CONFORMATION OF LAND MANAGEMENT IN AREAS OF OPEN AND CLOSED MINING ORE IN THE REGION OF KURSK MAGNETIC ANOMALY

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Abstract

The study of the modern structure of land management on areas of mining complexes accommodation of Kursk magnetic anomaly and for the information support of nature management and promoting the sustainable development of the territory was conducted. The processes of transformation of the landscape architecture of the area with an open and mining method in iron ore production are observed. The skeleton maps of functional use of land on the basis of satellite imagery areas were created.

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Keywords

Kursk Magnetic Anomaly, land management, mining areas, man-made landscapes, remote sensing data, Mining Processing Complex.

1 Introduction

Subjects of nature and sustainable development are relevant for more than one decade. Numerous Russian and foreign researches were focused on the environmental assessment, there are too many full reviews in this area [1]. The wide range of issues (technological, economic, environmental, etc.) exploded wildlife is often studied. At the same time, the research of the aspect of the integrated study of the competitive nature management, characteristic for the long-term development and densely populated regions of Russia was not conducted well. In these studies the maim attention is focused on one main type of natural resources using.

Belgorod and Kursk regions, are Russian regions if the long-term development. They have several major directions of economic development: the area for the resettlement and development of nature-exploiting industries; fertile soil and climatic conditions; limited water resources; the carrying capacity of the environment. In biotechnosphere here are formed four major natural-economic complexes: industrial, mining and industrial, agricultural, recreational-forestry. The value of these systems is determined by the importance and potential of consumer qualities of the natural environment and natural resources as the material basis of the production sector and the health of the population [2]. For the study area, where the main natural resource is black soil, and in opposition to - iron ore and other fields, there is a basic conflict of nature - the development of the mining complex (as well as the residential areas of other industrial and administrative centers) due to seizure and violation of large areas of agricultural land.

Carrying out research concerning the nature of the conflict of nature management in Chernozem regions of the long-term development on the example of the Belgorod and Kursk regions, development of criteria and indicators for sustainable development - is a multi-step process. The first step is the study of the interaction of the key elements of alternative sites and forms of nature. The first phase of research, we have been devoted to the research of the transformation of land

management structure as a result of the mining complex development in the region of the Kursk magnetic anomaly (hereinafter - KMA).

On the territory of Zheleznogorsk district (Kursk region) Open Joint Stock Company „Mikhailovsky Mining Processing Complex“ and related production (below - MMPC) is located. In the Starooskolsko-Gubkinsky mining district of the Belgorod region there is the complex enterprise of Open Joint Stock Company "Lebedinsky Mining Processing Complex " (below - LMPC), Open Joint Stock Company "Stoilensky" (below – SMPC), JSC "Combinat KMAruda" (below - KMAruda) In Yakovlevsky district of the Belgorod region branch of "METAL GROUP: "Yakovlevsky rudnik" (below - Yakovlevsky rudnik) is located. Within the first three complexes iron ore is extracted by the open way from quarries. On the Yakovlevsky mine underground ore extraction is dominated. [3]

The aim is to analyze the structure of the land use for further informational supply of nature management and environmental protection. The most objective assessment of the current use of the land can be carried out by using the decryption of satellite imagery data. The schemes of functional zoning of Zheleznogorsk, the Starooskolsko-Gubkinsky and Yakovlevsky mining areas were carried out. Coverage of the decoding zones was selected conditionally, according to the literature, because the complex effect on the surrounding area of GOKs can be traced to the distance of 20 km and more [4]. Except the structure of the land use the general landscape structure of the areas was observed.

2 The structure of the land management in the industrial area of Zheleznogorsk district

In the overall structure of KMA region the share of the converted industrial lands accounts for only 0.6% of the total; in the areas with open mining, the figure is much higher. So in the 20 km zone of the potential impact of the Mikhailovsky mining complex mining landscapes occupy more than 10 thousand hectares (6.1% of the territory). In addition there is the high share of cultivated and residential areas (for arable land 45.1% of the territory and under the settlements of more than 12%); Total landscape background is formed by the man-made areas and residential landscapes, agricultural landscapes (Fig. 1).

In relation to landscape, the territory of Zheleznogorsk industrial area is the plot of interfluvial landscape with adjacent of valleys in the east and west and river landscapes, rivers confined to the Chern and Rechitsa riverd. It is formed by the Devonian limestones, Jurassic and Cretaceous sands and clay deposits [5].

The terrain is the complex of vertical and horizontal partitioning; it is characterized by a variety of high-altitude stages. Density of valleys and ravines network in the most parts of area varies from 0.7 to 1.3 km / km^2, density of gully network - from 0.1 to 0.4 km / km^2. Surface height above sea level is generally 175-225 m. Absolute height in the floodplains of the rivers today rarely rises above 140-170 m (in the Seim river flood plain the lowest point is 130 m). Total terrain slope is from north-east to south-west, the depth of the river valleys plunging reaches 80-100 m. Woodiness is low. Forests are represented by small gully areas and upland oak woods, to a large extent they are modified by man. [5]

Bad lands are exposed by intense water and wind erosion. This represents a potential environmental threat to the surrounding natural and agricultural lands, residential areas. The alien to this natural-climatic zone ecotopes are formed, which are often colonized by weeds and adventitious plants. The share of quasi-natural ecosystems in the region accounts for just over 37% of the territory and they are presented by forest, gullies and ravines and riparian landscapes (Fig. 2, Table. 1).

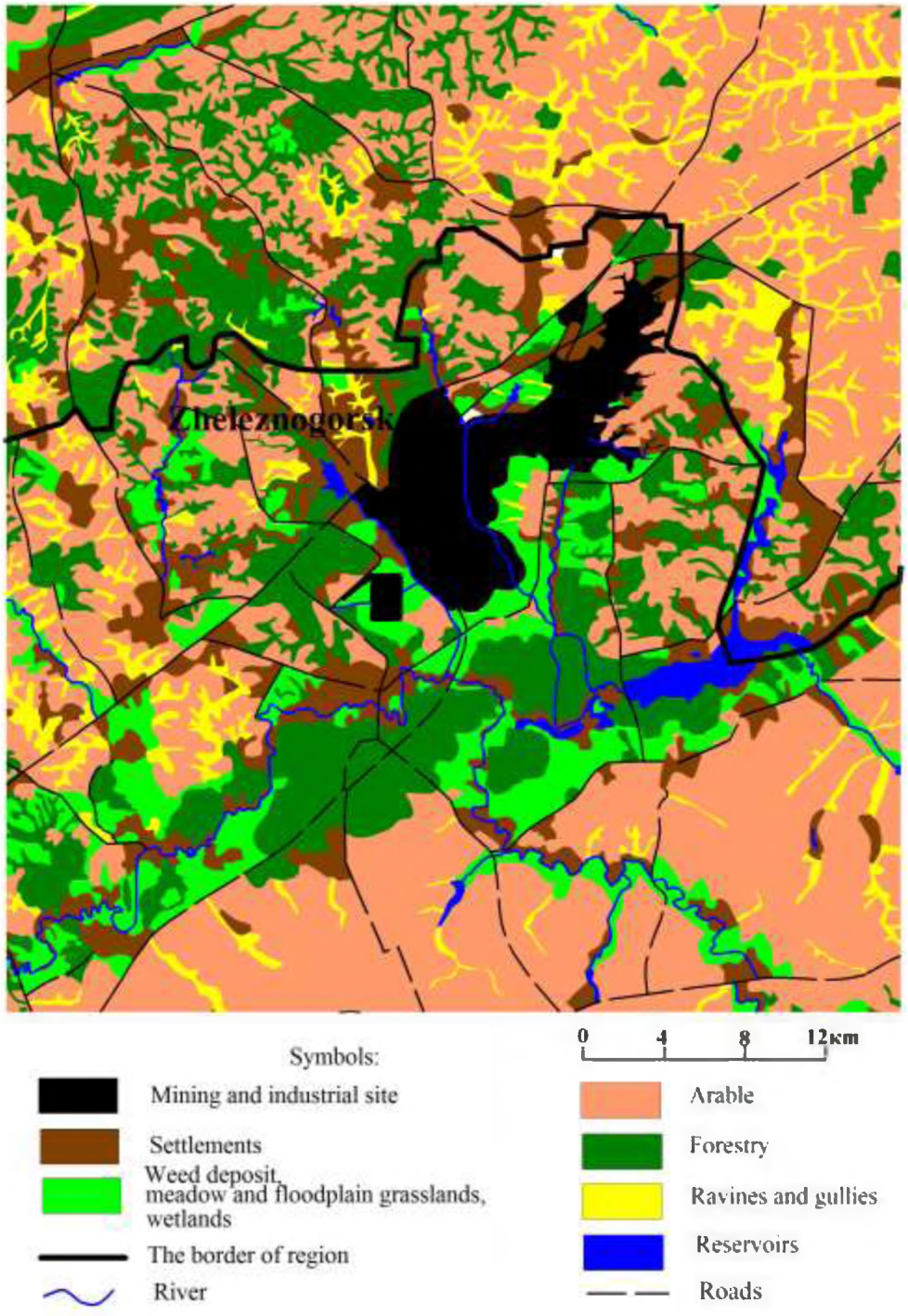

Fig. 1: Functional zoning of Zheleznogorsk industrial area

3 Land management in Starooskolsko-Gubkinsky industrial area

Slightly lower there is the proportion of man-made landscapes in the Starooskolsko-Gubkinsky industrial area (which includes the Lebedinsky and Stoilensky career complexes) - 5.3% of the 20 km zone of potential impact, arable land occupies large area (about 57%), which together with the inhabited territory is about 70% of the converted land. In the immediate vicinity territory is about

Table 1: Explication of lands in the area of industrial plants influence

Industrial zone	**KMA Region [1]**		**MMPC (zone of 20 km)**		**LMPC and SMPC (zone of 20 km)**		**Yakovlevsky mine (zone of 20 km)**	
Type of land	**Area in hectares**	**Share in %**	**Area in hectares**	**Share in %**	**Area in hectares**	**Share in %**	**Area in hectares**	**Share in %**
1. Man-made areas, including:	471256,5	9,2	43268,7	18,8	57110,2	19,2	13946,4	7,9
Mining and industrial site	21977,9	0,4	10479,6	4,5	11104,30	3,7	394,0	0,2
Weed deposits	8724,9	0,2	3622,7	1,6	4867,4	1,6	84,8	0,1
Roads	11978,0	0,2	1040,5	0,5	13134,8	4,4	663,0	0,4
Settlements	437300,6	8,4	28125,9	12,2	28003,70	9,4	12804,6	7,2
2. Areas of intensive agricultural use, including arable land	3235041,0	62,6	104268,7	45,1	168093,50	56,5	117963,3	66,7
3. Semi-naturals ecosystem, including:	1459843,1	28,2	83541,5	36,1	72364,2	24,4	45006,8	25,4
Forestry	392804,2	7,6	46016,20	19,9	27933,50	9,4	13852,9	7,8
Ravines and gullies	444521,1	8,6	15664,80	6,8	22372,80	7,5	17171,7	9,7
Meadow and floodplain grasslands	352984,4	6,8	15082,3	6,5	16313,3	5,5	11175,7	6,3
Wetlands	66630,1	1,3	2685,50	1,2	1346,10	0,5	1154,7	0,7
The water objects, including:	54699,3	1,0	4092,7	1,8	4398,5	1,5	1651,8	0,9
- Ponds, lakes	37631,4	0,7	3411,8	1,5	2916,8	1,0	1234,6	0,7
- River	17067,9	0,3	680,9	0,3	1481,7	0,5	417,2	0,2
In total	5171862,0	100,0	231078,9	100,0	297567,9	100,0	176916,5	100,0

70% of the converted land. In the immediate vicinity of the GOK (1 km from the industrial facilities) there is the reserve plot "Yamskaya Steppe" – cluster of the wilderness area "Belogorye". Its unique steppe landscapes also are partly degraded due to local rise of ground water level in the gully next to tailing [6].

In relation to landscape, the territory of the Starooskolsko-Gubkinsky industrial area is a plot of interfluves landscape with the adjacent north and south valleys and river landscapes, confined to Oskoletc and Chufichka rivers. In the past (until the middle of the XVII century), most of the territory was covered by oak-deciduous forests and meadow-steppe vegetation in some places it has been extended to the southern slopes of hills and river valleys. Under the forests gray forest soils and podzolized chernozems were formed. Interfluves landscape of the "pre-cultural" period could be called the upland broadleaved forest on gray forest soils underlain by loess-like calcareous heavy loams. Valley-river landscapes were broadleaf-forest and meadow forb slopes in conjunction with alder marshy floodplains of river valleys on gray forest, chernozem, meadow-bog and alluvial meadow soils underlain by rocks of various particle size distribution (from the sand to clay). Currently technologically-impaired and transformed landscapes are dominated. A substantial part of the territory (more than 5% within the 20 km zone of potential impacts) engaged directly with quarries, tailing dumps and industrial site with facilities and transport infrastructure [7].

4 The structure of the land management in the Yakovlevsky industrial area

The minimal transformation of the surrounding landscapes is observed in the Yakovlevsky area of the Belgorod region, where ore mining is done by underground (close) method on the basis of the Yakovlev deposit. The total area of man-made landscapes is around 480 ha (0.3% of 20 km zone of potential impacts), formed mainly by the infrastructure of plant complex (overpasses, stowing playground, sand pit, heap oxidized quartzite and others.) (Fig. 3).

Territory of the Yakovlevsky District is situated in the south-western spurs of the Central Russian Upland in the basin of the Vorskla river which is the left tributary of the Dnepr river. Left bank of the Vorskla river basin is flat territory, dominated by plateaus and gentle slopes of the watershed, extending for a dozen of kilometers. The right bank is characterized by more broken relief. The widespread circuslike beams covered in their upper reaches of the gully forests. The surface of such beams is often complicated by the erosion outliers as individual hills [6].

Fig. 2: Zheleznogorsk industrial area

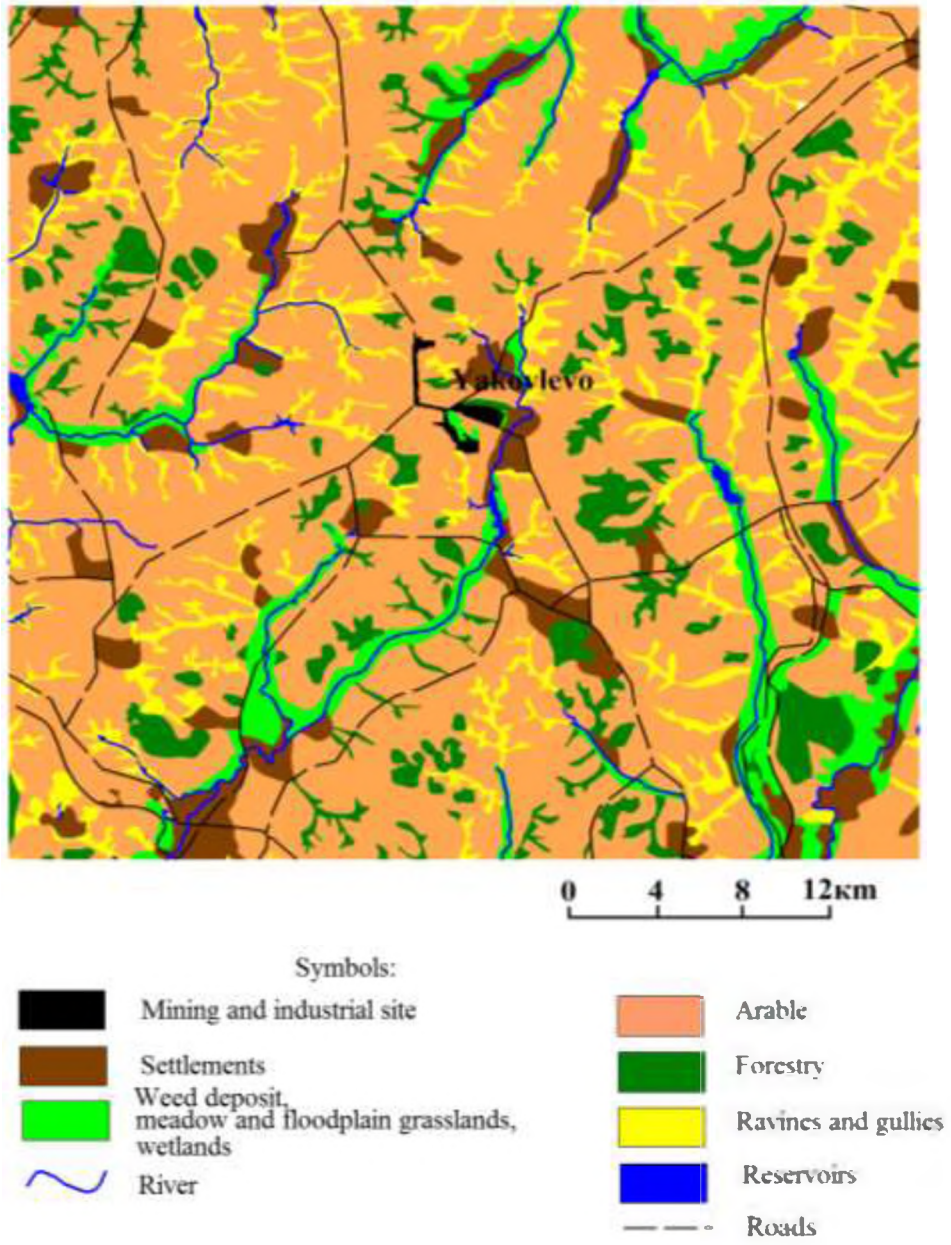

Fig. 3: Functional zoning of the Yakovlevsky mine district

5 Conclusion

All the observed converted mining landscapes of the territory conditionally can be divided into three categories. Firstly it is landscape radically transformed by the man with impaired lithogenic basis and it has nothing common with the original, natural appearance. They are localized within pits, dumps, tailings. In areas with open pit mining the area of these territories is 10-11 thousand hectares, while in the territory of the close mine production their area is not more than 300 hectares. The second category can include natural and man-made landscapes, characterized by a reduced biological productivity due to the indirect impact of the mining industry and the increased activity of exogenous geological processes. Such areas are concentrated around the industrial zones: the outskirts of industrial sites, vacant lots, with intensive transport network area (about 80 hectares on the territory of the closed mining ore and 3-4 thousand hectares in areas of quarrying.). The radius of these zones is 3-5 km around the territory of the mining companies. Next there is a zone of potential indirect effects of MPC (in fact, this influence is not experiencing) to 20 km.

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