

MINING IMPACT ON ENVIRONMENT ON THE NORTH OSSETIAN TERRITORY

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ABSTRACT: The article considers a problem of mining activity influence on environmental conditions. Modern mining production doesn't have fully waste-free and environmentally benign technologies, leading to atmosphere, soil, surface and ground waters pollution, accumulation of solid and liquid waste and also to irrational utilization of natural resources. Extent of anthropogenic activities negative influence in mining area of mineral production in the regions of Northern Caucasus considerably exceed the scales of consequences of natural geologic and geochemical processes, which take place on the Earth. Zones of anomalously high pollution levels caused by mountain areas topography and medium adsorption properties are determined for the territory of Vladikavkaz city. We take into account the direction of the wind rose for the influence of air currents on the distribution of contaminants and their potential impact on the oncological diseases rate of population. The spread of neoplasm among the inhabitants of urbanized mountainous territory was studied. The analysis of the data showed the close correlation between the characteristics of the wind flows and cancer morbidity for the age group from 18 to 20 years and for all age groups on the localization of blood diseases, thyroid gland, and bladder. In the case of a strong earthquake could happen discharges of hazardous wastes and substances that adversely affect human health and the environment in general.

Keywords: Mining Activity, Pollution, Environment, Morbidity, Seismicity, Seismic Hazard.

INTRODUCTION

In connection with growing anthropogenic impact the environment has become a global problem. The contribution to the pollution of the environment makes the mining industry, the share of which in the pollution of the environment is significant.

In mountainous terrain, the problem of isolation and limited space exacerbated further [1]. Factors that affect the state of the environment, under conditions of high mountains are a priority because of the special characteristics of landscape, spatial and geographical plan [3].

It should also be noted that the sources of risks are almost all kinds of natural phenomena and processes of a geological, hydrogeological and meteorological nature. One of the most dangerous natural phenomena in a mountainous terrain are the earthquakes. From the point of view of their distribution in the territories and regions most dangerous natural phenomena on the territory of Russia are earthquakes (about 20% of the potentially exposed to earthquakes of intensity of 7 points or more).

Apart from their direct destructive effect an earthquake could cause an environmental catastrophe in territories where there are industrial enterprises producing or processing hazardous chemicals.

Earthquake losses estimation made by global data from the insurance company Munich Re, show

that the number of events with dire consequences all over the world in the period 1986-1995 biennium has increased over the years 1960 in 3.2 times and losses volume increased 15.4 times [9]. An analysis of the reasons for the increase in losses testify that this is not a random phenomenon, but irreversible consequences of rapid population growth, industry, infrastructure, commercial and economic activity in the major cities and industrial centers located in the seismoactive regions.

Posted in cramped conditions the extraction and processing of waste creates environmentally the tense situation in the regions and contribute to the degradation of the natural environment. Environmental capacity of the biosphere of mountain systems compared to lowland areas is limited, therefore the man-made interference mountain landscape requires a balanced approach [2].

The feature of the paper is not only scientific but also its practical importance. It is one of the specific papers which investigates interconnections of hazardous natural and anthropogenic processes. In particular, wind rose effect on distribution of contaminants of heavy metals of the territory influences in its turn on population morbidity distribution. It's another phenomenological factor aggravating general ecological situation. The article considers secondary consequences of seismic impacts the effect of which can considerably increase the main losses from earthquake in the result of hard ecological consequences which appear

in a long time period and affect more population.

Investigations for the territory of Vladikavkaz city were performed by Geophysical Institute of Vladikavkaz Scientific Center of the Russian Academy of Sciences.

SEISMIC HAZARD OF THE TERRITORY

North Ossetia is located in a zone of high seismic activity [5], [8]. Here using the methods of the paleoseismology of the so-called "trenching" clearly identified in the area of historical earthquakes with 9-10 point intensity. In addition, the seismic risk is highest in the Republic since here with high seismic risk is the greatest population density [5], [7]. In 2007, on the basis of the PSE zones (possible source of earthquakes) made by E.A. Rogozhin (Fig. 1), by members of the CGI VSC RAS and RNO-A were compiled probabilistic seismic hazard maps in RNO-A [4], [6].

According to seismic hazard maps in the territory of the Republic for critical objects, and we can relate to such objects the tailings, the entire southern part of Republics is within 9-point intensity [4], [6] (Fig. 2).

When earthquakes with an intensity of 5 points even an extensive site built of some type soil, with tailing, will be exposed to. However, it is clear that the natural volume of solution with dissolved metals in it, will accelerate leaching of minerals, finally, will increase the amount of penetration of toxic substances into the soil and increase the area of contamination.

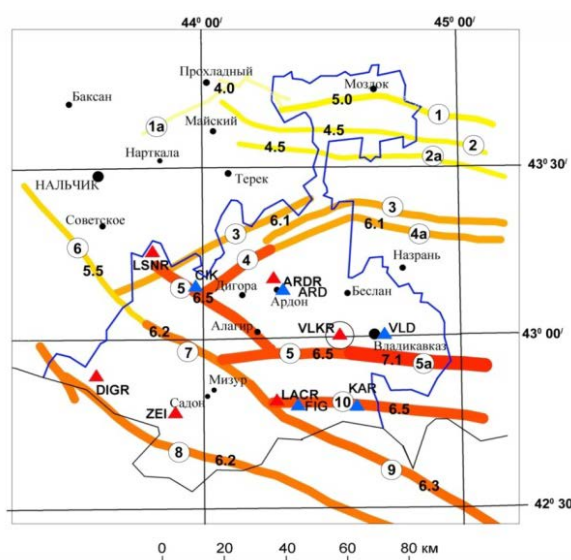


Fig. 1. Map of zones of possible source of earthquakes (PSE) on the territory of the Republic of North Ossetia-Alania (E.A. Rogozhin, 2007)

Toxic substances, less "canned" till time in bottom sediments, for example in r. Ardon, even

more will increase the contamination of the territory, and the flow of the river carry most of the rides to the mouth, polluting it. It is known when even the weak earthquake, so-called secondary earthquake hazards (for example, landslides or fires) may repeatedly exceed the seismic risk from earthquakes. When strong earthquakes leaching will increase significantly, and the effects generated by such a secondary threat, can without a doubt, many times exceed the losses from primary sources.

POLLUTION OF THE TERRITORY AND POSSIBLE CONSEQUENCES OF SEISMIC IMPACTS

For processing and analysis of data had developed a special database (Fig. 3). Forming the base settings include the place of residence, gender, age of the patient, the patient's body lesions localization (brain, larynx, stomach, female genital organs, thyroid gland, intestine, skin, bones, blood, lungs, lymph nodes, breast, male sex organs, liver, kidneys, prostate gland), just 17 names (name of patients for ethical reasons in the primary data not included). The patients were divided into several groups of up to 20 years of age, 20-29 years 30-39 years, 40-49 years 50-59 years 60-69 years or 70 years of age or older.

We also took into account the direction of the wind rose for the influence of air currents on the distribution of contaminants and their potential impact on the oncology disease rate of population.

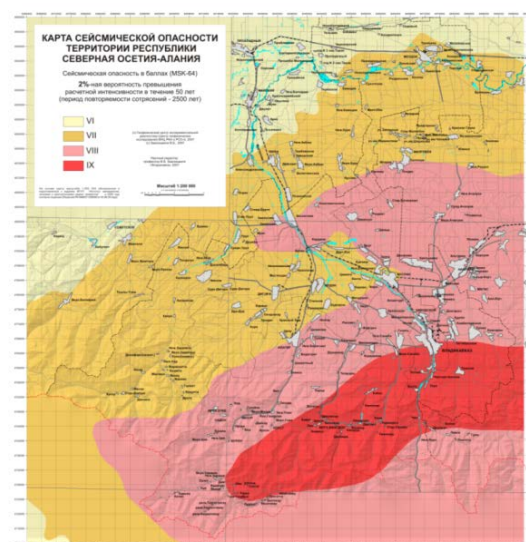


Fig. 2. Seismic hazard map of the territory of the Republic of North Ossetia-Alania

The predominant directions of air streams are as follows (according to long-term data from the

weather station "Vladikavkaz"):

- o North-9%
- o North East-9%
- o East-5%
- o South East-20%
- o South-19%
- o Southwest-9%
- o West-16%
- o North West-13%
- o Calm-33%

In addition, the dependence of the number of cases of cancer of the distance to the industrial sites per unit area were examined (Fig. 4). Dependency analysis shows that with increasing distance to the industrial sites, the number of cases per unit area decreases. It was built by a logarithmic trend line that best describes the type of the original curve. The value of the accuracy of the approximation is 0.806, which is fairly accurate approximation.

It should be noted that during the search of the curve type were also considered exponential, linear, polynomial, and exponential type of approximation. The choose a target formula was produced with two parameters and criteria:

1. The ratio should have been in the physical sense, i.e., not to give negative values and shall endeavour to zero with increasing distance. The linear, polynomial, and exponential approximation is excluded, as species do not satisfy the condition.
2. The value of the accuracy of the approximation should be close to unity.

In addition to the overall cancer incidence curve of the distance to the industrial sites per unit area were built similar curves for all age groups, locations of disease and gender.

Code	1	
Year	2005	
Age	60-69	
Gender	Female	
Localization	Face	
Street	Hidden	
House num.	8	
Housing	-	
Apartment	85	
Record number:	1 of 4732	

Fig. 3. Database dialog box of the population of Vladikavkaz

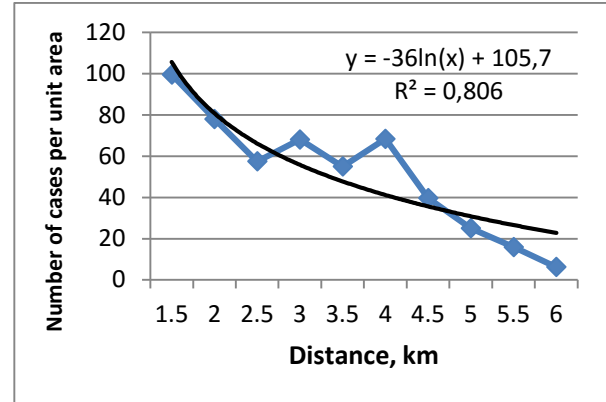


Fig. 4. The dependence of the number of cases of cancer on the distance to the industrial sites per unit area

It was found that for all age groups and locations of disease are just correlation curves depending on distance. Figure 5 presented such a dependency to the lymph nodes. This type of curve is a classic case of the Poisson distribution.

At the same time, some groups have well-defined dependence of number of diseases on a distance (Fig. 6). One can see that within the 2.5 km up to 4.5 km there is some slowdown in the rate of fall of the curve.

The close correlation between the characteristics of the wind flows and cancer morbidity is observed for the age group of up to 20 years and the localization of blood diseases, thyroid gland, bladder. This localization is typical for all age groups.

For these groups of populations the highest density of disease is observed in Northwestern, Western and Southern directions, corresponding to the predominant direction of air flow.

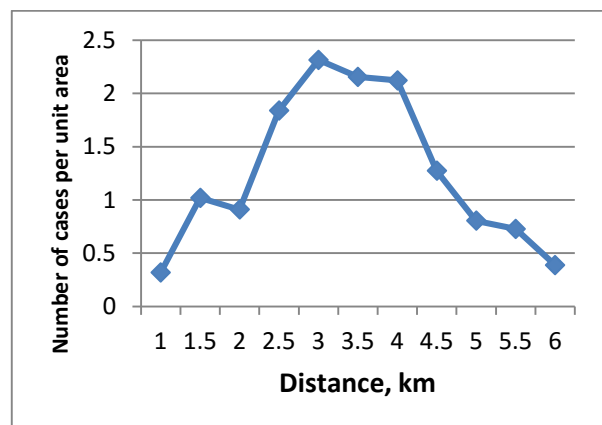


Fig. 5. The dependence of the number of cases of cancer of the lymph nodes of the distance to the industrial sites per unit area

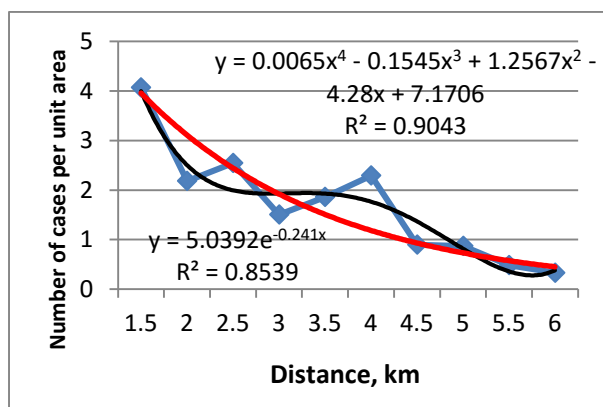


Fig. 6. The dependence of the number of cases of cancer of the bladder of the distance to the industrial sites per unit area

The data indicates the need for fuller and detailed research on anthropogenic factors on the development of neoplasms in the city of Vladikavkaz.

The maps were constructed on the basis of the information on the number of people served by HMOs and the incidence of diseases. Thus, we highlighted the most dangerous zones in which incidence is the highest value.

Using a generally accepted method of spatial zoning on the limits of the outpatient service medical clinics prevalence values were obtained for different years, as well as an average over several years, which was rendered on the map (Fig. 7).

The analysis of the built cards for different age groups, as well as the species localization, concluded that the features of air currents and the proximity of buildings and constructions of industrial enterprises "Elecrotsink" and "Pobedit", as well as the largest negative contribution form the tailings for the age group of up to 20 years. It should be noted that this impact is also most pronounced for cancer patients with well-defined localizations (blood, bladder and thyroid gland).

It should be noted that from table 1 cards to the conclusion of the relationship, as well as pollution and morbidity of the population. For example, in the West, where the wind rose is important vector, there has been a drop in percentage of patients at a reasonable distance from the industrial enterprises. The greatest percentage of patients is located in the South of the industrial enterprises, which also corresponds to the wind rose (most vector is directed precisely to the South) and map the pollution.

Table 1 The incidence of neoplasms on clinics

№	2005	2006	2007	2008	2009	2010	Mean
1	4.36	4.36	3.83	4.03	3.77	4.15	4.08
3	2.52	2.22	2.60	4.32	3.82	2.98	3.08
4	4.68	4.62	4.03	3.89	4.56	4.59	4.39
5	3.01	3.09	3.35	3.17	2.78	3.42	3.14
7	3.25	2.24	2.68	3.16	2.32	2.81	2.74

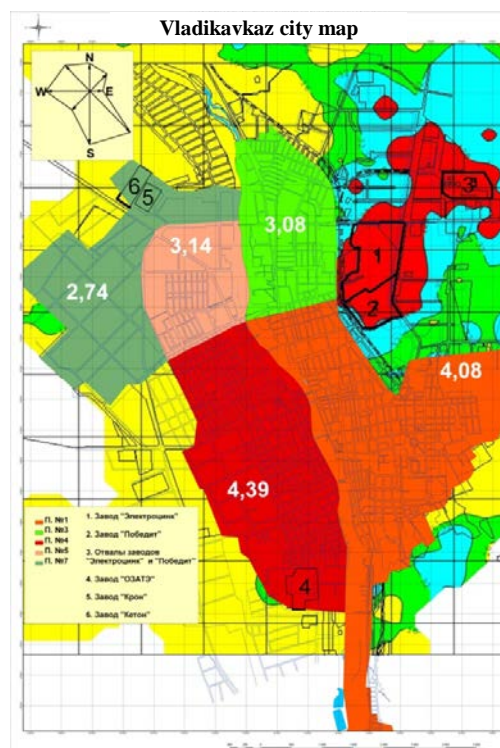


Fig. 7. The incidence of neoplasms in urban clinics.

The percentage of patients increasing on the left-bank over the right-bank depends on the serving zone of the Polyclinic No. 1, serving the right-bank part, includes nearby villages, in which the influence of contamination is much less.

In addition, it should be noted that when a strong earthquake could happen discharges of harmful substances, the collapse of tailings, violation of their integrity, soil, groundwater, rivers and air masses contamination, that can lead to dramatic increases of population morbidity.

CONCLUSIONS

- The spread of neoplasm among the inhabitants of urbanized mountainous territory on the example of the city of Vladikavkaz was studied. The incidence of neoplasms map is built for the city of Vladikavkaz.

- The extraction and waste processing products posted in cramped conditions creates environmentally tensed situation in the regions and contribute to the degradation of the natural environment, part of which is the population.

- We take into account the direction of the wind rose for the influence of air currents on the distribution of contaminants and their potential impact on the oncological diseases rate of population.

- The incidence of neoplasms was analyzed in the age groups under 20 years, 20–29, 30–39, 40–49, 50–59, 60–69, 70 years of age or older.

- The analysis of the data showed the close correlation between the characteristics of the wind flows and cancer morbidity for the age group from 18 to 20 years and for all age groups on the localization of blood diseases, thyroid gland, bladder.

- When a strong earthquake could happen discharges of hazardous waste and substances that adversely affect human health and the environment in general.

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