

INFLUENCE OF FERROUS METALLURGY OF THE STARY OSKOL - GUBKINSKY INDUSTRIAL AGGLOMERATION ON POPULATION HEALTH

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Annotation:

Influence of ferrous metallurgy on health of the population of the Belgorod region is revealed, the main ingredients of pollution of the atmosphere in a zone of influence of a mining complex are defined.

Keywords: emissions in the atmosphere, ferrous metallurgy, pollution, environmental risks, incidence of the population.

The Belgorod region is industrially developed subject of the Russian Federation, thanks to an arrangement in its territory of part of the pool of Kursk anomaly. It gives to the country of 36 percent of iron ores, 4 percent of ready hire, 9 percent of cement, 20 percent of slate, 30 percent of asbestos pipes, 13 percent of facing ceramics and other industrial output. In structure of industrial production of the Belgorod region 46% fall to the share of ferrous metallurgy [5].

Area specialization on production, processing of iron ore, smelting of steel create certain calls for a state of environment and population health. In the Belgorod region all types of economic activities broke 88-90 percent of the territory, in case of an admissible limit of direct violation of lands for UHP no more than 70 percent [9].

Especially intensively factors of pollution of violation of environment are shown within Stary Oskol Gubkinskogo of the industrial district where in the limited territory about 185 industrial enterprises which basis is constituted by the mining industry are concentrated.

Fast rates of industrial and civil engineering caused the high speed of increase of anthropogenous pressure on environment, emergence of adverse changes in a population state of health became a consequence of that. At the same time development of the KMA territorial and industrial complex continues to remain economically reasonable and has wide prospects on condition of a further intensification of production [8].

In this regard relevance of a subject of research is caused by need of an assessment of negative influence of ferrous metallurgy on a population state of health.

Thus object of research is ferrous metallurgy Stary Oskol Gubkinskoy of industrial agglomeration, and a subject is environmental risks to health the population caused by anthropogenous environmental pollution by ferrous metallurgy.

The purpose of our work was research of influence of environmental pollution on the incidence of the population caused by negative influence of KMA.

Health of the population is one of the essential demographic characteristics, determined in this respect quantitative and high-quality nature of reproduction of new generations. Today health of new generations to a lesser extent depends on influence of material living conditions and is more determined by health of parents, influence production and professional, and also ecological features of the environment in which there live people [11].

Environmental pollution in the cities - one of the important factors forming a state of health of citizens [2]. Numerous regional medico-geographical researches testify to reliable dependence of criteria of public health on quality of environment that serves as the precondition of a quantitative assessment of risk for health of the population caused by technogenic pollution of habitat.

The solid data is necessary for an exact assessment of influence of the polluted environment on indicators of health of the population about these parameters [3]. Statistically reliable dependence of incidence of the population on pollution of atmospheric air is noted, first of all, by diseases of respiratory organs: to chronic bronchitis, pneumonia, emphysema of lungs, bronchial asthma, diseases of the top respiratory ways. Pollution of atmospheric air influence resistance of an organism that is shown in growth of infectious diseases.

Feature of moving of the population in districts of Sary Oskol and Gubkin is stay in their territory of the Kursk magnetic anomaly forming geomagnetic fields of a high tension. For water supply of the population underground waters and danger of their pollution are used is caused by existence of large depressionny funnels in places of development of iron ore fields in the open way. So, the depressive funnel from a pit of Lebedinsky GOK extended in a radius of 50 km, and in a river basin Oskolets - to the opposite side from the river at the expense of an intensive drainage system from Lebedinsky and Stoilensky pits. It leads to pollution of underground waters, including the high content in them of iron, manganese, lead, compounds of nitrogen. Sary Oskol (226 thousand inhabitants) - one of the largest industrial centers of the Central Chernozem region, developing on the basis of resources of Kursk magnetic anomaly. Among the cities of area of 55,5% of all emissions from stationary sources in 2010 it was necessary for Sary Oskol, 20,7% - for Gubkin, the Main sources of pollution are «Oskol Electric Steel Works» in which sanitary protection zone lives seven thousand people, «Stoilensky GOK», «Lebedinsky GOK» and the cement works largest in Europe. Production of iron ore on GOK is carried out in the open way. In the 90th years the volume of gross emissions was cut almost by half, but since 1999 waste again increased. «Oskol Electric Steel Works» in 2003 was received by the certificate of conformity to requirements of the international environmental standard of ISO 14001/2004, but the ecological program of combine is focused, generally on the water preserving actions and to a lesser extent, on atmospheric air.

The greatest level of pollution of atmospheric air is characteristic for the southwest district of the city, the smallest - for northeast. In atmospheric air average annual concentration of the weighed substances and dioxide of nitrogen exceed maximum concentration limit twice. Connection between the frequency of an exacerbation of diseases of bronchial asthma and level of pollution of atmospheric air ($r = 0,34$) is established [10]. Indicators of the general incidence of the population (on number of primary addresses) were higher among inhabitants of the most polluted - the southwest area in comparison with the northeast district of the city.

Effects from influence of polluting substances are observed in the form of the increased incidence and/or mortality. Continuous impact of the polluted air on health of the population is reflected in growth of indicators of incidence and mortality. First of all it is reflected in increase in chronic diseases of respiratory organs and the mortality connected with these diseases, and also increase of mortality as a result of various cardiovascular diseases.

The main ingredients of pollution of the atmosphere in a zone of influence of a mining complex is the dust, gases and the aerosols arriving in the atmosphere as a result of loading and transport works, erosion of open surfaces of pits, emissions of concentrating limits and other processes of mining.

Among heavy metals the most priority pollutants of the atmosphere around Stoylensky and Lebedinsky Mining and Processing Integrated Works are barium, cadmium, manganese, copper, lead, zinc, chrome (fig 1).

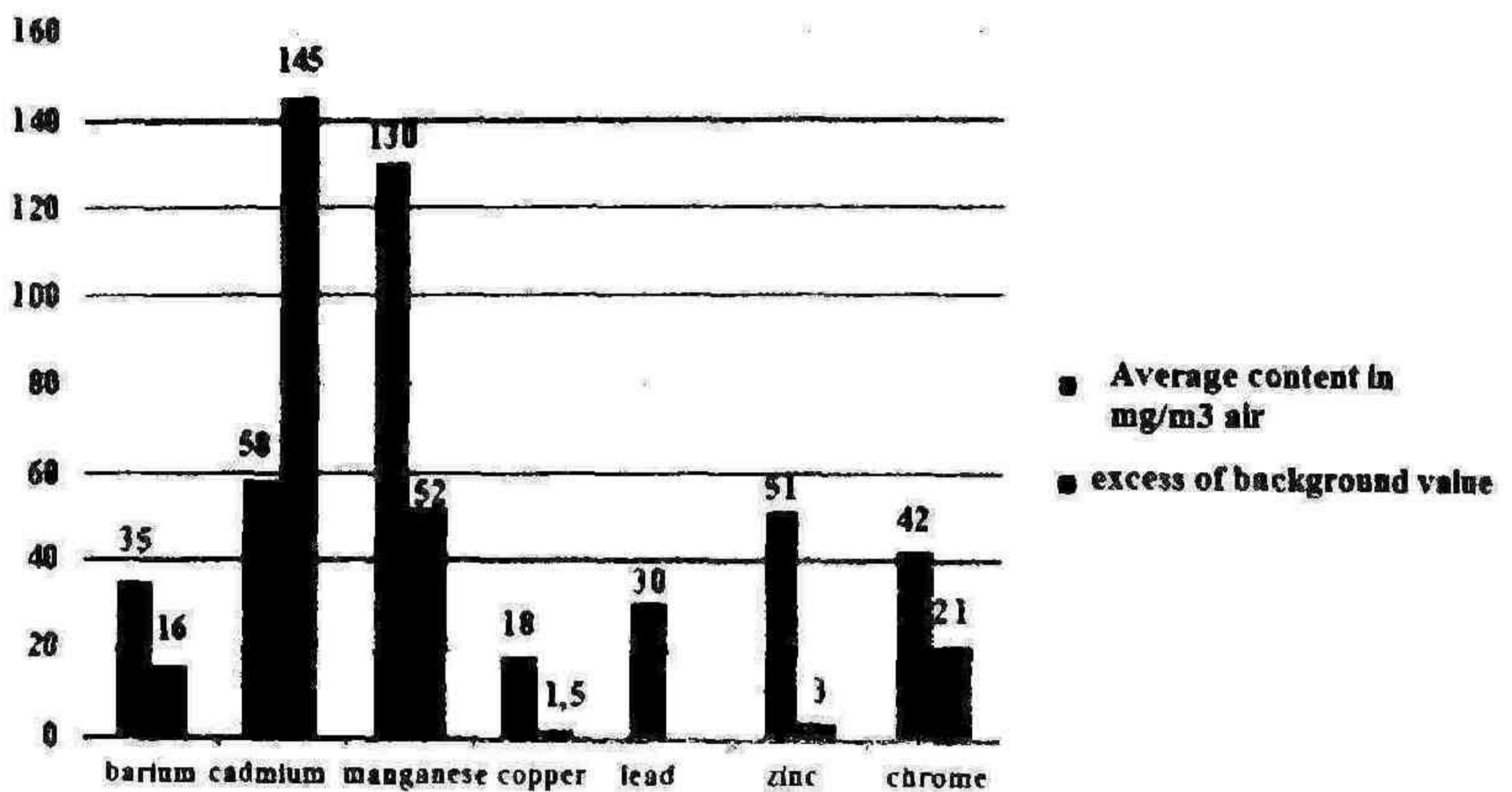


Fig.1. Atmosphere pollution by heavy metals [1]

It should be noted that gaseous substances arriving in the atmosphere from the mining entities aren't exposed to cleaning and in full arrive to the air pool of area.

In the Stary Oskol and Gubkinsky area round the center of gravity of emissions of a technogenic dust the steady zone of a zapyleniye of the air with a radius up to 40 kilometers, promoting pollution of landscapes and soils was created by heavy metals and other hazardous substances fixed since 1990 in space pictures [9].

Content of polluting substances is higher than maximum permissible concentration in settlements a dust, nitrogen and sulfur dioxides, formaldehyde benzapireny and others causes the increased incidence of children and adults. As a result of EL researches by Surzhikov it was established that depending on age the threshold of impacts of atmospheric pollution on population morbidity changes. The least sensitive is the national group at the age of 20-39 years, and the most sensitive - group of children from 3 to 6 years and the age group of adult population is more senior than 60 years. Children are peculiar «indicator group» reflecting reaction of an aboriginal population to harmful effects of factors of the environment. Owing to anatomic-physiological features children are more sensitive to quality of habitat, and manifestation terms at them are shorter than harmful effects. Therefore we consider it expedient to use in the research indicators of children's incidence [4].

To estimate communication level between indicators of children's health and atmosphere pollution we tried by means of the correlation analysis. On coefficients of correlations it is possible to judge communication between pollution of the environment and a population state of health. According to Kurolap [7] in this case as the quantity characteristic of force of communication the coefficient of pair linear correlation calculated on a formula serves:

$$r = \frac{\sum(x_1 - M_1)(x_2 - M_2)}{\sqrt{\sum(x_1 - M_1)^2 \sum(x_2 - M_2)^2}} \quad (1)$$

where x_1 , x_2 - values of the first and second variables, M_1 , M_2 - average values of the first and second variables.

The coefficient of correlation calculated by us is equal 0,878. Thus if the coefficient of correlation is higher +0,70, correlation dependence is considered strong. Thus we see that the state of health of the children's population and a state of environment strongly correlate. Also we can say that with increase in level of environmental pollution children's incidence grows also.

Visualization of level of children's incidence helps us to establish cause and effect dependence of population morbidity of the city Stary Oskol and the cities Gubkin from level of technogenic loading (fig 2).

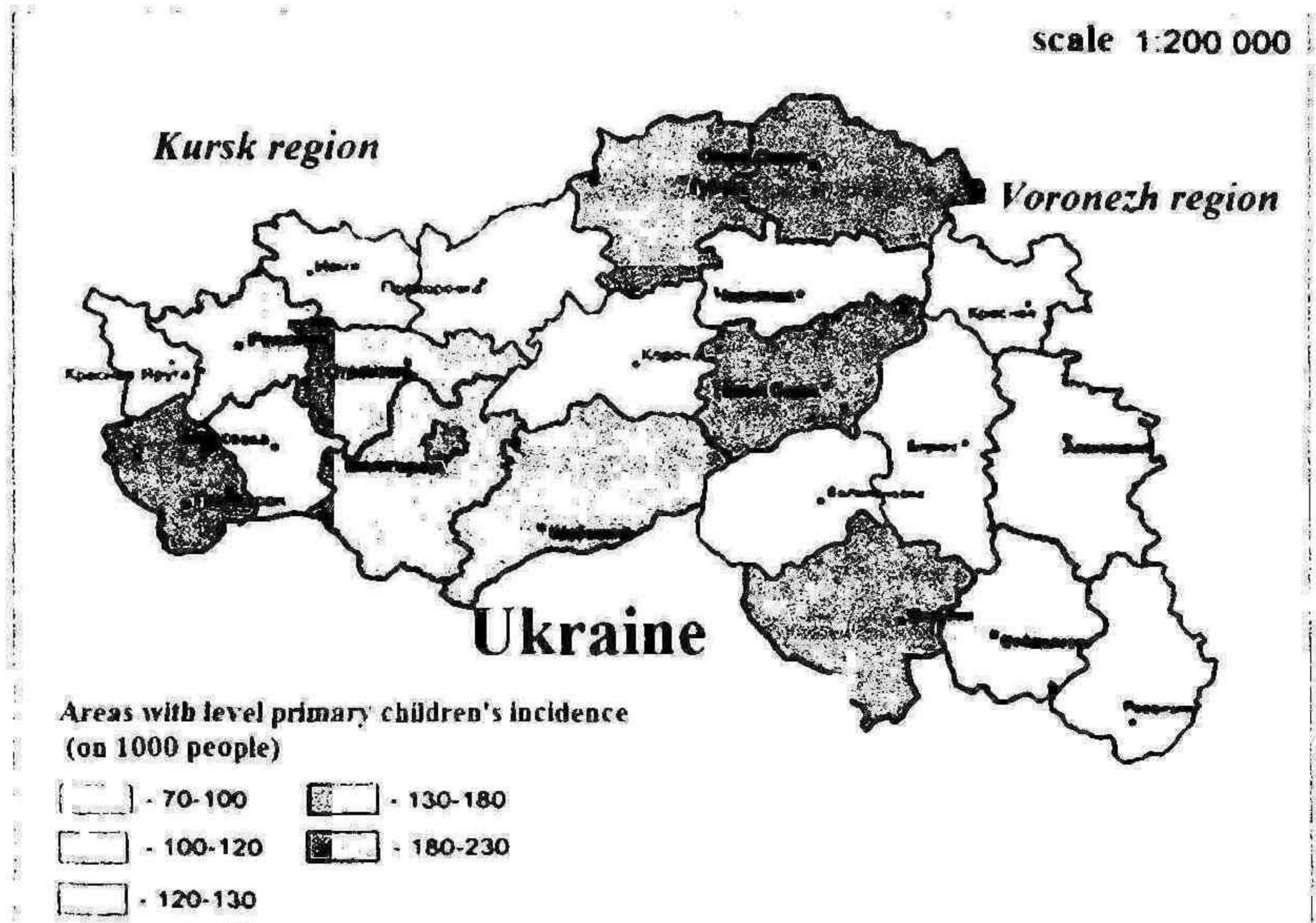


Fig. 2: Ranging of the Belgorod region on indicators of primary incidence among children [4]

Based on calculation of rated intensive indicators of incidence it is established that level of general incidence practically doesn't exceed the all-Russian (1,05). At dangerous level there are diseases of respiratory organs (1,25), a digestive tract (1,26), a new growth (1,24). Risk diseases are established from diseases of a class of diseases of respiratory organs:

- for the children's population it is allergic rhinitis (3,7), group of chronic diseases of the upper respiratory ways (pharyngitis, rhinitis) (1,7).
- for adult population it is chronic bronchitis (2,11), group of chronic diseases of the upper respiratory ways (1,81), diseases of almonds (1,66), allergic rhinitis (1,53).

Results of forecasting of scientists in the city witness Stary Oskol that in case of rejection of purposeful measures for decrease in complex anthropotechnogenic load of environment of the Stary Oskol and Gubkinsky area, population morbidity will annually increase on all classes bolezeny, including at children for 7,2 percent, and at adults for 4,4 percent [8].

Therefore causes concern the current situation in researched areas where there is a threat to a sustainable development in connection with the raised environmental risk for health of future generations. It can lead to decrease in quality of life of the population, decline of productive forces, so and economic capacity of the region.

Conclusions

It is necessary to conduct policy on environmental risk management processes. It is a complex challenge owing to many factors of impact and many reasons of diseases of the population. But the purposeful ecological policy which compound components can be is necessary for improvement of the environment and decrease in an environmental risk:

- 1) improvement of technological processes in ferrous metallurgy
- 2) high gardening of intracity space with implementation in structure of landings of gas-resistant green plantings.
- 3) creation of an «ecological framework».

Implementation of these actions will allow to reduce step by step risk of emergence of ecologically caused diseases among the population of area and to provide high level of its development.

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