Republic. Grade of exploration of mercury deposits is high. Most of them have been investigated on the depth except single deposits as Zardobulak.

There are 78 deposits and large ore showings of antimony within the South of the Kyrgyz Republic. Ten deposits are shown on the map, including Kadamzhai, Khaidarkan, Terek deposits, which for the time being are under exploitation. Reserves of 6 deposits - one is mono-metal antimony deposit and others – complex deposits (with mercury and gold), are registered in the State balance (namely Kadamzhai, Terek, Abshyr, Khaidarkan, Kassan, Northern Aktash). Reserves of antimony by B category are 2.6 thousand t. (.96%); by C₁ category – 174.3 thousand t. (1.77%); by C₂ category 94.2 thousand t. (1.54%); 1.5 thousand t. (0.97%) are in over balance ores; total – 271.1 thousand t. Total reserves and probable resources within the Kyrgyz Republic are estimated at 856.99 thousand t., but their main part haven't been explored properly. Largest deposits have been detail explored; large ore showings have been explored on the depth and on the small ore showings have been investigated only surface.

Several tens of deposits, different by their reserves have been discovered to this time. These deposits have complex ores and oxides of rare earth, tantalum-niobates and trace elements represent them. Depending on relation of majority and minority of these elements in ores marked out rare earth deposits with admixtures of tantalum and niobium or vice versa. Lithium, rubidium, scandium, zirconium and hafnium

are the typical admixtures of trace elements in the both types of deposits. Especially the two last elements (zirconium and hafnium) in some deposits reach commercial concentrates.

There are about 2500 original showings of gold mineralization within Tien Shan of the Kyrgyz Republic and they are spread throughout of country. Most of them are represented by small ore showings without commercial perspective, but about 100 showings of gold mineralization need further exploration.

Reserves of seventeen deposits are registered on the State balance, namely: Makmal, Jerooy, Kumtor, Soltonsary, Taldybulak Levoberezhny, Kurandzhailyau, Terekskoe, Terekkan, Terek-Mezhplastovoe, Abshyr, Ishtamberdy, Kuru-Tegerek, Dolpran, Perevalnoe, Mironovskoe, Chalkuiryuk-Akdzhylga, Chpchama. Their reserves of gold at the beginning of 1999 were: 379.138t by B+C₁ categories at a grade of 4.2g/t, 87.609t by C₂ category at a grade of 6.22g/t and over balance ores contained 60.6t at a grade of 2.06g/t. There are reserves of seven deposits on the branch industry balance, 527.909t namely: Dzhamgyr, Nichkesu, Komator, Taldybulak Levoberezhny, Kyzyltash, Altyn-Dzhylga, Kumtor. Their reserves are: 2.555t by C₁ category at a grade of 4.89g/t, 217.089t by C₂ category (4.64g/t); over balance reserves are: 0.150t by C₂ category (1.79g/t), 308.115t by P₁ category (4.66g/t). Officially registered reserves of gold are 1055.256t. By several dozens of deposits and ore showings, which are not registered on these balances, probable resources can be estimate at 1.0-1.5 thousand t. It is considered reserves of new deposits in perspective areas in compare with already discovered can't be equal. Accordingly with above mentioned gold potential of the Kyrgyz Republic estimated at 3-4 thousand t.

Most intensively prospecting for discovering gold deposits have been conducting during the last 20 years. The stage of exploration the territory of the Kyrgyz Republic for gold mineralization and some gold deposits is very low. Soil sampling for gold spectrum analysis has been carried out only on the half area of country. From a number of gold deposits and ore points only seven deposits have been detailed explored (Makmal, Jerooy, Kumtor, Mironovskoe, Perevalnoe, Terek, Terekkan); else seven deposits have been previously explored (Ishtamberdy, Chapchama, Karatyube, Bozymchak, Kurandzhailyau, Taldybulak Levoberezhny, Kuru-Tegerek); while the other 45 deposits and ore showings haven't been evaluated thoroughly however. There are more than one thousand of lithochemical (soil) and heavy concentrate (placer) anomalies, which haven't been investigated so far.

There are tens of uranium deposits and ore showings within the Kyrgyz Republic. Kadzhysai, Kavak, Mailisai, Tuyamuyun, Shakaptar uranium mines have been exploited recently. But for the time being they are closed. There are not any reserves of uranium on the State balance. Mineral rare base of this metal in the Kyrgyz Republic, together with placer deposits is estimated at 33 thousand tones. Mainly, all uranium deposits are small by their reserves and from them stand out: Kavak (2587.4t at a grade of 0.137%), Kok-Moinok (1473t at a grade of 0.06%), Dzhylskoe (1016t at a grade of 0.06%), Aramsinskoe (806.2t at a grade of 0.17%), Atdzhailyau I (724.6t at a grade of 0.07%), Utor-Tuyuk (703.6t at a grade of 0.147%) deposits.

There are more than 2500 deposits and showings of 120 types of non-metallic minerals. They are united in 10 geological-commercial groups on the map: colored stones, agrochemical raw materials, salts and chemical raw materials, raw materials for ceramics and glass production, raw materials for lime and cement production, building stones, raw materials for concrete and mortar production, raw materials for claydite and agglomerite production, facing stones, other non-metallic minerals.

Annual production, trade, review of current status and outlook for

Gold

Currently there are 9 indigenous gold deposits under development – Kumtor, Bozymchak, Solton-Sary, Terekkan, Ishtamberdy, Dzhamgyr, Kara-Kazyk, Taldy-Bulak Levoberezhny, Kuranjayloo. Dynamics of gold production is presented in Table 1.

Table 1 – Gold production in Kyrgyzstan (kg)

	2010	2011	2012	2013	2014	2015	2016	2017
Production	24637	22798	16127,4	27759,7	32677,2	17655,2	36267,6	16052,1
incl. Kumtor	23768	20846	14324,8	26613	29125	14807	30761	10083,2

In 2010-2017, 239,132 tons of gold (including losses) was produced, 205,23 tons of which is Kumtor deposit. The increase in reserves due to exploration, exploitation and revaluation of deposits amounted to 463.035 tons, of which 202.772 tons in the Kumtor deposit. Gold output is presented in Table 2.

Table 2 – Gold output in Kyrgyzstan (kg)

	2010	2011	2012	2013	2014	2015	2016	2017
Gold output	18071,6	18920,5	11199,7	19505,8	18404,1	16894,3	18224,4	18573,4
incl. Kumtor	17660,5	18138,0	9805	18674,6	17657	16195	17137	17503,4
Makmal	240,5	363,6	367,4	456,5	282,7	272,3	172,7	193,5
Terekkan	106,4	76,1	89,7	103,1	-	-	-	-
Solton-Sory	64,2	70,0	70,8	63,0	51,35	49,1	29,5	68,2
Jamgyr		172,4	390,8	208,6	413,09	377,9	679,41	587,7
Ishtamberdy		100,4	476,0	-	-	-	205,8	220,6

Placer gold

Alluvial gold was mined at the following fields: Sulu-Tegerek, Kara-Tyube, Buchuk, Baymak, Chanach, Kumbelsu, Kynda, Tokoiluu, Kara-Bulak and Zhartysuu. Placer gold production in Kyrgyzstan is presented in Table 3.

Table 3 – Placer gold production in Kyrgyzstan (kg)

	2010	2011	2012	2013	2014	2015	2016	2017
Gold output	155,6	157,4	189,8	282,1	84,157	62,466	57,93	8,82

From 2010 to 2017 as a result of mining alluvial deposits, gold reserves decreased by 1,138.273 kg.

In recent years, five gold enterprises have been commissioned in the country - Ishtamberdy, Kara-Kazyk, Dzhamgyr, Taldy-Bulak Levoberezhny, Bozymchak and Kuranjayloo, which produce gold ore and concentrates. The necessary production infrastructure is being built at the Jeruy, Kuru-Tegerek and Chaarat fields (Tulku-Bash section).

The following fields are at the development stage of the feasibility study and design: Buchuk, Shambesai, Unkur-Tash, Terek, Perevalnoe and Terekkan.

The most significant gold mining company in the industry is Kumtor Gold Company.

Non-ferrous and rare metals

Prospects for the development of non-ferrous metallurgy associated with the construction of mining enterprises in the deposits of tin and tungsten Trudovoe, Uchkoshkon and Kensu. Copper will be mined along with gold mining. Other well-known deposits and ore occurrences in terms of the quality of raw materials, reserves and resources at current world prices cannot be considered as a source of raw materials for new enterprises.

Antimony

For nearly 70 years, the Kadamzhai and Terek fields have been the raw material base of the Kadamzhai antimony plant. In small quantities, the supply of antimony concentrate was also carried out by the Khaidarkan Mercury Factory. Antimony production in Kyrgyzstan is presented in Table 4.

Table 4 – Antimony production in Kyrgyzstan (tons)

	2010	2011	2012	2013	2014	2015	2016	2017
Antimony	842,4	892,1	924,2	1474,1	26,1	53,0	40,0	11,7

Even in the Soviet period, antimony deposits were largely developed, enterprises processing antimony concentrates were reoriented to supplies from other regions of the former USSR and to imports from the CIS member states. Significant amounts of antimony concentrate were supplied from Tajikistan. Due to the shortage of metal antimony in the world, antimony products are currently highly liquid and in demand. However, it does not develop the Kadamzhay field, the residual reserves of which are about 80 thousand tons of metal, with the existing capacity, they would be enough for 15 years of full load.

The main enterprise operating in this industry is the Kadamjay antimony plant, meanwhile, at the design stage of the mine are LLC Tereksai Zhashtary and LLC Huacin.

Mercury

The Khaidarkan Mercury Factory is the world's only manufacturer and exporter of primary mercury. The demand for mercury, especially for mined mineral resources, is significantly reduced due to the implementation of the Minamata Convention on Mercury, which requires the acceding countries to phase out primary mining of mercury and prohibits parties to import mercury derived from primary mining from countries that have not ratified the Convention. In 2009, the Kyrgyz Republic approved the National Mercury Production Plan in Khaidarkan, developed with the support of the United Nations Environment Program. This document contains activities necessary to stop mercury production in the framework of environmental and social issues. Mercury production in Kyrgyzstan is presented in Table 5.

Table 5 – Mercury production in Kyrgyzstan (tons)

	2010	2011	2012	2013	2014	2015	2016	2017
Mercury	98,7	111,3	68,8	29,0	46,3	28	8,3	2,9

Iron

Known iron deposits are mainly related to small deposits with poor and common ores and are poorly studied. The state balance, reserves of iron ore are accounted for the Nadir deposit in the amount of 978 thousand tons and is mined as an additive in the production of cement for South Kyrgyz Cement CJSC and Southern Combine of Building Materials LLC. Explored geological reserves in the C1 category of the deposit are 17.3 mln tons of ore with an iron content of 37.5-42.2%.

Coal

The second in economic value after the gold mining industry is the coal mining industry. The time of its birth dates back to the end of the 19th century at some coal fields (Kok-Zhangak, Tash-Kumyr, Sulukta, Kyzyl-Kiya); coal has been produced intermittently for more than 100 years. Up to 1980, the industry constantly increased production volumes, the peak of productivity fell in the period 1976-1980, when on average more than 4.2 mln tons of coal were mined per year (of which 2.6 mln tons were mined underground, and 1.6 mln tons open-pit mines). Since then, a gradual decline in production began: average annual production in 1981-1985 was 3.6 mln tons, in 1986-1990 - 3.3 mln tons. A massive drop in production occurred after 1991 (less than 500 thousand tons). From 2012, growth began and in 2017 more than 1.9 mln tons were produced.

The basis of the organizational structure of the coal industry is currently formed by 54 coal small and large companies.

In 1991, the total number of employees in the industry was 15,923 people, in 2017, according to various estimates, from 3,200 to 4,000 people.

The main reasons for the decline in coal mining are:

- The presence in the industry of a large number of mines and cuts with complex mining and technological conditions that have become unprofitable in the market;
- The lack of a single state policy to maintain the fuel and energy complex and stable direct financial support during the collapse of the USSR;
- Orientation of the energy industry in the 1990s to the use of imported coal;
- The ubiquitous transition to electricity consumption, which led to the loss of the coal industry of the domestic market;
- Deterioration of the financial condition of the industry due to the insolvency of consumers, the imbalance of the refundable financial mechanism;
- The exhaustion of the service life of mining and mining equipment (depreciation of fixed assets exceeds 80%), its service life is about 30-40 years.

At present, the country's annual demand for coal is about 2.4 mln tons.

Coal mining is offset by the exploration of new deposits and the flank sections of previously explored deposits. Coal production in Kyrgyzstan is presented in Table 6.

Table 6 – Coal production in Kyrgyzstan (tons)

	2010	2011	2012	2013	2014	2015	2016	2017
Coal production	575	839	1100	1422,4	1829,8	1938,7	1852,1	1926,5
Companies	42	44	47	51	77	92	97	105
Deposits	47	49	53	56	84	100	105	113

Coal mining is among the most labor-intensive and inefficient processes (production per person per day is about one ton). With the underground mining method, in the prime cost of coal, wage costs with charges make up about 50% of the total production costs, and the high cost of road transportation, which makes coal production unprofitable at distances of 500-600 km from the market, has a huge impact on the cost of coal.

Coking coal

Uzgen basin is the largest coking coal reserves in Kyrgyzstan and includes 17 deposits. Only at the Tuyuk-Kargash deposits in the Uzgen district of the Osh region and Kok-Kiya in the Toguz-Torou district of the Jalal-Abad region, the estimated resources of coking coal are 275 mln tons. Coal briquette production has a long-term perspective on the market, but overall demand for traditional briquette is low. Requires a smokeless, more environmentally friendly briquette. Briquette as a commodity product turned out to be in the same market niche with competitive high-quality coal at a significantly higher cost.

Currently, there are no coal processing enterprises in the country, and there is no system for training specialists in energy technological processing of coal in domestic higher education institutions. Traditional energy technologies have already reached the limit of economic and environmental efficiency. Of considerable interest are the development of new methods and equipment that ensure the processing of coal into useful products, taking into account the requirements of environmental safety.

The use of coal for energy in its current form is the most "dirty" production compared to the use of other energy sources. The creation of environmentally friendly technologies to produce competitive products and generate electrical and thermal energy is a priority in many countries with large deposits of coal.

The need for a more active development of the coal industry and an increase in coal production in the coming years is determined by the existing shortage of resources in the energy sector of the republic. Existing prospective coal reserves in the republic make it possible to fully provide the economy with solid fuel in increasing amounts.

Non-metallic industrial raw materials

The mineral resource base of the country fully covers the needs of the production of building materials with regard to growth. However, in the domestic market of building materials, foreign products dominate, despite the costs incurred during transportation of building materials.

More than two hundred enterprises are registered in Kyrgyzstan, which extract a half dozen different types of non-metallic minerals, mainly building materials. The dynamics of the results of activities shows that the number of fields involved in exploitation is steadily increasing, while the number of enterprises is decreasing, which indicates a positive trend of consolidation.

Fresh and mineral-thermal groundwater

Currently in the Kyrgyz Republic, 115 fresh groundwater deposits are explored and accounted for by the State Water Balance of Groundwater of the Kyrgyz Republic. The total approved operating reserves for the fields are 25382.249 thousand m³ / day. 44 deposits operational reserves in the amount of 10,545.2 thousand m³ / day, approved by the State Commission on Mineral Reserves of the Kyrgyz Republic, and 71 deposits reserves in the amount of 14,837.049 thousand m³ / day were approved by the State Committee for Reserves and taken into account by the State Water Balance of the groundwater of the Kyrgyz Republic.

Reserves of thermal-mineral groundwater in the amount of 42.5 thousand m³ / day were approved by the State Committee for Reserves on 40 deposits.

Practically all water resources have been explored in the southern regions of the republic and their growth in the future is unlikely. There are still undiscovered resources in the north of the country.

Currently, about 305 licenses for groundwater abstraction have been issued. The vast majority (90%) of the right to use subsoil for the selection of groundwater belongs to local companies. Control over groundwater withdrawal is insufficient, there are many cases of unauthorized water withdrawal from wells. In most cases, the volumes of water withdrawal are not taken into account by the devices; accordingly, the mechanism for collecting royalties provided for by the Tax Code of the Kyrgyz Republic is not adjusted. The population provided with tap water pays only for the delivery of water, but not for the water itself. As a result, high-quality drinking water is wastefully used for irrigation and technical needs.

Social and environmental aspects of energy and mineral production

The large fund of discovered and explored deposits and the extremely low probability of discovering new ones provide an opportunity to assess the economic potential of the mining industry and predict its future development. For this purpose, for almost all fields of Kyrgyzstan of commercial interest, options have been calculated that allow plausibly to predict the development trend of the mining industries with macroeconomic parameters.

The inertial scenario proceeds from the current state of the mining industry without modernization of legislation, management, the optimistic scenario provides for the maximum possible growth, above which progress is unlikely.

After the results of the calculations, we can draw the following conclusions:

- The global stock market is very low in assessing mineral assets in Kyrgyzstan, which limits the ability of venture capital companies to mobilize funds for geological exploration projects and the development of deposits;
- Rates of speculative transactions are closer to the fair value of deposits than valuations of stock markets;
- Planned tenders and auctions will bring minimal revenues to the state budget;

- It is required to significantly improve the investment image of Kyrgyzstan by strengthening guarantees to investors and reducing other risks in order to increase the value of mineral resources.

It is necessary to promote the policy of informing participants of international capital markets (investment funds and banks) about the business environment in the Kyrgyz Republic, since potential investors do not have basic information about the Kyrgyz Republic

The market value of all gold mineral resources known today in Kyrgyzstan and obtained from the calculation by the income method is low and lies in the range of US\$ 3-5 bln.

Currently, the situation on the world market for mineral products is extremely favorable for Kyrgyzstan, due to the rapid growth of prices for traditional mineral resources: gold, silver, mercury, rare earth metals, tin, copper, antimony, molybdenum. Over the past decade, prices have increased by 4.5 times for gold and silver, rare earths — by 6 times, tin, antimony — by 2.5–3 times, for mercury by more than 20 times.

For a long time in Kyrgyzstan, it was not understood that mineral reserves in deposits have a market value.

The biggest mistake of the nineties was the creation of joint ventures with state equity participation without a valuation of the contribution of the Kyrgyz side in the form of a field.

Licenses for the development of mineral resources were issued free of charge, which in the middle of the 2000s gave rise to a powerful wave of speculation without the intention of developing the deposits;

Later, another extreme appeared: by incompetent analysts, the value of deposits was determined by multiplying mineral reserves in the ground by the market value of products. As a result, estimates were repeatedly inflated and reached values in many billions and even trillions of US dollars.

The emergence of a mining enterprise in rural areas is inevitably associated with certain socio-economic consequences. By their nature, they are ambiguous: along with the negative consequences associated with the alienation of land, some deterioration of the ecological situation, negatively affecting the health of local people, there are new socio-economic opportunities associated with the creation of additional jobs, improving infrastructure, etc. However, it is necessary to take into account that these activities also lead to new social and environmental consequences.

Due to the changing lifestyle of the community, a new type of business appears, and it is necessary to take into account that after the closure of an enterprise, residents should be able to return to their previous structure and develop farming and cattle breeding on their territory. Many studies have shown that the emergence of new high-paying jobs increases the purchasing power of local employees of the enterprise and, as a result, stimulates the local production of goods and services. On the other hand, growing demand causes a local price increase, which has a negative effect on the rest of the population.

When planning socio-economic strategies, mining enterprises within the framework of corporate responsibility should take measures to mitigate such consequences (raising the level of pasture productivity, restoring agricultural land, restoring floodplain forests, etc.). At the same time, it is precisely such programs that ensure sustainable social, ecological and economic development of the community. When designing the development of new deposits, the stage of liquidation of production should be described taking into account the indicated factors.

At present, the ecosystem approach is partially fixed in the natural resource and environmental legislation of the Kyrgyz Republic. At the same time, there is no mechanism for implementing the ecosystem approach in regulating environmental relations and protecting natural resources. In turn, the state environmental monitoring is carried out in relation to individual natural objects: land, water, forests, etc. However, ecosystems are not considered as a separate object of state environmental monitoring.

A serious omission is the lack of parameters of the standard state of natural ecosystems (primary biological productivity and biomass per sq. Km, state of biodiversity, etc.), which does not allow a clear assessment

of the specific damage and the necessary measures for compensatory measures to improve the state of the natural environment in the area of responsibility mine. The current system of environmental protection is reduced to payments for environmental pollution (emissions, discharges of pollutants, waste disposal). Payments for environmental pollution from mining enterprises are transferred to special accounts of state territorial funds for environmental protection and development of the forest industry. The further fate of the payments listed is unknown: the procedure for their use and the mechanism for restoring the environment from the funds received are not defined. These funds, as a rule, are directed to the implementation of measures that are not related to the spent sites of the mining industry. A scientifically based and legally fixed mechanism for determining environmental damage is required. A significant number of subordinate regulatory legal acts (instructions, guidelines) were terminated in connection with the adoption of the Law of the Kyrgyz Republic “On Regulatory Legal Acts”, and there are also no mechanisms for implementing existing regulatory legal acts.

In the process of nature management, civil, criminal and administrative liability for harming ecosystems is not clearly established. The sanctions provided for by the existing legislation for violation of the established requirements for environmental protection are disproportionate to the damage caused.

In addition, modern advanced technologies and methods of mining, the rational use of energy and natural resources, environmentally safe waste management and their recycling are not well introduced, and these practices are not legally encouraged.

Existing practice shows that the current system of environmental protection, based on the payment of penalties, is not effective and, in fact, is not the protection of the environment. It is necessary to study the possibility of applying the new approach to environmental protection, based on compensatory restoration of natural ecosystems, bringing disturbed systems to “proper condition”, securing this mechanism at the legal level, as well as applying advanced technologies and mining methods.

Technological efficiency and innovation

The mining sector of the Kyrgyz Republic, which possesses significant mineral resources and mineral reserves, has not been sufficiently used as a potential for the development of the Republic’s own economy since the country gained state sovereignty. The current situation is explained by many factors, of which the most significant are the following.

First, the results of geological work on the assessment of identified deposits and manifestations of various minerals in the Kyrgyz Republic for the previous period are based on the standard adopted in the former USSR, which is regulated by the “Instructions for the application of reserves classification ...” and relevant instructions for drafting projects, reports from estimates of reserves, feasibility studies of conditions and expediency of production, and other regulatory documents. The essence of the documents reflects a conservative approach to the assessment of resources and reserves of mineral deposits, when the predictive assessment of the object is based primarily on proven geological parameters, in some damage to the economic component of the mineral as a real asset. The need for the reporting materials to be in compliance with the unified requirements, standards and guidelines adopted in the former USSR creates some over-regulated environment in the assessment of mineral resources and reserves. The latter makes these reports insufficiently transparent, understandable and informative for the actors of the modern market economy - investment financial institutions.

Secondly, the saturation of reports on the assessment of objects of mineral raw materials and reserves with information of a special nature, relating not only to geological, geological, geophysical, hydrogeological, economic and environmental requirements, for all its strict formalization carries an excessively large amount of information not used even by experienced industry experts.

The inclusion of redundant information in reports, in accordance with the requirements of existing standards, predetermined the complexity and large amount of submissions on the assessment of reserves and resources of the subsoil. The lack of understanding of various aspects of the implementation of mining and geological projects, including economic and environmental, led to the opposition of these projects to part of the population and local communities of the Kyrgyz Republic.

The assessment of mineral resources and reserves according to the GKZ methodology, as already noted above, was based on the principle of achieving maximum geological knowledge of the object and was highly conservative in its requirements. On the one hand, it minimized possible risks in the development of deposits by the owner (in this case, the state), and on the other hand, was accompanied by a significant increase in the cost of work. At that time, this system met the requirements and ensured a high level of reliability of information on the country's mineral resources. The focus of the Russian classification is the degree of detail and comprehensive information on minerals. The definition of the category of resources and reserves was based on direct data on the occurrence, morphology, concentration and other characteristics of the ore bodies. To assign the reserves to one group or another, a certain set of geological survey activities was to be performed.

Its conservatism, which is relevant to scientific work, today does not always meet the needs of modern business. Assessment of the degree of entrepreneurial risk and methods of its management falls within the competence of businessmen and their partners (banks, insurers, other financial institutions), and not the state - the owner of the subsurface. The aforementioned conservatism itself often has not so much scientific and practical as bureaucratic roots.

Business planning in the mining industry should rely, to a greater extent, on a reasonable symbiosis of accurate geological data and economic feasibility. These requirements are met by the CRIRSCO template, whose assessments are free from the influence of bureaucratic procedures and often make it possible to more adequately and promptly assess the economic situation around the field and justify an adequate amount of funding for its study and development.

Data and knowledge management

There is the statement that geological information on the subsoil is the property of the Kyrgyz Republic. But geological information about subsoil obtained in the course of financing by entrepreneurs, enterprises and organizations, including joint and foreign, is their property for the period of the right to use subsoil, after which information about the subsoil is transferred free of charge to state ownership and transferred to national geological funds.

Geological information provides to a subsoil user at the time of subsoil use and other interested persons.

The State Geological Information Fund includes geological information about the subsoil, as well as archives, collections of samples of stone and core material, paleontological remains, thin sections, polished sections, museum collections, and a library of special literature on paper and electronic media. The State Geological Information Fund is completed on the basis of a compulsory copy of the geological information system by transferring it free of charge to all subsoil users. Subsoil users must annually submit to the State Geological Information Fund geological reports on paper and electronic media, including geo-referenced sampling databases.

It is possible to use geological information by third parties by special permissions due to the confidentiality period based on following items:

1. The objectives of the cadastre and the State balance of mineral reserves of the Kyrgyz Republic;

2. The formation of geological information resources on the structure and development of the subsoil, the laws of their distribution and other data, the formation of which is necessary in order to organize the state geological study of the subsoil.

There are two levels of access to geological information resources in the Kyrgyz Republic:

1. Introductory – using geological information in the State Geological Information Fund without copying;
2. Allowing electronic or paper copying of documents containing more detailed geological information.

Price of introductory access to geological information costs 1 minimum rate payment per 1 hour. 1 minimum rate payment is equal to 100 soms ~ 1.2 euro.

Price for full access consists of 2 parts:

1. Working with materials is equal to introductory level;
2. According to following table (Table 7)

Table 7 – Price for full access to geological information in Kyrgyzstan

Type of report	Rates	For 1 page of text	For 1 sq.dm of graphic	Minimum rate payment, soms
Regional survey	1	0,1	0,5	100
Exploration	2	0,1	0,5	100
Preliminary exploring	2,5	0,1	0,5	100
Detailed exploring	5	0,1	0,5	100
Development	7	0,1	0,5	100

Students and graduate students of higher and secondary specialized educational institutions have the right to use geological information resources of the State Geological Information Fund within the framework of the familiarization level of access and are exempt from payment for using geological information resources within the limits.

In some cases, access to geological information resources is constituting the State secret.

Conclusions on the status of energy and mineral resource management in Kyrgyz Republic

Having the rather small territory, the Kyrgyz Republic possesses a considerable mineral base of many kinds of mineral resources.

There are tens mining and mining-metallurgical operations, open pits, mines at deposits of gold, mercury, antimony, tin, tungsten, coal, oil, gas, salt, facing stones and construction materials, underground fresh, mineral and thermal waters. The mining of rare earth metals, copper, silver, bismuth, molybdenum, aluminium, uranium, thorium, vanadium, iron, semiprecious and precious stones is in the long term planned. Their commercial reserves have been prospected and prepared for development, or can be prospected and prepared for development in the shortest time.

Despite of considerable problems connected with reorganisation of economics of Republic for the market relations, the majority of enterprises of the mining and mining-metallurgical sector have saved production, personnel, and the developed infrastructure adequate to modern requirements. They have business ties

with the consumers of their commodity inside republic, from countries of CIS and long-range foreign countries in Europe and Asia.

Mineral raw materials of many deposits and mineral commodities have an export orientation and ensures the strong position of Kyrgyzstan on the world market of mineral raw materials and metals, owing to the fact that quality of commodity produced at the mining-metallurgical enterprises (gold, antimony, mercury, rare earth elements, uranium, molybdenum, tin, tungsten, fluor spar etc.) has the world standards and stable demand. It gives some advantages to Kyrgyzstan in competition with the producers from CIS countries and other countries of the world, requires less efforts to retain the reached positions on traditional kinds of mineral raw materials and metals, and also to enter the world market with new kinds of commodity.

The diverse raw mineral materials base of republic with considerable mineral reserves and good technologic characteristics of ores used by world industry allows successfully and profitably to implement many mining projects with engaging of the foreign investments and international mining corporations having modern management and high technologies.

The priority of the future development of the mining sector in long-term measurement is predetermined in rather high potential of mineral resources and that 80 per cent of the territory of Kyrgyzstan are occupied by highland, where other industries can not successfully develop.

Because of market conditions, the approach to exploration and preparation for industrial development of mineral reserves has been changed taking into account present conditions of the world market. Mineral deposits, where there is a possibility to single out areas for mining rich and easy-enriching ores for first years, have priority because it allows to decrease period of repayment of credits obtained for construction. In independent experts' opinion, the cost of mineral raw materials of mineral deposits in entrails of Kyrgyzstan is tens billions of US dollars. It allows in a long-term outlook through development of the mining industry, to strengthen the economy of republic, to create thousand new working places and to provide inflow of considerable receipts into the budget.

The long-term projects of the mining sector attract considerable credits for construction for new mines, as the mining-metallurgical sector is object of long-term interests of large multinational mining companies and financial structures. The development of the mining-metallurgical sector guarantees creation of new working places in allied industries of economics: construction, transport, power engineering, communication, services, delivery of goods; promotes development and maintaining of an infrastructure in regions of mines' activity, that is very important for some remote areas of republic.

The value of the contribution of the mining industry into economics of republic is well visible on an example of gold mining and other mining-metallurgical enterprises. They provide currency earnings and tax revenue, creation of new working places in the mining and allied industries, development and support of the regional infrastructure, increasing of export and gross domestic product.

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Annex

Annex I – Map of the Kyrgyz Republic



Annex II – Structure of the state regulation of subsoil use

