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MUSEUMS OF SAINT-PETERSBURG MINING UNIVERSITY (RUSSIA) AND FREIBERG MINING ACADEMY (GERMANY) AS THE BASIS OF SCIENTIFIC AND EDUCATIONAL TOURISM CLUSTER

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University museums are a group of educational museums of various specializations that are created to support the educational process, serve as a scientific research base for the academic teaching staff and students, and contribute to the knowledge development, transfer, and popularization. The foundation of the scientific and educational tourism cluster on the basis of the two world oldest mining museums and universities will make it possible to create a modern multifunctional structure with a high degree of interdisciplinarity. New forms of cluster interaction will include elements of various industries and fields of knowledge and guarantee not only economic benefits, but also fulfil an important role in the social relations development. The present stage of cluster development is focused on the creation of multifunctional structures characterized by the high interdisciplinary specialization. Special attention should be paid to a combination of the above-listed spheres, for example, the creation of a scientific and educational tourism cluster based on university museums.

***Key words*:** scientific and educational tourism cluster; Mining museum of Saint-Petersburg Mining University; Mining museum of Freiberg Mining Academy; multifunctional structures; interdisciplinarity; cluster modes of interaction

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Problem statement. Cluster structures in modern reality are an integral part of an economic system, regardless of the state policy and the level of social welfare. At the same time, clusters as a phenomenon of economic and social development arose relatively recently. The clustering process, providing sustainable regional growth, began to develop only since the mid-twentieth century. Let us consider the evolution of the cluster structures applied to the certain branches of the national economy.

The first stage started in the 70s of the last century with the active emergence of cluster structures. It reflected the need for productivity and output increase in different industries. Creation and development of such clusters pursued not only economic but also purely political goals. The final consumers were all market participants: the state, enterprises and households as a proportion of effective demand. At an early stage, the government played a key role in the organization of cluster structures. However, further, an increasing number of industrial clusters began to connect with the private businesses interested in the possibility of a significant increase in profitability due to general cost reduction and long-term optimization. The scale of production and the goods quality produced in the framework of cluster activity are much higher than those results of standalone production. Industry clusters are characterized by the innovations, close relationship with research centers, which often play a key role in such structures, as well as a high level of cooperation with the presence of vertical and horizontal relationships between participants. Among the branches of the national economy, where cluster structures have been used successfully for a long time, mining, automotive, pharmaceutical, chemical and a number of other industries can be especially highlighted.

The peak of the second stage of cluster development occurred in the 1990s. of the past century and was closely connected with the application of cluster initiatives in the service sector. The reason was the growing importance of the service sector in the steady increases in gross national product in

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countries with faster rates of development. At the same time, such clusters, in comparison with industrial ones, have a number of distinctive features. Tourism clusters can be considered as a typical example. Creation and development of these clusters are widespread both in foreign countries and in modern Russia. The role of the state in the creation and development of tourism clusters is to ensure the public-private partnership in the major cluster initiatives. The location of such clusters depends on the tourist and recreational potential areas, as well as the development perspectives of promising types of tourism within a certain territory. At the same time, a tourism cluster compared to an industrial one, has the average level of innovation, a fairly low interconnection with the research sector and a relatively high level of specialization. The most widespread tourism clusters are sanatorium and resort ones, combining recreational complexes and infrastructure, as well as clusters related to the sports and extreme.

The current stage of cluster development is focused on the creation of the multifunctional structures with higher interdisciplinary specialization than all of the previous ones. New forms of cluster interaction should include elements of various industries and fields of knowledge and guarantee not only economic benefits but also fulfil an important role in the social relations development. Educational organizations, cultural institutions, research sector, physical culture and sports organizations, and also entertainment industry companies can serve as a core of a new type cluster. Special attention should be paid to a combination of the above-listed spheres. As an example, the authors refer to the activities of university museums, which should be considered as a potential basis for the future scientific and educational tourist clusters [7-12].

The goals of scientific and educational tourism clusters created on the basis of university museums are the educational and scientific level of various consumers' categories; the development of general cultural and professional skills; preservation and replenishment of museum funds and an increasing demand for museum objects as an infrastructure tourism element [2, 3, 5].

The tasks to be solved in the process of establishing and implementation of the scientific and educational tourism cluster on the basis of university museums could be structured in five main directions:

• educational activity – ensuring a close relationship between the educational process and the functional capabilities of university museums [4, 6];

• research activities – conducting scientific research, including interdisciplinary ones, using the museum fund in the framework of various areas of academic interest;

• museum activities – preservation and replenishment of the museum fund, the exhibition equipment updating, improvement of exhibition approaches, an interactive space designing within the existing museum complex, new excursion forms developing;

• moral upbringing activity – raising the moral level of various population groups, preserving the fundamental social values, developing the environmental initiatives in the post-industrial society and the «green economy»;

• tourism activities – enhance the attraction of university museums as an element of infrastructure due to the development of the organized tourism system.

One of the projected scientific and educational tourism clusters can be based on the Mining Museum of the Saint-Petersburg Mining University and the Museums of the Freiberg Mining Academy, which provide unique mineralogical collections. Let's consider these academic centers in terms of the cluster structure development.

University museums as a basis for scientific and educational tourism clusters. University museums are a group of educational museums of various specializations that are created to support the educational process, serve as a scientific research base for the academic teaching staff and students, and contribute to the knowledge development, transfer, and popularization. The first museums began to appear in the late XVIII – early XIX centuries, when universities began to form

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cabinets of rarities, so-called Münzkabinett, collections of instruments and models used for illustrative purposes of the educational process. These cabinets were created in accordance with university statutes, as well as on the initiative of private individuals, scientists, and patrons and developed with the progress of national science and the education system.

Throughout the 19th and 20th centuries, university museums served as centers of scientific and educational ideas, reflecting the current state of development of the mineral and raw materials base and technologies. All great scientists and inventors coordinated their activities closely with such museums. At present, there is a sharp decline in the number of university museums around the world. The reduction in a number of science museums is observed even in such developed countries as Germany. For example, in 2017 the famous paleontological museum of the Leipzig University was closed, some botanical collections of the Botanical Garden of Jena University have been lost, etc. The cause of this problem is not so much the financing problems as waning public and scientific interest in classical museums, which are, as a rule, deprived of modern interactive media, visual special effects, computer technologies, etc.

Mining Museum of the Saint-Petersburg Mining University. The Mining Museum was founded at the same time as the Mining School. It was established by the Mining School Charter on June 28, 1774 (Fig.1). The Mineral Cabinet of «Russian and foreign fossils» laid the foundation for the museum collection. The unique collections of minerals, rocks, ores, fossils, mining equipment models, cold steel, lapidary artworks, and jewelry, are now exposed in the 12 main halls of the Mining Museum.

The museum is an educational, scientific and cultural department of the Mining University. In 2016, the fundamental repairs and reconstruction of the museum were carried out. The most important goal of this reconstruction was the better conditions of the museum's activities in two main areas:

• education; serves the interests of higher education and the knowledge development in the field of Earth sciences;

• science popularization; responsible for the dissemination and popularization of scientific geological knowledge and the formation of aesthetic perception of the geology and mining world.

Both directions presuppose the museum close connection and interaction with profile departments and educational process, as well as active participation in the training of highly qualified specialists in mining and geology.

The Mining Museum and the unique mineralogical exhibition «Terra Mineralia» of the Freiberg Mining Academy. The glorious history of the Freiberg Mining Academy began in 1765, when Prince Franz Xaver, regent of Saxony, founded a school for miners called «Kurfürsten Saxon



Fig.1. The Mining Museum halls, Saint-Petersburg Mining University

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Mining Academy of Freiberg», which very quickly became one of the most significant centers of world science and culture. Two chemical elements were discovered in the Freiberg Mining Academy: indium (Ferdinand Reich, 1863) and germanium (Clemens Winkler, 1886). Almost at the end of the XVIII century, the very first mineralogical collection in the world was beginning to form here. During the following centuries, it has been constantly replenished and now has about 500,000 museum specimens presented in the five main halls of the museum. In addition to the university museum's collection, the Academy is the owner of a unique mineralogical exhibition, calling Terra Mineralia. In 2004, the Swiss charity foundation Pohl-Ströher, the Freiberg Mining Academy received the richest mineralogical collection of Dr. Erika Pohl-Ströher, which became the basis for the exhibition. During 40 years she was gathering a remarkable collection of 5 thousand unique exhibits. Thus, the University of Freiberg received one of the largest and most valuable private mineralogical collections in the world, which allowed Terra Mineralia to become one of the most important mineralogical museums in the world.

In the XX century, the Academy could not replenish the museum collection for many reasons, including political ones. That's why the transfer of the Pohl-Ströher's collection was a special event. The Terra Mineralia exhibition complemented the present university collections. The Academy received a UNESCO grant for the reconstruction of the Freudenstein Castle of the Dukes of Saxony, located in the center of Freiberg and serving as a Terra Mineralia Museum since the 2008 (Fig.2).

Unlike the Mineralogical Collection of the Institute of Mineralogy of the Freiberg Mining Academy, where the exhibits are arranged according to its chemical compounds (as in the Mining Museum of the Saint-Petersburg Mining University). The Terra Mineralia exhibits are grouped on a geographical basis. In different halls we can find samples collected in Asia, Australia, America, Africa and Europe. The exhibition is equipped with the latest technology and it allows you to completely immerse yourself in the world of minerals. Floors, ceilings and museum display cases, are colored in ascetic black, creating a contrast with white-painted historical walls. There are windows shutters protecting against the direct sunlight. At the same time, there is no lack of light, because of the professionally illuminated display cases. Thus, the attention is grabbed by the exhibits and the main goal of the exhibition to show the beauty of the stone is achieved. There is also a small scientific center, accessible for all visitors and students of the Academy. On the first floor, there is a treasury (Fig.3), where the most outstanding exhibits (precious stones, meteorites, etc.) are collected. In the basement of the castle are storages and museum funds, equipped with the latest technology.

The exhibition is focused not only on the scientific but also on the aesthetic perception of the stone, its beauty and diversity. The exhibition also contains some interactive elements to draw the interest of the younger generation towards the mineralogy and geology. The simple models allow to imagine the mineral crystal lattice, to understand the piezoelectric effect, to look into a polarizing microscope, and to find out how ore minerals are used in science and technology. In general, the exhibition is an ideal example of a modern mineralogical museum.



Fig.2. Freudenstein Castle – the ancient castle of the Dukes of Saxony

The scientific and educational tourism cluster on the basis of mining museums. The formation of

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scientific and educational tourism cluster on the basis of Mining Museums of the Saint-Petersburg Mining University and the Freiberg Mining Academy is based on the successful long-term interuniversity cooperation in the educational, scientific, and cultural spheres. The joint activity of museums within the framework of the projected cluster will be based on the stated key tasks and involves a phased implementation of the following management decisions:



Рис.3. The Mineralogical Exhibition «Terra Mineralia»

• determination of a cluster development strategy;
• development of the organizational structure;
• identification of financing sources and volumes;
• segmentation of consumers and determination of their socio-economic characteristics;
• annual events planning;
• building of cluster awareness;
• implementation of a functional relationship between different curriculums and cluster activities;
• inclusion of the museum complex in the list of mandatory tourist sites;
• design of interactive space;
• creation of souvenir production in order to increase the image of mining museums.

Conclusion. The foundation of the scientific and educational tourism cluster on the basis of the two world oldest mining museums and universities will make it possible to create a modern multifunctional structure with a high degree of interdisciplinarity. New forms of cluster interaction will include elements of various industries and fields of knowledge and guarantee not only economic benefits but also fulfil an important role in the social relations development.

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