

<sup>1</sup>Akpambetova K.M., <sup>2</sup>Rahmetova A.A., <sup>3</sup>Chistova A.A.  
<sup>1,3</sup>*Karaganda State University named after E.A. Buketov, Kazakhstan*  
<sup>2</sup>*Karaganda State Industrial University, Kazakhstan*

## **RELIEF OF URBANIZED TERRITORIES OF CENTRAL KAZAKHSTAN**

The object of research in geomorphology is the relief of the earth's surface. While studying the relief attention is paid to morphological and morphometric parameters, investigated the genesis of relief and determined its age, composed geomorphological map. Certain difficulties arise in the study the relief of urbanized areas. In this article the relief of the mining region of Kazakhstan, especially the relief of Karaganda city was described.



Fig.1. Karaganda is located on that kind of flat relief.

Karaganda was formed in a place of miner settlements (Old Town) and a number of rural localities (Big Mikhailovka, Tikhonovka, Fyodorovka, Maikuduk, Prishahtinsk). Karaganda is characterized by dissociation and dispersion of residential areas and industrial zones. Enterprises are located in four districts of the city - South-East, North-East, West and North. Mines and coal industries are located in the Northern zone, and the transportation and warehousing in the West. The presence of limestone, sand, building stone and clay deposits has created numerous enterprises which produce construction materials. Electroenergy supply of the industrial areas of the region is carried out by Karaganda heat and power plant.

Geological structure of the territory of the city is complex and connected with the geology of Central Kazakhstan. In general territory of the region occupies the middle part of Paleozooids of Central Kazakhstan, including the Caledonian and Hercynian structures. Breeds crumpled into folds, violated by faults and cracks of different directions, intruded by intrusions. Karaganda synclinorium has been studied in detail, which is elongated in the meridional direction. It includes about thirty industrial areas. Middle part of the synclinorium occupies the Karaganda coal basin. The Western part of the synclinorium is characterized by alternating depressions and elevations formed by volcanogenic-terrigenous thickness of the Devonian and lower Paleozoic, and also Graben-synclinoria placed in them Samara and Zavyalovsky deposits of coal. Karaganda coal basin has over eighty coal layers, including about fifty layers operating capacity [2]. The qualitative composition of coal in the layers is uneven, the ash content into them is from 10 to 40%. Large ash content associated with the presence of layers of waste rocks. In addition to coal, the district has a deposits of limonite (Sasyk Karasu), limestone, gypsum, marl, shale, building stone, sandstone, marble. Mineral deposits, especially coal, put Karaganda region in a number of the richest and most industrially developed mining regions. Thus, the development of mineral deposits defines the formation of peculiar relief, which is referred to the mining type. Note also, that the development of mineral deposits contributed to the formation of certain relief processes in the area of research.

Karaganda is located on undulating sloping plain with marks no more than 160 m. The city consists of two parts - the "Old Town" and "New Town". Old Town with mines and processing plants is very extensive, and the New Town with high-rise office buildings, universities, shopping centers is the most comfortable district of Karaganda. Industrial district is divided by the valley of Big Bukpa river. By the river valley descend two ridges – Karaganda-Saransk and Karaganda-Mikhailovka with marks of 560 and 570 meters respectively.



Fig. 2. South-Eastern part of the city. On the background are heaps.

The Old Town district is a sloping plain with small hills separated by broad flat-bottomed hollows and ruts, in which is the flow of atmospheric and mine waters. On high smooth ridges, sloping down to the river, is a New Town. Plain Maykuduk with small hills Ushtobe and Kosoba is located on the East. In general, the relief of the city is favorable for the development of industrial enterprises, for holding the housing-civil construction. Changes in the relief of the city occur in the process of stripping operations and mining. This gives rise to open-cast mines, pits, mines, failing funnels and waste banks. In accordance with the technology of development on the surface the benches and terraces are created. Besides sculptural forms of relief are developing accumulative formations, which are common on the terraces of the lower levels of open-cast mines or occupy the area beyond. Such forms of relief are usually composed of a material that is the result of stripping operations, crushing. On the platforms of the benches it is possible to see the accumulative forms of relief of small size - debris cones at the rear seams accumulated through shedding, landslides and slumping. Resulting from quarrying technogenic forms and microforms of the relief are subjected to the influence of the slope of exogenous processes, which increases the water-erosion activities. Continuous exposure of water-erosion processes on the relief are gradually leads to a smoothing and elimination of irregularities. Modified character of the relief, the increase of positive and negative forms create new conditions for the formation of a microclimate.



Fig. 3. Mines transform the look of the city.

Technogenesis activates the processes of linear erosion, deflation, suffusion, formation of gullies and scours. These and other anthropogenic changes of the relief create new, not typical for the region's soil formation processes, chemical and physical parameters which are in dependence on the lithology of the rocks involved in technogenesis [1,3]. Development of the deposit of fluxing limestone contributes to changing of the relief. At the underground mining cracks, depression funnels appear, drawdown of surface occurs. As a result of subsidence housing complexes might fall within the bottom of the waste mine.

Perhaps the most common forms of the relief of Karaganda are waste banks of conical shape. Waste banks distributed mainly in the industrial part of the city and occupy large areas. Since 2003 the waste rock of slagheaps used as the basis for the roads, laid waste and abandoned mines, bore pits, ditches. Landscapes, placed in them the mining industry have significantly increased air pollution due to weathering of waste rock. Since the early 70s in Karaganda measures to utilization of coal production, including extinguishing and subsequent elimination of waste banks are implemented. A result of such works carried out by the Department of coal, waste banks stopped to emitting smoke. Activation of denudation processes contributed to the formation of powerful centers of accumulation of dust. Denudation of overburden in the dumps, waste banks, mines, quarries and subsequent migration of the contained chemical elements with the formation of secondary habitats scattering is the cause of anthropogenesis. At stockpiling rocks, which are extracted from the array at the sinking of excavations on mines and pits, overburden works in the quarries and branch cuts are formed dumping mounds. Dumping mounds can be diverse in size and shape. Open pit seizures and waste

dumps in most cases represent a lifeless area. Erosion processes, as a result of which incapacitates considerable amount of land, contribute to the accumulation at the foot of the slope of the dump the accumulative material. In the city territory there are several dumps with significant size and pollute the environment as an area, in which it is located, and the city as a whole. As it is visible, the strongest changes of the relief and other natural conditions of the city caused by human activities. Development of mineral deposits, artificial alignment of relief for construction of roads, the presence of quarries and bore pits without their subsequent recultivation, flooding of relief by exhaust mine waters, the presence of closed mines without their subsequent recultivation, the presence of waste rock dumps have led to waterlogging, flooding and subsidence of the most part of relief of the territory of Karaganda.

Currently, South-East district is one of the ecologically clean areas of Karaganda. The relief is lightly wavy, crossed by small ravines and ditches. Along the ditches stretched pipe of heating plants. Out of the four artificial reservoirs available in Karaganda and satellite towns, one is located in the region - Fedorovskoe reservoir.



Fig. 4. Fedorovskoe reservoir.

In modern conditions the territory of the reservoir is used as a recreational area for the population. The South-Eastern area of the city does not have in its territory the industrial enterprises. Here are the mostly university academic buildings, shopping centers, hotels, hospitals, parks, ski-storage, cinemas. Is carried an intensive construction of multi-storey residential arrays and cultural centers.

References:

1. Akpambetova K.M. The impact of technogenic load on the relief development // Modern problems of ecology in Central Kazakhstan: collection of scientific works., Karaganda 1998, p.66-72
2. Kushev G.L. Karaganda coal field. – Alma-Ata, 1963
3. Impact assessment of the ash dump on the components of the environment // PTD report of HES-1. Karaganda, 2000