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MEDICAL GEOLOGY STUDIES: PROBLEMS, PROSPECTS, SOLUTIONS

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At present, it is generally agreed that the conditions of the environment are very important for people's health. Moreover, people are constantly transforming the environment under their own preference, so it has not only made the habitat of people more comfortable, but also it has caused the ecological problems influencing our health.

Also it is very important to note that there are many factors necessary for normal functioning of a human body, but usually people do not even think about their possible significance. These conditions include soil and air composition, water hardness, proximity of various mineral deposits.

Geomedicine is the science dealing with the influence of natural factors on the geographical distribution of problems in human and veterinary medicine [Department of Chemistry, Norwegian University of Science and Technology, Trondheim, Norway]. Actually, one of the most important goals of medical geology is to estimate potential harmful impacts on human and animal health coming from the soil polluted by toxic metals. In addition, it is important to remember that not all essential elements are derived only from the soil minerals, because some of them such as iodine and selenium are supplied to soils by atmospheric transport from the marine environment [1].

As an emerging discipline, medical geology combines and systematizes the databases of many scientific branches, such as geology, geochemistry, biogeochemistry, soil sciences, and medicine. Therefore, it becomes possible to compare the situation of impact with the mechanism of impact, and after that to reveal what kind of polluted zone rehabilitation is necessary to be given living on a certain territory. Also, this rehabilitation should be less harmful for people [3]. Moreover, now the investigations in the field of medical geology allow finding the causes of endemic diseases. For example, after finding the link between Cashin-Beck disease and selenium shortage in soils of the certain regions in China it becomes possible to avoid new cases of Keshan disease, which have been estimated in amount of 3 million cases [4].

In regard to medical geology, it is necessary to determine the main directions of research. These directions include:

1. Determining reasons of endemic diseases

Studies of such scientists as Golovin, A.A., Krinochkin, L.A. and Pevzner allow us to reveal and contour potentially hazardous ecological zones and provinces with individual soil and atmosphere composition [3]. These zones include:

- Molybdenum (Transbaikalia and the other zones in the Far East)
- Strontium (the southern part of the Russian Plain and East Transbaikalia)
- Fluorine. (the south-western part of the Russian Plain, the South Urals, and the Altai).
- Selenium (the European part of Russia, in Transbaikalia, Yakutia, and the Far East, the Bureinsky massif – deficiency, the south-western part of the Russian Plain and Tuva Republic – abundance).

After revealing potentially hazardous territories it is necessary to make modification in technologies of industrial enterprises, sanitary recultivation or even relocation of urban areas into unpolluted areas. The importance of medical geology in this direction is to find mechanism of polluted zone rehabilitation.

2. Determining hazards of dust storms

Dust storms that arise after dust transposition from large deserts, such as the Sahara and the Gobi, are getting more and more hazardous, and now it begins to constitute a threat. It is vital to note that dust particles induce respiratory diseases, which are aggravated by microorganisms – pathogens of dangerous diseases. An important point is that dust storms cover about half of the Earth and the process only increases [2].

3. Researching the influence of geological exploration and industrial enterprises on people's health

This direction is very important, because mining activity not only transforms the surface, but also it leads to the release of toxic compounds into soil and atmosphere. As a result, toxic wastes, which usually include arsenic compound, can get into ground waters. The consequences of this event will be devastating. The increase in the number of diabetes, cancer, cardiovascular skin diseases among the population of Chili, Bangladesh and Taiwan is the confirmation of this fact [6].

4. Search and processing of medicinal raw materials

This direction deals with the research in the field of minerals, such as shungit and mountain balsam (mumijo), which can be used for treatment and prevention of some diseases. It is very important to identify the mechanism of their impact, because it allows using these minerals not only in alternative medicine, but also in a classical therapy. Moreover, search for new medical sources allows developing new resort and recreational areas [2].

It is possible to state that the questions considered by medical geology become more and more important for the mankind, and Russia is not an outsider in medical geology. Despite the great contribution and a large number of scientists working in this field, it is very important to increase a number of working opportunities and develop already existing geomaterial infrastructure located in the Far East and Siberia [2].

Actually, within the framework of «The development strategy of the geological sector of the Russian Federation until 2030» the problem of population health, which is interrelated to geologic exploration and mining enterprises, becomes a strategic one. Moreover, to deal with the problem of the lack of jobs it is necessary to adjust the curriculum towards an in-depth study of Natural Sciences boundaries, such as medical geology. As for ways to increase the interest among young people, the only way is to involve teenagers in research of local territories, which allows determining the conditions of the environment.

To sum up, it is necessary to note that medical geology is able to change people's attitude to the environment. Studies of the scientists working in geomedicine area demonstrate clearly how our activities affect our health. But only extensive educational work can consolidate this effect. Eventually, only individual understanding of each person in Russia will give the opportunity to determine Russia's place in the geopolitical arena in future.

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THE ARCTIC ZONE: POSSIBILITIES AND RISKS OF DEVELOPMENT

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Nowadays, the Arctic zone is a very important subject of international geopolitics. In addition, this is an extremely important ecological and environmental subject. The Intergovernmental Panel on Climate Change has informed again about serious and irreversible effects of global warming. The ice floe melts, the inhabitants run away, the biodiversity suffers, and, often, disappears. So the threat is real [3].

The challenges are numerous: to open a new seaway, to create air stops, to exploit new hydrocarbon and gas deposits, etc. No doubt, the Arctic is a zone of technological innovations and new perspectives and possibilities. For centuries, and even in the twentieth century, the Arctic has remained almost unknown, except indigenous peoples living there for millennia. Subsequently, the increasing military build-up in the North, from Alaska to Siberia, has placed the region at the heart of the conflicts of the Cold War and made from it a forbidden zone for almost the second half of the previous century [8].

Also historically, in comparison with European and Asian civilizations, the Arctic, as cooperation territory, in the field of economic and political progress, is almost like a new planet; the region is so young in the global context that has no equivalent in the world.

One of the most important and dangerous question is the problem of the Arctic zone division between different countries. Originally, there are five countries of the polar circumference: the United States, Canada, Denmark (via Greenland), Norway, and the Russian Federation. Approximately 25% of the undiscovered reserves of natural gas and oil are supposed to be located in the Arctic [1].

But in the 1990s these five countries with the participation of another three ones situated in the Arctic zone, namely, Finland, Iceland, and Sweden, created a high-level intergovernmental forum – the Arctic Council. During the creation of the Arctic Council in the 1990s, the eight member states were still hesitant in their approach and their mandate was very limited, mainly reduced to science and the environment; a rotating presidency and no permanent secretariat.

Nevertheless, the Arctic Council has matured, has turned into an effective tool for negotiating treaties, global agreements and concrete actions. In addition, even more remarkable, since the decision of the Council of Ministers of Kiruna in 2013, more than half of the G20 countries, the main countries of Europe and Asia, will be one way or another at the Arctic table. The Arctic, yet distant and unknown to the late twentieth century, has become a new field of action where the main economic and political forces advance gradually, ensuring their presence and long-term interests [6].

The intersection of multiple factors can cause the geopolitical conflicts in the Arctic, often under the guise of legal considerations [7]. Land claims are not frozen. They are even essential, especially playing on the extension of the exclusive economic zone by extended continental shelf. There are limits of the Committee of the Continental Shelf and of the Committee of London. It is up to them to decide these claims based on rules set by the United Nations Convention on