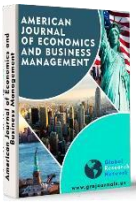

American Journal of Economics and Business Management

Vol. 7 Issue 12 | **pp.** 1604-1608 | **ISSN:** 2576-5973
Available online @ https://www.globalresearchnetwork.us/index.php/ajebm

Article

Formation And Development Of An Innovative Cluster Of The Mining And Metallurgical Industry

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Abstract: The article discusses the main aspects of the formation and development of an innovative cluster in the mining and metallurgical industry. The emphasis is placed on the importance of innovative technologies and their role in improving the competitiveness of the industry. The potential of introducing innovative solutions to optimize production processes, increase the added value of products and reduce the environmental burden is investigated. Special attention is paid to the analysis of international experience in creating clusters and its adaptation to the conditions of Uzbekistan. As a result, strategic measures aimed at stimulating innovation activity, developing human resources and attracting investment are proposed. The importance of interaction between science, business and the state for the successful implementation of the cluster modelis emphasized.

Keywords: Innovation Cluster, Mining And Metallurgical Industry, Competitiveness, Technologies, Personnel, Sustainable Development, Investments, Ecology, Cluster Model, International Experience

1. Introduction

The development of innovative activities in the mining industry plays an important role in strengthening the industry's competitiveness and achieving long-term strategic goals. In Asian countries, more than 520 million people are employed in this field, which is 6.4% of the total global figure. Technologies focused on the mining industry occupy 8.1% of the innovation market, contributing to the achievement of key goals such as developing innovation potential, improving the quality of human capital and ensuring environmental safety.

In this regard, the importance of scientific research aimed at improving the mechanisms for developing innovative activities in the mining industry at the global level is increasing.

2. Materials and Methods

In Uzbekistan, in the context of economic development with a focus on digital technologies, special attention is paid to improving the mechanisms for stimulating innovation activities of mining enterprises. The national Green Space Initiative is aimed at developing human capital, improving the standard of living of the population,

Citation: Ihtiyorovich, K. M. Formation And Development Of An Innovative Cluster Of The Mining And Metallurgical Industry. American Journal of Economics and Business Management 2024, 7(12), 1604-1608.

Received: 10th Sept 2024
Revised: 11th Oct 2024
Accepted: 24th Nov 2024
Published: 27th Dec 2024

strengthening environmental safety and protecting the environment. It also contributes to a significant increase in scientific creativity and innovation potential, improving the stability of key social, economic, environmental and financial indicators, as well as creating favorable conditions for attracting domestic and foreign private investment in the economy.

As part of the development program until 2030, a project for the development of the Yeshlik I field is being implemented. A third copper processing plant (MOF-3) is under construction to process the increasing volumes of ore produced, and the President recently launched the construction of a fourth plant.

These initiatives are the largest investment projects in the history of Uzbekistan. They will allow the plant to produce an additional 146 thousand tons of cathode copper annually, as well as create thousands of new jobs.A press tour was organized for the participants of the event at MOF-3, which is being prepared for commissioning. This factory will be unique in the CIS thanks to modern equipment from leading manufacturers from Germany, Finland, the USA and other countries, as well as a fully automated control system.

After the launch of this facility, AGMK's ore processing capacity will increase to 105 million tons per year. In addition, new technologies will significantly increase the production of 17 rare metals, which will strengthen the plant's production capabilities and strengthen its position in the global market. Resolution No. PQ-436 of 02.12.2022 "On measures to ensure the effectiveness of the strategy for the transition of the Republic of Uzbekistan to a" green economy "until 2030".

3. Results

In innovative activity in the mining industry, the socio-economic foundations of innovative activity in industry, the formation and activation of innovative mechanisms and their practical implementation are studied. Systematization of innovation performance indicators involves the structured allocation and grouping of key metrics that reflect the effectiveness and efficiency of innovative development. These indicators can be divided into several categories:

Systematization of innovation performance indicators

Resource support	**indicatorsIndicators of innovation activity**	**Performance indicators**
Volume of investment in research and development (R&D).	Share of enterprises implementing innovations	Revenue growth from sales of innovative products.
The share of innovation expenditures in the total enterprise budget.	Number of patented inventions and new technologies.	The share of innovative products in the total output.
The number of researchers and specialists engaged in innovation activities.	Number of innovative projects implemented during the reporting period.	Reduce costs by introducing new technologies.
Social and environmental indicators	**Indicators of international integration**	**Indicatorsof technological development**
Number of jobs created through innovative projects.	Volume of exported innovative products.	The level of implementation of digital technologies (IoT, Big Data, artificial intelligence).
Level of employee satisfaction with new working conditions.	Number of international partnerships and agreements in the field of innovation.	The share of automated processes in production.

Reduce the level of harmful emissions as a result of innovation.	Attracting foreign investment in innovative projects.	Speed of technology updates (hardware updates, implementation of new standards).

Systematization of such indicators makes it possible to conduct a comprehensive analysis of innovation activity, identify strengths and weaknesses, and develop strategic measures to increase the competitiveness of an enterprise or industry.

4. Discussion

Systematization of innovation performance indicators: approaches and significance: Innovative activity of enterprises plays a key role in ensuring their competitiveness, sustainability and adaptation to modern challenges. To effectively manage this process, it is necessary to systematize indicators that allow us to objectively assess the level of innovative development, identify problem areas and outline ways to eliminate them. This article discusses the importance of systematization of indicators of innovation activity, its main directions and practical significance.

1) The importance of systematization of indicators:

Systematization of innovation performance indicators is the process of classifying and grouping data that characterize the innovation potential and results of an enterprise or industry. It allows you to:

- Comprehensively analyze innovation activity, covering both quantitative and qualitative aspects.
- Identify strengths and weaknesses in the development of innovative potential.
- Formulate strategic decisions aimed at improving key aspects of the Company's operations.
- Improve governance transparency by providing stakeholders (management, investors, government) with clear and measurable results.

2) Main groups of innovation performance indicators

To systematize indicators, it is advisable to divide them into several groups:

1. *Resource indicators:*
   - The volume and structure of financing of innovative projects.
   - Share of investment in research and development (R&D) in the total budget.
   - The number of employees engaged in innovation activities.
2. *Indicatorsof innovation activity:*
   - The number of implemented innovative projects.
   - The percentage of new technologies, processes, or products implemented.
   - The number of patents and licenses obtained in the reporting period.
3. *Performance indicators:*
   - The share of revenue from innovative products in total revenue.
   - Reduction of production costs due to the introduction of innovations.
   - Increased labor productivitythanks to new technologies.
4. *Social and environmental indicators:*
   - The number of jobs created under innovative programs.
   - The level of environmental efficiency of production.
   - Reduction of pollutant emissions.
5. ПоказаIndicators of international integration:
   - Share of exported innovative products.
   - The volume of foreign investment in innovative projects.
   - Number of international research and development partnerships.

3) Practical application of systematization

Systematization of indicators allows for an in-depth analysis of innovation activity at various levels: from individual enterprises to industries and the national economy as a

whole. For example, at the enterprise level, it helps to allocate resources efficiently, assess the profitability of projects, and adjust strategies in a timelymanner. At the industry level, systematization allows you to assess the impact of innovations on the development of the entire economy, identify promising areas for investment, and develop support measures.

5. Conclusion

The importance of mechanisms in the development of innovative activities of mining enterprises is formed taking into account strategic considerations, as well as compliance with plans. This is a nanoeconomical vision that is already gaining popularity in the world experience, according to which digital technologies are aimed not only at economic stability, but also at the development of the Balkan social, environmental and educational spheres. In the context of accelerated scientific and technological progress and global competition, systematization of innovation performance indicators is becoming a necessary tool forai development.

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