Current state, prospects and problems of the gold mining industry of the Trans-Baikal Territory

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Abstract. The article considers the current state, problems and prospects of gold mining in the Trans-Baikal Territory. There has been an increase in the volume of gold production from ore and placer deposits over the past 5 years. Placer deposits make up a significant part of the total production volume. The reduction of reserves in placers and the decrease in the quality of minerals in them open up new prospects for the extraction of precious metals, namely in ore gold mining. The extraction of placer gold, even with the best existing technologies, remains a sector of high environmental risk, in many settlements there is a gradual decline in the population and the "extinction" of settlements, as well as illegal gold mining is gaining momentum. Neither regional nor federal environmental supervision bodies have the opportunity to resist the destruction and degradation of nature from the extraction of placer gold. In general, this leads to an increase in the negative impact of placer gold mining on natural complexes and socio-economic sustainable development of regions and municipalities on the territory of which this type of activity is carried out, an increase in accumulated environmental damage.

1. Introduction

The Trans-Baikal Territory has unique mineral resources that are promising for industrial development. The basis of its economic development is the industrial zone and its specialization is the integrated development of the potential of mineral resources in combination with the development of transport logistics, as well as cross-border cooperation.

The current situation in the global economy under the influence of COVID-19 stimulates domestic demand for the Russian gold, which in turn allows gold mining companies to function effectively even during the period of restrictions. As a result of the global crisis, favorable conditions have developed for the gold mining industry. Gold is traditionally a protective asset, and its prices are now at an attractive level. A decrease in the national currency exchange rate may contribute to the growth of marginality. The price of gold has increased 4 times over the past 20 years and reached almost $2000USD/ozt in August 2020 [1]

The purpose of this study is to evaluate the benefits and show the problems associated with gold mining in the Trans-Baikal Territory.

2. Data and methods
The study was conducted using comparative analysis and economic and statistical methods based on open-source information from the official databases and the various Internet resources. For the analysis and assessment of the mineral resource state of gold in the Trans-Baikal Territory, reports on the geological study of the subsurface and developed deposits, data from the Russian Federal Geological Fund, data from Rosstat and the Federal Tax Service, as well as expert assessments in the field of geology and field development were used.

3. Results and discussion

On the territory of the Trans-Baikal Territory, gold reserves are accounted for at 423 deposits, amounting to 659191 kg, 41 own – 31 071 kg, 25 complex – 286 154 kg and 357 placers – 2966 kg. Due to gold mining, losses in the subsurface, as well as exploration and revaluation, in 2019 the balance reserves of gold decreased by 16545 kg, increased by 21964 kg, off-balance reserves increased by 51 kg and amounted to 321737 kg.

Gold production for 2019 amounted to 29928 kg (21% more than the 2018 production volume), for primary gold deposits – 6063 kg, complex deposits – 12736 kg and alluvial deposits – 11129 kg. 727 kg of gold was processed from ore dumps (warehouses). The production of ore gold amounted to 18 799 kg, alluvial 11 993 kg.

56.3% of the gold reserves of the Trans-Baikal Territory are reserves of large deposits, among which the indigenous ones are Bystrinskoye, Novo-Shirokinskoye, Darasunskoye, Kochkovskoye, Talatuyskoye, Taseyevskoye; the placer ones are Bolshoy Amazar, Tura (middle part), Kamenskoye, Borzya Nizhnyaya, Black Uryum.

Geological exploration works are carried out at the expense of the enterprises’ own funds.

In 2019 63 enterprises carried out mining operations, according to 114 licenses, 12 gold deposits were exploited in Bystrinskoye (9685 kg), Novo-Shirokinskoye (2691 kg), Kochkovskoye (2511 kg), Delmachikskoye (1181 kg), Alexandrovskoye (984 kg), Savkinskoye (503 kg), Kirchenovskoye (381 kg), Noyon-Tologouyskoye (subsurface development by 356 kg), Darasunskoye (235 kg), Verkhne-Aliinskoye (183 kg), Archikoyyskoye (53 kg), Kazakovskoye (32 kg), Yuzhnoye (4 kg). The production of ore gold amounted to 18 799 kg 62.9% of the total gold production in the region.

Gold production from placer deposits amounted to 11129 kg, including 864 kg by the draining method and 10265 kg by the open method (table 1, figure 1).

Table 1. The dynamics of gold production in the Trans-Baikal Territory, kg.

| Period | Volume of extracted gold (ore), kg | Volume of extracted gold (placer), kg |
|---|---|---|
| 2015 | 4 903 | 6 384 |
| 2016 | 4 861 | 7 208 |
| 2017 | 4 500 | 8 800 |
| 2018 | 4 609 | 10 191 |
| 2019 | 18 799 | 11 129 |
The dynamics of gold production in the Trans-Baikal Territory, kg.

The volume of metal extracted during the development of placer deposits amounted to 37.19% of the total production in the region, the largest amount was extracted from JSC "Ksenyevsky mine" – 1691 kg, "Artel of Baldzha prospectors" LLC – 1148 kg, "Ust-Kara Mine" – 949 kg [2].

The practice of the last decades shows that geological exploration works are carried out mainly at the expense of the subsurface users’ own funds. There is no significant increase in gold reserves on the territory of the Trans-Baikal Territory. The distributed assets include 242 deposits with reserves of 565,633 kg, which leaves about 86% of all reserves of the region. Of these, there are 26 indigenous (38%), 10 indigenous complex (42%), and 206 placer (10%). Of which: 213 fields are being developed, 14 are being prepared for development, 15 are being explored. There are 181 gold deposits with reserves of about 94 tons in the unallocated assets.

The gold content in ore and placer deposits remains at a high level, ranging from 1.5 to 10 g / t and 0.34 to 3 g / t, respectively.

Gold mining remains a highly profitable production with a large number of potential and existing subsurface users trying to invest their own funds and make a profit with low costs. For example, the cost of processing 1 g of gold in 2019 varied from 889 to 2800 rubles, while the price for 1 g of the precious metal on 01.09.2020 was 4100 rubles/g.

The studies obtained at Rosnedra indicate an increased demand for obtaining licenses for geological exploration over the past 5 years (figure 2). According to the unofficial sources, this is one of the ways of the uncontrolled gold mining. Mostly such types of licenses were obtained for placer objects.

Most of the deposits developed in the Trans-Baikal Territory occur on the basis of the shift method and with the involvement of residents of other regions and even countries, which reduces the importance of alluvial gold mining to almost zero for maintaining the well-being of local communities and the socio-economic development of the region. Many settlements today are at the stage of “extinction”, but in the recent past they were a necessary infrastructure platform for the development of many gold mining territories.

Considering the contribution of the subsurface users developing gold-bearing deposits, it can be concluded that most of these enterprises make a minimal contribution to the socio-economic development of regions and municipalities. All proceeds from the sale of licenses and a large share of tax and non-tax payments of gold mining enterprises go to the federal budget, leaving only a small share of payments to the regions and, especially, municipalities. It should also be noted that a significant part of gold mining enterprises is registered and, accordingly, pays taxes not on the territory of municipalities where it operates, but in territorial and regional centers (figure 3).
JSC Norilsk Nickel, which is engaged in the development of the Bystrinsky field, is one of the enterprises that has been making a significant contribution to the development of the Trans-Baikal Territory for the past 4 years, allocating funds for the development of various areas. This includes the annual holding of competitions among universities and NGOs, for receiving grants for the development of the educational sphere for the population, the improvement of urban areas and much more.

There is a number of economic and environmental risks associated with gold mining. One of the most important aspects in the development of deposits, including gold-bearing ones, is the environmental one (table 2). The barbaric development of placer deposits, as well as the impact of placer gold mining on the environment (pollution of rivers, harmful effects on the ichthyofauna etc.), low payments for pollution as well as environmental legislation violations indicates the current negative situation in this area. The lack of proper supervision of compliance with the license agreements.

The situation is more or less positive in the extraction of indigenous gold, thanks to the solution of environmental problems, caring attitude towards the area where the extraction of ore gold is carried out, all which are among the priority tasks of the enterprises. The Activities aimed at the artificial reproduction of aquatic biological resources are conducted annually. For example, the Bureau of environmental Safety of Bystrinsky GOK supports biodiversity and is engaged in the multiplication of rare and valuable biological species in all territories where the company operates. Tens of millions of rubles are allocated annually for stocking.

This program is part of the company's activities to reduce the negative impact on nature. In 2021, for this purpose, Norilsk Nickel approved a new strategy in the field of ecology, which covers all the main areas of environmental impact, in particular, climate change, air, water, tailings and waste management, soil and biodiversity. About 40 initiatives will be implemented in the Trans-Baikal Territory as part of the strategy until 2031.

| Table 2. The risks arising from the development of gold-bearing deposits. |
|-----------------------------|---------------------------------|
| Risk                        | Impact                          |
| Socio-economic              | • The attracting of residents from other regions and even countries to work, which reduces the importance of gold mining to almost zero for maintaining the well-being of local communities and the socio-economic development of municipalities. The current pandemic has demonstrated that shift work is also associated with epidemiological risks and significantly increases the negative sentiments of the local population. • A significant part of gold mining enterprises is registered and, accordingly, pays taxes not on the territory of municipalities. • All proceeds from the sale of licenses and a large share of tax and non-tax payments of gold mining enterprises go to the federal budget, leaving only a small share of payments to regions and, especially, municipalities. |
| Ecological                  | • Placer gold mining, even with the best existing technologies, remains a sector of high environmental risk. • Alluvial gold mining changes the natural riverbeds, leads to a serious transformation of the slopes of river valleys. • Muddy plumes in rivers stretch for tens, and sometimes hundreds of kilometers downstream from placer gold mining sites. Because of this, the chemical composition, temperature and oxygen content in the water change. As a result, valuable fish leaves such rivers, and the river ecosystem degrades. • A large number of licenses are issued for placer gold-mining sites, either directly adjacent to the borders of specially protected natural territories (SPNA), or located in the river basins flowing through these SPNA. |

4. Conclusion
Gold production is significantly increasing, as well as expanding geographically. Ore mining of gold is gaining momentum, but placer mining remains dominant in the total volume of gold production in the Trans-Baikal Territory.

In 2020 the taxes received by the budgets of different levels during the extraction of precious metals amounted to: VAT – 6,752,601 thousand rubles; personal income tax – 1,589,013 thousand rubles; MET – 2,883,444 thousand rubles; regional taxes amounted to 803,618 thousand rubles and local taxes – 4,662 thousand rubles [6].

This indicates a good state in the gold-mining industry, and also shows the negative point that most of the taxes go to the federal budget.

In general, the extraction of gold, and especially placer gold, leads to an increase in the negative impact of mining on natural complexes and the socio-economic sustainable development of the regions and municipalities on the territory of which this type of activity is carried out, an increase in the accumulated environmental damage. This, in turn, leads to an increase in protest sentiments among the local population and an increase in social tension in the regions where gold mining is carried out [7].

References
[1] Latysheva M A 2020 Problems and prospects of development of inefficient gold mines IOP Conf. Ser: Earth and Environ. Sci. vol 629 (Irkutsk: Environmental transformation and sustainable development in Asian region) pp 69–8
[2] Statistical reporting of Rosnedr The state balance sheet for gold. Trans-Baikal territory (explanatory note as of January 1, 2020)
[3] Website of “Bulletin of the gold producer” Retrieved from: https://gold.1prime.ru
[4] Glazyrina I P, Mikheev I E and Eloyan A Yu 2017 Geogr. Nat. Res. 3 139–46
[5] Website WWF Russia submits for discussion the draft position of environmental organizations on alluvial gold mining. Retrieved from: https://wwf.ru
[6] Report of the State Tax Service “Receipt of tax revenues to the consolidated budget of the Russian Federation in 2021” (Report of the Tax Service No. 01 from January 01, 2021)
[7] Website of Non-governmental environmental organizations and movements of the Krasnoyarsk Territory Retrieved from: https://pandia.ru/text/77/348/73910.php