ЭКОНОМИЧЕСКАЯ, СОЦИАЛЬНАЯ, ПОЛИТИЧЕСКАЯ И РЕКРЕАЦИОННАЯ ГЕОГРАФИЯ / ECONOMIC, SOCIAL, POLITICAL, AND RECREATIONAL GEOGRAPHY

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SUSTAINABLE ENVIRONMENTAL AND ECONOMIC DEVELOPMENT OF THE KABARDINO-BALKARIAN REPUBLIC

Research article

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Abstract

Currently, the tailings dump of the liquidated joint-stock company Tyrnyauz Mining and Processing Plant is of considerable interest for the development of the economy of the Kabardino-Balkaria and in order to improve the environmental condition of the region. However, the lack of a developed methodological approach to the formation of an organizational and economic mechanism for circular subsoil use is one of the reasons hindering the development of a tailings dump. The article is devoted to the analysis of the circular economy, which will ensure the efficiency and effectiveness of subsoil waste management and secondary mineral resources, and will also help improve the ecosystem of the tourism cluster of the Elbrus region of the Kabardino-Balkarian Republic.

Keywords: organizational and economic mechanism of circular subsoil use, tailings pond, circular economy, subsoil use, environmental management, heavy metals, energy production cycles.

УСТОЙЧИВОЕ ЭКОЛОГО-ЭКОНОМИЧЕСКОЕ РАЗВИТИЕ КАБАРДИНО-БАЛКАРСКОЙ РЕСПУБЛИКИ

Научная статья

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Аннотация

В настоящее время хвостохранилище ликвидированного акционерного общества «Тырныаузский горно-обогатительный комбинат» представляет значительный интерес для развития экономики Кабардино-Балкарии и для улучшения экологического состояния региона. Однако отсутствие разработанного методического подхода к формированию организационно-экономического механизма кругового недропользования является одной из причин, сдерживающих развитие хвостохранилища. Статья посвящена анализу циркулярной экономики, которая обеспечит эффективность и результативность управления отходами недропользования и вторичными минеральными ресурсами, а также будет способствовать улучшению экосистемы туристического кластера Эльбрусского района Кабардино-Балкарской Республики.

Ключевые слова: организационно-экономический механизм кругового недропользования, пруд-хвостохранилище, круговая экономика, недропользование, природопользование, тяжелые металлы, циклы производства энергии.

Introduction

At the beginning of the twentieth century, humanity extracted 20 elements of the periodic table from nature, and now - 92 elements; About 100 thousand chemical compounds are created from the extracted elements, most of which go to waste in billions of tons and are harmful to the environment; they cannot be destroyed by burning, burying or dumping into the ocean. Of the 100 billion tons of ore, rock substances, and building materials extracted from the Earth, 98-99% goes to waste. For example, the prosperous 20% of countries use 85% of the world's wood, 75% of waste metals and 70% of energy. In Japan, recycling of industrial waste already exceeded 58.5% in the 80s. The question arises: who is preventing us from resorting to world experience in resolving this issue. I think it is completely insufficient to reduce the problem to purely material factors; it is necessary to focus on reducing the negative environmental consequences of economic development. The low level of knowledge about the problem of tailings management is very alarming; of course, I would like to have broader approaches, both from the authorities and scientists.

Research methods and principles

The presented work analyzes the environmental and economic aspects of the development of the tailings dump area of the Tyrnyauz tungsten-molybdenum plant. This is the only capital class I structure in Kabardino-Balkaria, which is the highest (~ 168 m) industrial waste storage facility in our country. The tailings dump was created in the bed of the Gizhgit River by the method of one-sided alluvium of tailings into a retaining earth dam. At the same time, the water flow of the river. After blocking its channel, Gizhgit is diverted through a special tunnel (with a cross-section of ~ 5 m^2 and a length of ~ 3.5 km)

bypassing the tailings dump into the river bed Baksan. The former river bed Gizhgit, which has steep slopes, is occupied by a number of terraces, at different times filled with waste from the plant's processing plant (fine sludge pumped in the form of pulp). During the operation of the tailings dump (since 1957), it has accumulated more than 80 million m^3 [1] of ore industry waste containing many types of heavy metals and toxic compounds, while the total volume of the tailings dump with a water component reaches ~ 120 million m^3.

Figure 1 - Tailings ponds of the Tyrnyauz tungsten-molybdenum plant
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For the last 20 years, no fresh waste has been received. The ecosystems that existed in the river valley were completely destroyed. The former biocenoses have been preserved on the upper parts of the slopes above the tailings terraces. Reclamation was carried out on the lower terraces, which consisted of filling up rocky soil and planting sea buckthorn shrubs on the oldest terraces. The filling of the upper terraces has now been completed. However, fine dust from open areas is blown by the wind and carried over long distances. On the terraces, different water regime conditions developed from arid, corresponding to the climate of the area, on the upper and middle terraces to excessively wet on the lower, where the outlets of drainage water created a swamp. It is the moisture supply that mainly affects the restoration of vegetation cover and its structure. The survey showed that the soil cover on the terraces, except for the swampy one, had not developed. In the profile there is a layer of aeolian sediments of dried pulp up to 5 cm, under it a layer of imported rocky-sandy soil of 10-15 cm, below a multi-meter layer of the same sludge. In areas with more developed vegetation there is only a fragile humus crust 1-2 mm thick [1]. The TVMK tailings pond is in disrepair. According to experts, if the tailings dump is destroyed or disrupted, an area of about 35 thousand square meters will be in the zone of environmental disaster. km with a population of more than 2.5 million people. The urgency of the problem dictates the need to make an urgent decision to prevent such developments. It should be noted that the tailings dump is located in the mountainous zone of the Kabardino-Balkarian Republic, where from time to time the territory is exposed to natural disasters and various geological processes (mudflows, landslides, collapses, screes, floods, subsidence, etc.) with considerable material damage, and sometimes with human casualties. These phenomena are most characteristic of mountainous areas, where elevation changes and temperature fluctuations are very significant. During the years of operation of the plant, waste from the enrichment of tungsten, molybdenum and copper-bismuth concentrates was supplied to the tailings dump through a ten-kilometer pipeline. About 30 names of chemical compounds of metals (Mo, Cu, Pb, Zn, Mn, Ag, Bi), each of which in strong concentrations is deadly to human and animal health. According to various estimates, from 1966 to 2001, from 25 to 118 million m^3 of waste were buried here. The pipeline has now been dismantled, but the waste remains in the lake. The water level in it is maintained using a discharge well connected to a drainage canal connecting the lake with the Baksan River. It is believed that the waste at the bottom of the lake has stuck together almost to the point of cement. If the tailings dam located next to the Baksan River fails, they could cause environmental and material damage on a significant scale. There are scientific studies that provide evidence that over decades of waste dumping, toxic slurry has settled not only on the beach, but also on neighboring slopes used as pastures. In the 2000s, there was a significant increase in the concentration of molybdenum in milk, wool and animal excrement [1], [2], [3].

The threat of an accident at this facility can arise for many reasons, including loss of stability of the downstream slope, overflow of the tailings dump and erosion of the surface discharge channel, destruction (collapse) of the bypass tunnel, earthquakes, etc. The situation has worsened sharply in recent decades due to the increased development of mudflow processes in the upstream drainage basin of the river. Gizhgit, as a result of which significant volumes of soil-clastic material, stones, fallen trees, etc. are carried into the river bed. These mudflows are periodically “drawn” by the flow of water into the tunnel and pose a threat of blockage with subsequent forced discharge of the river’s water flow. Gizhgit into the upper tail of the tailings pond. Overflow of the latter is fraught with a direct threat of its destruction, the reality of which was demonstrated by mudflows along the river in 2002 [1], [2], [3].

The relevance of this issue is determined by the fact that a relatively new phenomenon for the natural environment is being studied, a phenomenon that changes over time, namely, the impact of storing technogenic chemicals in a mountain ecosystem with a small safety margin, and in forms significantly different from natural ones. The period of post-technogenic impact is already significant, and a unique association of pollutants characterized by exceptional biological activity, including genotoxicity, has been identified [1], [2].

Research methodology

To improve the environmental situation in the area adjacent to the tailings pond, while simultaneously economic development can be achieved only through a systematic approach. For the republic as a whole, one of the main factors of its economic development is, first of all, the intensification of production. Improving and maximizing the reuse of tailings waste through circular systems and innovative technologies; collaboration with the manufacturing sector to develop competitive, high-quality products; good marking of materials and alloys to facilitate identification at the end of their service life [1], [2]. The circular economy we propose is restorative and closed in nature [4], [5], [6]. It is distinguished by a reduction in the volume of consumption and processing of primary raw materials, which is achieved through the use of secondary resources, which, in turn, leads to resource conservation, a reduction in the amount of waste, and as a result, the areas intended for their disposal [7], [8].

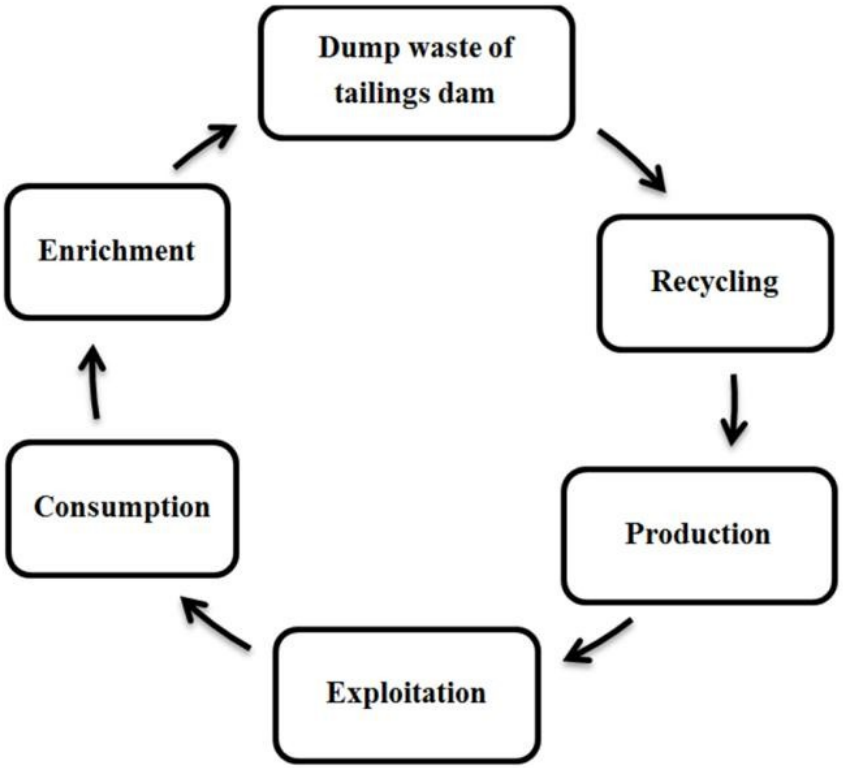

Figure 2 - Circular economy model
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Applying the circular system principle to tailings waste will minimize resource use and waste generation. All "waste" must become "food" for another process: either a by-product, a recovered resource for another industrial process, or as a renewable resource for nature (such as compost). It is known that circular business models based on energy production cycles can be as profitable as linear ones, allowing consumers to continue using similar products and services. As the analysis has shown, domestic scientists, as well as foreign ones [9], [10], using circularity, can come to the following concepts: waste-free, low-waste, resource saving, complexity, sustainability, efficiency, optimization, value creation, etc. One of the main advantages of the circular economy is that it not only preserves nature, but is also able to provide economic growth without increasing consumption and waste. The impetus for the complete recycling and recycling of all materials to become the main goal for the whole world was the depletion of natural resources and climate change. For the successful development of the economy of the Kabardino-Balkaria, it is important to combine production enterprises and residential areas on the territory of the economic region (local complexes). It is economically profitable to combine the entire set of production processes from tailings waste on the territory of their local location. Based on a combination of this type of raw material from primary forms - extraction and refining of raw materials - to obtaining all types of finished products that can be produced locally, based on the proximity of production to sources of raw materials and energy, rational use of all components of raw materials and energy resources. As production from waste of OJSC Tyrnyauz Mining and Processing Plant develops, the complex will acquire auxiliary ones that will complement the main ones operating on their waste. The impact of metal toxicity on human health and the environment will be critical to determining the safety of products made from tailings waste (eg, construction materials). A new approach based on a commitment to a circular economy and sustainable development, while respecting the principles of resource maximization and environmental sustainability, will help increase the economic value of the tailings dam. In a circular economy, labor is valued more than raw materials. As a result, employment increases. New jobs are created through labor-intensive recycling and high-quality repairs, and the emergence of new enterprises in the logistics and service sectors.

Implications for society and the environment

By implementing the principles of a circular economy, it is possible to reduce greenhouse gas emissions on a global scale. Circle Economy estimates that 62% of global greenhouse gas emissions (excluding emissions from land use and forestry) are associated with the extraction, processing and production of goods to meet society's needs; only 38% is discarded during the supply and use of products and services [11], [12]. An important principle of the circular economy is the decoupling of economic growth from the consumption of raw materials. As a result, the economy is not hampered by shortages of raw materials to grow. The transition to a circular economy is expected to contribute to economic growth. According to a 2017 UNEP report, the global economy will benefit by $2 trillion per year from more efficient use of resources by 2050 [13], [14], [15], [16].

Conclusion

With all the gravity of the choice between environmental and economic interests, common sense should prevail, namely: what is economical is what does not destroy the human environment and his health. That is, production and economic activities should be carried out, if not on a priority basis, then at least on a parity basis between ecology and economics. And this despite the fact that the economy is the initial basis for solving environmental problems created and being created by it. A circular business model (circular economy) will allow:

1. Reduce the environmental risks of subsoil use, helping to reduce the negative impact on all components of the environment.

2. Preserves natural reserves of minerals and the use of secondary mineral raw materials.

3. Will ensure the economic efficiency of circular subsoil use. It will be beneficial for enterprises to develop circular subsoil use if the results obtained not only cover, but also exceed, all costs incurred.

It is necessary to conduct a comprehensive scientific and technical examination of the entire facility, as well as monitor its condition and development dynamics, including field surveys of the earth dam, bypass tunnel and the entire mudflow basin of the river Gizhgit, including the subsequent development of protective anti-mudflow measures to prevent and prevent the formation of mudflows here. It is this combination of economic mechanism and scientific and practical environmental management that will be appropriate and will reduce environmental risks.

Конфликт интересов

Не указан.

Рецензия

Все статьи проходят рецензирование. Но рецензент или автор статьи предпочли не публиковать рецензию к этой статье в открытом доступе. Рецензия может быть предоставлена компетентным органам по запросу.

Conflict of Interest

None declared.

Review

All articles are peer-reviewed. But the reviewer or the author of the article chose not to publish a review of this article in the public domain. The review can be provided to the competent authorities upon request.

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